

# Technical Guide on Internal Audit in Oil & Gas Refining & Marketing (Downstream) Enterprises

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**Internal Audit Standards Board**  
**The Institute of Chartered Accountants of India**  
*(Set up by an Act of Parliament)*  
New Delhi

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## Foreword

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The oil and gas industry is risky, wildly expensive and critical to every person on the planet. It fuels nearly every other industry in the world, from agriculture to information technology. Growing energy demand of India and necessity to service that to ensure economic growth is not compromised, presents opportunities in the complete value chain of oil and gas sector. This trend of rising demand for petroleum products coupled with the concentration of petroleum reserves in few geographical areas, amongst other factors, pose challenges as well as opportunities for the petroleum refining industry as a whole.

Chartered accountants can play a significant role in the oil and gas sector which faces unique physical and financial challenges. In 2007, the Internal Audit Standards Board had issued "Technical Guide on Internal Audit in Oil and Gas Refining and Marketing (Downstream) Enterprises" which briefly dealt with basic operations undertaken in a refining and marketing (downstream) oil and gas company and the detailed procedures to be undertaken by the internal auditor in respect of each areas. I am happy to note that the Internal Audit Standards Board is bringing out this revised 2013 edition which includes latest updates in the oil and gas sector of the country. This updated publication would surely help the members to understand entire spectrum of operational, conceptual and practical issues related to internal audit in this sector.

I am sure that this Technical Guide would be help our members to learn and sharpen their skills in this sector and thereby be more professionally competent.

January 2, 2013  
New Delhi

**CA. Jaydeep Narendra Shah**  
President, ICAI



# Preface

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The petroleum sector plays a vital role in the economic growth of the country as every economy is largely dependent on petroleum products for its day-to-day activities. With economic growth and modernization, the demand for petroleum products has been on the rise and is expected to rise further, thereby putting pressure on exploration and production of crude oil and refining and marketing of petroleum products. This makes it essential that oil and gas companies have proper internal controls in place to ensure that maximum output is achieved through these valuable natural resources.

Considering the importance of this industry, the Internal Audit Standards Board of the Institute had in 2007 issued "Technical Guide on Internal Audit in Oil & Gas Refining & Marketing (Downstream) Enterprises". The objective of the Technical Guide was to provide to the members an overview of the basic operations undertaken in a refining and marketing (downstream) oil and gas company and the detailed internal audit procedures in respect of all the major areas. This revised edition has been brought out to include recent changes that have taken place in the oil and gas sector of the country. In the revised edition, additions have been made regarding changes in Oil industry structure in India, Liquefied Petroleum Gas, Natural Gas, Pipelines and its Accounting, Enterprise Resource Planning, Cost Accounting Records (Petroleum Industry) Rules, 2011, Service tax, Oil accounting calculations and certain new terms have also been added in the glossary. Further, the scheme of chapters remains the same as earlier edition and has been divided into seven main chapters – introduction, technical aspects involved in refining and marketing, internal audit of refining activities, internal audit of marketing activities, internal audit of special areas, cost audit and information systems audit.

At this juncture, I am grateful to CA. M. Ravi Bala Subrahmanyam, who had authored the earlier edition of the Guide also, for making updations and bringing out this revised edition of the Guide.

I wish to thank CA. Jaydeep N. Shah, President and CA. Subodh Kumar Agrawal, Vice President for their continuous support and encouragement to the initiatives of the Board. I must also thank my colleagues from the Council at the Internal Audit Standards Board, viz., , CA. Rajendra Kumar P., Vice-Chairman, IASB, CA. Amarjit Chopra, CA. Shiwaji B. Zaware, CA. Ravi Holani, CA. Anuj Goyal,

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I am sure that this revised Technical Guide would find a warm acceptance among the members and other interested readers, like it's earlier edition.

January 8, 2013  
Mumbai

**CA. Rajkumar S. Adukia**  
Chairman  
Internal Audit Standards Board

# Abbreviations

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<b>APM</b>	Administrated Pricing Mechanism
<b>ASTM</b>	American Society for Testing and Materials
<b>ATF</b>	Aviation Turbine Fuel
<b>ATU</b>	Amine Treatment Unit.
<b>BBU</b>	Bitumen Blowing Unit
<b>BIS</b>	Bureau of Indian Standards
<b>BPCL</b>	Bharat Petroleum Corporation Limited
<b>BRPL</b>	Bongaigon Refineries & Petrochemicals Limited
<b>BTU</b>	British Thermal Unit
<b>CIF</b>	Cost, Insurance and Freight
<b>CPCL</b>	Chennai Petroleum Corporation Limited
<b>CST</b>	Central Sales Tax
<b>CVD</b>	Countervailing Duties
<b>DCS</b>	Digital Control System
<b>DGH</b>	Directorate General of Hydrocarbons
<b>E &amp; P</b>	Exploration and Production
<b>EIL</b>	Engineers India Limited
<b>ERP</b>	Enterprises Resource Planning
<b>FDZ</b>	Free Delivery Zone
<b>FO</b>	Furnace Oil

<b>FOB</b>	Free On Board
<b>GAIL</b>	Gas Authority Of India Limited
<b>GDP</b>	Gross Domestic Product
<b>GNP</b>	Gross National Product
<b>GOHDS</b>	Gas Oil Hydro De-sulphurisation Unit.
<b>GOI</b>	Government of India
<b>GSPC</b>	Gujrat State Petroleum Corporation Limited
<b>HOEC</b>	Hindustan Oil Exploration Company Limited
<b>HPCL</b>	Hindustan Petroleum Corporation Limited
<b>HRD</b>	Human Resources Development
<b>HSD</b>	High Speed Diesel Oil
<b>IBP</b>	IBP Co. Limited
<b>IIP</b>	Indian Institute of Petroleum
<b>ILP</b>	Industry Logistic Plan
<b>IOCL</b>	Indian Oil Corporation Limited
<b>IPP</b>	Important Purity Price
<b>IQCM</b>	Industry Quality Control Manual
<b>JVC</b>	Joint Venture Company
<b>KL</b>	Kiloliter
<b>KM</b>	Kilometer
<b>KRL</b>	Kochi Refineries Limited
<b>LDO</b>	Light Diesel Oil
<b>LOBS</b>	Lube Oil Base Stock



<b>LPG</b>	Liquefied Petroleum Gas
<b>LSHS</b>	Low Sulphur heavy Stock
<b>MDPM</b>	Market Determined Pricing Mechanism
<b>MI</b>	Main Installation
<b>MMT</b>	Million Metric Tonnes
<b>MMTPA</b>	Million Metric Tonnes Per Annum
<b>MOP and NG</b>	Ministry Of Petroleum and Natural Gas
<b>MRPL</b>	Mangalore Refineries & Petrochemicals Limited
<b>MS</b>	Motor Spirit
<b>NDNE</b>	No-Domestic Non-Essential
<b>NOC</b>	National Oil Company
<b>NSU</b>	Naphtha Splitter Unit
<b>OCC</b>	Oil Coordination Committee
<b>OCRC</b>	Oil Cost Review Committee
<b>OEB</b>	Oil Economics Budget
<b>OIDB</b>	Oil Industry Development Board
<b>OIL</b>	Oil India Limited
<b>OISD</b>	Oil industry Safety Directorate
<b>ONGC</b>	Oil and Natural Gas Corporation Limited
<b>OPC</b>	Oil Pricing Committee
<b>OPEC</b>	Organization of Petroleum Exporting Countries
<b>OPRC</b>	Oil Prices Review Committee
<b>PCRA</b>	Petroleum Conservation Research Association

<b>POL</b>	Petroleum, Oil and Lubricants
<b>PPAC</b>	Petroleum Planning and Analysis Cell
<b>PSA</b>	Pressure Swing Absorption
<b>PSF</b>	Price Stabilization fund
<b>PSU</b>	Public Sector undertaking
<b>R &amp; D</b>	Research and Development
<b>RIL</b>	Reliance Industries Limited
<b>ROI</b>	Return on Investment
<b>RON</b>	Research Octane Number
<b>RPO (RO)</b>	Retail Pump Outlet
<b>RR</b>	Railway Receipt
<b>RSP</b>	Retail Selling Price
<b>RTD</b>	Round Trip Distance
<b>SKO</b>	Superior Kerosene Oil
<b>SRU</b>	Sulphur Recovery Unit
<b>ST</b>	Sales Tax
<b>SWS</b>	Sour Water Stripper Unit
<b>TAIPP</b>	Tariff Adjusted Import Parity Price
<b>TMT</b>	Thousand Metric Tonnes
<b>TOP</b>	Tap Off Point
<b>TPP</b>	Trade Purity Pricing
<b>VBU</b>	Visbreaker unit
<b>WTO</b>	World Trade Organisation

# Glossary

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<b>Additive</b>	A chemical added to oil, gasoline, or other products to enhance certain characteristics or to give them other desirable properties.
<b>Alkylation</b>	A chemical conversion process to form gasoline from lighter fractions using catalysts like sulphuric and hydrofluoric acids.
<b>American Petroleum Institute (APIs)</b>	Founded in 1919, is the first oil trade association to include all branches of the petroleum industry.
<b>Aromatics</b>	A class of organic compounds, related to hydrocarbons, which is used to raise the octane quality of gasoline.
<b>API Gravity</b>	A means used by the petroleum industry to express the density of petroleum liquids.
<b>Barrel</b>	A unit of volume equal to 42 US gallons.
<b>Basin</b>	A synclinal structure in the sub-surface, once the bed of a pre-historic sea. Basins, composed of sedimentary rock, are regarded as good prospects for oil exploration.
<b>Bitumen</b>	Any of various mixtures of hydrocarbons together with their non-metallic derivatives, asphalts and tars.
<b>Black Oil</b>	A term denoting residue oil. Oil used in ships' boilers or in large heating or generating plants; bunker oil.
<b>Blending</b>	The process of mixing two or more oils having different properties to obtain a lubricating oil of intermediate or desired properties. Certain classes of lube oils are blended to a specified viscosity. Other products, notably gasoline(s), are also blended to obtain desired properties.
<b>Block</b>	An area of land made up of a number of contiguous leaseholds large enough to drill an exploratory well.

<b>Bottom Sample</b>	A spot sample taken from the product at the bottom of the tank.
<b>Celibration</b>	The process or procedure of determining the exact volume capacity.
<b>Calibration Tables</b>	Developed by recognised industry methods that represent volumes in each tank according to the liquid level measured in the tank. The tables are with linear measurements (for example feet, inches, meters, centimetres) to obtain calibrated volumes (for example litres, cubic meters or cubic feet).
<b>Catalyst</b>	A substance that hastens or retards a chemical reaction without undergoing a chemical change itself during the process.
<b>Cat Cracker</b>	A large refinery vessel for processing reduced crude oil, naphtha, or other intermediates in the presence of a catalyst.
<b>Condensate</b>	Liquid hydrocarbons produced with natural gas are separated from the gas by cooling and various other means. Condensate generally has API gravity of 50 degrees to 120 degrees and is water white, straw, or bluish in colour.
<b>Corrosion</b>	The eating away of metal by chemical action or an electrochemical action. The rusting and pitting of pipelines, steel tanks, and other metal structures caused by a complex electrochemical action.
<b>Cracking</b>	The refining process of breaking down the larger, heavier, and more complex hydrocarbon molecules into simpler and lighter molecules. Cracking is accomplished by the application of heat and pressure and, in certain advanced techniques, by the use of a catalytic agent. Cracking is an effective process for increasing the yield of gasoline from crude oil.
<b>Crude Oil</b>	Oil as it comes from the well; unrefined petroleum.

<b>Cut</b>	A petroleum fraction; a product such as gasoline or naphtha distilled from crude oil.
<b>Datum Point</b>	The point from which all measurement for the calibration of the tank are related.
<b>Datum Plate</b>	A level metal plate located directly under the reference gauge point to provide a fixed contact surface from which liquid depth measurement can be made.
<b>Demurrage</b>	The charge incurred by the shipper for detaining a vessel, freight car, or truck.
<b>Density</b>	The density of homogeneous substance is the ratio of its mass to volume. The density varies as the temperature changes and it is usually expressed as the mass per unit volume at specified temperature.
<b>Deposit</b>	An accumulation of oil or gas capable of being produced commercially.
<b>Diesel fuel</b>	A fuel made of the light gas-oil range of refinery products. Diesel fuel and furnace oil are virtually the same product. Self-ignition is an important property of diesel fuel, as the diesel engine has no spark plugs; the fuel is ignited by the heat of compression within the engine's cylinders.
<b>Dip</b>	A term used to designate either the depth of liquid in a storage tank or the taking of measurement of such liquid level.
<b>Distillate</b>	Liquid hydrocarbons, usually water-white or pale straw colour and of high API gravity (above 60 degrees), recovered from wet gas by a separator that condenses the liquid out of the gas stream.
<b>Distillation</b>	The refining process of separating crude oil components by heating and subsequent condensing of the fractions by cooling.
<b>Distillation Column</b>	A tall, cylindrical vessel at a refinery or fractionating plant where liquid hydrocarbon feedstocks

are separated into component fractions, rare gases, and liquid products of progressively lower gravity and higher viscosity.

<b>Downstream</b>	Downstream are the operations after production of crude oil, i.e. refining and marketing.
<b>Exploration</b>	The search for oil and gas, including surveying, geological studies, geo-physical surveying, coring and drilling of wildcat wells.
<b>Ex-bond</b>	Imported products kept in the customs bonded warehouse by executing INTO bond bill of entry, shall be discharged on payment of appropriate customs duty through Ex bond bill of entry.
<b>Feedstock</b>	The raw or semi-finished material that is processed in a refinery or other processing plant.
<b>Flare Gas</b>	Gaseous hydrocarbons discharged from safety relief valves on process units in a refinery or chemical plant. Should a unit go down from an electrical or cooling water failure, making it necessary to dump a batch of liquid feed or product, the flare stack is equipped to handle such an emergency. If it were impossible to dump both gases and liquids in an emergency, the plant personnel and the operating units would be in danger. With the recovery equipment larger plants are installing flare gases as well as the dumped process fluid are recovered. The gases are used as fuel; the liquids are reprocessed.
<b>Flash Point</b>	The temperature at which a given substance will ignite.
<b>Floating Storage</b>	A large, converted, permanently moored oil tanker that holds production from offshore wells for transfer to seagoing oil transport vessels or to lighters for transport to shore stations.
<b>Fluid Catalytic Cracking Unit</b>	A large refinery for processing reduced crude, naphtha, or other intermediates in the presence

<b>(FCCU)</b>	of a catalyst. Catalytic cracking is regarded as the successor to thermal cracking as it produces less gas and volatile material; it provides a motor spirit of 10 to 15 octane numbers higher than that of thermally cracked product. The process is also more effective in producing isoparaffins and aromatics that are of high antiknock value.
<b>Fractionator</b>	A tall, cylindrical refining vessel where liquid feedstocks are separated into various components or fractions.
<b>Free Delivery Zone (FDZ)</b>	Each strategic point i.e. Depot/ Installation/ Refining is having a zone with a radius of 19.5 km i.e. one way on all directions, called free delivery zone. Whenever the loaded tank lorry leaves the depot/ installation/refining to a retail outlet the vehicle on its way travels through this zone during its upward journey and re-enters this zone on its return after the delivery of the product. Therefore, the round trip distance of this zone works out to 39 kms known as FDZ.
<b>Fuel Oil</b>	Any liquid or lequifiable petroleum product burned for the generation of heat in a furnace or for the generation of power in an engine, exclusive of oils with a flash point below 100 degree F.
<b>Furnace Oil</b>	Heating oil; light gas oil that can be used as diesel fuel and for residential heating.
<b>Gas</b>	Any fluid, combustible or noncombustible, which is produced in a natural state from the earth and which maintains a gaseous or rarefied state at ordinary temperature and pressure conditions.
<b>Gas Condensate</b>	Liquid hydrocarbons present in the casing head gas that condense upon being brought to the surface; formerly distillate, now condensate.
<b>Gasoil/ Gasoline</b>	A refined fraction of crude oil somewhat heavier than kerosene, often used as diesel fuel. Motor gasoline is a blend of different cuts or fractions in the gasoline range.

<b>Gauge Hatch</b>	The opening on the top of tank through which gauging and sampling operations are carried out.
<b>Gauging</b>	The process of measuring the height of liquid in storage tank usually using a weighted graduated steel tap and bob.
<b>Heavy Ends</b>	In refinery parlance, heavy ends are the heavier fractions of refined oil- fuel oil, lubes, paraffin, and asphalt-remaining after the lighter fractions have been distilled off.
<b>Hexane</b>	A hydrocarbon fraction of the paraffin series. At ordinary atmospheric conditions hexane is a liquid, but often occurs in small amounts of natural gas.
<b>Hydro Carbons</b>	Organic chemical compounds of hydrogen and carbon atoms. There are a vast number of these compounds, and they form the basis of all petroleum products. They may exist as gases, liquids or solids.
<b>Hydro Cracking</b>	A refining process for converting middle boiling or residual material to high octane gasoline, reformer charge stock, jet fuel, and/ or high grade fuel oil. Hydrocracking is an efficient, relatively low – temperature process using hydrogen and catalyst. The process is considered by some refiners as a supplement to the basic catalytic cracking process.
<b>Hydrodesulphurisation</b>	A process to reduce the sulphur content in products by converting sulphur compounds to hydrogen sulphide which is then removed.
<b>Hydrogen Sulphide (H<sub>2</sub>S)</b>	An odorous and noxious compound of sulphur found in 'sour' gas.
<b>Import Parity Price</b>	Landed cost of a product at a given port location based on specified supply location outside India.
<b>Integrated Oil Company</b>	A company engaged in all phases of the oil business i.e. exploration, production, transportation,



	refining, and marketing; a company that handles its own oil from wellhead to gasoline pump.
<b>INTO Bond</b>	On import of the products, the products are being kept in customs bonded premises under INTO bond bill of entry executed with customs authorities ie; products are being kept in the customs warehouse without payment of import duties
<b>Jet Fuel</b>	A specially refined grade of kerosene used in jet-propulsion engines.
<b>Joint Venture</b>	Business or enterprise entered into two or more partners. Usually the partner with the largest interest in the venture will be the operator.
<b>Kerosene</b>	Kerosene cut from the distillation of crude oil, not treated or 'doctor tested' to improve odour and colour.
<b>Light Crude</b>	Crude oil that flows freely at atmospheric temperatures and has an API gravity in the high 30s and 40s, a light coloured crude oil.
<b>Light Ends</b>	The more volatile products of petroleum refining, e.g. butane, propane, gasoline.
<b>Liquefied Natural Gas (LNG)</b>	Natural Gas that has been liquefied by severe cooling (-160 degrees C) for the purpose of shipment and storage in high pressure cryogenic tanks. To transform the liquid to a usable gas, the pressure is reduced and the liquid is warmed.
<b>Liquefied Petroleum Gas (LPG)</b>	Butane, propane and other light ends separated from natural gasoline or crude oil by fractionation or other processes. At atmospheric pressure, liquefied petroleum gases revert to the gaseous state LPG.
<b>Liquid Hydrocarbons</b>	Petroleum components that are liquid at normal temperatures and atmospheric pressure.
<b>Manifest</b>	A document issued by a shipper covering oil or products to be transported by truck.

