

Participant Handbook

Sector
Hydrocarbon

Sub-Sector
Downstream (Oil Refining and Marketing)

Occupation
LPG Installation & Complaint Handling

Reference ID: **HYC/Q3401, Version 1.0**
NSQF Level 4



LPG Mechanic

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Hydrocarbon Sector Skill Council

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Shri Narendra Modi
Prime Minister of India

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



Certificate

COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL
STANDARDS

is hereby issued by the

HYDROCARBON SECTOR SKILL COUNCIL

for

SKILLING CONTENT : PARTICIPANT HANDBOOK

Complying to National Occupational Standards of
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About this book

This Participant Handbook is designed for providing skill training and/ or upgrading the knowledge and basic skills to take up the job of an 'LPG Mechanic' in the hydrocarbon sector.

This Participant Handbook is designed based on the Qualification Pack (QP) under the National Skill Qualification Framework (NSQF) and it comprises of the following National Occupational Standards (NOS)/ topics.

- HYC/N 3401 Carry Out Installation of LPG Cylinders at Customer Premises with Adherence to Safety
- HYC/N 3402 Attending Complaints of LPG Leakage, Allied LPG Equipment's and Non-functioning of Equipment
- HYC/N 3403 Carry Out Mandatory Inspection of Consumer Premises Once in Every Two Years
- HYC/N 3103 Maintain Health and Hygiene Habits

Symbols Used



Key Learning
Outcomes



Steps



Exercise



Tips



Notes



Objectives

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1. Introduction

Unit 1.1 - Introduction to the Training Programme

Unit 1.2 - Introduction to Hydrocarbon Sector

Unit 1.3 - Introduction to Downstream Segment

Unit 1.4 - Role of an LPG Mechanic



Key Learning Outcomes



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

1. Explain the purpose of the training programme
2. State the benefits of the training programme
3. Discuss the qualification pack and National Occupation Standards
4. Explain about the hydrocarbon sector
5. Explain the meaning of hydrocarbons
6. List the different types of hydrocarbons
7. Describe the refining process for crude oil
8. Describe the distillation process
9. State the different types of fuels
10. List the three major segments in the hydrocarbon sector
11. State the functions of the downstream segment
12. List the roles and responsibilities of LPG Mechanic
13. State the personal attributes of LPG Mechanic

UNIT 1.1: Introduction to the Training Programme

Unit Objectives



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

1. Explain the purpose of the training programme
2. State the benefits of the training programme
3. Discuss the qualification pack and National Occupation Standards

1.1.1 Introduction to the Training Programme

This training programme is developed to impart specific skills to individuals who wish to work as an LPG Mechanic.

The training programme is based upon the National Occupational Standards for LPG Mechanic and installation of LPG cylinders for the new connection at customer premises. The National Occupational Standards have been described in the following sub-section of this session.

The training programme will enable an individual to:

- Perform specialised work such as LPG pre-installation, installation and post-installation activities at customer premises (domestic)
- Follow safety guidelines while setting up a cylinder
- Create customer awareness regarding LPG use and safety
- Attend customer complaints and resolve them in a timely manner
- Achieve customer satisfaction by providing excellent service
- Fulfilled customer requirement by resolving all types of complaints
- Carry out mandatory inspection for all customers under the gas agencies
- Maintain personal health and hygiene habits and follow environment protocol

1.1.2 Benefits of the Training Programme

After successful completion of the training programme, trainees will undergo an assessment which will have a theory and a practical test

- On successfully passing the assessment, a certificate will be awarded by the Hydrocarbon Sector Skill Council
- This will help you in getting employed as an LPG Mechanic in downstream companies or in working independently

1.1.3 Introduction to QP and NOS

This training programme is intended to impart basic skill and knowledge relevant to an LPG Mechanic and LPG cylinders installation activities required to be performed at the customer premises. This programme is based on the qualification pack called LPG Mechanic. The Qualification Pack Code for LPG Mechanic is HYC/Q 3401. This is also called a QP. A QP consists of a set of National Occupational Standards (NOS). NOS specify the standardised level of competency a worker should possess in order to perform the enlisted function at the workplace. Under the LPG Mechanic QP, there are four numbers of NOS which detail the functions to be performed at the work site by the LPG Mechanic.

NOS Code	Major Function/Task
HYC/N 3401	Carry out Installation of LPG Cylinders at Customer Premises with Adherence to Safety
HYC/N 3402	Attending Complaints of LPG Leakage, Allied LPG Equipment's Non-Functioning Complaints
HYC/N 3403	Carry out Mandatory Inspection of Customer Premises Once in Every Two Years
HYC/N 3103	Maintaining Health and Hygiene Habits

UNIT 1.2: Introduction to the Hydrocarbon Sector

Unit Objectives



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

1. Describe the hydrocarbon sector
2. Explain what hydrocarbons are and describe the different types of hydrocarbons
3. Describe the refining process for crude oil
4. State the different types of fuels

1.2.1 About the Hydrocarbon Sector

The hydrocarbon sector is one of the six-core industries in India and therefore has an impact on all the other sectors, industries, and segments in the country. Since India is a developing nation, there is an ever-increasing demand for energy and this demand further influences the growth of this sector. Today, 57 per cent of India's domestic crude oil production comes from Oil and Natural Gas Corporation (ONGC). India is also the fourth-largest importer of Liquefied Natural Gas (LNG) in the world.

One of the reasons why this sector is projected to flourish is government initiatives. State-run oil firms are working towards improving the Liquefied Petroleum Gas (LPG) infrastructure in Uttar Pradesh, which will also help create clean energy and generate employment. The Government of India (GOI) has introduced various policies in order to promote the use of biofuels for transport. Additionally GOI is also planning to build refineries in Rajasthan and Maharashtra, increase the use of LNG, and auction off oil and gas fields. GOI is also planning to create an integrated oil major that will compete in the global market.

