Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ESSCI
Skilling India in Electronics

Participant Handbook

Sector
Electronics

Sub- Sector
Consumer Electronics & IT Hardware

Occupation
After sales service

Reference ID: **ELE/Q3115, Version 2.0**
NSQF Level 4

Multi Skill Technician (Electrical)

Published by

Electronics Sector Skills Council of India (ESSCI)
155, 2nd Floor, ESC House, Okhla Industrial Area, Phase 3, New Delhi - 110020, India
Email : info@essc-india.org
Website: www.essc-india.org
Phone: +91 11 46035050, +91 8447738501

First Edition, July 2022

This book is sponsored by Electronics Sector Skills Council of India (ESSCI)

"Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission."

Shri Narendra Modi
Prime Minister of India

Skill India
कौशल भारत-कुशल भारत

ESSCI
Skilling India in Electronics

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

Certificate

COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

ELECTRONICS SECTOR SKILLS COUNCIL OF INDIA

for

SKILLING CONTENT : PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/Qualification Pack **"Multi Skill Technician (Electrical)"** QP No.**"ELE/Q3115, NSQF Level 4"**

Date of Issuance: 30.12.2021
Valid up to*: 02.06.2025
*Valid up to the next review date of the Qualification Pack or the 'Valid up to' date mentioned above (whichever is earlier)

Authorized Signatory
Electronics Sector Skills Council of India

Acknowledgments

The need for having a standard curriculum for the Job Role based Qualification Packs under the National Skills Qualification Framework was felt necessary for achieving a uniform skill-based training manual in the form of a participant handbook.

I would like to take the opportunity to thank everyone who contributed in developing this handbook for the Multi Skill Technician (Electrical).

The handbook is the result of tireless pursuit to develop an effective tool for imparting the Skill Based training in the most effective manner.

I would like to thank the team of KontentEdge for their support to develop the content, the SME and the team at the ESSCI along with the industry partners for the tireless effort in bringing the handbook in the current format.

CEO

Electronics Sector Skills Council of India

About this Book

This Participant Handbook is designed to enable training for the specific Qualification Pack (QP). Each National Occupational (NOS) is covered across Unit/s.
Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS.

- Explain the basics of electricity and electronics
- Describe the different types of electrical home appliances
- Describe the roles and responsibilities of a Multi Skill Technician
- Identify the tools and equipment required for repairing and servicing appliances
- Explain the measurement of different parameters
- Describe the various aspects of site inspection
- List the methods to securely troubleshoot a faulty appliance
- Describe the steps of repairing faulty appliances
- Explain how to check tools and equipment
- Describe preliminary fault identification and correction process
- Identify risks and hazards
- List the precautions related to health and safety hazards
- List safe working standards
- Identify the warning signs and labels
- Describe the importance of team work
- Explain work requirements and SOP
- Explain work etiquette

The symbols used in this book are described below.

Symbols Used


Key Learning Outcomes


Steps


Role Play


Tips


Notes


Unit Objectives


Activity

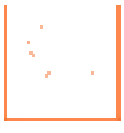

Practical

Table of Contents

S. No	Modules and Units	Page No.
1.	Introduction (Bridge Module)	1
	Unit 1.1 – Introduction to Multi Skill technician (Electrical)	3
	Unit 1.2 – Basics of Electricity	7
	Unit 1.3 – Basics of Electronics	15
	Unit 1.4 – Tools and Equipment	27
2.	Prerequisite of Work (ELE/N3147)	35
	Unit 2.1 – Understanding Customer Complaint	37
	Unit 2.2 – Site Preparation for Work	42
3.	LED Lights Fault Repair (ELE/N3148)	45
	Unit 3.1 – LED Basics	47
	Unit 3.2 – LED Configuration and Thermal Management	56
	Unit 3.3 – LED Light Diagnosis and Repair	65
4.	Small Home Appliances Repair (Geyser and Fan) (ELE/N3149)	73
	Unit 4.1 – Geyser Repairing	75
	Unit 4.2 – Fan Repairing	82
5.	Install and Repair Water Purifier (ELE/N3150)	89
	Unit 5.1 – Basics of a Water Purifier	91
	Unit 5.2 – Installing a Water Purifier	107
	Unit 5.3 – Repairing a Water Purifier	113
6.	Repair Mixer/Juicer/Grinder (ELE/N3151)	123
	Unit 6.1 – Basics of Mixer/Grinder/Juicer	125
	Unit 6.2 – Repair Mixer/Grinder /Juicer	137
7.	Work effectively at the workplace (ELE/N9905)	143
	Unit 7.1 – Effective Communication and Coordination at Work	145
	Unit 7.2 – Working Effectively and Maintaining Discipline at Work	152
	Unit 7.3 – Maintaining Social Diversity at Work	163
8.	Apply health and safety practices at the workplace (ELE/N1002)	171
	Unit 8.1 – Workplace Hazards	173
	Unit 8.2 – Fire Safety	185
	Unit 8.3 – First Aid	189
	Unit 8.4 – Waste Management	193

9. Employability and Entrepreneurship Skills 199

Unit 9.1 – Personal Strengths and Value System 203

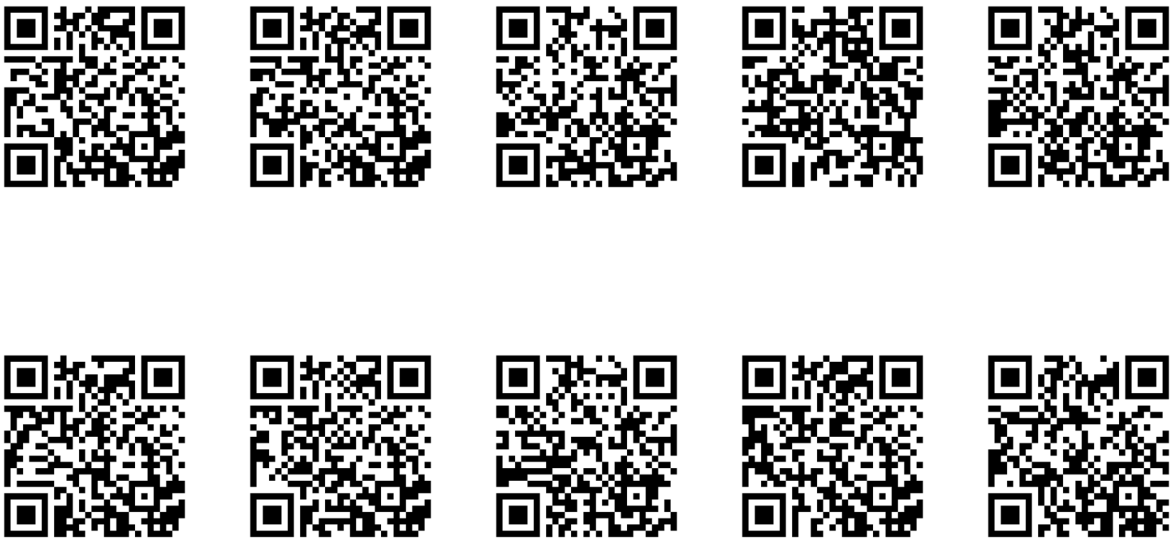
Unit 9.2 – Digital Literacy: A Recap 222

Unit 9.3 – Money Matters 227

Unit 9.4 – Preparing for Employment and Self-Employment 237

Unit 9.5 – Understanding Entrepreneurship 247

Unit 9.6 – Preparing to be an Entrepreneur 268



Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ESSCI
Skilling India in Electronics

1. Introduction

Unit 1.1 – Introduction to Multi Skill Technician

Unit 1.2 – Basics of Electricity

Unit 1.3 – Basics of Electronics

Unit 1.4 – Tools and Equipment

Key Learning Outcomes

At the end of this module, you will be able

1. Identify the role and responsibilities of a Multi skill technician
2. Identify the qualifications required to be a Multi skill technician
3. Use the knowledge of basics of electricity to work efficiently
4. Differentiate between the basic electrical components
5. Use the knowledge of basics of electronics to work efficiently
6. Differentiate between the basic electronic components
7. Identify the types of tools used for service and repair
8. List the equipment used in troubleshooting and repair of appliances

UNIT 1.1: Introduction to Multi Skill Technician

Unit Objectives

At the end of this unit, you will be able to:

1. Identify the role and responsibilities of a multi skill technician
2. Identify the qualifications required to be a multi skill technician

1.1.1 Who is a Multi Skill Technician

A multi skill technician (electrical) finds out and repairs faults in multiple small domestic home appliances. The individual installs the appliance, interacts with customers to diagnose the reported problem and its possible causes and rectifies minor problems or replaces faulty modules and parts. If the problem is major, he/ she recommends factory repairs.

A multi skill technician (electrical) basically finds out and repairs the fault of LED lights and home appliances such as kettle, mixer, water purifier, cooler and so on. He/she also troubleshoots and repairs the appliances at customer location or in a shop.

The following image shows a multi skill technician repairing an LED light:

Fig. 1.1.1: A multi skill technician repairing an LED light

1.1.2 Role and Responsibilities of Multi Skill Technician

A multi skill technician should be able to troubleshoot electrical home appliances such as fan, juicer/mixer, LED lights, water purifier, geyser and so on. The individual needs to perform basic wiring and soldering and use equipment such as a multimeter to check the functioning and performance of the appliances.

The following figure lists the responsibilities of a multi skill technician:

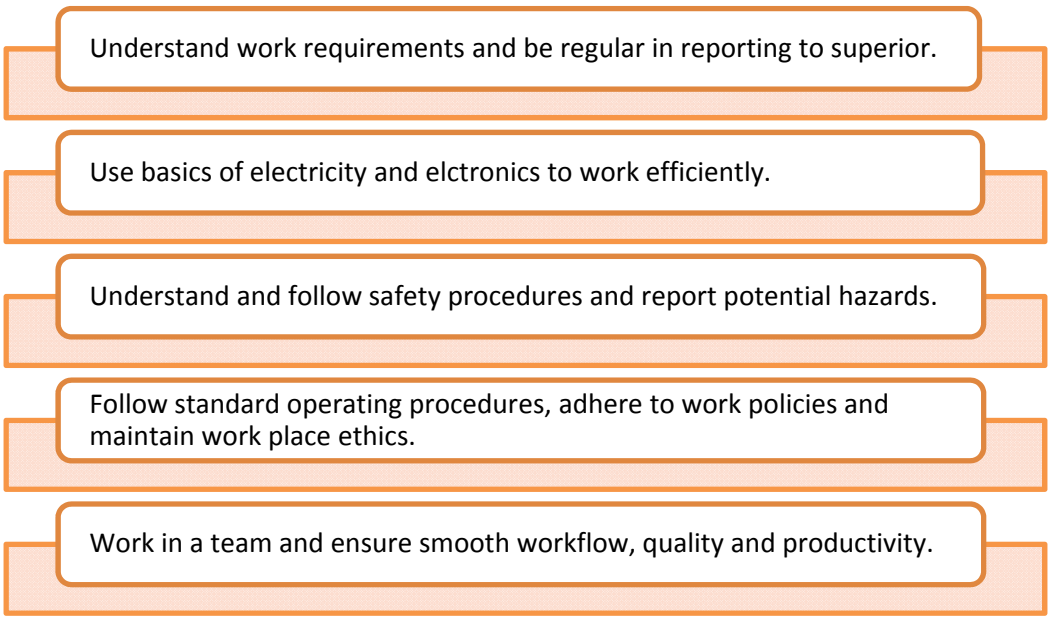


Fig. 1.1.2: Responsibilities of a multi skill technician

1.1.3 Pre-requisites for a Multi Skill Technician

The job of a multi skill technician involves working and managing work on his/her own. The individual, to be an able multi skill technician, must have the following qualities:

- Knowledge of basics of electricity and electronics
- Knowledge of handling and using the tools and equipment
- Attention to details
- Ability to interact with client and work at different client locations

The multi skill technician requires to possess some skills which are essential for his/her job. The following figure lists the skills required by a multi skill technician:

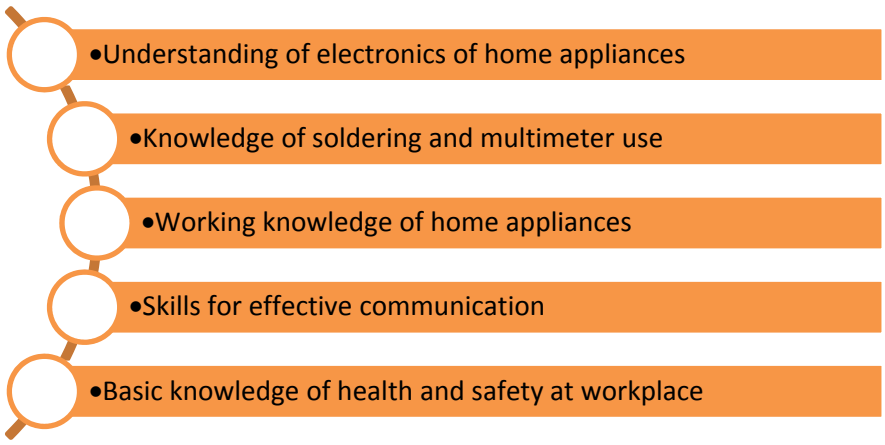


Fig. 1.1.3: Skills required by a multi skill technician

The technician must be qualified enough to be fit for the job role. The minimum qualification required for this role is 8th standard passed and the minimum age required is 18 years. The individual should have adequate decision-making ability to take care of certain problems as mentioned in the following list:

- Repetitive defects
- Machine failure
- Potential hazards
- Process disruptions
- Repair and maintenance of machine

Activity

1. Write three responsibilities of a multi skill technician apart from his/her job role.
   a. _____
   b. _____
   c. _____

2. List the essential skills required by a multi skill technician.
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____

UNIT 1.2: Basics of Electricity

Unit Objectives

At the end of this unit, you will be able to:

1. Use the knowledge basics of electricity to work efficiently
2. Differentiate between the basic electrical components

1.2.1 Electric Circuit

It is a path made by the interconnection of electrical components. Electrons from a voltage or current source flow along this path. The following figure lists the elements present in a basic electric circuit:

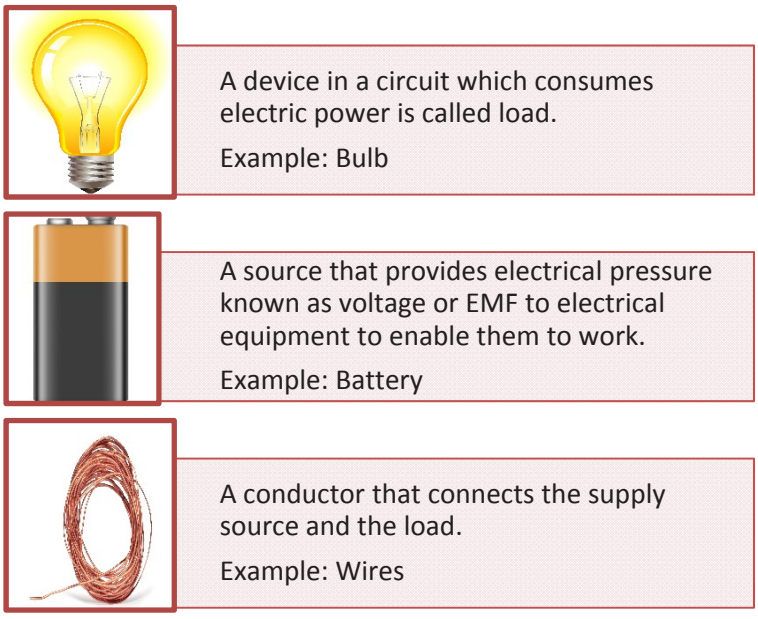


Fig 1.2.1: Electric circuit constituents

In a typical circuit, a battery provides voltage for the load through wires. For example, the required voltage for a bulb to glow is provided by a battery. The following figure shows such an electric circuit:

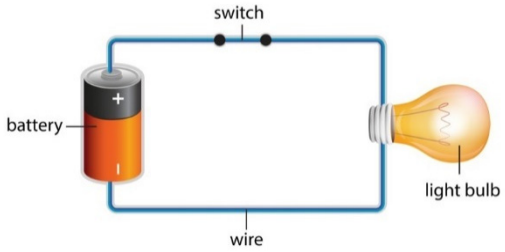


Fig. 1.2.2: An electric circuit

An electric circuit consists of two paths/loops, as shown in the following figure:

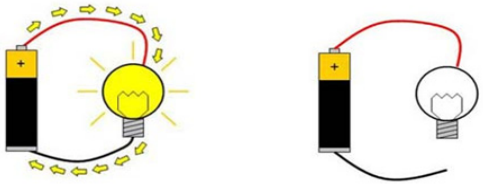


Fig. 1.2.3: Closed path (left) and open path (right)

1.2.2 Types of Electric Circuits

An electric circuit is classified into two types:

- Series circuit
- Parallel circuit

Series Circuit

In this type of a circuit, all components are connected as a chain and the current flowing through each of them is the same all over the circuit. There is a single route through which the current flows. So, the current passes through each and every component. Opening or breaking any point of a series circuit causes the whole circuit to stop functioning, which then needs to be replaced. The following figure represents a series circuit:

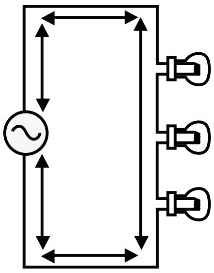


Fig 1.2.4: A series circuit

Parallel Circuit

In this type of a circuit, two or more components are connected in a parallel manner. In a parallel circuit, the components are of the same voltage. The current flow varies across the components. If any point of the circuit gets damaged, only that part needs to be replaced. The following figure represents a parallel circuit:

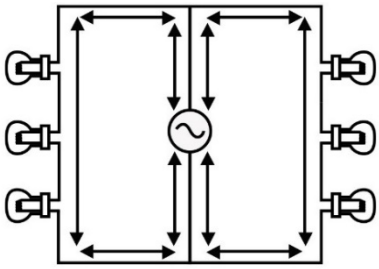


Fig 1.2.5: A parallel circuit

1.2.3 Parameters of Electric Circuit

Electricity is a natural force that comes into existence whenever there is a flow of electric charge between any two components. When working with circuits, awareness about some of the basic concepts of electricity is needed, otherwise wrong connection in a circuit may cause a high damage to the user and the circuit components. The main parameters associated with electricity are as follows:

- Voltage
- Current
- Resistance

Voltage

A force that causes electricity to move across the wire/cable is known as voltage. It can also be defined as the variance in the charge between the points of a circuit. Depending on the voltage, the electric current flows through a medium of a specific resistance. Volt is the unit of voltage and is denoted with letter V.

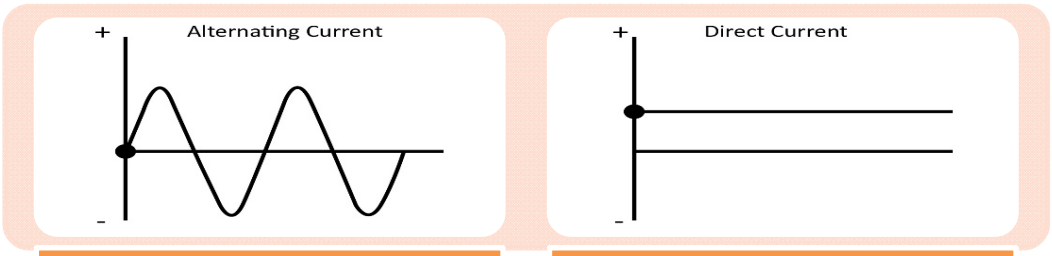
Current

Electric current, or simply current, is the flow of electric charge carried through electrons moving across wires. Ampere is the unit of current and is denoted with letter I. The units of current are listed in the following table:

Unit	Denoted by
Micro-Ampere	(μA) = 10-6A
Millie-Ampere	(mA) = 10-3A
Ampere	(A)

Alternating Current (AC) and Direct Current (DC) Current

The following figure shows the two types of current sources that are dependent on the direction in which the electrons flow:



AC can be defined as the flow of current in which electrons keep switching directions, going either forward or backward.

In this, the magnitude of induced current varies with time.

Types of AC are sinusoidal, trapezoidal, triangular and square.

DC can be defined as the flow of current in which the drift of electrons remains steady either in a single direction or forward.

In this, the magnitude of induced current remains constant.

Types of DC are pure and pulsating.

Fig 1.2.6: Difference between AC and DC current

Resistance

Resistance, as the word suggests, causes hindrance to any occurring force. In other words, it is an obstruction caused by a substance to the current flow. The unit of resistance is ohm and it is denoted with the symbol, Ω. According to Ohm's law, 1Ω resistance allows 1A of current to flow from one point to the other with a 1V voltage difference.

1.2.4 Ohm's Law

According to Ohm's law, the flow of current through a conducting material is directly proportional to the conductor's voltage. The mathematical formula of Ohm's law is as follows:

I = V/R

In this formula,

I is the current

V is the potential difference and

R is the resistance

Ohm's law states that resistance R in an electric circuit is constant and independent of the current I flowing through the circuit as shown in the following figure:

Fig 1.2.7: A simple electric circuit

1.2.5 Power Calculation and Energy Consumption

When electricity flows in an electric circuit, it results in some work done. For example, when it flows in a fan, the fan's blades rotate and when it flows in a refrigerator, it cools the items kept inside. Thus, when electricity flows through an appliance, it results in some work done. To calculate the electricity consumed, the following two parameters need to be considered:

- Power
- Energy

Power

The rate at which electrical energy flows through an electric circuit is known as electric power. Similar to mechanical power, electric power is the rate of doing electrical work, measured in watts (one joule per second) and denoted by *P*. The term wattage often refers to electric power in watts.

Thus, to denote the electric power (in watts) given by an electric current I consisting of a charge of *Q* coulombs in every t seconds through an electric potential (voltage) difference of V, use the following equation:

P= work done per unit time =-VQ/t = VI

Energy

If the electric power is the rate or speed of work done, then electric energy is the total amount of work done in a given time period. It is a product of the power of an electrical appliance and the duration of its usage. Electric energy can be explained with the following equation:

Electrical Energy(E) = Power(P) x Duration of Energy usage (T) = Power (Watt) x Time (hour)

E (Wh) = P (W) x T (h)

Power = Energy / Time

Example:

Electricity charges are paid based on "Units of Consumption".

1 unit = 1 kwh

If 500w is used for a device for 4 hours, then consumption is = 0.5 kw * 4 Hrs. = 2 Kwh (2 units). By multiplying the power consumption with the rate of electricity, the electricity bill for the usage is determined.

1.2.6 Earthing

The set of parts of an electric circuit connected with ground electricity is called as earthing.

Steps to check earthing

Step 1: Set the multimeter knob to 750V AC and connect the red probe into phase and black probe into neutral. Keep the switch in off position; the reading should show zero.

Step2: Turn on the switch and measure the voltage across phase and neutral. It should read 235V.

Step 3: Measure by inserting the black test probe in earth and red test probe in phase. Let the reading be "234" V.

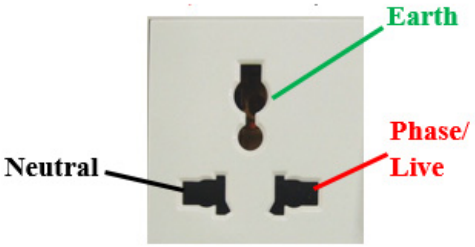


Fig.1.2.8: Earth, neutral & phase/live terminals

Step 4: Next, measure by inserting the red probe in earth and black probe in neutral. Let the reading be "001" V.

Step 5: If the difference is zero, it means the earthing is perfect.

As per standard norms, the difference between earthing and neutral should not be more than 3 V.

(Up to 3V is an acceptable value.)

1.2.7 Measurement of Electrical Parameters

There are many types of measuring tools available to measure voltage, current, power and energy. Some of the measuring tools are as follows:

- Multimeter
- Clamp Meter

Multimeter

A multimeter can be used for measuring voltage, current and resistance. It can also be used to detect faults in small circuits or to find out the broken wires in a circuit. It can be of two types. The following figure shows the two types of multimeters:

Analog Multimeter

It consists of a needle which points at the scale built on it for giving the measured value.

Digital Multimeter

It is an electronic meter which displays the measured values in a digital form.

Fig. 1.2.9: Types of multimeters

Usually, a standard multimeter can measure the following electrical quantities:

- DC Voltage
- DC Current
- AC Voltage
- AC Current
- Resistance

Clamp Meter

An electrical tester which combines a multimeter with a current sensor is known as a clamp meter. The probes in the device measure voltage, whereas the clamps measure the current. The clamps are the hinged jaws joined to an electric meter that allow the users to clamp around the cable/wire for measuring the current without disturbing any other element. While using a clamp meter, the wire/cable to be measured is not disconnected.
The following images shows types of clamp meters:

Fig. 1.2.10: Types of clamp meters

Usually, a standard clamp meter can measure the following electrical quantities:

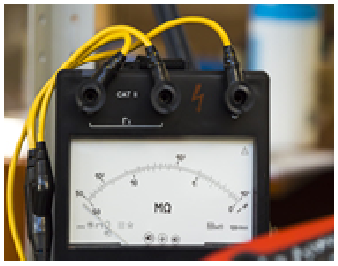
- AC current
- Temperature
- AC voltage
- Capacitance
- DC voltage
- Resistance
- DC current
- Frequency

Activity: Identification Game

Answer the following questions.

1. Which of the following equipment is used to measure voltage?

❑ Clamp meter



❑ Megger

❑ Ammeter

2. What is the mathematical formula of Ohm's law?

❑ I = P/V ❑ I = V/R ❑ P = -VQ/t

UNIT 1.3: Basics of Electronics

Unit Objectives

At the end of this unit, you will be able to:

1. Use the knowledge of basics of electronics to work efficiently
2. Differentiate between the basic electronic components

1.3.1 Electronic Component

An electronic equipment is made of various electronic components. Each electronic component comprises of electrical terminals, either two or more than two. These terminals are generally soldered onto a PCB to form a circuit that can perform a particular function, such as that of an amplifier, radio, mobile phone and so on.

Electronic components may be classified into three categories; active, passive, and electro-mechanic.

A circuit consists of a number of components that may be electrical, electronic, mechanical and so on. The following figure shows various types of circuit elements or components that are used in a control panel:

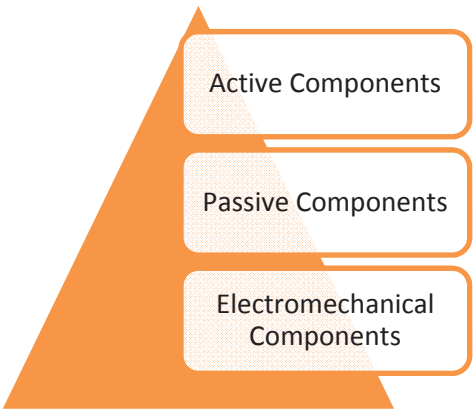


Fig. 1.3.1: Circuit elements

Active Components

Active components are those which are capable of amplifying (increasing the power of a signal) or processing electrical signals. They derive power from the DC source and increase the power of signals. These include components such as transistors, diode and so on.

Passive Components

A component is defined as a passive component if it does not require a separate power source for its operation. The only thing that is required for its operation is the AC flowing in the circuit. A passive component does not produce any power gain. Examples of passive components are inductor, resistor, transformer and capacitor.

Electromechanical Switches

A switch is considered as an electromechanical part as it has manual operation. However, the term electromechanical component is generally used for devices such as relays and vibrators which permit a voltage or current to regulate other separate voltages and currents that use mechanical switching of sets of contacts and solenoids. By this process of regulation, a voltage can activate a moving linkage. Vibrators change DC to AC by utilising vibrating sets of contacts.

1.3.2 Active Components

Active components depend on a source of energy to perform their functions. These components can amplify current and can produce a power gain. The following figure lists the different types of active components in a circuit:

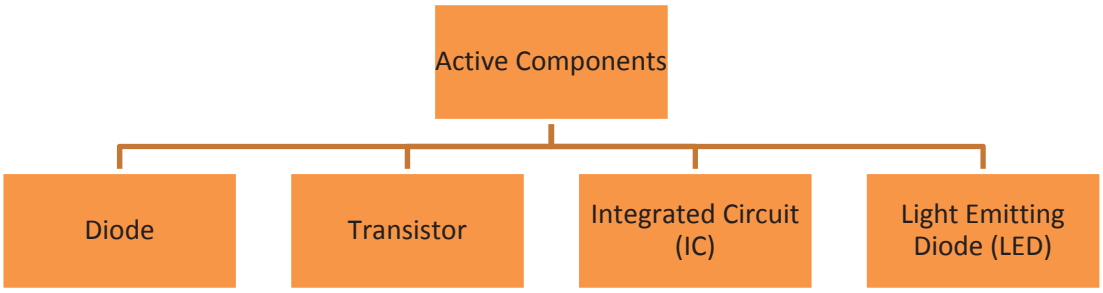


Fig. 1.3.2: Active components

Diode

A diode is a specialised electronic component with two terminals known as the anode and the cathode. It has asymmetric conductance, which means that it conducts mainly in one direction. It has very less resistance, ideally zero, to the flow of current in one direction whereas it has high resistance, ideally infinite, in the other direction. Diodes are usually made up of semiconductor materials such as germanium, silicon or selenium. Appliances such as microwave oven, water purifier and mixer/ juicer/ grinder have this component. The following image shows diodes:

Fig. 1.3.3: Diodes

Transistor

A transistor is an electronic device that is made up of semiconductor material. Usually, it consists three or more terminals for connecting to an external circuit. It is utilised to amplify or switch electrical power and electronic signals. Appliances such as microwave oven, water purifier and mixer/juicer/grinder have this component.

The following image shows a transistor:

Fig. 1.3.4: Transistor

The following figure lists the different types of transistors:

•Bipolar Junction Transistor (BJT)	•Junction Field Effect Transistor (JFET)	•Metal Oxide Semiconductor FET (MOSFET)
It is utilised in LED Driver for current control. The types are NPN and PNP	It is utilised in LED Driver for voltage control. The types are N-channel and P-channel	It is utilised to control the voltage in LED Driver. The types are depletion type (n- and p-channel) and enhancement type (n- and p-channel)

Fig. 1.3.5: Types of transistors

IC

An IC, also known as a microchip, is a semiconductor wafer on which a number of small resistors, capacitors and transistors are fabricated. It can work as an oscillator, an amplifier, a timer, a counter, a microprocessor or as computer memory. Appliances such as microwave oven, water purifier and mixer, juicer and grinder have this component. The following image shows an IC:

Fig. 1.3.6: IC

The two main advantages of ICs over discrete circuits are listed in the following figure:

Cost	•The cost of ICs is low because, instead of constructing each transistor at a time, photolithography is used for printing the chips along with all their components as a unit.
Performance	•Packaged ICs utilise less material than discrete circuits. •Their performance is high as their components switch quickly and use up less power than the components of a discrete circuit. •Less power consumption and quick switching happens because of the small size and closeness of the components.

Fig. 1.3.7: Main advantages of ICs

ICs are utilised in almost all electronic equipment nowadays and have brought a revolution in the world of electronics. An IC could be an amplifier, a microprocessor or a USB to serial converter. The low cost of ICs has made computers, mobile phones and other digital home appliances an essential and familiar part of modern society.

LED

An LED is made of a p-n junction diode which releases light when it is activated. It is a two-lead semiconductor source of light. Energy is released as photons when a suitable voltage is applied to the leads. It gives a visual feedback for the circuit. LEDs can be seen on laptops, mobile phones, cameras, and in cars. Nowadays, LEDs are even used for general lighting. Appliances such as microwave oven, water purifier and mixer/ juicer/grinder have this component. The following image shows an LED:

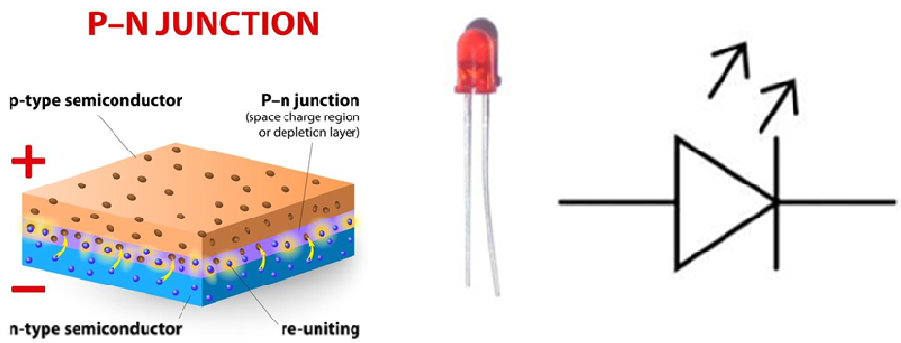


Fig. 1.3.8: LED

1.3.3 Passive Components

Passive components are those components which can perform their specific functions without any power source. These components are incapable of controlling current. The following figure lists the different types of passive components in a circuit:

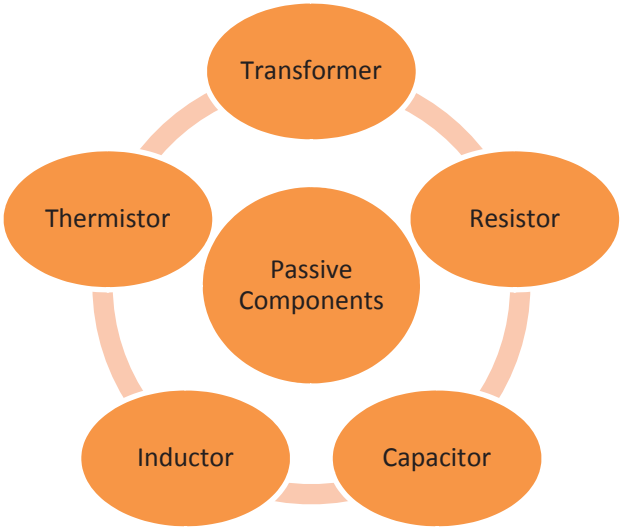


Fig. 1.3.9: Passive components

Transformer

A transformer consists of a metal core with coils of wire around it. It is a device used to convert AC to the required values by decreasing or increasing the alternating voltages in an electronic or electric system. Appliances such as microwave oven, water purifier and mixer/ juicer/ grinder haves this component. The following image shows a transformer:

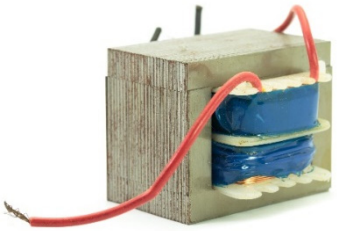


Fig. 1.3.10: Transformer

Resistor

A resistor is a component in an electronic circuit which is built to resist or limit the flow of current in that circuit. It may be a small carbon device or big wire-wound power resistor. Its size varies in length from 5mm up to 300mm. Appliances such as microwave oven, water purifier and mixer/ juicer / grinder have this component. The following image shows resistors:

Fig. 1.3.11: Resistors

Resistors can be of two types:

i. Fixed resistors – These comprise of metal films, wires having high resistance or carbon constituents.

ii. Variable resistors – These possess terminal resistance that can be changed by moving a dial, a screw or something similar and appropriate. Resistance is measured in ohms (Ω) 1000Ω = 1kΩ, 1,000,000Ω = 1MΩ

A resistor can also be rated according its capacity to carry power, such as 1/4W, 0.5W, 1W, 5W and so on.

Capacitor

A capacitor is a device which is made up of one or more pairs of conductors and an insulator that separates them. It is used to store electric charge. Appliances such as microwave oven, water purifier and mixer/ juicer / grinder have this component.

The following image show capacitors:

Fig. 1.3.12: Capacitors

The following figures lists the types of capacitors:

•Polarised	•Non-polarised
•Examples are electrolytic capacitors.	•Examples are film capacitors, ceramic capacitors, paper capacitors and so on.

Fig. 1.3.13: Types of capacitors

The capacitor's ability to store an electrical charge on its plates is called its capacitance. The unit of capacitance is farad (F) and it is denoted by the symbol C. It is always positive. A capacitor is said to have the capacitance of one Farad when a charge of one coulomb is stored on the plates by a voltage of one volt. Sub-multiples of farad are commonly used, such as micro-farads, nano-farads and pico-farads, as farad is a big unit of measurement.

Standard Units of Capacitance

Microfarad (µF) 1µF = 1/1,000,000 = 0.000001 = 10^{-6} F

Nanofarad (nF) 1nF = 1/1,000,000,000 = 0.000000001 = 10^{-9} F

Picofarad (pF) 1pF = 1/1,000,000,000,000 = 0.000000000001 = 10^{-12} F

Inductor

An inductor consist of a coil or a wire loop. This component is used to store energy in form of magnetic field. The more the turns in the coil, the more will be the inductance. Appliances such as microwave oven and water purifier have this component. The following image shows inductors:

Fig. 1.3.14: Inductor

The different types of inductors are listed in the following figure:

Fig. 1.3.15: Types of Inductors

Inductance is the ratio of the voltage to the rate of change of current and its unit is Henries (H). Inductors generally range from 1 µH (10−6H) to 1 H. Most of the inductors have a magnetic centre within the coil, which strengthens the magnetic fields, and thus the inductance. Inductors are extensively used in AC electronic equipment, especially radio equipment. They are used to allow DC to flow but not AC. Inductors specifically made for this function are known as chokes, which are also used in electronic filters to divide signals having different frequencies. When these inductors are combined with capacitors, they form tuned circuits. These circuits are typically used to tune radio and television receivers.

Thermistor

A thermistor is a kind of resistor which is more sensitive to temperature as compared to other resistors. It is extensively used as an inrush current limiter, temperature sensor, self-regulating heating element and self-resetting overcurrent protector. Appliances such as microwave oven and mixer/ juicer/ grinder have this component. The following image shows a thermistor:

Fig. 1.3.16: Thermistor

1.3.4 Electromechanical Components

Electromechanical components convert electric energy to mechanical energy (mechanical movement) or vice versa for carrying out electric operations.

The following figure lists various electromechanical components:

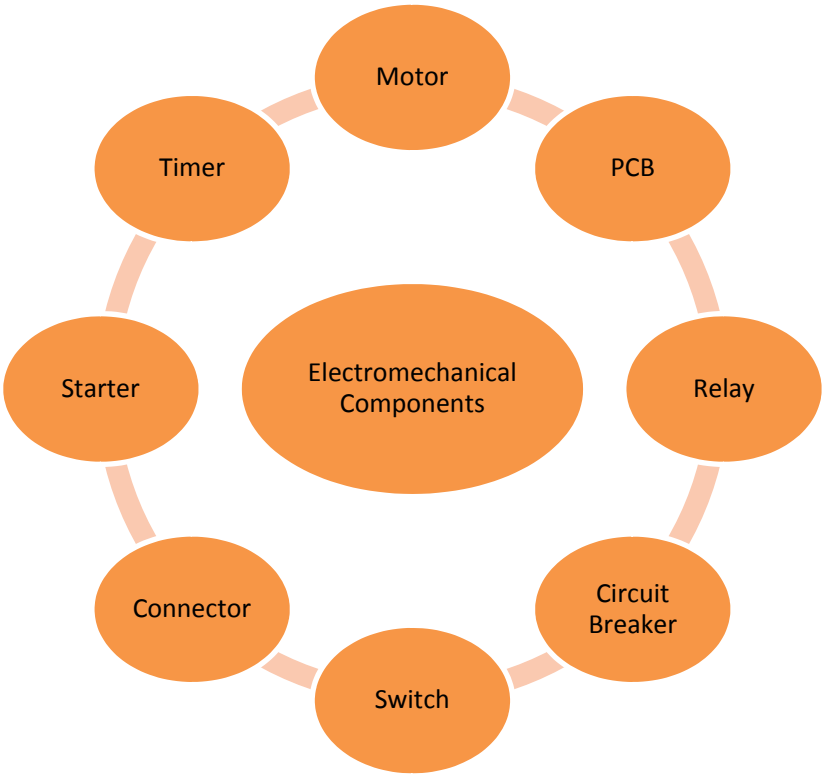


Fig. 1.3.17: Electromechanical components

Motor

A motor is an electrical component which is used to transform electrical energy into mechanical energy to produce linear or rotary force. Unlike magnetic solenoids, they generate usable mechanical powers. In a normal motoring mode, force is generated inside the motor through the interaction between its winding currents and magnetic field. Appliances such as water purifier and mixer/ juicer / grinder have this component. The following image shows the motor used in a mixer grinder:

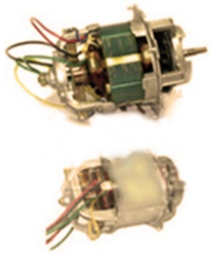


Fig. 1.3.18: Mixer grinder motor

Printed Circuit Board (PCB)

A PCB acts as a base for many items such as the components that are mounted on its surface and interconnected with wires, conductive tracks and so on. The components are generally soldered on the circuit board according to the specified design. Appliances such as microwave oven, water purifier and mixer /juicer/ grinder have this component.

The following image shows a PCB:

Fig. 1.3.19: PCB

Connector

A connector is a device which is used to join two circuits together. The connector may be a port, a plug, a cable connector and so on. All appliances have this either in the form of a cable connector or a plug, as shown in the following image:

Fig. 1.3.20: Plug

Switch

A switch is a component used to make or break connections in an electrical circuit. A switch is used to divert the current from one conductor to another one. It can be operated manually to control a circuit such as a light switch or can be operated by a moving object. It is made to control a wide range of currents and voltages. The following image shows a typical switch used in small appliances such as a mixer/ juicer/ grinder:

Fig. 1.3.20: Rotary switch

Relay

A relay is a switch that controls an electrical circuit by opening and closing contacts in another circuit, electromechanically or electronically. In electromechanical relays, the opening and closing of contacts is done by the magnetic force of an electromagnet. The electromagnet is a coil of wire wrapped round an iron core. In solid state relays, the switching is electronic as there are no contacts. Appliances such as microwave oven and water purifier have this component. The following image shows both the types of relays:

Fig. 1.3.21: Solid state relay and electromagnetic relay

Circuit Breaker

A circuit breaker is a requisite component of an electrical power system required for its control and protection. It is a switching device which can be operated manually as well as automatically. Its main function is to shield an electric circuit from harm caused by overload or short circuit. It interrupts the current flow when protective relays find out a fault. Appliances such as microwave oven and mixer/ juicer/grinder have this component. The following image shows a circuit breaker:

Fig. 1.3.22: Circuit breaker

Starter

A starter is a device that is used to start, stop, reverse and protect a motor. It controls the supply of electric power to the motor. It has two important parts, contactors and overload protection. Appliances such as microwave oven and mixer/ juicer /grinder have this component. The following image shows a starter:

Fig. 1.3.23: Starter

Timer

A timer, also known as a time switch, is a special type of clock that measures time intervals. It operates a switch that is controlled using a timing device. A timer may be built into a power circuit such as a water heater timer. It may also be built into an equipment such as a timer that turns off cooking in a microwave oven after a set period.

The following image shows an appliance that has a timer:

Fig. 1.3.24: Appliance with a timer

1.3.5 Resistance Colour Coding Table

Colour coding was formulated to identify small sized resistors on which the resistance value could not be printed. The colour bands should be interpreted as follows:

i. Colour bands should be read from that end which has the bands nearest to it.

ii. The 1st and 2nd bands stand for the first two digits.

iii. The 3rd band represents the power-of-ten multiplier (the number of zeroes after the second digit).

iv. The 4th band represents the manufacturer's tolerance (accuracy of the resistor).

The following figures show the colour coding table for resistors:

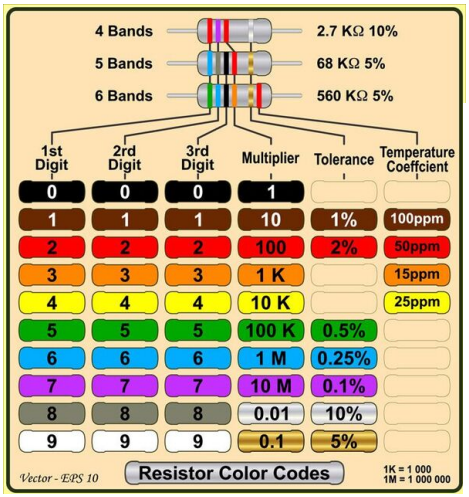
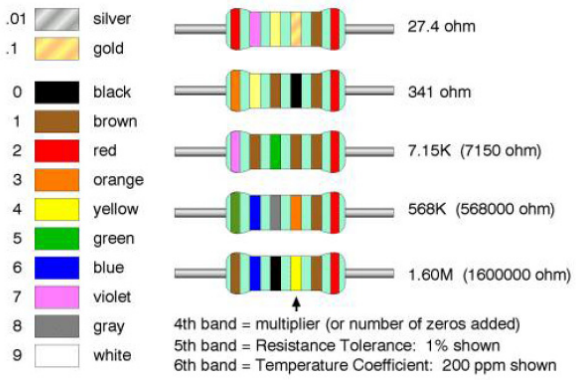
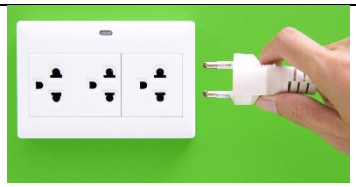
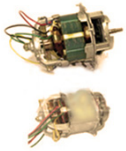


Fig. 1.3.25: Colour coding table for resistors



Activity: Identification Game

The following table shows the images of components typically used in home appliances. Match the images with their names.

1. Solid state relay	
2. Timer	
3. Inductor	
4. Starter	
5. Motor	
6. PCB	
7. Plug	

UNIT 1.4: Tools and Equipment

Unit Objectives

At the end of this unit, you will be able to:

1. Identify the types of tools used for service and repair
2. List the equipment used in troubleshooting and repair of appliances

1.4.1 Introduction to Tools

Tools are non-consumable items that can be used in installing or servicing electronic appliances. Tightening of bolts, stripping wires and measuring angles and length can be easily done with the help of specific tools.

Hand tools are the tools which are operated easily to perform tasks by using power and grip of hand. Some examples of hand tools are screw driver, hammer, measuring tape and wrenches.

Tools are essential for a multi skill technician as they help a technician to complete the task of installing appliances easily with less effort.

The following image shows the basic tools used in installation of appliances:

Fig. 1.4.1: Tools used in appliance installation

1.4.2 Basic Tools

The following tools are used for basic installation and servicing of appliances:

1. **Detachable small handle screwdriver**: This is a screw driver which can be used from either end. One end has a '+' shape for '+' shaped screws and the other end is for '-' shaped screws.
2. **Detachable long handle screw driver:** This is similar kind of a screw driver with a long stem. It can be used from either of its two ends. One end has a plus '+' shape for '+' shaped screws and the other end is for minus'-' shaped screws.
3. **Slim line slot head screw driver:** This is a screwdriver that is used to access the regions which cannot be reached with hands or even fingers. It has a long and thin stem and a minus'-' shape.

4. **Round screw driver:** This is used to screw and un-screw various types of screws such as minus '-', plus '+', star '*' and hexagonal screws. It has a magnetic front socket which can hold bits of various shapes.
5. **Bit pad:** This is a pad with eight-ten bits of varied shapes that are used with a round screw driver.
6. **Extension bit/rod:** This is a component that is attached to the front of a round screw driver to increase its length. Once attached, it increases the reach of the screw driver by an inch to three-four inches. The following image shows a screw driver set:

Fig. 1.4.2: Screw driver set with bits

7. **Tester**: This is used to check the presence of electric current in various sockets and wires during an installation process. The following image shows a tester:

Fig. 1.4.3: Tester

8. **Double ended round spanner:** This is a round spanner that can be used at either end. Each end has a different size. Generally, a set of spanner has a combination of sizes 10-11mm, 12-13 mm or 13-14mm.
9. **Simple spanner:** This is a normal spanner (wrench) which can be used from either end. These are two in number. One is a combination of 10-11mm and the other is a combination of 12-13mm and 14-15mm. The following image shows a spanner set:

Fig. 1.4.4: Spanner with wrench heads

10. **Adjustable wrench:** This is a spanner that can be adjusted as per the head size of a nut/bolt. It is helpful in situations where the installation engineers encounter a head which is either bigger or smaller than the limited sized spanner they otherwise carry along with them.

11. **Measuring tape:** This is a self-retracting pocket tape measure which is used to measure wall thickness and other measurements while carrying out installation. The following image shows a measuring tape:

Fig. 1.4.5: Measuring tape

12. **Spirit level meter:** This is an ideal tool for precise determination of horizontals, inclines and angles of surface. The following image shows a spirit level meter:

Fig. 1.4.6: Spirit level meter

13. **Heavy duty hammer:** This is used for driving nails, fitting parts and breaking objects. It has a handle and a head, with most of its weight in the head. One side of the head has a little slit that is used to pull out nails from walls or wooden brackets. The head of the hammer can be used as a reliable guide for minimum bend radius of coaxial cable while clipping it to the wall. The following image shows a heavy duty hammer:

Fig. 1.4.7: Heavy duty hammer

14. **Pliers:** Pliers are hand tools, designed primarily for gripping objects by using leverage. Three types of pliers are used by installation engineers. These are as follows:

    a. **Combination pliers:** These are used to grip small objects, to cut and bend wire and cable and to hammer other small tools such as a chisel or screwdriver and small nails. These pliers have a gripping joint at their snub nose, and a cutting edge in their craw. They also have insulated handle grips that reduce (but do not eliminate) the risk of electric shock from contact with live wires.

    b. **Side cutter or heavy duty cutter:** These are used to cut wires and nails.

    c. **Wire stripper/cutter:** This is used for stripping wires to remove their insulation while leaving the wire intact. It is an adjustable plier which can be adjusted using a screw driver to enable its usage on a thicker wire as well.

The following image shows cutters and pliers:

Fig. 1.4.8: Cutters and pliers

15. **Compression tool**: This is used to compress the connector on to the wire end. The connector is then connected to the LNBF of Antenna or to an STB jack.
16. **Cable preparation tool:** This is used to cut a cable and prepare it for use during installation. The following image shows cable crimping tools:

Fig. 1.4.9: Cable crimping tools

Note: Compression and crimping tools are generally used together. Crimp tool is used to cut the wire and the compression tool is used to fix the connector to the end of a wire. The outer sheet of a coaxial cable should not be cut manually as it may cause problems later.

17. **Component box:** This is a small box to keep small spare parts like screws, nuts, bolts, p-clips ans so on.
18. **Drill machine:** This is used to create holes and through-holes in concrete and masonry (max. diameter 20 mm). It is also used for drilling metal sheets, wood, drywall and driving screws. It operates at 600 W. It can be operated in two modes; normal as well as hammer. The normal motion is a rotatory motion whereas hammer motion is a combination of rotatory and hammer motion. There are separate bits for both the modes. The following image shows a drill and its drill bits:

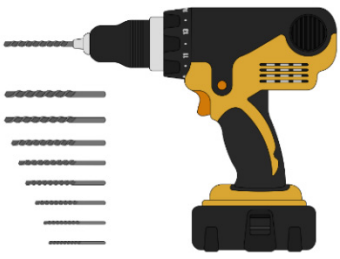


Fig.1.4.10: Drill machine and drill bits

19. **Bits:** Just like a drill machine has two modes, normal and hammer, bits are also of two types. One set of bit is used for normal drilling whereas the other is used for hammer drilling. Hammer drilling bit has got a different shape and has grooves for better grip. It

is generally used for concrete and comes in varied sizes such as 6mm, 8mm, 10mm, 12mm and of 47mm length.

20. **Digital multimeter**: This is an electronic device which is capable of taking various electronic measurements such as of current (both AC and DC), voltage and resistance. Advanced multimeters have a variety of other functions such as measurement of frequency (not up to a high level of precision), capacitance and temperature. The following image shows a multimeter:

Fig. 1.4.11: Digital multimeter

21. **Torch:** This is a battery operated source of light. It is kept in a tool kit and is used in case the light fades or is not appropriate during the time of installation.

22. **Hacksaw**: It is used by a technician to cut a plastic pipe or a plastic conduit. It is a hand saw with a C shaped frame which holds a blade. The following image shows a hacksaw:

Fig. 1.4.12: Hacksaw

23. **Cutting knife:** This is used at workplace to cut the tape of sealed package without damaging the packaging content. It is also known as a utility knife. The following image shows a cutting knife:

Fig. 1.4.13: Cutting knife

24. **Keyhole saw:** This is used to cut holes in a drywall or softer woods to install a new electric switch in the wall. It has a plastic or wooden handle with a pointed blade. In some keyhole saws, various blades can be fitted in the same handle. The following image shows a keyhole saw:

Fig. 1.4.14: Keyhole saw

25. **Tube cutter**: This tool is used to cut a copper or a plastic pipe in a clean, convenient and fast manner. It is also known as a pipe cutter. The following image shows a tube cutter:

Fig. 1.4.15: Tube cutter

26. **Torque wrench:** This is used to measure the torque in nuts or bolts. It is mainly used in prevention of over tightening of bolts and in underground steam pipe and water pipe repairs. The following image shows a torque wrench:

Fig. 1.4.16: Torque wrench

27. **Wrench:** This tool is used to turn fasteners such as nuts and bolts by applying torque and tightening the screw. The following image shows a wrench:

Fig. 1.4.17: Wrench

28. **Refrigerant gas detector:** This tool is used to detect a gas leak around an appliance or in the surrounding. The following figure shows a gas detector:

Fig. 1.4.18: Gas detector

29. **Digital clamp meter:** An electrical tester which combines a multimeter with a current sensor is known as a clamp meter. The probes in the device measure voltage whereas the clamps measure the current. The clamps are the hinged jaws joined to an electric meter that allows users to clamp around the cable/wire anytime for measuring the current without disturbing any other element. While using a clamp meter, the wire/cable to be measured is not disconnected.
The following image shows clamp meter:

Fig. 1.4.19: Clamp meter

1.4.3 Safety while Handling Tools

The tools selected for a particular set of job should be specifically suitable for the job. A tool should have a proper handle grip so as to avoid slipping of the tool while working. The tools should be used only for the purpose they are made for and not for any other purpose. They should be used under safe working limits as per their design specification.
A technician should always wear personal protective wear such as safety gloves, safety helmet, safety goggles, safety shoes, ear protecting plugs and safety mask.

The following images show personal protective equipment (PPE):

Fig. 1.4.20: PPE

The tools should be carried in a toolbox in a managed and organised way. They should be kept at a secure place to avoid any unauthorised access and to prevent any occurrence of an accident due to them. Before initiating work, the work piece should be checked to prevent any damage to the tool to be used on the work piece.

While starting to work at heights, the tools should be tied or put in a safe place to avoid dropping them due to any reason such as slipping. The tools should be operated in correct position and with proper strength so that they can be held and operated effectively. While using the tools, the correct procedure should be followed as per the manufacturer's instructions. While using sharp edged tools, it should be ensured that the direction of movement of the tool should be away from the body. After completion of work, the tools should be put in their appropriate place securely.

1.4.4 Maintenance and Housekeeping of Tools

As tools are essential for a multi skill technician, regular maintenance and check needs to be done to maintain the tools in good condition. Using or working with a damaged, broken or unsuitable tool is hazardous.

To keep the tools in good condition, the following steps should be checked:

- Get the tools from the store as per the requirement and return the tools in good condition after completion of work.
- A regular routine check of the tools should be done to examine the condition of the tools.
- Get the damaged and worn out tools fixed, else get the tools replaced.
- Before and after completion of work, clean the tools properly.
- Edges of sharp edged tools should be maintained sharp.
- The tools should be kept properly in the store department in appropriate toolboxes.
- Sharp tools should be kept with protective guard over their sharp edges.
- Broken tools should be discarded with care.
- Regular examination, repair and maintenance of the tools should be carried out only by a competent person.

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ESSCI

2. Pre-Requisites of Work

Unit 2.1 – Understanding Customers' Complaints

Unit 2.2 – Preparing Site for Work

Key Learning Outcomes

At the end of this module, you will be able to:

1. Prepare a to-do list before visiting customer premises
2. Explain how to interact with customers
3. Follow proper procedure to identify faults and offer solutions
4. Test the functionality of the repaired module
5. Explain the procedure for taking customer feedback
6. Select the location for ceiling fan installation
7. Choose the type and size of fan based on room dimensions

UNIT 2.1: Understanding Customers' Complaints

Unit Objectives

At the end of this unit, you will be able to:

8. Prepare a to-do list before visiting customer premises
9. Explain how to interact with customers
10. Follow proper procedure to identify faults and offer solutions
11. Test the functionality of the repaired module
12. Explain the procedure for taking customer feedback
13.

2.1.1 Customers' Concerns

A multi skill technician is responsible for the maintenance and repair of RO systems installed at customers' premises. It is very important for the technician to clearly understand the concerns of the customer. The following figure represents the various activities which should be done before scheduling a visit to the customers' premises:

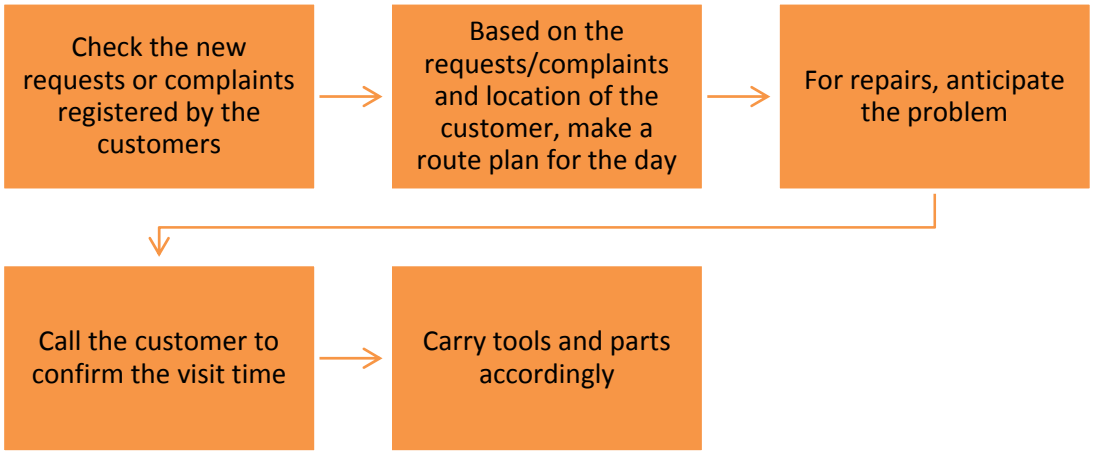


Fig 2.1.1: To-do list for a technician

Interaction with Customers on Phone

Prior to visiting a customer's premises for repairing/servicing, it is important to call the customer and ask about the problem in detail.