<b>Methane</b>	A colorless, odorless flammable gas (CH <sub>4</sub> ). Methane is the main constituent of natural gas, which is produced as free gas, and also associated with crude oil as it comes from the well. The simplest saturated hydrocarbon.
<b>Methanol</b>	Methyl alcohol; a colourless, flammable liquid derived from methane (natural gas).
<b>Methyl Tertiary Butyl Ether (MTBE)</b>	An additive used in unleaded gasoline to improve the octane quality. One of the important oxygenates for use in reformulating gasoline to reduce noxious emissions.
<b>Metric Ton</b>	A unit of weight equal to 1,000 Kilograms.
<b>Middle Distillates</b>	The term applied to hydrocarbons in the so-called middle range of refinery distillation, e.g., kerosene, light diesel oil, heating oil, and heavy diesel oil.
<b>Middle Sample</b>	A spot sample obtained at the midpoint of the middle of the tank contents.
<b>Round Trip Distance (RTD)</b>	Round trip distance is the distance from the depot/ installation /refinery to the retail outlet and back. Gross RTD is the combination of round trip distance of FDZ and the round trip distance of beyond FDZ.
<b>Motor Octane Number</b>	The measures of a gasoline's antiknock qualities, whether or not it will knock or ping in an engine with a given compression ratio. Motor octane number of a gasoline is determined by test engines run under simulated conditions of load and speed.
<b>Motor Spirit</b>	A highly volatile fraction in petroleum refining, an ingredient of motor gasoline, commonly referred to as petrol.
<b>Multibuoy Mooring System</b>	A tanker loading facility with five or seven mooring buoys to which the vessel is moored as it takes on cargo or bunkers from submerged hoses that are lifted

	from the sea bottom. Submarine pipelines connect the pipeline-end manifold to the shore.
<b>Naphtha</b>	A volatile, colour less liquid obtained from petroleum distillation used as solvent in the manufacture of paint and as dry-cleaning fluid.
<b>Natural Gas</b>	Gaseous forms of petroleum consisting of mixtures of hydrocarbons gases and vapours, the more important of which are methane, ethane, propane, butane, pentane, and hexane; gas produced from a gas well.
<b>Octane Number</b>	A measure of Gasoline's propensity to ignite under compression. The higher the octane number the less flammable a gasoline is.
<b>Organisation for Economic Cooperation and Development (OECD)</b>	Member countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Republic of Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States of America.
<b>Off-specification Product</b>	Refined product that does not meet normal quality requirements and therefore require special handling and restraint to assure separation from specification products.
<b>Olefins</b>	Class of unsaturated paraffin hydrocarbons recovered from crude oil. Typical examples include: butane, ethylene and propylene.
<b>Organisation of Petroleum Exporting Countries (OPEC)</b>	Oil producing and exporting countries in Middle east, Africa and south America that have organized for the purpose of negotiating with oil companies on matters of oil production, prices, and future concession rights. OPEC in 1984 had 13 members: Algeria, Ecuador, Gabon, Indonesia, Iraq, Iran, Libya, Kuwait, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates and Venezuela. The organisation was created in November 1960.

<b>Oxides</b>	Mineral compounds characterized by the linkage of oxygen with one or more metallic elements such as Cuprite, $\text{Cu}_2\text{O}$ or Spinel, $\text{MgAl}_2\text{O}_4$ .
<b>Oxygenates</b>	Additives for motor gasoline to promote cleaner burning in the engine and thus reducing polluting emissions, unburned hydrocarbons, and carbon monoxide. An oil industry term employed to describe a blending component capable of rapidly increasing the oxygen content of motor car fuels.
<b>Petrochemicals</b>	Chemicals derived from petroleum; feed stocks for the manufacture of variety of plastics and synthetic rubber.
<b>Petroleum</b>	In its broadest sense, the term embraces the whole spectrum of hydrocarbons-gaseous, liquid, and solid. In the popular sense, petroleum means crude oil.
<b>Pour Point</b>	The temperature at which a liquid ceases to flow or at which it congeals.
<b>Pressure</b>	The amount of force exerted on a unit of area by a fluid.
<b>Propane</b>	A petroleum fraction; a hydrocarbon, gaseous at ordinary atmospheric conditions, but readily converted to a liquid. When in a liquid state, propane must be stored in a high-pressure metal container. Propane is odourless, colourless, and highly volatile. It is used as a household fuel beyond the gas mains.
<b>Reference Height</b>	The distance from the bank bottom and/or datum plate to the established reference point or mark.
<b>Refinery</b>	A modern refinery is a large plant of many diverse processes. A refinery receives its charge stock, or crude oil, from the field via pipeline or from a tanker if the plant is located on a waterway. By processes that include heating, fractionating, pressure, vacuum, reheating in the presence of catalysts, and washing with acids. The crude is divided into hundreds of components: from exotic light gases to volatile liquids down through gasoline,

naphtha, kerosene, gas oils, and light and heavy lubricating oil stocks to heavy bunker fuel, residue oil, and finally petroleum coke, the bottom of the barrel.

<b>Reforming Process</b>	The use of heat and catalysts to effect the rearrangement of certain hydrocarbon molecules without altering their composition appreciably; the conversion of low-octane gasoline fractions into higher octane stocks suitable for blending into finished gasoline; also the conversion of naphtha to obtain volatile product of higher octane number.
<b>Reid Vapour Pressure</b>	A measure of volatility of a fuel, its ability to vaporize. Reid vapour pressure, the specific designation, is named after the man who designed the test apparatus for measuring vapour pressure.
<b>Retail Outlet</b>	Point of sale of petroleum products, primarily MS and HSD, for use as fuel for road transportation, commonly referred to as petrol pump.
<b>Retail Sales (RON)</b>	Sales through retail outlets. (Research Octane Number). A measure of a gasoline's antiknock quality determined by tests made on engines running under moderate conditions of speed and load.
<b>Sedimentary Basin</b>	An extensive area (often covering thousands of square miles) where substantial amounts of un-metamorphosed sediments occur. Most sedimentary basins are geologically depressed areas (shaped like a basin). The sediment is thickest in the interior and tends to thin out at the edges. There are many kinds of such basins, but it is in these formations that all the oil produced throughout the world has been found.
<b>Single-buoy Mooring System</b>	An offshore floating platform (20 to 35 feet in diameter) connected to pipelines from the shore for loading or unloading tankers. The SBM system is anchored in deep water, thus permitting large tankers to offload or lift cargo in areas where it is impractical to

	build a loading jetty or the close-in water is too shallow for deep-draft vessels.
<b>Sludge</b>	Deposits in fuel tanks and caused by presence of wax, sand, scale, asphaltenes, tar, water etc.
<b>Sour Crude</b>	Crude oil containing heavy sulphur and having a bad odour.
<b>Specification</b>	Term referring to the properties of given crude oil or petroleum product, which are "specified" since they often vary widely even within the same grade of product.
<b>Specific Gravity</b>	Weight of a particle, substance or chemical solution in relation to an equal volume of water at 15 deg C.
<b>Strategic Reserves</b>	Crude oil/ petroleum products stored as a fuel reserve in the event of a national emergency or a prolonged oil embargo by foreign suppliers.
<b>Straight-Run</b>	Refers to a petroleum product produced by the primary distillation of crude oil, free of cracked components.
<b>Stream</b>	A stream – whether oil, gas, or product-is what is being pumped through a pipeline, moved from one process unit to another.
<b>Sweet Crude</b>	Crude oil containing very little sulphur and having a good odour.
<b>Tail Gas</b>	Residue gas from a sulphur-recovery unit; any gas from a processing unit treated as residue.
<b>Tank Farm</b>	A group of large riveted or welded tanks for storage of crude oil or product. Large tank farms cover several square miles.
<b>Tap off Point</b>	The place at which petroleum products carried by a cross country pipeline are drawn off into storage tanks for distribution therefrom by various modes.
<b>Top Sample</b>	A spot sample obtained at the top of the tank contents.

<b>Trade Parity Price</b>	It is weighted average of the import parity and export parity prices in ratio of 80:20.
<b>Turnkey Contract</b>	A contract in which a contractor agrees to furnish all materials and labour and do all that is required to complete a well in a workmanlike manner. When on production, he delivers it to the owner ready to 'turn the key' and start the oil running into the lease tank, all for an amount specified in the contract.
<b>Ullage</b>	The reserve space in a storage tank between the top of the oil and the top of the tank. This space or ullage allows for expansion of the oil when it warms up from the sun or artificial heating.
<b>Upstream</b>	Pertaining to exploration and production of crude and natural gas.
<b>Vis-Breaking</b>	A light thermal cracking process carried out on a fuel oil during the refining process to reduce product viscosity without blending.
<b>Viscosity</b>	Measure of the internal friction or resistance of oil to flow. As the temperature of oil is increased, its viscosity decreases and it is therefore able to flow more readily.
<b>Volatile</b>	A volatile substance is one that is capable of being evaporated or changed to vapour at relatively low temperature.





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# Chapter 1

## Introduction

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1.1 The petroleum sector plays a vital role in the economic growth of the country as every economy is largely dependent on petroleum products for its day-to-day activities. Out of the total energy mix of oil, natural gas, coal, hydroelectric and nuclear/ others, the petroleum component occupies a major share. The demand for the petroleum products is increasing year by year thereby putting pressure on exploration and production of crude oil and refining and marketing of petroleum products. The increasing trend in the population and growth in the individual consumption has multiplied the demand for petroleum products manifolds. With economic growth and modernisation, the demand for petroleum products has been on the rise and is expected to rise further.

1.2 Petroleum has emerged as the world's most useful source of energy and a vital commodity in international market. The use of crude oil as a source of energy started around 1890 only. Till early forties, demand of petroleum products was low but with worldwide growth of industry there was a sudden shift in favour of petroleum as energy source as compared to coal. Major expansion and development in automobile industry also took place during this period. Oil dominated as a source of energy for transportation, electricity generation, etc. It also becomes essential as a petrochemical feed stock.

1.3 India is one of the countries, which have the highest growth rate in the consumption of petroleum products. The country's indigenous production of crude oil is, however, not sufficient to meet the overall demand for petroleum products, consequently, the country is heavily dependent on import of crude oil. Production/ import of crude oil, refining and marketing of petroleum products (with the exception of lubricants to a certain extent) was till recently done only by the Public Sector Undertakings (PSUs). A noticeable change has, however, taken place in the petroleum sector over the last couple of years, for example, oil fields have been offered for exploration to foreign/ Indian companies in the private sector, private sector has been allowed to set up refineries, import of a number of products has been decontrolled, parallel marketing of LPG under free pricing has also been allowed to the private sector. As the demand for petroleum products is growing, the extent to which the same is being met out of indigenous production is declining and only about 30 per cent of the oil and gas demand

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is likely to be met out of indigenous production. Consequently, the increased level of import of crude oil has serious repercussions on the country's balance of payment position and energy security, particularly in the background of increasing oil prices in the international markets.

1.4 The Oil sector is founded on two major activities, *one*, exploration and production (E and P) and *two*, refining, distribution and marketing. Whereas exploration and production of crude oil and gas is an upstream activity, refining, distribution and marketing are classified as downstream activities. Exploration and Production encompasses discovery and production of oil and gas by undertaking geological and geophysical surveys like remote sensing, airborne magnetic and field gravity surveys to identify the principal areas of adequate sediment cover, seismic surveys, drilling exploratory well, economic evaluation of the project, entering into agreements with the state, formulation of field development and production plan, decommission of the well.

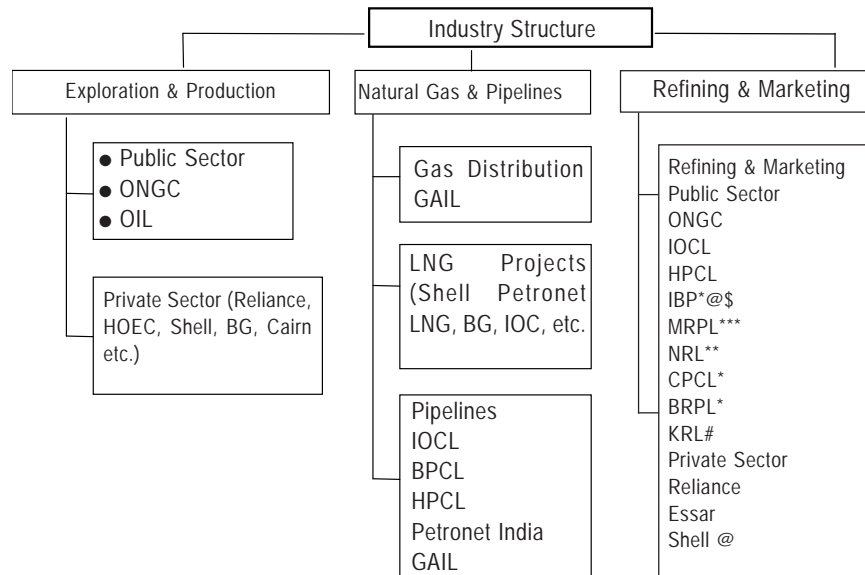
1.5 Refining activity, involves receiving the crude through pipelines/ coastal tankers from the indigenous/ imported destination, for refining the crude into different products at different temperature on the basis of demand/ requirement of respective product. Refining is an important activity since the crude, which was produced has to be refined into different products for the final use of products by the consumers. India can perhaps claim to have established one of the earliest refineries in the world.

1.6 Marketing activity involves the process of receiving the finished products or refined crude oil products, through pipeline, costal tankers, rail wagons and tank trucks for storing the products in the Installation/ Terminal/ Depot for onward distribution to final consumers.

1.7 In India, the operations of petroleum companies can be grouped into:

- (i) Exploration and Production
- (ii) Refining and Marketing
- (iii) Pure Refining
- (iv) Pure Marketing.

The following diagram brings out the oil industry's structure in India, the major players in the various upstream and downstream activities as on July 1, 2012.

**Note:**

\* Majority stake acquired by IOCL

\*\* Majority stake acquired by BPCL

\*\*\* Majority stake acquired by ONGC

@ Exclusive Marketing Company

\$ Being merged with IOCL

# Fully merged with BPCL

1.8 This Technical Guide provides an insight with regard to:

- (i) Refining and marketing activities
- (ii) Internal audit for refining and marketing activities.

The Guide will be useful to the readers in ascertaining various technical aspects and internal audit requirements of a downstream oil company. Since the size, functioning and nature of activities may vary from one company to another, the Guide cannot cover all the intricacies that might be involved in all practical situations. The various aspects/ principles enunciated in this Guide, might, therefore, require appropriate modification/ adjustments depending on size, function and nature of activities of a company under audit. The Technical Guide therefore does not touch upon internal audit of other aspects such as payroll, finance, etc., which are more or less common in all types of industries.

## Chapter 2

# Technical Aspects of Refining and Marketing Activities

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### Refining

2.1 Crude petroleum oil is a complex mixture of alkaline hydrocarbons with water, salt and earth particles. Hence, before it can be used for specific purposes, it has to be purified or refined. The process of separating the crude petroleum oil into more useful fractions is called refining.

2.2 Petroleum refining is a continuous process industry wherein several products carrying different boiling points and molecular compositions are produced from crude oil. The refinery units comprise of the Distillation Unit, Secondary processing Unit like Lube stock, FCCU, hydro finishing units for fuels, Diesel Hydro De-sulphurisation Units, Sulphur Units, Petrochemical feed stock Units, Wax Unit etc., with associated facilities – offshore and utilities. The refining of crude oil is done by process of fractional distillation. In other words, petroleum is separated into its constituents by the process of fractional distillation. The refining of petroleum into different components is based on fact that the different components of crude oil have different boiling point range.

2.3 The crude petroleum oil is heated to a temperature of about 400 degree Centigrade in a furnace and the vapours thus formed are passed into a tall fractionating column from near its bottom. As the mixture of hot vapours rises in the column, it starts getting cooled gradually. Due to this, the vapours of the higher boiling fractions of petroleum condense first in the lower part of the tower, whereas the vapours of the low boiling fractions rise up into the tower and condense later. In this way, the fraction of petroleum having highest boiling point range is collected in the lowest part of the fractionating tower whereas the fraction having lowest boiling point range is collected in the top-most part of the tower. The gases, which do not liquefy, are taken out from the top of the fractionating column. The fractional distillation is continued until the crude oil is separated into five or six

hydrocarbon fractions, each fraction having different boiling point over a different range of temperature. In this way, the fractions having different boiling ranges are collected separately. The residual oil or liquid residue, which does not vaporise under these conditions, is collected and subjected to further fractional distillation by heating above 400o C to get more useful fractions. The various fractions obtained by the fractional distillation of crude petroleum oil are petroleum gas, gasoline or petrol, kerosene oil, diesel oil, fuel oil, lubricating oil, paraffin wax and asphalt. The three fractions - lubricating oil, paraffin wax and asphalt - are obtained by the further fractionation of residual oil which collects at the bottom of the fractionating column. **APPENDIX A** contains a diagrammatic representation of the basic refining process.

2.4 Each fraction obtained from petroleum after refining is not a single compound but a simpler mixture of compounds. The various fractions of petroleum differ in the number of carbon atoms in their molecules. The various fractions of products obtained by the fractional distillation of petroleum will differ in their molecular compositions and boiling point ranges. **APPENDIX B** shows details of refinery block diagram with various refining units. The core issues involved in processing the crude include:

- (a) Improving the yield of the distillates;
- (b) Producing high value products;
- (c) Optimising the energy consumption;
- (d) Minimising the loss of hydrocarbons;
- (e) Environmental management issues; and
- (f) Product quality issues.

## Cost of Refining

2.5 The cost of refining consists of the following elements:

A. ***Delivered cost of crude oil*** – This includes expenditure incurred in respect of:

- (i) cost of crude;

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- (ii) transportation of crude to refineries;
  - (iii) marine/ transit insurance;
  - (iv) ocean loss/ pipeline loss;
  - (v) wharfage;
  - (vi) other landing charges;
  - (vii) customs duty or excise duty;
  - (viii) auxiliary duty; and
  - (ix) other levies.
- B. **Refining cost** – This includes expenditure incurred in respect of:
- (i) Chemicals and catalysts;
  - (ii) Consumables;
  - (iii) Utilities like water and power;
  - (iv) Salaries and wages;
  - (v) Overheads;
  - (vi) Repair and maintenance;
  - (vii) Depreciation;
  - (viii) Finance charges on working capital; and
  - (ix) Normal production loss.

## Technical Parameters in Refining Activity

2.6 The technical parameters in the refining activity comprise the following:

- Types of crude;
- Oil Industry Safety Directorate (OISD) norms;
- Explosives Norms – Petroleum Act, 1934 and Rules;



- Pollution control norms;
- Petroleum products and their usage; and
- Quality control.

## Types of Crude

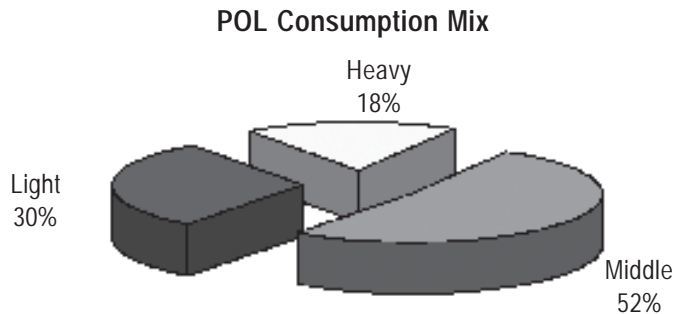
2.7 There are three types of crude namely:

- Sweet;
- Sour; and
- Heavy crude.

Processing of sweet crude involves lesser complications while producing the finished petroleum products as compared to processing of sour and heavy crudes. The refining configuration is built to take care of processing any type of crude. Sour and heavy crudes are cheap but require superior metallurgy and treatment. Pre and Post treatment of sour and heavy crude and precuts leads to higher capital and operation costs. The finished petroleum products obtained as a result of processing of the crude can be classified as:

- (a) Light distillates;
- (b) Middle distillates; and
- (c) Heavy ends/ distillates.

2.8 *Light distillates* are high value products consisting of LPG, Naphtha and Petrol. *Middle distillates* have lesser product value than light distillates, and consist of Kerosene, ATF, HSD and LDO. *Heavy distillates* are lesser value products as compared to light and middle distillates, and consist of FO, LSHS, HHS, lube oils and Bitumen. The trend world over is towards higher conversion of crude into light and middle distillates to obtain 85 per cent and balance of 15 per cent for heavy distillates/ ends. The consumption mix in India is tilted in favour of middle distillates as shown below.



Out of total the consumption of petroleum products, middle distillates account for 52 percent consumption, light distillates account for 30 percent and Heavy ends/ distillates accounts for 18 percent.

## Oil Industry Safety Directorate (OISD) Norms

2.9 Hydro-carbon processing and handling plants are inherently hazardous. Large and complex plants present substantial risk potential. The industry over the years has learnt lessons from fires and explosions and mishaps and also updates plant safety norms on a regular basis. The norms lay down minimum requirements of layouts within the plant boundary for petroleum refining, oil/ gas production and processing plants, LPG filling plants and other petroleum storage installations/ depots including inter distances between facilities and their relative locations. The facilities too are constructed as per the layout and distance norms laid down by OISD.

## Explosive Norms

### *The Petroleum Act, 1934*

2.10 The activities relating to import, transport, storage, production, refining and blending of petroleum are to be in compliance with the provisions of the Petroleum Act, 1934, which extends to the whole of India. Petroleum means any liquid hydro-carbon or mixture of hydro-carbons and any inflammable mixture (liquid, viscous or solid) containing any liquid hydro-carbon. The Act classifies petroleum products in the following classes:

Class "A" - Flash Point < 23° C

Class "B" - Flash Point  $\geq$  23° C < 65° C

Class "C" - Flash Point  $\geq$  65° C < 93° C

The Act deals with control over petroleum, testing of petroleum, penalties and procedure.