The hydrocarbon sector has played a vital role in the economic growth of the country.

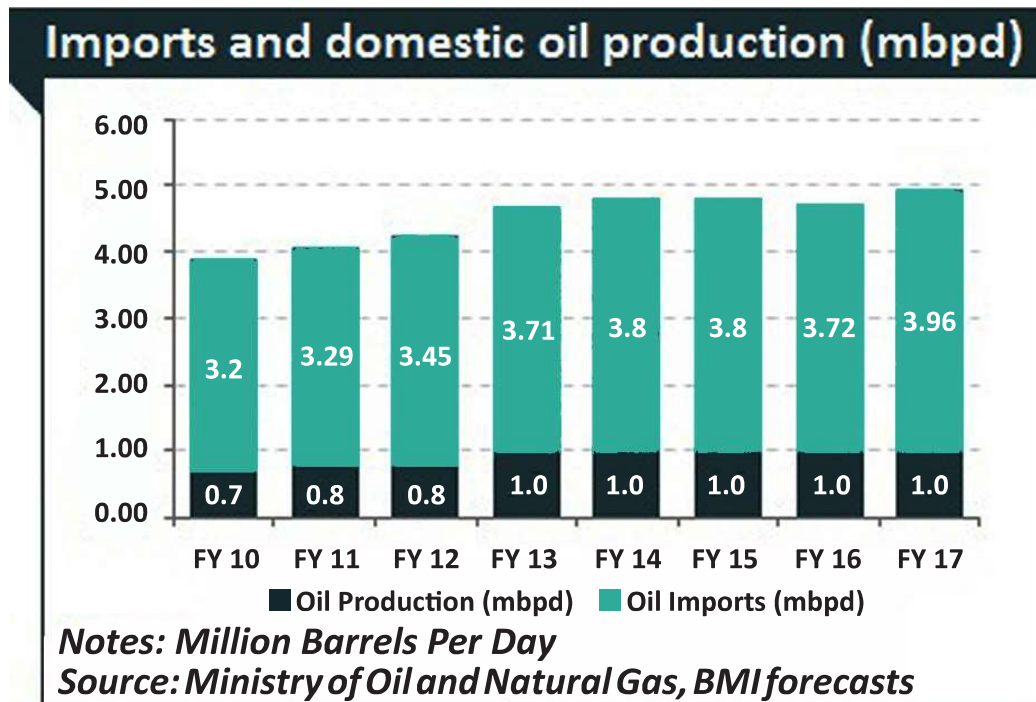


Fig. 1.2.1. Economic growth

The oil and gas (hydrocarbon) sector has seen significant growth over the past few years. India's energy consumption has almost doubled since 2000 and the potential for further rapid growth is enormous.

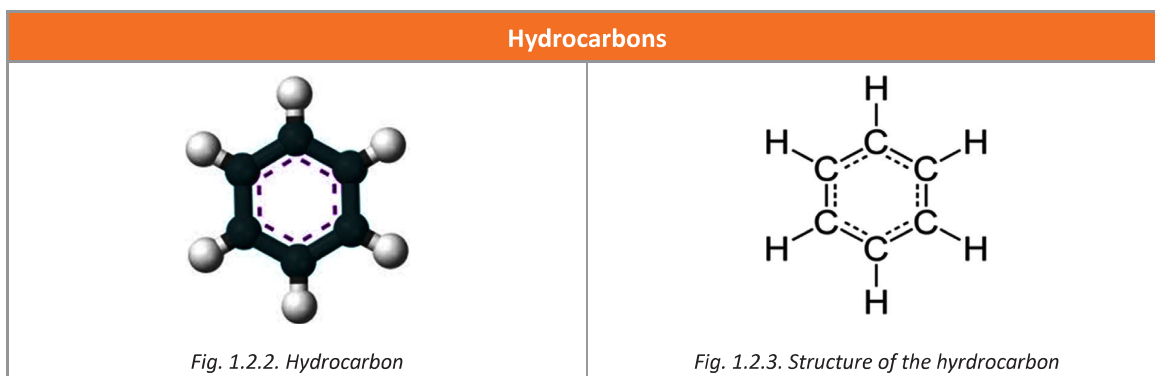
According to data¹ released by the Department of Industrial Policy and Promotion (DIPP), the petroleum and natural gas sector attracted FDI worth US\$ 6.86 billion between April 2000 and September 2017.

The Ministry of Petroleum and Natural Gas (MOP and NG) is a Ministry of the Government of India responsible for the exploration, production, refining, distribution, marketing, import, export, and conservation of petroleum, natural gas, petroleum products, and liquefied natural gas in India. They are the apex body for laying down the guidelines and rules for the petroleum and natural gas segment.

The Hydrocarbon Sector Skill Council (HSSC) plays a crucial role in the skill development ecosystem in India. Their job is to ensure that the training is relevant to industry needs and is aligned with the national skill development policy. As autonomous bodies, they front-end various activities and take measures to identify and close the skill gaps under the hydrocarbon segment.

1.2.2 About Hydrocarbons

Hydrocarbons are organic compounds which are made up of hydrogen and carbon atoms.



Types of Hydrocarbons:

There are four basic types of hydrocarbons:

- The common usages of alkanes are in natural gas and petroleum fuels.
- Alkenes are used in the syntheses of alcohols, plastics, lacquers, detergents, and fuels.
- Acetylene is used to cut and weld steel.
- Many aromatic compounds are used as solvents to remove or thin out oil or grease-based compounds. Toluene, for example, is an ingredient in paint thinners.

