

Participant Handbook

Sector
Hydrocarbon

Sub-Sector
Downstream (Oil Refining and Marketing)

Occupation
LPG Distribution

Reference ID: **HYC/Q3201, Version 1.0**
NSQF Level 4



LPG Delivery Personnel

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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

Job Role/ Qualification Pack: 'LPG Delivery Personnel' QP No. 'HYC/Q3201 NSQF Level 4'

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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 Delivery Personnel' 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 the following National Occupational Standards (NOS)/ topics.

- HYC/N 3201 Deliver LPG Cylinders to Consumers
- HYC/N 3102 Maintain Safe and Secure Working Environment
- HYC/N 3103 Maintain Health and Hygiene
- HYC/N 3202 Assist in Upkeep and Maintenance of LPG Storage Area

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 the Hydrocarbon Sector

Unit 1.3 - Introduction to the Downstream Segment

Unit 1.4 - Role of an LPG Delivery Personnel



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 what hydrocarbons are and describe the different types 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 an LPG Delivery Personnel
13. State the personal attributes of an LPG Delivery Personnel

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 Delivery Personnel.

The training programme is based upon the National Occupational Standards for LPG delivery and installation 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-delivery, delivery and post-delivery activities at customer premises
- Demonstrate the safe usage as well as safe handling of equipment
- Follow the safety guidelines while setting up a cylinder
- Assist in upkeep and maintenance of LPG storage area and LPG delivery vehicle
- Achieve customer satisfaction by providing excellent service
- Follow and maintain personal health, hygiene and work in line with safety environment protocol
- Build good rapport with the customer through effective communication that is respectful towards the customer

1.1.2 Benefits of the Training Programme

- After successful completion of the training programme, the participants 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 Delivery Personnel 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 LPG delivery and installation activities required to be performed at the customer premises. This programme is based on the qualification pack called LPG Delivery Personnel. The Qualification Pack Code for LPG Delivery Personnel is HYC/Q 3201. 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 Delivery Personnel QP, there are four numbers of NOS which detail the functions to be performed at the work site by the LPG Delivery Personnel.

NOS Code	Major Function/Task
HYC/N 3201	Deliver LPG Cylinders to Consumers
HYC/N 3102	Maintain Safe and Secure Working Environment
HYC/N 3103	Maintain Health and Hygiene
HYC/N 3202	Assist in Upkeep and Maintenance of LPG Storage Area

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.

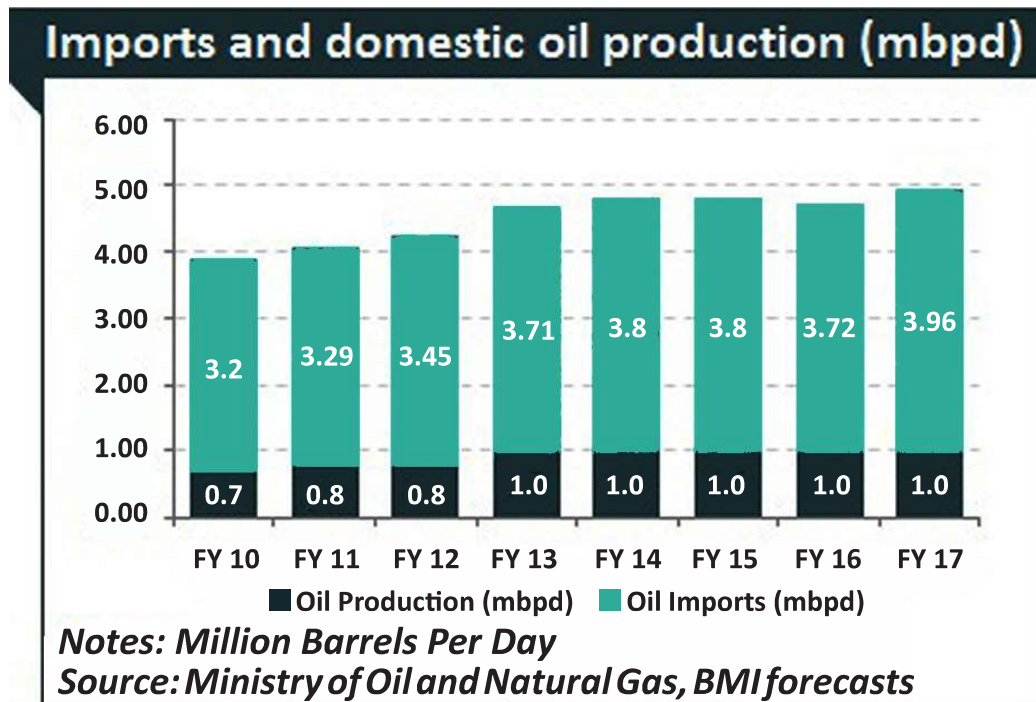


Fig. 1.2.1. Economic growth

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.