### ***The Petroleum Rules 1976***

2.11 The Petroleum Rules, 1976 came into force with effect from August 1, 1976 and deal with the procedures to be followed for import, transport, storage, electric installation licences, refining and blending of petroleum and testing. The Rules also contain general provisions on restriction, delivery and despatch of petroleum, approval of containers for storage, prevention of escape of petroleum, prohibition on employment of children and intoxicated person, prohibition of smoking, fires, and special precautions against accident and payment of fees, etc.

### ***Gas Cylinders Rules 1981***

2.12 These Rules deal with provisions relating to filling, possession, import and transport of cylinders, valves, safety devices, etc., for use in LPG.

### **Pollution Control Norms**

2.13 The oil industry needs to comply with the pollution control norms while discharging effluents into water bodies, air and earth etc. Emissions to atmosphere become a problem especially while processing sour and heavy crudes and burning high sulphur fuels. The main legislation relating to environment protection includes:

- (i) Water (Prevention and Control of Pollution) Act, 1974
- (ii) Water (Prevention and Control of Pollution) Cess Act, 1977
- (iii) Air (Prevention and Control of Pollution) Act, 1977
- (iv) Environment (Protection) Act, 1986
- (v) Forest (Conservation) Act, 1980
- (vi) Wildlife (Protection) Act, 1972
- (vii) Motor Vehicles Act and Rules, 1989.

## Petroleum Products and Their Usage

2.14 The petroleum products generated from the refining process normally have the following use:

*Petroleum gas* is used as fuel as such or in the form of liquefied petroleum gas. Petroleum gas is also used in the production of carbon black (needed in the tyre industry) and of hydrogen (needed in the fertilizer industry) and also used in the manufacture of gasoline (petrol) by the process of polymerization. LPG is also used for cooking.

*Gasoline or Petrol* is used as a fuel in motor cars, scooters, motor cycles, and other light vehicles. Petrol is also used as a solvent for dry cleaning of clothes and for making petrol gas.

*Kerosene oil* is used as household oil, as an illuminant in hurricane or petromax lamps, also used for making oil gas. A special grade of kerosene oil is used as aviation fuel in aero planes.

*Diesel oil* is used as a fuel for heavier vehicles like buses, trucks, railway engines and ships. It is also used to run water pumps required for irrigation in fields and in diesel generators to produce electricity on small scale.

*Furnace oil* is used in industries to heat boilers and furnaces. Fuel oil is a better fuel than coal because fuel oil burns completely and does not leave any residue.

*Lubricating oil* is used for lubricating machinery to reduce the friction and wear and tear of the same under severe operating conditions. It is used for both industrial and automotive applications.

*Paraffin wax* is used for making candles, Vaseline, ointments, wax paper, toilet goods and grease.

*Asphalt/ Bitumen* is a black sticky substance used for making road surfaces and the final residue of petroleum.

*Light Diesel Oil* is used for slow speed diesel engines in agriculture/marine industrial sectors. Also as a fuel in certain specialised industrial applications.

*Low Sulphur Heavy Stock* is used as fuel for industrial boilers and furnaces as well as feed stock in manufacture of fertilizers.

*Grease* is a semisolid product of dispersion of thickening agent in liquid lubricant.

*Naphtha* is used as feed stock for manufacture of fertilizer, Petrochemicals and power generation.

*Mineral Turpentine Oil* used as solvent for textile printing, dry cleaning, polish and insecticides.

Raw Petroleum Coke (RPC) is "bottom of the barrel" product of refinery. This is a solid product. There are two distinctive grades of RPC viz. Calcination or Green RPC and Fuel Grade or Pet coke. Calcination Grade RPC (CPC) is used for production of Anodes for the Aluminium Industry. Fuel Grade Pet coke is used primarily by Cement Plants. Petroleum Coke (Pet Coke) has high heat capacity. RPC is a by-product of the oil refining process and is derived from the distillation of petroleum crude in delayed cokers. CPC is used in the Aluminium, Graphite Electrode, Steel, Titanium Dioxide and other carbon consuming industries. Pet coke mainly used in industrial sector.

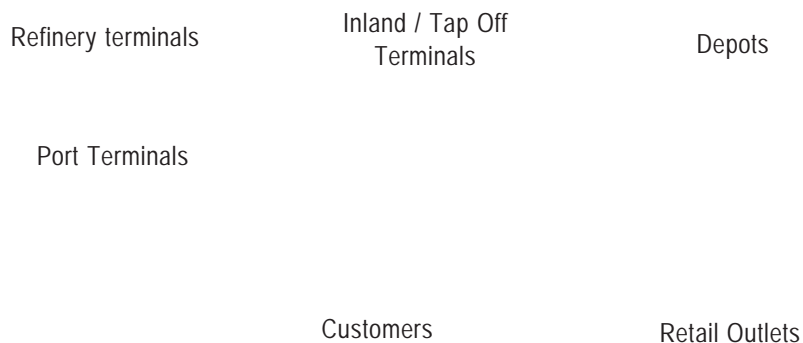
**APPENDIX C** shows the types of products produced from crude oil.

## **Quality Control**

2.15 The quality of petroleum, oil and lubricants (POL product) is controlled keeping in view the requirements of the end users and is in conformity with the BIS specifications. The Ministry of Environment, BIS and other agencies of Petroleum Ministry such as Indian Institute of Petroleum (IIP), Centre for High Technology (CHT) are jointly developing standards for products.

2.16 There is world wide concern about environmental pollution caused by emissions from automobiles. These emissions contain lead and benzene which are carcinogenic and adversely affect the health of the people. Sulphur and Suspended Particulate Matter (SPM) from diesel vehicles cause breathing problems such as asthma. Specifications of MS and HSD also have undergone changes and more stringent pollution control norms in the form of Bharat II, Bharat III and Bharat IV (like Euro II, and Euro III and Euro IV) are in place. Meeting these norms involve huge investment especially for those companies in the oil industry which processes sour and heavy crudes.

### DOWNSTREAM SUPPLY CHAIN



2.17 The quality control measures begin at the refinery itself at the time of transfer of product from the refinery to the TOP of the marketing company or loading of the tanker directly from the refinery to another port location. The concerned refinery provides its report confirming that the product in the tank for which transfer is proposed meets the quality specifications. Quality control labs are also set up at the refinery, TOPs, depots, port installations etc., to ensure that the products conform to the required specifications.

### Marketing Process

2.18 Petroleum products being mostly liquid in nature require special facilities for storage, transportation and distribution. Most of these are volatile in nature and require special care in handling delivery. Marketing and distribution of the products is done by oil companies normally through a large network of storage and distribution facilities as given below:

2.19 Marketing of petroleum products demands finer marketing skills in as much as the market leader is company, which can make products available to consumers in the most efficient manner at all times at right price, in right quantity, of right quality and at the right place. The marketing image can only be enhanced by extending excellent customer service and ensuring consumer/ public satisfaction. Further, market share can be improved *vis-à-vis* that of others by being pro-active and meeting customers' needs.

2.20 The marketing and distribution activity in an oil company normally falls under the following heads:

- (i) *Installation*: This consists of storage tanks and product handling

facilities for receipt of products from port and/ or refineries for onward despatch to direct customers in bulk and inland depots.

- (ii) *Distribution*: This consists of depots and transportation facilities for onward movement of products to retail outlets and direct customers.
- (iii) *Administration*: For efficient management of the all India network of installations, depots, LPG bottling plants, etc., oil companies have head office, regional and divisional offices.
- (iv) *Air Field Stations*: Oil companies have infrastructure at the airfield stations consisting of storage tanks, hydrants, pipelines, hoses etc., for fuelling aircraft.
- (v) *Retail Pump Outlets*: This is the last link in the distribution and the oil companies have dedicated dealer network for retailing MS and HSD.
- (vi) *LPG Filling*: Bulk LPG imported or from the refineries is bottled at the LPG bottling plants before being marketed to the domestic and industrial customers.
- (vii) Lube Blending plant (LBP): Base oil from Refinery is blended with Additives to manufacture Lubricants and Greases. Blended Lubricants and Greases are filled in Packed containers/pouches.
- (viii) Small Can filling Plant (SCFP): Here Blending activity do not take place. However Blended Lubricants and Greases are filled in small capacity containers/pouches

## Transportation

2.21 Transportation cost plays a vital role in determining the final selling prices for the consumers. The various modes used for transportation of petroleum and crude to consumers include coastal tankers, river barges, multi-product cross country pipelines, branch pipelines, railway wagons, road tank-trucks, etc. Crude oil is transported to the refineries either by tankers or by pipelines. The product from the refinery/ port installation are moved by rail, road, pipeline and coastal vessels. The centers of consumption and production and the points of import of petroleum could be at places separated by hundreds of miles. Surplus products at a location also need to be transported to areas facing deficit. Refineries could be anywhere in between the consumption and production centers. With the economics of refinery

location determining the exact position, crude has to be transported from production centers or points of import to the refineries and refined petroleum products have to be transported from refineries or points of import to the consumption centers.

2.22 All modes of transportation of petroleum products complement each other and form essential components of the logistics system. For bulk transportation of petroleum products, pipelines are the most energy efficient, convenient and preferred mode of transportation. With deregulation, the oil companies and shippers have multiple options in selecting the mode of transportation and there is an increased emphasis on quality and reliability of service.

## Market Intelligence

2.23 It may appear that oil companies are operating in the seller's market, the fact is that oil companies engaged in marketing gives rise to a healthy competition among the companies. Collecting market information is a critical factor for sustaining and improving operational efficiency. Being well informed also helps in knowing the pulse of the market, which would in turn, help in taking pro-active decisions and also in anticipating events before the actual occurrence and taking corrective action before the events become a part of history. The market intelligence can also be acquired by systematic and timely collection and collation of some important facts about various markets such as:

- (i) Geographic details of area with number of States, districts, cities/ towns, *talukas* and villages.
- (ii) Population of various districts, *talukas* villages, main occupation of the people and important crops/ agricultural seasons.
- (iii) Vehicular population and important fleet operators, workshops and garage.
- (iv) Road map showing important roads, such as national highway, state highway, MDR (Major District Roads) and village roads and their starting and terminalling points and also showing depots/ terminals/ ROs.



- (v) Road, rail, airline connection and road development, present and future.
- (vi) Competitors' activities/ strength.
- (vii) Industrial developments, number of major and minor industries and their locations, existing and expected/projected industries.
- (viii) Agricultural developments – minor and major irrigation projects, World Bank sponsored schemes.
- (ix) Infrastructure and other development of the area, housing as well as commercial.
- (x) Master plans for improvement in cities/ *talukas*.
- (xi) Government set up, important and concerned Ministers, Deputy Commissioner, Collectors, Police officials, PWD Engineers, Fire Force Officers, pertaining to each district.

### **Strategic Reserves**

2.24 The marketing/ refining companies have to maintain strategic reserves of petroleum products in the country since an oil supply crisis can disrupt the economic life of the country. It is therefore desirable to have a buffer to cope with the difficulties and manage the crisis should it reach a critical stage. However, before this stage is reached, it is desirable to intervene in the course of the crisis, for as supplies begin to dry up, there is a risk of speculation which fuels price increase and, to a certain extent, the crisis itself. It, therefore, makes good economic sense to have a means of defusing the crisis by off-loading the reserve stocks on the market before the crisis develops. Further, this buffer itself is a powerful deterrent for those who might be tempted to unleash a supply crisis.

### **Sharing Arrangements**

2.25 Memorandums of Understanding (MoUs) are a common feature in the oil industry, wherein one oil company enters into an MoU for sharing product supply, storage facilities with other oil companies which have product availability and infrastructure at a given place. As one company cannot have its own source of supply and infrastructure throughout the country, this

type of arrangement is necessary for oil companies for effective utilisation of their product and facilities.

### **Product Sharing Arrangements**

2.26 MS, HSD, SKO and LPG are mass consumption products. Each marketing company has created extensive retail network to satisfy the consumer's needs. In case of LPG, customers are enrolled by each company in all demand centres and the product requirement is met out of the production of the nearest refinery and/ or out of imports.

### **Sharing of Other Infrastructure Facilities**

2.27 It is difficult for a single oil company to have all the facilities throughout its marketing network for storing and distribution of products. It is, therefore, a normal practice in the oil industry to utilise the facilities of other company at the place where it does not have one and in turn lend its own facilities where the other company does not have such facilities.

### **Sharing of Product Pipelines**

2.28 The product pipelines are natural monopolies. The pipelines are shared by industry to protect consumer interests. This results in avoiding wasteful use of resources of the country, by cutting the need to build a second parallel pipeline one to the existing one.

### **Sharing of Port Facilities**

2.29 Like sharing of pipelines, the port facilities are also shared by the Industry.

### **Supply to Remote Areas**

2.30 There are several parts of our country which are remotely located and do not consume enough volumes of petroleum products to warrant setting up of storage and distribution facilities. Marketing companies due to socio-economic reasons are required to supply petroleum products to these areas even at losses.

## Technical Parameters in the Marketing Activity

2.31 The technical parameters involved in the marketing activity undertaken by the oil companies comprise:

- (i) Facilities - Storage tanks, under ground (UG) tanks/ above ground (AG) tanks, pipelines, products pump house/ loading pump house, fire fighting system like water and foam
- (ii) OISD Norms
- (iii) Petroleum Act and Rules – Explosive norms
- (iv) Pollution control
- (v) Quality control
- (vi) ISO requirements
- (vii) Marketing guidelines
- (viii) Transport discipline guidelines
- (ix) Types of markets
- (x) Types of distribution channels.

## Facilities

2.32 The important factors to be noted in respect of the facilities of the oil companies include:

- (a) *Product Storage Tanks* – The crude and petroleum products at the refineries/ terminals/ depots are stored in bulk in suitably calibrated storage tanks of capacity, which is related to the throughput of the location. The storage tanks are invariably installed above the ground level and are constructed on sand bed/ concrete foundation. These tanks are vertical, cylindrical in shape and either have a fixed cone roof or a floating roof. The floating roof tanks are installed to control the product losses due to evaporation. At times, the underground tanks of suitable capacity are also used for storage of petroleum products at depots. Apart from this, special types of tanks are also installed for specific uses.

- (b) *Inlet and Outlet pipelines* - The inlet and outlet pipes are provided to the tanks to facilitate receipt and withdrawal of products. These lines are provided at the bottom of the tank to avoid splashing of the products at the time of receipt and ensure maximum withdrawal of product. The delivery lines invariably have pumps to guide operations. Receipt lines are also provided with pump wherever necessary.
- (c) *Rail Wagon/ Tank Truck Filling Sheds* - Bulk of supplies to depots/ customers are effected by rail wagon/ tank truck. Each refinery/ depot/ installation are provided with rail wagon/ tank truck filling sheds to facilitate loading of tank trucks/ rail wagon. The number of bays provided at the rail wagon/ tank truck filling shed is commensurate with the daily/seasonal peak volumes handled at the refinery/ installation/ depot. Rail wagon/ tank truck filling bay is connected to the tanks by pipeline of requisite diameter.
- (d) *Observance of safety regulations* – As mentioned earlier, the petroleum products are classified according to their closed cup flash point as follows:
- Class "A" – Liquids which have a flash point below 23°C.
- Class "B" – Liquids which have flash point of 23°C or above but below 65°C.
- Class "C" – Liquids which have flash point of 65°C or above but below 93°C Unclassified liquids have a flash point of 93°C and above. Thus, depending on the class of petroleum products, which is required to be stored in the tank, the fabrication of the tank is carried out and required safety regulations are observed at the installation/terminal, while installing these tanks.
- (e) *Product pump house/ Loading pump house* - This consists of pipeline from storage tanks, together with pumps for each products for loading the product into Tank Wagon and Tank Truck.
- (f) *Fire fighting systems*- consists of water pipelines, pump house, fire engines, water storage, foam storage for controlling and putting off any fire hazards.

## **Oil Industry Safety Directorate (OISD) Norms**

2.33 *(Please refer paragraph 2.9 for details).*

## **Petroleum Act and Rules - Explosives Norms, Petroleum Rules, 1976 and Gas Cylinder Rules, 1981**

2.34 *(Please refer paragraphs 2.10 to 2.12 for details).*

## **Pollution Control Norms**

2.35 *(Please refer paragraph 2.13 for details).*

## **Quality Control**

2.36 The petroleum products marketed by the oil Industry conform to the Indian Standard Specifications which is followed as a marketing specification for each product. The concerned refinery provides its report confirming that the product in the tank for which transfer is proposed meets the specifications. Thereafter, required quality control measures are taken at all stages, i.e., receipt of product at TOPs through pipelines, through rail wagon, through tank trucks etc. Required procedures are followed to ensure quality control checks at various stages till the product is finally delivered to the consumer. For this purpose, quality control labs are set up at the refinery, TOPs, depots, port installations etc., to ensure that the products conform to the required specifications. Mobile laboratories are also set up to check the quality of the products while it is in transit from the supply location to the premises of the consumer (in case of delivered supplies). The mobile laboratories are also established for checking the quality of the product being dispensed from the Retail Outlet.

2.37 Product quality and specifications conform to the Industry Quality Control Manual. Petroleum products are received, stored and delivered at the Installation/ Depot as per the quality control manual for non-aviation products. The responsibility of ensuring proper quality control in various terminals/ installations and depots etc., rests with Operations Department of the respective oil company.

## ***Motor Spirit and High Speed Diesel Order, 1990***

2.38 In exercise of powers conferred by Section 3 of Essential Commodities Act 1955, the Central Government has passed this Order. The Order extends

to the whole of India and its objective is to prevent malpractices in the supply and distribution of MS and HSD. For the purpose of the Order, adulteration, pilferage, stock variation, unauthorised exchange, unauthorised purchase and unauthorised sale are considered as acts of omission and commission in respect of Motor Spirit and High Speed Diesel.

## ISO Requirements

2.39 The main requirements for getting ISO – 9002 certification on the performances and working of a marketing terminal/ depot/ tap-off/ retail outlet with a total commitment on quality of services render to customers is driven by the following goals:

- a) To maintain internationally benchmarked Quality Management and Environment Management system.
- b) To maintain growth in marketing of products.
- c) To train all employees for products knowledge, right attitude and customer satisfaction and loyalty for improving image of the company.
- d) To organize oil conservation and quality awareness programs at regular intervals.
- e) To train employees and dealers for overall management and dealer's staff in customer service as well as to launch new products and schemes developed by the company.

2.40 The ISO certifying agency normally looks at the following aspects before certifying that the particular marketing terminal/ depots/ tap-off point/ retail outlet meets ISO 9002 requirements:

- (i) Specifications as to the responsibilities and authority of personnel as they apply to quality.
- (ii) Structures of the quality system, the various levels of documentation used and the indented use of each level of documentation.
- (iii) Whether the customer requirements are understood and reviewed prior to processing orders.
- (iv) Whether design control is ensured.

## Technical Aspects of Refining and Marketing Activities

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- (v) The control information that affects quality by ensuring whether the relevant documents, both internal and external, are reviewed and approved by authorized personnel prior to release, and whether all relevant personnel have access to pertinent issues and whether revisions receive the same level of authorization as the originals.
- (vi) Whether the company has established and maintained a system for ensuring that purchased items and services conform to specific requirements.
- (vii) Whether it is ensured that all customer supplied material and services are verified, stored and maintained.
- (viii) Whether the company has established and maintained a system for identifying the product by suitable means.
- (ix) Whether the company has established and maintained a system for ensuring that activities are carried out under controlled conditions.
- (x) Whether the company has established and maintained a system for the inspection and testing, to ensure compliance with customer requirements.
- (xi) Whether the company has established and maintained a system to control, calibrate and maintain inspection, measuring and test equipments.
- (xii) Whether the company has implemented and maintained a system for indicating the inspection status of goods.
- (xiii) Whether the company has ensured that goods or services containing any non conformity to specification are promptly identified, documented and auctioned in accordance with company procedure.
- (xiv) Whether the company has established and maintained a system for implementing corrective and preventive action to eliminate the causes of actual or potential non conformity.
- (xv) Whether the company has implemented and maintained a system for the handling, storage, packaging, preservation and delivery.
- (xvi) Whether the company has established and maintained a system for

identification, collection, indexing, filing, storage and disposition of quality records.

- (xvii) Whether the company has established and maintained a system for planning and implementing internal quality audits.
- (xviii) Whether the companies has established and maintained a system for identifying training needs and provide for the training to all personnel performing activities affecting quality.
- (xix) Whether the company has established a servicing system.
- (xx) Whether the company has established and maintained a system for applying statistical techniques a basis for the assurance and Control of Quality.

2.41 The above requirements have to be complied with, by the Marketing terminal/ depot/ tap-off off point/ retail outlet as it pertain to the area of operations, for getting ISO – 9002 Certification.