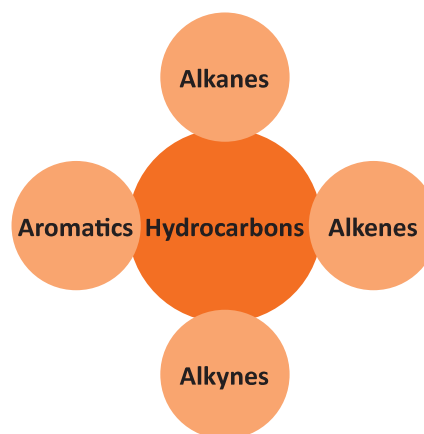


Fig. 1.2.4. Types of hydrocarbons

1- <https://www.ibef.org/industry/oil-gas-india.aspx>

Many of the fuels which we use are hydrocarbons. The majority of the hydrocarbons found naturally are present in crude oil. Crude oil is a mixture of hydrocarbons that exists as a liquid found underground or underwater. Hydrocarbons in crude oil can generally be divided into four categories:

Hydrocarbons in Crude Oil	Weight
Paraffins	15 to 60%
Napthenes	30 to 60%
Aromatics	3 to 30%
Asphaltics	6%

What is Petroleum?

Petroleum is a naturally occurring, yellow-to-black liquid found beneath the Earth's surface. It is a general term for crude oil and natural gas.

1.2.3 Refining of Crude Oil

Refining of crude oil refers to the process of converting crude oil into useful products. The process is divided into three basic steps: separation, conversion, and treatment.

1. Separation or Distillation process

Separation refers to the process of distillation. Crude oil is heated in a furnace so that hydrocarbons can be separated according to their weight and boiling point.

2. Conversion

Conversion is simply the process of changing one kind of hydrocarbon into another.

3. Treatment

Treatment is the final process of refining. One common example of treatment is the removal of sulphur from diesel fuel, which is necessary for it to meet clean air guidelines.

Distillation Process

This process is based on the principle that different substances boil at different temperatures. In the distillation process, crude oil is heated and fed into a tall steel tower called a distillation column and then separated into its components according to their boiling points. As the temperature of the crude oil in the distillation column rises, the crude oil separates itself into different components. Each component corresponds to a different type of petroleum product, depending on its boiling temperature.

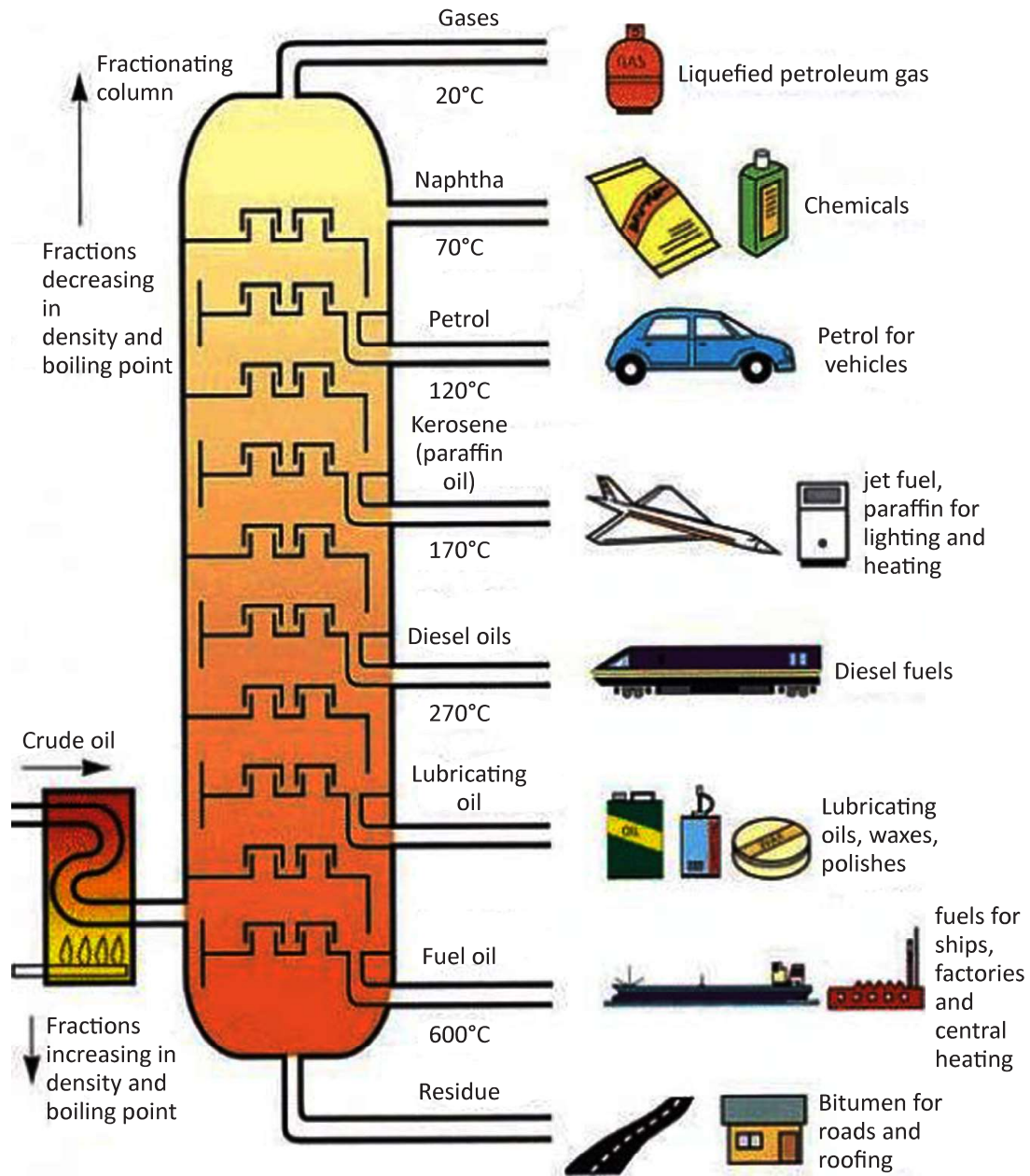


Fig. 1.2.5. Distillation process

1.2.4 Types of Fuel

There are three main types of fuels – solid fuels, liquid fuels and gaseous fuels.