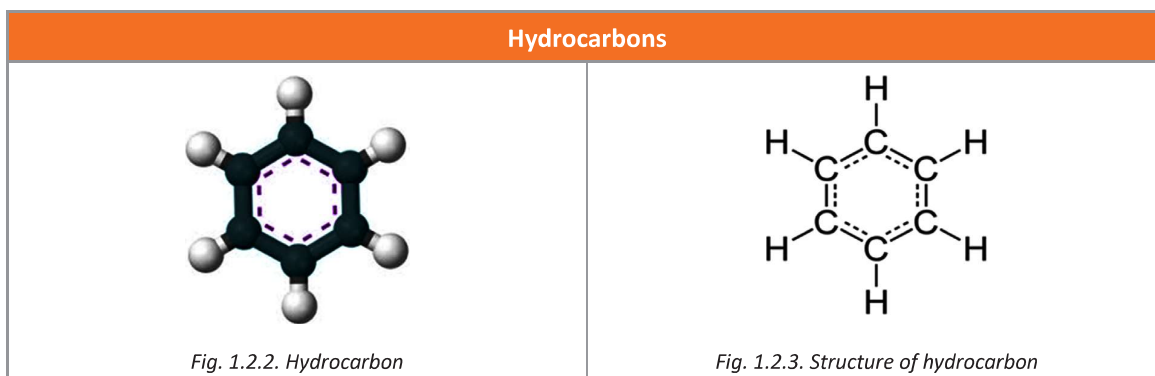
According to data¹ released by the Department of Industrial Policy and Promotion (DIPP), the petroleum and natural gas sector attracted FDI worth US\$ 6.86 billion between April 2000 and September 2017.

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.

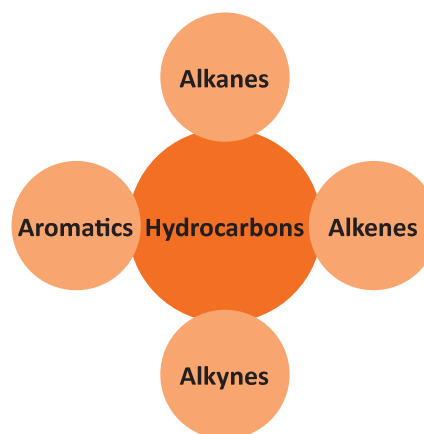


Fig. 1.2.4. Types of hydrocarbons

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.