### **Marketing Discipline Guidelines (MDGs)**

2.42 The Marketing Discipline Guidelines are formulated by the Ministry of Petroleum and Natural Gas and all the marketing activities of the oil companies are governed by these Guidelines. The basic objective of the Marketing Discipline Guidelines is to protect the ultimate customers' interests, so that they get the full value for their money in terms of correct price, quantity and quality. The Guidelines deal with the following:

- I. Handling of MS/HSD/SKO at the oil company's storage point such as depots, terminals and installations.
- II. Handling of products at retail outlets by dealers.
- III. Maintenance of company equipment at retail outlets.
- IV. Inspection of retail outlets/SKO dealerships.
- V. Prevention of adulteration at retail outlets - checks/actions to be taken.
- VI. Prevention of malpractices/irregularities at retail outlets.
- VII. Prevention of malpractices/irregularities at SKO/LDO dealerships.



## Transport Discipline Guidelines

2.43 The purpose of these guidelines is to ensure that:

- a. petroleum products are delivered in tank trucks in accordance with quality control manual for non aviation products as per specifications;
- b. petroleum products are transported and delivered to dealers/ customers and other storage points in good condition confirming to the specification; and
- c. a well defined system of checks exists at various stages of handling of petroleum products.

Under the transport agreement with the company the transporter are responsible for offering fit tank lorry to carry petroleum products and transporting/ delivering the same in good condition, as per specifications to the dealers/ customers, other storage points and are held accountable for any malpractice/ adulteration *enroute*.

## Types of Markets

### Retail Market Classification

2.44 This is mainly to identify the class of market in which an outlet has been set up.

*"A" Class Market* – Metropolitan cities and other cities having a population over 8 lakh as per the 2001 census.

*"B" Class Market* – Cities having a population below 8 lakh as per the 2001 census excluding North Eastern States, Himachal Pradesh, Jammu and Kashmir and Uttarakhand.

*"C" Class Market* – All other towns/ cities not covered under "A", "B" and "E" markets excluding locations on National/ State Highways.

*"D" Class Market* – Retail outlets on National/ State Highways.

*"E" Class Market* – Remote areas not covered by National/ State Highways and pockets of consumptions having no retail outlet within 10 KMs radius and to cater to the requirements of the agriculturalists etc., in the remote areas i.e., areas which are not on National/ State Highways, North Eastern

States, Himachal Pradesh, Jammu and Kashmir, Lakshadweep and Uttarakhand.

### **Types of Distribution Channels**

2.45 There are two channels of marketing in selling of petroleum products, one, retail and second, direct. The retail channel comprises the following three:

- (a) Retail outlets for MS, HSD, Lubricants, Greases. Under the category, the following types of retail outlets are further identified:
  - "A" site – which are Company owned and company controlled.
  - "B" site – which are Dealer owned and company controlled.
  - "C" site – which are Dealer owned and Dealer controlled.
- (b) Utility pumps for HSD.
- (c) Agency for Kerosene, LDO, Lubricants/ Greases.

## Chapter 3

# Internal Audit of Refining Activities

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3.1 The objective of internal auditing is to assist members of management at all levels in the effective discharge of their responsibilities by furnishing them with analysis, constructive appraisals, recommendations and pertinent comments concerning the activities reviewed.

3.2 Management is a process by which the affairs of an enterprise are conducted in such a manner that its goals and objectives are attained through optimum utilization of all available resources, within the legal, social, economic and environmental constraints. To achieve optimum utilization of resources, the management should determine the goals and objectives of the concern, quantify them to the extent possible, develop major policies and plans, implement them and exercise control over such implementation. The internal auditor should constantly review each of the aforesaid managerial functions. Hence, the scope of internal audit covers the following:

- Appraising the reliability and integrity of financial and operating information by evaluating the means developed by management to identify, classify, measure and report such information.
- Appraising the systems, management has established to ensure compliance with policies, plans, procedures, laws and regulations that could have a significant impact on operations and reports.
- Appraising the means, management has established to safeguard assets, and, as appropriate, verifying the existence of such assets.
- Appraising the systems, management has established to ensure economical and efficient use of resources.
- Appraising the systems, management has established to ensure results are consistent with established objectives/ goals and operations or programs are carried out as planned.

## **Crude**

3.3 Crude is the main input for producing refined petroleum products. Crude purchase may be indigenous or imported. The significant elements of the cost of the crude purchase includes the cost of crude, freight, customs duty, demurrage, wharfage or the port trust dues, ocean loss, other taxes and duties, insurance, etc.

### **Cost of Crude**

3.4 It includes the price paid for indigenous/ imported crude. FOB cost of imported crude is paid according to the rates as per Term/ Spot contract with the supplier. The FOB cost of indigenous crude is paid at the rates at par with international crude prices.

### **Freight**

3.5 Crude is generally transported through oil tankers of shipping companies and the freight is payable according to the terms of the contract of affreightment signed and entered into with the shipping companies.

### **Customs Duty**

3.6 Customs Duty is paid on imported crude at the prescribed tariff rate. In case there is bonded storage facility, duty is payable only at the time of removal of crude oil for processing/ refining.

### **Demurrage**

3.7 Demurrage refers to the compensation payable by the Refinery to the shipping company in case of any delay in unloading crude from the vessel, over and above the lay time as stipulated in the contract of affreightment. The holder of the Bill of Lading is required to pay demurrage at the agreed rate to the owner of the vessel.

### **Wharfage (Port Trust Dues)**

3.8 Wharfage on crude, both imported and indigenous unloaded at the port location, is payable as per respective Port Trust rate.

### **Ocean Loss**

3.9 This is applicable for both imported and indigenous crude. If ocean

loss in a voyage is more than the prescribed limit, a claim is lodged with the shipping company for the ocean loss.

### ***Other Taxes and Duties***

3.10 Cess, royalty and sales tax, if any, is payable on indigenous crude.

### **Insurance**

3.11 Insurance is arranged with insurance companies for an open insurance cover for crude oil shipments while in transit from foreign load points or coastal loading points till the crude oil is actually discharged at the refinery.

## **Internal Audit of Crude**

### ***Cost of Crude***

3.12 In respect of cost of crude, the internal auditor would verify:

- (i) Whether the crude purchase of imported/ indigenous crude is calculated as per the crude purchase agreement.
- (ii) Whether the quantity received as per the crude intake certificate corresponds with the surveyor's report.
- (iii) Whether in case the difference in the quantity loaded at the port of loading and the quantity received at the destination port is more than the specified limit, claim for transit loss (Ocean loss) is made with carrier as per the terms of the Chartered Party agreement.
- (iv) Whether the comparison of the on board quantity at the destination port with actual shore receipt has been made to ascertain the difference as a percentage of the Bill of Lading quantity. If the percentage so calculated is more than the specified limit, whether the carried quantity, if any, has been discharged in the next voyage or recovered from the carrier.
- (v) Whether the carrier has preferred protest notes with the supplier of the crude for huge difference between the gross Bill of Lading quantity and load port onboard quantity.
- (vi) Whether the difference is claimed from the supplier in case the supplier accepts the protest note.

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- (vii) The Entry Tax, handling and survey charges and their accounting.
- (viii) Whether in case of imported crude, payment is made for net Bill of Lading quantity.
- (ix) Whether there is an adequate system of monitoring the due dates for payment of crude purchase whether the same is functioning properly.
- (x) Whether the payment of cost of imported/ indigenous crude is made within due dates.
- (xi) Whether correct exchange rate has been adopted while utilising the buyer's credit.
- (xii) Whether correct exchange rate have been adopted for imported crude.

***Freight***

3.13 In respect of freight, the internal auditor would:

- (i) Examine the arrangements as regards transportation of crude based on terms of the purchase contract like FOB, Cand F, Time Chartered Vessel to verify whether the payment of freight made to shipping company is as per the contract of agreement signed and entered.
- (ii) Verify whether overage benefit in freight has been availed.
- (iii) Verify whether lighterage dues have been properly computed for C and F vessels and Chartered Vessels.
- (iv) Verify whether the dead weight freight paid is as per terms of agreement.
- (v) Verify computation of address commission and commission payable to private/ Government agencies.
- (vi) Verify whether the payment is made within stipulated time.
- (vii) Verify whether the exchange rate adopted for calculation of freight is as per the chartered party agreement for the Voyage.
- (viii) Verify whether provision for liability has been made for the amount due at the end of financial year.

- (ix) Verify accounting treatment for the above in annual account closing.

### ***Insurance***

3.14 While auditing the insurance aspect, the internal auditor would:

- (i) Verify whether the provisional tanker details are intimated to the insurance company before the actual loading takes place as per the terms of the marine open declaration policy.
- (ii) Verify the calculation of insurance premium with regard to the FOB quantity, freight and insurance and rate of insurance.
- (iii) Verify whether the insurance certificate is received for each Voyage.
- (iv) Verify whether the provisional amount deposited with the insurance company is adjusted against the final payment towards the Voyage and the balance is carried forward for adjustment in the subsequent payments.
- (v) Verify whether sufficient balance is maintained with the insurance company to ensure that the crude in transit is always covered.
- (vi) Verify that appropriate policies to be covered for employee's mediclaim, group accident cover; public liability cover and transit cover for incoming and outgoing cargos.
- (vii) Verify whether any no-claim bonus in case of nil – claim, has been accrued and if so, whether claimed in time. This is generally applicable in case of mega risk policies, since basic amount deductible in the policy claim is kept substantially high; hence the number of claim would normally be few or nil.

### ***Customs Duty***

3.15 While verifying customs duty, the internal auditor would verify whether:

- (i) Assessable value on the basis of which customs duty is paid has been calculated with regard to FOB cost, insurance, freight and landing charges.
- (ii) The rate of exchange notified by the customs authorities as on the

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date of filing of INTO Bond, is adopted for calculation of assessable value.

- (iii) The actual cost of crude paid is considered at the time of finalization of customs duty payments.
- (iv) The payment is made as per the customs duty rates applicable as on the date when the Ex-Bond is filed with the customs authorities.
- (v) The payment is made for crude processed on the basis of FIFO assumption.
- (vi) The sum of the quantity drawn for production as per the Ex-Bond filed on the various dates is equal to the quantity as per the crude intake certificate for each shipment.
- (vii) Proper distinction is made between indigenous crude and imported crude, as customs duty is applicable only for imported crude.
- (viii) A periodic reconciliation of "Current Account with Customs" as per the current account monthly statement given by customs authority and general ledger is done.

### ***Demurrage***

3.16 In respect of demurrage, the internal auditor would need to verify:

- (i) The exchange rate adopted for payment of demurrage is as per the chartered party agreement.
- (ii) The reasons and the calculation of excess hours for which demurrage payment is made from the shipping documents given by the carrier.
- (iii) Whether the payment is withheld if the carrier makes the claim after the stipulated period, as per the Chartered Party agreement.

### ***Wharfage***

3.17 In respect of wharfage, the internal auditor would verify whether:

- (i) The wharfage is paid for the gross quantity of crude discharged by the tanker as shown in the crude intake certificate.



- (ii) The rate is paid as per terms of MOU with port trust.
- (iii) The provisional amount deposited with port trust is adjusted against the final payment for each vessel.
- (iv) A periodic reconciliation of current account with port trust as per the current account monthly statements and general ledger is done.

### ***Clearing Agents and Surveyors***

3.18 Clearing agents are appointed to co-ordinate the process of compliance with the port trust and customs formalities. Surveyors prepare the survey report giving details of quantity of crude oil received, based on which the payment is effected. In this respect, the internal auditor would need to verify whether the payment made to clearing agents and surveyors are as per the terms of the contract and also whether the contract is renewed on expiry.

### ***Crude Oil Ledger***

3.19 Oil companies also maintain Crude Oil ledger showing the details of receipt of crude oil tanker wise and all components of crude cost. The internal auditor would need to verify the following information in the Ledger:

- (i) Whether the cost is maintained separately for imported and indigenous crude.
- (ii) Whether all the components of cost of crude like FOB cost, freight, customs duty, insurance, wharfage is entered properly.
- (iii) Whether the throughput as shown in COL is the same as the throughput shown in the monthly production statement.
- (iv) Whether the COL is maintained on FIFO basis.

### **Verification of other Aspects in Refining**

3.20 In addition to the above aspects, the refining process involves certain other significant processes/ aspects which need to be subjected to internal audit. These aspects include:

- (i) Licencing.

- (ii) Raw water facility.
- (iii) Bitumen drum fabrication
- (iv) Bitumen plant operation.
- (v) Oil movement and storage.
- (vi) Captive power plant activities.
- (vii) Maintenance.
- (viii) Shut down activities.
- (ix) Energy consumption.
- (x) Laboratories.
- (xi) Operations.

3.21 The internal auditor's procedures for verification of these aspects are discussed in the following paragraphs.

### **Licensing**

3.22 The internal auditor would need to verify the validity of the following licences:

- (i) Waste heat recovery boilers and fired boilers of captive power plant
- (ii) Explosive licences under Petroleum Act and Rules and Gas cylinder rules and SMPV rules.
- (iii) DGCA approval to store ATF under category D and E.
- (iv) Pollution Control Board Licence for air-consent, water consent, hazardous waste management licence.
- (v) For tanks under legal metrology.
- (vi) For storage of petroleum products.
- (vii) Factory licence including approval of plant.
- (viii) Weighbridge licence including plant approval.

- (ix) State sales tax registration and renewal.

### ***Raw Water Facility***

3.23 Broadly, following need to be seen by the internal auditor in respect of raw water facility.

- (i) Whether the required levies like right of way, insurance charges, raw water cess etc., have been paid.
- (ii) Whether the water pumped at the facility and water received at the refinery is being periodically monitored.
- (iii) Where the raw water facility is shared with other organisations, whether the water pumping costs and fixed costs that are required to be shared with hinterland organisations are being shared fully and recovered.

### ***Bitumen Drum Fabrication***

3.24 In respect of bitumen drum fabrication, the internal auditor would need to verify the following:

- (i) The related contract and the bank guarantees.
- (ii) Whether the fabricator has been issued steel coils beyond the bank guarantee limits.
- (iii) Any additional costs reimbursed to the fabricator and whether the same are as per the contract.
- (iv) Whether the insurance cover available at shop floor of the fabricator is sufficient to protect client's interest.
- (v) Whether the fabricator keeps stocks other than that of client. If so, how the distinction is being maintained physically.
- (vi) The results of physical verification of steel coils at fabricator and recovery action for shortage.
- (vii) The records for defective drums and lids and their replacement.
- (viii) Whether the fabricator is giving the correct number of drums for the

coils supplied. If not, whether he has made good the shortage, else recovery made from him.

- (ix) Whether there are any product losses due to drum leakage and if so, whether recovery action has been taken.

### ***Bitumen Plant Operation***

3.25 Bitumen is a category of organic liquids that are highly viscous, black, sticky and wholly soluble in carbon disulfide. Asphalt and tar are the most common forms of Bitumen. Bitumen in the form of asphalt is obtained by fractional distillation of crude oil. Bitumen being the heaviest and being the fraction with high boiling point, it appears as the bottom-most fraction. Bitumen is primarily used for paving roads. Its other uses are for the general water proofing products, including in the production of roofing felt and for sealing flat roofs. In a Bitumen plant, manufacture of Bitumen takes place as also filling of the Bitumen into drums for dispatch and sale. The internal auditor would need to verify the following aspects of bitumen plant operation:

- (i) Capacity utilisation, whether the same has been optimised.
- (ii) Fuel/ electricity etc. consumed *vis-a-vis* norms.
- (iii) Efficiency of operation as per the management's laid down norms.
- (iv) Idle time and reasons therefor.
- (v) Consumption of chemicals/ catalysts with laid down norms.
- (vi) Production planning *vs.* actual execution.
- (vii) Matching of production schedule with sales
- (viii) Reasons for off-spec production and remedial measures taken.
- (ix) Where there is manufacturers' guarantees are in place, verify whether the guaranteed outputs/ consumption etc., are matched.

### ***Oil Movement and Storage***

3.26 This activity is an offsite management facility, which deals with:

- (i) Entire stock accounting of crude oil.

- (ii) Analysing the stock loss on crude oil.
- (iii) Payment of statutory levies on crude oil.
- (iv) Verification of calibration of storage tanks.
- (v) Stock accounting of refined petroleum products.
- (vi) Payment of statutory levies on finished products.
- (vii) Sludge generation and disposal there off.
- (viii) Verifying fuel loss accounting.
- (ix) Verifying the actual production with the budgeted production.
- (x) Filing of returns of excise and customs duty with statutory authorities.

3.27 In respect of the oil movement and storage, the internal auditor would need to undertake the following procedures:

- (i) Verify water drainage from crude tank/ other tanks – production losses.
- (ii) Verify operation Loss (other than fuel and loss).
- (iii) Verify crude receipts.
- (iv) Analyse ocean loss – loading losses, transit losses, and unloading losses.
- (v) Verify surveyor's gauging for tanks.
- (vi) Verify production planning – crude composition Vs yield composition and RTP Vs demand forecast.
- (vii) Verify calibration chart of tankages and their validity.
- (viii) Verify flow meter reading *vis-à-vis* tank gauges for receipt/ despatches.
- (ix) Verify slop generation (dry-wet slop).
- (x) Verify sludge generation/ disposal record of sludge generation (in storage tanks).
- (xi) Verify list of contaminated products received/ treatment.

- (xii) Verify PLT losses – dispatch Vs receipt.
- (xiii) Verify dormant tanks loss (Refer RG1 and AR3As).
- (xiv) Verify inter tank transfer losses.
- (xv) Verify operation loss (export) from these tanks (loaded Vs received at ship).
- (xvi) Verify gauge tickets for serial no., signatures, dips in dip register, corrections, and cancellation.
- (xvii) Verify fuel and loss accounting.

3.28 Additionally, following aspects of the production planning are also required to be verified by internal audit:

- (i) Dip Stock Statement.
- (ii) Production Report-internal format.
- (iii) Daily deviation report.

### ***Captive Power Plant (CPP) Activities***

3.29 Captive power plant provides uninterrupted power and steam supply for running the pumps, compressors and other equipments. For meeting any emergency, alternative source of power supply from outside is also lined up. Super heated and saturated steam at various pressures is also supplied for process units and offsite area from this system. Steam is used for heating, stripping in columns, atomisation of fuel oil before burning in furnace, fire fighting, driving steam turbines and power operation. A steam turbine is a mechanical device that extracts thermal energy from pressurized steam and converts it into useful mechanical work. A Turbo generator is a Turbine directly connected to an electric generator for generation of electric power. Steam powered Turbo generators provide a majority of world's electricity and are also used by steam powered.

3.30 The procedures for internal audit of CPP activities would include:

- (i) Verification of capacity utilisation, whether optimized.
- (ii) Verification of fuel/ electricity etc., consumed *vis-a-vis* norms.

- (iii) Verifying the efficiency of operation as per the Management's laid down norms.
- (iv) Verifying the idle time and reasons therefore.
- (v) Verifying production planning Vs actual execution.
- (vi) Where there is manufacturers' guarantees are in place, verifying whether the guaranteed outputs/ consumption etc., are matched.

### ***Maintenance***

3.31 In a refinery there is an increased emphasis on sustaining high level of throughput and low level of down time. To achieve this it is necessary that the plant and equipment be maintained in good working order. Successful maintenance operations assist in maximizing efficiency and postponing or reducing future Capital expenditure. Maintenance can be preventive maintenance or corrective maintenance. The preventive maintenance refers to the efforts to avoid damages/ breakdown prior to the any noted damage or brake down. The corrective maintenance refers to efforts to rectify a breakdown or imminent breakdown of equipment in the Refinery.

3.32 The scope of internal audit in respect of the maintenance activity includes verification of:

- (i) Schedule of preventive maintenance.
- (ii) History cards of equipments – due date for maintenance.
- (iii) Segregation of equipments as per nature – critical/ non-critical.
- (iv) Monthly performance of rotating equipment.
- (v) Maintenance suggested by inspection department.
- (vi) Recommendations by annual internal safety audit *vis-à-vis* compliance thereof.
- (vii) Completion time Vs planned time.
- (viii) Actual cost Vs planned cost.
- (ix) Actual job done Vs planned scope.

- (x) Utilisation of cranes/ compressors – idling time.
- (xi) Idle equipment.
- (xii) Budget Vs actual expenses.