Fuel Types and Examples

Solid fuels



Fig. 1.2.6. Wood



Fig. 1.2.7. Coal



Fig. 1.2.8. Cow Dung

Some more examples are coke, charcoal, etc.

Liquid fuels



Fig. 1.2.9. Diesel, Petrol



Fig. 1.2.10. Kerosene



Fig. 1.2.11. Coal Tar

Some more examples are petrol, naphtha, ethanol, etc.

Gaseous fuels



Fig. 1.2.12. CNG



Fig. 1.2.13. LPG



Fig. 1.2.14. Biogas

UNIT 1.3: Introduction to the Downstream Segment

Unit Objectives



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

1. List the three major segments in the hydrocarbon sector
2. State the functions of the downstream segment

1.3.1 Different Segments of Hydrocarbon Sector (Petroleum Industry)

The petroleum industry is divided into three major segments: Upstream, Midstream, and Downstream.

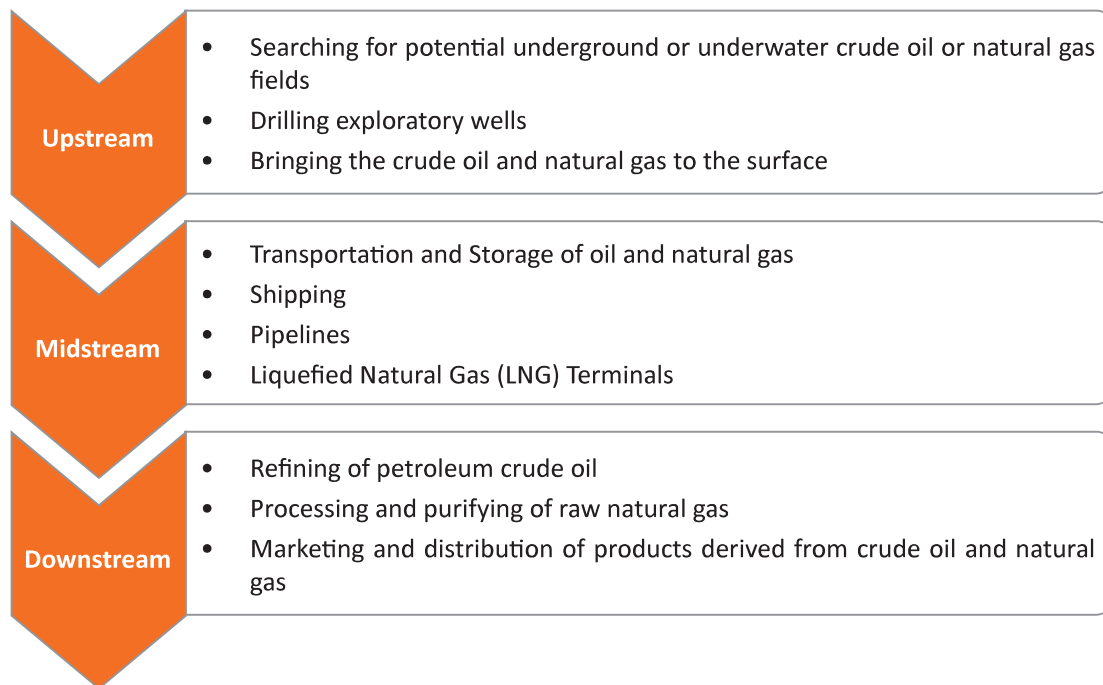


Fig. 1.3.1. Different segments of hydrocarbon sector

Processes involved in different segments of the petroleum industry:

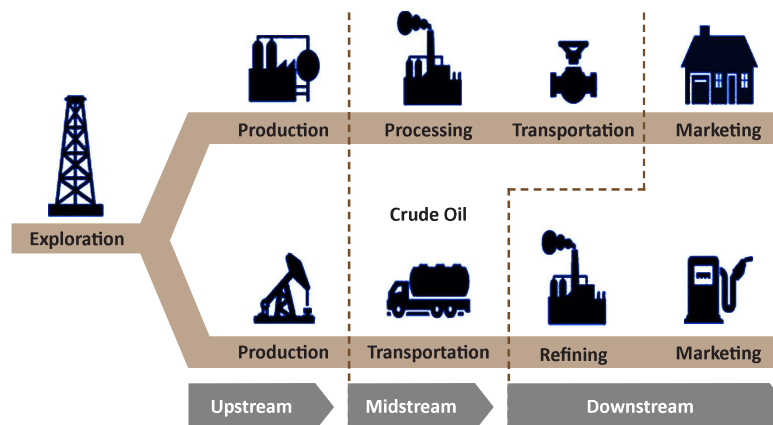


Fig. 1.3.2. Processes involved in different segments of the petroleum industry

1.3.2 About the Downstream Segment

The downstream segment involves the refining of petroleum crude oil and the processing and purifying of raw natural gas, as well as the marketing and distribution of products derived from crude oil and natural gas. The downstream segment reaches consumers through products such as petrol, kerosene, jet fuel, diesel oil, fuel oils, lubricants, waxes, asphalt, natural gas, and Liquefied Petroleum Gas (LPG), etc.

About the Downstream Segment in India



Fig. 1.3.3. Downstream segment

The downstream segment is also known as the oil and gas industry. The oil and gas industry is among the six core industries in India. It plays a major role in influencing the decision-making for all the other important sections of the economy. India's downstream segment has 19 refineries in the public sector and three in the private sector. Private companies such as Reliance Industries Ltd. and Essar Oil are the major refiners. In the year 2016, public sector refineries accounted for 54.42% of total refinery crude throughput and the private sector refineries' total crude throughput grew at a CAGR of 9.28%, reaching 88.7 million metric tonnes (MMT).

In the year 2016, total consumption of petroleum products by companies stood at around 183.5 MMT, higher by 11.2% in comparison with the previous fiscal year. The total number of retail outlets increased to 56,190 (including private) in April 2016 (provisional) from 53,419 in April 2015.