The following figure highlights the to-do list to be followed when on a call with a customer before visiting the premises:

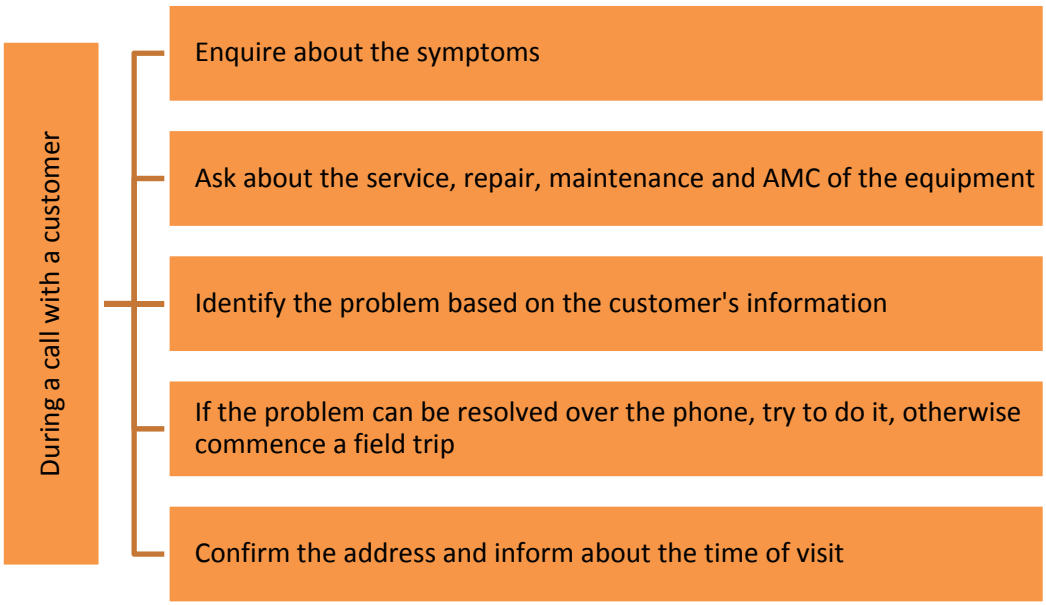


Fig 2.1.2: Interacting with customer on phone

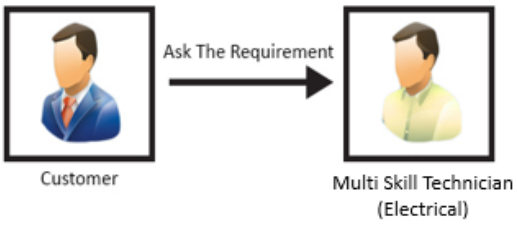
Interaction with Customers at Their Premises

It is a good practice to be humble and respectful towards the customer. The following figure represents how to interact with a customer when visiting the premises for service/repair:

Fig 2.1.3: Interacting with customer

2.1.2 Identification of Faults

It is very important for a technician to identify the fault correctly. Wrong identification of fault will lead to wrong solution, which will be waste of time and money and can also cause damage to the appliance.



When visiting a customer for a repair/servicing request, it is important to know the details of the problem and accordingly suggest a corrective measure. The customer should be satisfied with the suggested solution. The following figure highlights the to-do list to be followed at a customer's premises:

At customer's premises	Enquire about the symptoms and history of problem
	Ask about the year of purchase, service and warranty
	Identify the problem based on customer's information and examination
	Communicate the identified problem to the customer and inform about possible reasons
	Inform the customer regarding the costs involved and hand over the invoice after task is completed
	Ensure service is provided to achieve 100% customer satisfaction

Fig 2.1.4: To-do list to be followed at a customer's premises

2.1.3 Suggestion of Solution to Customer

After identifying the issue, the multi skill technician needs to offer solutions. He/she should explain all possible solutions along with the cost associated. He should then propose the best solution and let the customer decide whether to go ahead with the given solution or not.

The following figure shows the steps involved in offering solutions to a customer:

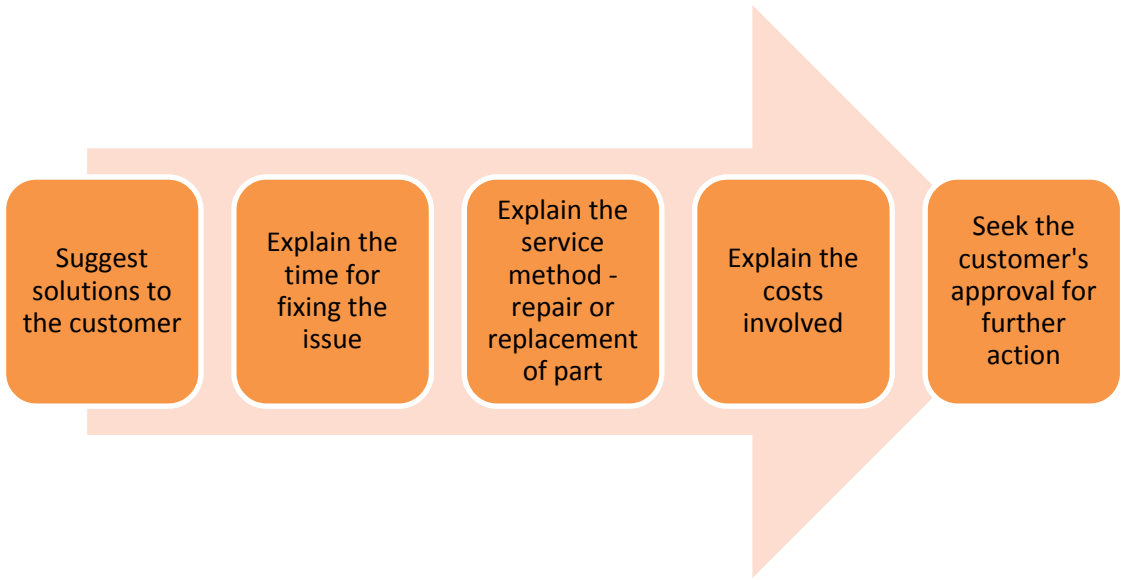


Fig 2.1.5: Suggesting a solution to the customer for an issue

Confirmation of Functionality of a Repaired Module

Once the component has been repaired, ensure that the unit/component is functioning properly with the repaired or replaced parts. The following figure lists the checks that should be performed after repairs are complete:

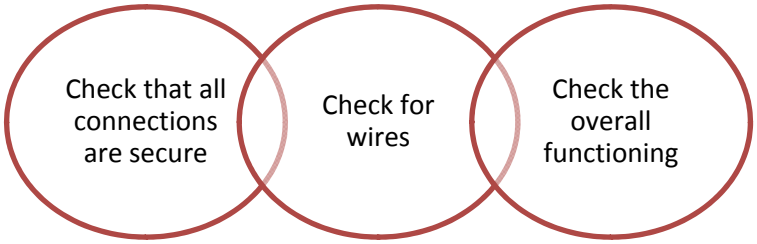


Fig 2.1.6: Checks performed after repairs

Collection of Feedback from Customers

The last step of understanding a customer's concerns is to take feedback from the customer. This is the most important step for an organisation. The procedure as shown in the following figure should be followed:

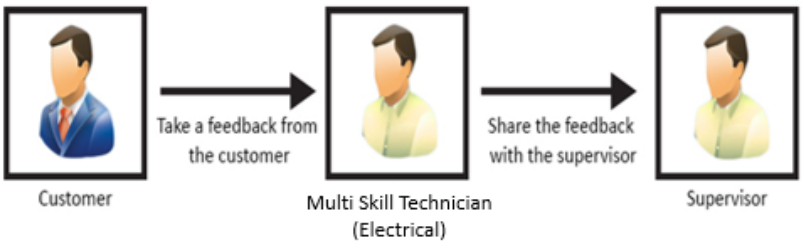


Fig. 2.1.7: Procedure to be followed for taking customer feedback

The time taken to resolve an issue and the difficulties that a customer encountered while communicating the problem should be understood. The misunderstandings observed during the interaction should be clearly documented.

The methods of interaction and behavioral aspects also need to be considered in drawing conclusions after each task or problem handling routine. Getting honest feedback from the clients helps to improve the organisational functioning.

The multi skill technician can get a feedback form filled by the customer at the facility. The following figure shows a typical template for a customer feedback form:

Customer Feedback Form

Please fill the form. We value your feedback.

Date: _____ Location: _____

Service: Complaint ☐ New Connection ☐

1. How would you rate our service?

☐ Very Good

☐ Good

☐ Poor

2. Did the technician come with all the necessary tools and equipment to do the job?

☐ Yes ☐ No

3. Did the technician behave politely with you?

☐ Yes ☐ No

4. Did the wireman have knowledge of the work to be done?

☐ Yes ☐ No

5. Any suggestion which you would like to share.

Fig. 2.1.8: A sample customer feedback form

UNIT 2.2: Site Preparation for Work

Unit Objectives

At the end of this unit, you will be able to:

1. Select the location for ceiling fan installation
2. Choose the type and size of fan based on room dimensions

2.2.1 Site Visit

Pre-installation Site Visit:

- Confirm the location address of the customer prior to the visit.
- Schedule the visit to the customer's premises.
- Check if the location meets structural requirements such as distance from the floor, ceiling and size of the room
- Check if the location meets electrical requirements such as power socket, earthing and wiring connection at ceiling where the fan should be installed
- Measure the dimensions of the room to install ceiling fan.
- Based on the dimensions, select the type of fan required and educate the customer in selecting the type of fan.
- The following table specifies the recommended fan size according to the room area:

Room Area (Sq. feet)	Fan Size (in mm)
<35	600
35 - 65	900
65 - 100	1200
100 - 225	1400
>225	Two or more fans are required

- Make the customer aware of any pre- installations/masonry/electrical work to be carried out at the location of installation.
- Seek appointment with customer for next visit to install the appliance.

2.2.2 Site Selection

- Plan the optimum route to reach the customer location.
- Carry the right tools and equipment recommended for the installation.
- Carry the recommended accessories and the extended warranty plans as applicable.
- In most of the sites, ceiling fans are installed at the centre of the room.
- From the centre, the fan provides smooth air flow throughout the room.
- Check the wiring at the junction box present at the centre of the ceiling.
- With the help of a line tester, check the power in the wires by turning the connection switch ON and OFF.

- Check for proper earthing of fan switch board.
- Check the distance of the fan from the surrounding to maintain proper airflow. The following image shows distance of a fan from the surrounding walls:

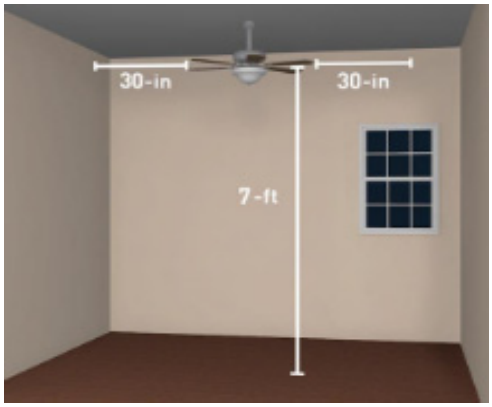


Fig.2.1.1 Recommended distance from sides and floor

Notes

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

3. LED Lights Fault Repair

Unit 3.1 – Light Emitting Diode (LED) Basics

Unit 3.2 – LED Configuration and Thermal Management

Unit 3.3 – LED Light Diagnosis and Repair

Key Learning Outcomes

At the end of this module, you will be able to:

1. Explain the evolution of High Power LED
2. Demonstrate LED working principle
3. List the parameters which affect the overall life of an LED
4. Identify various types of LED
5. List the advantages of LED light product
6. Explain colour rendering index and LED power source selection
7. Explain the various components of an LED luminiary
8. List the steps to be followed for LED driver selection
9. List the parameters which affect the overall life of an LED
10. Identify various types of LED configurations.
11. Explain the passive thermal designs for an LED
12. List the different reasons for LED failure
13. Explain the types of LED luminaire failures
14. Demonstrate the steps of diagnosing and repairing LED faults
15. List the key points to manage productivity and quality standard

UNIT 3.1: Light Emitting Diode (LED) Basics

Unit Objectives

At the end of this unit, you will be able to:

1. Explain the evolution of High Power LED
2. Demonstrate LED working principle
3. List the parameter which affect the overall life of LED
4. Identify various types of LED
5. List the advantages of LED light product
6. Explain the colour rendering index
7. Use the appropriate power source for an LED

3.1.1 Introduction to LED

An LED is a light emitting semiconductor electronic component. LEDs serve as a suitable replacement for halogen or standard light because they consume less energy and have a longer life. Also, they are brighter, smaller in size, capable of faster switching and more durable and reliable.

History of LED

LEDs have been used for many years in various areas of application which include industrial systems, advertising fields, light devices and car lights. The technical development of LEDs continues to stride ahead. In recent years, the luminous efficacy of white LEDs has risen to 130 lumens per watt and even more. This development of LEDs will continue in the future.

In 1907, an Englishman, Henry Joseph Round found out that inorganic materials can light up when an electric current is applied. In 1921, a Russian physicist, Oleg observed the "Round effect" of light emission. In 1935, a French physicist, Georges Destriau discovered emission of light in zinc sulfide. He is the inventor of electroluminescence. An American researcher, Nick Holonyak, developed the first red luminescence diode (type GaAsP). This first LED in the visible wavelength area was the beginning of the industrially -produced LED. With development of new semiconductor materials, LEDs began to be produced in new colours such as green, orange and yellow. In 1993, Shuji Nakamura developed the first brilliant blue LED and later the white LED. The first light-emitting diodes with 100 lumens per watt were manufactured in 2006.

Since 2010, LEDs with a luminous efficacy of 250 lumens per watt are being produced under laboratory conditions. Organic light-emitting diode (OLED) is seen as the future technology.

3.1.2 Working of LED

An LED comprises of several layers of semi-conducting material. When the diode is being utilised with DC, the active layer produces light. The light is decoupled directly or through reflections. The LED emits light in a particular colour and this colour is dependent on the

type of semiconductor material used in it. LEDs with a high degree of brightness, in all colours, can be produced by two material systems. Different voltages are needed to use the diode in forward bias. The following diagram shows the origin of the LED technology—Electroluminescence:

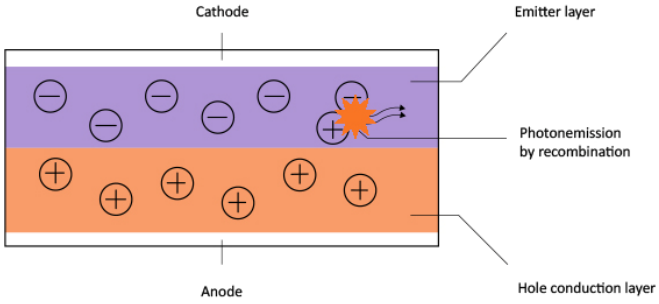


Fig. 3.1.1: Origin of the LED technology—Electroluminescence

In LED chips, on application of certain voltage, electromagnetic radiation in the form of light is given out.

LEDs are made of semiconductor crystals and when current flows through them, they emit light in the colours of red, green, yellow or blue, depending on the composition of the crystal compounds. Blue LEDs also emit white light if a yellowish fluorescent layer is used or a mix of red, green and blue LEDs (RGB) is created. The latter method is used for giving decorative effects to lighting.

3.1.3 Advantages of LED Technology

LED technology has many advantages over other lighting technologies. The consumers' profit from various possibilities of design due to a wide choice of colour and dimensions. LEDs have high economic benefits due to consumption of less energy, long life and better service intervals. They are reliable even in adverse environmental conditions. The following figure lists the advantages of using lights having LED technology:

1.It involves low consumption of power and provides immediate light when switched on.
1.It exhibits high level of efficiency and has long life.
1.It shows continuous dimming along with an ECG.
1.It has small dimensions and shows high resistance to switching cycles, impact and vibration.
1.It has a wide range of operating temperature.
1.It gives out no UV or IR radiation.
1.It possesses high colour saturation level without filtering.
It has no mercury.

Fig. 3.1.2: Advantages of lights with LED technology

3.1.4 Types of LEDs

There are basically three type of LEDs. The following figure shows the types of LEDs:

Indicator type or low power LED's, also called PTH LED

- These LEDs are generally available in 5 mm size, but also come in 3 mm and 8 mm sizes.
- They typically possess two “legs” and a narrow beam spread of 15˚ to 30˚.
- These LEDs have low power and function on currents from 20 mA to 100 mA. The heat produced is dissipated within the LEDs.

Illuminator type or power LED's, also called SMD LED

- These LEDs were first available in the market as effective packages of 1W and operated at 350 mA. Later, 3W and 5W high power LEDs were manufactured. These LEDs are soldered on a PCB directly.
- They provide a path which is thermally conductive for extracting heat and benefit from much better heat extraction.
- High power LEDs are available in various shapes and sizes.

Chip on board (COB)

- These LEDs are utilised for closely packed high-power LED modules.
- COB technology is used to place the LED chips directly onto the PCB. The beam spread can be narrow or wide angle.

Fig. 3.1.3: Types of LEDs

3.1.5 Factors Affecting Life of LED

LEDs can have an operating life of more than 50,000 hours. As compared to other light sources, LEDs seldom fail and are generally service free. The exception is the luminous flux whose life slightly decreases over the operating period. The following are the factors that can affect the entire LED module. The following figure lists the factors influencing an LED module:

Temperature

- When light is produced, heat too will be generated. This affects both the life cycle of an LED and its luminous flux and is applicable to an individual LED as well as the entire LED module. Thus, installation methods or suitable heat sinks should be used to diffuse the heat.
- The lower the temperature at which an LED works, the better will be its performance and life.

Mechanical influence

- Mechanical forces can influence an LED at various stages. This can happen when the LED is being manufactured, assembled or handled otherwise.
- It can also occur due to the use of certain materials which develop these forces during big temperature fluctuations.
- These forces can have a negative effect on the operating life of an LED or even damage it.

Current

- There is a specific current range within which an LED module should be operated.
- Even within the range, lower the current is, lesser will be the energy released and lower will be the heat produced.
- The current, thus, has a direct effect on the operating life of an LED.

Radiation and light

- An LED's housing design plays a vital role in the aging process of the components, which are influenced by the light given out by the chip.
- The built-in reflector ages faster within the first few hundred operating hours in some housing designs due to the high intensity and luminance of the light given out by the chip.

Dampness

- An LED by itself is strong and non-sensitive. It is unaffected by vibrations and is unbreakable.
- However, many metal components, connections and electronic parts inside it are sensitive and may get corroded due to dampness, thus, causing the module to fail.
- An appropriate choice of materials for the LED protects it from corrosion. If high operating life of the LED modules is desired than protection from dampness is a must.

Chemical influences

- Chemical influences can have varying influences on an LED depending on the location of the application.
- Hence, while setting up an LED lighting system, the environmental conditions must be kept in mind.

Fig. 3.1.4: Factors influencing an LED module

The following conditions of the environment have a negative effect on the operating life of an LED:

- If the atmosphere is corrosive (the air has high sulphur dioxide content)
- If the climate is coastal with medium salt content
- If there is a chemical industry nearby
- If it is in a swimming pool with medium chloride content

3.1.6 Colour Rendering Index

Colour Rendering Index (CRI) is used to know how well the colours of the objects are rendered by the light sources. The CRI has a scale from 0 to 100. It has a reference light source with which the light source rendering colour is compared and its performance is judged. Incandescent lamps, having a CRI of 100, are taken as the reference light source. The more the CRI, the better will be the colour rendering ability of the LED. CRI is, therefore, an important parameter to evaluate the quality of light.

However, the CRI measure of light sources can only be compared if they have the same colour temperature. The following image shows a colour temperature scale:

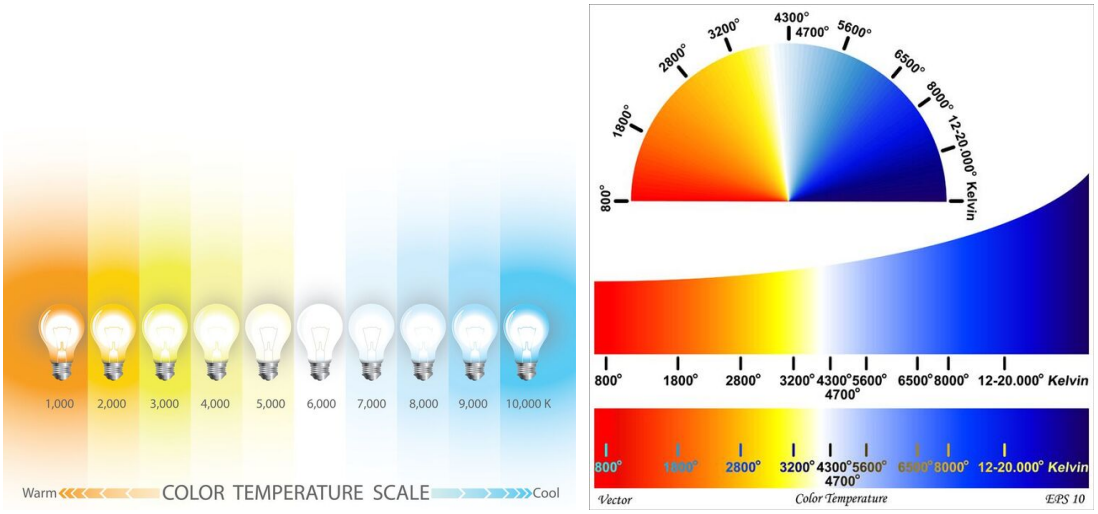


Fig. 3.1.5: Colour temperature scale

LED products with CRI greater than 80 are considered best for indoor application. Products with a CRI less than 80 are suitable for outdoor application.

Correlated Colour Temperature (CCT)

The colour characteristics of light as warm (yellowish) or cool (bluish) can be described by determining its colour temperature. It is measured in Kelvin (K).

In case of an LED light, there are primarily three types of white colours: warm white, natural white and cool white. The colours below 3000 K will seem yellow or orange, while those at 4000 K will appear almost neutral. When the colour temperature falls, the light seems warmer, and as it rises, it is cooler. Generally, most LED lights make CCT from 2700 K – 6700 K. The exceptions are a few special applications, such as decorative lights, aquarium lights and glow lighting.

The following figure shows different colour temperature LED lighting for different places:

Public applications	People mostly use warm white LEDs of 2800 – 3500 K to promote relaxation.
Hotel lighting	Hotel lobbies go for cool white LEDs of 5500 – 6500 K, while rooms generally have warm white lights of 2700 – 3200 K.
Office lighting	Offices usually have natural white LED of 4000 – 5000 K to cool white with CCT of 5500 - 6500 K to enhance concentration.
Warehouse lighting	Warehouse mostly use natural white light of 4000–5000 K or cool white light of 5500 – 6500 K.
Shopping mall lighting	Malls generally go for warm white lights with CCT OF 2700 –3200 K. Within the mall, different areas use different lighting—natural white with 4000 –5000 K and cool white with 5000 – 6500 K.

Fig. 3.1.6: Different colour temperature LED lighting for different places

3.1.7 LED Power Sources

The difference between powering an LED and other electronics product lies in the source of power. This is because a constant current source is required by an LED while most others need a constant voltage source. Hence, a dedicated power supply requires to be implemented to power the LEDs in a circuit.

The power supply must be able to provide a high voltage known as the forward voltage (V_f) that is enough to illuminate the LED. It should also provide controlled constant current known as forward current (I_f). Current above the value of I_f may damage the LED and the light output depends on the forward current. The following figure shows the diagram of an LED:

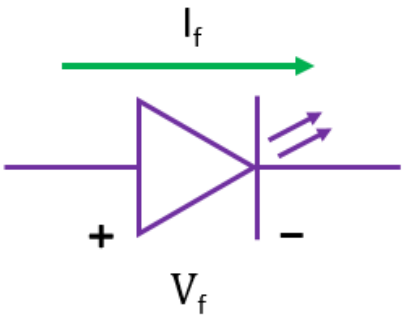


Fig. 3.1.7: Diagram of LED

LEDs can be categorised as:

- LEDs used as indicators: These use low power and are used to light a small indicator such as the one on a laptop that shines when the hard drive is on. The requirements are generally 10 mA to 20 mA.

- LEDs used for lighting: The power required for these is greater than that used for the indicator ones. Inefficient methods for powering LEDs result in huge power losses that are counterproductive, because LEDs are chosen to maximize the efficiency of lighting systems over others. LEDs may require hundreds of mAs (typically 350mA) to provide the light output that they are supposed to produce.

The light output is measured in:

- Candelas: It is the power of a light source that is emitted in a particular direction.
- Lumens: It is the amount of light that is produced from a source of 1 Candela in a solid angle of 1 steradian (SI unit of solid angle).

The LED applications specify high luminous intensity and therefore, the supply of power should be efficient and the output current must be controlled with accuracy. The following image shows a power LED:

Fig. 3.1.8: Power LED

The easiest method of supplying power to an LED is to utilise a DC constant voltage source that is already giving power to the other electronics within the circuit. The current can be typically regulated using a series resistor. This method proves to be cost-effective and useful, especially if other components already have power. The following figure shows the circuit diagram of such an LED:

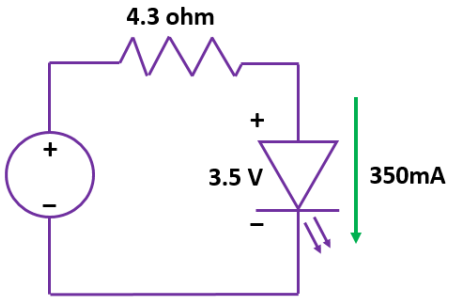


Fig. 3.1.9: Circuit diagram of LED

Indicator LEDs are generally powered by this method. For lighting applications, there are some drawbacks of this method and one of them is inefficiency. There is loss of power across the resistor in the form of heat. For example, if a 10V source is used to provide power to an LED with a Vf of 4.5V and an If of 450 mA, it results in a 1V drop across the resistor. This will lead to power wastage.

P = VI

P = (1V) (0.45A) = 0.450W

That means that there is 450 mW wastage in powering just one LED. One more drawback of this method is lack of control over the current. Vf can vary from one LED to another and, consequently, the voltage drop across the resistor too can vary. As a result, the current can vary across the various LEDs and so will the light output. In the case of multiple LEDs being powered, these drawbacks become even more prominent. If there is a 10V supply, the LEDs would have to be supplied power in parallel. Power would be dissipated across many resistors and the light output could vary from one LED to another. Thus, instead of using a current limiting resistor having a constant voltage source, it would be more suitable to arrange a constant current power supply. Many simple linear constant current supplies exist, but the most efficient is a switching mode power supply (SMPS). This can be explained with the help of the following example:

There is power loss in the linear supply due to voltage conversion. If a linear regulator is being utilised for the conversion of 12V to 3.5V and the load is 350 mA, the total power consumed can be given as:

P (total) = (12V) (0.350A) = 4.2W

The power utilised by the LED is: PLED = (3.5V) (0.35A) = 1.23W

The power wasted in the regulator is: PLINEAR = P (total) – PLED = 2.98W

Most SMPs are around 90 percent efficient. In the above example, the power consumption is: Ptot = (Vout) (Iout)/90%

P (total) = (3.5V) (0.35A)/ (0.90) = 1.36W P_{LED} = (3.5V) (0.35) = 1.23W PSMPS = P (total) – P_{LED} = 0.13W

Thus, if a switching regulator is being used, 0.13W is lost in power conversion. On the other hand, 2.98W is lost if a linear regulator is being used.
The designs of switching power supply controllers are complex as compared to those of linear regulators. They have the following components:

1. A controller IC
2. A high side MOSFET
3. A low side MOSFET/ catch diode
4. An inductor
5. Resistors and capacitors

The choice of a low side MOSFET or a catch diode depends on the kind of SMPS.

Series or Parallel

In applications having multiple LEDs, it is very important to figure out whether to power the LEDs in series or in parallel. The available supply voltage is often too low to meet the V_f of multiple LEDs. It may seem that powering the LEDs in parallel configuration would be the preferred method. A few disadvantages of parallel configuration of the LEDs include:

1. There is a variation of light output from one LED to the other.

The variation of forward voltage from LED to LED results in varying I_f, which causes the light output to vary. Because of negative temperature coefficient, the hotter the LED gets, the more current it uses and thus gets even hotter. However, grouping of the LEDs, considering the light output characteristics, is performed by the manufacturers of LED.

2. The LEDs may be damaged if there is failure in opening an LED.

More current could also flow to the other LEDs, which could possibly burn them out. If there is a short, a very small amount of current would flow to the other LEDs. Faults would have to be monitored and the available current would have to be adjusted to the other LEDs. Additional circuitry would be required to operate under these circumstances.

3. The required amount of current increases with each LED.

If multiple LEDs are powered in parallel, it could affect the power supply design. If N is the number of LEDs, it needs N* amount of current output. This implies that the inductor, catch diode and MOSFET need to be rated at a greater current. This would make them more expensive and larger in size.

If multiple LEDs are powered in series, these issues are eliminated, but some other problems come up. In series, the total Vf of the LEDs is cumulative. For example, if a series of five LEDs with a Vf max of 4V has to be turned on, the power supply voltage would require an output voltage of 20V. Instead of needing a larger maximum current rating, the output capacitors would need a larger voltage rating. The increase in the size and expense of a capacitor with a voltage rating of 6V verses 50V is less as compared to a 500mA inductor verses a 5A inductor.

For example, for lower current, the difference in the size of the inductor could be 5 mm^2 in comparison with 12 mm^2 for higher current. The package size of a high voltage rated capacitor and a low voltage rated one could be the same. The other drawback in series configuration is that if one LED fails, all other LEDs connected in the series are turned off.

If the LEDs are secured with an appropriate mechanical design for protecting them and a proper thermal design for preventing them from getting overheated, they have a greater lifespan. The advantage of LEDs connected in series is that each of them receives the same current and consequently, the same output of light.

UNIT 3.2: LED Configuration and Thermal Management

Unit Objectives

At the end of this unit, you will be able to:

1. Explain the various components of an LED luminiary
2. List the steps to be followed for LED driver selection
3. List the parameters which affect the overall life of an LED
4. Identify various types of LED configurations
5. Explain the passive thermal designs for an LED

3.2.1 LED Luminary

The following figure lists the major components of an LED luminary:

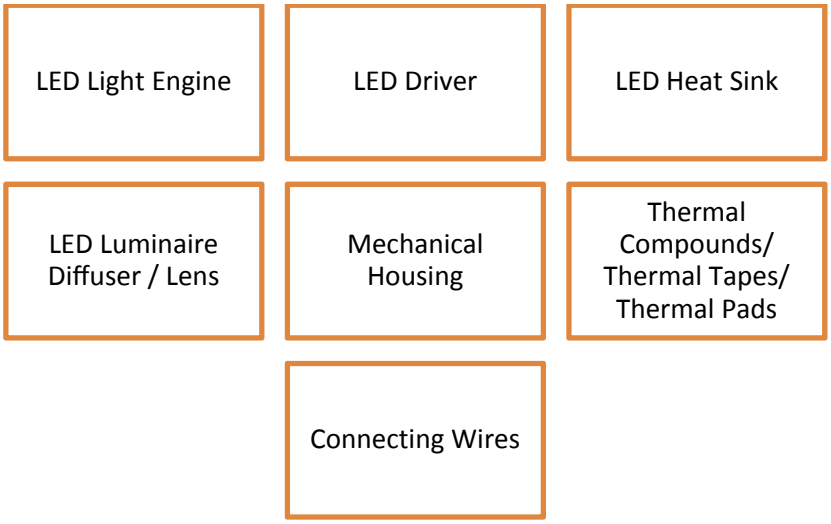


Fig. 3.2.1: Major components of an LED luminary

LED Light Engine

An LED light engine is the source of light of a luminaire. It is a printed circuit board mounted with LEDs. The following image show some examples of LED light engines/modules:

COB based light engine module

LED based light engine module

Flexible stip based light engine module

Fig. 3.2.2: Some examples of LED light engines/modules

Heat Sink

The heat sink of a thermal system allows conduction of heat away from various sensitive components. The following image show a heat sink:

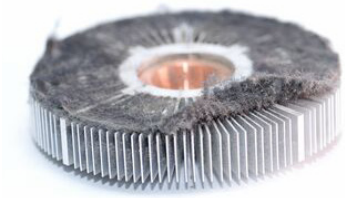
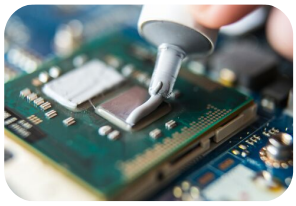


Fig. 3.2.3: Heat sink

Thermal Interface Materials

The thermal interface can comprise various materials. The following image shows examples of thermal interface materials:



Thermal grease

Thermal tapes

Thermal pads

Fig. 3.2.3: Thermal interface materials

LED Drivers

An LED driver is the source of power for LEDs. Whenever LED luminaries are being build, a driver or possibly even multiple drivers are needed. An LED driver is usually an AC/DC converter. In another words, it converts AC voltage from main 220V, 230V or 240V power supply to DC supply, suitable for the LED component.

There are different types of LED drivers, as there are different types of LEDs. LED drivers can be categorised as follows:

- **Constant Current LED Driver:** Constant current drivers always feed relatively constant current. The voltage range may vary. Many times, the output voltage range is related to the physical dimensions of the driver. This restriction may set some selection challenge, if the luminaries are compact and there is limited space for the driver. One of the important functions of a constant current driver is the capability to maintain constant current. The following figure lists the characteristics of a constant current LED driver:

•Efficiency	It indicates what part of the input power can actually be used by the driver to power the LED
•Power factor	The power factor indicates how much load the driver puts on the electrical network. The maximum value of power factor can be 1.

Fig. 3.2.4: Characteristics of a constant current LED driver

The colour and the brightness of an LED can be controlled using a constant current driver. It continuously maintains the level of current through the LED, regardless of the

operating conditions and the external factors, such as power supply drift and variations in Vf. There is an internal feedback network which keeps track of the flow of current in a string of LEDs and regulates the output to maintain the desired level of current.

The driver offers a flexible power solution for a wide range of LED products. The same current driver may be used for the super-bright LEDs that require forward voltage in the range of 3V to 3.5V.

- **Constant Voltage LED Driver:** A constant voltage driver keeps the voltage constant. The feeding current varies according to the load. The higher the load is, the bigger the current is. Constant voltage drivers are usually used in applications where all LED components are in series. These with high powers can be used as electrical energy suppliers for many smaller power constant current drivers.
  In larger lighting systems, they are storages that feed stable current into the LED loads they have. In some cases, constant voltage drivers are the only suitable solution, such as when replacing halogen lamps. Replacements require 12V or 24V voltage. If used in a parallel mode, electrical load variation can result into brightness variation due to current variation.

3.2.2 Selection of an LED Driver

The steps for selecting an LED driver are as follows:

Step 1: What forward current does the LED need?
The forward current of the LED needs to be found from the datasheet. If the LED needs a current of 350mA, try to find a driver with 350mA output current.

Step 2: How powerful should the driver be?
The power consumption of the LED can also be found from the datasheet or at least it can be calculated with the data in the datasheet. The power consumption can be calculated by multiplying the typical driving current value with the typical forward voltage value. Both are present in the LED data sheet. Sometimes, the power consumption can be found directly from the datasheet. If multiple LED components are being used, find a driver that can feed all the LED components in the luminaires.

Step 3: What output voltage range is needed from the driver?
Take a look at the datasheet and check the voltage of the LED. If there are multiple LEDs, add the voltages together. Then, find a driver with a voltage range that the LEDs fit into.

Step 4: Is dimming needed? If yes, then what type of dimming is needed?
A need for dimming is mainly dependent on the specification of the luminaire. If dimming is not needed, a normal on/off driver is enough. If dimming is needed, there are many different types available.

Step 5: What are the physical dimensions within which the driver has to fit in?
Consider whether there are some limitations for the physical dimensions of the driver. These will have an impact on driver selection. Find the physical dimensions of the driver from its datasheet.

Step 6: What kind of environment is the luminaire used in?

The place where the luminaire is designed to be used needs to be considered. If it is designed for indoor use, IP-classification does not need to be thought about much. If the luminaire is to be used in a room with a lot of dust or moisture, IP-classification has to be taken into account. IP20 class drivers can be used in indoor lighting applications but can hardly stand harsh conditions in outdoor lighting, unless the luminaire itself is waterproof, thus protecting the driver.

When a luminaire is designed for outdoor use, then check that the driver has good IP-class. Usually IP67 drivers are heavier in weight, the driver electronics is moulded with plastic (such as potted) and the electrical throughputs of the wires, both on the primary voltage and the secondary voltage side, are sealed with the required protection against moisture.

Step 7: Is the driver suited for European standards or American standards?

Does the driver have any approvals? Are the approvals for Europe (ENEC) or America (UL). This can generally be found from the datasheet of the driver.

3.2.3 LED Configuration Options

The number of customers who use LEDs increases with the increase in cost efficiency and brightness of the LEDS and decrease in their costs. Some common applications of LEDs, such as traffic lights, car lamps, LCD back lighting and architectural lighting prove to be advantageous considering the high efficiency and long operational lifetime of LEDs.

LED lighting applications generally utilise many LEDs in the range of 1W to 3W operating together. Multiple LEDs can be connected either in parallel or in series. Both configurations have advantages regarding efficiency, brightness matching and LED failure immunity. Another option of configuration known as a matrix is a hybrid of the series and parallel connection.

3.2.4 Series String Configuration

The total string voltage is a function of the number of LEDs in the string and the forward voltage (Vf) of each LED. If 30 LEDs with a Vf of 4.5VDC are used, the total string voltage would be 135VDC. One constant current driver provides the power to the LEDs and hence, in this configuration all LEDs receive the same current.

Advantages

The advantages are of series string configuration are:

- The configuration is simple consisting of only single circuit.
- Since each LED gets the same amount of current, there is no current imbalance.
- Since there is no resistor to limit the current, the efficiency of this configuration is high.

If an LED fails to work, then the remaining LEDs continue to operate normally and the string voltage decreases only by the V_f of the failed LED. Consequently, the power consumption also decreases. However, the overall brightness of the string dims by only one LED.

Disadvantages

This configuration poses a safety risk as the output voltage may become high if large numbers of LEDs are used.

For instance, to calculate the maximum number of LEDs that can be safely connected in a series configuration, for a constant current LED driver use the maximum output voltage of the driver divided by the forward voltage of each LED.

If V_{out} max = 40VDC, and the $V_{forward}$ = 3.5V, then the maximum number of LEDs is 40/3.5=11.43. A total of 11 LEDs can be connected in series with the constant current LED driver. To select the required output current of the driver, refer to the specification sheet for the LED used for the optimal current and then select an LED driver with the same optimum.

3.2.5 Parallel String Configuration

Joining LED strings in parallel will decrease the maximum string voltage and also add to the fault immunity.

Consider the following example where 10 LEDs are being used to light a lamp. The LEDs could be organised in 2 strings parallel to each other, with 5 LEDs in each. The following figure shows a parallel string configuration:

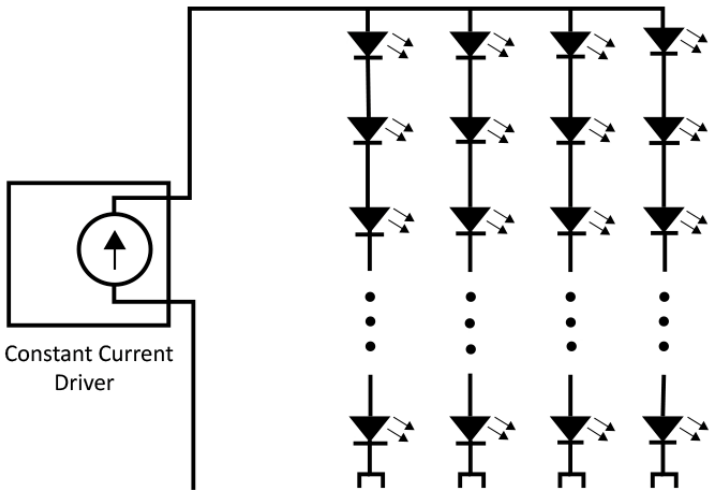


Fig. 3.2.5: Parallel string configuration

The combined string voltage of the entire setup decreases as compared to the series connection of the same by a factor. This factor is equal to the number of strings of the bulbs laid parallel to each other. There is division of the current between the strings, depending upon how perfectly the limiting resistor of each string has been matched. The Vf of the LEDs could also vary and result in major imbalances in the current of the various strings. Generally, a resistor is used in each string to balance the current.

Advantages

- A parallel configuration needs only single driver.
- The combined output voltage is comparably low.

- An approximate equal sharing of current can be obtained amidst the various LED strings by selecting the resistance value properly.

Disadvantages

- Although there is improvement in current sharing in this type of configuration, the power consumption rises and the system efficiency decreases.
- In a situation where one of the LEDs fail short, the rest of the LEDs face a higher level of stress since they are compelled to handle a larger amount of current. This might result in failure of other LED in the string. The LEDs in the rest of the strings will become dimmer as the total current is decided by the driver's current rating.
- In a situation where one of the LEDs fails open, all the LEDs in that string will stop working. The current in the rest of the strings will rise as per the number of strings. The effect of the open failed LED can be reduced by connecting a by-pass circuit in parallel with each LED. This measure will short out the failed LED.

Calculating the maximum output voltage of an LED driver

In a parallel connection, the product of V forward and the number of LEDs in each string is the total forward voltage. If the value of V forward is 3.5V and there are 2 strings of LEDs connected in parallel, the total forward voltage will be 5 x 3.5 = 17.5Vdc.

The output of a constant current LED driver is calculated by multiplying the optimal current for the LED being used with the number of strings. If there are 2 strings of LEDs and 350mA is the optimal current for the LEDs, then the LED drive must have a current rating of 350 x 2 = 700Ma.

3.2.6 Matrix Configuration

The matrix configuration tries to eradicate a few of the issues linked with parallel configuration by including more connections between the LEDs. Both matrix and parallel configuration have similar topology with the difference being the addition of a connection between each of the strings in matrix configuration. The first LED of each string has a parallel connection with the first LEDs of all the rest of the strings. Thus, successive LEDs are in parallel with their neighbouring LEDs. The LEDs are organised in a matrix of rows and columns.

Advantages

- A single output driver is required in this configuration. The output voltage as compared to a parallel configuration is relatively low
- Usually, this configuration possesses greater fault-tolerance.
- The efficiency is more as current sharing resistors are generally not utilised.

Disadvantages

- Current imbalances are a problem. Including resistors to help in current sharing is the simple solution, as in the case of a parallel configuration.
- Unequal current sharing results in irregular light and thermal distribution.

- In a situation where an LED fails short, the rest of the LEDs of the same row will also stop functioning. The LEDs of the other rows will function normally, except that the lamps will become less bright.
- In a situation where an LED fails open, the rest of the LEDs of the same row will have to face higher current. This raises the chance of another LED of that row also failing. The rest of the LEDs will function normally.

The effect of the open failed LED can be reduced by connecting a by-pass circuit in parallel with each LED. This measure will short out the failed LED.

3.2.7 Heat Transfer Procedure in an LED Luminary

For better performance of an LED, it is required to keep the junction temperature low. Heat in an LED is transferred by three means as listed in the following figure:

•Conduction	•Convection	•Radiation
It is the mechanism of heat transfer from one solid to another.	It is the mechanism of heat transfer from a solid to a moving fluid (air, for most LED applications).	It is the mechanism of heat transfer through thermal radiation between two bodies having different surface temperatures.

Fig. 3.2.6: Three means of heat transfer

The encapsulation of LEDs is typically made up of transparent resin, a poor thermal conductor. The electrical energy that is not converted into light, generates heat and is conducted via the back of the chip. The conduction of heat to the atmosphere takes a long path as follows:

junction → solder point → board → the heat sink → atmosphere

If the thermal impedance is low, the temperature of the junction will be lower and hence, lower will be the temperature of the surrounding. Hence, the thermal resistance within the path of heat conduction must be minimised so as to maximize the range of ambient temperature for a specific power dissipation.

The thermal resistance values vary depending on the manufacturer of the LED. They may range from 2.6 °C/W to 18 °C/W. The thermal resistance of the thermal interface material (commonly, thermal grease, solder and pressure-sensitive adhesive) also varies according to the type of material. Power LEDs are mounted on an MCPCB, which are then attached to a heat sink. In the package design, the important parameters are as follows:

- Flatness of the surface and contact area
- Quality of each component
- Applied mounting pressure
- The type of interface material and its thickness

3.2.6 Passive Thermal Designs

Adhesive and heat sinks are considered for passive thermal designs to ensure efficient thermal management of high-power LED applications.

Adhesive

Adhesive is used to attach LED to board, and board to the heat sinks. Thermal performance can be optimised by using a thermal conducive adhesive.

Heat Sink

Heat sinks serve as a medium to conduct heat outside from an LED source. The following figure lists the factors affecting the efficiency of a heat sink:

Material

- The efficiency of dissipation through conduction is affected by the thermal conductivity of the heat sink material (usually aluminium, but copper is also used).
- The new materials of a heat sink may include thermoplastics to be used for the applications with lower heat dissipation requirements.
- The heat sink made up of natural graphite solutions offer thermal transfer better than copper but it has a high production cost.
- Heat pipes can be used with aluminium or copper heat sinks for reducing the spreading resistance.

Shape

- Heat sinks should have a large surface area as the heat transfer takes place at the surface.
- For this, the size of the heat sink can be increased or many fine fins can be used.

Surface Finish

- Thermal radiation of heat sinks depends on its surface finish.
- For example, a painted surface offers emissivity greater than the unpainted one.
- About one-third of the heat, in flat-plate heat sinks is dissipated by radiation.
- A perfectly flat surface area allows reducing the thermal resistance between the LED source and the heat sink by using a thinner layer of thermal compound.
- Anodizing the surface of a heat sink also helps in decreasing the thermal resistance.

Method of Mounting

- Heat-sink mountings using screws and springs provide better performance than thermal conducive glue, clips or sticky tape.

Fig. 3.2.7: Factors affecting the efficiency of a heat sink

Heat Pipes and Vapour Chambers

They are passive devices used in LED thermal management, and offer effective thermal conductivity in the range of 10,000 to 100,000 W/m K. The benefits are as follow:

- They transfer heat to a heat sink that is in a remote location offering minimum drop in temperature

- A natural convection heat sink can be iso-thermalized, by reducing size and increasing the efficiency. For example, adding five heat pipes may reduce the mass of the heat sink from 4.4 kg to 2.9 kg that is by 34%.
- They directly transform the high heat flux under an LED to a lower one efficiently that can easily be removed.

Metal Core PCB (MCPCB)

MCPCBs are the circuit boards which have a base metal (aluminium alloy) to dissipate heat. To lower the thermal resistance, MCPCBs have dielectric polymer layer. One advantage of PCBs is the reduction in errors of routing and assembly.

To prevent raising of the temperature of the LED junction by the heat produced by the driver, the LED drive circuitry must be separated from the LED board.

UNIT 3.3: LED Light Diagnosis and Repair

Unit Objectives

At the end of this unit, you will be able to:

1. Illustrate an LED along with its components
2. List the different reasons for LED failure
3. Identify the types of LED luminaire failures
4. Explain the various LED failure modes
5. List the types of secondary optics failure
6. Identify the types of thermal management system failures
7. Identify the cause of LED driver circuit failure
8. Demonstrate the steps of diagnosing and repairing LED faults
9. List the key points to manage productivity and quality standard

3.3.1 Construction of LED

Every component is critical in the functioning of an LED luminaire. Failure of any one of them would cause the entire system to stop functioning. The following diagram shows the construction of an LED luminaire:

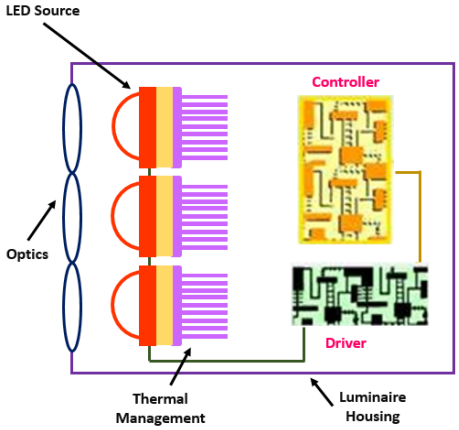


Fig. 3.3.1: Construction of an LED luminaire

3.3.2 Reasons for LED Failure

LED lighting, one of the efficient sources of lighting available in the market, offers several benefits, including a lifespan of up to 50,000 hours. However, there may be failure of LED lights before their expected lifetime, if they are not properly maintained. For preventing premature failure of LEDs, one must be aware of the reasons that can cause such a failure.

Different reasons for LED failure are as follows:

1. Hot Environment:

The light emitted by LEDs reduces exponentially, depending on time and temperature. The higher the temperature of the environment, the earlier the degradation of the LED light,

leading to a shorter lifespan. Hence, thermal management is vital for ensuring a longer life for the LEDs.

2. Incorrect LED Driver:

LEDs must be powered from a DC source, while incandescent lighting can be operated by using either source, AC or DC. LEDs can be driven by an AC power supply by using an LED power supply or an LED driver. High voltage or current from the driver or the power supply results in failure of an LED, as it will suffer overdrive.

3. Incorrect Polarity:

LEDs must be connected according to their polarity; as being diodes, they are polar sensitive. Hence, the positive terminal (anode) and the negative terminal (cathode) are connected to the positive and negative terminal of the supply respectively. If LED terminals are connected in reverse, there may be catastrophic failure, leading to open-circuit failure along with no light emanation.

3.3.3 LED Luminaire Failure Analysis

90% of the luminaire failures are due to something other than fault in the LEDs. The following figure shows the chart representing the causes of failure:

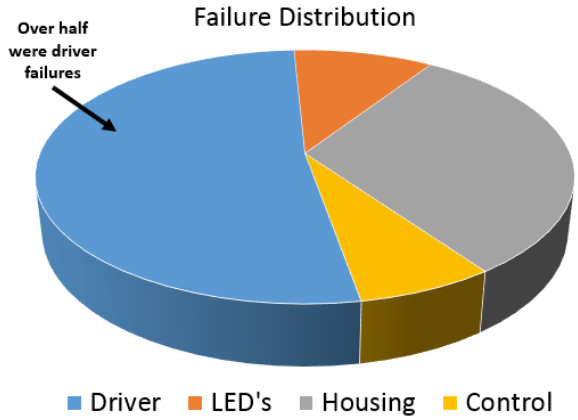


Fig. 3.3.2: Chart representing the causes of failure

The following figure lists the types of LED luminaire failures:

Fig. 3.3.3: Types of LED luminaire failures

Other prominent components that can fail are Input- fuse/ MOV and Output- transistor/ transformer/ IC.

3.3.4 LED Failure

Different LED failure modes are listed as follows:

Packaging Related Failure

The following figure lists the different package related failures:

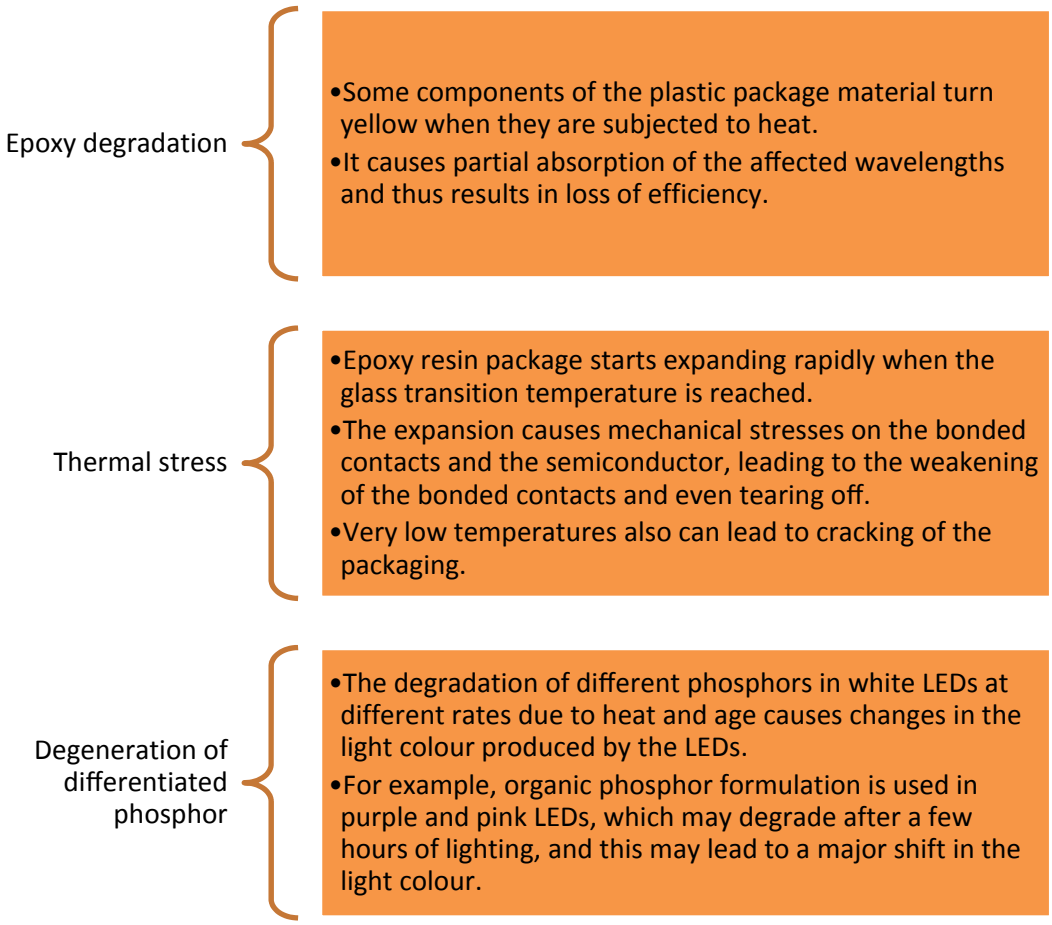


Fig. 3.3.4: Different package related failures

Metal and Semiconductor Related Failure

A common mechanism for degradation of the location of radiative recombination (known as active region) is nucleation and growth of dislocations. This is caused due to the presence of a defect in the crystal and the rate is accelerated by high current density, heat and the light emitted from the LED. Elements such as aluminum gallium arsenide are more vulnerable to this.

Metal atoms are moved to the active region from the electrodes as a result of metal diffusion, which happens due to high voltage or currents at elevated temperatures.

Stress Related Failure

The following figure lists different stress related failures:

Thermal runaway

- This is caused by loss of thermal conductivity that occurs due to presence of non-homogeneities in the substrate.
- In this case, damage caused by heat results in more heat generation.
- Most common voids are the ones which are caused by incomplete soldering.

Electrostatic discharge

- This may cause:
  - A permanent shift of the parameters of the semiconductor junction
  - Immediate failure
  - Latent damage that leads to enhanced rate of degradation

Fig. 3.3.5: Different stress related failures

3.3.5 Secondary Optics Failure

Secondary optics ensures that the output beam of the LED lamp meets the photometric specifications by modifying it. Secondary optics in LED may be any of the following:

- Diffuser
- Lens
- Specular or diffused reflector
- Lens and reflector combination; for example, total internal reflection lens or TIR

The following image shows failure of secondary optics in LEDs:

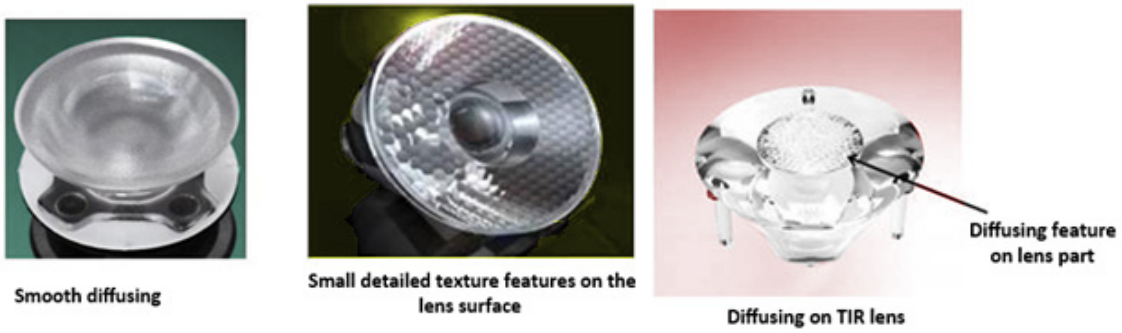


Fig. 3.3.6: Failure of secondary optics

The secondary optic, in case of outdoor applications, is exposed to ionising radiation emitted from the sun.

3.3.6 Thermal Management System Failure

The following figure show the types of thermal management system failures:

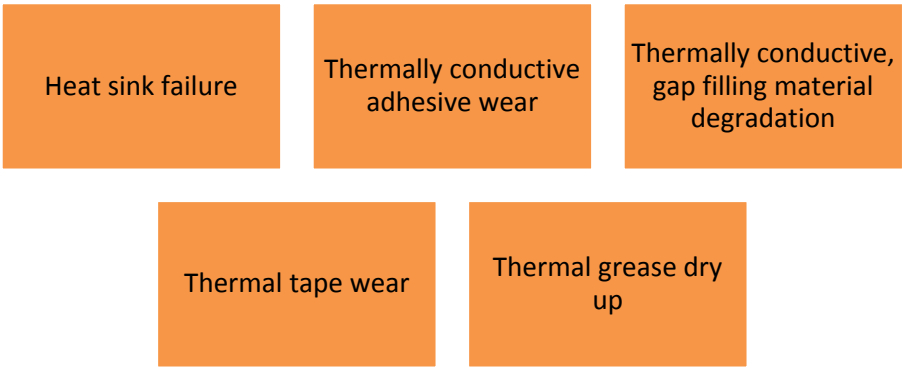


Fig. 3.3.7: Types of thermal management system failure

3.3.7 Driver Failure

Most of the high-power LED drivers, especially those using power greater than 15W, use electrolytic capacitors. There can be two cases. The capacitors can be placed either on the input AC stage for allowing noise filtering or on the driver's output DC stage.