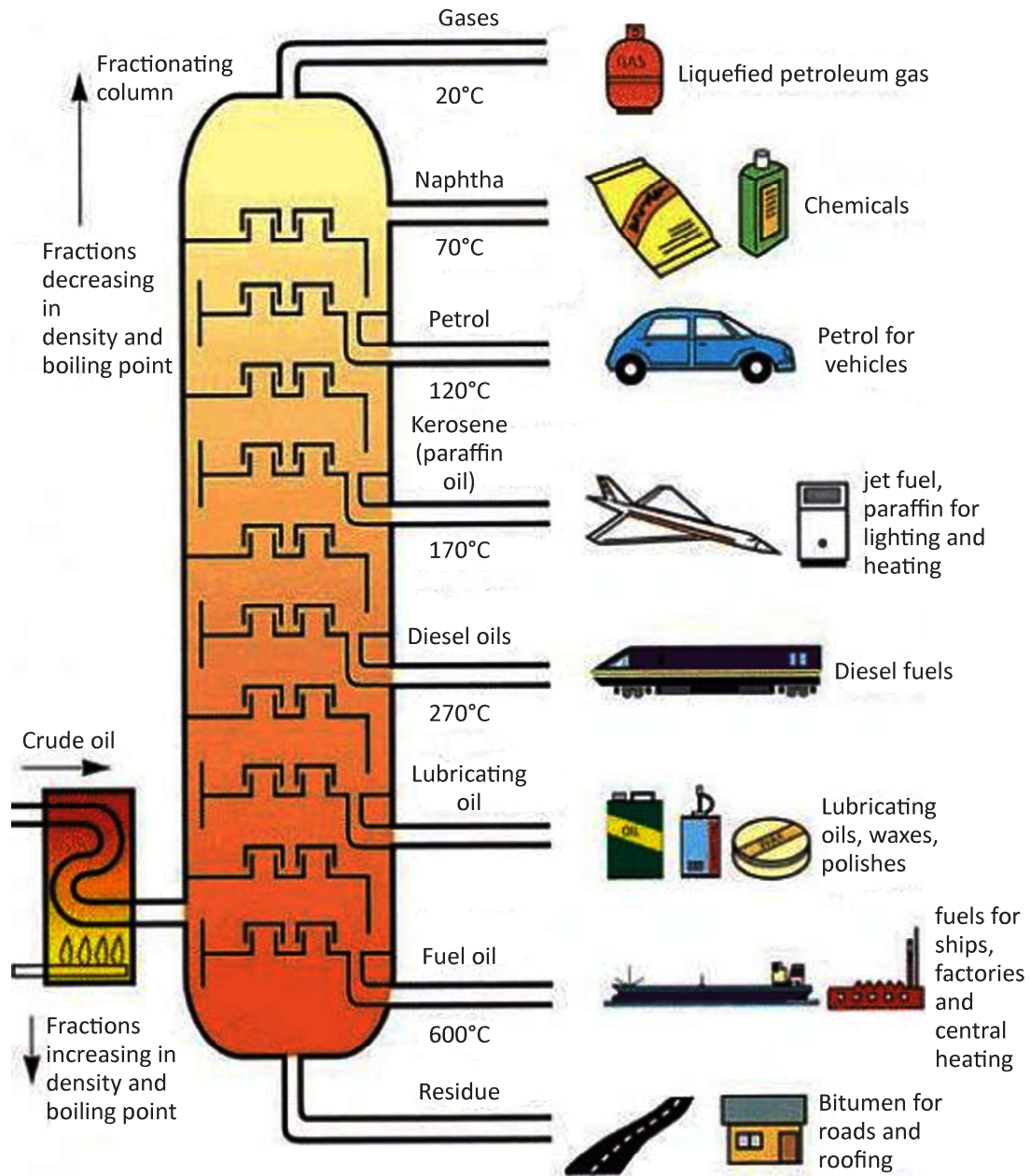


Fig. 1.2.5. Distillation process

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.