UNIT 1.4: Role of an LPG Mechanic

Unit Objectives



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

1. List the roles and responsibilities of an LPG Mechanic
2. State the personal attributes of an an LPG Mechanic

1.4.1 Who is LPG Mechanic?

The LPG Mechanic is responsible for new LPG connection and mandatory checking or emergency handling at the customer premises. He should be able to use proper tools and equipment while on visit to customer for new connection. He should have the technical knowledge to solve the customer complaints regarding LPG and its allied products. He must educate the customer on safe usage of LPG and allied equipment. He should provide good customer service and should be courteous and respectful towards the customer.



Fig. 1.4.1. LPG Mechanic

1.4.2 Role and Responsibility of LPG Mechanic

This job role involves the following:

- Visit the LPG distributor showroom and collect the new customer details as per the schedule and plan of installation
- Carry the tools, equipment and required documents for domestic LPG cylinder installation
- Execute pre- Installation, installation and post-installation activities of LPG cylinders at customer premises
- Demonstrate the safety usage of as well as safe handling of LPG appliances

- Achieve customer satisfaction by providing excellent service
- Attend all types of customer complaints related to LPG leakage and functioning of LPG cylinders, stoves, etc.
- Fulfil customer requirement by resolving all complaints within 48 hours
- Carry out mandatory inspection as per the mandatory inspection format for domestic installation
- Plan and organise tasks in order to meet expected outcomes
- Apply different kinds of problem-solving strategies to resolve customer issues

As part of his job role, he also needs to:

- Conduct pre-checking before installation activities such as; visit the showroom, collect the customer details as per the day's schedule and plan accordingly
- Check if the tool-kit is ready with all essential tools and replenish the required consumables
- Wear proper uniform and carry ID cards provided by distributors at all times while visiting customer premises
- Greet the customer in a polite manner
- Educate customers on the properties of LPG and safe usage of LPG equipment
- Ensure that there are no other inflammable items in the kitchen during the setting up of the LPG cylinder.
- Ensure cylinders are installed at places free from obstruction / prone to damage or vulnerable to unsafe conditions.
- If any unsafe practices are observed, they should be politely communicated to the customer.
- Follow dos and don'ts during LPG cylinder installation and emergency complaint handling.
- Get the customer feedback, record the same and convey the same to the showroom staff.
- Understand customer's need for service quality requirements.
- Understand the importance of mandatory inspection
- Operate within the appropriate health, hygiene and safety regulations ensuring the working environment, property are safe and secure at all times

Career Path of LPG Mechanic

An individual may progress from LPG Mechanic to the Supervisor level.

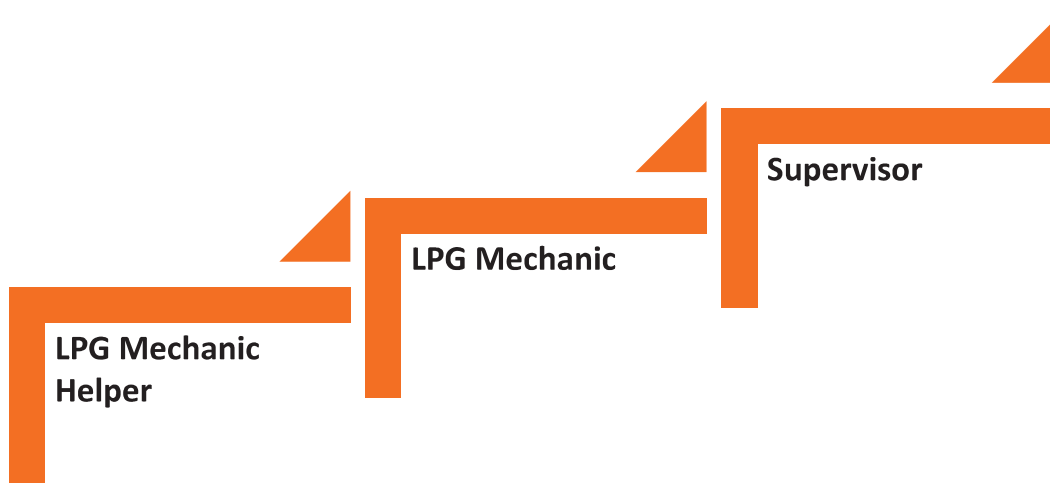


Fig. 1.4.2. Career path for LPG mechanic

1.4.3 Personal Attributes of LPG Mechanic

In addition to the above, LPG Mechanic should:

- be honest, reliable and responsible
- be well-organised and plan assigned tasks
- be courteous while communicating with customers
- maintain mental and physical fitness to perform at work
- have an eye for detail
- be able to read and write
- be a good listener
- maintain personal health and hygiene
- stay alert and observant to notice potential hazards in and around the storage area and customer premises
- solve problems with an analytical mind-set
- always wear proper uniform and carry ID card while visiting the customer

Exercise



Read the questions carefully and answer them.

1. What are your expectations from this training programme?

2. What are the three main sections of the hydrocarbon sector?

3. List the roles and responsibilities of an LPG Mechanic.

Hands-on practice sessions will be conducted at the LPG Showroom/Distributors/Godown.