### **Shutdown Activities**

3.33 The throughput of major Refinery units declines as the catalyst becomes spent and the corrosion resulting from heat and minerals reduces product flows. Production overtime is closely monitored and plans are set to 'Turnaround' or "Shutdown and Overhaul" a unit. This requires a major effort on the part of the Refinery and has significant financial impacts in terms of both cost and short term loss of revenue. In a turnaround or shutdown and overhaul, the units are completely overhauled. Pumps are replaced, trays are repaired or replaced, and, in catalytic units, the catalyst is refurbished and replaced and all corrosion is removed. Major turnarounds or shutdowns are required to be performed on an annual or bi-annual basis.

3.34 Internal audit of the shut down activities involves verification/ analysis of the following aspects:

- (i) Periodicity of shutdown.
- (ii) Recommendations made by inspection for turn around *vis-à-vis* compliance.
- (iii) Unit-wise planned shut down duration *vis-à-vis* actual period and reasons for variations.
- (iv) Unit-wise records maintained during shutdown.
- (v) List of POs placed by maintenance for shutdown work.
- (vi) Utilisation of procured items as well as surplus generation.
- (vii) Local cash purchases in turnaround.
- (viii) Crane hiring Vs crane utilization at garage.
- (ix) Price for items purchased during shutdown *vis-à-vis* price for regular purchase.
- (x) Material received after shutdown.



- (xi) Budget Vs actual expenditure.
- (xii) Creation of fixed assets.

### ***Energy Consumption (Encon)***

3.35 Every refinery consumes fuel/ energy while refining the crude oil into refined products. Energy efficient processors/ equipment such as furnaces, pumps, exchanges are to be examined and monitored for optimum consumption of fuel/ energy. Continuous updation of energy consumption techniques for efficient utilization of fuel/energy is required.

3.36 The internal auditor's procedures in respect of audit of Encon include:

- (i) Verification of the records maintained for consumption of the fuels.
- (ii) Verification of the consumption of the fuel *vis-à-vis* the pattern and the reasons for higher consumption and remedy therefore.
- (iii) Verification of the reasons for the unidentified losses/ gains.
- (iv) Examining the abnormal variation in case of higher fuel and loss.
- (v) Verifying the envisaged benefits of the upcoming ENCON projects.
- (vi) Verifying the benefits of the completed ENCON projects.

### ***Laboratories***

3.37 After the crude oil is refined into the finished products and the products are taken to the product tanks, samples of the finished products are sent to the laboratory for testing. Once the product meets the quality specification as per BIS or customer requirement, then the certificate of quality is issued by the laboratory. Thereafter, the product is dispatched to market.

3.38 The following is an illustrative set of procedures for the internal audit of laboratories:

- (i) Verify quality control – testing as per specifications/ cancelled/ revised test reports.
- (ii) Verify time taken to release test reports.
- (iii) Verify treatment to off-spec batches.

- (iv) Verify monthly MIS/ statutory reports.
- (v) Verify whether the activities of R and D centre are in line with the proposal.
- (vi) Verify utilisation of all the equipment/ facilities.
- (vii) Verify idle facilities/ equipment.

## **Internal Audit of Operations**

3.39 Internal audit of the operations covers the following aspects of the refinery:

- (i) Crude distillation unit.
- (ii) Hydrocracker unit.
- (iii) Hydrogen unit.
- (iv) Gas oil hydro-desulphisation unit.
- (v) Visbreaker unit.
- (vi) Sulphur recovery unit.
- (vii) Consumption of chemicals and catalysts.

### ***Crude Distillation Unit***

3.40 This unit is used for distillation of crude oil which is carried out in the column and Gas oil, Kerosene and Heavy Naphtha are withdrawn as side draw-offs. The unit is based on the principle of fractional distillation as discussed earlier in the publication. Crude oil is separated into fractions by fraction distillation. The fractioning column is cooler at the top than at the bottom so the vapours can condense more easily while moving up the column. The heavier fractions that emerge from the bottom of the fractionating column are often broken up (cracked) to make more useful products.

### ***Hydrocracker Unit***

3.41 The purpose of Hydrocracker unit is to crack (split) crude oil into different types of products at different ranges of temperature. Hydrocracking

is a catalytic cracking (splitting) process. The products of this process are saturated hydrocarbons. Major products from hydro cracking are Jet Fuel, Diesel, relatively high octane rating gasoline fractions and LPG. All these products have a very low content of sulphur and contaminants.

### ***Hydrogen Unit***

3.42 The need of Hydrogen is increasing day by day for treating the products like Petrol (Motor Spirit), HSD, fuel oils and feeds for FCC (Fuel Catalytic Cracking) and other plants for bringing down the sulphur. The purpose of Hydrogen plant is to produce Hydrogen for meeting the requirement of various Hydro treatment process of crude oil. The feed for Hydrogen plant is Refinery fuel gas, saturated LPG, Natural Gas and light Naphtha.

### ***Gas Oil Hydro-Desulphurisation Unit***

3.43 The purpose of the unit is to remove Sulphur and Nitrogen, convert olefins/ aromatics<sup>1</sup> to saturated compounds; and remove contaminants like oxygenates and organometallic compounds. This unit is used for the production of extra low sulphur diesel with a sulphur content of less than 0.25 per cent, which results in positive environmental protection in the control of automotive emissions.

### ***Visbreaker Unit***

3.44 It is an operation that converts high viscosity Petroleum stocks to lower viscosity Petroleum stocks suitable as heavy fuel oil. Viscosity is a measure of resistance to flow and is an important parameter for desalting. It is also highly dependant on temperature. Higher viscosity crude needs high temperature for effective desalting. There is a limit for temperature in desalters operation. Viscosity is an important property for lube oils because it gives the lubricating property to the oil. This is required to prevent wear and tear in the moving parts of a machine on occurrence of metal to metal contact. For fuel oils, it gives flow properties which are needed for pump selection for transporting. The process of removing salts from crude oil is called desalting. These salts cause severe corrosion in crude refining units. The de-salters are designed for removal of 99 percent salt in crude oil. De-

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<sup>1</sup> Olefins/ Aromatics are unsaturated Hydrocarbons.

salters remove salts, sludge and mud from crude to avoid corrosion and fouling in exchangers' columns and down stream equipment.

3.45 A visbreaker is a chemical plant where thermal cracking in a furnace reactor (at high temperature) is used to transform heavy Hydro carbons (e.g., vacuum distillation residue) into lighter hydro carbons (LPG, Gasoline). Heavy hydro carbons are generally used as fuel oil in chemical plants. The product of the visbreaker has lower viscosity.

### ***Sulphur Recovery Unit***

3.46 Sulphur is a mixture of 'Sourness" and "Sweetness" of crude, sweet grades have less than 0.5 per cent of Sulphur whereas sour grades will have greater than 0.5 per cent of Sulphur. Sulphur, besides being corrosive to the fuel systems, is a pollutant to the air and affects life. Global efforts are being made to minimize the sulphur content in Petrol, High Speed Diesel and fuel oils. The objective of Sulphur recovery unit is to convert Hydrogen Sulphide ( $H_2S$ ) into elemental Sulphur. Sulphur recovery is required because of increasing demand for environmental friendly fuels, increased use of High Sulphur and heavier crudes in future as also tightening of emission of standards by government/ regulatory bodies.

3.47 Internal auditor's procedures in respect of the crude distillation unit, hydrocracker unit, hydrogen unit, gas oil hydro-desulphisation unit, vis breaker unit and sulphur recovery unit are more or less similar and include:

- (i) Verifying whether there is optimum capacity utilisation.
- (ii) Verifying fuel/electricity etc. consumption vis-a-vis norms.
- (iii) Verifying efficiency of operations as per the Management's laid down norms.
- (iv) Verifying idle time and reasons therefore.
- (v) Verifying consumption of chemicals/ catalysts with laid down norms.
- (vi) Reviewing production planning Vs actual execution.
- (vii) reviewing production schedule vis a vis sales

- (viii) Examining reasons for off-spec production and remedial measures taken.

Where there are manufacturers' guarantees in place, the internal auditor would verify whether the guaranteed outputs/ consumption etc., are matched.

### ***Consumption of Chemicals and Catalyst***

3.48 During the refining process of crude oil, various chemicals and catalysts are used. The purpose of chemicals is mainly to improve the quality of products so as to meet the desired specifications. Catalysts are used in various reformers and other secondary processing facilities. A catalyst is the substance that is introduced into the refining process, which initiates a chemical reaction that cracks (splits) the crude oil molecules into its components. Catalysts used in the refinery process are usually various metals including precious metals.

3.49 In respect of the consumption of chemicals and catalysts, the internal auditor would normally verify the following:

- (i) Inventory of chemical/ catalyst.
- (ii) Slow moving chemicals and verify their shelf lives.
- (iii) Status of temporary items/ regular items/obsolete items.
- (iv) Disposal of obsolete items.
- (v) Procurement of chemical/ catalyst Vs consumption.
- (vi) Issue Vs consumption.
- (vii) Consumption versus budget and consumption versus norms.
- (viii) Excess consumption of chemical catalyst.
- (ix) Catalyst replacement activity and disposal process of spent catalyst.
- (x) New catalyst procurement activity *vis-à-vis* the performance criteria adopted and the guarantees obtained.

## Chapter 4

# Internal Audit of Marketing Activities

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### Purchases

4.1 Marketing companies purchase the refined products from imports, own refinery/other marketing companies for the storage and distribution of products to the ultimate consumers. The purchase accounting between the Oil Companies is termed as Inter Oil Company transaction/ product exchange, which includes not only purchase of products, but also rendering storage assistance, by one company to another company. The product exchange, storage assistance and other hospitality arrangements are entered into between oil companies with a view to eliminate the avoidable cross-haul of products and reducing the strain in the transportation network and as well as to bring down the distribution cost.

### Quantity Determination

4.2 Quantity delivered by the refinery is determined in terms of KL at 15 degree centigrade by converting the dip reading into volume by using valid calibration charts issued by the CPWD. Where the products are to be billed in MT basis, the volume is to be converted into MT quantity by using the ASTM tables by duly applying the volume reduction factor and density.

### Oil Accounting Calculations

Purchase Transactions: Billing and Settlement is done at KL 15 deg C or MT as case may be.

Product/Sale accounting is maintained in selling unit i.e. at KL at Natural temperature or MT as case may be.

For the purpose of custody transfer of bulk petroleum oils, volumes and densities are stated at a fixed temperature or base temperature. Sixties degree fahrenheit (60 deg F) is used as base temperature worldwide. Volumes metered at temperatures other than base value are adjusted to base value by factor developed and tabulated in

petroleum measurement tables. These tables are expected to apply to crude petroleum regardless of source and to all normally liquid petroleum products derived therefrom.

If a quantity of oil is subjected to a change in temperature, its volume will increase as the temperature rises or decrease as the temperature falls. The volume change is proportional to the thermal coefficient of expansion of liquid, which varies with density (API gravity) and temperature. The correction factor of the effect of the temperature and pressure on a volume of liquid (CTPL) is called volume correction factor (VCF). The function of this correction factor is to adjust volume of liquid at observed temperature to its volume at a standard temperature. The most common standard temperature is 60 deg F or 15 deg C.

According to ASTM (American society for testing materials) are based on the procedure where a volume measured at given temperature is calculated to a volume at a standard temperature using volumetric correction. This corrected value is called standard volume. The mass of the product is obtained by multiplying the standard volume by the product density at standard temperature.

ASTM Tables: The correction factors are available in the following ASTM tables.

Table 53 A: Correction of observed densities to density at 15 deg C of crude oils

Table 54 A : Correction of volumes to 15 deg C against Density at 15 deg c for crude oils.

Table 53 B: Correction of observed densities to density at 15 deg C of Products.

Table 54 B: Correction of volumes to 15 deg C against Density at 15 deg c for products.

## **Types of Inter Company Transactions**

4.3 The inter oil company transactions (sourcing of products) among marketing oil companies normally take the following forms:

- Outright purchase/ sales.
- Hospitality assistance.
- Safe keeping assistance.
- Loan transaction.
- Decantation of Tank wagons.

### ***Outright Purchase/ Sale***

4.4 These transactions take place at the industry locations *viz.*, refinery supply points, pipeline tap off points and marketing company's terminals put up near a refinery. The produce is transferred from the seller to the buyer company, ordinarily, by means such as tank wagon (TW), tank trucks (TT), tank to tank transfer through pipelines, tanker or barge. It is also important for the internal auditor to understand that where such outright purchase takes place at the refinery, the costs involved in such transactions at the refinery include the refinery transfer point (RTP) or the import parity price (IPP), the excise duty, inland freight upto inland refinery from the nearest port, terminalling charges and other applicable taxes and statutory dues. If, however, the purchase takes place at a point other than the refinery then the freight upto the depot/ tap off or installation point from nearest port as well as the inventory carrying costs would also be included in the cost as mentioned afore.

### ***Hospitality Assistance***

4.5 Hospitality arrangement envisages extending storage assistance by the company owning the facilities to another company who may or may not have storage facilities at that location. The hospitality assistance involves costs in terms of terminalling charges and the stock loss as per norms.

### ***Safe Keeping Assistance***

4.6 Safe keeping assistance can be rendered by a marketing oil company to another marketing oil company at negotiated terms at the assisting company's storage location at the port or upcountry installation. It can also be extended at depot location where assisted company's own storage facilities are inadequate to handle additional volume. Safe keeping assistance



also involves costs in terms of terminalling charges as well as stock loss as per norms.

### ***Loan Transactions***

4.7 Such transactions are entered into on spot basis to tide over the emergent situations of product shortage or slippage of the arrival of TT and TW. All loan transactions are repayable by the borrowing company from out of the subsequent purchases by it.

### ***Decantation of Tank Wagon***

4.8 At times, tank wagon originally consigned to up-country location of a marketing oil company might be diverted or wrongly placed at the siding of other marketing companies or their bulk customers. Industry has in place a procedure to trace these transactions and to find out the original dispatch details. On ascertaining the original information of dispatches, the settlement of accounts between marketing oil companies is effected. Valuation of product decanted is based on the source of the product for TAIPP and destination for excise duty/ sales tax, freight and terminalling charges. Quantity received at the decanting location should be as per dispatch quantity. All transit losses should be borne by the decanting company. There should not be any under recovery for the original consignee company on any account.

## **Product Accounting**

4.9 All product accountings are done at 15OC. For products pumped in the local pipelines, accounting thereof is based on the following factors:

- (i) The actual quantities pumped from the mother tanks, in case of marketing terminals of one oil marketing company to Marketing terminals of other oil marketing companies.
- (ii) The actual quantity received in Marketing terminals tanks of one oil marketing company from the Refinery tanks of other oil marketing companies.
- (iii) Actual quantity pumped from the Refinery tank of one oil marketing company to Refinery tanks of other oil marketing companies.
- (iv) In case of coastal movement, the billable quantity is determined on the basis of quantity of products delivered as measured in the shore

storage tanks at the loading location. In case of import of product, all import related cost, including ocean losses, is normally shared in the ratio of quantity received by each party.

- (v) Products directly purchased and moved on account of purchasing party through cross country pipeline, quantity pumped in pipeline on account of Purchasing company will be delivered at destination.

### ***Settlements***

4.10 Inter oil company transactions take place reciprocally (i.e., purchase and sale of petroleum products takes place between the marketing oil companies at different locations simultaneously). Hence, to avoid multi-point settlement work, a centralised net settlement system has been established by the oil industry. These centralized settlements take place every month. Local Sales tax payable on sales/ purchase transaction, if any, is paid by the assisted company to assisting company on the due date of payment as per the applicable sales tax law. Monthly settlements among the companies are based only on Joint Certificates (JCs). Separate JCs are prepared for the current month and for prior period transactions. Based on the JCs, monthly billings for all elements of price, duty, freight, taxes and other charges are exchanged and final settlement thereof effected. Payment for the terminalling charges is made on a monthly basis on receipt of the claims from an oil marketing company. Cost of coastal tanker movements including ocean losses and other associated costs incurred as per ILP are shared by the oil marketing companies. It should be, however, noted that in case of oil companies marketing their own refined products, the above purchase accounting would not apply.

4.11 The internal auditor needs to verify the following aspects of purchase accounting:

- (i) The type of inter company transaction made.
- (ii) Whether the elements of purchases are recorded as per the type of inter company transactions.
- (iii) Whether the product accounting are done as per paragraph 4.09.
- (iv) Whether the quantity billed is as per the joint certificate

- (v) Whether TAIPP price as prevalent at the time of despatch has been charged.
- (vi) Whether Excise Duty at prevailing rate as on the date of despatch has been charged.
- (vii) Whether relevant Railway Freight/ Siding/ Coastal Freight/ Pipeline Freight has been paid.
- (viii) Whether relevant inventory holding charges/installation charges are paid as per the MoU with other companies.
- (ix) Whether the product despatched from the loading base has been received at the receiving location and look into the same if not received.
- (x) Whether other amounts paid are in line with MoU between the Companies.
- (xi) Whether the payments are made as per payment terms specified in the MoU between the companies.

## Sales Accounting

4.12 After producing different products from crude, the Refinery undertakes sale of products through the marketing companies/ units or directly to the customers. The sales may take place in the form of Sales to marketing companies/ units in respect of mass consumption products like MS, HSD, SKO (D), LPG (D), ATF, in line with marketing arrangement and also other petroleum products or direct sale by refinery in respect of LDO, FO, LSHS, Naphtha, LPG (B), Base Oil (for Lube manufacturing), Wax, Bitumen, Hexane, Propylene, Hydrogen and other industrial petroleum products. The transfer of product takes place by way of coastal tanker, pipeline, rail wagon, tank lorries and trucks.

4.13 A Product Outturn Certificate (POC) is the basis of preparation of invoice for sale of petroleum products. This certificate indicates opening and closing dip measurement of oil and water, temperature, density, volume correction factor and gross oil, free water, net oil at observed temperature, net oil at 15OC in volume and weight and quantity of oil transferred worked out after applying volume correction factor.

4.14 Sales are affected through a supply distribution network comprising of installation, despatch unit, depots, LPG bottling plant, from where the products are sold to dealers, distributors as well as direct consumers. Products are sold either directly to the consumers or through a network of dealers. In case of bulk purchasers, deliveries are affected through pipeline or through other modes of transport. In case of MS and HSD the sales are affected through Retail Pump Outlet (RPO), which are either operated by dealers appointed by the Company or by the companies themselves. The prices chargeable to Retail Outlet Dealer/ Direct Consumer are intimated to respective Depots/ Installation on a regular basis and as and when there is a change in the prices. The sales invoice package is installed at the Depot/ Installation for raising the invoices and receiving the payments thereof. The sales invoice is raised from the supplying location like Depot/ Installation and payments are collected at the location itself. In case of sales to dealers, the payment is against supply of products. In other words, the sales are on "Cash and Carry" basis. Since the amount is collected immediately on sale of products, there are no debtors in this case. However, Government consumers and certain major consumers are extended credit facilities.

### *Types of Sales*

4.15 Sale of finished petroleum products falls into two categories – retail and industrial/ direct consumers. The following table gives the details of product, type of sale, type/ mode of payment:

Product	Type of Sale	Type/ Mode Of Payment	Remarks
MS	Retail/ Credit	Advance Payment/ Payment against Supply / Extension of credit	For sales through Retail Pump Outlets only.
HSD	Retail/Industrial/ Direct Customers	Advance Payment/ Payment against Supply/ Advance Payment/ Payment Against Supply/Extension of Credit.	
SKO	PDS	Advance Payment/ Payment against Supply	This kerosene is doped with Blue Dye for PDS
SKO (I)	Industrial/ Direct Customers	Advance Payment/ Payment against supply/Extension of Credit.	

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Product	Type of Sale	Type/ Mode Of Payment	Remarks
LDO/FO/ Naphtha/ LSHS/ Bitumen	Industrial/ Direct Customers	Advance Payment/ Payment against supply/ Extension of credit	
LPG	Domestic	Advance payment/Payment against supply	
LPG	Industrial/ Direct Customers	Advance payment/ Payment against supply/ Extension of credit	
ATF	Aviation Sector	Advance payment/ Payment against supply/ Extension of credit	
Other Heavy Crude of Petroleum Products	Industrial/ DirectCustomers	Advance payment/ payment against supply / Extension of credit.	
Base Oil	Industrial/ DirectCustomers	Advance payment/ payment against supply/ Extension of credit.	

Payment Modes: Payments are received by way of 1. Cheque, 2. Demand draft/Pay order, 3. RTGS (Real time Gross settlement), 4. NEFT (National Electronic Fund transfer) and 5. Internet transfers.

4.16 The internal auditor's procedures with regard to the sales accounting would include:

- (a) Verifying the type of sales affected, whether cash or credit and Retail or Direct Customer.
- (b) Verifying that the appropriate price is charged to each customer/ dealer, as applicable to them depending on the delivery point.
- (c) Verifying, in case of credit sales, that proper approval has been given by the competent authority, as per Credit Policy, after appropriately evaluating the credit worthiness of the Customer/ Dealer.
- (d) Verifying that price change, whenever it occurs, is properly billed to Customer/ Dealers and accounted for.