In a driver circuit, the electrolytic capacitors are weak elements and fail frequently at high temperatures. The following figure shows a driver circuit:

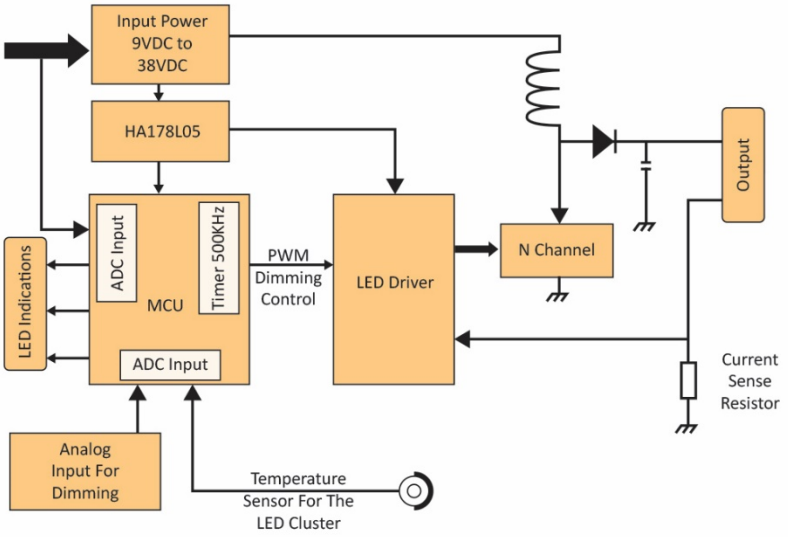


Fig. 3.3.8: LED driver circuit

3.3.8 Diagnosing and Repairing Fault

The following image shows an LED luminary:

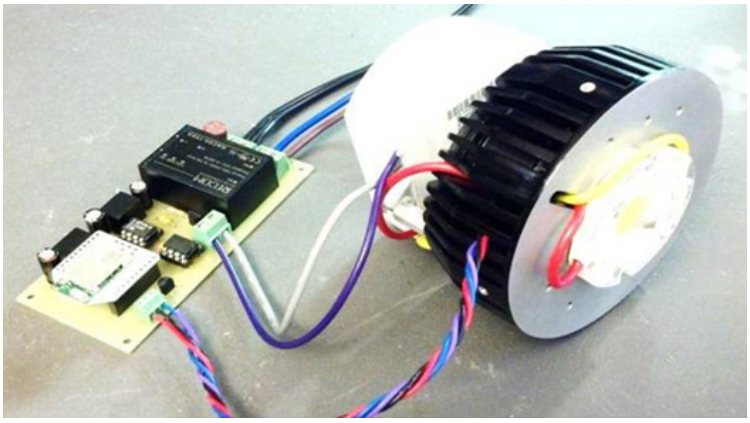


Fig. 3.3.9: LED luminary

Two main types of LED faults are:

- Component level faults
- Connection/soldering faults

The following figure lists the steps of diagnosing and repairing an LED fault as a result of loose connection:

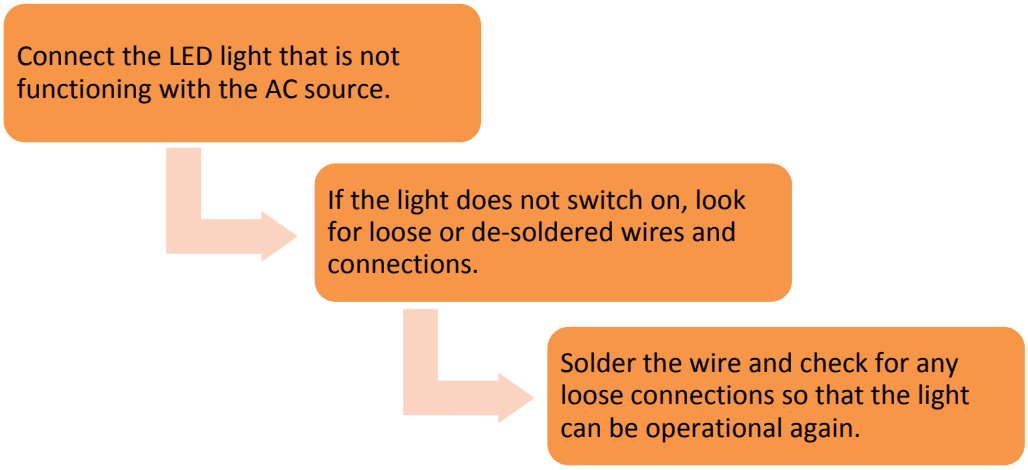


Fig. 3.3.10: Steps of diagnosing an LED fault as a result of loose connection

The following figure lists the steps for diagnosing and repairing a light engine fault:

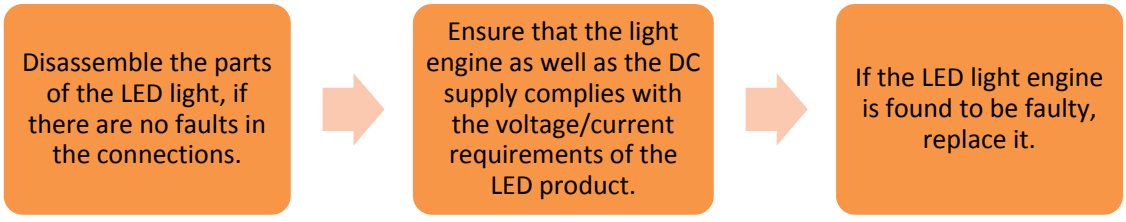


Fig. 3.3.11: Steps for diagnosing a light engine fault

The following figure lists the steps for diagnosing and repairing an LED driver fault:

Check the driver with an AC supply or a multimeter to measure the voltage and the current output, in case the LED light engine is functioning properly.

Measure the output voltage and the current of each section of the supply unit to identify the faulty section.

Check every component of the section that either shows no output or has output voltage less than the desired one, by using a multimeter.

Repair /replace the damaged component, primarily the electrolytic capacitors.

Check the output voltage/current again with the multimeter and reassemble, if the repaired driver is found in order.

Fig. 3.3.12: Steps for diagnosing an LED driver fault

The following figure shows the components of an LED driver:

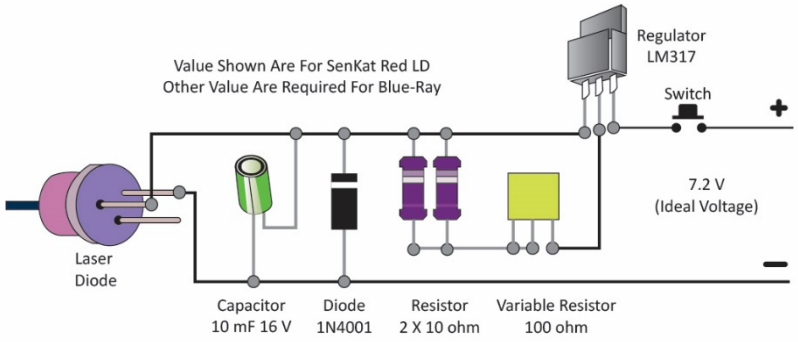


Fig. 3.3.13: Components of an LED driver

The following figure lists the steps for diagnosing and repairing an LED strip level fault:

Connect the LED light that is not functional with the AC supply. → Look for the damaged or non-functional LED strips or LEDs from the LED strips array in the light. → Replace the damaged LED strips by removing the glass shell.

Connect the LED array with the AC source and check it. → Replace the glass shell if all the LED strips are working.

Fig. 3.3.14: Steps for diagnosing an LED strip level fault

3.3.9 Achieving Productivity and Quality Standard

The following figure lists the key points to manage productivity and quality standard:

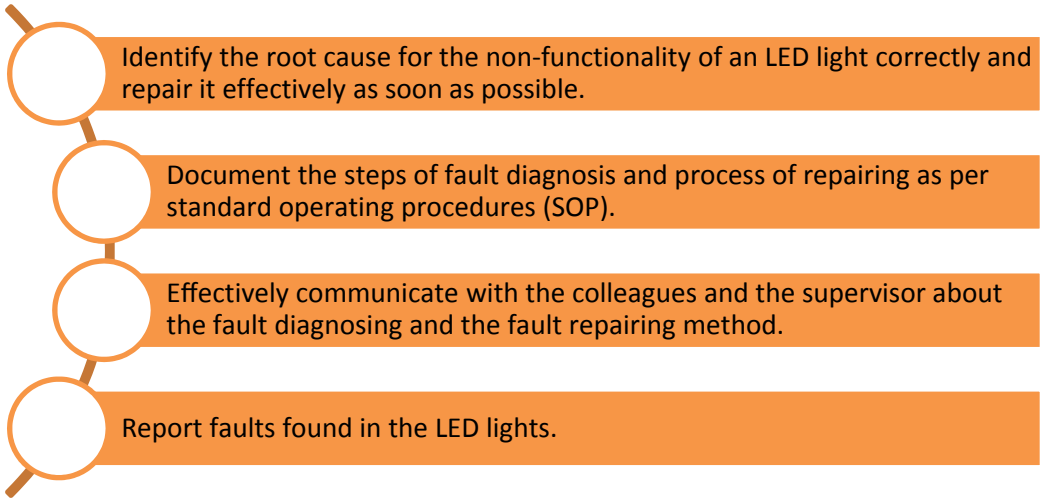


Fig. 3.3.15: Key points to manage productivity and quality standard

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ESSCI

4. Small Home Appliances Repair (Geyser and Fan)

Unit 4.1 – Geyser Repairing

Unit 4.2 – Fan Repairing

Key learning Outcomes

At the end of this module, you will be able to:

1. Explain the basic parts and working of a geyser
2. List the types of geysers
3. Identify the steps to troubleshoot and repair geyser
4. Explain how to test the performance of a geyser
5. Explain the basic components of a fan
6. List the types of fans
7. Explain the working of a fan
8. Identify the steps for troubleshooting and repairing a fan
9. List the steps to check performance of a fan

UNIT 4.1: Geyser Repairing

Unit Objectives

At the end of this unit, you will be able to:

1. Explain the basic parts and working of a geyser
2. List the types of geysers
3. Identify the steps to troubleshoot and repair a geyser
4. Explain how to test the performance of a geyser

4.1.1 Basic Parts of a Geyser

An appliance which uses electricity to heat water is called as geyser. The following figure lists the parts of a geyser:

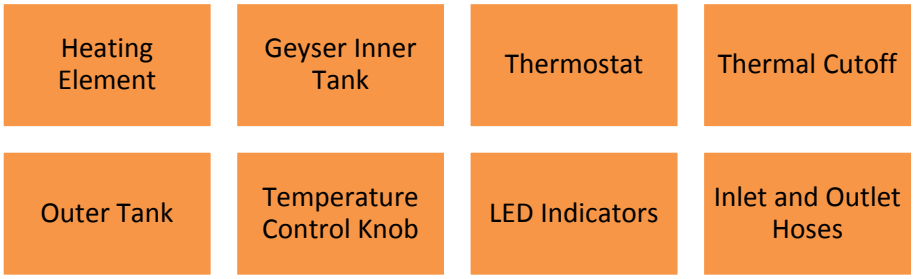


Fig. 4.1.1: Parts of a geyser

Heating Element

It is the most important part of a geyser. It converts electricity into heat and cold water to hot water. The efficiency of geyser depends on the efficiency of its heating element. The following image shows the heating element of a geyser:

Fig. 4.1.2: Heating element

Geyser Inner Tank

In a storage geyser, the inner tank stores water. The stored water gets heated in this tank. The tank should be corrosion resistant. It can be made with pure copper or stainless steel. Most of the inner tanks are suitable for both soft water and hard water. The following image shows the inner tank of a geyser:

Fig.4.1.3: Geyser inner tank

Thermostat

It controls the water temperature and protects the geyser from over-heating of water. The geyser has the temperature range of 30^0C to 60^0C (varies with brand). If the temperature of water is below 30^0C, then the thermostat allows the heating element to heat the water. After water temperature reaches 60^0C, the thermostat cuts of the heating element. If the water temperature drops below 30^0 C, then again the heating of water starts. This cycle continues until the geyser is switched OFF. The following image shows a thermostat:

Fig. 4.1.4: Thermostat

Thermal Cutoff

It is an additional safety element in the geyser. It is a bimetallic temperature control device which operates at a temperature of 90^0C. If the thermostat fails to operate, the thermal cutoff stops the power from reaching the heating element. The following image shows a thermal cutoff:

Fig. 4.1.5: Thermal cut off

Outer Tank

This is the part which covers the inner tank of a geyser. It is made with rust resistant, mild steel. It comes in different colours to attract the customers as it is the outer visible part of the geyser. The following image shows an outer tank:

Fig. 4.1.6 Outer tank

Temperature Control Knob:

This part is not available in all models. The temperature knob is used to set the temperature of water. After reaching the set temperature, the thermostat cuts off the heating element and prevents the water from heating beyond the set temperature. The following image shows a temperature control knob:

Fig. 4.1.7: Temperature control knob

LED Indicators

The colour of the indicators varies with the brand. The red indicator indicates the power supply to the geyser heating element. The green indicator gives information about heating of water. The following image shows LED indicators:

Fig. 4.1.8: LED indicators

Inlet and Outlet Hoses:

The inlet hose allows cold water to flow from the water supply source to the geyser inlet. The outlet hose allows hot water to flow from the geyser outlet to the hot water tap.

Fig. 4.1.9: Geyser inlet/outlet hose

4.1.2 Types of Geysers

The different types of geysers are listed in the following figure:

Storage Tank Geyser

- It consists of insulated water tank in which water is heated and stored.
- The temperature of water inside the storage tank is maintained by the thermostat.
- This type of geyser is useful for large families and places where the requirement of hot water is more.

Tankless Geyser

- This type of geyser does not consist of any storage tank. It heats the water on demand.
- After switching ON the geyser, the water passes through the heating element and gets heated instantly.
- This type of geyser is useful for small families and places where the requirement of hot water is less.

Solar Geyser

- This type of geyser uses solar energy to heat the water.
- This type of geyser requires high initial cost and after that it saves electricity bill.
- Solar geysers are best suitable for individual houses.

Hybrid Heat Pump Water Heater

- It consists of tank for storage and a heat pump.
- The heat pump captures heat from air or ground and transfers it to the water.
- This type of heater uses electricity to move heat from one place to other.
- This type of heater works more efficiently in warm climate.
- It involves high installation costs.

Fig. 4.1.10: Different types of geysers

The following table lists the differences between instant geyser and storage geyser:

Sl.No	Feature	Instant Geyser	Storage Geyser
1	Wall space	It occupies less wall space	It occupies more wall space
2	Storage Tank	It is tankless geyser, which heats water on demand instantly	It has storage tank to store the water
3	Hot water dispensing	Water comes immediately when the geyser is switched ON	It requires minimum 5 minutes to heat water

4	Water flow	Maximum 10 litres (depends on capacity) of hot water dispenses at one time and one must wait for more time for additional hot water	Water flow is continuous as minimum 10 litres (depends on capacity) of water stored in the tank is heated at the same time
5	Maintenance	Requires less maintenance	Requires more maintenance for draining and cleaning storage tank periodically
6	Power consumption	It consumes less power than storage geyser	It consumes more power than instant geyser
7	Suitability	It is best suitable for small families	It is best suitable for large families

4.1.3 Working of Geysers

The following figure shows how a geyser works:

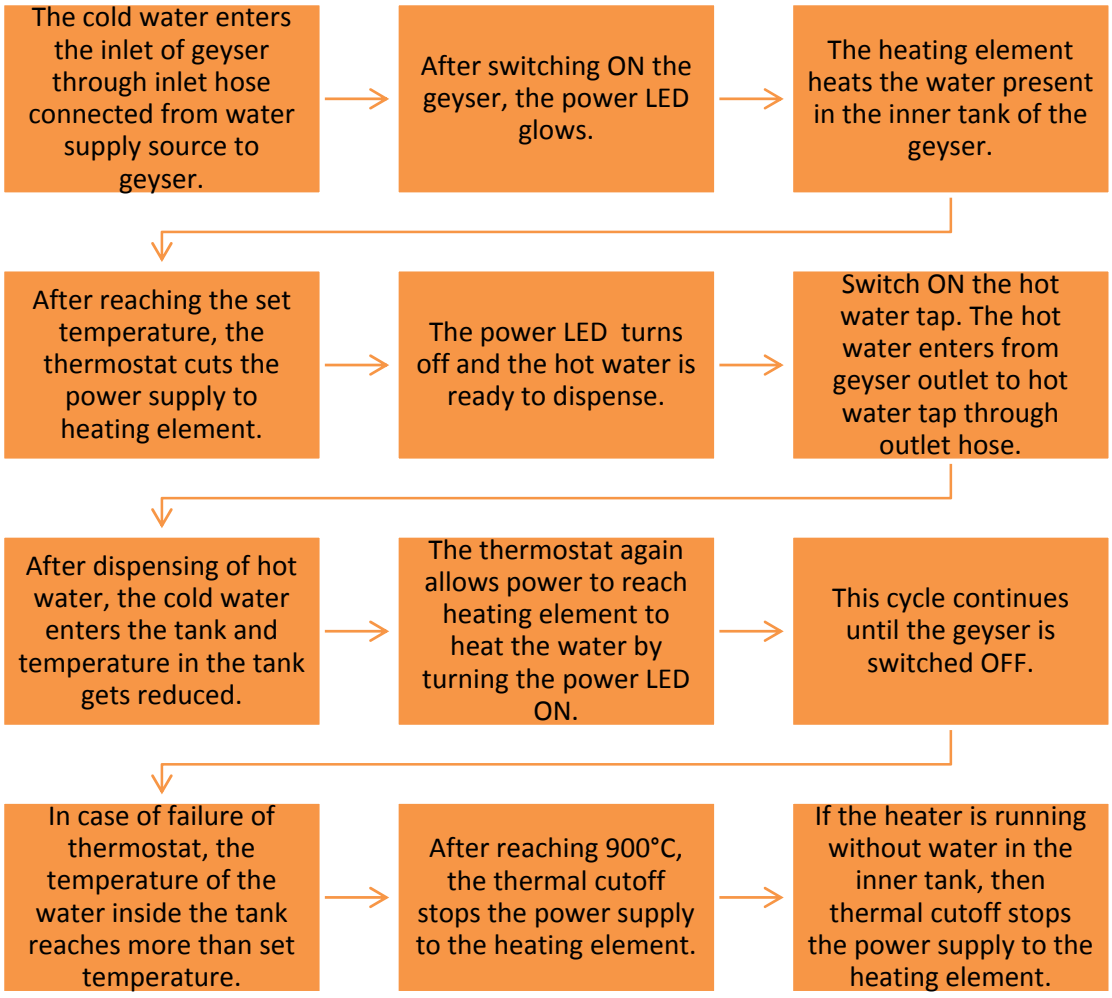


Fig. 4.1.11: Working of a geyser

4.1.4 Identifying and Troubleshooting the Fault

To repair a fault, it is required to identify the fault. The following figure lists the standard operating procedure for identifying a fault:

——

Understand the possible fault(s) based on the symptoms observed and also reported by customer.

Use a range of diagnostic documents—service manual, circuit/wiring diagrams, fault analysis charts, flow charts—to investigate the fault.

Use a range of tools and equipment for carrying out the diagnostic tests to investigate the fault.

Perform basic diagnostic tests to confirm that the power source is providing required inputs to the appliance and there is no fault with the same, and there are no external faults such as improper levelling and weak or no earthing.

Isolate the appliance from the power source, disassemble the component(s) or module(s) from the appliance and perform the functional test(s) to confirm their working.

Inform the superior if it is not possible to identify the fault.

Fig. 4.1.12: Standard operating procedure for identifying a fault

The following table lists some common faults, their related causes and their solutions:

Fault	Cause	Solution
Geyser not turning ON	Insufficient voltage	Check the voltage output from power socket
	Thermal cutoff drip	Reset the thermal cutoff button
No hot water dispensing, or water dispensed is not hot enough or is hotter than usual	Temperature knob is set to low (if applicable)	Set the temperature knob to required temperature
	Heating element is damaged	Check the continuity heating element, if not working, replace the heating element
	Thermostat is damaged	Check the continuity of thermostat, if not working, replace the thermostat
	Thermal cutoff is damaged	Check the continuity of thermal cutoff, if not working, replace thermal cutoff
Water leakage from geyser	Geyser valves are loose	Tighten the geyser valves
	High pressure of water than geyser capacity	Install safety pressure valve
Unusual noise from geyser	Deposit of salts and minerals due to hard water	Clean water storage tank
	Heating element damaged	Check the continuity of heating element, if not working, replace the heating element

	Thermal cutoff is damaged	Check the continuity of thermal cutoff, if not working, replace the thermal cutoff
Shock from geyser	Improper earthing	Check earthing of power socket
	Heating element is damaged	Check the continuity of heating element, if not working, replace the heating element

4.1.5 Testing the Performance

After a repair work is done, testing is important. The technician needs to give a demo to the customer to show that the geyser is working fine. The following figure lists the standard operating procedure for testing the geyser:

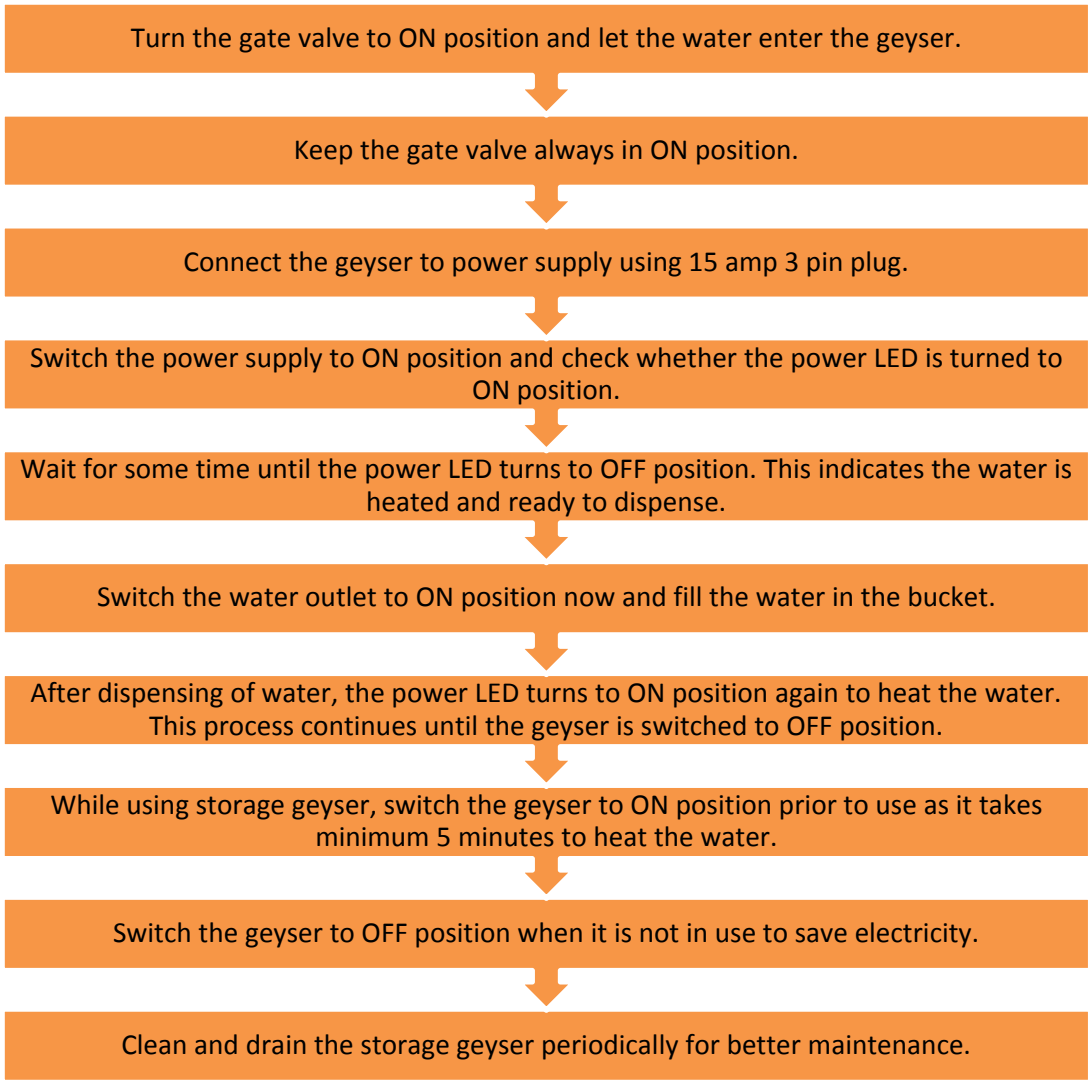


Fig. 4.1.13: Standard operating procedure

UNIT 4.2: Fan Repairing

Unit Objectives

At the end of this unit, you will be able to:

1. Explain the basic components of a fan
2. List the types of fans
3. Explain the working of a fan
4. Identify the steps for troubleshooting and repairing a fan
5. List the steps to check performance of a fan

4.2.1 Basic Parts of a Fan

A fan that is suspended from the ceiling of a room and circulates air in the room is called as a ceiling fan. It usually works with electrical power. It doesn't change the temperature of the room and produces cooling effect by forced convection method. The following image shows a ceiling fan:

Fig. 4.2.1: Ceiling fan

The following figure lists the basic parts of a ceiling fan:

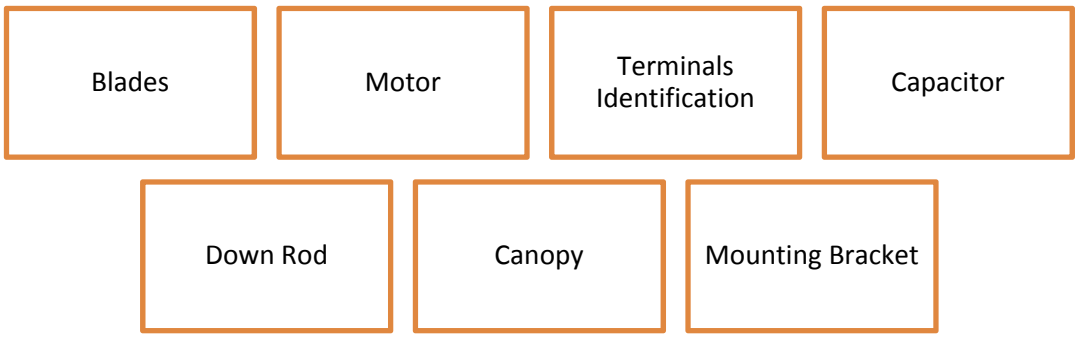


Fig. 4.2.2: Basic parts of a ceiling fan

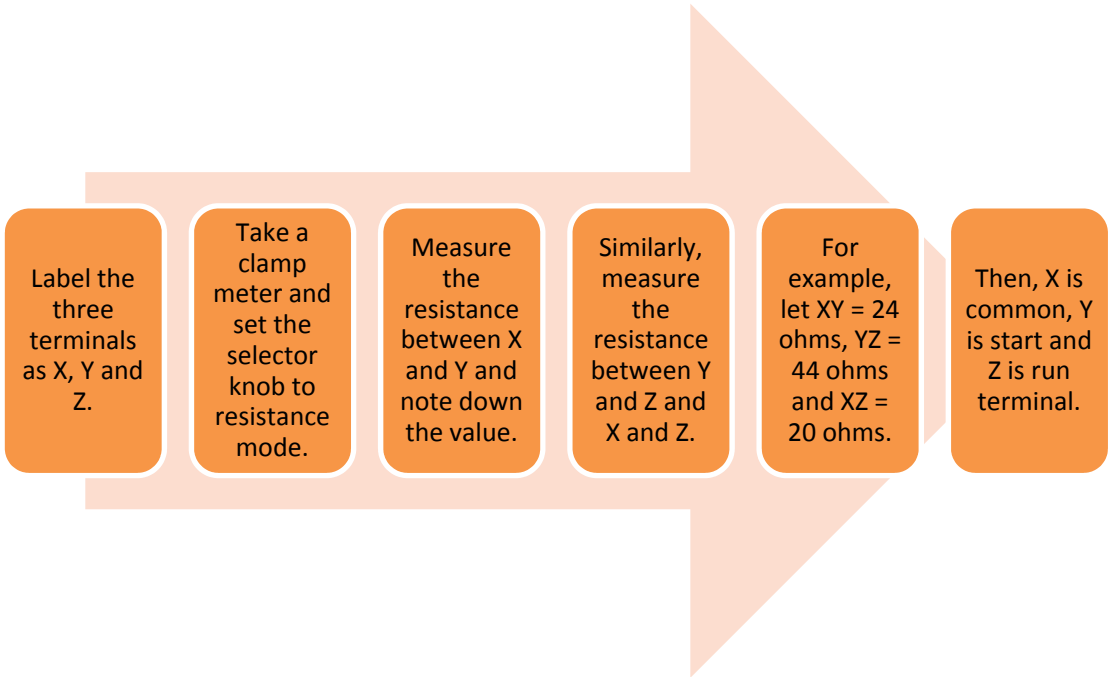
Blades

The blades of a fan are also called as wings and help in air flow. They can easily be replaced with another set of blades in case of any damage. The fan blades should be 8 to 9 feet above the floor for better air circulation and safety. The following image shows blades of a ceiling fan:

Fig. 4.2.3 Blades

Motor

- The motor of a fan causes it to rotate. The type of motor used in a ceiling fan is a single phase capacitor-start and run motor. It has 3 terminals—start, run and common. Also, it has 2 windings—start and run. The following figure lists the steps for identification of terminals:



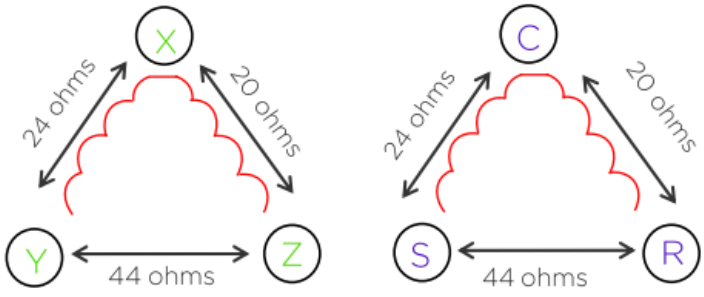


Fig. 4.2.4: Identification of motor terminals

Capacitor

A capacitor provides phase difference between motor windings. Due to phase difference, the motor starts and the fan begins to rotate. The capacitor is connected to start and run terminal of the motor. The following image shows a capacitor of a fan:

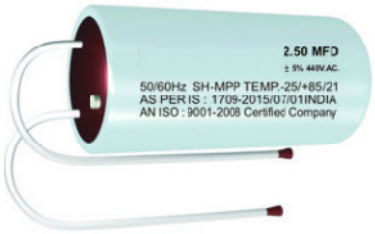


Fig.4.2.5: Capacitor

Down Rod

Down rod is a metal pipe that connects the mounting bracket of a fan with its motor assembly. It is used to suspend the fan from the ceiling of a room. The length of the down rod depends on the height of the ceiling. The following image shows down rods of a fan:

Fig 4.2.6: Down rods

The following table gives the recommended length (approx.) of the down rod according to ceiling height:

Ceiling Height (Feet)	Down Rod Length (Inches)
9	12
10	18
12	24
14	36
16	48
18	60
20	72

Canopy

There are two canopies present for each ceiling fan. One of them is located at the top of the fan, above the down rod, and the other at the bottom of the fan, below the down rod. They are used to cover the electrical connections of the fan. The following image shows the canopy of a fan:

Fig. 4.2.7: Canopy

Mounting Bracket

A ceiling fan is attached to the ceiling of a room with the help of a mounting bracket. At the time of installation, the mounting bracket should be installed properly to avoid the danger of the fan falling from the ceiling. The following image shows the canopy of a mounting bracket:

Fig. 4.2.8: Mounting bracket

4.2.2 Types of Ceiling Fans

The following figure shows the types of ceiling fans:

Standard ceiling fans:

- These fans are found in most of the houses.
- They are attached to the mounting bracket of the ceiling with the help of down rods
- These fans have 3 to 5 number of blades and are 7 to 9 feet above the floor.

Low profile ceiling fans:

- These are also called as hugger fans or flush mounting fans.
- These fans are useful if the height of room ceiling is less than 8 feet
- They are attached to the mounting bracket of the ceiling directly without any down rod.

Dual motor ceiling fans:

- These are ceiling fans with two motors.
- They have a central motor attached with two horizontal rods.
- Both the rods have fans with adjustable speed.
- These types of fans are mostly used in public places due to the capacity of circulating more air.

Damp and wet ceiling fans:

- These fans are made with motors that can resist damages due to moisture and humidity.
- They are useful for rooms or outdoor areas that do not receive direct precipitation.
- They have weather blades and motors that are not affected by humidity and moisture.

Remote controlled fans with and without light:

- These fans can be controlled with remote control.
- The remote control can be operated from the range of 40 to 50 feet.
- Some fans have light which can be turned ON and OFF with remote control.

Commercial ceiling fans:

- These fans are useful for very large areas.
- Their heavy-duty motors deliver higher air movement.
- They are found in railway stations, bus stands and wide rooms.

Fig. 4.2.9: Types of ceiling fans

4.2.3 Working of Ceiling Fans

The following figure describes how a ceiling fan works:

According to the basic physics, hot air always raises up and cold air moves down.

❖The ceiling fan rotates in anti-clock wise direction and at that time the blades pull the hot air towards the fan.

❖After pulling the hot air, the blades push the air down as a breeze.

❖The hot air pushed by the fan gets reflected by the objects in the room and rises up again.

❖This process of air circulation continues as the fan rotates in the room.

❖The circulated air evaporates the sweat of the people present in the room.

❖Due to this, the people in the room feels cool and comfortable.

Fig. 4.2.10: Working of a ceiling fan

4.2.4 Identifying and Troubleshooting Faults

To repair a fault, it is required to identify the fault. The following figure lists the standard operating procedure for identifying a fault in a ceiling fan:

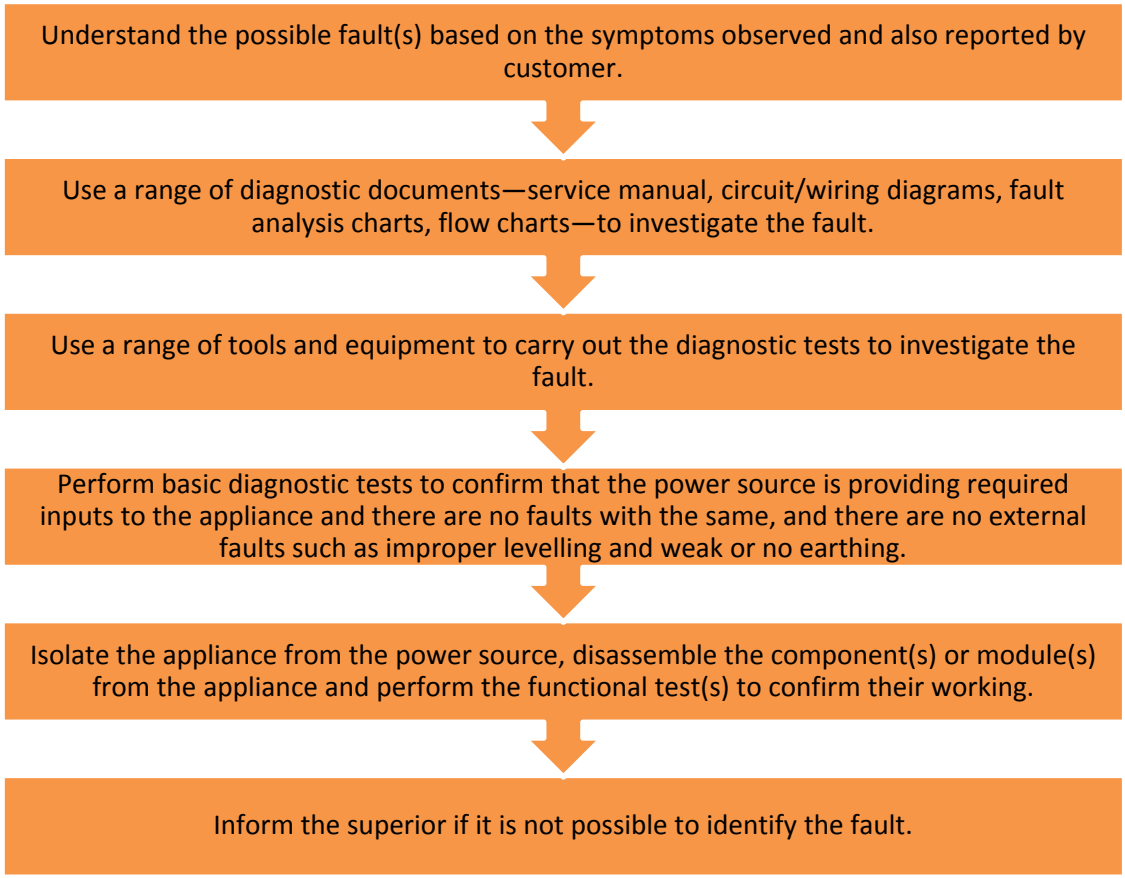


Fig. 4.2.11: Standard operating procedure for identifying a fault in a ceiling fan

The following table lists some common faults, their related causes and their solutions:

Fault	Cause	Solution
Fan is running in the wrong direction	Incorrect wiring	Interchange the start and run windings connected to the terminal box
Fan is not running	Power supply failure	Check the power at fan switch terminals and regulator
	Open winding	Check the continuity of start and run winding
Fan is rotating in lower speed than usual	Regulator failure	Test the regulator and replace with new regulator
	Capacitor failure	Check the capacitor and replace with new capacitor
Fan body is getting hot quickly	Dust accumulated below fan	Clean the dust for heat dissipation
	High current is drawn	Check the fan ratings with power supply
	Capacitor failure	Check the capacitor and replace with new capacitor

Humming sound	Upper canopy issue	Check whether upper canopy is touching the ceiling and adjust it
	Loose fan blades	Check the connections of fan blades and tighten them
	Ball bearing problem	Lubricate the ball bearing and if the sound continues, replace the bearing

4.2.5 Performance Testing and Demonstration

The following figure lists the standard operating procedure for testing a ceiling fan:

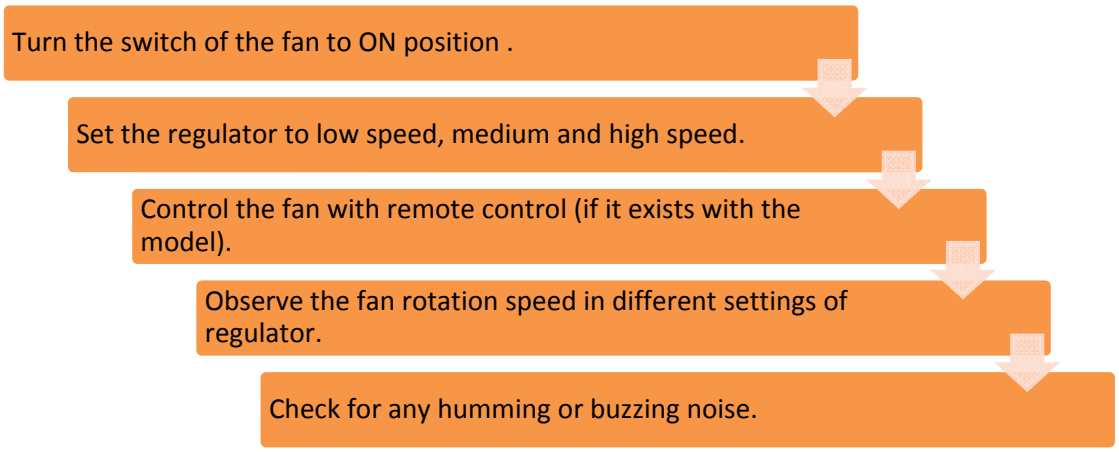


Fig. 4.2.12: Standard operating procedure for testing a ceiling fan

After repairing is done, the technician should demonstrate the operations to the customer. The following figure explains how to demonstrate the operations to the customer:

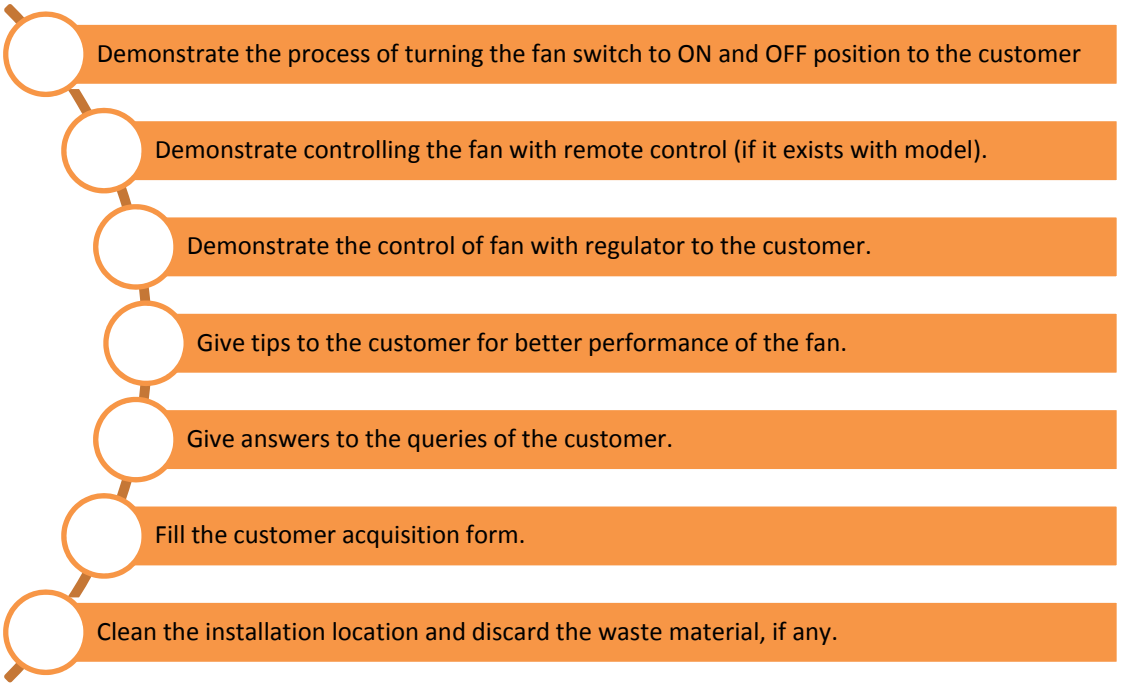


Fig. 4.2.13: Standard operating procedure for testing a ceiling fan

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

5. Install and Repair Water Purifier

Unit 5.1 – Basics of a Water Purifier

Unit 5.2 – Installing a Water Purifier

Unit 5.3 – Repairing a Water Purifier

Key learning Outcomes

At the end of this module, you will be able to:

1. Explain the properties of water that affect a purifier
2. Identify the types of contaminants present in water
3. List the methods of water treatment
4. List the major steps of a water purification process
5. Differentiate between the types of water purifiers
6. Identify various properties and components of an RO water purifier
7. List the steps involved in the functioning of an RO water purifier
8. Describe the pre-installation process of RO water purifiers
9. Install RO water purifiers
10. Describe the post-installation process of RO water purifiers
11. Perform steps to troubleshoot an RO water purifier
12. List the steps to be followed for the maintenance of an RO water purifier
13. Explain the safety steps to be considered while doing service and maintenance

UNIT 5.1: Basics of a Water Purifier

Unit Objectives

At the end of this unit, you will be able to:

1. Explain the properties of water that affect a purifier
2. Identify the types of contaminants present in water
3. List the methods of water treatment
4. List the major steps of a water purification process
5. Differentiate between the types of water purifiers
6. Identify various properties and components of an RO water purifier
7. List the steps involved in the functioning of an RO water purifier

5.1.1 Properties of Water Affecting Water – based Appliances

Water is the most abundant compound found on Earth and is essential for the survival of all life forms. More than 70% of Earth's surface is covered with water in the form of snow, glaciers, oceans, rivers and lakes. It is the only substance on earth that exists in all three physical states; in liquid state at standard temperature and pressure, in solid state as ice and in gaseous state as water vapour.

However, very little of this water is drinkable, as 96% of the Earth's water is salt water. Around 98% of the remaining freshwater is in the form of glaciers and polar ice caps. This leaves just about 1% of the freshwater on the surface in the form of rivers and lakes. Not all of this freshwater is safe for human consumption as it is contaminated with bacteria.

To make fresh water safe for drinking, it needs to be cleaned so that its intake does not cause any harm. The various properties of water make it a necessity for supporting life.

Properties of Water

Water is a transparent, odourless, tasteless and colourless liquid. Its chemical name is H_2O and it is made up of two hydrogen atoms and one oxygen atom joined together by covalent bonds. The following figure lists the various properties of water:

Universal Solvent

- Water can form hydrogen bonds and this property makes it a powerful solvent.
- It can dissolve a large number of different chemical substances.
- It is this dissolving power of water that supports life on Earth by carrying dissolved nutrients, minerals and chemicals wherever it goes.

High Specific Heat

- Water has a high specific heat capacity.
- Specific heat refers to the amount of heat needed to alter the temperature of a substance.
- Water can absorb and store a lot of heat before it gets hot.
- This enables it to moderate earth's temperature.

Strong Surface Tension

- Water has a high surface tension.
- Its high polarity makes its molecules strongly attracted to each other.
- Its molecules are adhesive and form a layer on its surface.
- High surface tension is responsible for the capillary action of water and enables it to move through plant roots and stems and even blood vessels in animals.

Neutral pH

- Water is neither acidic nor basic; it has a neutral pH value 7.

High Polarity

- Water has a high polarity.
- The hydrogen and oxygen molecules in water join at an angle with the oxygen atom at vertex and the hydrogen atoms at tips.
- The difference in the electro negativity of oxygen and hydrogen atoms makes water a strong polar compound.

Lower Density of Ice

- The density of ice is lower than the density of water.
- Water expands when it freezes and its molecules form a crystalline structure which is less dense than liquid water.
- This enables the ice to float on water and prevent oceans, lakes and rivers from freezing, thereby allowing life to exist on Earth.

Fig. 5.1.1: Properties of water

5.1.2 Water Treatment

Clean and safe water is critical for everyday life. Very little of the water found in nature is drinkable as it is contaminated with virus, bacteria and parasites. This water needs to be treated before it can become useful. Water treatment is the process of removing pathogenic micro-organisms which have entered water and making it fit for use.

The following figure lists the purpose of water treatment:

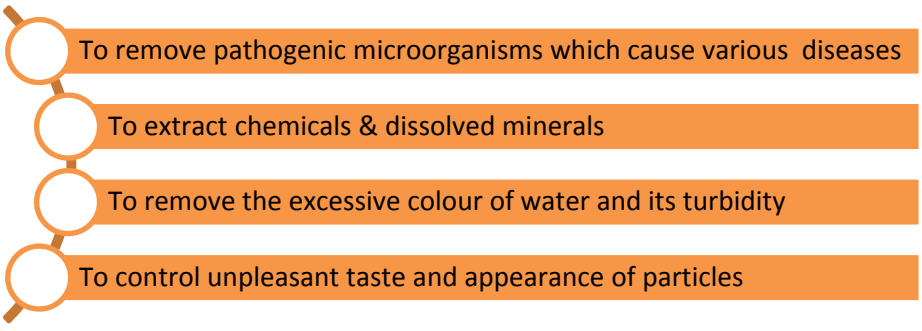


Fig. 5.1.2: Purpose of water treatment

There are four common types of contaminants that are generally found in water. These are shown in the following figure:

Fig. 5.1.3: Contaminants in water

Bacteria

Bacteria are a group of microorganisms that are found in plants, soil and water. Most of the bacteria are harmless but some of them can cause sickness and disease in humans. The most common of these are coliform bacteria which are present in intestines of warm blooded animals. It enters water when the water gets contaminated by animal faeces and can cause diseases such as cramps, vomiting, diarrhoea and intestinal infection.

Minerals

Minerals are inorganic substances found in rocks and similar matter in the earth. Some minerals such as calcium, magnesium and potassium are considered good for humans and some such as lead, arsenic and aluminum are considered harmful. Water is not a reliable source of minerals as it contains a mix of both types of minerals. The human body cannot absorb these minerals properly. The level of minerals dissolved in water determines its hardness.

Particulates

Particulates are minute particles of dirt, sand, rust and sediment found in water. Particulates themselves do not adversely affect health but they are carriers of other harmful contaminants in water; organic, inorganic and microbiological. Particulates are measured in microns where one micron is one millionth of a metre.

Chemicals

Chemical contaminants can be natural or man-made. They enter water through pollution, industrial discharge, urban activities, agriculture and disposal of waste. These undesirable contaminants include toxic metal salts, nitrogen, bleach, pesticides, fertilizers and human and animal drugs.

The presence of these contaminants makes water treatment very important. These methods involve removal of contaminants from water to make it safe for human consumption without any risk of unfavourable effects on health.

5.1.3 Water Treatment Methods

Water treatment is done at two levels:

Community water treatment	Domestic water treatment
•Public drinking water systems use surface water treatment plants to provide safe drinking water to people.	•Individuals use home treatment units such as filters, water softners and distillation systems to remove specific contaminants, to improve the taste of water and to protect against diseases.

Fig. 5.1.4: Types of water treatment

Water treatment methods use different types of agents to make water safe for drinking purpose. Water treatment agents can be divided into three categories as shown in the following figure:

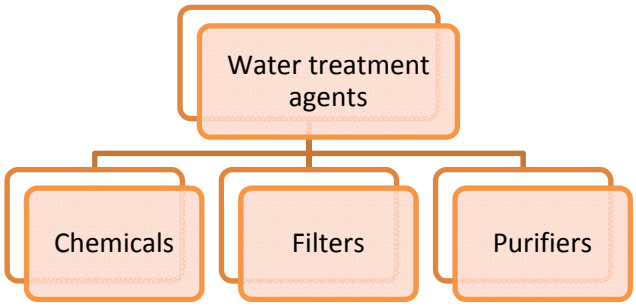


Fig. 5.1.5: Water treatment agents

Chemicals

A variety of chemicals are used in the process of water treatment for the purpose of desalination and for stoppage of fouling and scaling. The three most commonly used chemicals are chlorine, chlorine dioxide and ozone. They are used as disinfectants to kill unwanted microorganisms present in water and improve the taste, odour and clarity of water.

Filters

Filters purify water by removing impurities from it and reducing its contamination. The filtration process consists of making water flow over some type of filter which blocks the route of the contaminants. The filter can be a physical barrier, a chemical process or a biological process. There are four main types of filters as shown in the following figure:

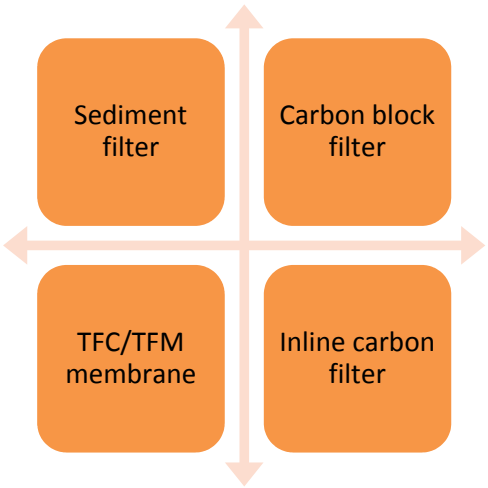


Fig. 5.1.6: Types of filters

Sediment Filter

Sediment filters remove suspended particulate matter such as sand, dirt, silt and organic matter from water. Water flows from the outside to the core of the filter and the impurities are retained on the filter surface. They, however, do not remove contaminants such as chlorine, lead, mercury and other organic compounds dissolved in water. The following figure shows how a sediment filter works:

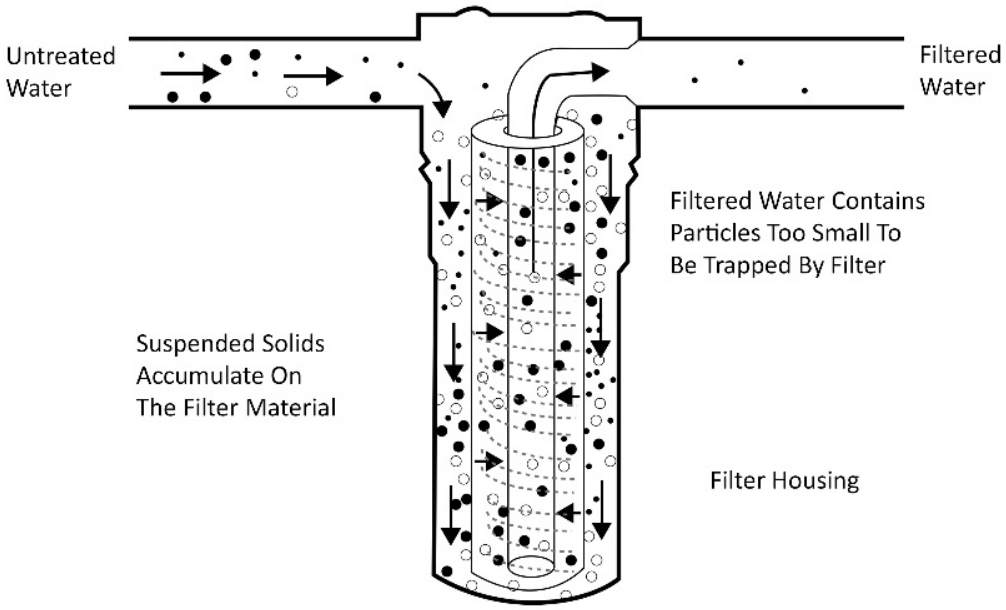


Fig. 5.1.7: Working of a sediment filter

Carbon Block Filter

Activated carbon block filters are used to remove contaminants such as chlorine, benzene, pesticides and other organic compounds. Carbon is activated by adding a positive charge, which enhances the surface area as well as the ability of absorption of the filter.
The following figure shows how a carbon block filter works:

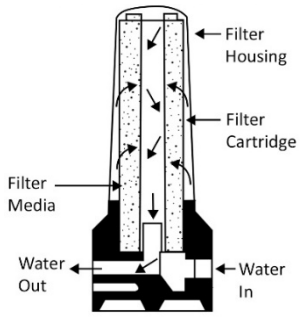


Fig. 5.1.8: Working of a carbon block filter

TFC/TFM Membrane

TFC/TFM are semi-permeable membranes used in the reverse osmosis (RO) water purification systems. Untreated water is forced through the membranes, which act like a strainer and allow pure water to pass through leaving the dissolved contaminants behind. The following figure shows different parts of a TFC/TFM membrane:

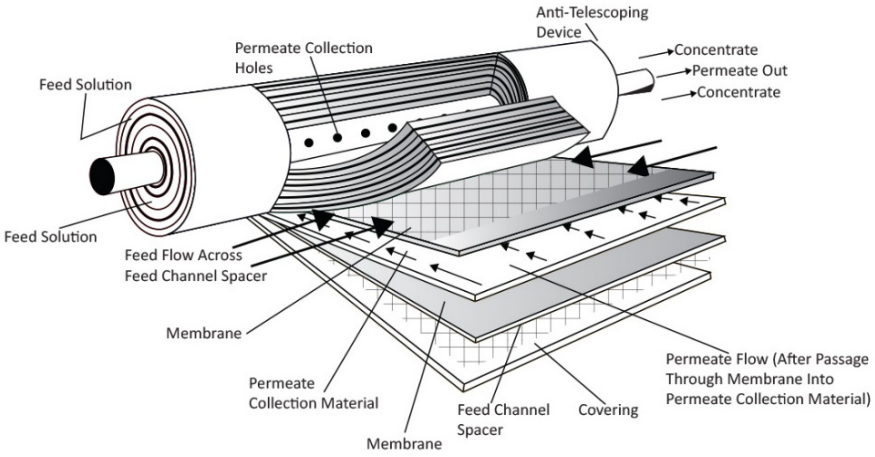


Fig. 5.1.9: Parts of a TFC/TFM membrane

Inline Carbon Filter

Carbon filters can also be installed in-line as a part of the RO water purification system. They are used as pre-treatment to safeguard other water treatment units, such as TFC/TFM membranes, from any damage due to organic fouling or oxidation.

The following figure shows an inline carbon filter:

Fig. 5.1.10: Inline carbon filter

Purifiers

Water purifiers remove contaminants such as excess salts, suspended particles and microbes dissolved in water and preserve its necessary vitamins and minerals.