2. Carry Out Installation of LPG Cylinders at Customer Premises with Adherence to Safety



Unit 2.1 - About LPG Cylinders

Unit 2.2 - Pre-Installation Activities

Unit 2.3 - Installation Activities

Unit 2.4 - Post-Installation Activities

Unit 2.5 - Creating Customer Awareness on Safe Usage of LPG

Unit 2.6 - Emergency Procedures in Case of a Fire



Key Learning Outcomes



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

1. State the properties of LPG
2. List the characteristics of LPG
3. Describe how LPG is filled in cylinders
4. Explain the use of LPG
5. Describe the pre-installation activities at the distributor's showroom/godown
6. Describe the pre-installation activities at the customer premises
7. Identify the required tools and equipment required for LPG installation
8. Describe the LPG installation activities at the customer premises
9. Explain the procedure for a new domestic LPG connection
10. Describe the post-installation activities performed at the customer premises
11. State the procedure for billing
12. List the hazards that occur when dealing with LPG
13. Explain safety measures while dealing with LPG
14. Describe the safety practices regarding LPG cylinder usage
15. State the Fire Triangle
16. List the different types of fire
17. State the different types of fire extinguishers and their uses
18. Describe the DCP type fire extinguisher and its uses
19. Explain the procedure to use fire extinguisher

UNIT 2.1: About LPG Cylinders

Unit Objectives



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

1. State the properties of LPG
2. List the characteristics of LPG
3. Describe how LPG is filled in cylinders
4. Explain the use of LPG

2.1.1 What is LPG?

Liquefied Petroleum Gas (LPG) is a combination of hydrocarbon gases such as propane and butane. Though LPG is in gaseous state at normal temperature, it becomes a liquid with the application of higher pressure. This property allows for its use as a fuel.

LPG is sold in India as per the specifications of IS 4576, which is a standard specified by the Indian Government. LPG is produced at refineries during processing of crude or is extracted from natural gas.

LPG is the most convenient form of fuel in comparison to similar category of gaseous fuel like Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG) due to its basic inherent properties. LPG is used as a domestic fuel in kitchens. It is also gaining popularity in industries for a wide variety of its uses. LPG is a pure and clean source of energy.

LPG provides even and controllable heat, and is an ideal source of heat and power for several industrial uses. As LPG is a colourless and odourless gas, it cannot be detected. Therefore, Ethyl Mercaptan is a liquid chemical added to LPG to provide odour for detection during LPG leakage.

2.1.2 Characteristics and Properties of LPG

LPG mainly consists of one or more of the following hydrocarbons:

Propane (C_3H_8)

Propylene (C_3H_6)

n-butane (C_4H_{10})

Iso-butane (C_4H_{10})

Butylene (C_4H_8)

Small quantities of one or more of the following hydrocarbons may also be present:

Ethane (C_2H_6)

Ethylene (C_2H_4)

Pentane (C_5H_{12})

Pentene (C_5H_{10})

The required specifications and composition of the hydrocarbons for LPG sold in India is specified in Indian Standards IS 4576 - Liquefied Petroleum Gases. This standard prescribes the requirements and methods of sampling and test for all types of LPG commercially marked for household, commercial, industrial applications and pipeline transmission excluding automotive use.

2.1.2.1 Properties of LPG

Flammable

LPG forms a flammable mixture with air in the range of 2% to 10%.

It can, therefore, lead to a fire or an explosion hazard if stored or used incorrectly.

High Density

LPG is approximately twice as heavy as air when in gas form.

It normally settles down at ground level or low lying places.

Colourless

LPG is colourless, both in liquid and vapour phase.



Rapid Vapourisation

LPG, in liquid form, when released from a container or a cylinder vapourises immediately and expands 270 times which can lead to an explosion.

Hence a vapour space of approximately 15% is left in the LPG cylinder.

Odourless

LPG in general is odourless and cannot be detected by human senses.

Hence an odourising substance - Ethyl Mercaptan is added to LPG to provide odour for detection during leaks.

Fig. 2.1.1. Properties of LPG

Boiling Point:

The temperature at which the vapour pressure of a liquid becomes equal to the external pressure is called boiling point. The normal boiling point is the temperature at which the vapour pressure reaches 760 mm of mercury or 1 atmosphere.

Hydrocarbon Gas	Boiling Point
Propane	- 42°C
Butane	- 20°C
LPG	sub-zero

2.1.3 How is LPG Filled in Cylinders?

LPG cylinders are produced as per Bureau of Indian Standards (BIS) 3196 by manufacturers approved by the Chief Controller of Explosives, Nagpur (CCOE). These manufacturers have a BIS license. Every new LPG cylinder is checked at various manufacturing stages and marked by BIS after various tests carried out as per the BIS codes and Gas Cylinder Rules, 2004. Thereafter, each LPG cylinder is checked at the LPG bottling Plants. Only the LPG cylinders which meet the standards, as specified in the Gas Cylinder Rules, are filled, checked and sent to the distributors for delivery to the customers.

Procedure of filling LPG in cylinders:

1. Empty cylinders received in the bottling plant for filling are initially checked for any damage or repair.
2. Once the cylinder passes this stage, cylinders are washed and dried to remove dirt and loose particles. Washing is done in capped condition to avoid damage to valves.
3. The dried cylinders are then sent for purging. Purging removes unwanted gas or liquid from the cylinder.

4. Purging is done for new cylinders, hot repaired cylinders and retested cylinders. Air is removed from the cylinders up to 0.35 kg/cm² of vacuum.
5. Cylinders are then transferred to a carousel for filling after punching the tare weight and cylinder type.
6. The filling process is automated. On filling up the desired weight, the filling gun gets disconnected.
7. Filled Cylinders undergo a weight check to ensure the cylinders are filled with the correct quantity.