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- (e) Verifying that each Customer/ Dealer is paying the invoice amount through such mode of payment (as approved by the competent authority).
- (f) Verifying the age-wise analysis of debtors on regular basis.
- (g) Verifying that the discounts/ rebates charged to customers/ dealers are as per the rates approved by the competent authority, as applicable to each customer/ dealer or category of customers/ dealers.
- (h) Verifying that short-payments are received from the customers/ dealers within a reasonable time.
- (i) Whether a periodic report of customer dues, invoice wise taken and analysed for overdue payment.
- (j) Whether periodic reconciliation of customer balances is done.
- (k) Whether 'balance confirmations' are obtained from customers.
- (l) Verifying that outstanding dues are collected as per due dates and in case of collection beyond due dates, interest and penalty, in case the sales contract so provides, are collected.
- (m) Verifying that the appropriate sales tax rates are applied and necessary concession forms in respect of Sales Tax are collected.
- (n) Verifying that appropriate concessional excise duty rates are applied and the necessary concessional forms in respect of Excise Duty collected.

4.17 In respect of the export sales, the internal auditor would need to verify the following:

- Advance Licenses/ Duty drawback and utilisation of same.
- Duty free replenishment certificates.
- Liabilities provided and the end of the accounting year towards the above.

### ***Sales Tax***

4.18 Sales Tax is paid to respective State authorities on or before the due

date on the basis of tax register generated on a monthly basis. The monthly returns are filed along with the payment made every month. In addition, an annual return is also filed before the prescribed dates. Yearly assessment is taken up immediately after the close of the yearly account and completed at the earliest.

4.19 In respect of the sales tax, the procedures of the internal auditor would include verification of the following:

- (i) Whether the monthly turnover as per the books reconciles with the turnover as per monthly sales tax return.
- (ii) Whether sales tax return is filed with sales tax authorities within due dates.
- (iii) Whether the approval of competent authority has been taken for charging concessional sales tax to customers.
- (iv) Whether the concessional forms are filed with sales tax authorities along with monthly returns.
- (v) Whether the applicable taxes are charged to customers
- (vi) Whether the revision in tax rates are applied from the due date.
- (vii) Whether in addition to monthly returns, annual returns are filed with sales tax authorities.
- (viii) that in the case of any disputes in sales tax demanded by tax authorities, whether necessary appeal is filed with Appellate Authority and are shown as Contingent Liabilities.

### ***Value Added Tax (VAT)***

4.20 The Value Added Tax (VAT) concept has been adopted by all the States Sales Authorities. The concept of Value Added Tax is that at each stage of sale of goods/ products, the subject goods/ products will be taxed at the applicable VAT rate. The reseller of the goods will be entitled to get a set off of the tax paid on purchase of goods against the sales tax payable on resale of goods. With the introduction of VAT, multiplicity of taxes levied by State Sales Tax Authorities like Turn over tax, surcharge on sales tax, additional surcharge are abolished.

4.21 In respect of VAT, the internal auditor would examine the following aspects:

- (i) That VAT registration has been applied and obtained the registration number.
- (ii) That Input Tax Credit has been availed in case of purchase of products/ goods which are eligible for Input Tax Credit.
- (iii) The list of products/ goods which are eligible for Input Tax Credit.
- (iv) That Tax payer Identification Number (TIN) has been shown in all invoices.
- (v) That Returns to be filed monthly/ quarterly as specified in the State VAT Act/ Rules are complied with.
- (vi) That VAT rates are applied at applicable rates
- (vii) That the VAT payable on sale of goods are paid after set off of the Input Tax on purchases of goods and paid to authorities as per due dates.
- (viii) That Self Assessment returns are filed as per the VAT Act.
- (ix) Whether there is any demand for tax/ penalty from VAT authorities for non payment of VAT tax with in due dates and for non filing of returns with in due dates.

### ***Excise Duty***

4.22 Excise Duty becomes due as soon as manufacture of a product is completed. Accordingly, after refining of crude oil is completed, duty has to be paid on all products at the applicable rates. The duty is charged at the time of removal of products from refinery. While verifying the excise duty, the internal auditor would need to verify:

- (i) Whether excise returns are filed with department within the stipulated time as per the Act.
- (ii) Whether the Cenvat credit available for a particular month is set off against excise duty payable, to arrive at the balance amount payable to excise department.



- (iii) The action taken in case of show cause notices received from the excise department.
- (iv) Whether the product list is periodically filed with Excise department as and when there are changes in the same.
- (v) Whether there are instances where the excise duty is collected from the customers but the same has not been remitted to excise authorities.
- (vi) Whether there is any disputable duty demanded by the excise authorities, if yes, then whether in that case appeal is filed with the appellate authorities and are shown as Contingent Liability.
- (vii) Whether there is a list maintained classifying various items as cenvatable or non-cenvatable so as to facilitate availing of Cenvat credit
- (viii) Whether the documents received are properly maintained in Cenvat Section to facilitate preference of claims and for further reference.
- (ix) The accounting of Cenvat claims, including the details of total Cenvat claimed, utilized and expunged and balances to be claimed.
- (x) Whether there is any time delay in preference of Cenvat claims.
- (xi) Whether RG23 Part C is prepared as required under Statute and the same is submitted to central excise before the due date for the respective month.

### **Collection Accounting**

4.23 Operations of an oil company are normally spread out throughout the length and breadth of the country, treasury activities being centralised at the corporate head quarters. As such, the sales proceeds are remitted to the head office, from all the selling points. Most of the major payments are handled at the head office. Consequently, the process of collection of funds at the up-country locations (Depots, Installation, LPG Bottling Plants) and its subsequent movement to head office assumes considerable importance.

It normally covers all the operations from the time the sale is affected till the monies are received and used. It commences from the point the instruments

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are lodged at the up-country locations and it covers the movement of the funds and ends with the ultimate use at head office. Collections are generally in the form of demand draft, pay order, cheques, electronic transfers, etc.

4.24 The internal auditor, while carrying out internal audit of the collection accounting aspect would need to look into the following:

- a) Whether the payment instruments are deposited in the designated bank on a daily basis at the product supply point.
- b) Whether the designated bank transfers the amount deposited on a daily basis, to the Main Collection Account at the Head/ Corporate Office, as per the agreement with the respective banks.
- c) Whether the bank charges collected by the bank are as per the agreement.
- d) Whether in case of delay of transfer of funds, the banks are paying interest for the delayed transfer, as per the agreement.
- e) Whether all the bank statements are received as on a regular basis.
- f) Whether monthly reconciliation of all the bank accounts is being done to find out the missing credits to be given by banks.
- g) The correspondence with the banks for getting missing credits.
- h) The control measures adopted over the dishonoured instruments and subsequent receipt of amount together with interest and penalty.
- i) Age-wise analysis of amounts not credited by the bank.

### ***Sales Tax***

4.25 Sales tax collected on sale of products are paid to the respective State authorities on monthly basis depending on due dates of respective tax authorities. The payment of sales tax is based on the sale tax summary obtained on monthly basis from sales accounting. The internal auditor's procedures in this regard would be similar to those in paragraph 4.19.

### ***Value Added Tax (VAT)***

4.26 The concept of VAT and the internal auditor's procedures in that regard has been discussed in paragraphs 4.20 and 4.21.

### ***Excise Duty***

4.27 Excise duty is payable on the products only when the products received from the refinery are under bonded movements. In other words, duty is payable when the refinery transfers the products to marketing terminal/ installation/ depot under Bond without payment of duty.

4.28 The areas to be covered by the internal auditor in this regard include:

- (a) Verifying whether duties have been paid at the applicable rates.
- (b) Verifying whether assessable values have been properly ascertained.
- (c) Verifying whether duties have been debited to PLA Register on the due date only i.e., 5th of the following month for the previous month removals.
- (d) Verifying whether RG1 Register is kept up to date with all the information.
- (e) Verifying whether re-warehousing of AR3As for bonded movements have been done within permissible time limit.
- (f) Verifying that monthly returns are filed in time.
- (g) Verifying that the condonable limit of storage/handling/in transit losses as per Excise Act have been availed, were applicable.
- (h) Verifying whether all the show-cause notices have been replied within a reasonable time and proper action taken thereon.
- (i) Verifying issue of invoices subjectable to cenvat.
- (j) verifying the availment of cenvat on raw materials, base oils and additives (for Lube Plants).
- (k) Verifying that in case demand raised by authorities is not accepted, appeals have been filed with appellate authorities and shown as contingent liability.

## Service Tax

4.29 Service tax is levied on the services rendered by a person. The person who collects the service tax has to remit the tax to Government of India within the due dates specified for remittance.

Service tax is administered by Central Indirect taxes department i.e. Excise department.

Registration: A person providing taxable service is liable to pay service tax in terms of Section 68. Every person who is liable to pay service tax has to apply for Registration with Superintendent of Central Excise.

In the oil industry, oil companies are liable to pay the service tax on the services rendered by them mainly collection of SSLF (Service Station Licence Fees) from Retail outlet dealers. SSLF are collected by oil companies towards provision of Pumps and tanks to the Retail Outlet.

Another service rendered by oil companies is collection of Terminalling Charged from other oil companies. Terminalling charges are collected for handling of petroleum products on behalf of other oil companies.

Oil companies are liable to collect service tax on SSLF and Terminalling charges and pay to service tax department on due dates.

Oil companies are incurring service tax on the services provided to them by service providers.

Service tax rules provides for taking the input tax credit of service tax paid on the services received and same may be adjusted against the payment of service tax paid on output services or against the payment of excise duty.

Where one unit of a company has paid service tax on the services received at the respective location and the unit is not able to adjust the input service tax paid against the output tax as the unit is not rendering output service which is liable to service tax. In that case the unit can distribute the service tax paid on the services received to another unit of the company where that unit is paying service tax on the output service rendered or paying excise duty on manufacture of goods.

In the above case input service tax distributor (ISD) has to get register himself register for ISD registration and distribute the input service tax to another unit.

### **Internal Audit of Transactions**

1. To verify that the all units of company has to be registered itself with service tax Department wherever applicable
2. To verify that the service taxes are paid within due dates as per the act
3. To verify that returns as per the act are filed in time.
4. To verify whether the units have incurred interest, for late payment of service tax.
5. To verify whether the units have availed input service tax credit
6. To verify whether ISD registration has been obtained for distribution of input service tax credit to other units where it can be availed
7. To verify, in case where one unit is unable to avail the input service tax credit, whether it is passed on to the unit where it can be availed.

### ***Customs Duty***

4.30 Customs duty is payable when finished products are imported, for example, in case of shortage and also in case of shut down of refinery for maintenance.

4.31 The internal auditor's procedures in this regard would include:

- (a) Verifying INTO Bond BOE-Rate declaration quantity.
- (b) Verifying certification by surveyors/ CE authorities – receipts.
- (c) Verifying payment of duty (ex-bond) Vs actual clearance – delay and impact.
- (d) Verifying holding of customs product over a year in bond and filing for codonation, where required.

- (e) Verifying final BOE (scrutinised by authorities).
- (f) Verifying removal of Customs Product Vs Duty Payment.
- (g) Verifying the terms and conditions of the contract with the clearing and forwarding agents, if any.
- (h) Verifying the ocean losses analysis and claim status.
- (i) Verifying review of other payments to Port, Customs, etc.
- (j) Verifying that where in case demand raised by authorities are not accepted, appeals are filed with appellate authorities and are shown as Contingent Liability.
- (k) Verifying the extent of duty paid stocks held and funds blocked over and above consumption requirement.

## **Stock Accounting**

4.32 A sound stock accounting system enables timely preparation of Balance Sheet and Profit and Loss Account, submission of accurate monthly statements in a timely manner to bank(s) for hypothecation of goods where necessary, submission of accurate monthly returns in a timely manner to insurance company under Declaration Policy, accurate assessment of adventitious gains/ losses on account of changes in ex- Refinery price/ Excise Duty/ Freight, follow up of consignment in transit and prefer timely claim on Railways/ Transport contractors, maintenance of records as stipulated by the Excise authorities, and last, but not the least, managerial control for optimizing profit.

4.33 Since the sales are affected from Depot/ Terminal, all the products are stored at the storage tanks kept at Depot/ Terminal. Stock Accounting is done separately for Bonded and Duty paid stocks, Bulk and Packed stocks and products and packages. Each stock location maintains stock records giving details of:

- (a) Opening stock.
- (b) Receipts, Transfers, purchases – local and imported.
- (c) Operating gains/ transit gains.

- (d) Inter tank product movement receipts.
- (e) Total of receipts side.
- (f) Sales.
- (g) Transfers to other locations/ other companies.
- (h) Inter tank product movement issues.
- (i) Transit loss/ Operating loss/ Accident and other losses.
- (j) Own issues, issues for manufacturing/ blending/ samples.
- (k) Total of issues.
- (l) Closing stock.

Each location sends the monthly summary of the stock report to the regional/ head office for the ultimate accounting of the stocks.

### ***Physical Verification of Stocks***

4.34 Physical stock of crude and finished petroleum products is calculated by taking dip measurement of each tank. The measurement of dip is referred to calibration chart of each tank to find out the volume of the product. The calibration chart, which is certified by CPWD contains the details of volume of the products corresponding to dip measurement. The quantity ascertained by physical measurement is verified with books stock to find out actual loss/ gain on daily basis.

### ***Product Losses/ Gains***

4.35 The petroleum products are highly volatile products and susceptible to losses during transit, storage and handling and also due to variation in temperature. Transit losses or gains occur during transportation of products by way of pipelines, coastal tankers, tank wagons, by road (by tank lorries). The losses are minimal in case of transit through pipelines. Operating or handling losses/ gains occur when the storage tanks are operated for deliveries/ cleaning. During storage of products in tanks, loss/gain may arise due to evaporation/ temperature variation.

### ***Valuation of Stocks***

4.36 Stocks are valued at cost or net realisable value, whichever is lower. The cost is determined as under:

At Refinery:

Crude oil valuation: It is valued by comparing the Actual cost and the replacement cost, considering the realisable value. The methodology is summarised below:

When replacement cost of crude oil is more than the actual cost valuation of crude oil, Valuation done at actual cost.

Where replacement cost of crude oil is less than the actual cost valuation is to done on the following basis.

If the realisable value (of products to be generated out of the crude in stock) is more than the cost of crude oil, valuation to be done at actual cost.

If the realisable value is less than the cost of crude oil, valuation to be done at replacement actual cost.

The actual landed cost crude oil inventory (including crude oil in transit) shall be worked out on weighted average basis.

**Intermediate stock or work in process:** It is valued at lower of its cost or realisable value.

**Finished goods:** They are valued at cost determined on weighted average basis or net realisable value, whichever is lower. Cost of finished products internally produced is determined on crude stock reckoned on weighted average basis and processing cost.

#### **At Marketing Locations**

**Finished products valuation:** They are valued at cost determined on FIFO basis or Net realisable value (NRV) whichever is lower.

Cost includes IPP/RTP +excise/customs duty+ freight, Wharfage and port charges + Terminalling charges paid on purchases+ taxes/Octroi paid on purchases + filling charges.



Computation of NRV: Applicable selling price (including subsidy in case of SKO/LPG) for respective Products minus(-) Discounts/ freight under recovery and irrecoverable taxes.

**Lubricants/Greases:** at Manufacturing cost i.e. Actual cost of production for individual grades of lubricants/ greases, the freight element, the actual blending cost, the actual packing cost and excise duty.

Base oil: At weighted average purchase cost

Additives: At weighted average purchase cost

**Products for own use samples /costs:**

At port locations: IPP/RTP + excise/customs duty + Terminalling charges

At Terminals/Depot: IPP/RTP + excise/customs duty + Terminalling charges + Freight for location.

***Recovery of Losses***

4.37 During the transportation of products from the Refinery to Installation/ Depot, if the transit losses are more than the normal percentage of loss, the same is normally recovered from the transporters like Coastal Tankers, Railways and Tank Lorry Contractors.

4.38 While examining the stock accounting aspect of the oil company, the internal auditor would look into the following areas:

- (i) Whether stock reports are received from the Supply/ Distribution locations on daily/ weekly/ fortnightly/ monthly basis, as the case may be.
- (ii) Whether various stocks are valued as per elements discussed above.
- (iii) Whether the stock/ product dispatched by the supply locations are received at receiving locations.
- (iv) Whether stocks are physically verified on a periodical basis.
- (v) Whether in case of movement of product by coastal tankers, tank wagon and tank trucks that stock in transit at the end of each month are subsequently received by the receiving locations.

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- (vi) Whether stocks/ products are valued as per the Accounting Standard (AS) 2, *Valuation of Inventories*, issued by ICAI.
- (vii) Whether various stock losses discussed above are within the normal norms of losses.
- (viii) Whether stocks at all locations are adequately insured.
- (ix) Whether monthly stock declarations are filed with the insurance company in order to avail stock declaration policy, thereby reducing the quantum of premium.
- (x) Whether losses to be recovered from various transporters like coastal tanks, railways and tank truck contractors are received on a regular basis.
- (xi) Whether an age-wise analysis of stock held, particularly lubricants and greases are periodically done.
- (xii) Whether slow moving and obsolete stocks/ products are identified and properly accounted for.

### ***Railway Claims***

4.39 Railways are an economic, convenient and reliable mode of transportation of petroleum products. The oil industry, therefore, normally uses tank wagons provided by the Indian Railways for transporting its bulk products. These tank wagons are calibrated by the Oil Industry on behalf of Central Tank Wagon Calibration Committee. Sometimes, tank wagons loaded at the loading location do not reach the receiving location due to various reasons. The consignor oil company can raise a claim in respect of credit for the products decanted wrongly by other Oil Company/ Railways or the value of the product for non-receipt of such wagon within a reasonable time. If any wagon is not received for more than a month, all efforts should be made to trace the wagon and to obtain necessary product credit or lodge claim on Railways for compensation as the case may be. Following are some of the situations under which claims are normally lodged with Railways:

- *Interception*: The product tank wagon, mostly with HSD, is intercepted by loco foremen of Railway for Railway's consumption at any of the stations *enroute* to the destination station. Although the Railways have got the consumer supply arrangement with oil companies, yet

at times, some of their locations likely to become dry due to delay in receipt of wagons despatched on Railway's account and the loco foremen may decide to pull out few wagons from the rack of wagons moving on the line and decant into their storage tanks.

- *Non-Delivery*: If any of the tank wagon in a rack is not received beyond three months and the same is not traceable, then a "Partial Delivery" certificate is obtained from the destination station for non-delivery of the tank wagons and claim lodged with Railways for compensation for the value of products contained in the wagons non-delivered.
- *Short Receipt* : Short receipt of the products arise due to:
  - Leakage of products due to defective/ tampered/ missing seals.
  - Transshipment of products *enroute* from the original tank wagons into some other tank wagons due to the original tank wagon becoming defective and declared sick.
  - Rail accidents and while salvaging the products from the wagons met with an accident and transshipped into some other wagon or tank truck for transportation to the nearest depot location.
- *Excess Freight*: Some times the freight charged are paid in excess due to application of wrong rate. Necessary documents with claim are lodged with Railways for refund of excess freight.

4.40 Notice for claim for compensation in respect of all claims is required to be lodged with the Railways within six months from the date of booking or date of the Railway Receipt. The claims lodged after six months period are declared as Time Barred claims. The following documents need to be furnished to the Regional Railways Officer for lodging the claim notice:

- Copy of Railway Receipt.
- Loading/ Despatch Advice or *Challan*.
- Joint Dip Measurement and Shortage certificate issued by the Railways in case of Short Delivery claim.

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- Partial Delivery or Non-delivery Certificate.
- Transshipment Certificate, if any.
- Laboratory Certificate, if any tests have been conducted.

4.40 For verifying the claims raised against the Railways, the internal auditor should:

- (a) Verify that stocks are reconciled on a periodical basis i.e., weekly, fortnightly and monthly basis to find out the non-receipt of products at receiving locations, after a reasonable time.
- (b) Verify that the claims lodged with railways are covered under any one or more of the situations mentioned above.
- (c) Verify that efforts are made to trace the non-receipt of products and obtaining necessary product credit or lodge claim on the Railways for compensation, as the case may be.
- (d) Verify that claims are lodged to the jurisdiction of respective Railway Zones.
- (e) Verify that claims are lodged with the Railways within six months from the date of loading or date of Railway Receipt, failing which the claims would become time barred.
- (f) Verify that claims are made in prescribed form separately since claim forms for non-delivery and claims for short receipt differ.
- (g) Verify the MIS maintained for recovery of claims.
- (h) Verify the necessary accounting entries made while loading the claim and after receipt of claim.
- (i) Verify that all the necessary documents required for lodging claim notice are filed with the Railways.
- (j) Verify the age-wise analysis of Railway claims.