The difference between water filters and purifiers lies in the type of impurities removed by them. The following figure lists the main differences between the two:

Water filters	Water purifiers
•Eliminate or minimise impurities such as dissolved salts and heavy metals •Work like a strainer and prevent unwanted elements from entering •Cannot remove viruses from water	•Eliminate contaminants such as bacteria and viruses present in water •Kills and removes unwanted elements from water •Removes even essential minerals from water

Fig. 5.1.11: Water filters vs. water purifiers

5.1.4 Water Purification Process

Water purification is the process of removing contaminants from untreated or raw water to get pure water that is safe for consumption. It consists of three different processes as shown in the following figure:

Physical processes	•Filtration, sedimentation and distillation
Biological processes	•Slow sand filters or biologically active carbon
Chemical processes	•Flocculation, chlorination and the use of ultraviolet light

Fig. 5.1.12: Water purification processes

Steps of the Purification Process

The water purification process consists of four major steps as shown in the following figure:

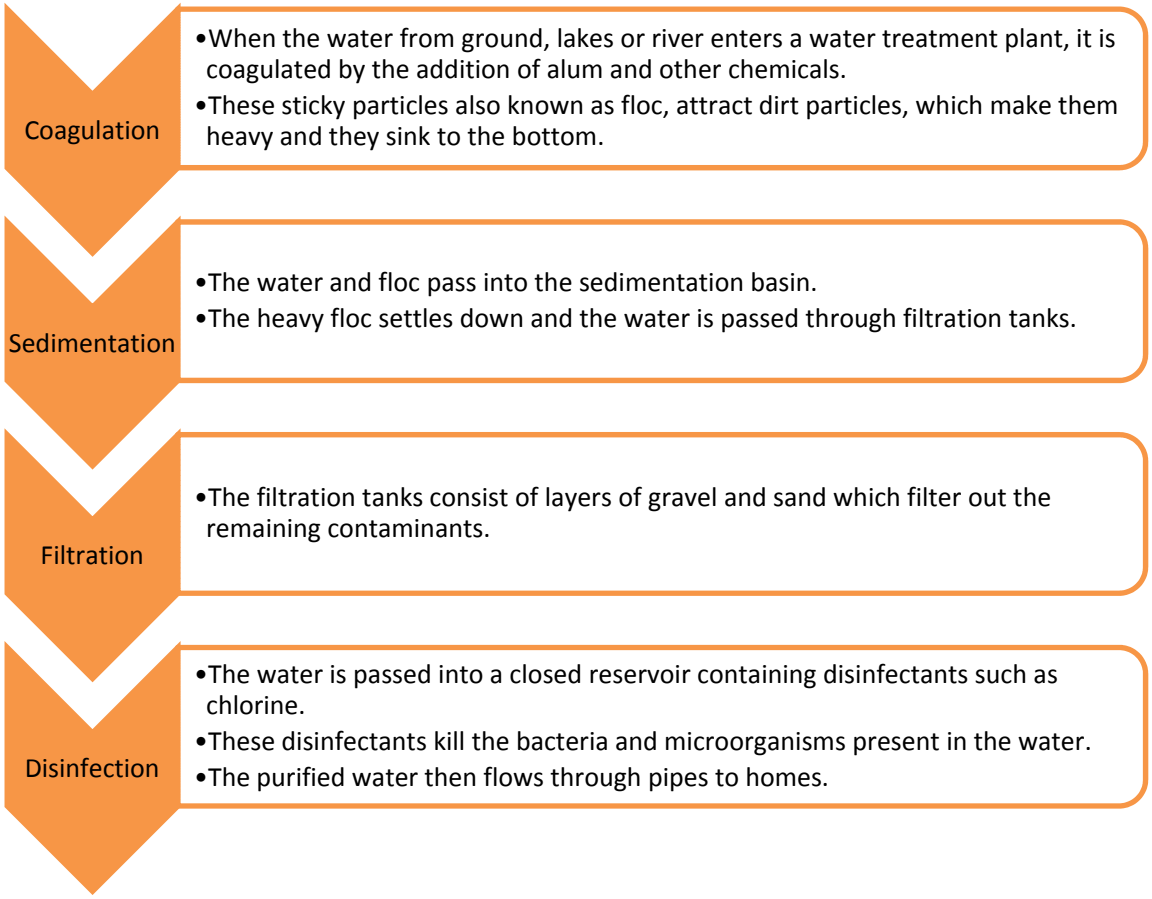


Fig. 5.1.13: Steps of water purification

5.1.5 Types of Water Purifiers

Pure, clean and safe drinking water is a necessity for human life and health. Water that is supplied in homes is contaminated with organic and inorganic particles. It becomes critical to purify the tap water to ensure it is safe for consumption and does not have any adverse effect on health. A water purifier removes contaminants such as excess salts, suspended particles and microbes dissolved in water and preserves its necessary vitamins and minerals. The following image shows a common water purifier:

Fig. 5.1.14: Water purifier

There are five major categories of water purifiers depending on the purification methods they use. The following figure lists these categories:

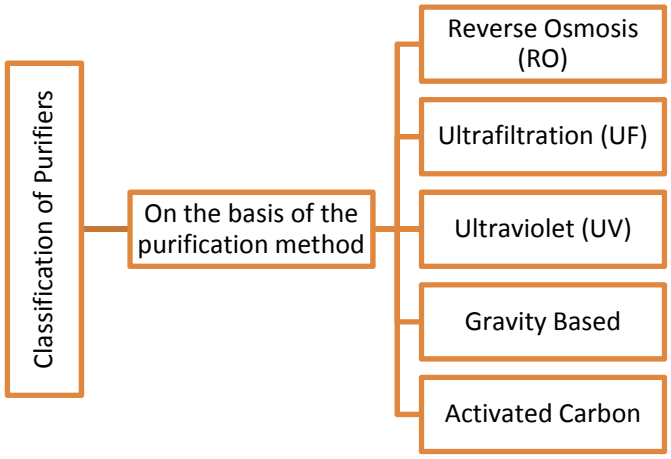


Fig. 5.1.15: Types of purifiers

RO Water Purifiers

RO water purifiers are the most commonly used purifiers and are based on the principle of reverse osmosis. They make use of the membrane technology to eliminate contaminants such as salts, heavy metals and germs dissolved in water. The following image shows an RO purifier membrane:

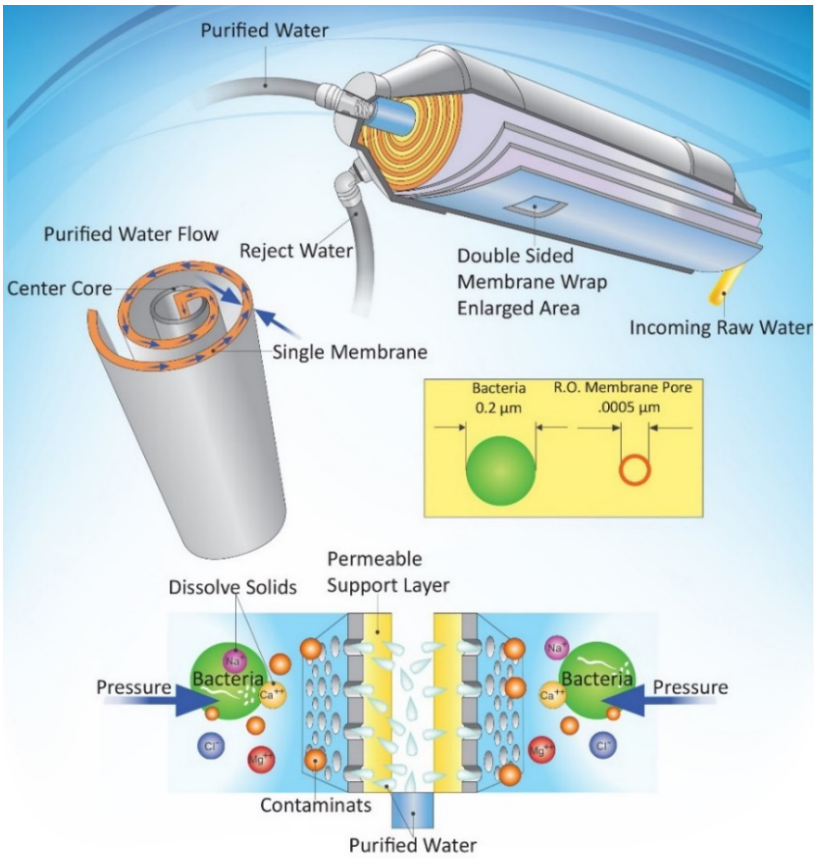


Fig. 5.1.16: RO purifier membrane

The main advantages of using an RO purifier are as shown in the following figure:

Fig. 5.1.17: Advantages of an RO purifier

There are certain disadvantages of an RO purifier such as:

- Removes essential minerals along with dissolved impurities
- Alters the taste of water
- Wastes large quantity of water
- Requires electricity to purify water
- Requires special care and maintenance for its membrane

UF Water Purifiers

UF water purifiers use membranes similar to an RO membrane but with larger pores. They remove all germs and bacteria from water but do not remove dissolved salts or solids. They are suitable in homes where the water supplied is not very hard and has less dissolved salts. The process of purification in a UF purifier is shown in the following image:

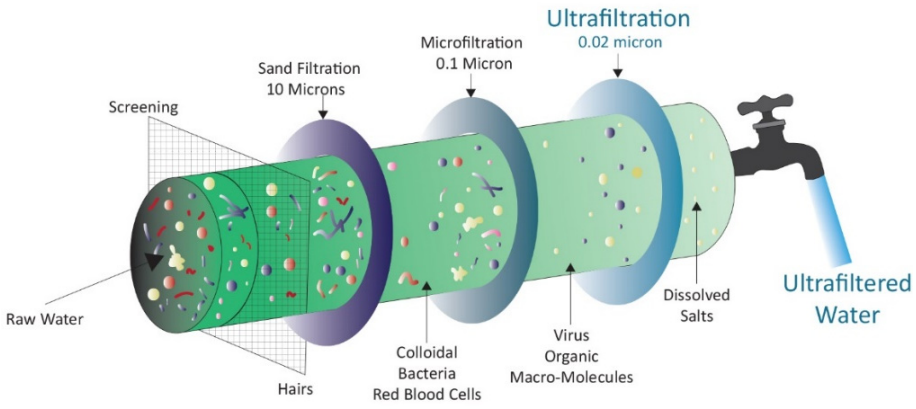


Fig. 5.1.18: Process of purification in a UF purifier

The main advantages of using a UF purifier are as shown in the following figure:

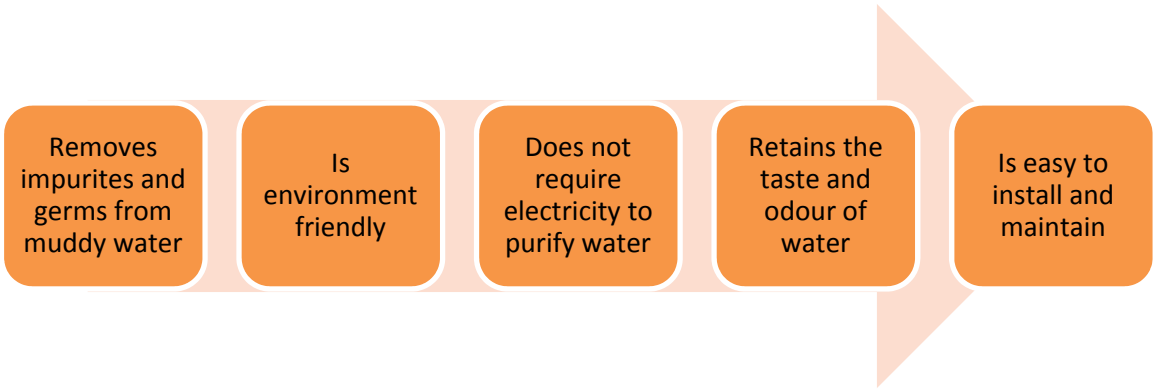


Fig 5.1.19: Advantages of a UF purifier

There are certain disadvantages of a UF purifier such as:

- Unable to remove dissolved impurities such as arsenic, lead, nitrates and fluorides
- Ineffective as compared to an RO water purifier as it cannot block dissolved salts and solids
- Effective only for water with low TDS

UV Water Purifiers

UV water purifiers use ultraviolet rays to kill all germs, bacteria and microbes dissolved in water. A small mercury lamp is placed inside the purifier, which produces high frequency short wave UV radiations. When water passes through this element, it is exposed to the UV light which kills all the living organisms in it. It is required to separate filters and then remove the dead germs.

UV purifiers are used in residences, breweries, water stores, restaurants and municipalities.

The following image shows the working of UV water purifiers:

The main advantages of using a UV purifier are as shown in the following figure:

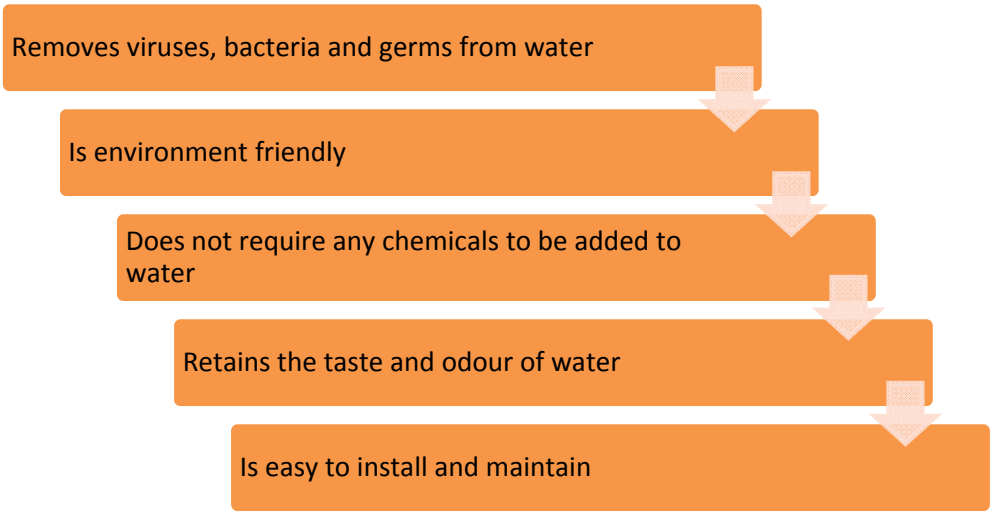


Fig. 5.1.20: Advantages of a UV purifier

There are certain disadvantages of a UV purifier such as:

- Unable to remove dissolved impurities such as arsenic, lead, nitrates and fluorides
- Requires electricity to purify water

Gravity Based Water Purifiers

Gravity based water purifiers are based on the principle of gravity. The water flows from a higher compartment over the filters to a lower compartment. They do not require electricity and use either chemical based, UF based or ceramic cartridge-based filters to purify water. The following figure shows the parts of a gravity based purifier:

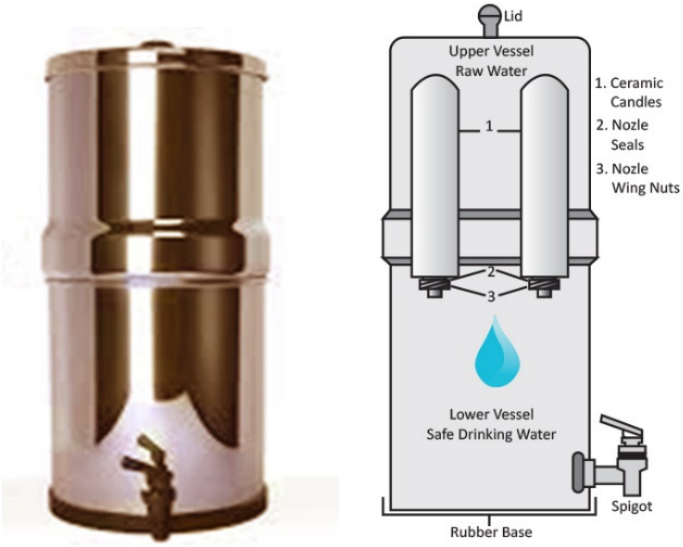


Fig. 5.1.21: Gravity based purifier

The main advantages of using a gravity based purifier are as shown in the following figure:

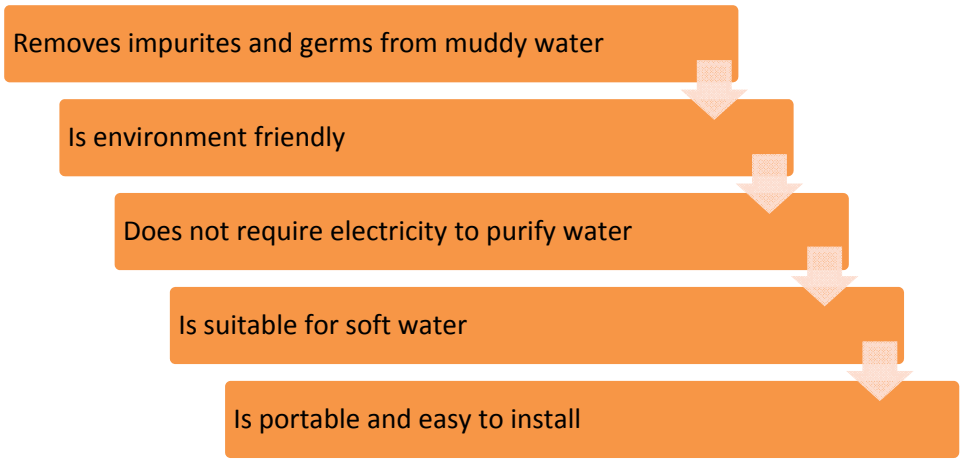


Fig. 5.1.22: Advantages of a gravity based purifier

There are certain disadvantages of a gravity based purifier such as:

- Unable to remove dissolved impurities such as arsenic, lead, nitrates and fluorides
- Ineffective as compared to an RO water purifier as it cannot block dissolved salts and solids
- Effective only for water with low TDS

Activated Carbon Water Purifiers

Activated carbon is carbon with a positive charge added to it. When water flows over it, the negative ions of contaminants get attracted to the surface of the activated carbon filter. Activated carbon water purifiers can remove volatile organic compounds, pesticides, herbicides, chlorine and other chemicals found in tap water. This makes the water safe to drink. The following images show an activated carbon block filter and the process of purification in it:

Fig 5.1.23: Activated carbon block filter

The main advantages of using an activated carbon purifier are as shown in the following figure:

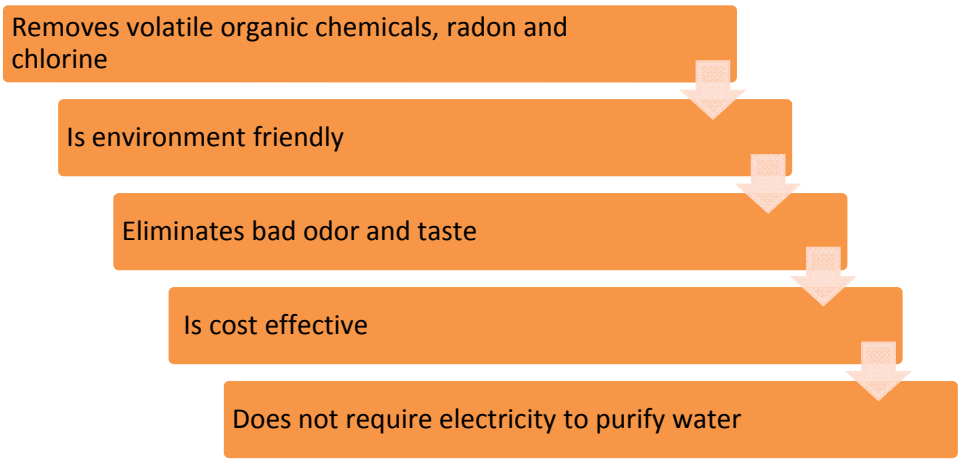


Fig. 5.1.24: Advantages of an activated carbon purifier

There are certain disadvantages of an activated carbon purifier such as:

- Unable to remove dissolved microbes and impurities such as arsenic, lead, nitrates and fluoride
- Ineffective as compared to an RO water filter as it cannot block dissolved salts and solids
- Requires frequent filter changes

5.1.6 RO Water Purifier

RO water purifiers work on the principle of reverse osmosis. In this process, pressure is applied on contaminated water to force it through a semi-permeable membrane. The water is purified by filtering and flushing out the impurities as shown in the following image:

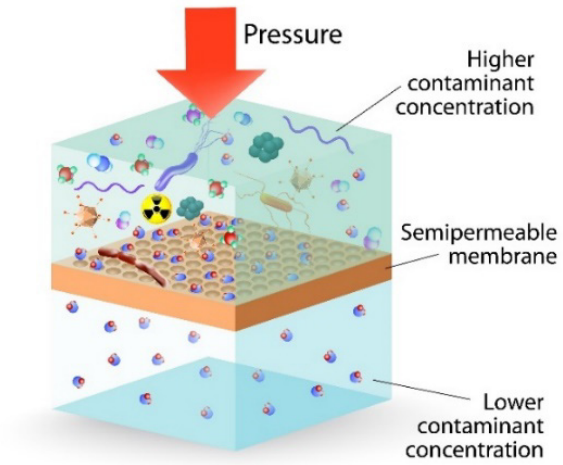


Fig. 5.1.25: Reverse osmosis process

Properties of RO Water Purifier

The properties of an RO water purifier are shown in the following figure:

- Is suitable for hard water
- Removes dissolved salts and organic and inorganic particles
- Removes dissolved impurities such as sulfates, fluorides, bacteria, pesticides, arsenic and chloramines
- Improves taste, odour and appearance of water
- Is economical to purchase and easy to maintain
- Has simple operation and control

Fig. 5.1.26: Properties of an RO water purifier

Components of RO Water Purifier

The following figure lists the basic components of an RO system:

Supply line valve	•Attaches the inlet of the RO pre-filter to the water source through a tube
Pre-filter sediment	•Removes sand, dirt and other sediments
Carbon filter	•Adsorbs chemical impurites such as chlorine and pesticides and improves odour and taste of water
RO membrane	•Removes almost all dissloved salts, impurities and bacteria
Water tank	•Stores water before 'post filtration'
Post filter	•Also known as 'polishing' filter as it removes the remaining taste and odour from the treated water
Shut-off valve	•Automatically shuts-off the water supply to the membrane when the storage tank gets full
Check valve	•Prevents backward flow of water from the tank to the membrane
Flow restrictor	•Maintains pressure on the inlet of the membrane to ensure the highest quality of water
Drain line	•Connects one outlet of the membrane to the drain to dispose off waste water

Fig. 5.1.27: Components of an RO water purifier

Functioning of RO Water Purifier

The following figure lists the steps involved in the functioning of an RO water purifier:

Step 1	•Water enters from the supply line
Step 2	•Water enters the sediment filter which strains out sand, dirt and sediments
Step 3	•Water enters the carbon filter which removes chlorine and other contaminants
Step 4	•Water enters the RO membrane which filters out all additional contaminants
Step 5	•Water enters the storage tank •Waste water containing imputirites is drained out
Step 6	•Water enters post filter to remove any remaining odor and taste in water
Step 7	•Water leaves the filter and goes to faucet

Fig 5.1.28: Functioning of an RO water purifier

The following diagram shows the flow of water in an RO purifier:

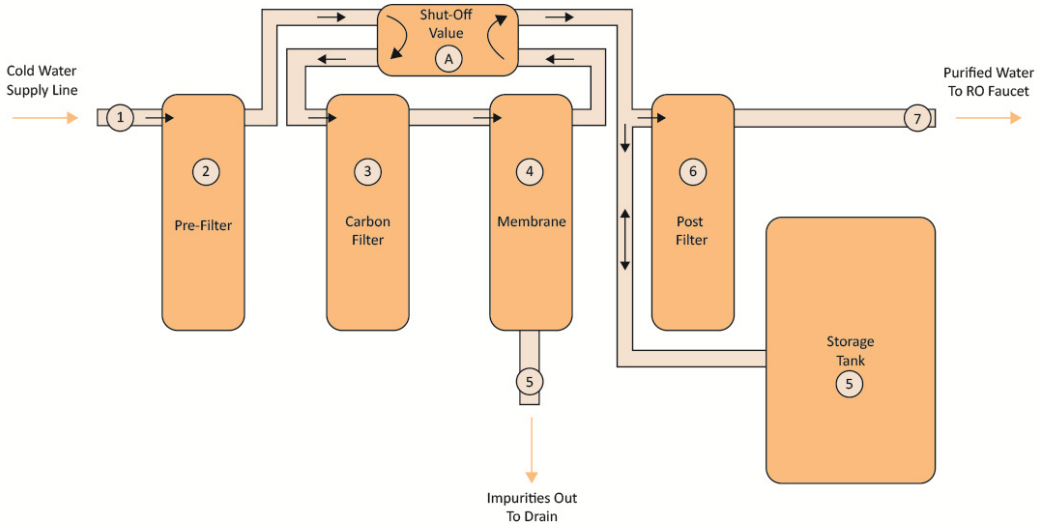


Fig. 5.1.29: Water flow in an RO water purifier

The following diagram shows the flow of electric current in an RO purifier:

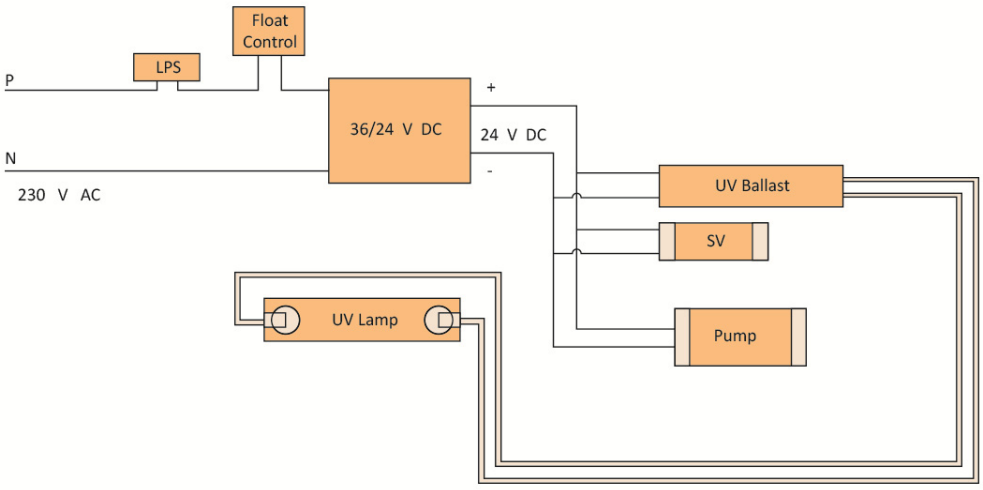


Fig. 5.1.30: Electrical circuit diagram of an RO water purifier

UNIT 5.2: Installing a Water Purifier

Unit Objectives

At the end of this unit, you will be able to:

1. Describe the pre-installation process of RO water purifiers
2. Install RO water purifiers
3. Identify the safety procedures to be followed during installation
4. Describe the post-installation process of RO water purifiers

5.2.1 Pre-installation Process of Water Purifiers

Before beginning the installation, the pre-installation process should be followed to ensure that the unit is properly installed. The pre-installation checks consist of tasks as shown in the following figure:

Inspection	Removing the package	Package validation
•Inspect the carton and the unit to ensure there are no concealed damages due to rough handling	•Remove the components from the shipping carton carefully	•Check that all installation parts such as the unit, faucet, tubing and installation hardware are present

Fig. 5.2.1: Pre-installation process of RO water purifiers

The following figure lists the guidelines that should be followed before installing an RO water purifier:

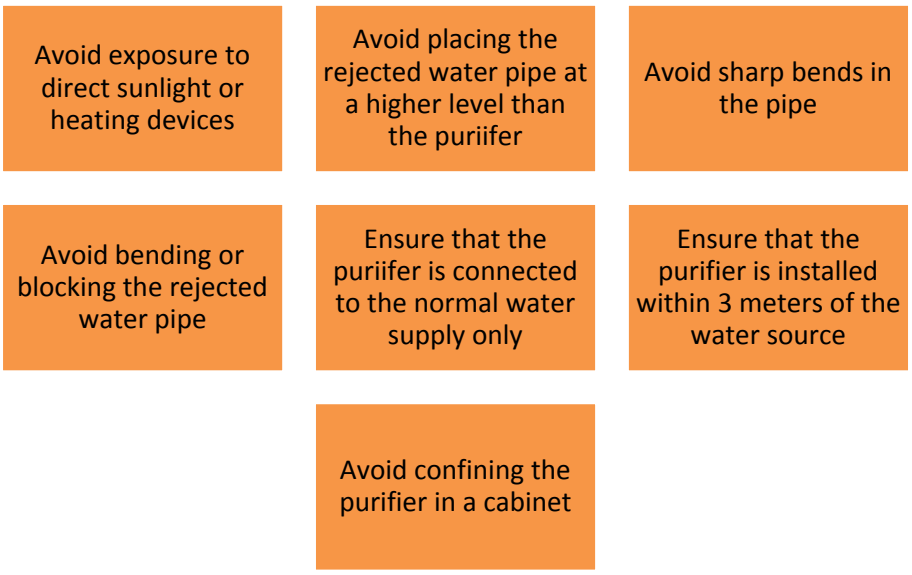


Fig. 5.2.2: Pre-installation guidelines

5.2.2 Installation of RO Water Purifiers

The installation process begins with site preparation. The recommended site preparation steps are shown in the following figure:

- Ensure single phase connection is within 3m of the point of installation
- Ensure raw water supply is within 3m
- Ensure raw water supply tank is at least 10 feet above the purifier
- Ensure there is a sink near the purifier
- Ensure waste water drain is within 3m
- Ensure enough space is there as per the dimensions of the purifier

Fig. 5.2.3: Site preparation steps

Installation Procedure

The following steps should be performed when installing a wall mounted RO water purifier:

1. Disconnect the water supply line from the normal tap water.
2. Mark screw locations at same horizontal level on the wall.
3. Screw in two self-taping screws into the marked positions.
4. Hang the purifier with the help of wall mounting screws present at the back of the purifier. The following figure shows wall mounting screw slots for hanging the purifier:

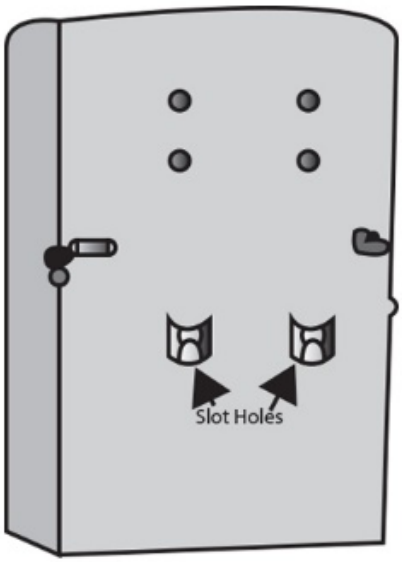


Fig. 5.2.4: Wall mounting screw slots for hanging the purifier

5. Fix the SS ball valve to the port of 3-way connector as shown in the following figure:

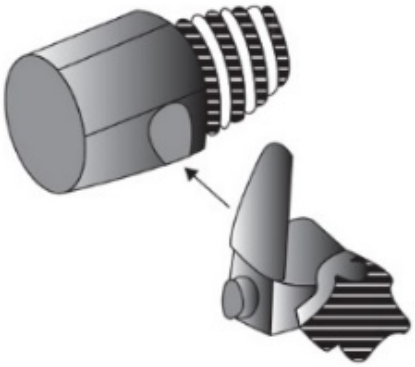


Fig. 5.2.5: Fixing the SS ball valve to the port of 3-way connector

6. Connect the raw water supply to the 3-way connector:
   a. Connect the threaded end of the connector to the raw water supply.
   b. Connect the other end to a tap, if required.

   The following figure shows the 3-way connector connected to the water supply:

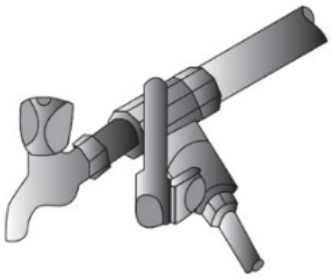


Fig. 5.2.6: 3-way connector connected to the water supply

7. The left side of the purifier has a lower pushfit elbow fitting labelled as WATER IN.
8. Take the white pipe which is for raw water supply:
   a. Connect one end to the SS ball valve.
   b. Connect the other end to the WATER IN fitting.

   The following figure shows connecting the pipe which is for water supply:

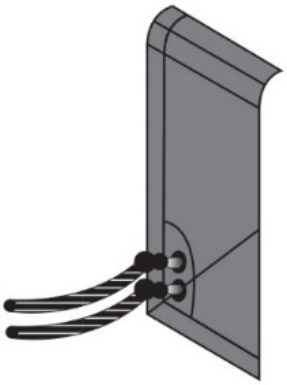


Fig. 5.2.7: Connecting the pipe which is for water supply

9. The left side of the purifier has an upper push fit elbow fitting labelled as REJECT WATER.
10. Take the blue pipe which is for reject water:
    a. Connect one end to the REJECT WATER fitting.
    b. Leave the other end in the drain.

    The following figure shows connecting the pipe which is for reject water:

Fig. 5.2.8: Connecting the pipe which is for reject water

11. Open the SS ball to start the flow of water into the purifier.
12. Ensure that the filters are soaked in water before connecting the power supply.

5.2.3 Safety Procedures to be Followed During Installation

The following figure explains the safety guidelines that must be followed by a multi skill technician when installing an RO system:

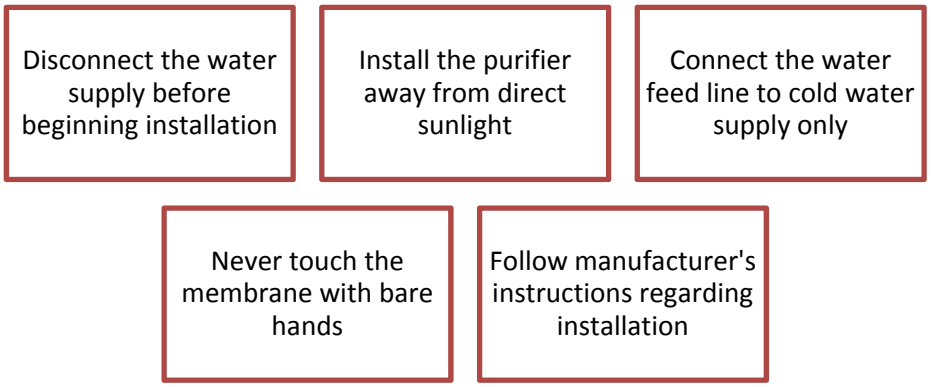


Fig. 5.2.9: Safety procedures during installation

5.2.4 Post-installation Process of RO Water Purifiers

Once the purifier has been successfully installed, it is time to follow the post-installation process to ensure completion of the installation process. The post-installation process consists of tasks as shown in the following figure:

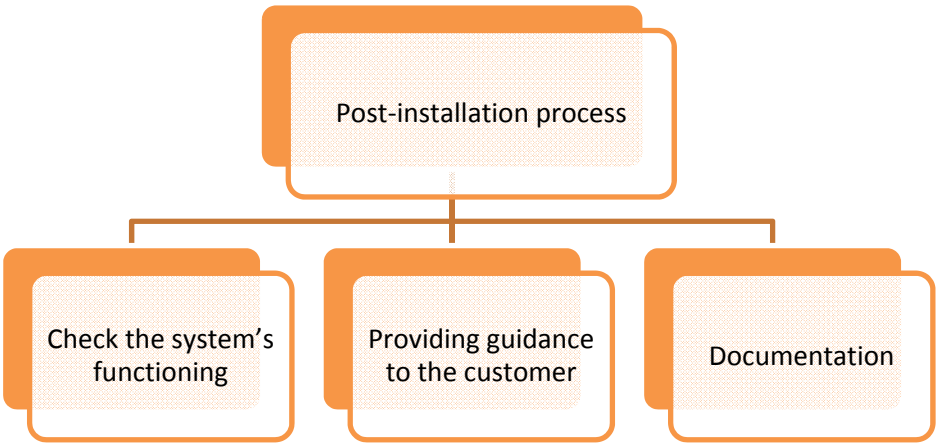


Fig. 5.2.10: The post-installation process

Check the System's Functioning

Perform the checks as shown in the following figure to ensure that the purifier is working properly:

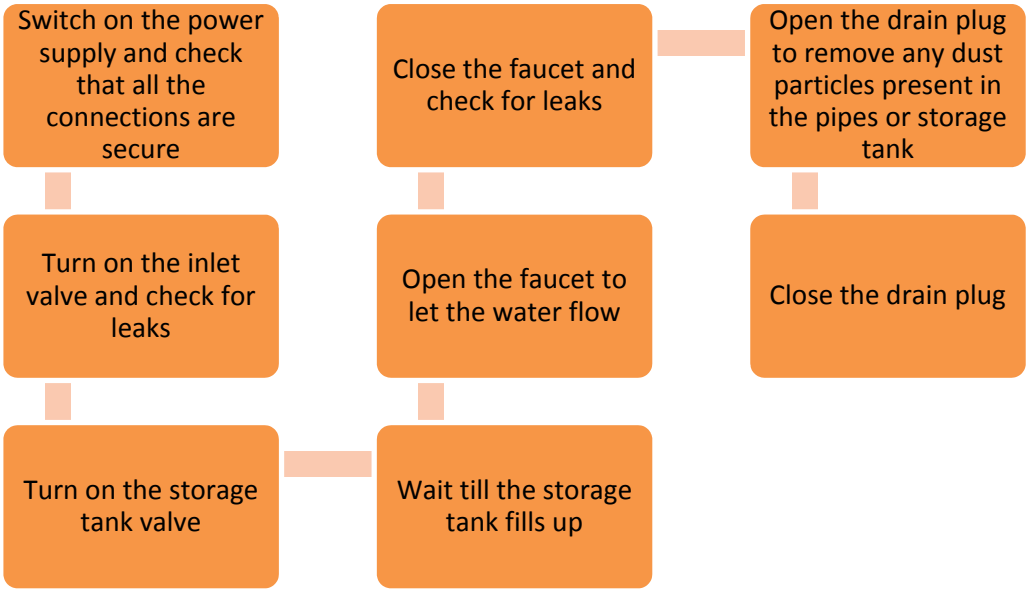


Fig. 5.2.11: Checks to ensure proper working of an RO purifier

Provide Guidance to the Customer

After installing the purifier, the multi skill technician should give a demonstration of the working of the purifier. It is a way of promoting or showing the operation of purifier to the users. The goal of demonstrating is to show the customer how to operate and use the purifier.

There are a few rules which must be considered while preparing for the demo. The following figure lists these rules:

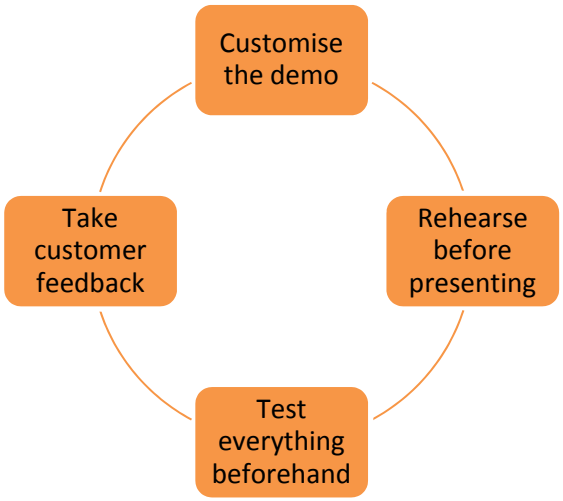
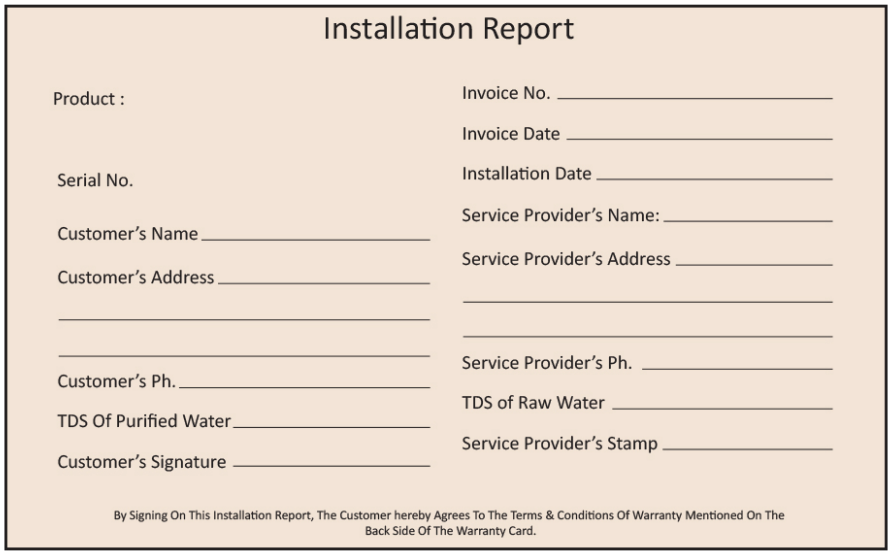


Fig. 5.2.12: Rules for an effective demo

Perform Documentation

The last task of the post-installation process is to fill in all the details in the installation report clearly and get feedback from the customer. The following image shows a typical template of the installation form that the multi skill technician should fill-in after installing an RO system:



Installation Report

Product :

Serial No.

Customer's Name _____

Customer's Address _____

_____

_____

Customer's Ph. _____

TDS Of Purified Water _____

Customer's Signature _____

Invoice No. _____

Invoice Date _____

Installation Date _____

Service Provider's Name: _____

Service Provider's Address _____

_____

_____

Service Provider's Ph. _____

TDS of Raw Water _____

Service Provider's Stamp _____

By Signing On This Installation Report, The Customer hereby Agrees To The Terms & Conditions Of Warranty Mentioned On The Back Side Of The Warranty Card.

Fig. 5.2.13: A sample installation report

UNIT 5.3: Repairing of Water Purifiers

Unit Objectives

At the end of this unit, you will be able to:

1. Perform steps to troubleshoot an RO water purifier
2. List the steps to be followed for the maintenance of an RO water purifier
3. Explain the safety steps to be considered while doing service and maintenance

5.3.1 Troubleshooting of RO Water Purifiers

Troubleshooting refers to repair of faulty products or processes. It begins with searching for the source of a problem and ends with finding the solution for that problem to ensure that the product or process functions properly. Good troubleshooting consists of the following four steps:

1. Identification of the symptoms
2. Elimination of the causes of a problem
3. Verification of the solution
4. Restoration of the product or process

The multi skill technician should follow some simple steps for troubleshooting as shown in the following figure:

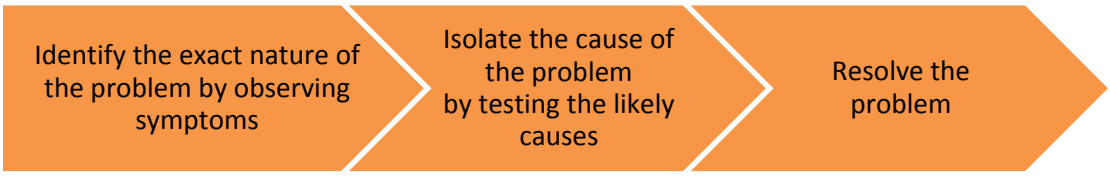


Fig. 5.3.1: Steps for troubleshooting

Troubleshooting Chart

The following table lists some common problems and their solutions:

Issue	Diagnosis	Solution
Not Enough /No water from Tap	Blocked or closed feed water input	• Open or unblock valve
	Blocked sediment/carbon filter	• Replace filters
	Closed tank valve	• Open valve
	Blocked drain flow restrictor	• Replace drain flow restrictor

	Membrane housing valve stuck	• Replace check valve
	Malfunctioning automatic shut-off valve	• Replace automatic shut-off valve
	Membrane polluted	• Replace membrane
Low pressure from water outlet tap/faucet	Incorrect air pressure in storage tank	• Empty storage tank • Find the air valve stem and add air till all water is removed • Pressurise the tank to 8 PSI • Reinstall the tank • Turn on the feed supply
	Blocked post carbon filter	• Replace post carbon filter
	Partially closed tank valve	• Open valve
	Faulty faucet	• Replace faucet
High TDS in output water	Blocked pre-filter	• Replace pre-filter
	Incorrectly sealed membrane	• Install the membrane correctly
	Exhausted membrane	• Replace membrane
	Reversed output and drain water lines	• Swap the connections
	Malfunctioning automatic shut-off valve	• Replace automatic shut-off valve
	Dirty post-carbon filter	• Clean/replace post-carbon filter
Bad taste or odour	Blocked post carbon filter	• Replace post carbon filter
	Exhausted membrane	• Replace membrane
	Dirty storage tank	• Clean storage tank
	Water in storage tank left for a long time	• Drain and clean storage tank
Leaking membrane housing	Leak in threaded end cap	• Lubricate O-ring and tighten cap • Replace O-ring if leak continues

	Leak in cap or body of housing	• Check housing/ cap for cracks • Replace if cracked or damaged
Leaking filter housing	Improper O-ring seating	• Seat O-ring in groove • If dirty, clean and lubricate O-ring • Replace if cracked or damaged
	Housing cap loose	• Hand tighten cap properly
	Damaged housing	• Replace if cracked or damaged
Leaking fitting	Damaged or cracked fitting	• Replace fitting
	Improper tubing or thread installation	• Check and correct tubing and thread installation
System continuously running	Automatic shut-off valve not working	• Replace automatic shut-off valve
	Low incoming water pressure	• Increase water pressure to 40 psi
	Low air pressure in storage tank	• Increase air pressure to 5 - 7 psi when empty
	Damaged storage tank	• Replace storage tank
	Worn out flow restrictor	• Replace flow restrictor
	Incorrectly installed membrane	• Check membrane installation
Milky water	New system or filters	• Air in lines - will go way with use
	Water supply	• High oxygen content - will go way with use
	Bad membrane	• Check TDS of water • Replace membrane
Noisy drain/ faucet	Air gap faucet	• Check air gap is properly installed
	Drain tube	• Check drain line for loops, bends, dips or kinks

5.3.2 Maintenance of RO Water Purifiers

To ensure that the water purifier provides the same quality water, it is essential to do periodic maintenance of the system. The following figure lists the steps to be followed for the maintenance of an RO system:

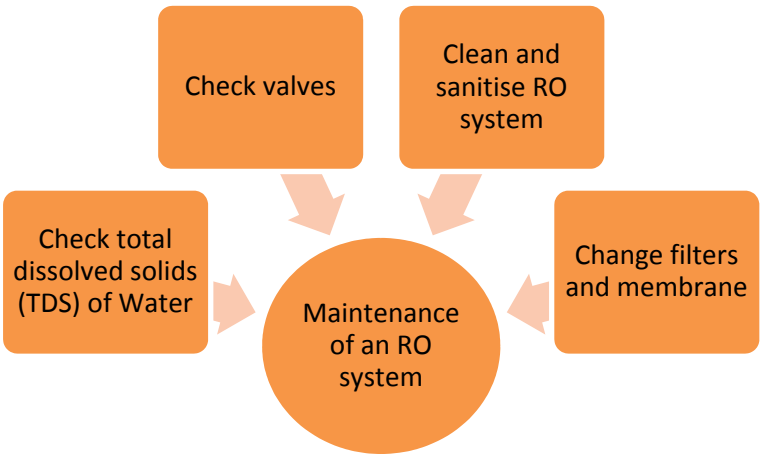


Fig. 5.3.2: Maintenance of an RO system

Check TDS of Water

Water is often called the universal solvent because it picks up impurities easily. The impurities can be minerals, salts, metals or ions. These are also known as 'dissolved solids'. These dissolved solids increase the electrical conductivity of water.

TDS is used as a measure to determine the purity of water and the quality of water purification systems.

TDS

TDS are the total amount of dissolved solids present in water. It is the sum of positively charged ions (cations) and negatively charged ions (anions) in the water. It is measured in units of mg per unit volume of water (mg/L) and is also referred to as parts per million (ppm).

The maximum contamination level advised for TDS is 500 mg /l and a high level of TDS indicates the possibility of toxic ions such as lead, arsenic, cadmium and others dissolved in water. The following figure shows the various levels of TDS in water:

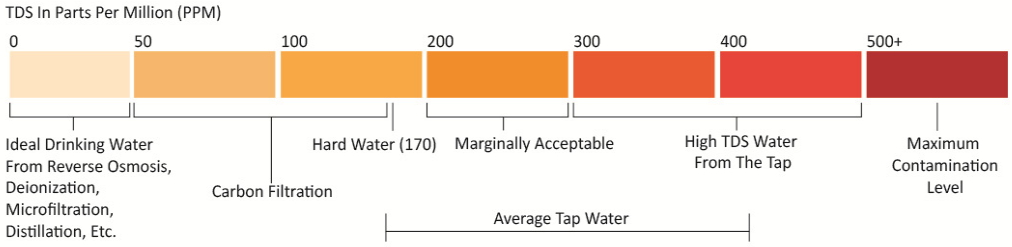


Fig. 5.3.3: Levels of TDS in water

It is important to monitor the TDS regularly to ensure that the water purification system is effective in removing unwanted particles from water.
The following figure lists the reasons for testing water for high TDS:

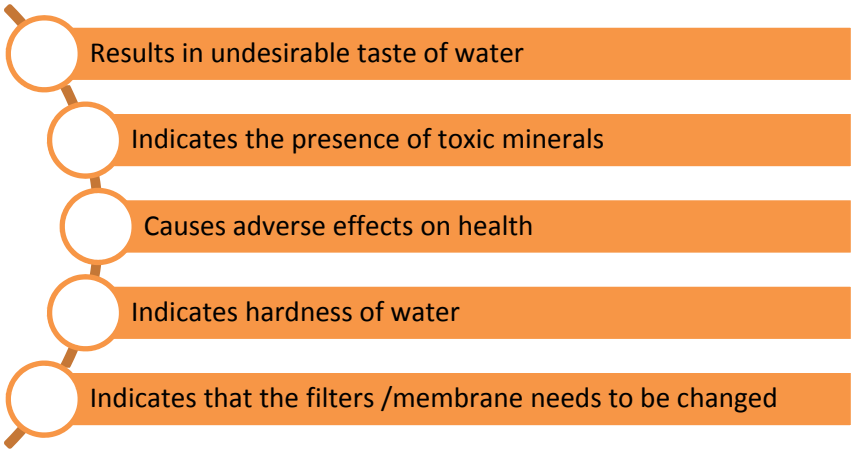


Fig. 5.3.4: Reasons for testing water for high TDS

TDS Meter

TDS of water or any solution is measured with the help of TDS meter. It is a small hand held device that measures the electrical conductivity of water and estimates the TDS from that reading. The following figure shows a commonly used TDS meter:

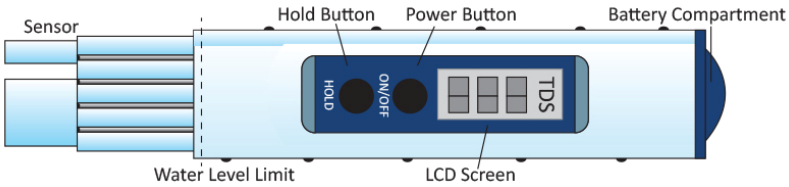


Fig. 5.3.5: TDS meter

Taking TDS Measurements

A TDS meter is very easy and simple to use. The following figure lists the steps of taking TDS measurements using a TDS meter:

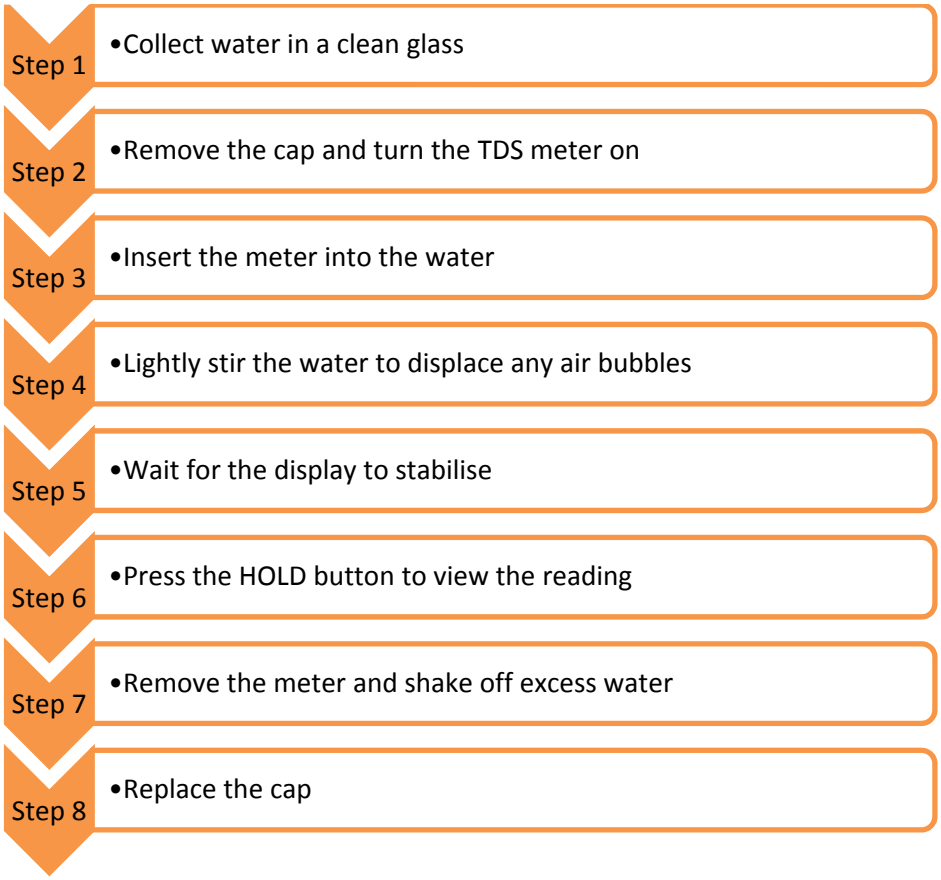


Fig. 5.3.6: Using a TDS meter

Check valves

An RO system has two types of valves— auto-shut-off valve (ASV) and check valve (CV). If either of the two is defective then the RO system will not shut-off and the water will start running constantly. The following figure lists the steps involved in checking auto-shut-off valve and check valve:

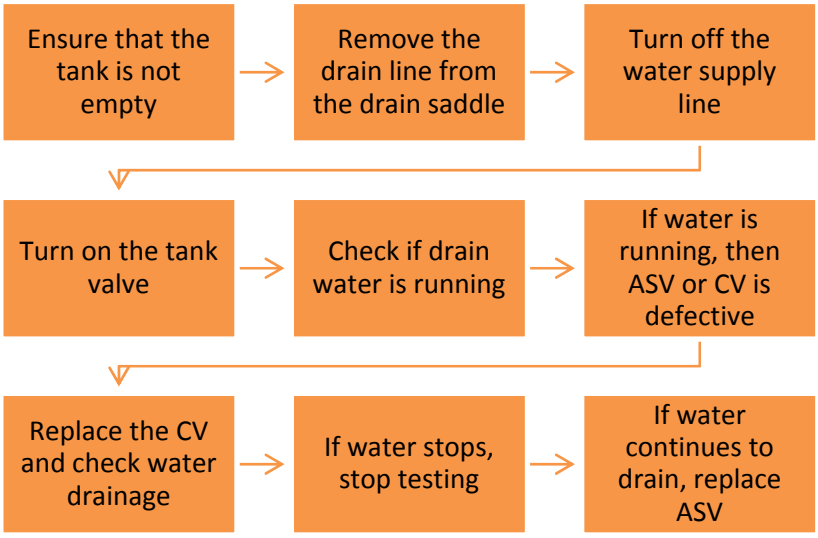


Fig. 5.3.7: Steps to check valves of an RO system

Clean and Sanitize RO System

An RO system should be cleaned and sanitised at least once every year. The steps to sanitise an RO system are listed in the following figure:

Fig. 5.3.8: Steps to sanitise an RO system

Changing Filters and Membrane

It is recommended to change the filters/membrane of an RO system as per the schedule shown in the following figure:

Sediment filter	Carbon filter	Carbon post filter	R O membrane
•Change every 6 - 12 months	•Change every 6 - 12 months	•Change every 12 months	•Change every 24 months

Fig. 5.3.9: Filter change schedule

When changing filters or the membrane of the system, it is vital to follow appropriate sanitation and service procedures as outlined in the following figure:

Ensure correct cartridges are used for replacement
Remove the cartridge from packaging only after service is complete
Ensure the area around system is free from dust
Be sure to wash hands before starting work
Be careful not to run hot water through the unit

Fig. 5.3.10: Sanitation and service procedures

Changing filter

The following figure lists the steps involved in changing the filter:

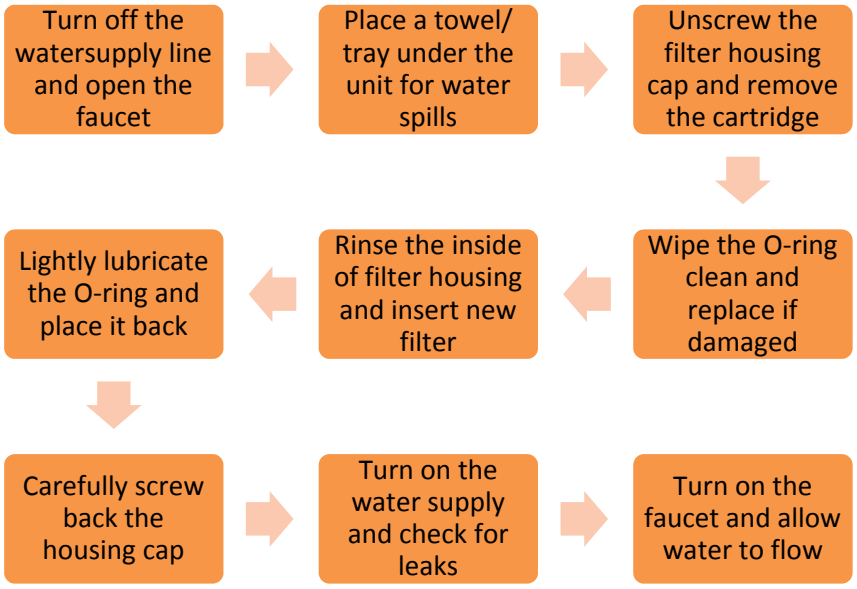


Fig. 5.3.11: Steps of changing the filter

Changing Membrane

The following figure explains the steps involved in changing the membrane:

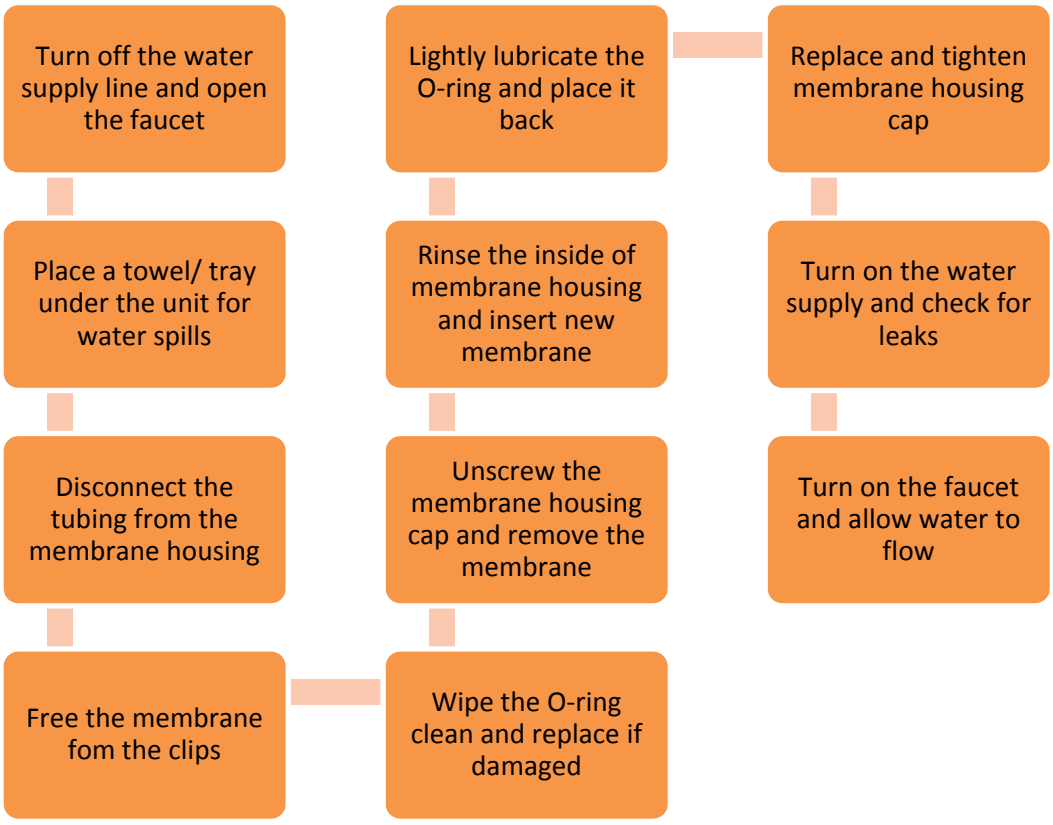


Fig. 5.3.12: Steps of changing the membrane

Informing the Customer about the Dos and Don'ts of Maintenance

Inform the customers that an RO water purifier lasts for many years if it is maintained properly. The following figure shows the various dos and don'ts that should be followed:

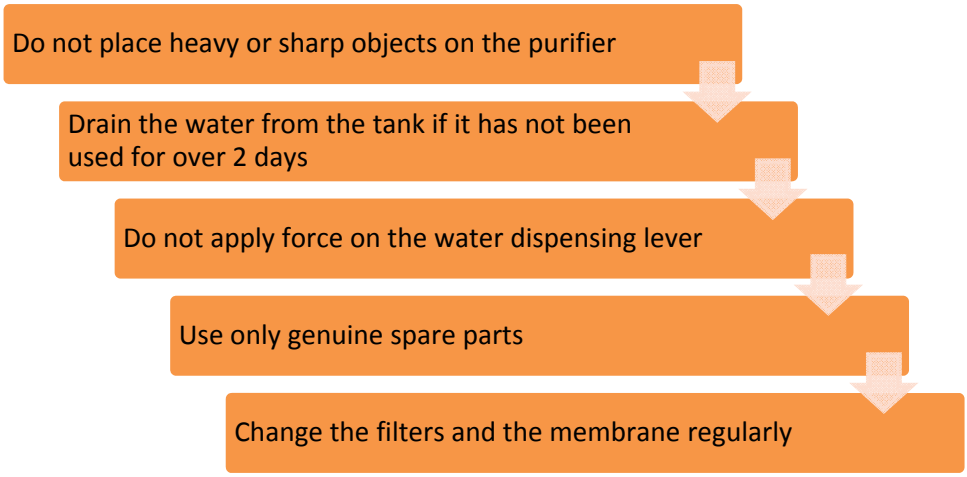


Fig. 5.3.13: Dos and don'ts of maintenance

5.3.3 Safety Procedures for Repairing or Maintenance

The following figure explains the safety guidelines that must be followed by a technician when doing repair or maintenance of an RO system:

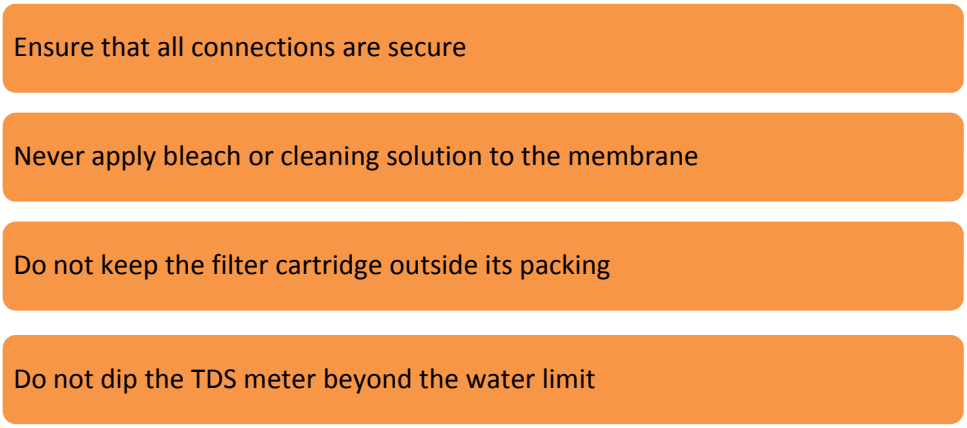


Fig. 5.3.14: Safety procedures while doing repair or maintenance

Notes

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ESSCI

6. Repair Mixer/Juicer/Grinder

Unit 6.1 – Basics of Mixer/Grinder/Juicer

Unit 6.2 – Repair Mixer/Grinder /Juicer

Key Learning Outcomes

At the end of this module, you will be able to:

1. Identify the parts of a mixer/grinder/juicer
2. Identify different types of mixer/grinder/juicer
3. Identify parts of a mixer/grinder/juicer
4. Describe working with a mixer/grinder/juicer
5. Perform the cleaning of mixer/grinder/juicer
6. Troubleshooting mixer/grinder problems
7. Servicing/replacing the components of mixer/grinder
8. Troubleshooting juicer problems
9. Repairing/Servicing the Juicer

UNIT 6.1: Basics of Mixer/Grinder/Juicer

Unit Objectives

At the end of this unit, you will be able to:

1. Explain the function of a mixer/grinder/juicer
2. Identify different types of mixer/grinder/juicer
3. Identify parts of a mixer/grinder/juicer
4. Describe working with a mixer/grinder/juicer
5. Perform the cleaning of a mixer/grinder/juicer

6.1.1 What is a Mixer/Grinder?

It is an electrical kitchen appliance used for mixing and grinding food. It has different jars for mixing, wet grinding and dry grinding. It uses gears to rotate a set of beaters to mix food contained in a bowl. The high-speed spinning blade grinds the material while mixing it. The following image shows a common household mixer/grinder:

Fig. 6.1.1: Mixer/Grinder

6.1.2 Types of Mixers

There are many types of mixers depending on their usage. The following figure shows the different types of mixers:

Stand mixer

- Contains attachments such as whisk, beater and dough hook to mix different type of ingredients

Hand Mixer

- Includes a hand-held mixing device; the handle is mounted on enclosed motor which drives the beaters

Spiral mixer

- Contains a stationary spiral shaped agitator and rotating bowl

Planetary mixer

- Contains a stationary bowl and rotating agitator to mix, whip or blend ingredients

Dough mixer

- Used for kneading large quantities of dough

Fig. 6.1.2: Types of mixers

6.1.3 Parts of Mixer/Grinder

The following figure shows the different parts of a mixer /grinder:

Sr. No.	Image	Part
1		Lid
2		Liquidising jar
3		Dry grinding jar
4		Wet grinding jar
5		Blender grinding blade
6		Dry grinding blade
7		Wet grinding blade
8		Base unit

Fig. 6.1.3: Parts of mixer/grinder

6.1.4 Working with a Mixer/Grinder

Before First Use

The following figure lists the practices to be followed before using the mixer/grinder for the first time:

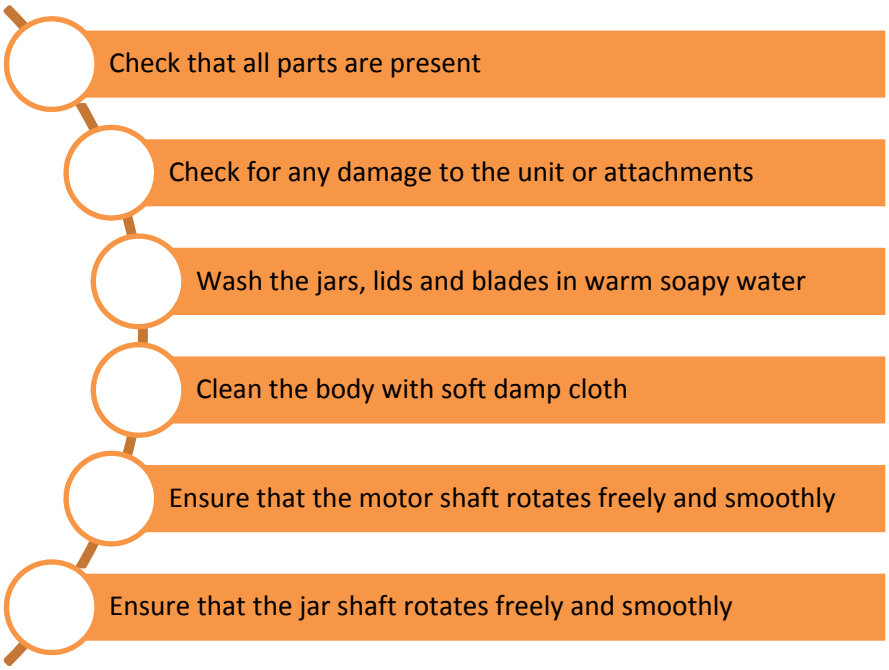


Fig. 6.1.4: Practices to follow before using the mixer/grinder

Using Mixer/Grinder

A mixer/grinder is very simple and easy to use. The following figure lists the steps of using a mixer/grinder:

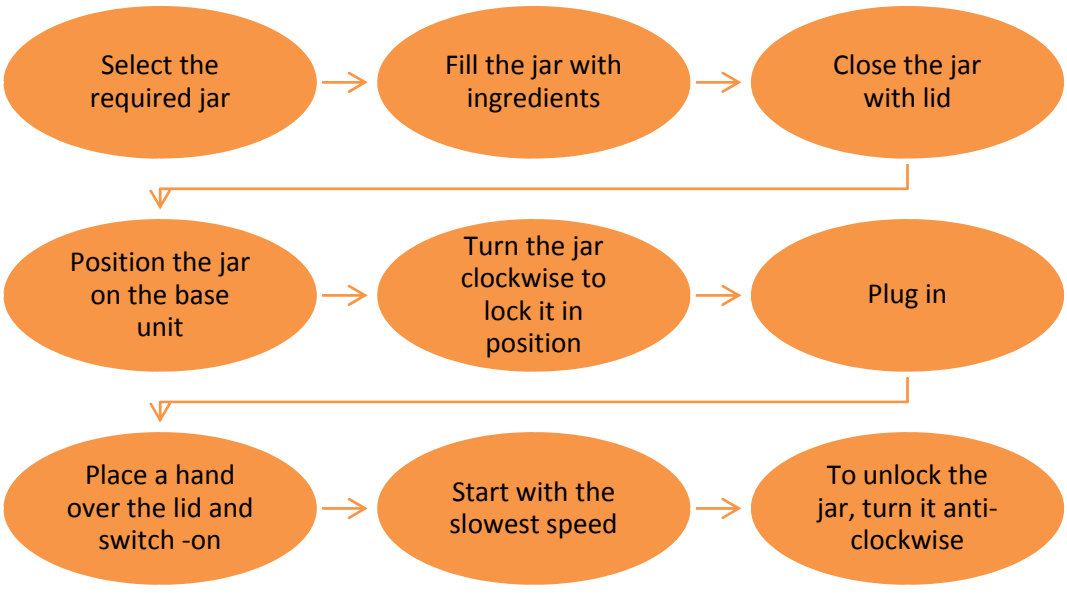


Fig. 6.1.5: Steps to follow for using a mixer/grinder

Auto Overload Protector (OLP)

The mixer/grinder comes equipped with protection against sudden overloads. In such situations, the OLP trips and the mixer/grinder shuts-off immediately. This protects the unit from burning and enhances the motor life. The OLP button is located at the bottom of the unit. The following figure shows the location of OLP in a mixer/grinder:

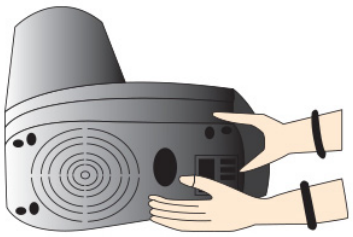


Fig. 6.1.6: Location of OLP in a mixer/grinder

The following figure lists the steps in case the mixer/grinder stops due to OLP:

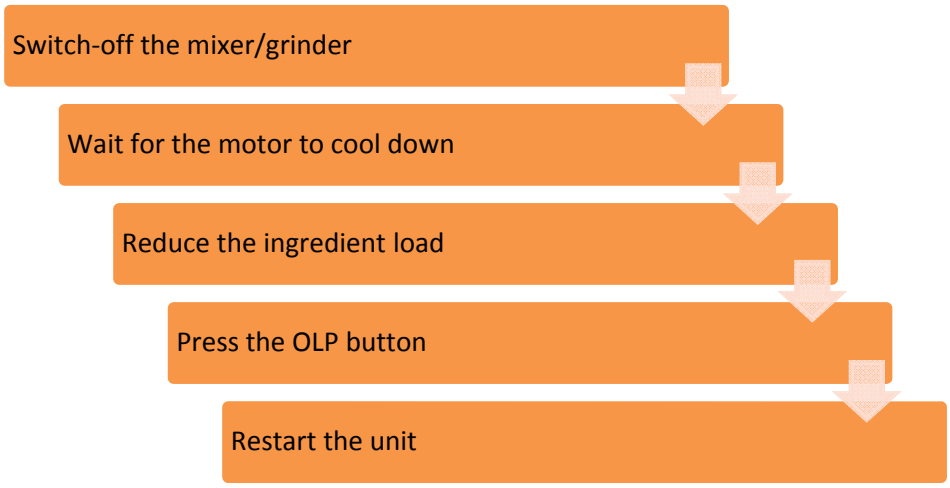


Fig. 6.1.7: Steps to follow when the mixer/grinder stops due to OLP

Cleaning the mixer/grinder

All the parts of a mixer/grinder such as jars, blades and the base unit should be cleaned thoroughly after every use.

Cleaning the jars

The following figure shows the steps of cleaning the jars of a mixer/grinder:

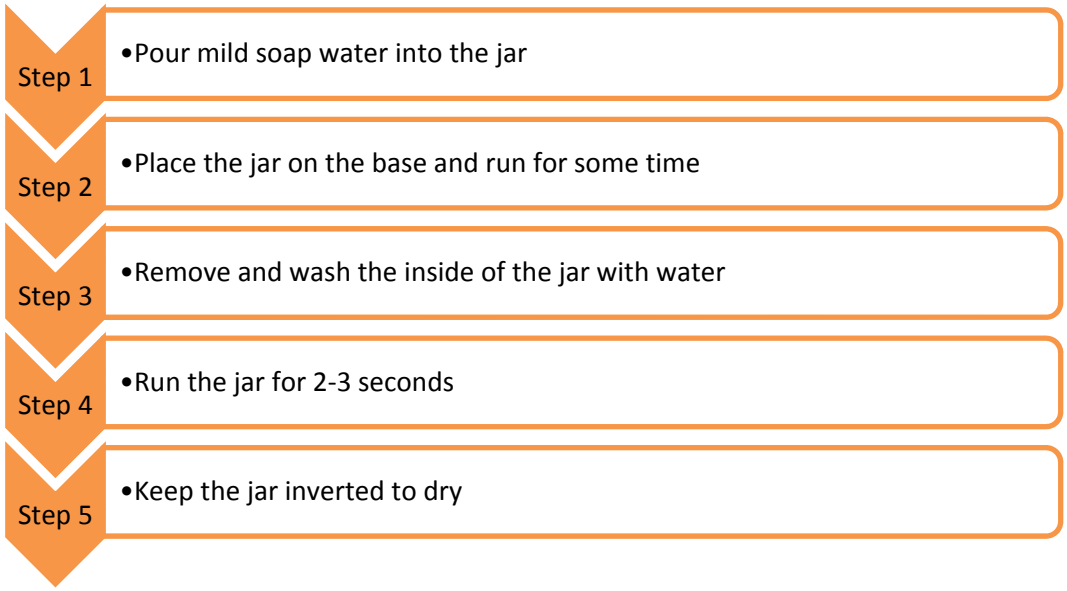


Fig. 6.1.8: Cleaning the jar of a mixer/grinder

Cleaning the base unit

The following figure shows the steps of cleaning the base unit of a mixer/grinder:

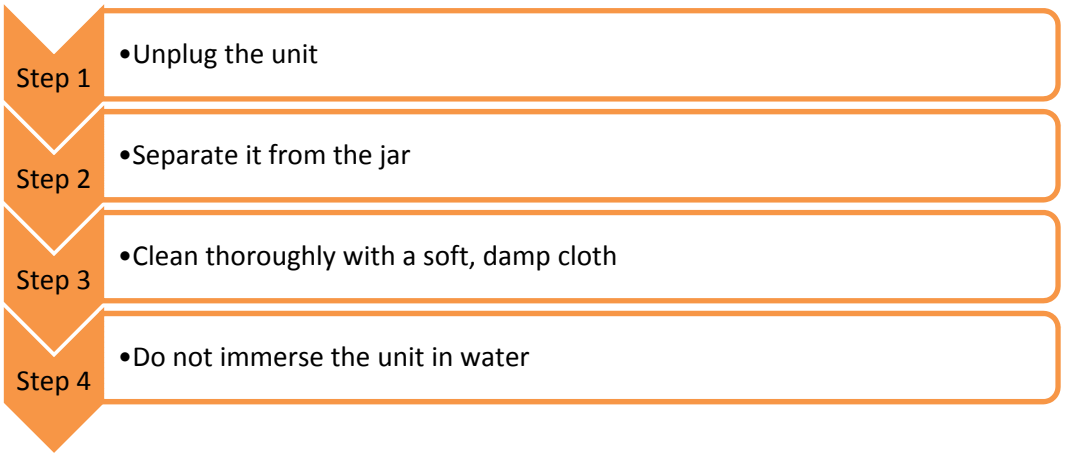


Fig. 6.1.9: Cleaning the base of a mixer/grinder

Cleaning the blades

The following figure shows the steps of cleaning the blades of a mixer/grinder:

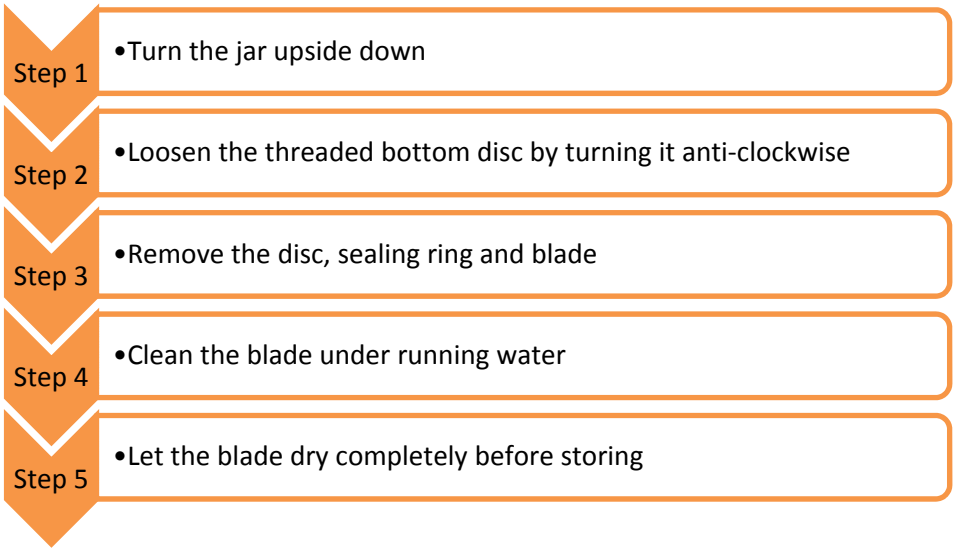


Fig. 6.1.10: Cleaning the blades of a mixer/grinder

6.1.4 What is Juicer?

It is an electrical kitchen appliance used for extracting juice out of fruits and vegetables. It crushes or shreds the fruits and vegetables against a mesh filter that separates pulp from liquid content. The following figure shows a common household juicer:

Fig. 6.1.11: Juicer

6.1.5 Types of Juicers

There are many types of juicers depending on their how the juice is extracted. The following figure shows the different types of juicers:

		
Centrifugal juicer •Produce is inserted into a chute and a shredder plate shreds the produce and spins the pulp into the basket	Masticating juicer •The produce is inserted from top and a slow rotating auger crushes it againt the mesh screen.	Citrus juicer or Reamer •A motorised reamer squeezes citrus fruits such as orange, lemon and grapefruit and the juice flows down

Fig. 6.1.12: Types of juicers

6.1.6 Parts of Juicer

The following table shows the different parts of a juicer:

Sr. No.	Image	Parts
1		Plunger
2		Hopper
3		Drum lid

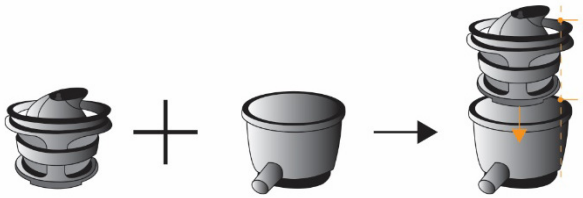
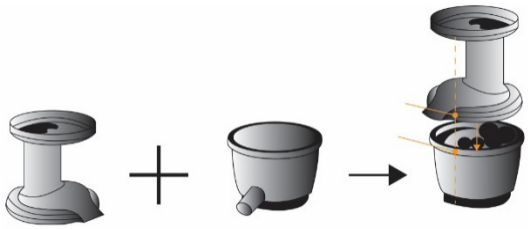
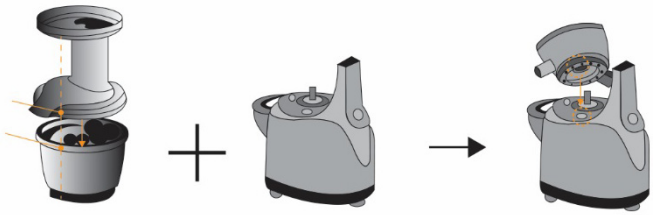
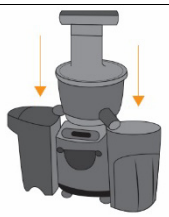
4		Juicing screw
5		Strainer
6		Rotation wiper
7		Juicing bowl
8		Base
9		Pulp cup
10		Juice cup

6.1.6 Working with a Juicer

Assembling Juicer

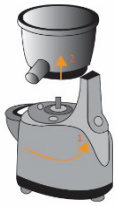
The following table shows the steps to assemble different parts of a juicer:

Step	Parts	Process
1		Put the juicing screw into strainer. Position the set into rotation wiper. Turn until the juicing screw clicks into position.

2		Push the strainer down the juicing bowl until it clicks into position
3		Position the drum lid on the juicing bowl
4		Assemble the top set onto the base Ensure that it clicks into place
5		Fix the juice cup and the pulp cup into their respective places

Disassembling Juicer

The following table shows the steps to disassemble different parts of a juicer:

Step	Parts	Process
1		Open the drum lid by turning it in anti-clockwise direction
2		Lift the juicing bowl off the base by turning it in anti-clockwise direction
3		Separate the bowl from the set of rotation wiper, strainer and juicing screw
4		Disassemble the juicing screw and strainer from the rotation wiper

Using Juicer

A juicer is very simple and easy to use. The following figure shows the steps of using a juicer:

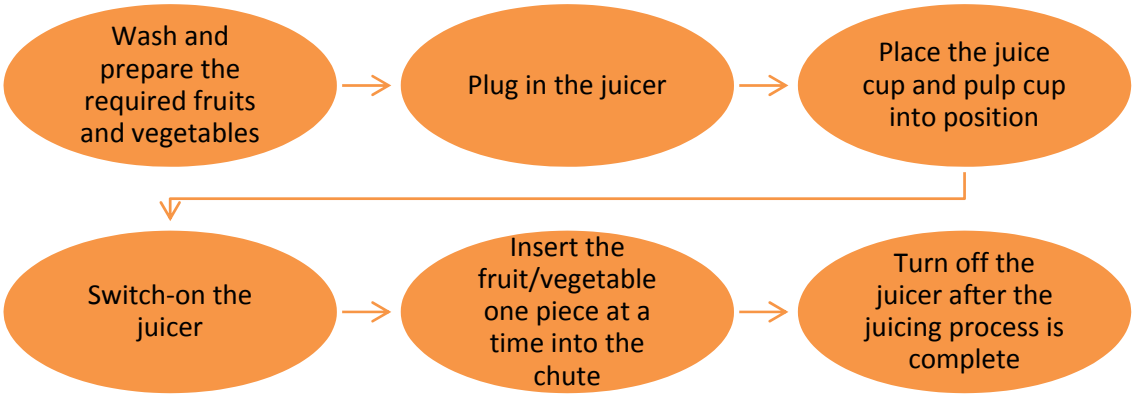


Fig 6.1.13: Steps to follow for using a juicer

Cleaning Juicer

It is very important to take proper care of a juicer. It should be cleaned thoroughly after every use. The following figure shows the steps of cleaning a juicer:

Fig 6.1.14: Cleaning a juicer

UNIT 6.2: Repairing Mixer/Grinder/Juicer

Unit Objectives

At the end of this unit, you will be able to:

1. Identify potential problems and their solutions in a mixer/grinder
2. Implement the steps of servicing/replacing the components of a mixer/grinder
3. Identify the potential problems and their solutions in a juicer
4. Implement the steps of repairing/servicing a juicer

6.2.1 Troubleshooting Mixer/Grinder Problems

Some frequently occurring mixer/grinder problems and their solutions are given in the following table:

Sr. No.	Problems	Solution
1	Unit fails to start	• Ensure cord is plugged in properly • Ensure power supply is active • Ensure the unit is switched on • Ensure that the jar is not overloaded
2	Motor stopped	• Ensure cord is plugged-in properly • Ensure that the grinder safety knob is not loose • Switch off the unit and unplug • Let the juicer cool down from overheating
3	Mixer not functioning at all speeds	• Check the speed control • Replace if defective
4	Motor humming but beaters not rotating	• Check motor • Replace if defective
5	Mixer vibrating excessively	• Check and replace beaters if defective • Check and service gears if broken or misaligned • Check and replace motor if defective
6	Mixer noisy	• Switch off the mixer and unplug • Stir the contents into middle of jar from the walls • Add water and start

7	Overflowing jar	• Check and reduce excess liquid from jar • Check and fit the cap properly
8	Jar leaking from below	• Check blade shaft/ jar brush • Replace if worn out

6.2.2 Servicing/Replacing the Components of Mixer/Grinder

To ensure that the mixer/grinder functions properly, it is important to do the servicing of components such as speed control switch and gears.

Servicing the Speed Control Switch

A switch is a simple component that is used to stop or start the operation of a motor. A speed control switch is a three speed switch used to select low, medium or high speed by rotating the knob. The speed is controlled by providing varying current to the motor of the mixer/grinder. The following figure lists the steps of servicing a switch:

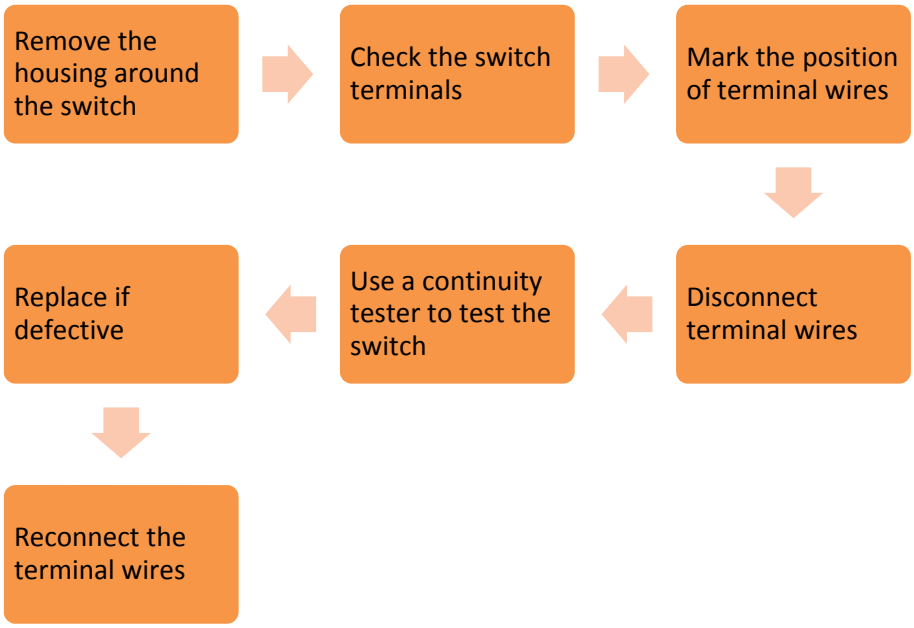


Fig. 6.2.1: Servicing a speed control switch

Servicing the Gears

The mixer/ grinder has a gear mechanism that rotates the beaters in opposite directions to mix the ingredients.

The following figure lists the steps of servicing the gears:

Fig. 6.2.2: Servicing the gears

Replacing a fuse

A fuse is a device used to protect the wiring of an electrical appliance from overheating and catching fire due to overload or short circuit. If the motor of the mixer/grinder stops working, its fuse may have blown. The following figure lists the steps of replacing a fuse:

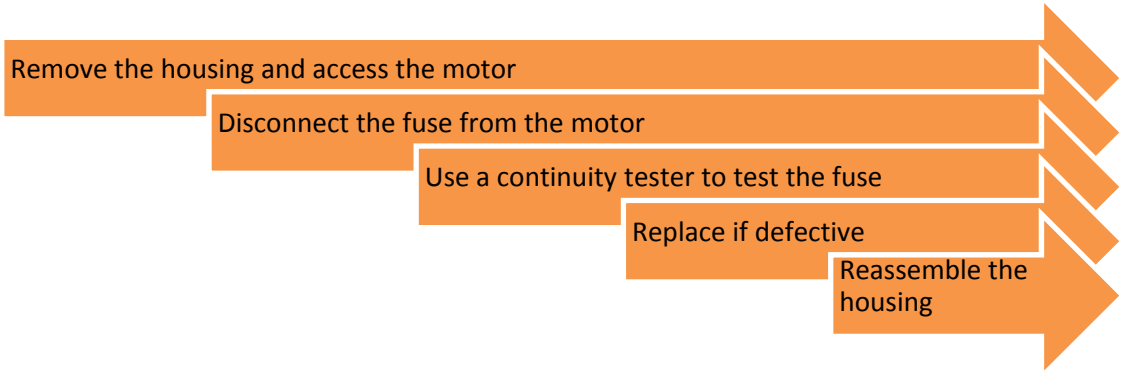


Fig. 6.2.3: Replacing a fuse

Replacing the motor

The mixer/grinder/juicer runs on a single-phase induction motor. The following figure lists the steps of replacing the motor:

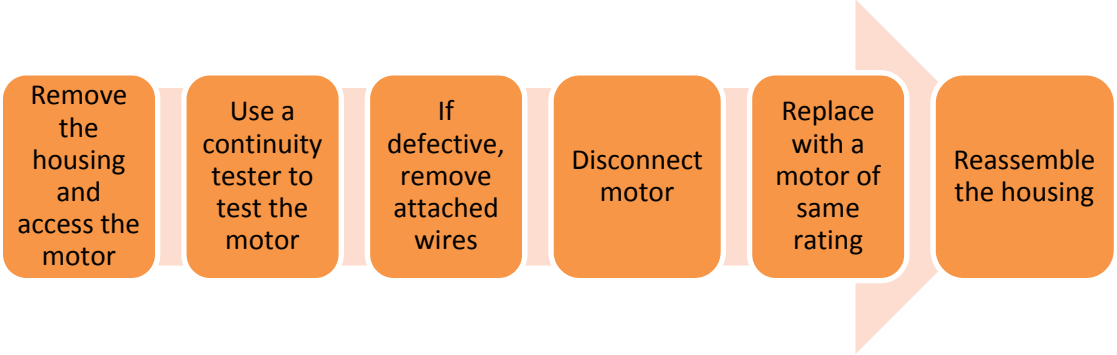


Fig. 6.2.4: Replacing the motor

6.2.3 Troubleshooting Juicer Problems

Some frequently occurring juicer problems and their solutions are given in the following table:

Sr. No.	Problems	Solution
1	Unit fails to start	• Ensure cord is plugged in properly • Ensure power supply is active • Ensure the juicer is switched on
2	Motor stopped	• Ensure cord is plugged in properly • Ensure parts are correctly assembled • Switch-off the juicer and unplug • Let the juicer cool down from overheating
3	Juicer noisy	• Switch off the juicer and unplug • Ensure parts are correctly assembled • Ensure juicer is on level surface • Ensure ingredients are cut properly
4	Juice leakage from top	• Switch off the juicer and unplug • Check that the compression silicone is assembled properly • If not, disassemble the juicer • Assemble the compression silicone properly
5	Plastic parts discoloured	• Clean the juicer after every use • Rub the discoloured parts with cooking oil • Clean with mild soap • Remove and clean silicone parts separately
6	Mould in silicone parts	• Remove and clean silicone parts separately
7	Strainer damaged	• Refer to instructions manual for proper usage • Avoid overcrowding food or forcing food down the chute
8	Attachments deformed	• Avoid cleaning parts in dishwasher • Do not use harsh cleaners

9	Too much pulp with juice	• Cut food into smaller parts • Insert food slowly • Allow all the pulp to eject before adding more food
10	Reduced juice output	• Ensure that the spout is fully opened • Ensure that there is no excess pulp in filter basket • If there is excess pulp, stop the juicer and clean filter basket
11	Handle lock not closing	• Push down on the locking tab • Open the lock fully • Press down and close the lock properly

6.2.4 Repairing/Servicing the Juicer

The following figure lists the steps of repairing a juicer:

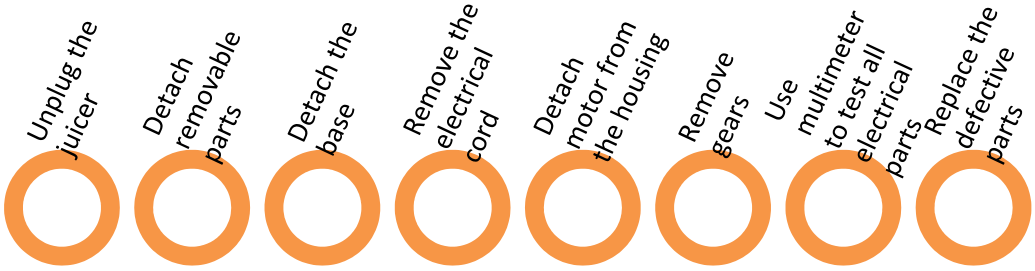


Fig. 6.2.5: Repairing a juicer

The following figure lists the steps of servicing the juicer drive system:

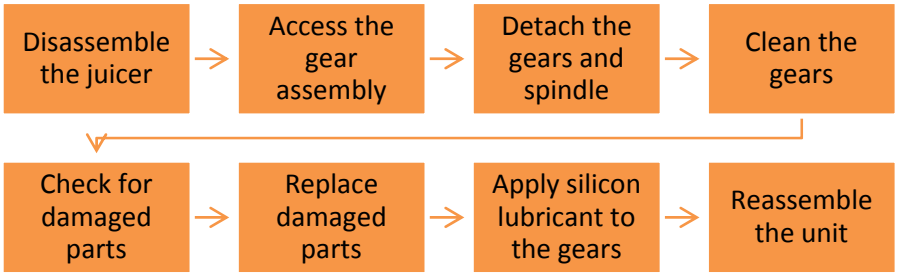


Fig. 6.2.6: Servicing the juicer drive system

Notes

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ESSCI
Skilling India in Electronics

7. Work effectively at the workplace

Unit 7.1 Effective Communication and Coordination of work
Unit 7.2 Work Effectively and Maintain discipline at work.
Unit 7.3 Maintain social diversity at work

ELE/N9905

Key Learning Outcomes

By the end of this unit, participants will be able to:

1. State the importance of work ethics and workplace etiquette
2. State the importance of effective communication and interpersonal skills
3. Explain ways to maintain discipline in the workplace
4. Discuss the common reasons for interpersonal conflict and ways of managing them effectively.

UNIT 7.1: Efffecte Communicacation aCoordinainati t Work

Unit Objectives

By the end of this unit, participants will be able to:

1. Work efffectely at the workplace.
2. Demonstrate practicesrelated to gender and PwD sensitazation.

7.1.1 Importance of Work Ethics and Workplace Etiquette

Workplace ethics are a set of moral and legal guidelines that organizations follow. These guidelines influence the way customers and employees interact with an organization. Workplace ethics essentially guide how an organization serves its clients and treats its employees.

For example, if a company seeks to fulfil the promises it makes, it may develop processes and set up a robust support system to address this policy and build customer/client loyalty. To achieve this goal, the company may implement specific incentive programs for employees to encourage them to produce high-quality work and ensure the organization fulfils the promises it makes to its clients/ customers.

Many organizations, often the large ones, set detailed ethical codes to guide their operations and control how the organizational processes impact the stakeholders. These ethics usually help organizations maintain certain standards of responsibility, accountability, professionalism and among others, as they navigate through different challenges and day-to-day circumstances. By following these guidelines, organizations often experience several benefits that improve the lives of stakeholders, such as customers, employees, leaders, etc.

Examples of Common Workplace Ethics

Fig. 7.1.1 Examples of Common Workplace Ethics

Workplace ethics are essential for a successful organization with a satisfied and loyal team. High ethical standards help in ensuring all stakeholders, such as customers, investors, employees, and other individuals involved in the workplace operations, feel the organization is safeguarding their interests. By creating and implementing ethical guidelines, organizations can keep the best interests of their employees in mind while maintaining a positive influence on those they impact through their processes.

As a result, employees maintain the organization's best interests by being ethical in their daily work duties. For example, fairly-treated employees of an organization who understand the organization's commitments to environmental sustainability are usually less likely to behave in a manner that causes harm to the environment. Thus, they help maintain a positive public image of the organization. It means that workplace ethics help in maintaining reciprocal relationships that benefit organizations at large and the individuals associated with and influenced by the organizational policies.

Benefits of Workplace Ethics

There are various benefits of implementing workplace ethics. When organizations hold themselves to high ethical standards, leaders, stakeholders, and the general public can experience significant improvements. Following are some of the key benefits of employing ethics in the workplace:

Fig. 7.1.2 Benefits of Workplace Ethics

7.1.2 Interpersonal Communication

Interpersonal communication is a process that involves sharing ideas and emotions with another person, both - verbally and non-verbally. It is essential to interact effectively with others in both personal and professional lives. In professional life or the workplace, strong interpersonal skills play a crucial role in achieving effective collaboration with colleagues.

Interpersonal Skills

Interpersonal skills, in other terms, are known as people skills, which are used to communicate and interact with others effectively. These are soft skills one uses to communicate with others and understand them. One uses these skills in daily life while interacting with people

Examples of Interpersonal Skills

Fig 7.1.3 Examples of Interpersonal Skills

Numerous interpersonal skills involve communication. Communication can be verbal, such as persuasion or tone of voice — or non-verbal, such as listening and body language.

Importance of Interpersonal Skills

Interpersonal skills are essential for communicating and collaborating with groups and individuals in both personal and professional life. People with strong interpersonal skills often are able to build good relationships and also tend to work well with others. Most people often enjoy working with co-workers who have good interpersonal skills.

Among other benefits of good interpersonal skills is the ability to solve problems and make the best decisions. One can use the ability to understand others and good interpersonal communication skills to find the best solution or make the best decisions in the interest of everyone involved. Strong interpersonal skills help individuals work well in teams and collaborate effectively. Usually, people who possess good interpersonal skills also tend to be good leaders, owing to their ability to communicate well with others and motivate the people around them.

Interpersonal communicationis the key to working in a team environment and working ccollectely to achieve shared goals. Following are the interperso

Verbal Communication

The ability to speak clearly, appropriately and confidently can help one communicate effectively with others. It is vital to select the appropriate vocabulary and tone for the target audience.

For example – one should speak formally and professionally in the work environment, while informal language is acceptable in an intimate environment with close friends and family. Also, one should avoid using complex or technical language while communicating with an audience that may not be familiar with it. Using simple language in a courteous tone helps achieve better communication, irrespective of the audience.

Active Listening

Active listening is defined as the ability to pay complete or undivided attention to someone when they speak and understand what they are saying. It is important for effective communication because without understanding what the speaker is saying, it becomes difficult to carry forward a conversation. One should ensure to use appropriate verbal and non-verbal responses, e.g. eye contact, nodding, or smiling, to show interest in what the speaker says. Active listening is also about paying attention to the speaker's body language and visual cues. Asking and answering questions is one of the best ways to demonstrate an interest in conversing with the other person.

Active listening is critical for communicating effectively without ambiguity. It helps one understand the information or instructions being shared. It may also encourage co-workers to share their ideas, which ultimately helps achieve collaboration.

Body Language

One's expression, posture, and gestures are as important as verbal communication. One should practice open body language to encourage positivity and trust while communicating. Open body language includes - maintaining eye contact, nodding, smiling and being comfortable. On the other hand, one should avoid closed body language, e.g. crossed arms, shifting eyes and restless behaviour.

Empathy

Empathy is the ability to understand the emotions, ideas and needs of others from their point of view. Empathy is also known as emotional intelligence. Empathetic people are good at being aware of others' emotions and compassionate when communicating with them. Being empathetic in the workplace can be good to boost the morale of employees and improve productivity. By showing empathy, one can gain the trust and respect of others.

Conflict Resolution

One can use interpersonal communication skills to help resolve disagreements and conflicts in the workplace. This involves the application of negotiation and persuasion skills to resolve arguments between conflicting parties. It is also important to evaluate and understand both sides of the argument by listening closely to everyone involved and finding an amicable solution acceptable to all.

Good conflict resolution skills can help one contribute to creating a collaborative and positive work environment. With the ability to resolve conflicts, one can earn the trust and respect of co-workers.nal communicationskills that vital for success at work:

Teamwork

Employees who communicate and work well in a team often have better chances of achieving success and common goals. Being a team player can help one avoid conflicts and improve productivity. One can do this by offering to help co-workers when required and asking for their feedback and ideas. When team members give their opinions or advice, one should positively receive and react to the opinions/advice. One should be optimistic and encouraging when working in groups.

Improving Interpersonal Skills

One can develop interpersonal skills by practising good communication and setting goals for improvement. One should consider the following tips to improve their interpersonal skills:

- One should ask for feedback from co-workers, managers, family or friends to figure out what needs improvement concerning their interpersonal skills.
- One can identify the areas of interpersonal communication to strengthen by watching others.
- One can learn and improve interpersonal skills by observing co-workers, company leaders and professionals who possess good interpersonal skills. This includes watching and listening to them to note how they communicate and the body language used by them. It is vital to note their speed of speaking, tone of voice, and the way they engage with others. One should practice and apply such traits in their own interactions and relationships.
- One should learn to control their emotions. If stressed or upset, one should wait until being calm to have a conversation. One is more likely to communicate effectively and confidently when not under stress.
- One can reflect on their personal and professional conversations to identify the scope of improvement and learn how to handle conversations better or communicate more clearly. It helps to consider whether one could have reacted differently in a particular situation or used specific words or positive body language more effectively. It is also vital to note the successful and positive interactions to understand why they are successful.
- One should practice interpersonal skills by putting oneself in positions where one can build relationships and use interpersonal skills. For example, one can join groups that have organized meetings or social events. These could be industry-specific groups or groups with members who share an interest or hobby.
- Paying attention to family, friends and co-workers and making efforts to interact with them helps a lot. One should complement their family, friends and co-workers on their good ideas, hard work and achievements. Trying to understand someone's interests and showing interest in knowing them can help one build strong interpersonal skills. Offering to help someone, especially in difficult situations, helps build stronger and positive workplace relationships.
- One should avoid distractions, such as a mobile phone, while interacting with someone. Giving someone full attention while avoiding distractions helps achieve a clear exchange of ideas. By listening with focus, one can understand and respond effectively.

- One can attend appropriate courses on interpersonal skills or sign up for workshops at work to improve interpersonal skills. One can find many resources online also, such as online videos.
- For personal mentoring, one can approach a trusted family member, friend, co-worker, or current/ former employer. A person one looks up to with respect and admires is often a good choice to be selected as a mentor. One can even hire a professional career or communication coach.

Interpersonal communication skills often help one boost their morale, be more productive in the workplace, complete team projects smoothly and build positive and strong relationships with co-workers.

Notes

UNIT 7.2: Working Efffectely and Maintaining Discipline at Work

Unit Objectives

By the end of this unit, participants will be able to:

- Discuss the importance of following organizational guidelines for dress code, time schedules, language usage and other behavioural aspects
- Explain the importance of working as per the workflow of the organization to receive instructions and report problems
- Explain the importance of conveying information/instructions as per defined protocols to the authorised persons/team members
- Explain the common workplace guidelines and legal requirements on non-disclosure and confidentiality of business-sensitive information
- Describe the process of reporting grievances and unethical conduct such as data breaches, sexual harassment at the workplace, etc.
- Discuss ways of dealing with heightened emotions of self and others.

7.2.1 Discipline at Work

Discipline is essential for organizational success. It helps improve productivity, reduce conflict and prevent misconduct in the workplace. It is important to have rules concerning workplace discipline and ensure that all employees comply with them. In the absence of discipline, a workplace may experience conflicts, bullying, unethical behaviour and poor employee performance. An efficient workplace disciplinary process helps create transparency in the organization. Benefits of disciplinary standards:

All employees follow the same rules which helps establish uniformity and equality in the workplace

Managers and supervisors have defined guidelines on what accon to take while initi atg disciplinary y aon

With well-defined and enforced disciplinary rules, an organiizaon can avoid various safety, security, rupati nal risks

Fig 7.2.1 Benefits of Disciplinary Standards

Maintaining an organized and cohesive workforce requires maintaining discipline in both personal and professional behaviour. It is important to follow the appropriate measures to keep employees in line without affecting their morale.

Defining Discipline

The first and crucial step in maintaining workplace discipline is to define what is meant by discipline. It helps to evaluate common discipline problems and devise guidelines for handling them effectively.

Among a number of areas, discipline usually covers:

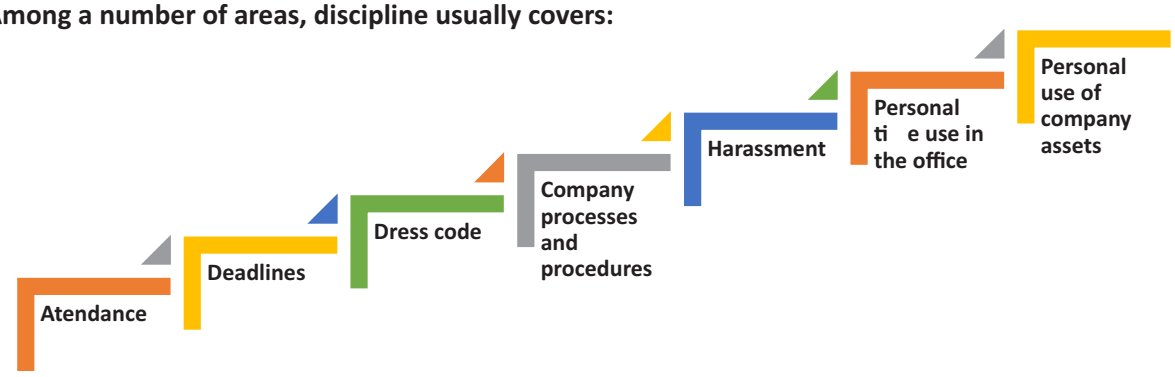


Fig 7.2.2 Examples of Workplace Discipline

According to demography and local issues, it may also include substance use and related issues.

It is vital for a workplace to have an employee handbook or company policy guide, to serve as a rulebook for employees to follow. The employee handbook/ company policy guide should be reviewed and updated periodically according to any issues or areas, or concerns identified concerning workplace discipline. Such manuals should also cover all the laws and regulations governing workplace behaviour.

Defining and documenting workplace rules aids in their implementation, ensuring little or no ambiguity. All employees in a workplace should also have easy access to the workplace guidelines so that they can refer to them to get clarity whenever required. To maintain discipline at work, it is also critical to ensure uniform application of workplace guidelines to all employees without exception.

7.2.2 Employee Code of Conduct

The employee code of conduct manual serves as a guide for employees to inform them regarding the behaviour expected from them at work. It helps create a good work environment with consistent behaviour from employees. The manual should list examples of acceptable and not acceptable behaviours at work. The code of conduct should be discussed with employees so that they have the clarifications required.

For example, an organization may create guidelines concerning the conduct with clients to ensure no contact is made with them except for business purposes, also prescribing the use of appropriate means of communication.

Employees should have a clear understanding concerning their job responsibilities and the behaviour expected from them with all stakeholders, e.g. company personnel, clients and associated third parties. It is critical to have documented guidelines for employees to follow concerning all aspects of work. It should also document the disciplinary action to be followed in case of non-compliance, e.g. verbal and

then written warning, temporary suspension or eventual termination of service in case of repeated non-compliance with the employee code of conduct. Employees should know what the company rules are and what will happen if they break the rules. However, disciplinary action should be initiated only when reasonably required to avoid its misuse for employee harassment.

There should also be an effective mechanism for employees to raise their concerns/ grievances and have them addressed while maintaining privacy, as required, e.g. raising concerns regarding the behaviour of a co-worker.

The employee code of conduct manual must be duly reviewed and approved by the concerned stakeholders, such as the Human Resources (HR) department and company executives.

7.2.3 Interpersonal Conflicts

Interpersonal conflict is any type of conflict between two or more people. These are found in both - personal and professional relationships - among friends, family, and co-workers. In the workplace, interpersonal conflict is often observed when a person or group of people interfere with another person's attempts at completing assignments and achieving goals. It is critical to resolve conflicts in the workplace to boost the morale of employees, repair working relationships among them, and improve customer satisfaction.

Reasons for Workplace Conflicts

Workplace conflicts are often observed when two or more people have different points of view. This can happen between managers, co-workers, or clients and customers. In general, interpersonal conflicts are caused by a lack of communication or unclear communication.

Some of the leading reasons for workplace conflicts are:

- Difference in values
- Personality clashes
- Poor communication

Example of poor communication – if a manager reassigns a task to another employee without communicating with the employee to whom it was originally assigned, interpersonal conflict can arise among them. This may potentially make the first employee, i.e. who was originally assigned the task, feel slighted and mistrusted by the manager. It may even cause animosity in the first employee toward the employee who has now been assigned the task.

Types of Interpersonal Conflict

Following are the four types of interpersonal conflicts:

a. **Policy-related interpersonal conflict**

When a conflict relates to a decision or situation that involves both parties, it can be called a policy-related interpersonal conflict. Example – two people or groups working on the same project, trying to adopt different approaches. To resolve policy-related interpersonal conflicts, the parties involved should try to look for a win-win situation or make a compromise. This is especially critical to resolve trivial issues so that work is not affected and common goals are achieved.

b. **Pseudo-conflicts**

Pseudo-conflict arises when two people or groups want different things and cannot reach an agreement. Pseudo-conflicts usually involve trivial disagreements that tend to hide the root of the issue.

c. **Ego-related interpersonal conflicts**

In ego conflicts, losing the argument may hurt or damage a person's pride. Sometimes ego conflicts arise when a number of small conflicts pile up on being left unresolved. To resolve ego-related conflicts, it's best to find the root of the issue and work towards a resolution.

d. **Value-related interpersonal conflicts**

Sometimes conflicts may occur between people when they have different value systems. Such conflicts can be difficult to identify initially, making the people involved think the other party is being disagreeable or stubborn, wherein they just have different values. Some co-workers may highly value their personal/ family time after office that they may be unreachable to clients during non-office hours, while others may place a high value on client satisfaction and may still be available for clients during non-office hours. Conflict may arise among such people when they may be required to coordinate to help a client during after-office hours. Value-related interpersonal conflicts are often difficult to settle since neither party likes to compromise.

Resolving Interpersonal Conflicts

Conflicts are usually likely in the workplace; they can, however, be prevented. Often resolving interpersonal conflicts through open communication helps build a stronger relationship, paving the way for effective coordination and success. Some ways to resolve interpersonal conflict:

- **Communication -** A great way to resolve interpersonal conflicts is for the opposing parties to listen to one another's opinions and understand their viewpoints. Meeting in person and keeping the conversation goal-oriented is important. One can have effective communication by following some measures, e.g. staying on the topic, listening actively, being mindful of the body language, maintaining eye contact, etc.

- **Active Listening -** One should patiently listen to what the other person is saying without interrupting or talking over them. It helps one display empathy and get to the root of the issue. Asking questions to seek clarification when required helps in clear communication and conveys to the other person that one is listening to them. Practising active listening is a great way to improve one's communication skills.
- **Displaying Empathy -** Listening attentively and identifying the anxieties/ issues of co-workers is a great way to show empathy and concern. It is essential to understand their feelings and actions to encourage honesty and avoid future conflict.
- **Not Holding Grudges -** With different types of people and personalities in a workplace, it is common for co-workers to have conflicts. It is best to accept the difference in opinions and move on. Being forgiving and letting go of grudges allows one to focus on the positive side of things and perform better at work.

Work-related interpersonal conflicts can be complicated because different people have different leadership styles, personality characteristics, job responsibilities and ways in which they interact. One should learn to look above interpersonal conflicts, resolving them to ensure work goals and environment are not affected.

7.2.4 Importance of Following Organizational Guidelines

Policies and procedures or organizational guidelines are essential for any organization. These provide a road map for the operations of the organization. These are also critical in ensuring compliance with the applicable laws and regulations by guiding the decision-making process and business operations.

Organizational guidelines help bring uniformity to the operations of an organization, which helps reduce the risk of unwanted and unexpected events. These determine how employees are supposed to behave at work, which ultimately helps the business achieve its objectives efficiently.

However, organizational guidelines are ineffective and fail to serve their purpose if they are not followed. Many people don't like the idea of following and abiding by specific guidelines. Such people should be made to understand the benefits of following the organizational guidelines. Some of the key benefits are given below:

With well-defined organizational guidelines in place, no individual can act arbitrarily, irrespective of their position in the organization. All individuals will know the pros and cons of taking certain actions and what to expect in case of unacceptable behaviour. Benefits of following organizational guidelines:

- Consistent processes and structures - Organization guidelines help maintain consistency in operations, avoiding any disorder. When all employees follow the organizational guidelines, an organization can run smoothly. These ensure that people in different job roles operate as they are supposed to, knowing what they are responsible for, what is expected of them, and what they can expect from their supervisors and co-workers. With clarity in mind, they can do their jobs with confidence and excellence. With every person working the way intended, it's easy to minimise errors.

  With all the staff following organizational guidelines, the organization has a better scope of using time and resources more effectively and efficiently. This allows the organization to grow and achieve its objectives.
- **Better quality service -** By following organizational guidelines, employees perform their duties correctly as per the defined job responsibilities. It helps enhance the quality of the organization's products and services, helping improve the organization's reputation. Working with a reputable organization, employees can take pride in their work and know they are contributing to the reputation.
- **A safer workplace -** When all employees follow organizational guidelines, it becomes easy to minimise workplace incidents and accidents. It reduces the liabilities associated with risks for the organization and limits the interruptions in operations. Employees also feel comfortable and safe in the workplace, knowing their co-workers are ensuring safety at work by following the applicable guidelines.

Different organizations may have different guidelines on dress code, time schedules, language usage, etc. For example – certain organizations in a client-dealing business requiring employees to meet clients personally follow a strict dress code asking their employees to wear formal business attire. Similarly, organizations operating in specific regions may require their employees to use the dominant regional language of the particular region to build rapport with customers and serve them better. Certain organizations, such as banks, often give preference to candidates with knowledge of the regional language during hiring.

Working hours may also differ from one organization to another, with some requiring employees to work extra compared to others. One should follow the organizational guidelines concerning all the aspects of the employment to ensure a cohesive work environment.

7.2.5 Workflow

Workflow is the order of steps from the beginning to the end of a task or work process. In other words, it is the way a particular type of work is organised or the order of stages in a particular work process.

Workflows can help simplify and automate repeatable business tasks, helping improve efficiency and minimise the room for errors. With workflows in place, managers can make quick and smart decisions while employees can collaborate more productively.

Other than the order that workflows create in a business, these have several other benefits, such as:

- Identifying Redundancies - Mapping out work processes in a workflow allows one to get a clear, top-level view of a business. It allows one to identify and remove redundant or unproductive processes.

  Workflow gives greater insights into business processes. Utilizing such useful insights, one can improve work processes and the bottom line of the business. In many businesses, there are many unnecessary and redundant tasks that take place daily. Once an organization has insight into its processes while preparing workflow, it can determine which activities are really necessary.

  Identifying and eliminating redundant tasks creates value for a business. With redundant tasks and processes eliminated, an organization can focus on what's important to the business.

- Increase in Accountability and Reduction in Micromanagement - Micromanagement often causes problems in a business setting as most employees don't like being micromanaged, and even many managers don't like the practice. Micromanagement is often identified as one of the reasons why people quit their job.

  However, the need for micromanagement can be minimized by clearly mapping out the workflow. This way, every individual in a team knows what tasks need to be completed and by when and who is responsible for completing them. This makes employees more accountable also.

  With clearly defined workflow processes, managers don't have to spend much time micromanaging their employees, who don't have to approach the manager to know what the further steps are. Following a workflow, employees know what is going on and what needs to be done. This, in turn, may help increase the job satisfaction of everyone involved while improving the relationships between management and employees.

- Improved Communication - Communication at work is critical because it affects all aspects of an organization. There are instances when the main conflict in an organization originates from miscommunication, e.g. the management and employees disagreeing on an aspect, despite pursuing the same objectives. Poor communication is a common workplace issue that is often not dealt with.