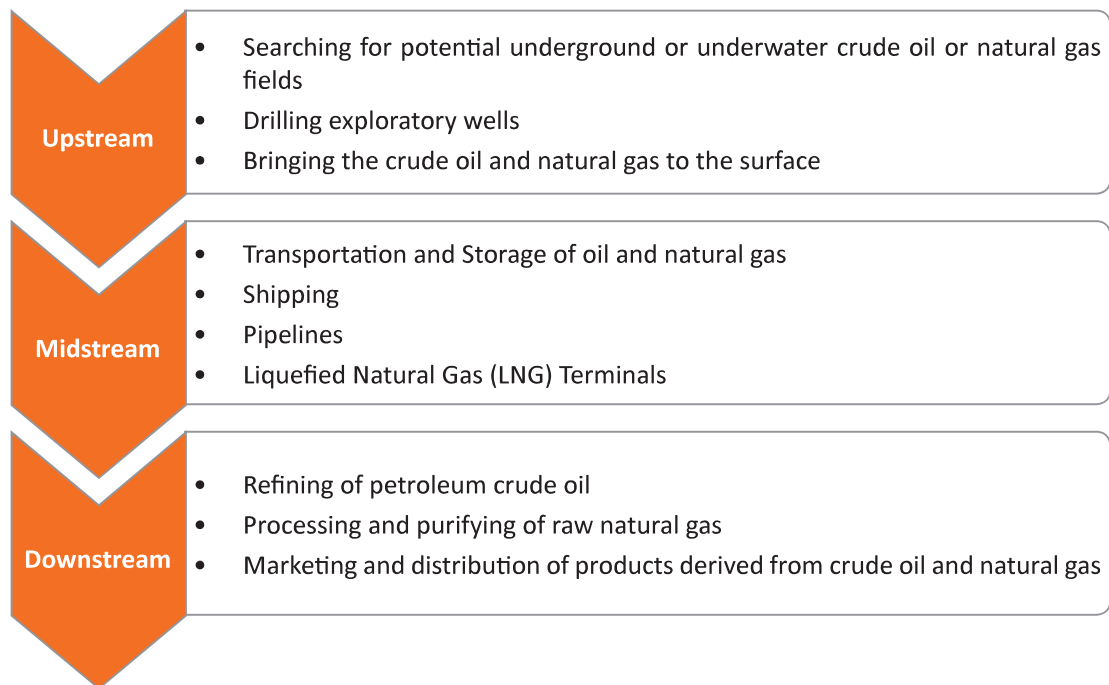


Fig. 1.3.1. Different segments of hydrocarbon sector

Processes involved in different segments of the petroleum industry:

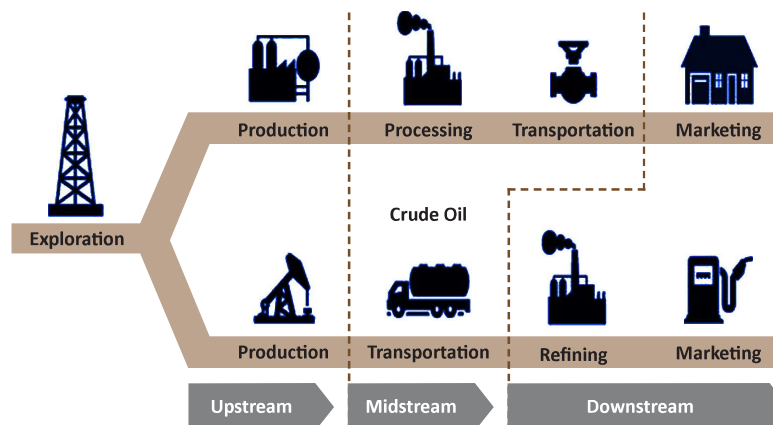


Fig. 1.3.2. Processes involved in different segments of the petroleum industry

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 Delivery Personnel

Unit Objectives



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

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

1.4.1 Who is an LPG Delivery Personnel?

The LPG Delivery Personnel is the one who delivers filled LPG cylinders from the distributors/godown to the customer premises and returns the empty cylinders from the customer premises to the distributors/godown.

The job of an LPG Delivery Personnel is important as he is the first point of contact for a customer on a periodic basis and thus is the face of the organisation.

He must deliver the cylinder to the right address of the customer. He should be able to disconnect the empty cylinder and replace it with a filled cylinder at the customer premises while diligently following safety practices.

He should also explain the safety measures to the customer and educate them about the dos and don'ts of handling LPG.

He should provide good customer service and should be courteous and respectful towards the customer.



Fig. 1.4.1. LPG Delivery Personnel

1.4.2 Roles and Responsibilities of an LPG Delivery Personnel

This job role involves the following:

- Visit the godown and collect the refilled LPG cylinders according to the schedule and plan of delivery
- Carry the tools and equipment required for domestic LPG cylinder delivery
- Execute pre-delivery, delivery and post-delivery activities of LPG cylinders at customer premises
- Demonstrate the safe usage of LPG as well as safe handling of equipment
- Achieve customer satisfaction by providing excellent service

- Fulfil customer requirement by resolving all complaints within 48 hours
- Build good rapport with the customer through effective communication
- Plan and organise tasks in order to meet expected outcomes
- Apply different kinds of problem-solving strategies to resolve customer issues
- Assist in upkeep and maintenance of LPG storage area and LPG Delivery Vehicle

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

- Conduct pre-checking before installation activities, such as, visiting the showroom or godown, collecting customer details as the per the day's schedule and planning accordingly.
- Check if the tool-kit is ready with all essential tools and replenish the required consumables.
- Wear proper uniform and carry ID card provided by distributors at all times while visiting customer premises.
- Greet the customer in a polite manner.
- Educate consumers 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 the storage and handling of LPG cylinders.
- Get the customer feedback, record the same and convey the same to the showroom staff.
- Understand customer's need for service quality requirements.