## Chapter 5

# Internal Audit of Special Areas

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5.1 Operations in the oil refining and marketing companies are vast, comprising numerous and extremely complex processes. Effective internal audit in such companies requires an in depth technical knowledge of these processes. It is also necessary for the internal auditor to understand and devote specific attention to certain special areas in such companies, which have a lasting impact on the effective and efficient functioning of the company. The areas requiring special attention in the refinery are (i) standard and throughput production pattern; (ii) fuel consumption and loss; (iii) optimization of product mix; (iv) apportionment of joint costs; and (v) oil accounts. The aspects of marketing needing special attention of the internal auditor include (i) pricing of products; (ii) installation or terminals; and (iii) transportation. The following paragraphs provide a brief insight into internal audit of these critical areas.

### Refinery

#### Standard Throughput and Production Pattern

5.2 The fixing of standard throughput and standard product pattern of each refinery is important as it is at this level of throughput that the refinery gets full compensation for the cost incurred and capital investment. Any refinery processing less than the standard refinery throughput is likely to incur loss whereas a refinery processing more than the standard refinery throughput will get an extra margin. The internal auditor's procedures with regard to internal audit of standard throughput and production pattern would include verification of the following aspects:

- (a) Whether the standard throughput level has been fixed.
- (b) Whether a standard product pattern of the refinery is defined.
- (c) Whether the refinery achieves the standard throughput to get full compensation for the fixed cost and capital investment.

- (d) Whether the refinery achieves more than 100 percent of the standard throughput to get more margins.
- (e) Whether the actual yield is commensurate with the expected yield.
- (f) The trend of production in the last few years Vs ILP (Industry Logistic Plan).
- (g) ILP Vs actual upliftment.
- (h) Gross Refinery Margin (GRM).

### **Fuel Consumption and Loss**

5.3 Some crude oil is consumed as fuel and lost in the process of refining. The ceiling fixed for fuel consumption and loss in refineries is generally high, higher than even the actual figures. Thus, there is no deterrent against fixing higher percentage of fuel consumption and loss. Since both these factors ultimately reduce the net availability of crude oil for refining, they should be minimised with reference to a given pattern of production to achieve the maximum efficiency.

5.4 Internal audit of fuel consumption involves verification of the following aspects:

- (a) Whether ceilings are fixed for fuel and loss are comparable with other refineries of similar nature.
- (b) Whether the actual loss is not more than the ceiling fixed.
- (c) Whether the quantum of consumption of crude oil as a fuel in the refining process is pre-defined.
- (d) Whether the actual consumption of crude oil as a fuel is not more than the ceiling fixed so that the net availability of crude oil for refining is maximised.

### **Optimisation of Product Mix**

5.5 The next aspect in oil and gas refining companies requiring special attention of the internal auditors is the optimisation of the product mix. The optimisation of the product mix is an operational parameter with fine tuning of temperature controls and cut points being used to produce excess quantity

of one product over another. The degree of automation in controls and the experience of control technicians would determine the operational efficiency on the product mix front. In addition to flexibility in determining the product mix, the ability to process various kinds of crude helps in exploiting the trading differentials between various grades of crude.

5.6 The internal auditor's procedures for examining the aspects related to optimisation of product mix include:

- (a) Verifying that there exists an operational parameter for fine tuning of temperature controls for production of a product to a desired extent.
- (b) Verifying the automation in controls and experience of control technicians to determine the operational efficiency on product mix front.
- (c) Verifying the flexibility in determining the product mix to maximise the efficiency and profitability.
- (d) Verifying the facility of processing of various grades of crude.
- (e) Verifying that the various utilities like water, steam, or power are optimally used.

### **Apportionment of Joint Cost**

5.7 The total cost of production of refinery is required to be allocated to individual products on a reasonable basis to determine the cost of production of each product. In petroleum refining the numerous units like distilling units, cracking units, alkylation and polymerisation plant are involved. Each of these units produces intermediate product streams, which require extensive reprocessing, heating and blending. The effect of these processing and successive stages multiplies the difficulty in allocating the joint cost of raw materials and processing charges to the refined products with any degree of reasonable accuracy. Even assuming that with difficulty the cost of different products can be worked out from the joint and common costs, the end results may not be in tune with market preferences for different petroleum products and their prevalent prices. Strict application of conventional process costing method will result in low cost for high value products, such as MS, Naphtha and ATF and comparatively higher cost for low value products, such as FO and bitumen.

5.8 Since all the final products come from the same raw material, the final products can be termed as joint products. Joint products may be defined as products which are by very nature of production process cannot be produced separately, and which have equal economic importance. The basic problem in respect of joint products is that of apportionment of the cost incurred upto the point of split off. Since all the processes are very complex and interlinked, it is very difficult to have any accurate method of apportionment and allocation of cost. Apportionment and allocation, is therefore, done by employing various joint costing methods available *viz.*,

- Physical measurement.
- Selling prices a separation point or after further processing.
- Marginal cost technique.
- Working back from sales to an estimated cost.

5.9 Normally, apportionment of joint cost to the final products by physical measurement or, alternatively, by selling prices at separation point, is adopted as method(s) for allocation of cost since the production of petroleum products involves various processes and produced from various types of crude, making it difficult to find out the number of processes a particular product undergoes before it is finally separated. In other words, till a particular products meets its specification, it has to go through several processes repeatedly which makes it difficult to find out the actual number of processes undergone and computation of cost thereof under process costing techniques.

5.10 Examination of the joint costs requires verification of the fact that:

- (a) All refining costs are collected and collated.
- (b) Apportionment of joint costs is done to know the cost of production of each product.
- (c) The methods used for allocation of joint costs can reasonably determine the cost of each product.

## **Oil Accounts**

5.11 This department is responsible for consolidation of dip readings in the Daily Dip Statement (DDS) based on dip memos, preparation of Daily



Transfer Sheet (DTS), Daily Production Statement (DPS), Excise returns, Crude Intake certificate, Product Outturn Certificate (POCs), Product Intake Certificate (PICs) and calculation of loss percentage based on information from technical services department and co-ordination with clearing agents for filing of INTO and EX bond with Customs authorities.

5.12 Internal auditor's procedures for verifying the oil accounts, normally include:

- (i) Verifying whether the POCs are prepared correctly based on the dip readings.
- (ii) Verifying whether the details of production and calculation of fuel and loss are proper.
- (iii) Verifying whether the reconciliation of opening of stock of crude processed, crude received and closing stock of crude is properly done.
- (iv) Verifying whether the details of production/ inter-tank transfer/ despatch as per the Daily Transfer Sheet (DTS) for the day matches with the difference between the closing dip as per the Daily Dip Statement (DDS) of the previous day with the closing dip as per the DDS for the day.
- (v) Examining the reconciliation of the closing and opening dip with the quantity of receipt/ despatch as per the dip memos received from the pump house i.e., whether the quantity of increase or decrease as per the dip memo is equal to the quantity of increase or decrease as shown in the dip statements/ DTS.
- (vi) Verifying whether the product-wise total of dispatches for a day as per the POC is equal to the dispatch as shown in the DTS for the day.
- (vii) Verifying whether the dip readings as per the automatic radar gauging system are comparable with the dip readings as per the dip memo.
- (viii) Verifying whether the dispatches as shown in the DTS are equal to the dispatch as shown in the Daily Production Statement (DPS).

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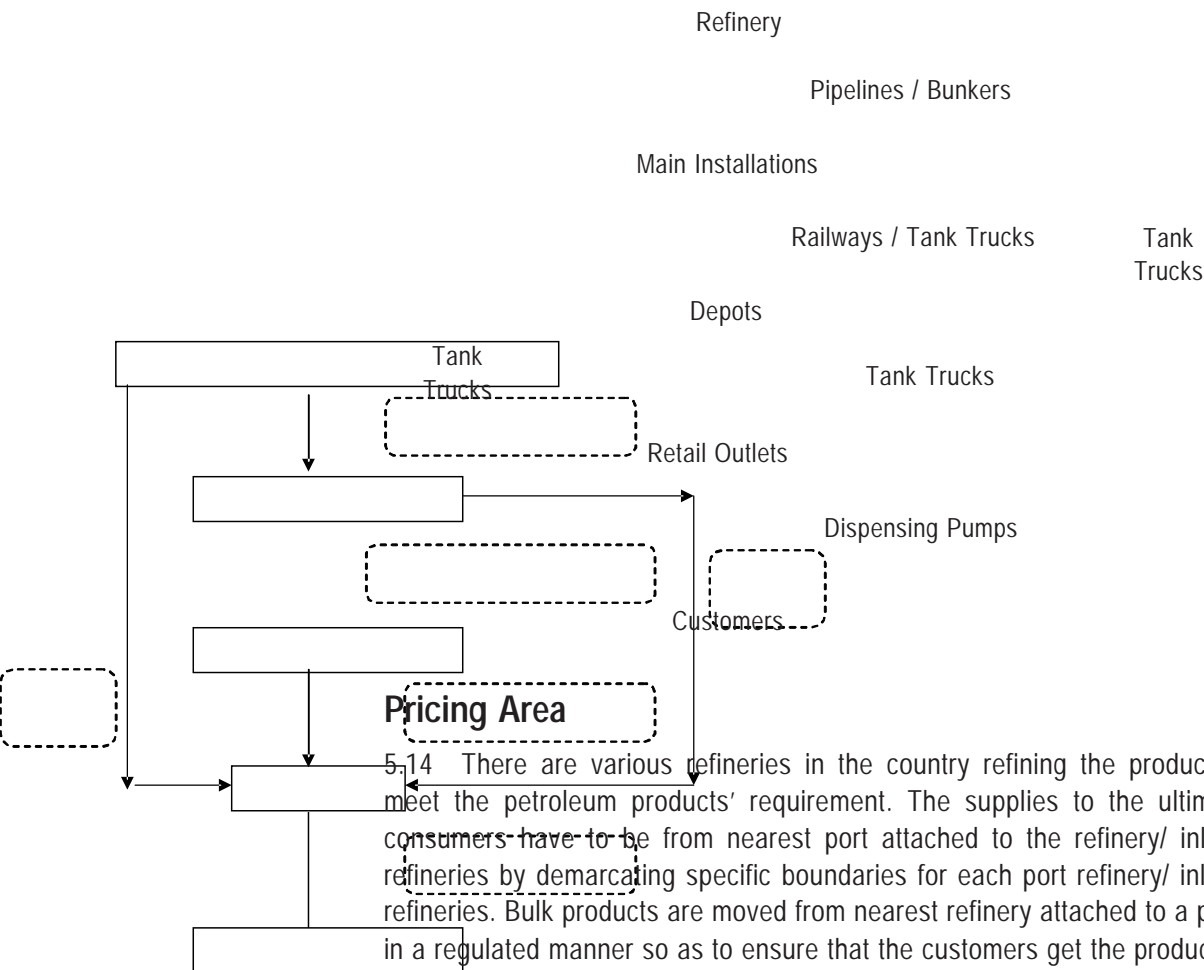
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- (ix) verifying whether the following details as recorded in the dip memos and the POC are the same:
  - (a) Tank number.
  - (b) Product description.
  - (c) Batch number.
  - (d) AR3A number.
  - (e) Installation to which the product is despatched.
  - (f) Pumping time – start time and stop time.
  - (g) Gross opening and closing dips of product and water level.
  - (h) Temperature etc.
- (x) Verifying whether the details of production, dispatch and receipt as shown in the excise return RT-12, AR3A forms, are in agreement with DTS, DPS and POC.
- (xi) Verifying whether there is any movement of product/ crude from tanks designated for maintenance.
- (xii) Verifying whether the dip memos are maintained in the order of the serial number.
- (xiii) Verifying whether in case of alterations of dip memos, they are cancelled and new dip memos prepared and the cancelled dip memos retained.
- (xiv) Verifying whether supplementary POCs are prepared in case of alterations of POCs.
- (xv) Verifying whether the actual production (total throughput and products produced) is comparable with the budgeted production estimates as given by Production Planning Department.

## Marketing Activity

### Pricing of Products

5.13 Selling prices are fixed with reference to nearest source of supply. The products are moved from refinery in a regulated manner so as to ensure that the customers get the product at the most economical cost, i.e., from the nearest source of supply by cheapest practical mode of transport. The product movement from refineries to customers as well as the mode of transports commonly employed is given below:



5.14 There are various refineries in the country refining the product to meet the petroleum products' requirement. The supplies to the ultimate consumers have to be from nearest port attached to the refinery/ inland refineries by demarcating specific boundaries for each port refinery/ inland refineries. Bulk products are moved from nearest refinery attached to a port, in a regulated manner so as to ensure that the customers get the product at the most economical cost i.e., from the nearest source of supply by the cheapest practical mode of transport. All the port refineries/ inland refineries are known as Primary Pricing Points. The oil industry computes the final

selling prices to be charged to the consumers taking into consideration the nearest primary pricing point (Port)/ secondary pricing point (inland location), irrespective of the actual source of supply. The general guiding principle for the above is that the price to the consumer should be cheapest from the pricing base. It may be noted here that for deciding the pricing base for retail outlet, the various alternate sources of supplies are considered. The price to consumer should be the cheapest being the guiding principle, the freight economics from various pricing points is considered for working out the RPO price.

### **Selling Prices**

5.15 The selling prices of petroleum products MS, HSD consist of the following elements:

- (a) Ex-refinery gate price/ Refinery Transfer Price (RTP)/ Import Parity Price (IPP).
- (b) Marketing cost plus margin.
- (c) Siding and shunting charges at MI.
- (d) Rail/ pipeline freight.
- (e) Siding and shunting charges at Depot.
- (f) State Specific Cost.
- (g) RPO charges/ RPO surcharges.
- (h) Excise duty.
- (i) FDZ delivery charges (at the rate of Rupees per kilo litre).
- (j) Delivery charges beyond FDZ (at the rate of Rupees per kilo litre per kilo metre).
- (k) Toll taxes.
- (l) Sales tax as applicable.
- (m) Dealers' commission.

- (n) Shrinkage allowance (in case of high altitude markets).
- (o) Rounding off differential.

5.16 The ceiling selling prices of petroleum products SKO – Public Distribution System consist of the following elements:

- (a) Ex-refinery gate price/ Refinery Transfer Price (RTP)/ Import Parity Price (IPP).
- (b) Marketing cost plus margin.
- (c) Siding and shunting charges at MI.
- (d) Rail/ pipeline freight.
- (e) Siding and shunting charges at Depot.
- (f) State Specific Cost.
- (g) Excise duty.
- (h) Toll taxes.
- (i) Sales tax as applicable.
- (j) Transportation costs.
- (k) Wholesalers commission.
- (l) Retailers commission.
- (m) Rounding off differential.

5.17 The prices for other products comprise the following elements of cost:

- (a) Ex-refinery gate price/ Refinery Transfer Price (RTP)/ Import Parity Price (IPP).
- (b) Marketing cost plus margin.
- (c) Siding and shunting charges at MI.
- (d) Rail/ pipeline freight.

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- (e) Siding and shunting charges at Depot.
- (f) State Specific Cost.
- (g) Excise duty.
- (h) Local Levies and Sales Tax.

5.18 The pricing of petroleum products like MS, HSD, SKO (D), LPG (D), ATF upto 31st March, 2002, used to be fixed by the Oil Co-ordination Committee (OCC) under Ministry of Petroleum and Natural Gas under Administrative Pricing Mechanism (APM), thereby the margin per KL of these products was fixed by OCC and other elements of sale price/purchase cost were surrendered/ claimed to/ from the Pool Account operated by OCC. The oil companies had to follow the price fixed by OCC and they had no role to play in price fixation. However, with effect from April 1, 2002, the prices are being fixed by oil companies on Industry basis and margin per KL fluctuates according to changes in international crude price.

5.19 The pricing of petroleum products like FO, LSHS, LDO, Naphtha are fixed by the Industry since April 1, 1998. The prices charged in these cases by the oil companies may differ ultimately when they finally sell to direct/ industrial customers depending on the discounts/ rebates given by individual oil company. The techniques of marginal costing are applied in case of these products if supply of product is more than demand. The price of lubricants/ greases was also decontrolled from November 1993. The prices of these products are fixed by individual oil companies on their own. The marginal costing concepts are equally applied in pricing of lubricants as well for industrial sector.

5.20 The procedures of the internal auditor for examining the aspects related to pricing would include verifying:

- (i) That fixation of port-based prices is based on agreed norms.
- (ii) That the prices fixed for various retail outlets are with special reference to cheapest source of supply.
- (iii) Analysing the international price movement of crude.
- (iv) That products are sourced from the most economic supply source.

- (v) That appropriate excise duty rates are charged in RSP and incorporated the changes wherever there is revision of excise duty.
- (vi) That appropriate sales tax rates are charged in RSP and incorporated the changes wherever there is revision of sales tax rates.
- (vii) That appropriate distances to the retail outlets from the supply location are determined for the fixing up the selling prices for each outlet.
- (viii) That round trip distances are updated wherever there is change in the source of supply.
- (ix) That the pricing of outlet has been determined based on the set guidelines.
- (x) That all local taxes like octroi/ toll tax have been included wherever applicable
- (xi) Whether price revisions have been implemented/ communicated on time and correctly.
- (xii) That in case of any new depot, the depot rate built-up is as per the prescribed guideline.
- (xiii) That the consumer rates are determined as per the guidelines.

### **Installations/ Terminals**

5.21 Installations/ Terminals consist of storage tanks and product handling facilities for receipt of products from port and/ or refineries for onward despatch to direct customers in bulk and inland depots.

5.22 The internal audit procedures in this regard comprise verifying that:

- (i) All the facilities are utilised to the optimum extent.
- (ii) There are no idle assets.
- (iii) The product is received into the tanks as per the invoice raised by the supplying company.
- (iv) All the excise formalities are complied with in case of bonded location for storage and distribution of products.

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- (v) Daily physical stock dips are taken and calculations of stocks are as per the calibration chart of each tank.
- (vi) The product tanks are calibrated and calibration charts are certified by the CPWD.
- (vii) The receipt losses, storage/ handling and transit losses are kept to the minimum extent possible.
- (viii) Applicable charges like rent, electricity are collected from the companies, as per agreement, to which the space is provided for.
- (ix) The safety norms are complied.
- (x) All the fire fighting facilities are available and monthly fire drills are carried out.
- (xi) All quality control tests required as per industry quality control manual are carried out.
- (xii) All the MIS, accounting returns are sent to Head Office on regular basis.
- (xiii) Adequate security arrangements are available.
- (xiv) All the assets and product stocks are adequately insured.
- (xv) Appropriate controls are exercised over the contaminated products and its accounting thereof.
- (xvi) All the statutory licences/ approval required for the location are obtained.
- (xvii) The operating cost/ profitability as a cost centre and profit centre.
- (xviii) Demurrage is paid for delay intake of product from the coastal tankers.
- (xix) Short receipt of product in respect of coastal tankers is claimed from the shippers.
- (xx) Tankage hiring facility, if applicable, including the terms of hiring, product losses in transit and settlement etc.



## Depots

5.23 A depot normally consists of storage tanks and product handling facilities for receipt of products for onward despatch and transportation facilities for onward movement of products to retail outlets and direct customers.

5.24 The internal audit of a depot ordinarily comprises the following procedures:

- a) Verifying all the points mentioned in paragraph 5.22 except points xviii and xix.
- b) Verifying whether demurrage charges are paid to Railways (for delayed decantation of product from wagon or (for delayed filling of product into the wagon.
- c) Verifying that in case of short receipts of product through rail wagon, a certificate to that effect has been received to lodge claim with Railways.
- d) Verifying that product shortage in case of tank lorry receipts are fully recovered from the transport contractors.

## Tap Off Points (TOP)

5.25 Internal audit of tap off points involves the same procedures as mentioned in paragraph 5.22 except points xviii and xix.

## Taluka Kerosene Depot

5.26 Taluka Kerosene Depot is a depot for storing Kerosene for delivery to Public Distribution System. Needless to say that such depots hold an important place in the economy and society as a whole. The internal auditor therefore needs to pay special attention to audit of such depots.

5.27 The internal auditor's procedures for carrying out audit of *taluka* kerosene depots involve verifying:

- a) The validity of agreement/ renewal of agreement
- b) The payments are made to contractors as per terms of agreement.
- c) Control over manual records maintained.