- This highlights why workflow is important. Workplace communication dramatically can increase with the visibility of processes and accountability. It helps make the daily operations smoother overall.

- Better Customer Service - Customers or clients are central to a business. Therefore, it is imperative to find and improve ways to improve customer experience. Relying on outdated manual systems may cause customer requests or complaints to be overlooked, with dissatisfied customers taking their business elsewhere. However, following a well-researched and defined workflow can help improve the quality of customer service.

By automating workflows and processes, an organization can also reduce the likelihood of human error. This also helps improve the quality of products or services over time, resulting in a better customer experience.

7.2.6 Following Instructions and Reporting Problems

All organizations follow a hierarchy, with most employees reporting to a manager or supervisor. For organizational success, it is vital for employees to follow the instructions of their manager or supervisor. They should ensure they perform their duties as per the given instructions to help achieve the common objectives of the organization and deliver quality service or products. This consequently helps maintain the reputation of the organization.

It is also important to be vigilant and identify problems at work or with the organizational work processes. One should deal with the identified within their limits of authority and report out of authority problems to the manager/ supervisor or the concerned person for a prompt resolution to minimise the impact on customers/clients and business.

7.2.7 Information or D ta Sharing

Information or data is critical to all organizations. Depending on the nature of its business, an organization may hold different types of data, e.g. personal data of customers or client data concerning their business operations and contacts. It is vital to effective measures for the appropriate handling of different types of data, ensuring its protection from unauthorized access and consequent misuse.

One should access certain data only if authorised to do so. The same is applicable when sharing data which must be shared only with the people authorised to receive it to use it for a specific purpose as per their job role and organizational guidelines. For example – one should be extra cautious while sharing business data with any third parties to ensure they get access only to the limited data they need as per any agreements with them. It is also critical to monitor how the recipient of the data uses it, which should strictly be as per the organizational guidelines. It is a best practice to share appropriate instructions with the recipient of data to ensure they are aware of the purpose with which data is being shared with them and how they are supposed to use and handle it. Any misuse of data must be identified and reported promptly to the appropriate person to minimise any damage arising out of data misuse.

These days most organizations require their employees and business partners or associated third parties to sign and accept the relevant agreement on the non-disclosure of business-sensitive information. In simple terms, business-sensitive information is confidential information. It is proprietary business information collected or created during the course of conducting business, including information about the business, e.g. proposed investments, intellectual property, trade secrets, or plans for a merger and information related to its clients. Business-sensitive information may sometimes also include information regarding a business's competitors in an industry.

The release of business-sensitive information to competitors or the general public poses a risk to a business. For example, information regarding plans for a merger could be harmful to a business if a competitor gets access to it.

7.2.8 Reporting Issues at Work

Most organizations have defined guidelines on appropriate reporting processes to be followed for reporting different types of issues. For example – one can report any grievances or dissatisfaction concerning co-workers to their manager/supervisor, e.g. data breaches or unethical conduct. If the concern is not addressed, then the employee should follow the organizational guidelines and hierarchy for the escalation of such issues that are not addressed appropriately.

For example – any concern related to sexual harassment at the workplace should be escalated to the concerned spokesperson, such as Human Resources (HR) representative, and if not satisfied with the action taken, it should be reported to the senior management for their consideration and prompt action.

7.2.9 Dealing with Heightened Emotions

Humans are emotional beings. There may be occasions when one is overwhelmed by emotions and is unable to suppress them. However, there may be situations when one must manage emotions well, particularly at work.

Stress in one's personal and professional life may often cause emotional outbursts at work. Managing one's emotions well, particularly the negative ones, is often seen as a measure of one's professionalism. Anger, dislike, frustration, worry, and unhappiness are the most common negative emotions experienced at work.

Ways to manage negative emotions at work:

- **Compartmentalisation –** It's about not confining emotions to different aspects of one's life. For example, not letting negative emotions from personal life affect work-life and vice versa. One should try to leave personal matters and issues at home. One should train their mind to let go of personal matters before reaching work. Similarly, one can compartmentalise work-related stresses so that negative emotions from work don't affect one's personal life.

- **Deep breathing and relaxation –** Deep breathing helps with anxiety, worry, frustration and anger. One should take deep breaths, slowly count to ten - inhaling and exhaling until one calms down. One can also take a walk to calm down or listen to relaxing music. Talking to someone and sharing concerns also helps one calm down.

- **The 10-second rule -** This is particularly helpful in controlling anger and frustration. When one feels their temper rising, they should count to 10 to calm down and recompose. If possible, one should move away to allow temper to come down.

- **Clarify -** It is always good to clarify before reacting, as it may be a simple case of misunderstanding or miscommunication.

- **Physical activity -** Instead of losing temper, one should plan to exercise, such as running or going to the gym, to let the anger out. Exercise is also a great way to enhance mood and release any physical tension in the body.

- **Practising restraint -** One should avoid replying or making a decision when angry, not allowing anger or unhappiness to cloud one's judgement. It may be best to pause any communication while one is angry, e.g. not communicating over email when angry or upset.

- **Knowing one's triggers -** It helps when one is able to recognise what upsets or angers them. This way, one can prepare to remain calm and plan their reaction should a situation occur. One may even be able to anticipate the other party's reaction.

- **Be respectful -** One should treat their colleagues the same way one would like to be treated. If the other person is rude, one need not reciprocate. It is possible to stay gracious, firm and assertive without being aggressive. Sometimes, rude people back away when they don't get a reaction from the person they are arguing with.

- **Apologise for any emotional outburst –** Sometimes, one can get overwhelmed by emotions, reacting with an emotional outburst. In such a case, one should accept responsibility and apologise immediately to the affected persons without being defensive.

- **Doing away with negative emotions -** It is recommended to let go of anger, frustration and unhappiness at the end of every workday. Harbouring negative emotions affects one emotionally, affecting their job performance also. Engaging in enjoyable activities after work is a good stress reliever.

Notes

UNIT 7.3: Maintaining Social Diversity at Work

Unit Objectives

By the end of this unit, participants will be able to:

1. Explain the concept and importance of gender sensitivityand equality.
2. Discuss ways to create sensitivityfor different genders and Persons with h Disabiliti(PwD).

7.3.1 Gender Sensitivity

Gender sensitivity is the act of being sensitive towards people and their thoughts regarding gender. It ensures that people know the accurate meaning of gender equality, and one's gender should not be given priority over their capabilities.

Fig 7.3.1 Gender Equality

Women are an important source of labour in many sectors, yet they have limited access to resources and benefits. Women should receive the same benefits and access to resources as men. A business can improve its productivity and quality of work by providing better support and opportunities to women.

Important Terms

- **Gender Sensitivity-** Gender sensitivity is the act of being sensitive to the ways people think about gender.
- **Gender Equality -** It means persons of any gender enjoy equal opportunities, responsibilities, and rights in all areas of life.
- **Gender Discrimination –** It means treating an individual unequally or disadvantageously based on their gender, e.g. paying different wages to men and women for similar or equal job positions.

Strategies for Enhancing Gender Equity

To enhance gender equity, one should:

- Follow gender-neutral practices at all levels at work.
- Participate together in decision-making.
- Help in promoting women's participation in different forums.
- Assist women in getting exposure to relevant skills and practices.
- Assist women in capacity building by mentoring, coaching or motivating them, as appropriate.
- Assist in the formation and operation of women support groups.
- Assist in the implementation of women-centric programmes.
- Combine technical training with reproductive health and nutrition for coffee farming households.
- Assist in making a work environment that is healthy, safe, and free from discrimination.

Bridging Gender Differences

Men and women react and communicate very differently. Thus, there are some work differences as both genders have their style and method of handling a situation.

Although, understanding and maturity vary from person to person, even between these genders, based on their knowledge, education, experience, culture, age, and upbringing, as well as how one's brain functions over a thought or problem.

In order to bridge the gap, one should:

- Not categorize all men and women in one way.
- Be aware of the verbal and non-verbal styles of communication of every gender to avoid any miscommunication and work better.
- Be aware of partial behaviour and avoid it.
- Encourage co-workers of different genders to make room by providing space to others.

Ways to reduce Gender Discrimination

- Effective steps against sexual harassment by the concerned authorities and general public.
- Gender stereotypes are how society expects people to act based on their gender. This can only be reduced by adopting appropriate behaviour and the right attitude.
- Objectification of females must be abolished.

Ways to Promote Gender Sensitivity in the Workplace

Practices that promote gender diversity should be adopted and promoted.

- All genders should receive equal responsibilities, rights, and privileges.
- All genders should have equal pay for similar or the same job roles/ positions.
- Strict and effective workplace harassment policies should be developed and implemented.
- An open-minded and stress-free work environment should be available to all the employees, irrespective of their gender.
- Women should be encouraged to go ahead in every field of work and assume leadership roles.
- Follow appropriate measures for women's empowerment.
- Men should be taught to be sensitive to women and mindful of their rights.

7.3.2 PwD Sensitivity

Some individuals are born with a disability, while others may become disabled due to an accident, illness or as they get old. People with Disabilities (PwD) may have one or more areas in which their functioning is affected. A disability can affect hearing, sight, communication, breathing, understanding, mobility, balance, and concentration or may include the loss of a limb. A disability may contribute to how a person feels and affect their mental health

Important Terms

·**Persons with Disabilities (PwD) –** Persons with Disabilities means a person suffering from not less than 40% of any disability as certified by a medical authority.

·**Types of Disability:**

a. Blindness – Visually impaired
b. Low Vision
c. Leprosy Cured
d. Hearing impairment
e. Locomotor disability
f. Mental retardation
g. Mental illness

PwD Sensitivity

PwD sensitivity promotes empathy, etiquette and equal participation of individuals and organizations while working with individuals with a disability, e.g. sensory, physical or intellectual.

Ways to be PwD Sensitive

To be sensitive to PwD, one should:

- Be respectful to all Persons with Disabilities (PwD) and communicate in a way that reflects PwD sensitivity.
- Always be supportive and kind towards a PwD with their daily chores.
- Be ready to assist a PwD to help them avail of any benefit/ livelihood opportunity/ training or any kind that helps them grow.
- Encourage and try to make things easier and accessible to PwD so that they can work without or with minimum help.
- Protest where feasible and report any wrong act/behaviour against any PwD to the appropriate authority.
- Learn and follow the laws, acts, and policies relevant to PwD.

Appropriate Verbal Communication

As part of appropriate verbal communication with all genders and PwD, one should:

- Talk to all genders and PwD respectfully, maintaining a normal tone of voice with appropriate politeness. It is important to ensure one's tone of voice does not have hints of sarcasm, anger, or unwelcome affection.
- Avoid being too self-conscious concerning the words to use while also ensuring not to use words that imply one's superiority over the other.
- Make no difference between a PwD and their caretaker. Treat PwD like adults and talk to them directly.
- Ask a PwD if they need any assistance instead of assuming they need it and offering assistance spontaneously.

Appropriate Non-verbal Communication

Non-verbal communication is essentially the way someone communicates through their body language. These include:

- **Facial expressions -** The human face is quite expressive, capable of conveying many emotions without using words. Facial expressions must usually be maintained neutral and should change according to the situation, e.g. smile as a gesture of greeting.
- **Body posture and movement -** One should be mindful of how to sit, stand, walk, or hold their head. For example - one should sit and walk straight in a composed manner. The way one moves and carries self, communicates a lot to others. This type of non-verbal communication includes one's posture, bearing, stance, and subtle movements.

- **Gestures -** One should be very careful with their gestures, e.g. waving, pointing, beckoning, or using one's hands while speaking. One should use appropriate and positive gestures to maintain respect for the other person while being aware that a gesture may have different meanings in different cultures.

- **Eye contact -** Eye contact is particularly significant in non-verbal communication. The way someone looks at someone else may communicate many things, such as interest, hostility, affection or attraction. Eye contact is vital for maintaining the flow of conversation and for understanding the other person's interest and response. One should maintain appropriate eye contact, ensuring not to stare or look over the shoulders. To maintain respect, one should sit or stand at the other person's eye level to make eye contact.
- **Touch -** Touch is a very sensitive type of non-verbal communication. Examples are - handshakes, hugs, pat on the back or head, gripping the arm, etc. A firm handshake indicates interest, while a weak handshake indicates the opposite. One should be extra cautious not to touch others inappropriately and avoid touching them inadvertently by maintaining a safe distance.

Rights of PwD

PwD have the right to respect and human dignity. Irrespective of the nature and seriousness of their disabilities, PwD have the same fundamental rights as others, such as:

- Disabled persons have the same civil and political rights as other people
- Disabled persons are entitled to the measures designed to enable them to become as self-dependent as possible
- Disabled persons have the right to economic and social security
- Disabled persons have the right to live with their families or foster parents and participate in all social and creative activities.
- Disabled persons are protected against all exploitation and treatment of discriminatory and abusive nature.

Making Workplace PwD Friendly

- One should not make PwD feel uncomfortable by giving too little or too much attention
- One should use a normal tone while communicating with a PwD and treat them as all others keeping in mind their limitations and type of disability
- Any help should be provided only when asked for by a PwD
- One should help in ensuring the health and well-being of PwD.

Expected Employer Behaviour

Some of the common behavioural traits that employees expect from their employers are:

- Cooperation: No work is successful without cooperation from the employer's side. Cooperation helps to understand the job role better and complete it within the given timeline.
- Polite language: Polite language is always welcomed at work. This is a basic aspect that everybody expects.
- Positive Attitude: Employers with a positive attitude can supervise the work of the employees and act as a helping hand to accomplish the given task. A person with a positive attitude looks at the best qualities in others and helps them gain success.
- Unbiased behaviour: Employers should always remain fair towards all their employees. One should not adopt practices to favour one employee while neglecting or ignoring the other. This might create animosity among co-workers.
- Decent behaviour: The employer should never improperly present oneself before the employee. One should always respect each other's presence and behave accordingly. The employer should not speak or act in a manner that may make the employee feel uneasy, insulted, and insecure.

Exercise

1. List down three examples of workplace ethics.
2. List down three examples of interpersonal skills.
3. Identify two reasons for workplace conflicts.
4. Identify two ways of resolving interpersonal conflicts
5. List down two ways of dealing with heightened emotions at work.
6. List down two types of non-verbal communication.

Notes

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ESSCI
Skilling India in Electronics

8. Apply health and safety practices at the workplace

Unit 8.1 Workplace Hazards
Unit 8.2 Fire Safety
Unit 8.3 First Aid
Unit 8.4 Waste Management

ELE/N1002

Key Learning Outcomes

By the end of this module, participa ts will be able to:

1. Discuss job-site hazards, risks and accidents
2. Explain the organizational safety procedures for maintaining electrical safety, handling tools and hazardous materials
3. Describe how to interpret warning signs while accessing sensitive work areas
4. Explain the importance of good housekeeping
5. Describe the importance of maintaining appropriate postures while lifting heavy objects
6. List the types of fire and fire extinguishers
7. Describe the concept of waste management and methods of disposing of hazardous waste
8. List the common sources of pollution and ways to minimize them
9. Elaborate on electronic waste disposal procedures
10. Explain how the administer appropriate first aid to victims in case of bleeding, burns, choking, electric shock, poisoning and also administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock

UNIT 8.1: Workplace Hazards

Unit Objectives

By the end of this unit, participants will be able to:

- Discuss job-site hazards, risks and accidents
- Explain the organizational safety procedures for maintaining electrical safety, handling tools and hazardous materials
- Describe how to interpret warning signs while accessing sensitive work areas
- Explain the importance of good housekeeping
- Describe the importance of maintaining appropriate postures while lifting heavy objects
- Explain safe handling of tools and Personal Protective Equipment to be used.

8.1.1 Workplace Safety

Workplace safety is important to be established for creating a safe and secure working for the workers. The workplace has to be administered as per the rules of the Occupational Safety and Health Administration (OSHA). It refers to monitoring the working environment and all hazardous factors that impact employees' safety, health, and well-being. It is important to provide a safe working environment to the employees to increase their productivity, wellness, skills, etc.

The benefits of workplace safety are:

- Employee retention increases if they are provided with a safe working environment.
- Failure to follow OSHA's laws and guidelines can result in significant legal and financial consequences.
- A safe environment enables employees to stay invested in their work and increases productivity.
- Employer branding and company reputation can both benefit from a safe working environment.

8.1.2 Workplace Hazards

A workplace is a situation that has the potential to cause harm or injury to the workers and damage the tools or property of the workplace. Hazards exist in every workplace and can come from a variety of sources. Finding and removing them is an important component of making a safe workplace.

Common Workplace Hazards

The common workplace hazards are:

·Biological: The threats caused by biological agents like viruses, bacteria, animals, plants, insects and also humans, are known as biological hazards.

- **Chemical:** Chemical hazard is the hazard of inhaling various chemicals, liquids and solvents. Skin irritation, respiratory system irritation, blindness, corrosion, and explosions are all possible health and physical consequences of these dangers.
- **Mechanical:** Mechanical Hazards comprise the injuries that can be caused by the moving parts of machinery, plant or equipment.
- **Psychological:** Psychological hazards are occupational hazards caused by stress, harassment, and violence.
- **Physical:** The threats that can cause physical damage to people is called physical hazard. These include unsafe conditions that can cause injury, illness and death.
- **Ergonomic:** Ergonomic Hazards are the hazards of the workplace caused due to awkward posture, forceful motion, stationary position, direct pressure, vibration, extreme temperature, noise, work stress, etc.

Workplace Hazards Analysis

A workplace hazard analysis is a method of identifying risks before they occur by focusing on occupational tasks. It focuses on the worker's relationship with the task, the tools, and the work environment. After identifying the hazards of the workplace, organisations shall try to eliminate or minimize them to an acceptable level of risk.

Control Measures of Workplace Hazards

Control measures are actions that can be taken to reduce the risk of being exposed to the hazard. Elimination, Substitution, Engineering Controls, Administrative Controls, and Personal Protective Equipment are the five general categories of control measures.

- **Elimination:** The most successful control technique is to eliminate a specific hazard or hazardous work procedure or prevent it from entering the workplace.

- **Substitution:** Substitution is the process of replacing something harmful with something less hazardous. While substituting the hazard may not eliminate all of the risks associated with the process or activity, it will reduce the overall harm or health impacts.

- **Engineering Controls:** Engineered controls protect workers by eliminating hazardous situations or creating a barrier between the worker and the hazard, or removing the hazard from the person.

- **Administrative Controls:** To reduce exposure to hazards, administrative controls limit the length of time spent working on a hazardous task that might be used in combination with other measures of control.

- **Personal Protective Equipment:** Personal protective equipment protects users from health and safety hazards at work. It includes items like safety helmets, gloves, eye protection, etc.

8.1.3 Risk for a Drone Technician

A drone technician may require to repair the propeller, motor and its mount, battery, mainboards, processor, booms, avionics, camera, sensors, chassis, wiring and landing gear. A technician may face some risks while repairing the drones' equipment.

- The technician is susceptible to being physically harmed by propellers.
- Direct contact with exposed electrical circuits can injure the person.
- If the skin gets in touch with the heat generated from electric arcs, it burns the internal tissues.
- Major electrical injuries can occur due to poorly installed electrical equipment, faulty wiring, overloaded or overheated outlets, use of extension cables, incorrect use of replacement fuses, use of equipment with wet hands, etc.

8.1.4 Workplace Warning Signs

A Hazard sign is defined as 'information or instruction about health and safety at work on a signboard, an illuminated sign or sound signal, a verbal communication or hand signal.'

There are four different types of safety signs:

- Prohibition / Danger Alarm Signs
- Mandatory Signs
- Warning Signs
- And Emergency

1. Prohibition Signs: A "prohibition sign" is a safety sign that prohibits behaviour that is likely to endanger one's health or safety. The colour red is necessary for these health and safety signs. Only what or who is forbidden should be displayed on a restriction sign.

Fig. 8.1.1. Prohibition arning Signs

2. Mandatory Signs:

Mandatory signs give clear directions that must be followed. The icons are white circles that have been reversed out of a blue circle. On a white background, the text is black.

Fig. 8.1.2. Mandatory Signs

3. Warning Signs

Warning signs are the safety informationcommunicaatiosigns. They are shown as a 'yellow colour triangle'.

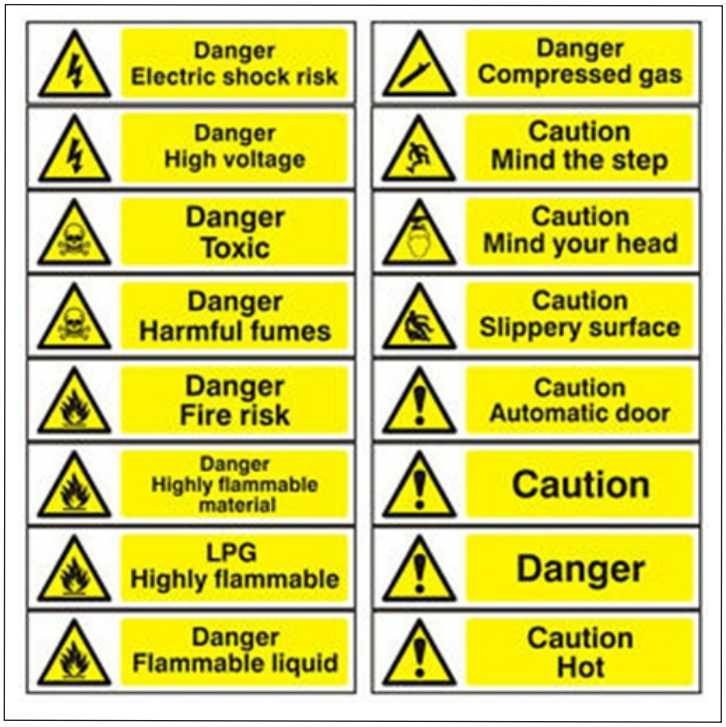


Fig. 8.1.3. Warning Signs

4. Emergency Signs

The locationor routes to emergency ffacilitieare indicated by emergency signs. These signs have a green backdrop with a white emblem or writing.These signs convey basic informaatioand frequently refer to housekeeping, company procedures, or logistics.

Fig. 8.1.4. Emergency Signs

8.1.5 Cleanliness in the Workplace

Workplace cleanliness maintenance creates a healthy, efficient and productive environment for the employees. Cleanliness at the workplace is hindered by some elements like cluttered desks, leftover food, waste paper, etc. A tidy workplace is said to improve employee professionalism and enthusiasm while also encouraging a healthy working environment.

Benefits of cleanliness in the workplace:

1. Productivity: Cleanliness in the workplace can bring a sense of belonging to the employees, also motivating and boosting the morale of the employees. This results in increasing their productivity.
2. Employee Well-being: Employee well-being can be improved by providing a clean work environment. Employees use fewer sick days in a workplace where litter and waste are properly disposed of, and surfaces are cleaned regularly, resulting in increased overall productivity.
3. Positive Impression: Cleanliness and orderliness in the workplace provide a positive impression on both employees and visitors.
4. Cost saving: By maintaining acceptable levels of cleanliness in the workplace, businesses can save money on cleaning bills and renovations, which may become necessary if the premises are not properly kept.

Reasons for Cleaning the Workplace

- Cleaning of dry floors, mostly to prevent workplace slips and falls.
- Disinfectants stop bacteria in their tracks, preventing the spread of infections and illness.
- Proper air filtration decreases hazardous substance exposures such as dust and fumes.
- Light fixture cleaning improves lighting efficiency.
- Using environmentally friendly cleaning chemicals that are safer for both personnel and the environment.
- Work environments are kept clean by properly disposing of garbage and recyclable items.

8.1.6 Lifting and Handling of Heavy Loads

Musculoskeletal Injuries (MSIs), such as sprains and strains, can occur while lifting, handling, or carrying objects at work. When bending, twisting, uncomfortable postures and lifting heavy objects are involved, the risk of injury increases. Ergonomic controls can help to lower the risk of injury and potentially prevent it.

Types of injuries caused while lifting heavy objects:

- Cuts and abrasions are caused by rough surfaces.
- Crushing of feet or hands.
- Strain to muscles and joints

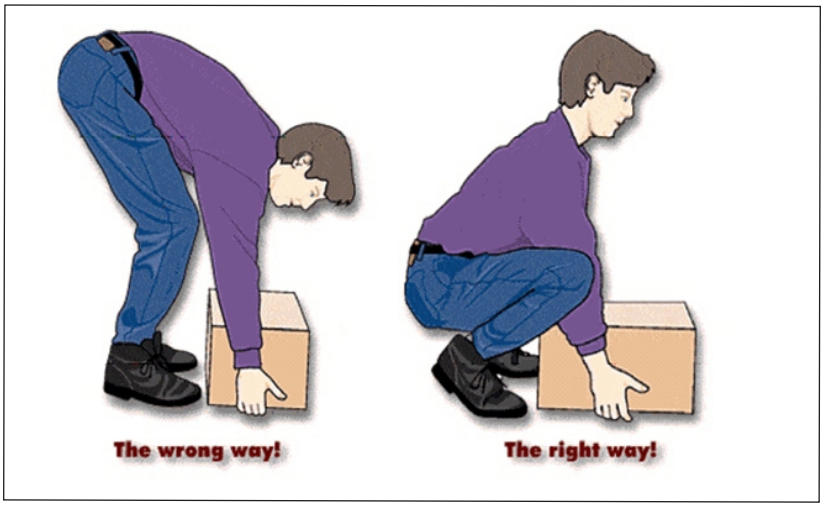


Fig. 8.1.5. Lifting loads echnique

Preparing to lift

A load that appears light enough to bear at first will grow increasingly heavier as one carries it further. The person carrying the weight should be able to see over or around it at all times.

The amount of weight a person can lift, depends on their age, physique, and health

It also depends on whether or not the person is used to lifting and moving hefty objects.

Common Causes of Back Injuries

The Most Common Causes of Back Injuries are:

1) **Inadequate Training:** The individual raising the load receives no sufficient training or guidance.
2) **Lack of awareness of technique:** The most common cause of back pain is incorrect twisting and posture, which causes back strain.
3) **Load size:** The load size to consider before lifting. If the burden is too much for one's capacity or handling, their back may be strained and damaged.
4) **Physical Strength:** Depending on their muscle power, various persons have varied physical strengths. One must be aware of their limitations.
5) **Teamwork:** The operation of a workplace is all about working together. When opposed to a single person lifting a load, two people can lift it more easily and without difficulty. If one of two people isn't lifting it properly, the other or both of them will suffer back injuries as a result of the extra strain.

Techniques for Lifting Heavy Objects

Technique	Demonstraton
1. Ensure one has a wide base of support before lifting the heavy object. Ensure one's feet are shoulder-width apart, and one foot is slightly ahead of the other at all times. This will help one maintain a good balance during the lifting of heavy objects. This is known as the Karate Stance.	
2. Squat down as near to the object as possible when one is ready to lift it, bending at the hips and knees with the buttocks out. If the object is really heavy, one may wish to place one leg on the floor and the other bent at a straight angle in front of them.	

3. Maintain proper posture as one begin to lift upward. To do so, one should keep their back straight, chest out, and shoulders back while gazing straight ahead.	
4. By straightening one's hips and knees, slowly elevate the thing (not the back). As one rises, they should extend their legs and exhale. Lift the heavy object without twisting the body or bending forward.	
5. Do not lift bending forward.	
6. Hold the load close to the body.	

7. Never lift heavy objects above the shoulder	
8. Use the feet (not the body) to change direction, taking slow, small steps.	
9. Set down the heavy object carefully, squatting with the knees and hips only.	

Table 8.1.1 Techniques for lifting he vy objects

[3]*Source:https://ww .braceability.ccom/blogs/articles/7-prop-heavavy-liftinechniques*

8.1.7 Safe Handling of Tools

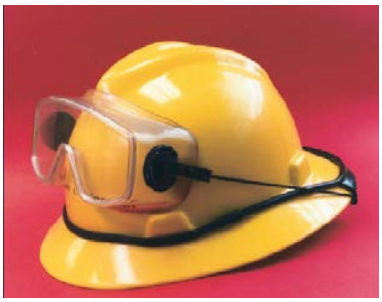
Workers should be trained on how to use tools safely. When tools are misplaced or handled incorrectly by workers, they can be dangerous. The following are some suggestions from the National Safety Council for safe tool handling when they are not in use:

- Never carry tools up or down a ladder in a way that makes it difficult to grip them. Instead of being carried by the worker, tools should be lifted up and down using a bucket or strong bag.
- Tools should never be tossed but should be properly passed from one employee to the next. Pointed tools should be passed with the handles facing the receiver or in their carrier.
- When turning and moving around the workplace, workers carrying large tools or equipment on their shoulders should pay particular attention to clearances.
- Pointed tools such as chisels and screwdrivers should never be kept in a worker's pocket. They can be carried in a toolbox, pointing down in a tool belt or pocket tool bag, or in hand with the tip always held away from the body.
- Tools should always be stored while not in use. People below are put in danger when tools are left sitting around on an elevated structure, such as a scaffold. In situations when there is a lot of vibration, this risk increases.

8.1.8 Personal Protective Equipment

Personal protective equipment, or "PPE," is equipment worn to reduce exposure to risks that might result in significant occupational injuries or illnesses. Chemical, radiological, physical, electrical, mechanical, and other job dangers may cause these injuries and diseases.

PPE used for protection fom the following injuries are:

Injury Protecton	Protecton	PPE
Head Injury Protecton	Falling or flying objects, stationary objects, or contact with electrical wires can cause impact, penetration, and electrical injuries. Hard hats can protect one's head from these injuries. A common electrician's hard hat is shown in the figure below. This hard hat is made of nonconductive plastic and comes with a set of safety goggles.	
Foot and Leg Injury Protecton	In addition to foot protection and safety shoes, leggings (e.g., leather) can guard against risks such as falling or rolling objects, sharp objects, wet and slippery surfaces, molten metals, hot surfaces, and electrical hazards.	 
Eye and Face Injury Protecton	Spectacles, goggles, special helmets or shields, and spectacles with side shields and face shields can protect against the hazards of flying fragments, large chips, hot sparks, radiation, and splashes from molten metals. They also offer protection from particles, sand, dirt, mists, dust, and glare.	

Protecton against Hearing Loss	Hearing protection can be obtained by wearing earplugs or earmuffs. High noise levels can result in permanent hearing loss or damage, as well as physical and mental stress. Self-forming earplugs composed of foam, waxed cotton, or fibreglass wool usually fit well. Workers should be fitted for moulded or prefabricated earplugs by a specialist.	
Hand Injury Protecton	Hand protection will aid workers who are exposed to dangerous substances by skin absorption, serious wounds, or thermal burns. Gloves are a frequent protective clothing item. When working on electrified circuits, electricians frequently use leather gloves with rubber inserts. When stripping cable with a sharp blade, Kevlar gloves are used to prevent cuts.	
Whole Body Protecton	Workers must protect their entire bodies from risks such as heat and radiation. Rubber, leather, synthetics, and plastic are among the materials used in whole-body PPE, in addition to fire-retardant wool and cotton. Maintenance staff who operate with high-power sources such as transformer installations and motor-control centres are frequently obliged to wear fire-resistant clothes.	

Table 8.1.2. Personal protective equipment

Notes

UNIT 8.2: Fire Safety

Unit Objectives

By the end of this unit, participants will be able to:

1. List the types of fire and fire e extinguiss.

8.2.1 Fire Safety

Fire safety is a set of actions aimed at reducing the amount of damage caused by fire. Fire safety procedures include both those that are used to prevent an uncontrolled fire from starting and those that are used to minimise the spread and impact of a fire after it has started. Developing and implementing fire safety measures in the workplace is not only mandated by law but is also essential for the protection of everyone who may be present in the building during a fire emergency.

The basic Fire Safety Responsibilities are:

- To identify risks on the premises, a fire risk assessment must be carried out.
- Ascertain that fire safety measures are properly installed.
- Prepare for unexpected events.
- Fire safety instructions and training should be provided to the employees.

8.2.2 Respond to a Workplace Fire

- Workplace fire drills should be conducted on a regular basis.
- If one has a manual alarm, they should raise it.
- Close the doors and leave the fire-stricken area as soon as possible. Ensure that the evacuation is quick and painless.
- Turn off dangerous machines and don't stop to get personal items.
- Assemble at a central location. Ascertain that the assembly point is easily accessible to the employees.
- If one's clothing catches fire, one shouldn't rush about it. They should stop and descend on the ground and roll to smother the flames if their clothes catch fire.

8.2.3 Fire Extinguisher

Fire extinguishers are portable devices used to put out small flames or minimise their damage until fire-fighters arrive. These are maintained on hand in locations such as fire stations, buildings, workplaces, public transit, and so on. The types and quantity of extinguishers that are legally necessary for a given region are determined by the applicable safety standards.

Types of fire extinguishers are:

There are five main types of fire extinguishers:

1. Water.
2. Powder.
3. Foam.
4. Carbon Dioxide (CO2).
5. Wet chemical.

1. **Water:** Water fire extinguishers are one of the most common commercial and residential fire extinguishers on the market. They're meant to be used on class-A flames.

2. **Powder:** The L2 powder fire extinguisher is the most commonly recommended fire extinguisher in the Class D Specialist Powder category, and is designed to put out burning lithium metal fires.

3. **Foam:** Foam extinguishers are identified by a cream rectangle with the word "foam" printed on it. They're mostly water-based, but they also contain a foaming component that provides a quick knock-down and blanketing effect on flames. It suffocates the flames and seals the vapours, preventing re-ignition.

4. **Carbon Dioxide (CO2):** Class B and electrical fires are extinguished with carbon dioxide extinguishers, which suffocate the flames by removing oxygen from the air. They are particularly beneficial for workplaces and workshops where electrical fires may occur since, unlike conventional extinguishers, they do not leave any toxins behind and hence minimise equipment damage.

5. **Wet Chemical:** Wet chemical extinguishers are designed to put out fires that are classified as class F. They are successful because they can put out extremely high-temperature fires, such as those caused by cooking oils and fats.

Notes

UNIT 8.3: First Aid

Unit Objectives

By the end of this unit, participants will be able to:

1. Explain how the administer appropriate first aid to victims in case of bleeding, burns, choking, electric shock, poisoning
2. Explain how to administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock.

8.3.1 First Aid

First aid is the treatment or care given to someone who has sustained an injury or disease until more advanced care can be obtained or the person recovers.

The aim of first aid is to:

- Preserve life
- Prevent the worsening of a sickness or injury
- If at all possible, relieve pain
- Encourage recovery
- Keep the unconscious safe.

First aid can help to lessen the severity of an injury or disease, and in some situations, it can even save a person's life.

8.3.2 Need for First Aid at the Workplace

- In the workplace, first aid refers to providing immediate care and life support to persons who have been injured or become unwell at work.
- Many times, first aid can help to lessen the severity of an accident or disease.
- It can also help an injured or sick person relax. In life-or-death situations, prompt and appropriate first aid can make all the difference.

8.3.2 Need for First Aid at the Workplace

In the workplace, first aid refers to providing immediate care and life support to persons who have been injured or become unwell at work.

Many times, first aid can help to lessen the severity of an accident or disease.

It can also help an injured or sick person relax. In life-or-death situations, prompt and appropriate first aid can make all the difference.

8.3.3 Treating Minor Cuts and Scapes

Steps to keep cuts clean and prevent infectionsand scars:

- **Wash Hands:** Wash hands first with soap and water to avoid introducing bacteria into the cut and causing an infection. One should use the hand sanitiser if one is on the go.
- **Stop the bleeding:** Using a gauze pad or a clean towel, apply pressure to the wound. For a few minutes, keep the pressure on.
- **Clean Wounds:** Once the bleeding has stopped, clean the wound by rinsing it under cool running water or using a saline wound wash. Use soap and a moist washcloth to clean the area around the wound. Soap should not be used on the cut since it may irritate the skin. Also, avoid using hydrogen peroxide or iodine, as these may aggravate the wound.
- **Remove Dirt:** Remove any dirt or debris from the area. Pick out any dirt, gravel, glass, or other material in the cut with a pair of tweezers cleaned with alcohol.

8.3.4 Heart Atack

When the blood flow carrying oxygen to the heart is blocked, a heart attack occurs. The heart muscle runs out of oxygen and starts to die.

Symptoms of a heart attack can vary from person to person. They may be mild or severe. Women, older adults, and people with diabetes are more likely to have subtle or unusual symptoms.

Symptoms in adults may include:

- Changes in mental status, especially in older adults.
- Chest pain that feels like pressure, squeezing, or fullness. The pain is most often in the centre of the chest. It may also be felt in the jaw, shoulder, arms, back, and stomach. It can last for more than a few minutes or come and go.
- Cold sweat.
- Light-headedness.
- Nausea (more common in women).
- Indigestion.

- Vomiting.
- Numbness, aching or tingling in the arm (usually the left arm, but the right arm may be affected alone, or along with the left).
- Shortness of breath
- Weakness or fatigue, especially in older adults and in women.

First Aid for Heart Attack

If one thinks someone is experiencing a heart attack, they should:

- Have the person sit down, rest, and try to keep calm.
- Loosen any tight clothing.
- Ask if the person takes any chest pain medicine, such as nitro-glycerine for a known heart condition, and help them take it.
- If the pain does not go away promptly with rest or within 3 minutes of taking nitro-glycerine, call for emergency medical help.
- If the person is unconscious and unresponsive, call 911 or the local emergency number, then begin CPR.
- If an infant or child is unconscious and unresponsive, perform 1 minute of CPR, then call 911 or the local emergency number.

Notes

UNIT 8.4: Waste Management

Unit Objectives

By the end of this unit, participants will be able to:

1. Describe the concept of waste management and methods of disposing of hazardous waste.
2. List the common sources of pollutionand ways to minimize them.
3. Elaborate on electronic waste disposal procedures.

8.4.1. Waste Management and Methods of Waste Disposal

The collection, disposal, monitoring, and processing of waste materials is known as waste management. These wastes affect living beings' health and the environment. For reducing their effects, they have to be managed properly. The waste is usually in solid, liquid or gaseous form.

The importance of waste management is:

Waste management is important because it decreases waste's impact on the environment, health, and other factors. It can also assist in the reuse or recycling of resources like paper, cans, and glass. The disposal of solid, liquid, gaseous, or dangerous substances is the example of waste management.

When it comes to trash management, there are numerous factors to consider, including waste disposal, recycling, waste avoidance and reduction, and garbage transportation. Treatment of solid and liquid wastes is part of the waste management process. It also provides a number of recycling options for goods that aren't classified as garbage during the process.

8.4.2 Methods of Waste Management

Non-biodegradable and toxic wastes, such as radioactive remains, can cause irreversible damage to the environment and human health if they are not properly disposed of. Waste disposal has long been a source of worry, with population increase and industrialisation being the primary causes. Here are a few garbage disposal options.

1. **Landfills:** The most common way of trash disposal today is to throw daily waste/garbage into landfills. This garbage disposal method relies on burying the material in the ground.
2. **Recycling:** Recycling is the process of transforming waste items into new products in order to reduce energy consumption and the use of fresh raw materials. Recycling reduces energy consumption, landfill volume, air and water pollution, greenhouse gas emissions, and the preservation of natural resources for future use.

3. **Composting:** Composting is a simple and natural bio-degradation process that converts organic wastes, such as plant remnants, garden garbage, and kitchen waste, into nutrient-rich food for plants.
4. **Incineration:** Incineration is the process of combusting garbage. The waste material is cooked to extremely high temperatures and turned into materials such as heat, gas, steam, and ash using this technology.

8.4.3 Recyclable, Non-Recyclable and Hazardous Waste

1. **Recyclable Waste:** The waste which can be reused or recycled further is known as recyclable waste.
2. **Non-recyclable Waste:** The waste which cannot be reused or recycled is known as non-recyclable waste. Polythene bags are a great example of non-recyclable waste.
3. **Hazardous Waste:** The waste which can create serious harm to the people and the environment is known as hazardous waste.

8.4.4 Sources of Pollution

Pollution is defined as the harm caused by the presence of a material or substances in places where they would not normally be found or at levels greater than normal. Polluting substances might be in the form of a solid, a liquid, or a gas.

- **Point source of pollution:** Pollution from a point source enters a water body at a precise location and can usually be identified. Effluent discharges from sewage treatment plants and industrial sites, power plants, landfill sites, fish farms, and oil leakage via a pipeline from industrial sites are all potential point sources of contamination.

  Point source pollution is often easy to prevent since it is feasible to identify where it originates, and once identified, individuals responsible for the pollution can take rapid corrective action or invest in longer-term treatment and control facilities.
- **Diffuse source of pollution:** As a result of land-use activities such as urban development, amenity, farming, and forestry, diffuse pollution occurs when pollutants are widely used and diffused over a large region. These activities could have occurred recently or in the past. It might be difficult to pinpoint specific sources of pollution and, as a result, take rapid action to prevent it because prevention often necessitates significant changes in land use and management methods.

Pollution Prevention

Pollution prevention entails acting at the source of pollutants to prevent or minimise their production. It saves natural resources, like water, by using materials and energy more efficiently.

Pollution prevention includes any practice that:

- Reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal;
- Reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants (these practices are known as "source reduction");
- Improved efficiency in the use of raw materials, energy, water, or other resources, or Conservation is a method of safeguarding natural resources.
- Improvements in housekeeping, maintenance, training, or inventory management; equipment or technology adjustments; process or method modifications; product reformulation or redesign; raw material substitution; or improvements in housekeeping, maintenance, training, or inventory control.

8.4.5 Electronic Waste

Lead, cadmium, beryllium, mercury, and brominated flame retardants are found in every piece of electronic waste. When gadgets and devices are disposed of illegally, these hazardous compounds are more likely to contaminate the earth, pollute the air, and leak into water bodies.

When e-waste is dumped in a landfill, it tends to leach trace metals as water runs through it. The contaminated landfill water then reaches natural groundwater with elevated toxic levels, which can be dangerous if it reaches any drinking water bodies. Despite having an environmentally benign approach, recycling generally results in international shipment and dumping of the gadgets in pits.

Some eco-friendly ways of disposing of e-waste are:

- Giving back the e-waste to the electronic companies and drop-off points
- Following guidelines issued by the government
- Selling or donating the outdated technology-based equipment
- Giving e-waste to a certified e-waste recycler

Exercise

1. Name all five types of fire extinguishers.
2. Explain PPE in brief.
3. List the common workplace hazards.
4. Fill in the blacks:
   i. A "_____ sign" is a safety sign that prohibits behaviour that is likely to endanger one's health or safety.
   ii. _____ entails acting at the source of pollutants to prevent or minimise their production.
   iii. _____ is the treatment or care given to someone who has sustained an injury or disease until more advanced care can be obtained or the person recovers.
   iv. The threats caused by biological agents like viruses, bacteria, animals, plants, insects and also humans, are known as _____.
   v. The workplace has to be administered as per the rules of the _____.

Notes

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ESSCI

9. Employability & Entrepreneurship Skills

Unit 9.1 – Personal Strengths & Value Systems

Unit 9.2 – Digital Literacy: A Recap

Unit 9.3 – Money Matters

Unit 9.4 – Preparing for Employment & Self-Employment

Unit 9.5 – Understanding Entrepreneurship

Unit 9.6 – Preparing to be an Entrepreneur

Key Learning Outcomes

At the end of this module, you will be able to:

1. Explain the meaning of health
2. List common health issues
3. Discuss tips to prevent common health issues
4. Explain the meaning of hygiene
5. Discuss the purpose of Swacch Bharat Abhiyan
6. Explain the meaning of habit
7. Discuss ways to set up a safe work environment
8. Discuss critical safety habits to be followed by employees
9. Explain the importance of self-analysis
10. Discuss motivation with the help of Maslow's Hierarchy of Needs
11. Discuss the meaning of achievement motivation
12. List the characteristics of entrepreneurs with achievement motivation
13. List the different factors that motivate you
14. Discuss the role of attitude in self-analysis
15. Discuss how to maintain a positive attitude
16. List your strengths and weaknesses
17. Discuss the qualities of honest people
18. Describe the importance of honesty in entrepreneurs
19. Discuss the elements of a strong work ethic
20. Discuss how to foster a good work ethic
21. List the characteristics of highly creative people
22. List the characteristics of highly innovative people
23. Discuss the benefits of time management
24. List the traits of effective time managers
25. Describe effective time management technique
26. Discuss the importance of anger management
27. Describe anger management strategies
28. Discuss tips for anger management
29. Discuss the causes of stress
30. Discuss the symptoms of stress
31. Discuss tips for stress management
32. Identify the basic parts of a computer
33. Identify the basic parts of a keyboard
34. Recall basic computer terminology
35. Recall the functions of basic computer keys
36. Discuss the main applications of MS Office
37. Discuss the benefits of Microsoft Outlook
38. Discuss the different types of e-commerce
39. List the benefits of e-commerce for retailers and customers
40. Discuss how the Digital India campaign will help boost e-commerce in India

41. Describe how you will sell a product or service on an e-commerce platform
42. Discuss the importance of saving money
43. Discuss the benefits of saving money
44. Discuss the main types of bank accounts
45. Describe the process of opening a bank account
46. Differentiate between fixed and variable costs
47. Describe the main types of investment options
48. Describe the different types of insurance products
49. Describe the different types of taxes
50. Discuss the uses of online banking
51. Discuss the main types of electronic funds transfers
52. Discuss the steps to prepare for an interview
53. Discuss the steps to create an effective Resume
54. Discuss the most frequently asked interview questions
55. Discuss how to answer the most frequently asked interview questions
56. Discuss basic workplace terminology
57. Discuss the concept of entrepreneurship
58. Discuss the importance of entrepreneurship
59. Describe the characteristics of an entrepreneur
60. Describe the different types of enterprises
61. List the qualities of an effective leader
62. Discuss the benefits of effective leadership
63. List the traits of an effective team
64. Discuss the importance of listening effectively
65. Discuss how to listen effectively
66. Discuss the importance of speaking effectively
67. Discuss how to speak effectively
68. Discuss how to solve problems
69. List important problem-solving traits
70. Discuss ways to assess problem solving skills
71. Discuss the importance of negotiation
72. Discuss how to negotiate
73. Discuss how to identify new business opportunities
74. Discuss how to identify business opportunities within your business
75. Explain the meaning of entrepreneur
76. Describe the different types of entrepreneurs
77. List the characteristics of entrepreneurs
78. Recall entrepreneur success stories
79. Discuss the entrepreneurial process
80. Describe the entrepreneurship ecosystem
81. Discuss the purpose of the Make in India campaign
82. Discuss key schemes to promote entrepreneurs

83. Discuss the relationship between entrepreneurship and risk appetite
84. Discuss the relationship between entrepreneurship and resilience
85. Describe the characteristics of a resilient entrepreneur
86. Discuss how to deal with failure
87. Discuss how market research is carried out
88. Describe the 4 Ps of marketing
89. Discuss the importance of idea generation
90. Recall basic business terminology
91. Discuss the need for CRM
92. Discuss the benefits of CRM
93. Discuss the need for networking
94. Discuss the benefits of networking
95. Discuss the importance of setting goals
96. Differentiate between short-term, medium-term and long-term goals
97. Discuss how to write a business plan
98. Explain the financial planning process
99. Discuss ways to manage your risk
100. Describe the procedure and formalities for applying for bank finance
101. Discuss how to manage your own enterprise
102. List important questions that every entrepreneur should ask before starting an enterprise

UNIT 9.1: Personal Strengths & Value Systems

Unit Objectives

At the end of this unit, participant will be able to:

1. Explain the meaning of health
2. List common health issues
3. Discuss tips to prevent common health issues
4. Explain the meaning of hygiene
5. Discuss the purpose of Swacch Bharat Abhiyan
6. Explain the meaning of habit
7. Discuss ways to set up a safe work environment
8. Discuss critical safety habits to be followed by employees
9. Explain the importance of self-analysis
10. Discuss motivation with the help of Maslow's Hierarchy of Needs
11. Discuss the meaning of achievement motivation
12. List the characteristics of entrepreneurs with achievement motivation
13. List the different factors that motivate you
14. Discuss the role of attitude in self-analysis
15. Discuss how to maintain a positive attitude
16. List your strengths and weaknesses
17. Discuss the qualities of honest people
18. Describe the importance of honesty in entrepreneurs
19. Discuss the elements of a strong work ethic
20. Discuss how to foster a good work ethic
21. List the characteristics of highly creative people
22. List the characteristics of highly innovative people
23. Discuss the benefits of time management
24. List the traits of effective time managers
25. Describe effective time management technique
26. Discuss the importance of anger management
27. Describe anger management strategies
28. Discuss tips for anger management
29. Discuss the causes of stress
30. Discuss the symptoms of stress
31. Discuss tips for stress management

9.1.1 Health, Habits, Hygiene: What is Health?

As per the World Health Organization (WHO), health is a "State of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity." This means being healthy does not simply mean not being unhealthy – it also means you need to be at peace emotionally and feel fit physically. For example, you cannot say you are healthy simply because you do not have any physical ailments like a cold or cough. You also need to think about whether you are feeling calm, relaxed and happy.

Common Health Issues

Some common health issues are:

- Allergies
- Asthma
- Skin Disorders
- Depression and Anxiety
- Diabetes
- Cough, Cold, Sore Throat
- Difficulty Sleeping
- Obesity

9.1.1.1 Tips to Prevent Health Issues

Taking measures to prevent ill health is always better than curing a disease or sickness. You can stay healthy by:

- Eating healthy foods like fruits, vegetables and nuts
- Cutting back on unhealthy and sugary foods
- Drinking enough water everyday
- Not smoking or drinking alcohol
- Exercising for at least 30 minutes a day, 4-5 times a week
- Taking vaccinations when required
- Practicing yoga exercises and meditation

How many of these health standards do you follow? Tick the ones that apply to you.

1. Get minimum 7-8 hours of sleep every night. ☐
2. Avoid checking email first thing in the morning and right before you go to bed at night. ☐
3. Don't skip meals – eat regular meals at correct meal times. ☐
4. Read a little bit every single day. ☐
5. Eat more home cooked food than junk food. ☐
6. Stand more than you sit. ☐
7. Drink a glass of water first thing in the morning and have at least 8 glasses of water through the day. ☐
8. Go to the doctor and dentist for regular check-ups. ☐
9. Exercise for 30 minutes at least 5 days a week. ☐
10. Avoid consuming lots of aerated beverages. ☐

9.1.1.2 What is Hygiene?

As per the World Health Organization (WHO), "Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases." In other words, hygiene means ensuring that you do whatever is required to keep your surroundings clean, so that you reduce the chances of spreading germs and diseases.

For instance, think about the kitchen in your home. Good hygiene means ensuring that the kitchen is always spick and span, the food is put away, dishes are washed, and dustbins are not overflowing with garbage. Doing all this will reduce the chances of attracting pests like rats or cockroaches, and prevent the growth of fungus and other bacteria, which could spread disease.

How many of these health standards do you follow? Tick the ones that apply to you.

1. Have a bath or shower every day with soap – and wash your hair with shampoo 2-3 times a week. ☐
2. Wear a fresh pair of clean undergarments every day. ☐
3. Brush your teeth in the morning and before going to bed. ☐
4. Cut your fingernails and toenails regularly. ☐
5. Wash your hands with soap after going to the toilet. ☐
6. Use an anti-perspirant deodorant on your underarms if you sweat a lot. ☐
7. Wash your hands with soap before cooking or eating. ☐
8. Stay home when you are sick, so other people don't catch what you have. ☐
9. Wash dirty clothes with laundry soap before wearing them again. ☐
10. Cover your nose with a tissue/your hand when coughing or sneezing. ☐

See how healthy and hygienic you are, by giving yourself 1 point for every ticked statement! Then take a look at what your score means.

Your Score

- **0-7/20:** You need to work a lot harder to stay fit and fine! Make it a point to practice good habits daily and see how much better you feel!
- **7-14/20:** Not bad, but there is scope for improvement! Try and add a few more good habits to your daily routine.
- **14-20/20:** Great job! Keep up the good work! Your body and mind thank you!

9.1.1.3 Swachh Bharat Abhiyan

We have already discussed the importance of following good hygiene and health practices for ourselves. But, it is not enough for us to be healthy and hygienic. We must also extend this standard to our homes, our immediate surroundings and to our country as a whole.

The 'Swachh Bharat Abhiyan' (Clean India Mission) launched by Prime Minister Shri Narendra Modi on 2nd October 2014, believes in doing exactly this. The aim of this mission is to clean the streets and roads of India and raise the overall level of cleanliness. Currently this mission covers 4,041 cities and towns across the country. Millions of our people have taken the pledge for a clean India. You should take the pledge too, and do everything possible to keep our country clean!

9.1.1.4 What are Habits?

A habit is a behaviour that is repeated frequently. All of us have good habits and bad habits. Keep in mind the phrase by John Dryden: "We first make our habits, and then our habits make us." This is why it is so important that you make good habits a way of life, and consciously avoid practicing bad habits.

Some good habits that you should make part of your daily routine are:

- Always having a positive attitude
- Making exercise a part of your daily routine
- Reading motivational and inspirational stories
- Smiling! Make it a habit to smile as often as possible
- Making time for family and friends
- Going to bed early and waking up early

Some bad habits that you should quit immediately are:

- Skipping breakfast
- Snacking frequently even when you are not hungry
- Eating too much fattening and sugary food
- Smoking, drinking alcohol and doing drugs
- Spending more money than you can afford
- Worrying about unimportant issues
- Staying up late and waking up late

Tips

- Following healthy and hygienic practices every day will make you feel good mentally and physically.
- Hygiene is two-thirds of health – so good hygiene will help you stay strong and healthy!

9.1.2: Safety: Tips to Design a Safe Workplace

Every employer is obligated to ensure that his workplace follows the highest possible safety protocol. When setting up a business, owners must make it a point to:

- Use ergonomically designed furniture and equipment to avoid stooping and twisting
- Provide mechanical aids to avoid lifting or carrying heavy objects
- Have protective equipment on hand for hazardous jobs
- Designate emergency exits and ensure they are easily accessible
- Set down health codes and ensure they are implemented
- Follow the practice of regular safety inspections in and around the workplace
- Ensure regular building inspections are conducted
- Get expert advice on workplace safety and follow it

9.1.2.1 Negotiable Employee Safety Habits

Every employer is obligated to ensure that his workplace follows the highest possible safety protocol. When setting up a business, owners must make it a point to:

- Immediately report unsafe conditions to a supervisor
- Recognize and report safety hazards that could lead to slips, trips and falls
- Report all injuries and accidents to a supervisor
- Wear the correct protective equipment when required
- Learn how to correctly use equipment provided for safety purposes
- Be aware of and avoid actions that could endanger other people
- Take rest breaks during the day and some time off from work during the week

Tips 

- Be aware of what emergency number to call at the time of a workplace emergency
- Practice evacuation drills regularly to avoid chaotic evacuations

9.1.3 Self-Analysis – Attitude, Achievement Motivation

To truly achieve your full potential, you need to take a deep look inside yourself and find out what kind of person you really are. This attempt to understand your personality is known as self-analysis. Assessing yourself in this manner will help you grow, and will also help you to identify areas within yourself that need to be further developed, changed or eliminated. You can better understand yourself by taking a deep look at what motivates you, what your attitude is like, and what your strengths and weaknesses are.

9.1.3.1 What is Motivation?

Very simply put, motivation is your reason for acting or behaving in a certain manner. It is important to understand that not everyone is motivated by the same desires – people are motivated by many, many different things. We can understand this better by looking at Maslow's Hierarchy of Needs.

9.1.3.2 Maslow's Hierarchy of Needs

Famous American psychologist Abraham Maslow wanted to understand what motivates people. He believed that people have five types of needs, ranging from very basic needs (called physiological needs) to more important needs that are required for self-growth (called
self-actualization needs). Between the physiological and self-actualization needs are three other needs – safety needs, belongingness and love needs, and esteem needs.

These needs are usually shown as a pyramid with five levels and are known as Maslow's Hierarchy of Needs.

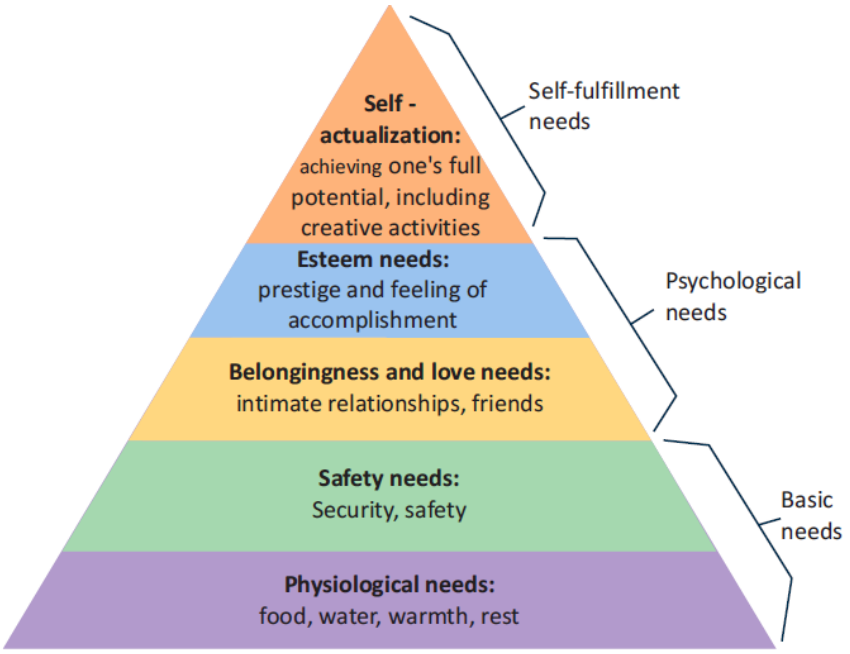


Fig. 9.1.1: Maslow's Hierarchy of Needs

The lowest level depicts the most basic needs. According to Maslow, our behaviour is driven by our basic needs, until those needs are fulfilled. Once they are fulfilled, we move to the next level and are motived by the next level of needs. Let's understand this better with an example.