Career Path of LPG Delivery Personnel

An individual may progress from LPG Delivery Personnel to the Supervisor level.

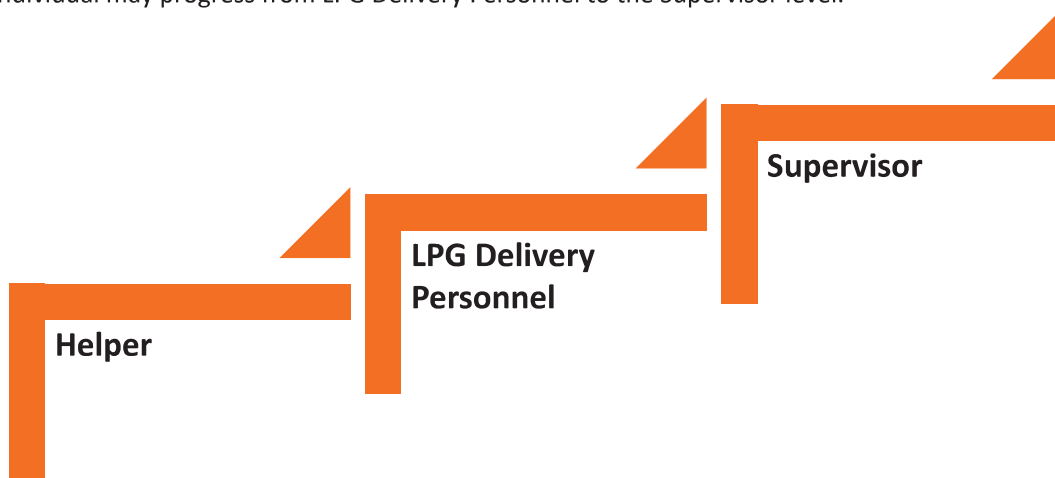


Fig. 1.4.2. Career Path for LPG Delivery Personnel

1.4.3 Personal Attributes of an LPG Delivery Personnel

In addition to the above, LPG Delivery Personnel 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 while visiting the customer

Exercise



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 Delivery Personnel.

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

Tips

- Hydrocarbons are organic compounds which are made up of hydrogen and carbon atoms.
- The four basic types of hydrocarbons are – Alkanes, Alkenes, Alkynes and Aromatics.
- Fuels are divided into three main types – Solid fuels, Liquid fuels and Gaseous fuels.
- The three major segments of Hydrocarbon Sector are: Upstream, Midstream, and Downstream.

Notes





2. Deliver LPG Cylinders to Consumers

- Unit 2.1 - About LPG Cylinders
- Unit 2.2 - Pre-Delivery Activities
- Unit 2.3 - Delivery Activities
- Unit 2.4 - Post-Delivery Activities



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-delivery activities at the distributor's showroom/godown
6. Identify the required tools and equipment required for pre-delivery activities
7. Describe the pre-delivery activities at the customer premises
8. Describe the delivery activities at the customer premises
9. Explain the procedure to replace a cylinder
10. Explain the procedure for a new domestic LPG connection
11. Describe the post-delivery activities performed at the customer premises
12. State the procedure for billing

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 760mm 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/cm^2 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.