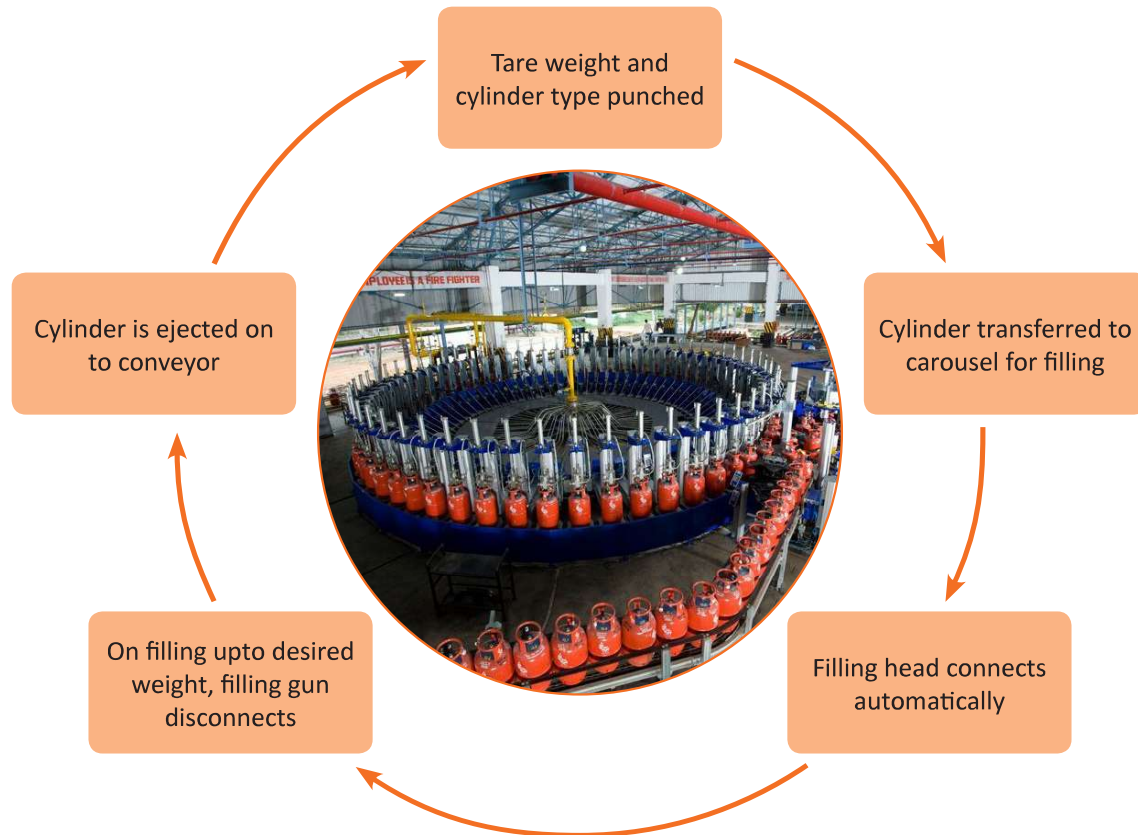


Fig. 2.1.2. Procedure of filling LPG in cylinders

2.1.4 Uses of LPG

The uses of LPG as a fuel are as follows:

Household

It is used for cooking and heating water at home.



Fig. 2.1.3. LPG use at home for cooking

Vehicles

It can be used to power vehicles such as cars, vans, etc.



Fig. 2.1.4. LPG use in vehicle

Industrial

It is used for heat treatment in industries such as metal cutting and forging, etc. Other areas of application include construction, textile, paper, ceramics, etc.



Fig. 2.1.5. LPG use at construction site

Commercial

It is used for cooking in commercial spaces such as hotels and restaurants. It is also used for heating water, lighting, and air conditioning. Other areas of application include agriculture, horticulture, etc.



Fig. 2.1.6. LPG use in restaurants

2.1.5 Types of LPG Cylinders

LPG cylinders are sold and used in India in various sizes and capacities.



Fig. 2.1.7. LPG cylinders sizes and capacities

There are two types of material used to produce cylinders. They are as follows:

Steel Cylinders

Steel cylinders are considered traditional as steel has been used since the inception of LPG storage. They are prone to corrosion.



Fig. 2.1.8. Steel Cylinder

Composite Cylinders

Composite cylinders are a new generation of cylinders and have come into use in recent times. They are lightweight, non-explosive, and non-corrosive. Composites are costlier than steel.



Fig. 2.1.9. Composite Cylinder

2.1.5.1 Parts of a Cylinder

The body of LPG cylinder can be divided into three main parts, namely the neck portion called collar shroud, the main body (pressure part) and the foot ring.