Rupa comes from a very poor family. She never has enough food, water, warmth or rest. According to Maslow, until Rupa is sure that she will get these basic needs, she will not even think about the next level of needs – her safety needs. But, once Rupa is confident that her basic needs will be met, she will move to the next level, and her behaviour will then be motivated by her need for security and safety. Once these new needs are met, Rupa will once again move to the next level, and be motivated by her need for relationships and friends. Once this need is satisfied, Rupa will then focus on the fourth level of needs – her esteem needs, after which she will move up to the fifth and last level of needs – the desire to achieve her full potential.

9.1.3.3 Understanding Achievement Motivation

We now know that people are motivated by basic, psychological and self-fulfillment needs. However, certain people are also motivated by the achievement of highly challenging accomplishments. This is known as Achievement Motivation, or 'need for achievement'.

The level of motivation achievement in a person differs from individual to individual. It is important that entrepreneurs have a high level of achievement motivation – a deep desire to accomplish something important and unique. It is equally important that they hire people who are also highly motivated by challenges and success.

What Motivates You?

What are the things that really motivate you? List down five things that really motivate you. Remember to answer honestly!

I am motivated by:

Characteristics of Entrepreneurs with Achievement Motivation

Entrepreneurs with achievement motivation can be described as follows:

- Unafraid to take risks for personal accomplishment
- Love being challenged Future-oriented Flexible and adaptive
- Value negative feedback more than positive feedback
- Very persistent when it comes to achieving goals
- Extremely courageous
- Highly creative and innovative
- Restless - constantly looking to achieve more
- Feel personally responsible for solving problems

Think about it:

- How many of these traits do you have?
- Can you think of entrepreneurs who display these traits?

9.1.3.4 How to Cultivate a Positive Attitude?

The good news is attitude is a choice. So, it is possible to improve, control and change our attitude, if we decide we want to!

The following tips help foster a positive mindset:

- Remember that you control your attitude, not the other way around
- Devote at least 15 minutes a day towards reading, watching or listening to something positive
- Avoid negative people who only complain and stop complaining yourself
- Expand your vocabulary with positive words and delete negative phrases from your mind
- Be appreciative and focus on what's good in yourself, in your life, and in others
- Stop thinking of yourself as a victim and start being proactive
- Imagine yourself succeeding and achieving your goals

9.1.3.5 What is Attitude?

Now that we understand why motivation is so important for self-analysis, let's look at the role our attitude plays in better understanding ourselves. Attitude can be described as your tendency (positive or negative), to think and feel about someone or something. Attitude is the foundation for success in every aspect of life. Our attitude can be our best friend or our worst enemy. In other words:

"The only disability in life is a bad attitude."

When you start a business, you are sure to encounter a wide variety of emotions, from difficult times and failures to good times and successes. Your attitude is what will see you through the tough times and guide you towards success. Attitude is also infectious. It affects everyone around you, from your customers to your employees to your investors. A positive attitude helps build confidence in the workplace while a negative attitude is likely to result in the demotivation of your people.

9.1.3.6 What Are Your Strengths and Weaknesses?

Another way to analyse yourself is by honestly identifying your strengths and weaknesses. This will help you use your strengths to your best advantage and reduce your weaknesses. Note down all your strengths and weaknesses in the two columns below. Remember to be honest with yourself!

Strengths	Weaknesses

Tips

- Achievement motivation can be learned.
- Don't be afraid to make mistakes.
- Train yourself to finish what you start.
- Dream big.

9.1.4 Honesty & Work Ethics: What is Honesty?

Honesty is the quality of being fair and truthful. It means speaking and acting in a manner that inspires trust. A person who is described as honest is seen as truthful and sincere, and as someone who isn't deceitful or devious and doesn't steal or cheat. There are two dimensions of honesty – one is honesty in communication and the other is honesty in conduct.

Honesty is an extremely important trait because it results in peace of mind and builds relationships that are based on trust. Being dishonest, on the other hand, results in anxiety and leads to relationships full of distrust and conflict.

9.1.4.1 Qualities of Honest People

Honest individuals have certain distinct characteristics. Some common qualities among honest people are:

- They don't worry about what others think of them. They believe in being themselves – they don't bother about whether they are liked or disliked for their personalities.
- They stand up for their beliefs. They won't think twice about giving their honest opinion, even if they are aware that their point of view lies with the minority.
- They are think skinned. This means they are not affected by others judging them harshly for their honest opinions.
- They forge trusting, meaningful and healthy friendships. Honest people usually surround themselves with honest friends. They have faith that their friends will be truthful and upfront with them at all times.

They are trusted by their peers. They are seen as people who can be counted on for truthful and objective feedback and advice.

- **Honesty and employees:** When entrepreneurs build honest relationships with their employees, it leads to more transparency in the workplace, which results in higher work performance and better results.
- **Honesty and investors:** For entrepreneurs, being honest with investors means not only sharing strengths but also candidly disclosing current and potential weaknesses, problem areas and solution strategies. Keep in mind that investors have a lot of experience with startups and are aware that all new companies have problems. Claiming that everything is perfectly fine and running smoothly is a red flag for most investors.

- **Honesty with oneself:** The consequences of being dishonest with oneself can lead to dire results, especially in the case of entrepreneurs. For entrepreneurs to succeed, it is critical that they remain realistic about their situation at all times, and accurately judge every aspect of their enterprise for what it truly is.

9.1.4.2 Importance of Honesty in Entrepreneurs

One of the most important characteristics of entrepreneurs is honesty. When entrepreneurs are honest with their customers, employees and investors, it shows that they respect those that they work with. It is also important that entrepreneurs remain honest with themselves.

Let's look at how being honest would lead to great benefits for entrepreneurs.

- **Honesty and customers:** When entrepreneurs are honest with their customers it leads to stronger relationships, which in turn results in business growth and a stronger customer network.

9.1.4.3 What are Work Ethics?

Being ethical in the workplace means displaying values like honesty, integrity and respect in all your decisions and communications. It means not displaying negative qualities like lying, cheating and stealing.

Workplace ethics play a big role in the profitability of a company. It is as crucial to an enterprise as high morale and teamwork. This is why most companies lay down specific workplace ethic guidelines that must compulsorily be followed by their employees. These guidelines are typically outlined in a company's employee handbook.

9.1.4.4 Elements of a Strong Work Ethic

An entrepreneur must display strong work ethics, as well as hire only those individuals who believe in and display the same level of ethical behavior in the workplace. Some elements of a strong work ethic are:

- **Professionalism:** This involves everything from how you present yourself in a corporate setting to the manner in which you treat others in the workplace.
- **Respectfulness:** This means remaining poised and diplomatic regardless of how stressful or volatile a situation is.
- **Dependability:** This means always keeping your word, whether it's arriving on time for a meeting or delivering work on time.
- **Dedication:** This means refusing to quit until the designated work is done, and completing the work at the highest possible level of excellence.
- **Determination:** This means embracing obstacles as challenges rather than letting them stop you, and pushing ahead with purpose and resilience to get the desired results.

- **Accountability:** This means taking responsibility for your actions and the consequences of your actions, and not making excuses for your mistakes.
- **Humility:** This means acknowledging everyone's efforts and had work, and sharing the credit for accomplishments.

9.1.4.5 How to Foster a Good Work Ethic?

As an entrepreneur, it is important that you clearly define the kind of behaviour that you expect from each and every team member in the workplace. You should make it clear that you expect employees to display positive work ethics like:

- **Honesty:** All work assigned to a person should be done with complete honesty, without any deceit or lies.
- **Good attitude:** All team members should be optimistic, energetic, and positive.
- **Reliability:** Employees should show up where they are supposed to be, when they are supposed to be there.
- **Good work habits:** Employees should always be well groomed, never use inappropriate language, conduct themselves professionally at all times and so on.
- **Initiative:** Doing the bare minimum is not enough. Every team member needs to be proactive and show initiative.
- **Trustworthiness:** Trust is non-negotiable. If an employee cannot be trusted, it's time to let that employee go.
- **Respect:** Employees need to respect the company, the law, their work, their colleagues and themselves.
- **Integrity:** Each and every team member should be completely ethical and must display above board behaviour at all times.
- **Efficiency:** Efficient employees help a company grow while inefficient employees result in a waste of time and resources.

Tips

- Don't get angry when someone tells you the truth and you don't like what you hear.
- Always be willing to accept responsibility for your mistakes.

9.1.5 Creativity & Innovation

What is Creativity?

Creativity means thinking outside the box. It means viewing things in new ways or from different perspectives, and then converting these ideas into reality. Creativity involves two parts: thinking and producing. Simply having an idea makes you imaginative, not creative. However, having an idea and acting on it makes you creative.

Characteristics of Highly Creative People

Some characteristics of creative people are:

- They are imaginative and playful
- They see issues from different angles
- They notice small details
- They have very little tolerance for boredom
- They detest rules and routine
- They love to daydream
- They are very curious

What is Innovation?

There are many different definitions of innovation. In simple terms, innovation means turning an idea into a solution that adds value. It can also mean adding value by implementing a new product, service or process, or significantly improving on an existing product, service or process.

Characteristics of Highly Innovative People

Some characteristics of highly innovative people are:

- They embrace doing things differently
- They don't believe in taking shortcuts
- They are not afraid to be unconventional
- They are highly proactive and persistent
- They are organized, cautious and risk-averse

Tips

- Take regular breaks from your creative work to recharge yourself and gain fresh perspective.
- Build prototypes frequently, test them out, get feedback, and make the required changes.

9.1.6 Time Management

Time management is the process organizing your time, and deciding how to allocate your time between different activities. Good time management is the difference between working smart (getting more done in less time) and working hard (working for more time to get more done).

Effective time management leads to an efficient work output, even when you are faced with tight deadlines and high pressure situations. On the other hand, not managing your time effectively results in inefficient output and increases stress and anxiety.

Benefits of Time Management

Time management can lead to huge benefits like:

- Greater productivity
- Higher efficiency
- Better professional reputation
- Reduced stress
- Higher chances for career advancement
- Greater opportunities to achieve goals

Not managing time effectively can result in undesirable consequences like:

- Missing deadlines
- Inefficient work output
- Substandard work quality
- Poor professional reputation
- Stalled career
- Increase in stress and anxiety

9.1.6.1 Traits of Effective Time Managers

Some traits of effective time managers are:

- They begin projects early
- They set daily objectives
- They modify plans if required, to achieve better results
- They are flexible and open-minded
- They inform people in advance if their help will be required
- They know how to say no
- They break tasks into steps with specific deadlines
- They continually review long term goals
- They think of alternate solutions if and when required
- They ask for help when required
- They create backup plans

9.1.6.2 Effective Time Management Techniques

You can manage your time better by putting into practice certain time management techniques. Some helpful tips are:

- **Plan out your day as well as plan for interruptions.** Give yourself at least 30 minutes to figure out your time plan. In your plan, schedule some time for interruptions.
- **Put up a "Do Not Disturb" sign** when you absolutely have to complete a certain amount of work.
- **Close your mind to all distractions.** Train yourself to ignore ringing phones, don't reply to chat messages and disconnect from social media sites.
- **Delegate your work.** This will not only help your work get done faster, but will also show you the unique skills and abilities of those around you.
- **Stop procrastinating.** Remind yourself that procrastination typically arises due to the fear of failure or the belief that you cannot do things as perfectly as you wish to do them.
- **Prioritize.** List each task to be completed in order of its urgency or importance level. Then focus on completing each task, one by one.
- **Maintain a log of your work activities.** Analyse the log to help you understand how efficient you are, and how much time is wasted every day.
- **Create time management goals** to reduce time wastage.

Tips

- Always complete the most important tasks first.
- Get at least 7 – 8 hours of sleep every day.
- Start your day early.
- Don't waste too much time on small, unimportant details.
- Set a time limit for every task that you will undertake.
- Give yourself some time to unwind between tasks.

9.1.7 Anger Management

Anger management is the process of:

1. Learning to recognize the signs that you, or someone else, is becoming angry
2. Taking the best course of action to calm down the situation in a positive way

Anger management does not mean suppressing anger.

Importance of Anger Management

Anger is a perfectly normal human emotion. In fact, when managed the right way, anger can be considered a healthy emotion. However, if it is not kept in check, anger can make us act inappropriately and can lead to us saying or doing things that we will likely later regret.

Extreme anger can:

- **Hurt you physically**: It leads to heart disease, diabetes, a weakened immune system, insomnia, and high blood pressure.
- **Hurt you mentally**: It can cloud your thinking and lead to stress, depression and mental health issues.
- **Hurt your career**: It can result in alienating your colleagues, bosses, clients and lead to the loss of respect.
- **Hurt your relationships**: It makes it hard for your family and friends to trust you, be honest with you and feel comfortable around you.

This is why anger management, or managing anger appropriately, is so important.

9.1.7.1 Anger Management Strategies

Here are some strategies that can help you control your anger:

Strategy 1: Relaxation

Something as simple as breathing deeply and looking at relaxing images works wonders in calming down angry feelings. Try this simple breathing exercise:

1. Take a deep breath from your diaphragm (don't breathe from your chest)
2. Visualize your breath coming up from your stomach
3. Keep repeating a calming word like 'relax' or 'take it easy' (remember to keep breathing deeply while repeating the word)
4. Picture a relaxing moment (this can be from your memory or your imagination)

Follow this relaxation technique daily, especially when you realize that you're starting to feel angry.

Strategy 2: Cognitive Restructuring

Cognitive restructuring means changing the manner in which you think. Anger can make you curse, swear, exaggerate and act very dramatically. When this happens, force yourself to replace your angry thoughts with more logical ones. For instance, instead of thinking 'Everything is ruined' change your mindset and tell yourself 'It's not the end of the world and getting angry won't solve this'.

Strategy 3: Problem Solving

Getting angry about a problem that you cannot control is a perfectly natural response. Sometimes, try as you may, there may not be a solution to the difficulty you are faced with. In such cases, stop focusing on solving the problem, and instead focus on handling and facing the problem. Remind yourself that you will do your best to deal with the situation, but that you will not blame yourself if you don't get the solution you desire.

Strategy 4: Better Communication

When you're angry, it is very easy to jump to inaccurate conclusions. In this case, you need to force yourself to stop reacting, and think carefully about what you want to say, before saying it. Avoid saying the first thing that enters your head. Force yourself to listen carefully to what the other person is saying. Then think about the conversation before responding.

Strategy 5: Changing Your Environment

If you find that your environment is the cause of your anger, try and give yourself a break from your surroundings. Make an active decision to schedule some personal time for yourself, especially on days that are very hectic and stressful. Having even a brief amount of quiet or alone time is sure to help calm you down.

9.1.7.2 Tips for Anger Management

The following tips will help you keep your anger in check:

- Take some time to collect your thoughts before you speak out in anger.
- Express the reason for your anger in an assertive, but non-confrontational manner once you have calmed down.
- Do some form of physical exercise like running or walking briskly when you feel yourself getting angry.
- Make short breaks part of your daily routine, especially during days that are stressful.
- Focus on how to solve a problem that's making you angry, rather than focusing on the fact that the problem is making you angry.

9.1.8 Stress Management

We say we are 'stressed' when we feel overloaded and unsure of our ability to deal with the pressures placed on us. Anything that challenges or threatens our well-being can be defined as a stress. It is important to note that stress can be good and bad. While good stress keeps us going, negative stress undermines our mental and physical health. This is why it is so important to manage negative stress effectively.

Causes of Stress

Stress can be caused by internal and external factors.

Internal causes of stress

- Constant worry
- Rigid thinking
- Unrealistic expectations
- Pessimism
- Negative self-talk
- All in or all out attitude

External causes of stress

- Major life changes
- Difficulties with relationships
- Having too much to do
- Difficulties at work or in school
- Financial difficulties
- Worrying about one's children and/or family

9.1.8.1 Symptoms of Stress

Stress can manifest itself in numerous ways. Take a look at the cognitive, emotional, physical and behavioural symptoms of stress.

Cognitive Symptoms	Emotional Symptoms
• Memory problems • Concentration issues • Lack of judgement • Pessimism • Anxiety • Constant worrying	• Depression • Agitation • Irritability • Loneliness • Anxiety • Anger

Physical Symptoms	Behavioural Symptoms
• Aches and pain • Diarrhoea or constipation • Nausea • Dizziness • Chest pain and/or rapid heartbeat • Frequent cold or flu like feelings	• Increase or decrease in appetite • Over sleeping or not sleeping enough • Withdrawing socially • Ignoring responsibilities • Consumption of alcohol or cigarettes • Nervous habits like nail biting and pacing

9.1.8.2 Tips to Manage Stress

The following tips can help you manage your stress better:

- Note down the different ways in which you can handle the various sources of your stress.
- Remember that you cannot control everything, but you can control how you respond.
- Discuss your feelings, opinions and beliefs rather than reacting angrily, defensively or passively.
- Practice relaxation techniques like meditation, yoga or tai chi when you start feeling stressed.
- Devote a part of your day towards exercise.
- Eat healthy foods like fruits and vegetables. Avoid unhealthy foods especially those containing large amounts of sugar.
- Plan your day so that you can manage your time better, with less stress.
- Say no to people and things when required.
- Schedule time to pursue your hobbies and interests.
- Ensure you get at least 7-8 hours of sleep.
- Reduce your caffeine intake.
- Increase the time spent with family and friends.

UNIT 9.2: Digital Literacy: A Recap

Unit Objectives

At the end of this unit, you will be able to:

1. Identify the basic parts of a computer
2. Identify the basic parts of a keyboard
3. Recall basic computer terminology
4. Recall the functions of basic computer keys
5. Discuss the main applications of MS Office
6. Discuss the benefits of Microsoft Outlook
7. Discuss the different types of e-commerce
8. List the benefits of e-commerce for retailers and customers
9. Discuss how the Digital India campaign will help boost e-commerce in India
10. Describe how you will sell a product or service on an e-commerce platform

9.2.1 Computer and Internet basics

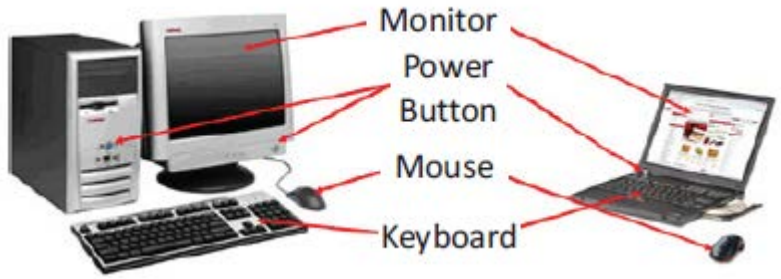


Fig.9.2.1. Parts of a Computer

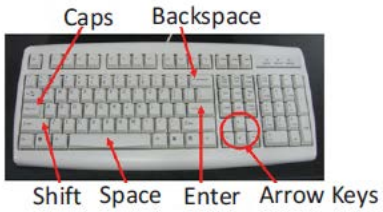


Fig.9.2.2. Parts of a Keyboard

Basic Parts of a Computer

1. **Central Processing Unit (CPU):** The brain of the computer. It interprets and carries out program instructions.
2. **Hard Drive:** A device that stores large amounts of data.
3. **Monitor:** The device that contains the computer screen where the information is visually displayed.

4. **Desktop:** The first screen displayed after the operating system loads.
5. **Background:** The image that fills the background of the desktop.
6. **Mouse:** A hand-held device used to point to items on the monitor.
7. **Speakers:** Devices that enable you to hear sound from the computer.
8. **Printer:** A device that converts output from a computer into printed paper documents.
9. **Icon:** A small picture or image that visually represents something on your computer.
10. **Cursor:** An arrow which indicates where you are positioned on the screen.
11. **Program Menu:** A list of programs on your computer that can be accessed from the Start menu.
12. **Taskbar:** The horizontal bar at the bottom of the computer screen that lists applications that are currently in use.
13. **Recycle Bin:** A temporary storage for deleted files.

Basic Internet Terms

- **The Internet:** A vast, international collection of computer networks that transfers information.
- **The World Wide Web:** A system that lets you access information on the Internet.
- **Website:** A location on the World Wide Web (and Internet) that contains information about a specific topic.
- **Homepage:** Provides information about a website and directs you to other pages on that website.
- **Link/Hyperlink:** A highlighted or underlined icon, graphic, or text that takes you to another file or object.
- **Web Address/URL:** The address for a website.
- **Address Box:** A box in the browser window where you can type in a web address.

Basic Computer Keys

- **Arrow Keys:** Press these keys to move your cursor.
- **Space bar:** Adds a space.
- **Enter/Return:** Moves your cursor to a new line.
- **Shift:** Press this key if you want to type a capital letter or the upper symbol of a key.
- **Caps Lock:** Press this key if you want all the letters you type to be capital letters. Press it again to revert back to typing lowercase letters.
- **Backspace:** Deletes everything to the left of your cursor

Tips

- When visiting a .com address, there no need to type http://or even www. Just type the name of the website and then press Ctrl + Enter. (Example: Type 'apple' and press Ctrl + Enter to go to www.apple.com)
- Press the Ctrl key and press the + or - to increase and decrease the size of text.
- Press F5 or Ctrl + R to refresh or reload a web page.

9.2.2 MS Office and Email

About MS Office

MS Office or Microsoft Office is a suite of computer programs developed by Microsoft. Although meant for all users, it offers different versions that cater specifically to students, home users and business users. All the programs are compatible with both, Windows and Macintosh.

Most Popular Office Products

Some of the most popular and universally used MS Office applications are:

- **Microsoft Word**: Allows users to type text and add images to a document.
- **Microsoft Excel**: Allows users to enter data into a spreadsheet and create calculations and graphs.
- **Microsoft PowerPoint**: Allows users to add text, pictures and media and create slideshows and presentations.
- **Microsoft Outlook**: Allows users to send and receive email.
- **Microsoft OneNote**: Allows users to make drawings and notes with the feel of a pen on paper.
- **Microsoft Access**: Allows users to store data over many tables.

Why Choose Microsoft Outlook?

A popular email management choice especially in the workplace, Microsoft Outlook also includes an address book, notebook, web browser and calendar. Some major benefits of this program are:

- **Integrated search function**: You can use keywords to search for data across all Outlook programs.
- **Enhanced security**: Your email is safe from hackers, junk mail and phishing website email.
- **Email syncing**: Sync your mail with your calendar, contact list, notes in One Note and…your phone!
- **Offline access to email:** No Internet? No problem! Write emails offline and send them when you're connected again.

Tips

- Press Ctrl+R as a shortcut method to reply to email.
- Set your desktop notifications only for very important emails.
- Flag messages quickly by selecting messages and hitting the Insert key.
- Save frequently sent emails as a template to reuse again and again.
- Conveniently save important emails as files.

9.2.3 E-Commerce

What is E-Commerce?

E-commerce is the buying or selling of goods and services, or the transmitting of money or data, electronically on the internet. E-Commerce is the short form for "electronic commerce."

Examples of E-Commerce

Some examples of e-commerce are:

- Online shopping
- Online auctions
- Online ticketing
- Electronic payments
- Internet banking

Types of E-Commerce

E-commerce can be classified based on the types of participants in the transaction. The main types of e-commerce are:

- **Business to Business (B2B)**: Both the transacting parties are businesses.
- **Business to Consumer (B2C)**: Businesses sell electronically to end-consumers.
- **Consumer to Consumer (C2C):** Consumers come together to buy, sell or trade items to other consumers.
- **Consumer-to-Business (C2B)**: Consumers make products or services available for purchase to companies looking for exactly those services or products.
- **Business-to-Administration (B2A)**: Online transactions conducted between companies and public administration.
- **Consumer-to-Administration (C2A)**: Online transactions conducted between individual and public administration.

9.2.3.1 Benefits of E-Commerce

The e-commerce business provides some benefits for retailers and customers.

Benefits for retailers

- Establishes an online presence
- Reduces operational costs by removing overhead costs
- Increases brand awareness through the use of good keywords
- Increases sales by removing geographical and time constraints

Benefits for customers

- Offers a wider range of choice than any physical store
- Enables goods and services to be purchased from remote locations
- Enables consumers to perform price comparisons

9.2.3.2 Digital India Campaign

Prime Minister Narendra Modi launched the Digital India campaign in 2015, with the objective of offering every citizen of India access to digital services, knowledge and information. The campaign aims to improve the country's online infrastructure and increase internet connectivity, thus boosting the e-commerce industry.

Currently, the majority of online transactions come from tier 2 and tier 3 cities. Once the Digital India campaign is in place, the government will deliver services through mobile connectivity, which will help deliver internet to remote corners of the country. This will help the e-commerce market to enter India's tier 4 towns and rural areas.

E-Commerce Activity

Choose a product or service that you want to sell online. Write a brief note explaining how you will use existing e-commerce platforms, or create a new e-commerce platform, to sell your product or service.

Tips

- Before launching your e-commerce platform, test everything.
- Pay close and personal attention to your social media.

UNIT 9.3: Money Matters

Unit Objectives

At the end of this unit, you will be able to:

1. Discuss the importance of saving money
2. Discuss the benefits of saving money
3. Discuss the main types of bank accounts
4. Describe the process of opening a bank account
5. Differentiate between fixed and variable costs
6. Describe the main types of investment options
7. Describe the different types of insurance products
8. Describe the different types of taxes
9. Discuss the uses of online banking
10. Discuss the main types of electronic funds transfers

9.3.1 Personal Finance – Why to Save?

Importance of Saving

We all know that the future is unpredictable. You never know what will happen tomorrow, next week or next year. That's why saving money steadily through the years is so important. Saving money will help improve your financial situation over time. But more importantly, knowing that you have money stashed away for an emergency will give you peace of mind. Saving money also opens the door to many more options and possibilities.

Benefits of Saving

Inculcating the habit of saving leads to a vast number of benefits. Saving helps you:

- **Become financially independent**: When you have enough money saved up to feel secure you can start making your choices, from taking a vacation whenever you want, to switching careers or starting your own business.
- **Invest in yourself through education**: Through saving, you can earn enough to pay up for courses that will add to your professional experience and ultimately result in higher paying jobs.
- **Get out of debt**: Once you have saved enough as a reserve fund, you can use your savings to pay off debts like loans or bills that have accumulated over time.
- **Be prepared for surprise expenses:** Having money saved enables you to pay for unforeseen expenses like sudden car or house repairs, without feeling financially stressed.
- **Pay for emergencies**: Saving helps you deal with emergencies like sudden health issues or emergency trips without feeling financially burdened.

- **Afford large purchases and achieve major goals**: Saving diligently makes it possible to place down payments towards major purchases and goals, like buying a home or a car.
- **Retire**: The money you have saved over the years will keep you comfortable when you no longer have the income you would get from your job.

Tips

- Break your spending habit. Try not spending on one expensive item per week, and put the money that you would have spent into your savings.
- Decide that you will not buy anything on certain days or weeks and stick to your word.

9.3.2 Types of Bank Accounts

In India, banks offer four main types of bank accounts. These are:

1. Current Accounts
2. Savings Accounts
3. Recurring Deposit Accounts
4. Fixed Deposit Accounts

Current Accounts

Current accounts offer the most liquid deposits and thus, are best suited for businessmen and companies. As these accounts are not meant for investments and savings, there is no imposed limit on the number or amount of transactions that can be made on any given day. Current account holders are not paid any interest on the amounts held in their accounts. They are charged for certain services offered on such accounts.

Saving Accounts

Savings accounts are meant to promote savings, and are therefore the number one choice for salaried individuals, pensioners and students. While there is no restriction on the number and amount of deposits made, there are usually restrictions on the number and amount of withdrawals. Savings account holders are paid interest on their savings.

Recurring Deposit Accounts

Recurring Deposit accounts, also called RD accounts, are the accounts of choice for those who want to save an amount every month, but are unable to invest a large sum at one time. Such account holders deposit a small, fixed amount every month for a pre-determined period (minimum 6 months). Defaulting on a monthly payment results in the account holder being charged a penalty amount. The total amount is repaid with interest at the end of the specified period.

Fixed Deposit Accounts

Fixed Deposit accounts, also called FD accounts, are ideal for those who wish to deposit their savings for a long term in return for a high rate of interest. The rate of interest offered depends on the amount deposited and the time period, and also differs from bank to bank. In the case of an FD, a certain amount of money is deposited by the account holder for a fixed period of time. The money can be withdrawn when the period expires. If necessary, the depositor can break the fixed deposit prematurely. However, this usually attracts a penalty amount which also differs from bank to bank.

9.3.2.1 Opening a Bank Account

Opening a bank account is quite a simple process. Take a look at the steps to open an account of your own:

Step 1: Fill in the Account Opening Form

This form requires you to provide the following information:

- Personal details (name, address, phone number, date of birth, gender, occupation, address)
- Method of receiving your account statement (hard copy/email)
- Details of your initial deposit (cash/cheque)
- Manner of operating your account (online/mobile banking/traditional via cheque, slip books)
- Ensure that you sign wherever required on the form.

Step 2: Affix your Photograph

Stick a recent photograph of yourself in the allotted space on the form.

Step 3: Provide your Know Your Customer (KYC) Details

KYC is a process that helps banks verify the identity and address of their customers. To open an account, every individual need to submit certain approved documents with respect to photo identity (ID) and address proof. Some Officially Valid Documents (OVDs) are:

- Passport
- Driving License
- Voters' Identity Card
- PAN Card
- UIDAI (Aadhar) Card

Step 4: Submit All your Documents

Submit the completed Account Opening Form and KYC documents. Then wait until the forms are processed and your account has been opened!

Tips

- Select the right type of account.
- Fill in complete nomination details.
- Ask about fees.
- Understand the rules.
- Check for online banking – it's convenient!
- Keep an eye on your bank balance.

9.3.3 Costs: Fixed vs Variable

What are Fixed and Variable Costs?

Fixed costs and variable costs together make up a company's total cost. These are the two types of costs that companies have to bear when producing goods and services. A fixed cost does not change with the volume of goods or services a company produces. It always remains the same.

A variable cost, on the other hand, increases and decreases depending on the volume of goods and services produced. In other words, it varies with the amount produced.

Differences between Fixed and Variable Costs

Let's take a look at some of the main differences between fixed and variable costs:

Criteria	Fixed Costs	Variable Costs
Meaning	A cost that stays the same, regardless of the output produced.	A cost that changes when the
Nature	Time related.	Volume related.
Incurred	Incurred irrespective of units being produced.	Incurred only when units are produced
Unit cost	Inversely proportional to the number of units produced	Remains the same, per unit.
Examples	Depreciation, rent, salary, insurance and tax	Material consumed, wages, commission on sales and packing expenses

Tips

- When trying to determine whether a cost is fixed or variable, simply ask the following question: Will the particular cost change if the company stopped its production activities? If the answer is no, then it is a fixed cost. If the answer is yes, then it is probably a variable cost.

9.3.4 Investment, Insurance and Taxes

Investment

Investment means that money is spent today with the aim of reaping financial gains at a future time. The main types of investment options are as follows:

- **Bonds:** Bonds are instruments used by public and private companies to raise large sums of money – too large to be borrowed from a bank. These bonds are then issued in the public market and are bought by lenders.
- **Stocks:** Stocks or equity are shares that are issued by companies and are bought by the general public.
- **Small Savings Schemes:** Small Savings Schemes are tools meant to save money in small amounts. Some popular schemes are the Employees Provident Fund, Sukanya Samriddhi Scheme and National Pension Scheme.
- **Mutual Funds:** Mutual Funds are professionally managed financial instruments that invest money in different securities on behalf of investors.
- **Fixed Deposits:** A fixed amount of money is kept aside with a financial institution for a fixed amount of time in return for interest on the money.
- **Real Estate:** Loans are taken from banks to purchase real estate, which is then leased or sold with the aim of making a profit on the appreciated property price.
- **Hedge Funds:** Hedge funds invest in both financial derivatives and/or publicly traded securities.
- **Private Equity:** Private Equity is trading in the shares of an operating company that is not publicly listed and whose shares are not available on the stock market.
- **Venture Capital:** Venture Capital involves investing substantial capital in a budding company in return for stocks in that company.

Insurance

There are two types of insurance, Life Insurance and General Insurance.

Life Insurance Products

The main life insurance products are:

- **Term Insurance:** This is the simplest and cheapest form of insurance. It offers financial protection for a specified tenure, say 15 to 20 years. In the case of your death, your family is paid the sum assured. In the case of your surviving the term, the insurer pays nothing.

- **Endowment Policy:** This offers the dual benefit of insurance and investment. Part of the premium is allocated towards the sum assured, while the remaining premium gets invested in equity and debt. It pays a lump sum amount after the specified duration or on the death of the policyholder, whichever is earlier.
- **Unit-Linked Insurance Plan (ULIP):** Here part of the premium is spent on the life cover, while the remaining amount is invested in equity and debt. It helps develop a regular saving habit.
- **Money Back Life Insurance:** While the policyholder is alive, periodic payments of the partial survival benefits are made during the policy tenure. On the death of the insured, the insurance company pays the full sum assured along with survival benefits.
- **Whole Life Insurance:** It offers the dual benefit of insurance and investment. It offers insurance cover for the whole life of the person or up to 100 years whichever is earlier.

General Insurance

General Insurance deals with all insurance covering assets like animals, agricultural crops, goods, factories, cars and so on.

General Insurance Products

The main general insurance products are:

- **Motor Insurance:** This can be divided into Four-Wheeler Insurance and Two-Wheeler insurance.
- **Health Insurance:** The main types of health insurance are individual health insurance, family floater health insurance, comprehensive health insurance and critical illness insurance.
- **Travel Insurance:** This can be categorised into Individual Travel Policy, Family Travel Policy, Student Travel Insurance and Senior Citizen Health Insurance.
- **Home Insurance:** This protects the house and its contents from risk.
- **Marine Insurance:** This insurance covers goods, freight and cargo against loss or damage during transit by rail, road, sea and/or air.

Taxes

There are two types of taxes:

1. Direct Taxes
2. Indirect Taxes.

Direct Tax

Direct taxes are levied directly on an entity or a person and are non-transferrable. Some examples of Direct Taxes are:

- **Income Tax:** This tax is levied on your earning in a financial year. It is applicable to both, individuals and companies.
- **Capital Gains Tax:** This tax is payable whenever you receive a sizable amount of money. It is usually of two types – short term capital gains from investments held for less than 36 months and long term capital gains from investments held for longer than 36 months.

- **Securities Transaction Tax:** This tax is added to the price of a share. It is levied every time you buy or sell shares.
- **Perquisite Tax:** This tax is levied is on perks that have been acquired by a company or used by an employee.
- **Corporate Tax:** Corporate tax is paid by companies from the revenue they earn.

Indirect Tax

Indirect taxes are levied on goods or services. Some examples of Indirect Taxes are:

- **Sales Tax:** Sales Tax is levied on the sale of a product.
- **Service Tax:** Service Tax is added to services provided in India.
- **Value Added Tax:** Value Added Tax is levied at the discretion of the state government. The tax is levied on goods sold in the state. The tax amount is decided by the state.
- **Customs Duty & Octroi:** Customs Duty is a charge that is applied on purchases that are imported from another country. Octroi is levied on goods that cross state borders within India.
- **Excise Duty:** Excise Duty is levied on all goods manufactured or produced in India

Tips

- Think about how quickly you need your money back and pick an investment option accordingly.
- Ensure that you are buying the right type of insurance policy for yourself.
- Remember, not paying taxes can result in penalties ranging from fines to imprisonment.

9.3.5 Online Banking, NEFT, RTGS etc.

What is Online Banking?

Internet or online banking allows account holders to access their account from a laptop at any location. In this way, instructions can be issued. To access an account, account holders simply need to use their unique customer ID number and password.

Internet banking can be used to:

- Find out an account balance
- Transfer amounts from one account to another
- Arrange for the issuance of cheques
- Instruct payments to be made
- Request for a cheque book
- Request for a statement of accounts
- Make a fixed deposit

Electronic Funds Transfers

Electronic funds transfer is a convenient way of transferring money from the comfort of one's own home, using integrated banking tools like internet and mobile banking.

Transferring funds via an electronic gateway is extremely convenient. With the help of online banking, you can choose transferring funds:

- Into your accounts of the same bank.
- Into other people's accounts of the same bank.
- Into accounts in different banks through NEFT.
- Into other bank accounts though RTGS.
- Into various accounts through IMPS.

NEFT

NEFT stands for National Electronic Funds Transfer. This money transfer system allows you to electronically transfer funds from your respective bank accounts to any other account, either in the same bank or belonging to any other bank. NEFT can be used by individuals, firms and corporate organizations to transfer funds between accounts.

In order to transfer funds via NEFT, two things are required:

- A transferring bank
- A destination bank

Before you can transfer funds through NEFT, you will need to register the beneficiary who will be receiving the funds. In order to complete this registration, you will require the following information:

- Recipient's name
- Recipient's account number
- Recipient's bank's name
- Recipient's bank's IFSC code

RTGS

RTGS stands for Real Time Gross Settlement. This is a real time funds transfer system which enables you to transfer funds from one bank to another, in real time or on a gross basis. The transferred amount is immediately deducted from the account of one bank, and instantly credited to the other bank's account. The RTGS payment gateway is maintained by the Reserve Bank of India. The transactions between banks are made electronically.

RTGS can be used by individuals, companies and firms to transfer large sums of money. Before remitting funds through RTGS, you will need to add the beneficiary and his bank account details via your online banking account.

In order to complete this registration, you will require the following information:

- Name of the beneficiary
- Beneficiary's account number
- Beneficiary's bank address
- Bank's IFSC code

IMPS

IMPS stands for Immediate Payment Service. This is a real-time, inter-bank, electronic funds transfer system used to transfer money instantly within banks across India. IMPS enables users to make instant electronic transfer payments using mobile phones through both, Mobile Banking and SMS. It can also be used through ATMs and online banking. IMPS is available 24 hours a day and 7 days a week. The system features a secure transfer gateway and immediately confirms orders that have been fulfilled.

To transfer money through IMPS, you need to:

- Register for IMPS with your bank
- Receive a Mobile Money Identifier (MMID) from the bank
- Receive a MPIN from the bank

Once you have both these, you can login or make a request through SMS to transfer a particular amount to a beneficiary.

In order for the beneficiary to receive the transferred money, he must:

- Link his mobile number with his respective account
- Receive the MMID from the bank

In order to initiate a money transfer through IMPS, you will need to enter the following information:

- The beneficiary's mobile number
- The beneficiary's MMID
- The transfer amount
- Your MPIN

As soon as money has been deducted from your account and credited into the beneficiary's account, you will be sent a confirmation SMS with a transaction reference number, for future reference.

9.3.5.1 Differences between NEFT, RTGS & IMPS

Criteria	NEFT	RTGS	IMPS
Settlement	Done in batches	Real-time	Real-time
Full form	National Electronic Fund Transfer	Real Time Gross Settlement	Immediate Payment Service
Timings on Monday – Friday	8:00 am – 6:30 pm	9:00 am – 4:30 pm	24x7
Timings on Saturday	8:00 am – 1:00 pm	9:00 am – 1:30 pm	24x7
Minimum amount of money transfer limit	₹1	₹2 lacs	₹1
Maximum amount of money transfer limit	₹10 lacs	₹10 lacs per day	₹2 lacs
Maximum charges as per RBI	Up to 10,000 – ₹2.5 above 10,000 – 1 lac - ₹5 above 1 – 2 lacs ₹15 above 2 – 5 lacs ₹25 above 5 – 10 lacs ₹25	above 2 – 5 lacs ₹25 above 5 – 10 lacs ₹50	Up to 10,000 – ₹5 above 10,000 – 1 lac – ₹5 above 1 – 2 lacs – ₹15

Fig.9.3.2: Differences Between NEFT, RTGS & IMPS

Tips

- Never click on any links in any e-mail message to access your online banking website.
- You will never be asked for your credit or debit card details while using online banking.
- Change your online banking password regularly.

UNIT 9.4: Preparing for Employment & Self-Employment

Unit Objectives

At the end of this unit, you will be able to:

1. Discuss the steps to prepare for an interview
2. Discuss the steps to create an effective Resume
3. Discuss the most frequently asked interview questions
4. Discuss how to answer the most frequently asked interview questions
5. Discuss basic workplace terminology

9.4.1 Interview Preparation: How to Prepare for an Interview?

The success of your getting the job that you want depends largely on how well your interview for that job goes. Therefore, before you go in for your interview, it is important that you prepare for it with a fair amount of research and planning. Take a look at the steps to follow in order to be well prepared for an interview:

1. **Research the organization that you are having the interview with.**
    - Studying the company beforehand will help you be more prepared at the time of the interview. Your knowledge of the organization will help you answer questions at the time of the interview, and will leave you looking and feeling more confident. This is sure to make you stand out from other, not as well informed, candidates.
    - Look for background information on the company. Ty and find an overview of the company and its industry profile.
    - Visit the company website to get a good idea of what the company does. A company website offers a wealth of important information. Read and understand the company's mission statement. Pay attention to the company's products/services and client list. Read through any press releases to get an idea of the company's projected growth and stability.
    - Note down any questions that you have after your research has been completed.
2. **Think about whether your skills and qualifications match the job requirements.**
    - Carefully read through and analyse the job description.
    - Make a note of the knowledge, skills and abilities required to fulfil the job requirements.
    - Take a look at the organization hierarchy. Figure out where the position you are applying for fits into this hierarchy.

3. **Go through the most typical interview questions asked, and prepare your responses.**
   - Remember, in most interviews a mix of resume-based, behavioural and case study questions are asked.
   - Think about the kind of answers you would like to provide to typical questions asked in these three areas.
   - Practice these answers until you can express them confidently and clearly.
4. **Plan your attire for the interview.**
   - It is always safest to opt for formal business attire, unless expressly informed to dress in business casual (in which case you should use your best judgement).
   - Ensure that your clothes are clean and well-ironed. Pick neutral colours – nothing too bright or flashy.
   - The shoes you wear should match your clothes, and should be clean and suitable for an interview.
   - Remember, your aim is to leave everyone you meet with the impression that you are a professional and highly efficient person.
5. **Ensure that you have packed everything that you may require during the interview.**
   - Carry a few copies of your resume. Use a good quality paper for your resume print outs.
   - Always take along a notepad and a pen.
   - Take along any information you may need to refer to, in order to fill out an application form.
   - Carry a few samples of your work, if relevant.
6. **Remember the importance of non-verbal communication.**
   - Practice projecting confidence. Remind yourself to smile and make eye contact. Practice giving a firm handshake.
   - Keep in mind the importance of posture. Practice sitting up straight. Train yourself to stop nervous gestures like fidgeting and foot-tapping.
   - Practice keeping your reactions in check. Remember, your facial expressions provide a good insight into your true feelings. Practice projecting a positive image.
7. **Make a list of questions to end the interview with.**
   - Most interviews will end with the interviewer(s) asking if you have any questions. This is your chance to show that you have done your research and are interested in learning more about the company.
   - If the interviewer does not ask you this question, you can inform him/her that you have some queries that you would like to discuss. This is the time for you to refer to the notes you made while studying the company.
   - Some good questions to ask at this point are:
     - What do you consider the most important criteria for success in this job?
     - How will my performance be evaluated?
     - What are the opportunities for advancement?
     - What are the next steps in the hiring process?
   - Remember, never ask for information that is easily available on the company website.

Tips

- Ask insightful and probing questions.
- When communicating, use effective forms of body language like smiling, making eye contact, and actively listening and nodding. Don't slouch, play with nearby items, fidget, chew gum, or mumble.

9.4.2 Preparing an Effective Resume

A resume is a formal document that lists a candidate's work experience, education and skills. A good resume gives a potential employer enough information to believe the applicant is worth interviewing. That's why it is so important to create a résumé that is effective. Take a look at the steps to create an effective resume:

Step 1: Write the Address Section

The Address section occupies the top of your resume. It includes information like your name, address, phone number and e-mail address. Insert a bold line under the section to separate it from rest of your resume.

Example:

Jasmine Watts
Breach Candy, Mumbai – India
Contact No: +91 2223678270
Email: jasmine.watts@gmail.com

Step 2: Add the Profile Summary Section

This part of your resume should list your overall experiences, achievements, awards, certifications and strengths. You can make your summary as short as 2-3 bullet points or as long as 8-10 bullet points.

Example:

Profile Summary

- A Content Writer graduated from University of Strathclyde having 6 years of experience in writing website copy.
- Core expertise lies in content creation for e-learning courses, specifically for the K-12 segment.

Step 3: Include Your Educational Qualifications

When listing your academic records, first list your highest degree. Then add the second highest qualification under the highest one and so on. To provide a clear and accurate picture of your educational background, it is critical that include information on your position, rank, percentage or CPI for every degree or certification that you have listed.

If you have done any certifications and trainings, you can add a Trainings & Certifications section under your Educational Qualifications section.

Example:

Educational Qualifications

- Masters in International Management (2007) from Columbia University with 8.8 CPI.
- Bachelor of Management Studies (2004) from Mumbai University with 87% marks.
- 10+2 with Math, Stats (2001) from Maharashtra Board with 91% marks.
- High School (1999) from Maharashtra Board with 93% marks.

Step 4: List Your Technical Skills

When listing your technical skills, start with the skills that you are most confident about. Then add the skills that you do not have as good a command over. It is perfectly acceptable to include just one skill, if you feel that particular skill adds tremendous value to your résumé. If you do not have any technical skills, you can omit this step.

Example:

Technical Skills

- Flash
- Photoshop

Step 5: Insert Your Academic Project Experience

List down all the important projects that you have worked on. Include the following information in this section:

- Project title
- Contribution
- Organization
- Description
- Platform used

Example:

Academic Projects

Project Title: Different Communication Skills

Organization: True Blue Solutions

Platform used: Articulate

Contribution: Content writing and graphic visualization

Description: Development of storyboards for corporate induction & training programs

Step 6: List Your Strengths

This is where you list all your major strengths. This section should be in the form of a bulleted list.

Example:

Strengths

- Excellent oral, written and presentation skills
- Action-oriented and result-focused
- Great time management skills

Step 7: List Your Extracurricular Activities

It is very important to show that you have diverse interests and that your life consists of more than academics. Including your extracurricular activities can give you an added edge over other candidates who have similar academic scores and project experiences. This section should be in the form of a bulleted list.

Example:

Extracurricular Activities

- Member of the Debate Club
- Played tennis at a national level
- Won first prize in the All India Camel Contest, 2010

Step 8: Write Your Personal Details

The last section of your résumé must include the following personal information:

- Date of birth
- Nationality
- Gender & marital status
- Languages known

Example:

Personal Details

- Date of birth: 25th May, 1981
- Gender & marital status: Female, Single
- Nationality: Indian
- Languages known: English, Hindi, Tamil, French

Tips

- Keep your resume file name short, simple and informational.
- Make sure the resume is neat and free from typing errors.
- Always create your resume on plain white paper.

9.4.3 Interview FAQs

Take a look at some of the most frequently asked interview questions, and some helpful tips on how to answer them.

Q1. Can you tell me a little about yourself?

Tips to answer:

- Don't provide your full employment or personal history.
- Offer 2-3 specific experiences that you feel are most valuable and relevant.
- Conclude with how those experiences have made you perfect for this specific role.

Q2. How did you hear about the position?

Tips to answer:

- Tell the interviewer how you heard about the job – whether it was through a friend (name the friend), event or article (name them) or a job portal (say which one).
- Explain what excites you about the position and what in particular caught your eye about this role.

Q3. What do you know about the company?

Tips to answer:

- Don't recite the company's About Us page.
- Show that you understand and care about the company's goals.
- Explain why you believe in the company's mission and values.

Q4. Why do you want this job?

Tips to answer:

- Show that you are passionate about the job.
- Identify why the role is a great fit for you.
- Explain why you love the company.

Q5. Why should we hire you?

Tips to answer:

- Prove through your words that you can not only do the work, but can definitely deliver excellent results.
- Explain why you would be a great fit with the team and work culture.
- Explain why you should be chosen over any other candidate.

Q6. What are your greatest professional strengths?

Tips to answer:

- Be honest – share some of your real strengths, rather than give answers that you think sound good.
- Offer examples of specific strengths that are relevant to the position you are applying for.
- Provide examples of how you've demonstrated these strengths.

Q7. What do you consider to be your weaknesses?

Tips to answer:

- The purpose of this question is to gauge your self-awareness and honesty.
- Give an example of a trait that you struggle with, but that you're working on to improve.

Q8. What are your salary requirements?

Tips to answer:

- Do your research beforehand and find out the typical salary range for the job you are applying for.
- Figure out where you lie on the pay scale based on your experience, education, and skills.
- Be flexible. Tell the interviewer that you know your skills are valuable, but that you want the job and are willing to negotiate.

Q9. What do you like to do outside of work?

Tips to answer:

- The purpose of this question is to see if you will fit in with the company culture.
- Be honest – open up and share activities and hobbies that interest and excite you.

Q10. If you were an animal, which one would you want to be?

Tips to answer:

- The purpose of this question is to see if you are able to think on your feet.
- There's no wrong answer – but to make a great impression try to bring out your strengths or personality traits through your answer.

Q11: What do you think we could do better or differently?

Tips to answer:

- The purpose of this question is to see if you have done your research on the company, and to test whether you can think critically and come up with new ideas.
- Suggest new ideas. Show how your interests and expertise would help you execute these ideas.

Q12: Do you have any questions for us?

Tips to answer:

- Do not ask questions to which the answers can be easily found on the company website or through a quick online search.
- Ask intelligent questions that show your ability to think critically.

Tips

- Be honest and confident while answering.
- Use examples of your past experiences wherever possible to make your answers more impactful.

9.4.4 Work Readiness – Terms & Terminologies

Every employee should be well versed in the following terms:

- **Annual leave:** Paid vacation leave given by employers to employees.
- **Background Check:** A method used by employers to verify the accuracy of the information provided by potential candidates.
- **Benefits:** A part of an employee's compensation package.
- **Breaks:** Short periods of rest taken by employees during working hours.
- **Compensation Package:** The combination of salary and benefits that an employer provides to his/her employees.
- **Compensatory Time (Comp Time):** Time off in lieu of pay.
- **Contract Employee:** An employee who works for one organization that sells said employee's service to another company, either on a project or time basis.
- **Contract of Employment:** When an employee is offered work in exchange for wages or salary, and accepts the offer made by the employer, a contract of employment exists.
- **Corporate Culture:** The beliefs and values shared by all the members of a company, and imparted from one generation of employees to another.
- **Counter Offer/Counter Proposal:** A negotiation technique used by potential candidates to increase the amount of salary offered by a company.
- **Cover Letter:** A letter that accompanies a candidate's resume. It emphasizes the important points in the candidate's resume and provides real examples that prove the candidate's ability to perform the expected job role.
- **Curriculum Vitae (CV)/Resume:** A summary of a candidate's achievements, educational work experience, skills and strengths.
- **Declining Letter:** A letter sent by an employee to an employer, turning down the job offer employer to the employee.
- **Deductions:** Amounts subtracted from an employee's pay and listed on the employee's pay slip.
- **Discrimination:** The act of treating one person not as favourably as another person.
- **Employee:** A person who works for another person in exchange for payment.
- **Employee Training:** A workshop or in-house training that an employee is asked to attend by his or her superior, for the benefit of the employer.
- **Employment Gaps:** Periods of unemployed time between jobs.
- **Fixed-Term Contract:** A contract of employment which gets terminated on an agreed-upon date.
- **Follow-Up:** The act of contacting a potential employer after a candidate has submitted his or her resume.
- **Freelancer/Consultant/Independent Contractor:** A person who works for him or herself for temporary jobs and projects with different employers.
- **Holiday**: Paid time-off from work.
- **Hourly Rate**: The amount of salary or wages paid for 60 minutes of work.

- **Internship**: A job opportunity offered by an employer to a potential employee, called an at the employer's company for a fixed, limited time period.
- **Interview**: A conversation between a potential employee and a representative of an order to determine if the potential employee should be hired.
- **Job Application**: A form which asks for a candidate's information like the candidate's name, details and work experience. The purpose of a candidate submitting a job application, is to show that candidate's interest in working for a particular company.
- **Job Offer**: An offer of employment made by an employer to a potential employee.
- **Job Search Agent**: A program that enables candidates to search for employment opportunities by selecting criteria listed in the program, for job vacancies. background, made by the and pitches intern, to work employer, in address, contact
- **Lay Off**: A lay off occurs when an employee is temporarily let go from his or her job, due to the employer not having any work for that employee.
- **Leave**: Formal permission given to an employee, by his or her employer, to take a leave of absence from work.
- **Letter of Acceptance**: A letter given by an employer to an employee, confirming the offer of employment made by the employer, as well as the conditions of the offer.
- **Letter of Agreement**: A letter that outlines the terms of employment.
- **Letter of Recommendation**: A letter written for the purpose of validating the work skills o f a person.
- **Maternity Leave**: Leave taken from work by women who are pregnant, or who have just given birth.
- **Mentor**: A person who is employed at a higher level than you, who offers you advice and guides you in your career.
- **Minimum wage**: The minimum wage amount paid on an hourly basis.
- **Notice**: An announcement made by an employee or an employer, stating that the employment contract will end on a particular date.
- **Offer of Employment**: An offer made by an employer to a prospective employee that contains important information pertaining to the job being offered, like the starting date, salary, working conditions etc.
- **Open-Ended Contract**: A contract of employment that continues till the employer or terminates it.
- **Overqualified**: A person who is not suited for a particular job because he or she has too m any years of work experience, or a level of education that is much higher than required f or the job, or is currently or was previously too highly paid.
- **Part-Time Worker**: An employee who works for fewer hours than the standard number of hours normally worked.
- **Paternity Leave**: Leave granted to a man who has recently become a father.
- **Recruiters/Head-hunters/Executive Search Firms**: Professionals who are paid by employers to search for people to fill particular positions.
- **Resigning/Resignations**: When an employee formally informs his or her employer that he or she is quitting his or her job.

- **Self-Employed**: A person who has his or her own business and does not work in the capacity of an employee.
- **Time Sheet**: A form that is submitted to an employer, by an employee, that contains the number of hours worked every day by the employee.

UNIT 8.5: Understanding Entrepreneurship

Unit Objectives

At the end of this unit, you will be able to:

1. Discuss the concept of entrepreneurship
2. Discuss the importance of entrepreneurship
3. Describe the characteristics of an entrepreneur
4. Describe the different types of enterprises
5. List the qualities of an effective leader
6. Discuss the benefits of effective leadership
7. List the traits of an effective team
8. Discuss the importance of listening effectively
9. Discuss how to listen effectively
10. Discuss the importance of speaking effectively
11. Discuss how to speak effectively
12. Discuss how to solve problems
13. List important problem solving traits
14. Discuss ways to assess problem solving skills
15. Discuss the importance of negotiation
16. Discuss how to negotiate
17. Discuss how to identify new business opportunities
18. Discuss how to identify business opportunities within your business
19. Understand the meaning of entrepreneur
20. Describe the different types of entrepreneurs
21. List the characteristics of entrepreneurs
22. Recall entrepreneur success stories
23. Discuss the entrepreneurial process
24. Describe the entrepreneurship ecosystem
25. Discuss the government's role in the entrepreneurship ecosystem
26. Discuss the current entrepreneurship ecosystem in India
27. Understand the purpose of the Make in India campaign
28. Discuss the relationship between entrepreneurship and risk appetite
29. Discuss the relationship between entrepreneurship and resilience
30. Describe the characteristics of a resilient entrepreneur
31. Discuss how to deal with failure

9.5.1 Concept Introduction

Anyone who is determined to start a business, no matter what the risk, is an entrepreneur. Entrepreneurs run their own start-up, take responsibility for the financial risks and use creativity, innovation and vast reserves of self-motivation to achieve success. They dream big and are determined to do whatever it takes to turn their idea into a viable offering. The aim of an entrepreneur is to create an enterprise. The process of creating this enterprise is known as entrepreneurship.

9.5.1.1 Importance of Entrepreneurship

Entrepreneurship is very important for the following reasons:

1. It results in the creation of new organizations
2. It brings creativity into the marketplace
3. It leads to improved standards of living
4. It helps develop the economy of a country

9.5.1.2 Characteristics of Entrepreneurs

All successful entrepreneurs have certain characteristics in common.

They are all:

- Extremely passionate about their work
- Confident in themselves
- Disciplined and dedicated
- Motivated and driven
- Highly creative
- Visionaries
- Open-minded
- Decisive

Entrepreneurs also have a tendency to:

- Have a high-risk tolerance
- Thoroughly plan everything
- Manage their money wisely
- Make their customers their priority
- Understand their offering and their market in detail
- Ask for advice from experts when required
- Know when to cut their losses

9.5.1.3 Examples of Famous Entrepreneurs

Some famous entrepreneurs are:

- Bill Gates (Founder of Microsoft)
- Steve Jobs (Co-founder of Apple)
- Mark Zuckerberg (Founder of Facebook)
- Pierre Omidyar (Founder of eBay)

9.5.1.4 Types of Enterprises

As an entrepreneur in India, you can own and run any of the following types of enterprises:

Sole Proprietorship

In a sole proprietorship, a single individual owns, manages and controls the enterprise. This type of business is the easiest to form with respect to legal formalities. The business and the owner have no separate legal existence. All profit belongs to the proprietor, as do all the losses the liability of the entrepreneur is unlimited.

Partnership

A partnership firm is formed by two or more people. The owners of the enterprise are called partners. A partnership deed must be signed by all the partners. The firm and its partners have no separate legal existence. The profits are shared by the partners. With respect to losses, the liability of the partners is unlimited. A firm has a limited life span and must be dissolved when any one of the partners dies, retires, claims bankruptcy or goes insane.

Limited Liability Partnership (LLP)

In a Limited Liability Partnership or LLP, the partners of the firm enjoy perpetual existence as well as the advantage of limited liability. Each partner's liability is limited to their agreed contribution to the LLP. The partnership and its partners have a separate legal existence.

Tips

- Learn from others' failures.
- Be certain that this is what you want.
- Search for a problem to solve, rather than look for a problem to attach to your idea.

9.5.2 Leadership & Teamwork: Leadership and Leaders

Leadership means setting an example for others to follow. Setting a good example means not asking someone to do something that you wouldn't willingly want to do yourself. Leadership is about figuring out what to do in order to win as a team, and as a company.

Leaders believe in doing the right things. They also believe in helping others to do the right things. An effective leader is someone who:

- Creates an inspiring vision of the future.
- Motivates and inspires his team to pursue that vision.