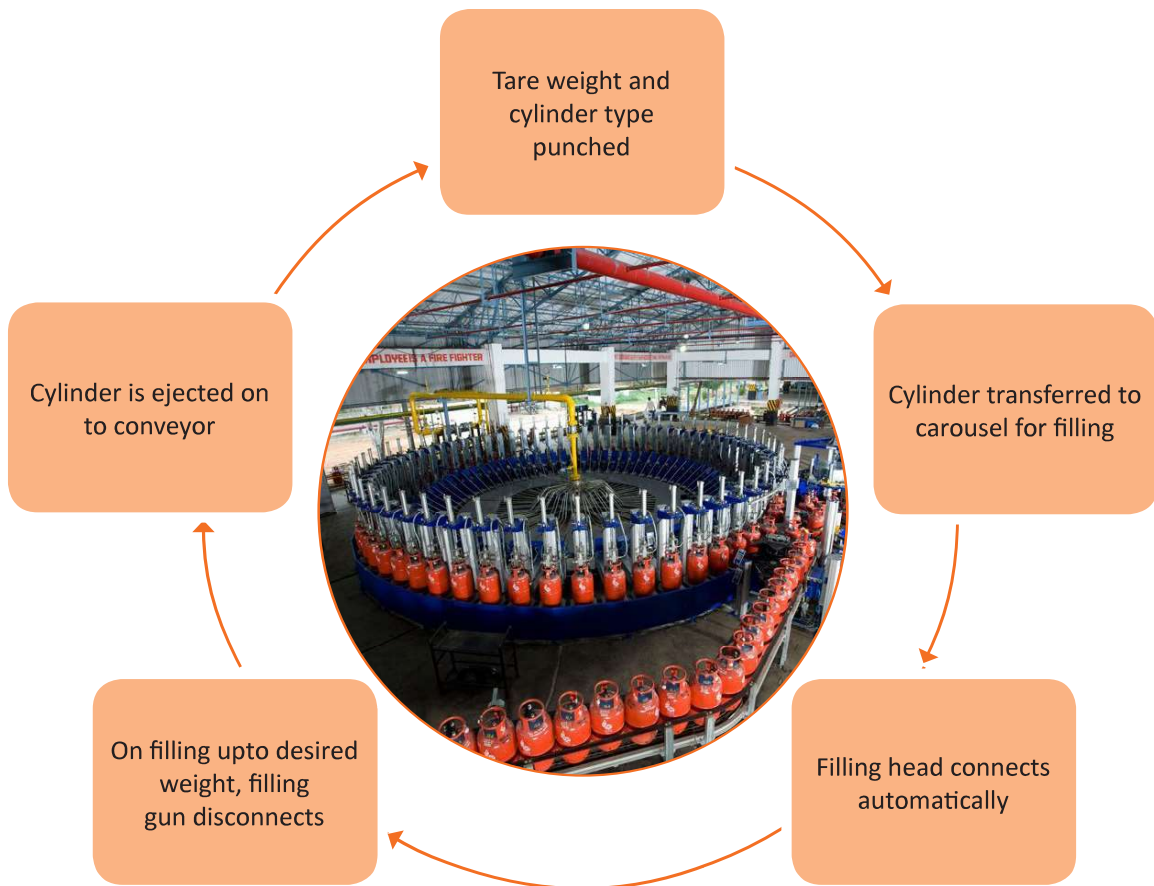


Fig. 2.1.2. Procedure of filling LPG in cylinders

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.