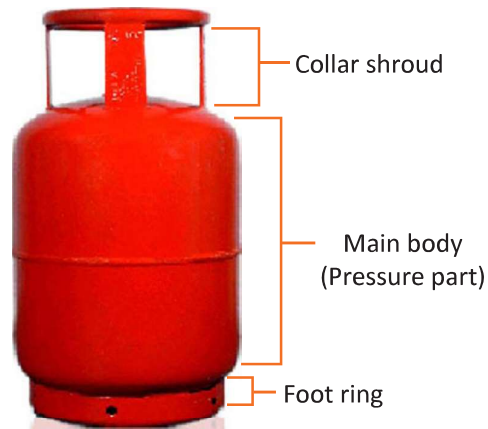


Fig. 2.1.10. Parts of a cylinder

2.1.6 LPG Supply Chain

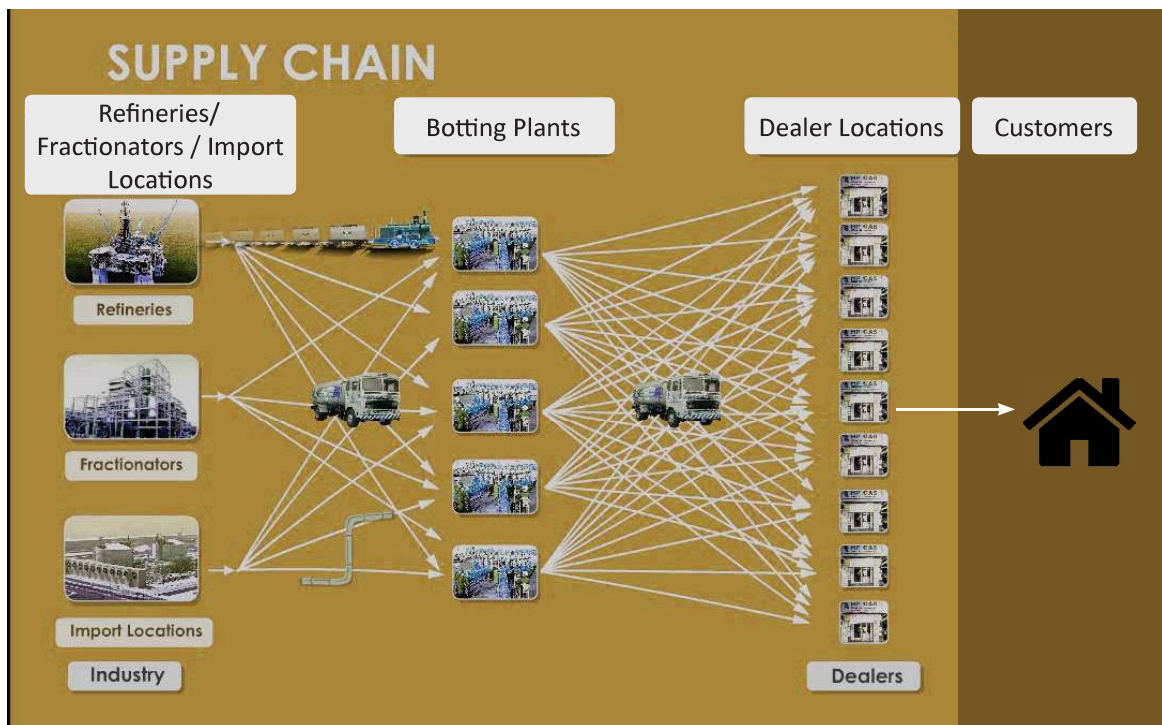


Fig. 2.1.11. LPG supply chain

LPG Distributors:

LPG distributorships are appointed by Public Sector Oil Marketing Companies (OMCs) and are governed by the terms and conditions of the agreement entered into between the OMCs and the Distributors. The LPG distributors are responsible to sell a product of the correct quality and quantity and provide excellent customer service.

Domestic Customer:

The customers who used LPG at home.

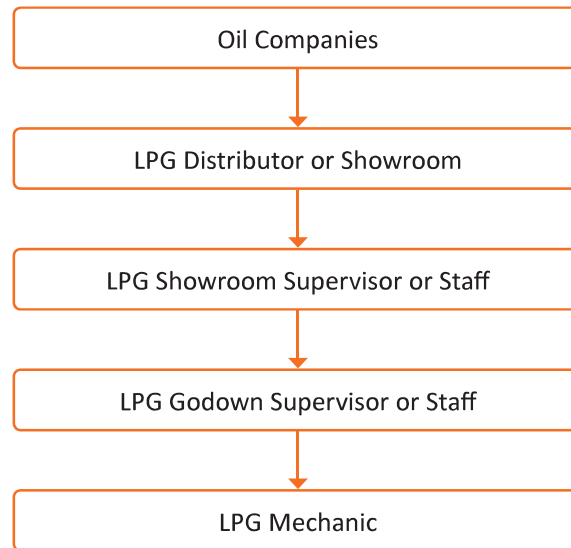
Organisation chart:

Fig. 2.1.12. Organisation chart

2.1.6.1 Standard LPG Cylinder Equipment

<p>SC Valve</p> <p>Pin</p> <p>Fig. 2.1.13. Cylinder valve</p>	<p>Self-closing valve</p> <ul style="list-style-type: none"> • A device that regulates, directs or controls the flow of gas by opening, closing or partially obstructing various passageways • Ensures that the cylinder with a self-closing valve should always meet BIS standard
<p>Pressure regulator</p> <ul style="list-style-type: none"> • It helps to regulate the pressure of LPG in cylinders. • Uses a pressure regulator of appropriate type, which matches the cylinder self-closing valve • It should always meet ISI standard. 	<p>Knob</p> <p>Nozzle</p> <p>Fig. 2.1.14. Pressure regulator</p>
<p>Fig. 2.1.15. 'O' ring</p>	<p>'O' ring</p> <ul style="list-style-type: none"> • It is designed to be seated in a groove • It is compressed during assembly between two or more parts, creating a seal at the interface.

Safety cap

- It helps to prevent dust from getting inside the valve.
- It is used to prevent damage to the valve.
- It also helps in preventing the spread of gas in case of a pin-leak.



Fig. 2.1.16. Safety cap



Fig. 2.1.17. Suraksha LPG hose

Suraksha LPG hose

- This leak-proof tube is a connector between the cylinder and the gas stove.
- It helps to supply LPG from the cylinder to the gas stove.
- Always use ISI marked suraksha hose.
- The Suraksha LPG hose is produced by manufacturers who are approved by LERC and BIS, according to IS - 9573: 1998 Type

Features of Suraksha LPG Hose

The hose is manufactured with strict quality control standards that cover raw materials, processing and the finished product. The key features are as follows:

- The hose is built using three layers, with the inner and outer layer made of high quality rubber. The middle layer is made using interwoven copper or brass coated high carbon steel wire mesh that cuts down any deficit in the rubber tube.
- The hose is crack-proof and cannot be harmed by rodents on account of the interwoven steel wire mesh.
- The outer layer of the hose can withstand damage from fire, weather and abrasion.
- Each hose contains details such as batch number, month/year of manufacture, and expiry date (month/year).
- The hoses are packed and sold in pouches which carry details such as manufacturer, MRP, length, instruction card and safety tips.

Gas Stove

- Today, gas stoves use two basic types of ignition sources i.e. standing pilot and electric.
- A stove with a standing pilot has a small, continuously burning gas flame under the cooktop.
- Green Label LPG stoves save fuel and possess a thermal efficiency of 68% and above. Other LPG stoves possess a thermal efficiency of 64%. Other advantages are as follows:
 - They are manufactured with strict quality control checks.
 - Authorities at BIS certify each stove and provide a serial number for each unit.
 - Consumers will receive a BIS certificate along with the stove, which will be packaged according to specifications.



Fig. 2.1.18. Gas stove