9.5.2.1 Leadership Qualities That All Entrepreneurs Need

Building a successful enterprise is only possible if the entrepreneur in charge possesses excellent leadership qualities. Some critical leadership skills that every entrepreneur must have are:

1. **Pragmatism:** This means having the ability to highlight all obstacles and challenges, in order to resolve issues and reduce risks.
2. **Humility:** This means admitting to mistakes often and early, and being quick to take responsibility for your actions. Mistakes should be viewed as challenges to overcome, not opportunities to point blame.
3. **Flexibility:** It is critical for a good leader to be very flexible and quickly adapt to change. It is equally critical to know when to adapt and when not to.
4. **Authenticity:** This means showing both, your strengths and your weaknesses. It means being human and showing others that you are human.
5. **Reinvention:** This means refreshing or changing your leadership style when necessary. To do this, it's important to learn where your leadership gaps lie and find out what resources are required to close them.
6. **Awareness:** This means taking the time to recognize how others view you. It means understanding how your presence affects those around you.

9.5.2.2 Benefits of Effective Leadership

Effective leadership results in numerous benefits. Great leadership leads to the leader successfully:

- Gaining the loyalty and commitment of the team members
- Motivating the team to work towards achieving the company's goals and objectives
- Building morale and instilling confidence in the team members
- Fostering mutual understanding and team-spirit among team members
- Convincing team members about the need to change when a situation requires adaptability

9.5.2.3 Teamwork and Teams

Teamwork occurs when the people in a workplace combine their individual skills to pursue a common goal. Effective teams are made up of individuals who work together to achieve this common goal. A great team is one who holds themselves accountable for the end result.

9.5.2.4 Importance of Teamwork in Entrepreneurial Success

For an entrepreneurial leader, building an effective team is critical to the success of a venture. An entrepreneur must ensure that the team he builds possesses certain crucial qualities, traits and characteristics. An effective team is one which has:

1. **Unity of purpose:** All the team members should clearly understand and be equally committed to the purpose, vision and goals of the team.
2. **Great communication skills:** Team members should have the ability to express their concerns, ask questions and use diagrams, and charts to convey complex information.
3. **The ability to collaborate:** Every member should feel entitled to provide regular feedback on new ideas.
4. **Initiative:** The team should consist of proactive individuals. The members should have the enthusiasm to come up with new ideas, improve existing ideas, and conduct their own research.
5. **Visionary members:** The team should have the ability to anticipate problems and act on these potential problems before they turn into real problems.
6. **Great adaptability skills:** The team must believe that change is a positive force. Change should be seen as the chance to improve and try new things.
7. **Excellent organizational skills:** The team should have the ability to develop standard work processes, balance responsibilities, properly plan projects, and set in place methods to measure progress and ROI.

Tips

- Don’t get too attached to your original idea. Allow it to evolve and change.
- Be aware of your weaknesses and build a team that will complement your shortfalls.
- Hiring the right people is not enough. You need to promote or incentivize your most talented people to keep them motivated.
- Earn your team’s respect.

9.5.3 Communication Skills

Listening is the ability to correctly receive and understand messages during the process of communication. Listening is critical for effective communication. Without effective listening skills, messages can easily be misunderstood. This results in a communication breakdown and can lead to the sender and the receiver of the message becoming frustrated or irritated.

It’s very important to note that listening is not the same as hearing. Hearing just refers to sounds that you hear. Listening is a whole lot more than that. To listen, one requires focus. It means not only paying attention to the story, but also focusing on how the story is relayed, the way language and voice is used, and even how the speaker uses their body language. The ability to listen depends on how effectively one can perceive and understand both, verbal and non-verbal cues.

9.5.3.1 How to Listen Effectively?

To listen effectively you should:

- Stop talking
- Stop interrupting
- Focus completely on what is being said
- Nod and use encouraging words and gestures
- Be open-minded
- Think about the speaker's perspective
- Be very, very patient
- Pay attention to the tone that is being used
- Pay attention to the speaker's gestures, facial expressions and eye movements
- Not try and rush the person
- Not let the speaker's mannerisms or habits irritate or distract you

9.5.3.2 The Importance of Speaking Effectively

How successfully a message gets conveyed depends entirely on how effectively you are able to get it through. An effective speaker is one who enunciates properly, pronounces words correctly, chooses the right words and speaks at a pace that is easily understandable. Besides this, the words spoken out loud need to match the gestures, tone and body language used.

What you say, and the tone in which you say it, results in numerous perceptions being formed. A person who speaks hesitantly may be perceived as having low self-esteem or lacking in knowledge of the discussed topic. Those with a quiet voice may very well be labelled as shy. And those who speak in commanding tones with high levels of clarity, are usually considered to be extremely confident. This makes speaking a very critical communication skill.

9.5.3.3 How to Speak Effectively?

To speak effectively you should:

- Incorporate body language in your speech like eye contact, smiling, nodding, gesturing etc.
- Build a draft of your speech before actually making your speech.
- Ensure that all your emotions and feelings are under control.
- Pronounce your words distinctly with the correct pitch and intensity. Your speech should be crystal clear at all times. Use a pleasant and natural tone when speaking. Your audience should not feel like you are putting on an accent or being unnatural in any way.
- Use precise and specific words to drive your message home. Ambiguity should be avoided at all costs.
- Ensure that your speech has a logical flow.

- Be brief. Don't add any unnecessary information.
- Make a conscious effort to avoid irritating mannerisms like fidgeting, twitching etc.
- Choose your words carefully and use simple words that the majority of the audience will have no difficulty understanding.
- Use visual aids like slides or a whiteboard.
- Speak slowly so that your audience can easily understand what you're saying. However, be careful not to speak too slowly because this can come across as stiff, unprepared or even condescending.
- Remember to pause at the right moments.

Tips 

- If you're finding it difficult to focus on what someone is saying, try repeating their words in your head.
- Always maintain eye contact with the person that you are communicating with, when speaking as well as listening. This conveys and also encourages interest in the conversation.

9.5.4 Problem Solving & Negotiation Skills

As per The Concise Oxford Dictionary (1995), a problem is, "A doubtful or difficult matter requiring a solution"

All problems contain two elements:

1. Goals
2. Obstacles

The aim of problem solving is to recognize the obstacles and remove them in order to achieve the goals.

9.5.4.1 How to Solve Problems?

Solving a problem requires a level of rational thinking. Here are some logical steps to follow when faced with an issue:

- **Step 1:** Identify the problem
- **Step 2:** Study the problem in detail
- **Step 3:** List all possible solutions
- **Step 4:** Select the best solution
- **Step 5:** Implement the chosen solution
- **Step 6:** Check that the problem has really been solved

9.5.4.2 Important Traits for Problem Solving

Highly developed problem-solving skills are critical for both, business owners and their employees. The following personality traits play a big role in how effectively problems are solved:

- Being open minded
- Asking the right questions
- Being proactive
- Not panicking
- Having a positive attitude
- Focusing on the right problem

9.5.4.3 How to Assess for Problem Solving Skills?

As an entrepreneur, it would be a good idea to assess the level of problem solving skills of potential candidates before hiring them. Some ways to assess this skill are through:

1. **Application forms:** Ask for proof of the candidate's problem solving skills in the application form.
2. **Psychometric tests:** Give potential candidates logical reasoning and critical thinking tests and see how they fare.
3. **Interviews:** Create hypothetical problematic situations or raise ethical questions and see how the candidates respond.
4. **Technical questions:** Give candidates examples of real life problems and evaluate their thought process.

9.5.4.4 What is Negotiation?

Negotiation is a method used to settle differences. The aim of negotiation is to resolve differences through a compromise or agreement while avoiding disputes. Without negotiation, conflicts are likely to lead to resentment between people. Good negotiation skills help satisfy both parties and go a long way towards developing strong relationships.

Why Negotiate?

Starting a business requires many, many negotiations. Some negotiations are small while others are critical enough to make or break a start-up. Negotiation also plays a big role inside the workplace. As an entrepreneur, you need to know not only know how to negotiate yourself, but also how to train employees in the art of negotiation.

How to Negotiate?

Take a look at some steps to help you negotiate:

- **Step 1:** Pre-Negotiation Preparation: Agree on where to meet to discuss the problem, decide who all will be present and set a time limit for the discussion.
- **Step 2:** Discuss the problem: This involves asking questions, listening to the other side, putting your views forward and clarifying doubts.
- **Step 3:** Clarify the Objective: Ensure that both parties want to solve the same problem and reach the same goal.
- **Step 4:** Aim for a Win-Win Outcome: Try your best to be open minded when negotiating. Compromise and offer substitute solutions to arrive at an outcome where both win.
- **Step 5:** Clearly Define the Agreement: When an agreement has been reached, the details of the agreement should be crystal clear to both sides, with no scope for misunderstandings.
- **Step 6:** Implement the Agreed Upon Solution: Agree on a course of action to set the solution in motion.

Tips

- Know exactly what you want before you work towards getting it
- Give more importance to listening and thinking, than speaking
- Focus on building a relationship rather than winning
- Remember that your people skills will affect the outcome
- Know when to walk away – sometimes reaching an agreement may not be possible

9.5.5 Business Opportunities Identification

"The entrepreneur always searches for change, responds to it and exploits it as an opportunity."

Peter Drucker

The ability to find good business opportunities is an important characteristic of an entrepreneur.

What is an Opportunity?

The word opportunity suggests a good chance or a favourable situation to do something offered by circumstances.

A business opportunity is typically a good/favourable change that can be used to run a business in a given environment, at a given point of time.

Common Questions Faced by Entrepreneurs

A critical question that all entrepreneurs face is how to go about finding the business opportunity that is right for them.

Some common questions that entrepreneurs constantly think about are:

- Should the new enterprise introduce a new product or service based on an unmet need?
- Should the new enterprise select an existing product or service from one market and offer it in another where it may not be available?
- Should the enterprise be based on a tried and tested formula that has worked elsewhere?

It is therefore extremely important that entrepreneurs must learn how to identify new and existing business opportunities and evaluate their chances of success.

When is an Idea an Opportunity?

An idea is an opportunity when:

- It creates or adds value to a customer
- It solves a significant problem, removes a pain point or meets a demand
- Has a robust market and profit margin
- Is a good fit with the founder and management team at the right time and place

Factors to Consider When Looking for Opportunities

Consider the following when looking for business opportunities:

- Economic trends
- Changes in funding
- Changing relationships between vendors, partners and suppliers
- Market trends
- Changes in political support
- Shift in target audience

Ways to Identify New Business Opportunities

- **Identify Market Inefficiencies:** When looking at a market, consider what inefficiencies are present in the market. Think about ways to correct these inefficiencies.
- **Remove Key Hassles:** Rather than create a new product or service, you can innovatively improve a product, service or process.
- **Create Something New:** Think about how you can create a new experience for customers, based on existing business models.
- **Pick a Growing Sector/Industry:** Research and find out which sectors or industries are growing and think about what opportunities you can tap in the same.
- **Think About Product Differentiation:** If you already have a product in mind, think about ways to set it apart from the existing ones.

Ways to Identify Business Opportunities within Your Business

1. **SWOT Analysis**

An excellent way to identify opportunities inside your business is by creating a SWOT analysis. The acronym SWOT stands for strengths, weaknesses, opportunities, and threats. SWOT analysis framework:

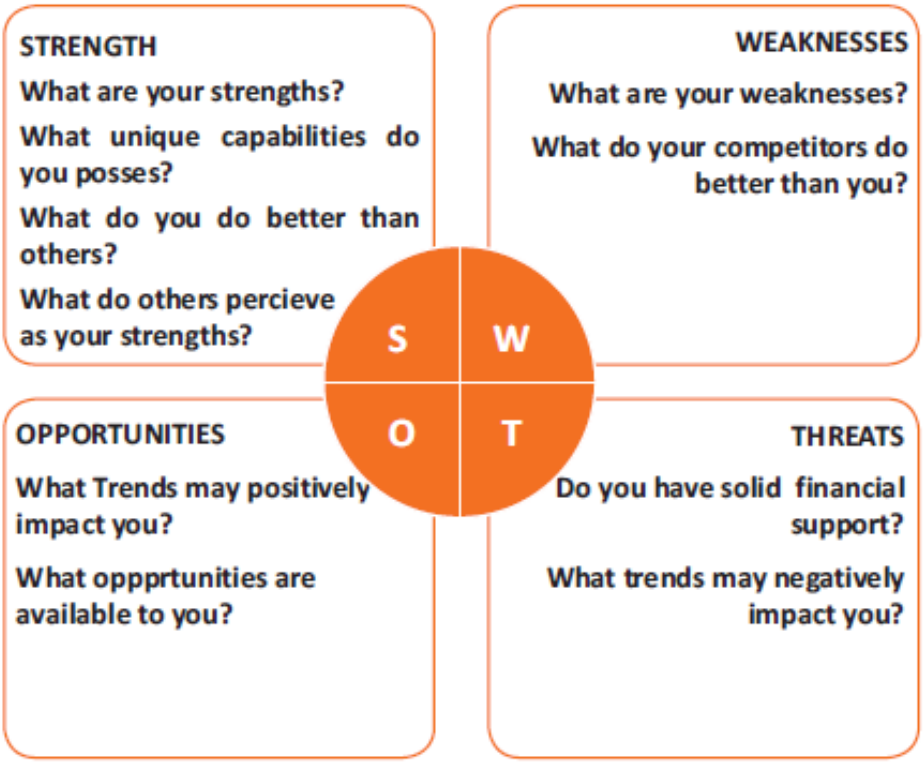


Fig.9.5.1. SWOT Analysis

Consider the following when looking for business opportunities:

By looking at yourself and your competitors using the SWOT framework, you can uncover opportunities that you can exploit, as well as manage and eliminate threats that could derail your success.

2. **Establishing Your USP**

Establish your USP in such a way that positions you differently from your competitors. Identify the uniqueness about your product that will motivate customers to buy from you and then promote that reason.

Opportunity Analysis

Once you have identified an opportunity, you need to analyse it. To analyse an opportunity, you must:

- Focus on the idea
- Focus on the market of the idea
- Talk to industry leaders in the same space as the idea
- Talk to players in the same space as the idea

Tips

- Remember, opportunities are situational.
- Look for a proven track record.
- Avoid the latest craze.
- Love your idea.

9.5.6 Entrepreneurship Support Eco-System

An entrepreneur is a person who:

- Does not work for an employee
- Runs a small enterprise
- Assumes all the risks and rewards of the enterprise, idea, good or service

Types of Entrepreneurs

There are four main types of entrepreneurs:

1. **The Traditional Entrepreneur:** This type of entrepreneur usually has some kind of skill – they can be a carpenter, mechanic, cook etc. They have businesses that have been around for numerous years like restaurants, shops and carpenters. Typically, they gain plenty of experience in a particular industry before they begin their own business in a similar field.
2. **The Growth Potential Entrepreneur:** The desire of this type of entrepreneur is to start an enterprise that will grow, win many customers and make lots of money. Their ultimate aim is to eventually sell their enterprise for a nice profit. Such entrepreneurs usually have a science or technical background.
3. **The Project-Oriented Entrepreneur:** This type of entrepreneur generally has a background in the Arts or psychology. Their enterprises tend to be focus on something that they are very passionate about.
4. **The Lifestyle Entrepreneur:** This type of entrepreneur has usually worked as a teacher or a secretary. They are more interested in selling something that people will enjoy, rather than making lots of money.

Characteristics of an Entrepreneur

Successful entrepreneurs have the following characteristics:

- They are highly motivated
- They are creative and persuasive
- They are mentally prepared to handle each and every task
- They have excellent business skills – they know how to evaluate their cash flow, sales and revenue

- They are willing to take great risks
- They are very proactive – this means they are willing to do the work themselves, rather than wait for someone else to do it
- They have a vision – they are able to see the big picture
- They are flexible and open-minded
- They are good at making decisions

9.5.6.1 Entrepreneur Success Stories

Dhiru Bhai Ambani

Dhirubhai Ambani began his entrepreneurial career by selling "bhajias" to pilgrims in Mount Girnar on weekends. At 16, he moved to Yemen where he worked as a gas-station attendant, and as a clerk in an oil company. He returned to India with Rs. 50,000 and started a textile trading company. Reliance went on to become the first Indian company to raise money in global markets and the first Indian company to feature in Forbes 500 list.

Dr. Karsanbhai Patel

Karsanbhai Patel made detergent powder in the backyard of his house. He sold his product door-to door and offered a money back guarantee with every pack that was sold. He charged Rs.3 per kg when the cheapest detergent at that time was Rs.13 per kg. Dr. Patel eventually started Nirma which became a whole new segment in the Indian domestic detergent market.

9.5.6.2 The Entrepreneurial Process

Let's take a look at the stages of the entrepreneurial process.

- **Stage 1:** Idea Generation. The entrepreneurial process begins with an idea that has been thought of by the entrepreneur. The idea is a problem that has the potential to be solved.
- **Stage 2:** Germination or Recognition. In this stage a possible solution to the identified problem is thought of.
- **Stage 3:** Preparation or Rationalization. The problem is studied further and research is done to find out how others have tried to solve the same problem.
- **Stage 4:** Incubation or Fantasizing. This stage involves creative thinking for the purpose of coming up with more ideas. Less thought is given to the problem areas.
- **Stage 5:** Feasibility Study: The next step is the creation of a feasibility study to determine if the idea will make a profit and if it should be seen through.
- **Stage 6:** Illumination or Realization. This is when all uncertain areas suddenly become clear. The entrepreneur feels confident that his idea has merit.
- **Stage 7:** Verification or Validation. In this final stage, the idea is verified to see if it works and if it is useful.

Take a look at the diagram below to get a better idea of this process.

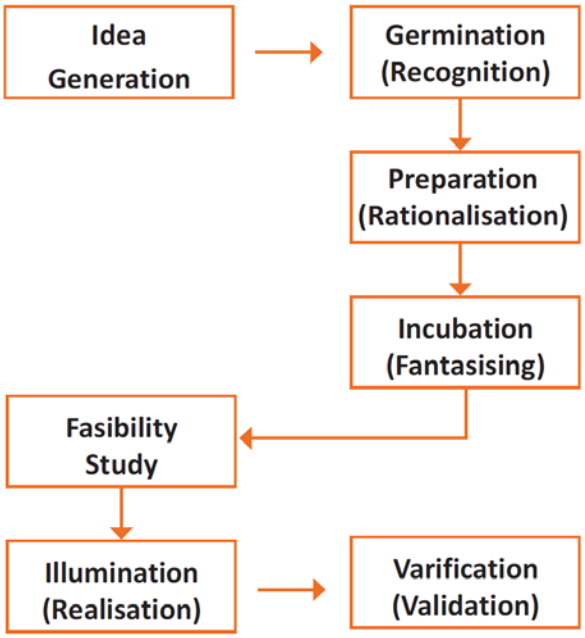


Fig.7.5.2: Stages of the entrepreneurial process

9.5.6.3 What is an Entrepreneur?

The entrepreneurship support ecosystem signifies the collective and complete nature of entrepreneurship. New companies emerge and flourish not only because of the courageous, visionary entrepreneurs who launch them, but they thrive as they are set in an environment or 'ecosystem' made of private and public participants. These players nurture and sustain the new ventures, facilitating the entrepreneurs' efforts. An entrepreneurship ecosystem comprises of the following six domains:

1. **Favourable Culture:** This includes elements such as tolerance of risk and errors, valuable networking and positive social standing of the entrepreneur.
2. **Facilitating Policies & Leadership:** This includes regulatory framework incentives and existence of public research institutes.
3. **Financing Options:** Angel financing, venture capitalists and micro loans would be good examples of this.
4. **Human Capital:** This refers to trained and untrained labour, entrepreneurs and entrepreneurship training programmes, etc.
5. **Conducive Markets for Products & Services:** This refers to an existence or scope of existence of a market for the product/service.
6. **Institutional & Infrastructural Support:** This includes legal and financing advisers, telecommunications, digital and transportation infrastructure, and entrepreneurship networking programmes.

These domains indicate whether there is a strong entrepreneurship support ecosystem and what actions should the government put in place to further encourage this ecosystem.

The six domains and their various elements have been graphically depicted.

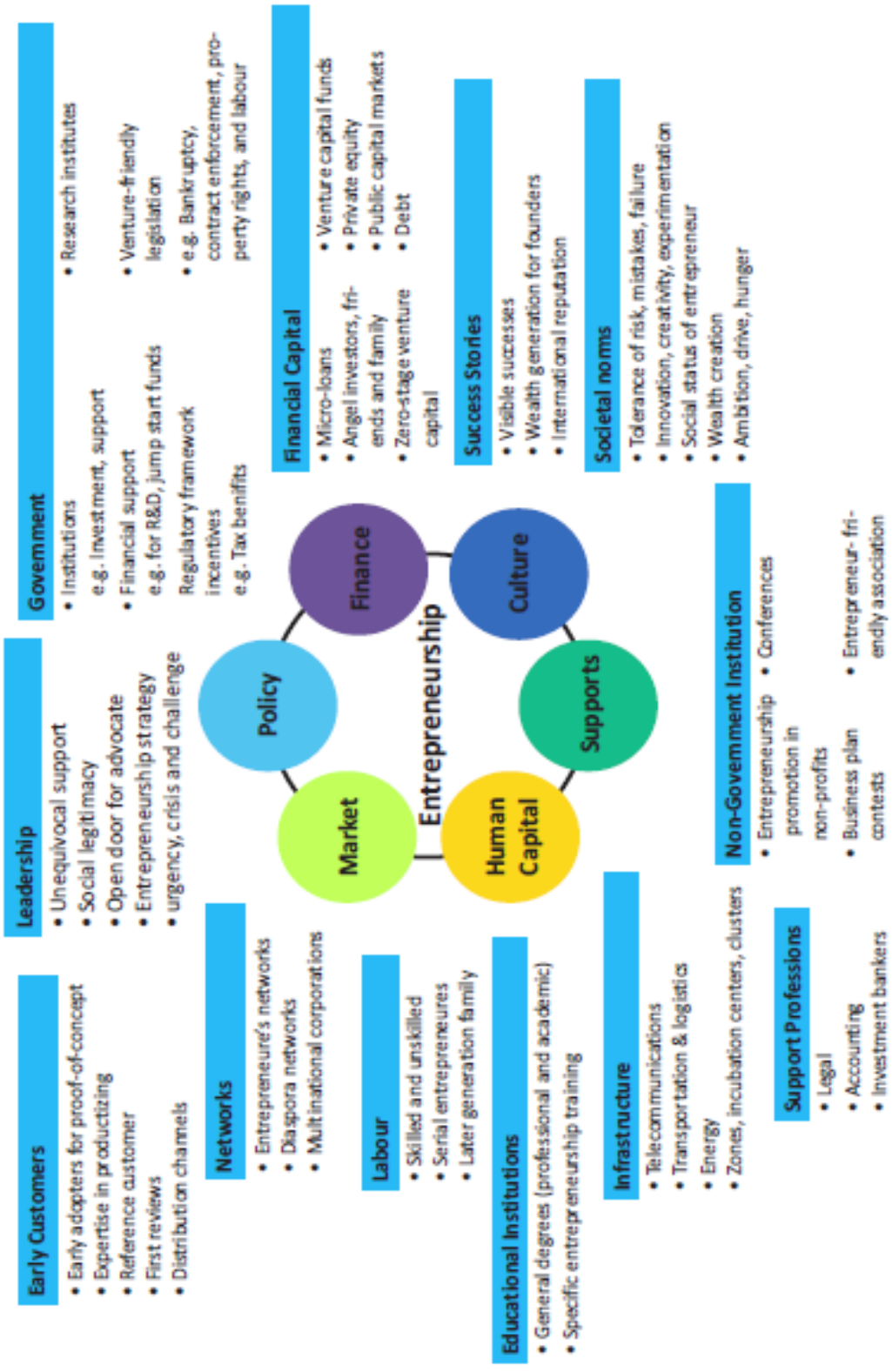


Fig.9.5.3. Entrepreneurship at a Glance

Every entrepreneurship support ecosystem is unique and all the elements of the ecosystem are interdependent. Although every region's entrepreneurship ecosystem can be broadly described by the above features, each ecosystem is the result of the hundred elements interacting in highly complex and particular ways.

Entrepreneurship ecosystems eventually become (largely) self-sustaining. When the six domains are resilient enough, they are mutually beneficial. At this point, government involvement can and should be significantly minimized. Public leaders do not need to invest a lot to sustain the ecosystem. It is imperative that the entrepreneurship ecosystem incentives are formulated to be self-liquidating, hence focusing on sustain ability of the environment.

9.5.6.4 Government's Role in the Entrepreneurship Ecosystem

Encouraging new ventures is a major focus for policymakers. Governments across the world are recognizing that new businesses flourish in distinctive types of supportive environments. Policymakers should study the scenario and take into account the following points whilst they formulate policies and regulations that enable successful entrepreneurship support ecosystems.

- Policymakers should avoid regulations that discourage new entrants and work towards building efficient methods for business startups. Policies and regulations which help existing, leading firms over entrepreneurial ventures, limit competition and obstruct growth/formation of new companies.
- Therefore, in place of developing policies that are intended to improve market failures, policymakers should interact with entrepreneurs and understand the challenges faced by them. The feedback is used to develop policies which encourage exploring ideas, developing new products and increase the rates of deal flow.
- Entrepreneurial supporters ideally need to create a database that enables identifying who the members in the ecosystem are and how they are connected. The ecosystem database are useful tools in developing engagement strategies.
- Disruptions are inevitable in economic as well as social life. However, it's important to note that economic disruption gives rise to entrepreneurial opportunities. Architects of the entrepreneurship ecosystems (entrepreneurs, mentors, policymakers and consumers,) should anticipate these dips, thus capitalizing on the opportunities they create.

9.5.6.5 Snapshot of the Entrepreneurship Ecosystem in India

Entrepreneurship has earned a newfound respect in India. Many Indians, with exposure to the world of business, who traditionally would have opted for a job, are setting up their own ventures. Many elements of the entrepreneurship ecosystem are beginning to come together. For example, increase in venture capitalists, government schemes and incubators, academia industry linkages, and emerging clusters and support to rural economy.

All these initiatives are effective but there is a need to scale up and enrich the ecosystem further in the following ways:

1. We need to review our attitude towards failures and accept them as learning experiences.
2. We must encourage the educated to become entrepreneurs and provide students in schools and colleges with entrepreneurship skills.
3. Universities, research labs and the government need to play the role of enablers in the entrepreneurship support ecosystem.
4. Policymakers need to focus on reducing the obstacles such as corruption, red tape and bureaucracy.
5. We need to improve our legal systems and court international venture capital firms and bring them to India.
6. We must devise policies and methods to reach the secondary and tertiary towns in India, where people do not have access to the same resources available in the cities.

Today, there is a huge opportunity in this country to introduce innovative solutions that are capable of scaling up, and collaborating within the ecosystem as well as enriching it.

9.5.6.6 Make in India Campaign

Every entrepreneur has certain needs. Some of their important needs are:

- To easily get loans
- To easily find investors
- To get tax exemptions
- To easily access resources and good infrastructure
- To enjoy a procedure that is free of hassles and is quick
- To be able to easily partner with other firms

The Make in India campaign, launched by Prime Minister Modi aims to satisfy all these needs of young, aspiring entrepreneurs. Its objective is to:

- Make investment easy
- Support new ideas
- Enhance skill development
- Safeguard the ideas of entrepreneurs
- Create state-of-the-art facilities for manufacturing goods

Tips

- Research the existing market, network with other entrepreneurs, venture capitalists, angel investors, and thoroughly review the policies in place to enable your entrepreneurship.
- Failure is a stepping stone and not the end of the road. Review yours and your peers' errors and correct them in your future venture.
- Be proactive in your ecosystem. Identify the key features of your ecosystem and enrich them to ensure self-sustainability of your entrepreneurship support ecosystem.

9.5.7 Risk Appetite & Resilience

Entrepreneurship and Risk

Entrepreneurs are inherently risk takers. They are path-makers not path-takers. Unlike a normal, cautious person, an entrepreneur would not think twice about quitting his job (his sole income) and taking a risk on himself and his idea.

An entrepreneur is aware that while pursuing his dreams, assumptions can be proven wrong and unforeseen events may arise. He knows that after dealing with numerous problems, success is still not guaranteed. Entrepreneurship is synonymous with the ability to take risks. This ability, called risk-appetite, is an entrepreneurial trait that is partly genetic and partly acquired.

What is Risk Appetite?

Risk appetite is defined as the extent to which a company is equipped to take risk, in order to achieve its objectives. Essentially, it refers to the balance, struck by the company, between possible profits and the hazards caused by changes in the environment (economic ecosystem, policies, etc.). Taking on more risk may lead to higher rewards but have a high probability of losses as well. However, being too conservative may go against the company as it can miss out on good opportunities to grow and reach their objectives.

The levels of risk appetite can be broadly categorized as “low”, “medium” and “high.” The company’s entrepreneur(s) need to assess all possible alternatives and choose the option most likely to succeed. Companies have varying levels of risk appetites for different objectives. The levels depend on:

- The type of industry
- Market pressures
- Company objectives

For example, a start-up with a revolutionary concept will have a very high risk appetite. The start-up can afford short term failures before it achieves longer term success. This type of appetite will not remain constant and will be adjusted to account for the present circumstances of the company.

Risk Appetite Statement

Companies have to define and articulate their risk appetite in sync with decisions made about their objectives and opportunities. The point of having a risk appetite statement is to have a framework that clearly states the acceptance and management of risk in business. It sets risk taking limits within the company. The risk appetite statement should convey the following:

- The nature of risks the business faces.
- Which risks the company is comfortable taking on and which risks are unacceptable.
- How much risk to accept in all the risk categories.
- The desired trade-off between risk and reward.
- Measures of risk and methods of examining and regulating risk exposures.

Entrepreneurship and Resilience

Entrepreneurs are characterized by a set of qualities known as resilience. These qualities play an especially large role in the early stages of developing an enterprise. Risk resilience is an extremely valuable characteristic as it is believed to protect entrepreneurs against the threat of challenges and changes in the business environment.

What is Entrepreneurial Resilience?

Resilience is used to describe individuals who have the ability to overcome setbacks related to their life and career aspirations. A resilient person is someone who is capable of easily and quickly recovering from setbacks. For the entrepreneur, resilience is a critical trait. Entrepreneurial resilience can be enhanced in the following ways:

- By developing a professional network of coaches and mentors
- By accepting that change is a part of life
- By viewing obstacles as something that can be overcome

Characteristics of a Resilient Entrepreneur

The characteristics required to make an entrepreneur resilient enough to go the whole way in their business enterprise are:

- A strong internal sense of control
- Ability to diversify and expand
- Strong social connections
- Survivor attitude
- Skill to learn from setbacks
- Cash-flow conscious habits
- Ability to look at the bigger picture
- Attention to detail

Tips

- Cultivate a great network of clients, suppliers, peers, friends and family. This will not only help you promote your business, but will also help you learn, identify new opportunities and stay tuned to changes in the market.
- Don’t dwell on setbacks. Focus on what you need to do next to get moving again.
- While you should try, and curtail expenses, ensure that it is not at the cost of your growth.

9.5.8 Success & Failures

Understanding Successes and Failures in Entrepreneurship

Shyam is a famous entrepreneur, known for his success story. But what most people don't know, is that Shyam failed numerous times before his enterprise became a success. Read his interview to get an idea of what entrepreneurship is really about, straight from an entrepreneur who has both, failed and succeeded.

Interviewer: Shyam, I have heard that entrepreneurs are great risk-takers who are never afraid of failing. Is this true?

Shyam: Ha ha, no of course it's not true! Most people believe that entrepreneurs need to be fearlessly enthusiastic. But the truth is, fear is a very normal and valid human reaction, especially when you are planning to start your own business! In fact, my biggest fear was the fear of failing. The reality is, entrepreneurs fail as much as they succeed. The trick is to not allow the fear of failing to stop you from going ahead with your plans. Remember, failures are lessons for future success!

Interviewer: What, according to you, is the reason that entrepreneurs fail?

Shyam: Well, there is no one single reason why entrepreneurs fail. An entrepreneur can fail due to numerous reasons. You could fail because you have allowed your fear of failure to defeat you. You could fail because you are unwilling to delegate (distribute) work. As the saying goes, "You can do anything, but not everything!" You could fail because you gave up too easily – maybe you were not persistent enough. You could fail because you were focusing your energy on small, insignificant tasks and ignoring the tasks that were most important. Other reasons for failing are partnering with the wrong people, not being able to sell your product to the right customers at the right time at the right price… and many more reasons!

Interviewer: As an entrepreneur, how do you feel failure should be looked at?

Shyam: I believe we should all look at failure as an asset, rather than as something negative. The way I see it, if you have an idea, you should try to make it work, even if there is a chance that you will fail. That's because not trying is failure right there, anyway! And failure is not the worst thing that can happen. I think having regrets because of not trying, and wondering 'what if' is far worse than trying and actually failing.

Interviewer: How did you feel when you failed for the first time?

Shyam: I was completely heartbroken! It was a very painful experience. But the good news is, you do recover from the failure. And with every subsequent failure, the recovery process gets a lot easier. That's because you start to see each failure more as a lesson that will eventually help you succeed, rather than as an obstacle that you cannot overcome. You will start to realize that failure has many benefits.

Interviewer: Can you tell us about some of the benefits of failing?

Shyam: One of the benefits that I have experienced personally from failing is that the failure made me see things in a new light. It gave me answers that I didn't have before. Failure can make you a lot stronger. It also helps keep your ego in control.

Interviewer: What advice would you give entrepreneurs who are about to start their own enterprises?

Shyam: I would tell them to do their research and ensure that their product is something that is actually wanted by customers. I'd tell them to pick their partners and employees very wisely and cautiously. I'd tell them that it's very important to be aggressive – push and market your product as aggressively as possible. I would warn them that starting an enterprise is very expensive and that they should be prepared for a situation where they run out of money. I would tell them to create long term goals and put a plan in action to achieve that goal. I would tell them to build a product that is truly unique. Be very careful and ensure that you are not copying another start-up. Lastly, I'd tell them that it's very important that they find the right investors.

Interviewer: That's some really helpful advice, Shyam! I'm sure this will help all entrepreneurs to be more prepared before they begin their journey! Thank you for all your insight!

Tips

- Remember that nothing is impossible.
- Identify your mission and your purpose before you start.
- Plan your next steps – don't make decisions hastily.

UNIT 9.6: Preparing to be an Entrepreneur

Unit Objectives

At the end of this unit, you will be able to:

1. Discuss how market research is carried out
2. Describe the 4 Ps of marketing
3. Discuss the importance of idea generation
4. Recall basic business terminology
5. Discuss the need for CRM
6. Discuss the benefits of CRM
7. Discuss the need for networking
8. Discuss the benefits of networking
9. Discuss the importance of setting goals
10. Differentiate between short-term, medium-term and long-term goals
11. Discuss how to write a business plan
12. Explain the financial planning process
13. Discuss ways to manage your risk
14. Describe the procedure and formalities for applying for bank finance
15. Discuss how to manage your own enterprise
16. List important questions that every entrepreneur should ask before starting an enterprise

9.6.1 Market Study/The 4 Ps of Marketing/Importance of an IDEA

Understanding Market Research

Market research is the process of gathering, analysing and interpreting market information on a product or service that is being sold in that market. It also includes information on:

- Past, present and prospective customers
- Customer characteristics and spending habits
- The location and needs of the target market
- The overall industry
- Relevant competitors

Market research involves two types of data:

- **Primary information.** This is research collected by yourself or by someone hired by you.
- **Secondary information.** This is research that already exists and is out there for you to find and use.

Primary research

Primary research can be of two types:

- **Exploratory:** This is open-ended and usually involves detailed, unstructured interviews.
- **Specific:** This is precise and involves structured, formal interviews. Conducting specific

Secondary research

Secondary research uses outside information. Some common secondary sources are:

- **Public sources:** These are usually free and have a lot of good information. Examples are government departments, business departments of public libraries etc.
- **Commercial sources:** These offer valuable information but usually require a fee to be paid. Examples are research and trade associations, banks and other financial institutions etc.
- **Educational institutions:** These offer a wealth of information. Examples are colleges, universities, technical institutes etc.

9.6.1.1 The 4 Ps of Marketing

The 4 Ps of marketing are Product, Price, Promotion and Place.

Let's look at each of these 4 Ps in detail.

Product

A product can be tangible, like a good or intangible, like a service.

Whatever your product is, it is critical that you have a clear understanding of what you are offering, and what its unique characteristics are, before you begin with the marketing process.

Some questions to ask yourself are:

- What need does the customer have for the product/service?
- What needs does it satisfy?
- Are there any more features that can be added?
- Does it have any expensive and unnecessary features?
- How will customers use it?
- What should it be called?
- How is it different from similar products?
- How much will it cost to produce?
- Can it be sold at a profit?

Price

Once all the elements of Product have been established, the Price factor needs to be considered. The Price of a Product will depend on several factors such as profit margins, supply, demand and the marketing strategy.

Some typical questions to ask yourself include:

- What is the value of the product/service to customers?
- Do local products/services have established price points?
- Is the customer price sensitive?
- Should discounts be offered?
- How is your price compared to that of your competitors?

Promotion

Once you are certain about your Product and your Price, the next step is to look at ways to promote it. Some key elements of promotion are advertising, public relations, social media marketing, email marketing, search engine marketing, video marketing and more.

Some questions to ask yourself are:

- Where should you promote your product or service?
- What is the best medium to use to reach your target audience
- When would be the best time to promote your product?
- How are your competitors promoting their products?

Place

According to most marketers, the basis of marketing is about offering the right product, at the right price, at the right place, at the right time. For this reason, selecting the best possible location is critical for converting prospective clients into actual clients.

Some questions to ask yourself are:

- Will your product or service be looked for in a physical store, online or both?
- What should you do to access the most appropriate distribution channels?
- Will you require a sales force?
- Where are your competitors offering their products or services?
- Should you follow in your competitors' footsteps?
- Should you do something different from your competitors?

Importance of an IDEA

Ideas are the foundation of progress. An idea can be small or ground-breaking, easy to accomplish or extremely complicated to implement. Whatever the case, the fact that it is an idea gives it merit. Without ideas, nothing is possible. Most people are afraid to speak out their ideas, out for fear of being ridiculed. However, if are an entrepreneur and want to remain competitive and innovative, you need to bring your ideas out into the light.

Some ways to do this are by:

- Establishing a culture of brainstorming where you invite all interested parties to contribute
- Discussing ideas out loud so that people can add their ideas, views, opinions to them

- Being open minded and not limiting your ideas, even if the idea who have seems ridiculous
- Not discarding ideas that you don't work on immediately, but instead making a note of them and shelving them so they can be revisited at a later date.

Tips

- Keep in mind that good ideas do not always have to be unique.
- Remember that timing plays a huge role in determining the success of your idea.
- Situations and circumstances will always change, so be flexible and adapt your idea accordingly.

9.6.2 Business Entity Concepts: Basic Business Terminology

If your aim is to start and run a business, it is crucial that you have a good understanding of basic business terms. Every entrepreneur should be well versed in the following terms:

- **Accounting:** A systematic method of recording and reporting financial transactions.
- **Accounts payable:** Money owed by a company to its creditors.
- **Accounts Receivable:** The amount a company is owed by its clients.
- **Assets:** The value of everything a company owns and uses to conduct its business.
- **Balance Sheet:** A snapshot of a company's assets, liabilities and owner's equity at a given moment.
- **Bottom Line:** The total amount a business has earned or lost at the end of a month.
- **Business:** An organization that operates with the aim of making a profit.
- **Business to Business (B2B):** A business that sells goods or services to another business.
- **Business to Consumer (B2C):** A business that sells goods or services directly to the end user.
- **Capital:** The money a business has in its accounts, assets and investments. The two main types of capital are debt and equity.
- **Cash Flow:** The overall movement of funds through a business each month, including income and expenses.
- **Cash Flow Statement:** A statement showing the money that entered and exited a business during a specific period of time.
- **Contract:** A formal agreement to do work for pay.
- **Depreciation:** The degrading value of an asset over time.
- **Expense:** The costs that a business incurs through its operations.
- **Finance:** The management and allocation of money and other assets.
- **Financial Report:** A comprehensive account of a business' transactions and expenses.
- **Fixed Cost:** A one-time expense.

- **Income Statement (Profit and Loss Statement):** Shows the profitability of a business during a period of time.
- **Liabilities:** The value of what a business owes to someone else.
- **Marketing:** The process of promoting, selling and distributing a product or service.
- **Net Income/Profit:** Revenues minus expenses.
- **Net Worth:** The total value of a business.
- **Payback Period:** The amount of time it takes to recover the initial investment of a business.
- **Profit Margin:** The ratio of profit, divided by revenue, displayed as a percentage.
- **Return on Investment (ROI):** The amount of money a business gets as return from an investment.
- **Revenue:** The total amount of income before expenses are subtracted.
- **Sales Prospect:** A potential customer.
- **Supplier:** A provider of supplies to a business.
- **Target Market:** A specific group of customers at which a company's products and services are aimed.
- **Valuation:** An estimate of the overall worth of the business.
- **Variable Cost:** Expenses that change in proportion to the activity of a business.
- **Working Capital:** Calculated as current assets minus current liabilities.

9.6.3 CRM & Networking

What is CRM?

CRM stands for Customer Relationship Management. Originally the expression Customer Relationship Management meant managing one's relationship with customers. However, today it refers to IT systems and software designed to help companies manage their relationships.

The Need for CRM

The better a company can manage its relationships with its customers, the higher the chances of the company's success. For any entrepreneur, the ability to successfully retain existing customers and expand the enterprise is paramount. This is why IT systems that focus on addressing the problems of dealing with customers on a daily basis are becoming more and more in demand.

Customer needs change over time, and technology can make it easier to understand what customers really want. This insight helps companies to be more responsive to the needs of their customers. It enables them to modify their business operations when required, so that their customers are always served in the best manner possible. Simply put, CRM helps companies recognize the value of their clients and enables them to capitalize on improved customer relations.

Benefits of CRM

CRM has a number of important benefits:

- It helps improve relations with existing customers which can lead to:
  - Increased sales
  - Identification of customer needs
  - Cross-selling of products
- It results in better marketing of one's products or services
- It results in better marketing of one's products or services
- It enhances customer satisfaction and retention
- It improves profitability by identifying and focusing on the most profitable customers

9.6.3.1 What is Networking?

In business, networking means leveraging your business and personal connections in order to bring in a regular supply of new business. This marketing method is effective as well as low cost. It is a great way to develop sales opportunities and contacts. Networking can be based on referrals and introductions, or can take place via phone, email, and social and business networking websites.

The Need for Networking

Networking is an essential personal skill for business people, but it is even more important for entrepreneurs. The process of networking has its roots in relationship building. Networking results in greater communication and a stronger presence in the entrepreneurial ecosystem. This helps build strong relationships with other entrepreneurs.

Business networking events held across the globe play a huge role in connecting like-minded entrepreneurs who share the same fundamental beliefs in communication, exchanging ideas and converting ideas into realities. Such networking events also play a crucial role in connecting entrepreneurs with potential investors. Entrepreneurs may have vastly different experiences and backgrounds but they all have a common goal in mind – they all seek connection, inspiration, advice, opportunities and mentors. Networking offers them a platform to do just that.

Benefits of Networking

Networking offers numerous benefits for entrepreneurs. Some of the major benefits are:

- Getting high quality leads
- Increased business opportunities
- Good source of relevant connections
- Advice from like-minded entrepreneurs
- Gaining visibility and raising your profile
- Meeting positive and enthusiastic people

- Increased self-confidence
- Satisfaction from helping others
- Building strong and lasting friendships

Tips

- Use social media interactions to identify needs and gather feedback.
- When networking, ask open-ended questions rather than yes/no type questions.

9.6.4 Business Plan: Why Set Goals?

Setting goals is important because it gives you long-term vision and short-term motivation. Goals can be short term, medium term and long term.

Short-Term Goals

- These are specific goals for the immediate future.

Example: Repairing a machine that has failed.

Medium-Term Goals

- These goals are built on your short-term goals.
- They do not need to be as specific as your short-term goals.

Example: Arranging for a service contract to ensure that your machines don't fail again.

Long-Term Goals

These goals require time and planning.

They usually take a year or more to achieve.

Example: Planning your expenses so you can buy new machinery

Why Create a Business Plan?

A business plan is a tool for understanding how your business is put together. It can be used to monitor progress, foster accountable and control the fate of the business. It usually offers a 3-5year projection and outlines the plan that the company intends to follow to grow its revenues. A business plan is also a very important tool for getting the interest of key employees or future investors.

A business plan typically comprises of eight elements.

9.6.4.1 Elements of a Business Plan

Executive Summary

The executive summary follows the title page. The summary should clearly state your desires as the business owner in a short and business like way. It is an overview of your business and your plans. Ideally this should not be more than 1-2 pages.

Your Executive Summary should include:

- **The Mission Statement:** Explain what your business is all about.

  Example: Nike's Mission Statement

  Nike's mission statement is "To bring inspiration and innovation to every athlete in the world."
- **Company Information:** Provide information like when your business was formed, the names and roles of the founders, the number of employees, your business location(s) etc.
- **Growth Highlights:** Mention examples of company growth. Use graphs and charts where possible.
- **Your Products/Services:** Describe the products or services provided.
- **Financial Information:** Provide details on current bank and investors.
- **Summarize future plans:** Describe where you see your business in the future.

Business Description

The second section of your business plan needs to provide a detailed review of the different elements of your business. This will help potential investors to correctly understand your business goal and the uniqueness of your offering.

Your Business Description should include:

- A description of the nature of your business
- The market needs that you are aiming to satisfy
- The ways in which your products and services meet these needs
- The specific consumers and organizations that you intend to serve
- Your specific competitive advantages

Market Analysis

The market analysis section usually follows the business description. The aim of this section is to showcase your industry and market knowledge. This is also the section where you should lay down your research findings and conclusions.

Your Market Analysis should include:

- Your industry description and outlook
- Information on your target market
- The needs and demographics of your target audience
- The size of your target market

- The amount of market share you want to capture
- Your pricing structure
- Your competitive analysis
- Any regulatory requirements

Organization & Management

This section should come immediately after the Market Analysis. Your Organization & Management section should include:

- Your company's organizational structure
- Details of your company's ownership
- Details of your management team
- Qualifications of your board of directors
- Detailed descriptions of each division/department and its function
- The salary and benefits package that you offer your people

Service or Product Line

The next section is the service or product line section. This is where you describe your service or product, and stress on their benefits to potential and current customers. Explain in detail why your product of choice will fulfil the needs of your target audience.

Your Service or Product Line section should include:

- A description of your product/service
- A description of your product or service's life cycle
- A list of any copyright or patent filings
- A description of any R&D activities that you are involved in or planning

Marketing & Sales

Once the Service or Product Line section of your plan has been completed, you should start on the description of the marketing and sales management strategy for your business.

Your Marketing section should include the following strategies:

- **Market penetration strategy:** This strategy focuses on selling your existing products or services in existing markets, in order to increase your market share.
- **Growth strategy:** This strategy focuses on increasing the amount of market share, even if it reduces earnings in the short-term.
- **Channels of distribution strategy:** These can be wholesalers, retailers, distributers and even the internet.
- **Communication strategy:** These can be written strategies (e-mail, text, chat), oral strategies (phone calls, video chats, face-to-face conversations), non-verbal strategies (body language, facial expressions, tone of voice) and visual strategies (signs, webpages, illustrations).

Your Sales section should include the following information:

- **A salesforce strategy:** This strategy focuses on increasing the revenue of the enterprise.
- **A breakdown of your sales activities:** This means detailing out how you intend to sell your products or services – will you sell it offline or online, how many units do you intend to sell, what price do you plan to sell each unit at, etc.

Funding Request

This section is specifically for those who require funding for their venture. The Funding Request section should include the following information:

- How much funding you currently require.
- How much funding you will require over the next five years. This will depend on your long-term goals.
- The type of funding you want and how you plan to use it. Do you want funding that can be used only for a specific purpose, or funding that can be used for any kind of requirement?
- Strategic plans for the future. This will involve detailing out your long-term plans – what these plans are and how much money you will require to put these plans in motions.
- Historical and prospective financial information. This can be done by creating and maintaining all your financial records, right from the moment your enterprise started, to the present day. Documents required for this are your balance sheet which contains details of your company's assets and liabilities, your income statement which lists your company's revenues, expenses and net income for the year, your tax returns (usually for the last three years) and your cash flow budget which lists the cash that came in, the cash that went out and states whether you had a cash deficit (negative balance) or surplus (positive balance) at the end of each month.

Financial Planning

Before you begin building your enterprise, you need to plan your finances. Take a look at the steps for financial planning:

- **Step 1:** Create a financial plan. This should include your goals, strategies and timelines for accomplishing these goals.
- **Step 2:** Organize all your important financial documents. Maintain a file to hold your investment details, bank statements, tax papers, credit card bills, insurance papers and any other financial records.
- **Step 3:** Calculate your net worth. This means figure out what you own (assets like your house, bank accounts, investments etc.), and then subtract what you owe (liabilities like loans, pending credit card amounts etc.) the amount you are left with is your net worth.
- **Step 4:** Make a spending plan. This means write down in detail where your money will come from, and where it will go.
- **Step 5:** Build an emergency fund. A good emergency fund contains enough money to cover at least 6 months' worth of expenses.
- **Step 6:** Set up your insurance. Insurance provides long term financial security and protects you against risk.

Risk Management

As an entrepreneur, it is critical that you evaluate the risks involved with the type of enterprise that you want to start, before you begin setting up your company. Once you have identified potential risks, you can take steps to reduce them. Some ways to manage risks are:

- Research similar business and find out about their risks and how they were minimized.
- Evaluate current market trends and find out if similar products or services that launched a while ago are still being well received by the public.
- Think about whether you really have the required expertise to launch your product or service.
- Examine your finances and see if you have enough income to start your enterprise.
- Be aware of the current state of the economy, consider how the economy may change over time, and think about how your enterprise will be affected by any of those changes.
- Create a detailed business plan.

Tips

- Ensure all the important elements are covered in your plan.
- Scrutinize the numbers thoroughly.
- Be concise and realistic.
- Be conservative in your approach and your projections.
- Use visuals like charts, graphs and images wherever possible.

9.6.5 Procedure and Formalities for Bank Finance

The Need for Bank Finance

For entrepreneurs, one of the most difficult challenges faced involves securing funds for start-ups. With numerous funding options available, entrepreneurs need to take a close look at which funding methodology works best for them. In India, banks are one of the largest funders of start-ups, offering funding to thousands of start-ups every year.

9.6.5.1 What Information Should Entrepreneurs Offer Banks for Funding?

When approaching a bank, entrepreneurs must have a clear idea of the different criteria that banks use to screen, rate and process loan applications. Entrepreneurs must also be aware of the importance of providing banks with accurate and correct information. It is now easier than ever for financial institutions to track any default behaviour of loan applicants. Entrepreneurs looking for funding from banks must provide banks with information relating to their general credentials, financial situation and guarantees or collaterals that can be offered.

General Credentials

This is where you, as an entrepreneur, provide the bank with background information on yourself. Such information includes:

- **Letter(s) of Introduction:** This letter should be written by a respected business person who knows you well enough to introduce you. The aim of this letter is set across your achievements and vouch for your character and integrity.
- **Your Profile:** This is basically your resume. You need to give the bank a good idea of your educational achievements, professional training, qualifications, employment record and achievements.
- **Business Brochure:** A business brochure typically provides information on company products, clients, how long the business has been running for etc.
- **Bank and Other References:** If you have an account with another bank, providing those bank references is a good idea.
- **Proof of Company Ownership or Registration:** In some cases, you may need to provide the bank with proof of company ownership and registration. A list of assets and liabilities may also be required.

Financial Situation

Banks will expect current financial information on your enterprise. The standard financial reports you should be prepared with are:

- Balance Sheet
- Cash-Flow Statement
- Business Plan
- Profit-and-Loss Account
- Projected Sales and Revenues
- Feasibility Study

Guarantees or Collaterals

Usually banks will refuse to grant you a loan without security. You can offer assets which the bank can seize and sell off if you do not repay the loan. Fixed assets like machinery, equipment, vehicles etc. are also considered to be security for loans.

9.6.5.2 The Lending Criteria of Banks

Your request for funding will have a higher chance of success if you can satisfy the following lending criteria:

- Good cash flow
- Adequate shareholders' funds
- Adequate security
- Experience in business
- Good reputation

The Procedure

To apply for funding the following procedure will need to be followed.

- Submit your application form and all other required documents to the bank.
- The bank will carefully assess your credit worthiness and assign ratings by analysing your business information with respect to parameters like management, financial, operational and industry information as well as past loan performance.
- The bank will make a decision as to whether or not you should be given funding.

Tips

- Get advice on funding options from experienced bankers.
- Be cautious and avoid borrowing more than you need, for longer than you need, at an interest rate that is higher than you are comfortable with.

9.6.6 Enterprise Management - An Overview

To manage your enterprise effectively you need to look at many different aspects, right from managing the day-to-day activities to figuring out how to handle a large-scale event. Let's take a look at some simple steps to manage your company effectively.

Step 1: Use your leadership skills and ask for advice when required.

Let's take the example of Ramu, an entrepreneur who has recently started his own enterprise. Ramu has good leadership skills – he is honest, communicates well, knows how to delegate work etc. These leadership skills definitely help Ramu in the management of his enterprise. However, sometimes Ramu comes across situations that he is unsure how to handle. What should Ramu do in this case? One solution is for him to find a more experienced manager who is willing to mentor him. Another solution is for Ramu to use his networking skills so that he can connect with managers from other organizations, who can give him advice on how to handle such situations.

Step 2: Divide your work amongst others – realize that you cannot handle everything yourself.

Even the most skilled manager in the world will not be able to manage every single task that an enterprise will demand of him. A smart manager needs to realize that the key to managing his enterprise lies in his dividing all his work between those around him. This is known as delegation. However, delegating is not enough. A manager must delegate effectively if he wants to see results. This is important because delegating, when done incorrectly, can result in you creating even more work for yourself. To delegate effectively, you can start by making two lists. One list should contain the things that you know you need to handle yourself. The second list should contain the things that you are confident can be given to others to manage and handle.

Besides incorrect delegation, another issue that may arise is over-delegation. This means giving away too many of your tasks to others. The problem with this is, the more tasks you delegate, the more time you will spend tracking and monitoring the work progress of those you have handed the tasks to. This will leave you with very little time to finish your own work.

Step 3: Hire the right people for the job.

Hiring the right people goes a long way towards effectively managing your enterprise. To hire the best people suited for the job, you need to be very careful with your interview process. You should ask potential candidates the right questions and evaluate their answers carefully. Carrying out background checks is always a good practice. Running a credit check is also a good idea, especially if the people you are planning to hire will be handling your money. Create a detailed job description for each role that you want filled and ensure that all candidates have a clear and correct understanding of the job description. You should also have an employee manual in place, where you put down every expectation that you have from your employees. All these actions will help ensure that the right people are approached for running your enterprise.

Step 4: Motivate your employees and train them well.

Your enterprise can only be managed effectively if your employees are motivated to work hard for your enterprise. Part of being motivated involves your employees believing in the vision and mission of your enterprise and genuinely wanting to make efforts towards pursuing the same. You can motivate your employees with recognition, bonuses and rewards for achievements. You can also motivate them by telling them about how their efforts have led to the company's success. This will help them feel pride and give them a sense of responsibility that will increase their motivation. Besides motivating your people, your employees should be constantly trained in new practices and technologies. Remember, training is not a one-time effort. It is a consistent effort that needs to be carried out regularly.

Step 5: Train your people to handle your customers well.

Your employees need to be well-versed in the art of customer management. This means they should be able to understand what their customers want, and also know how to satisfy their needs. For them to truly understand this, they need to see how you deal effectively with customers.

This is called leading by example. Show them how you sincerely listen to your clients and the efforts that you put into understand their requirements. Let them listen to the type of questions that you ask your clients so they understand which questions are appropriate.

Step 6: Market your enterprise effectively.

Also, hire a marketing agency if you feel you need help in this area. Now that you know what is required to run your enterprise effectively, put these steps into play, and see how much easier managing your enterprise becomes!

Tips

- Get advice on funding options from experienced bankers.
- Be cautious and avoid borrowing more than you need, for longer than you need, at an interest rate that is higher than you are comfortable with.

9.6.7 Considering Entrepreneurship

Questions to ask yourself before considering entrepreneurship.

1. Why am I starting a business?
2. What problem am I solving?
3. Have others attempted to solve this problem before? Did they succeed or fail?
4. Do I have a mentor1 or industry expert that I can call on?
5. Who is my ideal customer2?
6. Who are my competitors3?
7. What makes my business idea different from other business ideas?
8. What are the key features of my product or service?
9. Have I done a SWOT4 analysis?
10. What is the size of the market that will buy my product or service?
11. What would it take to build a minimum viable product5 to test the market?
12. How much money do I need to get started?
13. Will I need to get a loan?
14. How soon will my products or services be available?
15. When will I break even6 or make a profit?
16. How will those who invest in my idea make a profit?
17. How should I set up the legal structure7 of my business?
18. What taxes8 will I need to pay?
19. What kind of insurance9 will I need?
20. Have I reached out to potential customers for feedback

Tips

- It is very important to validate your business ideas before you invest significant time, money and resources into it.
- The more questions you ask yourself, the more prepared you will be to handle to highs and lows of starting an enterprise.

Footnotes:

1. A mentor is a trusted and experienced person who is willing to coach and guide you.
2. A customer is someone who buys goods and/or services.
3. A competitor is a person or company that sells products and/or services similar to your products and/or services.
4. SWOT stands for Strengths, Weaknesses, Opportunities and Threats. To conduct a SWOT analysis of your company, you need to list down all the strengths and weaknesses of your company, the opportunities that are present for your company and the threats faced by your company.
5. A minimum viable product is a product that has the fewest possible features, that can be sold to customers, for the purpose of getting feedback from customers on the product.
6. A company is said to break even when the profits of the company are equal to the costs.
7. The legal structure could be a sole proprietorship, partnership or limited liability partnership.
8. There are two types of taxes – direct taxes payable by a person or a company, or indirect taxes charged on goods and/or services.
9. There are two types of insurance – life insurance and general insurance. Life insurance overs human life while general insurance covers assets like animals, goods, cars etc.