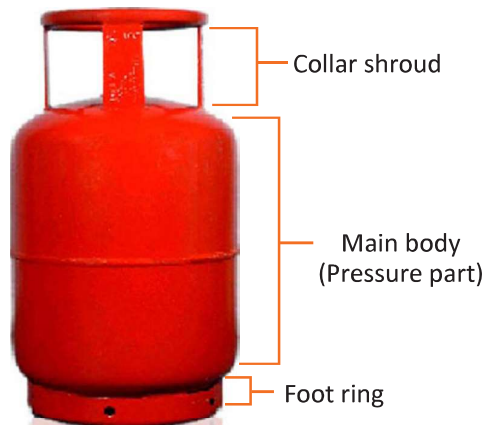


Fig. 2.1.10. Parts of a cylinder

2.1.6 LPG Supply Chain

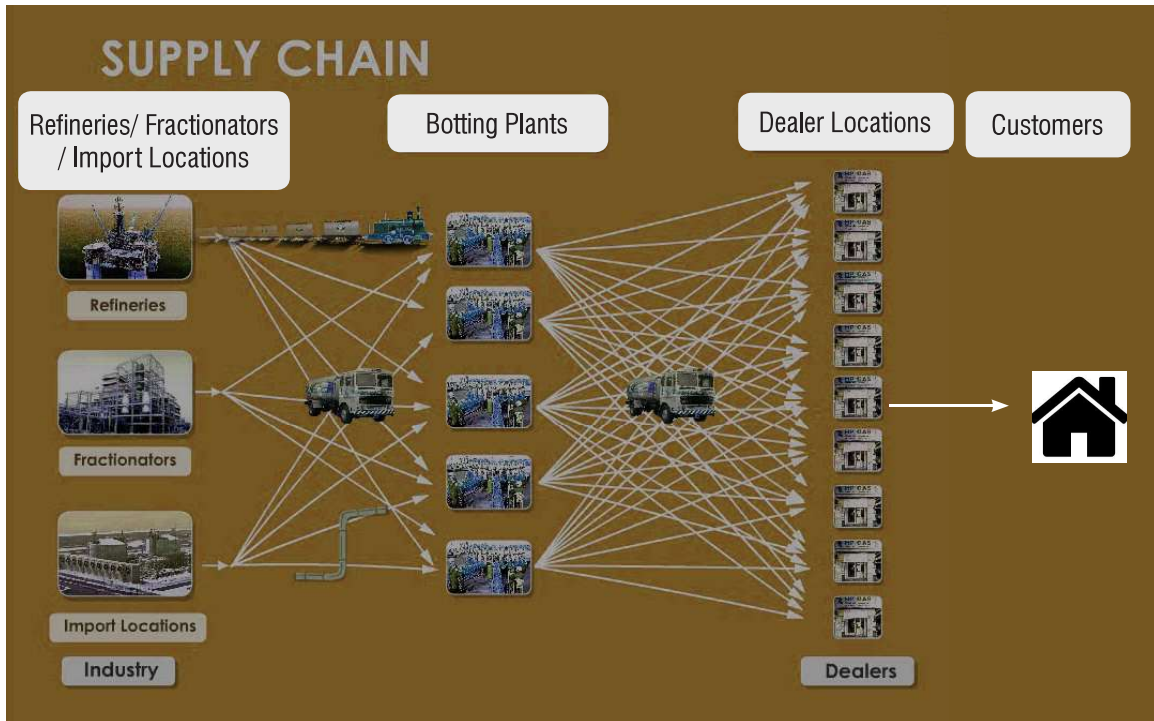


Fig. 2.1.11. LPG supply chain

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:

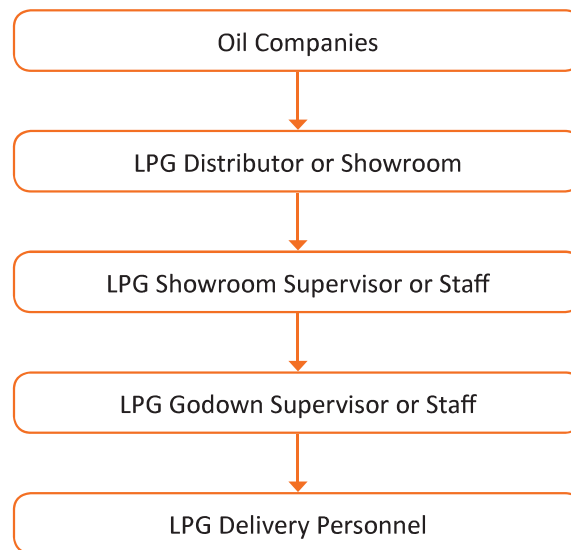


Fig. 2.1.12. Organisation chart

UNIT 2.2: Pre-Delivery Activities

Unit Objectives



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

1. Describe the pre-delivery activities at the distributor's showroom/godown
2. Identify the required tools and equipment required for pre-delivery activities
3. Describe the pre-delivery activities at the customer premises

2.2.1 Pre-Delivery Activities

The LPG Delivery Personnel is responsible for transporting filled LPG cylinders from the distributor's showroom or godown to the customer premises. He is also responsible for pre-delivery checks at the showroom or godown. While delivering the filled LPG cylinder to the customer, the LPG Delivery Personnel needs to perform the following pre-delivery activities.

- He must first visit the LPG distributor's showroom or godown to collect the filled LPG cylinders as per the day's schedule and plan of delivery.
- The cylinders are collected from the LPG distributor's showroom or godown, after carrying out the following pre-checks:
 - Check the tare weight of the cylinder, for example 15.7 kg.
 - Ensure that the cylinder is properly sealed.
 - Check the due date for testing on the cylinder.

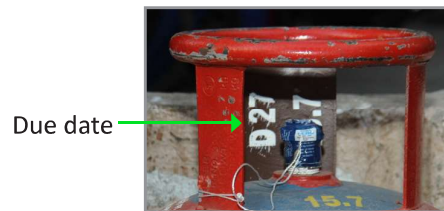


Fig. 2.2.1. Due date

- Ensure that the self-closing (SC) valve is properly protected by the valve protection (VP) ring.



Fig. 2.2.2. Cylinder inspection