- d) Utilisation of facilities at the location.
- e) That all the assets and product stocks are adequately insured.
- f) That the product tanks are calibrated and calibration charts are certified by CPWD.
- g) That all the statutory licences/ approval required for the location are obtained.

### **Aviation Service Facilities**

5.28 Oil companies normally also have infrastructure at the airfield stations consisting of storage tanks, hydrants, pipelines, hoses etc., for fuelling aircrafts. Internal audit of aviation service facilities involves examining:

- a) The agreements entered into various airlines for fuelling of product.
- b) Whether invoices are raised and payments received are, as per agreements.
- c) Whether appropriate prices are charged to respective airlines.
- d) Whether the applicable sales tax rates are charged to respective airlines.
- e) Whether all the excise formalities and related records are maintained in case the location is bonded warehouse.
- f) Whether the product tanks are calibrated and calibration charts are certified by CPWD.
- g) Whether physical stocks dips are taken on daily basis and reasons for variation in stocks, if any, are appropriately recorded.
- h) Whether all the safety norms are adhered to.
- i) Whether all the assets and product stocks are adequately insured.
- j) Whether all the facilities are optimally utilised.
- k) The operating cost and profitability as a cost centre and profit centre.

## **Lube Depot**

5.29 The lube depot stores blended lubricants and greases for automotives and industrial needs. The internal auditor's procedures for auditing the lube depots would differ from one product to another. Illustrative procedures for the products are discussed below:

### *Base Oil*

- a) Verifying the receipt of base oil with respect to invoice received or bill of lading received.
- b) Verifying the base oil AR3A quantities Vs pipeline receipts ex- refinery.
- c) Verifying the control on loss of the product received.
- d) Examining the mode of payment for imported cargo.
- e) Verifying whether daily physical dips of all the tanks are taken and reasons for variation, if any, appropriately recorded.

### *Chemicals and Additives*

- a) Verifying the receipt of chemical and additives vs indent pattern.
- b) Verifying the stock holding vs actual utilization, slow and surplus stocks.
- c) Verifying the shortages in receipts and recoveries control.

### *Containers*

- a) Verifying the indents on fabricators Vs purchase order quantity and terms.
- b) Verifying the execution of call ups by the fabricator and time delay in execution.
- c) Verifying the receipt confirmation and inspection reports of the same.
- d) Verifying the control over rejects and receipts without GRNs.

*Cartons, Packing Materials and Consumables*

- a) Verifying the indents on suppliers Vs Purchase Order quantity and terms.
- b) Verifying the quality testing and sample test reports.
- c) Verifying the control over damages in cartons and control over wastage.
- d) Verifying the inventory control system at the blending plant.
- e) Verifying the accounting and treatment of rejected materials.

*Blending/ Production*

- a) Verifying the adequacy of control in production process.
- b) Verifying the utilisation of materials and consumption pattern.
- c) Verifying quantity mix ratios Vs actual mix ratio on test check basis.
- d) Verifying the production plan and market demands/ indents.
- e) Verifying the filling Vs empty drums/ containers.
- f) Verifying the accounting of the finished goods.
- g) Verifying utilisation of blending facilities – idling assets and unutilised facilities.

*Repacking/ Small Fillings*

- a) Verifying the agreements/ Purchase Order with re-packers for small filling.
- b) Verifying control over the finished product stocks sent to small packs and receipt of filled packs thereof.

## **Transportation**

5.30 Transportation cost plays a vital role in determining the final selling prices for the consumers. Crude oil is transported to the refineries either by coastal tankers or by pipelines. All modes of transportation of petroleum

products complement each other and form the essential components of the logistic system. For bulk transportation of petroleum products, pipelines are the most energy efficient, convenient and most preferred mode of transportation. Efficient and economic transportation of petroleum products to the consumption centers is a major challenge. In order to ascertain the source of supply to a particular area, it is vital to examine and ensure that there will not be any price disparity in the neighbouring areas of each pricing area boundaries therefore; the equivalent cost norm plays a vital role in demarcating economic supply zone. Different supply zones of each port or inland refineries are thus demarcated on the basis of equivalent cost of one of the major product.

5.31 The principle of distribution is to plan and execute the movement of petroleum products from the refineries/ main ports to various distribution centres in a systematic and organized manner. The bulk petroleum products are required to be moved by one or more of the following mode of transportation:

### **Coastal Tankers/ Barges**

5.32 These are used for carrying petroleum products from port refineries to port terminals. At the receiving location, an oil jetty is available for discharging the tanker through a pipeline, which runs from the oil jetty to the terminal. The discharge of the product is carried out with the help of high capacity pumps. The internal auditor's procedures with regard to coastal tankers involve:

- a) Verifying whether the payments to shippers are done as per the agreement/contract with them.
- b) Verifying whether the quantity base on which charges have been levied is correct.
- c) Verifying that if the coastal tanker cost is being reimbursed to any other oil company then whether it is as per agreement.
- d) Checking whether the parcel sizes are as per assumed parcel size.
- e) Verifying whether the lay time is as per agreed terms
- f) Examining whether the demurrage claims is as per agreed terms

- g) Verifying whether the detention, exceptions, lay time is as per agreed terms
- h) Verifying the charter hire, bunker cost and port charges
- i) Verifying wharfage, survey fees, agency fees etc.
- j) Verifying insurance payments
- k) Examining the idling cost of vessels
- l) Verifying whether the ocean is prorated as per final receipt quantity

### **Pipelines**

5.33 Some of the mainland installations are connected through a pipeline from the refinery to the installation. Such installations are called Pipeline Terminals. In case of long pipeline running through the mainland, receiving, storing and distribution facilities are set up at suitable locations *enroute*. These are called Tap-off points since product is tapped off here from the main pipeline. Internal audit procedures for examining the transportation through pipelines involve:

- Verifying whether the contract of agreement for transportation of products has been entered to with owner of pipelines.
- Verifying whether the freights is paid as per the agreed terms of the contract.
- verifying whether there are any transit losses

### **Tank Wagons**

5.34 By far the most common mode of product movement to inland depot locations is through railway tank wagon. For receiving the product through tank wagons, each depot is provided with a siding of suitable capacity and the products are discharged through a pipeline, which runs from the railway siding to the depot tank. The procedures employed for internal audit of transportation by means of railways include the following:

- Verifying whether the payments are released as per due dates agreed in the agreement with the Railways.

- Verifying whether the payment is released as per the amount mentioned in the Railway Receipts (RR).
- Verifying whether the freight charged and calculations in RR is in line with railway tariff table rates.
- Verifying whether appropriate tariff rates are applied as per the railway tariff table *i.e.*, if a particular consignment is eligible for charging on train load rates, wagon load rates are not charged.
- Verifying whether freight paid on behalf of other marketing companies are recovered within the due dates agreed.
- Verifying whether in case there is excess payment of freight due to application of wrong rates, the necessary refund claims are submitted within reasonable time.
- Verifying whether in case there is excess payment of freight due to short receipt of product, the necessary refund claims are submitted within reasonable time.
- Verifying whether demurrage charges are paid to railway for delayed decantation of product or delayed loading of the product into the wagon.

## Tank Trucks

5.35 Tank trucks are used extensively in transporting products from a source to the last point of sale *i.e.*, retail outlets/ customer premises. Internal audit of transportation by means of tank trucks/ lorries involves examination of the following aspects:

- Whether transport contractors are selected as per approved policy.
- Whether the transport agreement/ contract has been entered into with contractor.
- Whether the security deposit payable as per the contract agreement has been received.
- Whether the approved tank lorry vehicle as mentioned in the contract agreement has been used to deliver the products.

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- Whether the contractor complies with transport discipline guidelines, during transportation of the products.
- Whether the rate and amount claimed is as per the contract and is within the contract validity period.
- Whether the payment is released after getting acknowledgement copy of the goods received.
- Whether the RTD kilometers claimed by the contractor tallies with approved RTD kilometers from that particular location.
- Whether the shortages certified by tank driver have been recovered from transportation bill.
- Whether the payments are released only to the approved list of tank lorry vehicles maintained.
- Whether the master data of each approved tank lorry is maintained.
- Whether the black listed tank lorries have been removed from the approved list of tank lorries.
- Whether the payments released for quantities claimed by the contractors tallies with actual sales made.
- Whether the provision for liability has been provided in case of amounts payable to contractor, at the time of closing of books of accounts.

### **Fleet Cards**

5.36 Oil marketing companies have started issuing Fleet Cards to the Fleet Owners/ Operators to facilitate cashless purchase of Petrol, Diesel and Lubes from the selected Retail Outlets. The Fleet Cards provide the following features to the Fleet Owners/ Operators:

- a) Flexible Prepaid and credit option
- b) Fuelling at select quality and quantity assured outlets on all major highways and halting points
- c) Single/ multiple cards loading at all participating retail outlets.



- d) Attractive rewards program
  - e) Free personal accident insurance cover for fleet owners, drivers, co-drivers and helpers.
  - f) Free vehicle tracking facility through web site.
  - g) Option for real time truck tracking at subsidized cost
  - h) Each fleet owner is issued a fleet card for every vehicle enrolled. The card is assigned a unique Personal Identification Number (PIN). The card also bears the name of fleet owner, vehicle registration number, Card number and card validity date.
- 5.37 The internal audit procedures of in respect of the fleet cards comprise:
- a) Examining the policy of fleet card program
  - b) Verifying whether the eligible fleet owners are given cards as per the policy.
  - c) Verifying whether the amount paid in advance by the fleet owners are accounted for properly in the books and booking of sales is done on a daily basis based on the up-liftment of Petrol, Diesel and Lubes.
  - d) Verifying whether the card swiping machines are working properly.
  - e) Verifying whether the reward points are given to fleet owners as per entitlement in relation to the up-liftment of Petrol, Diesel and Lubes.
  - f) Verifying the periodic account statement of each fleet card.

## **Liquefied Petroleum Gas (LPG)**

5.38 Liquefied Petroleum Gas (LPG) is one of the joint products which is produced during refining of crude oil or produced along with drilling operation of natural gas / crude oil. It consists of Hydrocarbons namely propane and Butane. LPG is highly inflammable and is stored in high pressure storage vessels. Clean burning, all purpose, and readily available, portable and efficient fuel. LP gas at normal temperature and pressure is a gas. It changes to a liquid when subjected to modest pressure or cooling. The reason LP gas is liquefied is to make it easy and efficient to transport and store.

LPG is highly inflammable. LPG is odourless, color less and is heavier than air. Ehtyle Mercaptan is added as odouriser for detection of any leak. LPG as per IS: 4576 is being marketed in India.

Varieties of LPG bought and sold include mixes that are primarily propane ( $C_3H_8$ ), primarily butane ( $C_4H_{10}$ ) and, most commonly, mixes including both propane and butane, depending on the season, in winter more propane, in summer more butane.

### Uses of LPG

5.39 LPG is one of the safest, economical, eco friendly healthy cooking fuels for all. LPG is being used a cooking fuel's in most urban and semi urban household's. The rural population is also increasingly using it.

Besides domestic usage, LPG is often used as an efficient source of energy in various industrial and commercial applications. Some of the important areas where LPG is used extensively are:

Usage Sector	Applications
Metal cutting	Provides stable high temperature required for the purpose. Also provides clean cuts.
Kiln and Furnaces	Used In incinerators, crematoriums, ceramic and brick kilns, For heat treatment etc.
Process Industries	Extensively used in Glass, automobile and textile industries for glass blowing, paint drying/ surface coating and singing activities. Also used by Electronics industry involved in TV picture tube manufacturing etc.
Fabrication	Used for providing homogeneous temperature bath required for melting operations with lead, sulphur and carbon free burning ensuring high quality of production specification
Poultry	Used for used in Poultry rearing with accurate temperature controls

Aerosol	Used as an propellant in aerosol cartridges
Industrial processing	Used for instant and controlled drying processes right from curing of fibre glass to tea leaves drying and dry roasting of nuts
Radiant Heating	Used for heating purposes both in homes and industrial and commercial complexes
Generators	Used as a clean eco friendly fuel for running the generators even in the closed premises
Hotels and Cook Houses	Used for all possible cooking skills from boiling, stewing, simmering, baking, grilling and roasting to braising

### Vulnerability of LPG

5.40 LPG is a flammable gas which has the potential to create a hazard. Therefore it is important that the properties and safe handling of LPG are understood and applied in the domestic and commercial/industrial situations. LPG is stored under pressure. The gas will leak from any joint or connection which is not sealed properly. LPG is heavier than air. Any significant leak will move downwards and stay on the ground. It will accumulate in any low-lying area such as depressions in the ground, drains or pits.

Since LPG is stored in two phases, liquid and gaseous, there is potential for either a liquid leak or a gas leak. If the leak is a gas leak it may not be seen (because LPG is colourless), except where the leak is of sufficient size to be seen shimmering in the air. When a liquid leak occurs, the gas release will be seen as a patch of ice around the area of the leak, or as a jet of white liquid. This white appearance is due to the cooling effect created by the rapid expansion of the LPG liquid into a gas. The condensing atmospheric moisture makes the leak visible. In concentrated amounts and in uncontrolled conditions, LPG has the potential to create a fire or an explosion.

To overcome the above vulnerability the oil companies take necessary precautions for safe handling of LPG in respect of storage, transportation and filling of LPG in cylinders.

## Storage

5.41 LPG will evaporate at normal temperatures and pressures and is supplied in pressurized steel cylinders. They are typically filled to between 80% and 85% of their capacity to allow for thermal expansion of the contained liquid. The ratio between the volumes of the vaporized gas and the liquefied gas varies depending on composition, pressure, and temperature, but is typically around 250:1. The pressure at which LPG becomes liquid, called its vapour pressure LPG is heavier than air, and thus will flow along floors and tend to settle in low spots, such as basements. This can cause ignition or suffocation hazards if not dealt with.

Large amounts of LPG can be stored in bulk cylinders and can be buried underground. Since LPG turns gaseous under ambient temperature and pressure, it must be stored in special pressure vessels. If the containers are cylindrical and horizontal, they are referred to as "cigars" or "bullets", whereas circular ones are "spheres".

LPG is composed primarily of propane and butane, while natural gas is composed of the lighter methane and ethane. LPG, vaporized and at atmospheric pressure, has a higher calorific value (94 MJ/m<sup>3</sup> equivalent to 26.1kWh/m<sup>3</sup>) than natural gas (methane) (38 MJ/m<sup>3</sup> equivalent to 10.6 kWh/m<sup>3</sup>), which means that LPG cannot simply be substituted for natural gas.

The LPG produced is Bulk in nature and is stored in Sphere or Bullets above / below ground at the production Location. The Sphere or Bullet is made by using Mild steel plates which will confirm to norms of Oil Industry Safety Directorate (OISD) which relates to safety aspects with regard to Storage and Handling of LPG. Packed LPG is stored cylinders having capacity of 5 kg, 14.2 kg, 19kg and 47.5 kg.

Gas processing is a source of approx. 60% of LPG produced. Crude Oil processing is a source of approx 40% of LP Gas produced. World prices of LPG in general move in line with crude oil prices although as with most commodities it does have its own supply and demand parameters which are a critical determination of price. Saudi Arabia is the world largest producer of LPG and Saudi Aramco contact price (CP) as a world maker price upon which exports and domestic sales to wholesaler (makers) are negotiated.

## Transportation

5.42 Bulk LPG is transported through a coastal tanker, pipeline, and rail wagon or tank lorry to a Bottling Plant or to Industrial customer for industrial use. In case of Packed LPG used for cooking and heating, it is transported in cylinders having capacity of 5 kg, 14.2 kg, 19kg and 47.5 kg in a Lorry to the Distributor premises. From the Distributor premises the cylinders are transported to customer premises in a small lorry or Tricycle.

## Filling/Bottling of Bulk LPG

5.43 The Bulk LPG for filling into cylinders is moved to a Bottling Plant by pipeline, and rail wagon or tank lorry. The product received by Tank wagon/ Tank lorry is decanted and through Pipeline from Decanting bay, is again stored Sphere or Bullets above / below ground.

At Bottling Plant the Bulk LPG will be drawn from the Storage tanks through a pipeline and fill the LPG into various sizes of Cylinders depending upon the demand of respective size of cylinders.

For putting up of Bottling Plant all statutory requirements should be complied with as given in para 2.31 of page no. 20 of the publication and Gas cylinders rules 1981.

5.44 The facilities created at a Bottling Plant are:

- (i) Decanting Bay for Decanting the Bulk LPG received by Tank wagon/ Tank Lorry
- (ii) Storage tanks for Bulk LPG,
- (iii) Pipelines from Decantation bay to Storage tanks
- (iv) Pipelines from storage tank to Filling Points.
- (v) Filling Shed for filling the Bulk LPG into various sizes of Cylinders.
- (vi) Filling points in filling shed
- (vii) Conveyer chains for movement of Empty/ Filled cylinders.
- (viii) Carrousel Filling Systems, Filling Heads (cylinder filling machines) and Ejection Systems

- (ix) Check Weighing Systems
  - LeakTestingBaths
  - ManualLeakDetectors
  - WeightCorrectionMachines
- (x) SealApplicationSystems
  - ThermosealingMachine
  - WashingSystems
- (xi) ElectricalEquipment
  - FireandGasAlarmSystems
  - ProductionDataManagement Systems
- (xii) Water and fire fighting systems
- (xiii) Valve Opener and Closer systems
- (xiv) Valve Orientation Machine

The above facilities are common to all Bottling Plants and are Capital in Nature and are capitalised.

## **Marketing and Distribution**

5.45 The LPG is sold by way of Bulk quantity and Packed quantity. The sale of Bulk LPG is done to Industrial customers or customers who require LPG in large quantities. The sale of Packed LPG is done to House hold sector (Domestic) and Hotel industry(commercial). The type of sales made are Packed domestic LPG (5 kg and 14.2 kg), packed commercial (19 kg and 47.5 kg) and Bulk (in MTs).

The cylinders used for packed LPG should comply with the requirements of LPG cylinders act.

The Packed Domestic LPG is distributed to the customers through Distributors network. The packed commercial LPG is distributed either directly to

customers or through Distributors network. The Bulk LPG is distributed directly to customers.

The distributors are appointed by the company based on the laid down criteria for selection of distributors depending upon the requirement for appointment for a particular location at a Place.

Facilities created/ required at Distributors Premises are as under:

- (a) Godown for storing Cylinders
- (b) Admin office cum showroom
- (c) Delivery Vehicles for Distribution of cylinders to customers
- (d) Manpower for carrying out work

Godown licence from CCOE (Chief Controller of Explosives) for storing of cylinders and Comprehensive Insurance Policy including third party insurance should be taken.

The distributors will be compensated by way of commission (Rs. /cylinder) for the total no. of cylinders sold in a month.

For getting refilled cylinders, customers would register a request with respective Distributor and filled cylinders will be supplied to customers accordingly.

Corpus Fund will be provided by the company for working capital to the distributor in respect of packed cylinders distribution. Working capital is given for construction of showroom/Godown and for initial load of 306 filled cylinders. This is given to SC/ST category of Distributors. The distributors will be required to repay the loan along with the interest in terms of EMI as per provisions of MOPNG.

Retail counter is a facility created at the Bottling plant to distribute the Domestic 14.2 kg packed cylinders to the customers directly without routing through the appointed Distributors.

Auto LPG for vehicles is distributed through Retail outlet Network.

Distributor gets packed cylinders of 5kgs, 14.2 Kgs, 19 Kgs and 47.5 kg from Bottling plant on submission of payment.

### **Functions of Distributors**

- (a) Issue (Single / Double cylinders) Subscription voucher (SV) to customers who are allotted LPG connection by the company against payment of Deposit towards Cylinders and pressure regulators
- (b) Issue Transfer voucher (TV) to customers who have shifted their residence to some other place.
- (c) Issue Termination voucher (TV) to customers who have surrendered the LPG connection.
- (d) Replacement of defective PRs(Pressure Regulator) with new PRs provided by the company, as free replacement to the customers.
- (e) Return the empty cylinders received from customers to the Bottling plants for getting the LPG filled cylinders
- (f) Submit the reconciliation of LPG Deposit amount received for the new connections issued and deposit amount returned to Transferred/ terminated connections.
- (g) Submit EMR (Equipment Movement Report) reconciliation for the cylinders and pressure regulators
- (h) Indemnifying the company for shortages cylinders and pressure regulators.

There are Marketing Discipline Guide lines (MDG) which are to be followed by the distributors while marketing and distribution of LPG filled cylinders. Those who violate the implementation of MDG guide lines are liable for fines, penalties and suspension of distributorship.

### **Accounting of LPG Transactions**

#### **5.46 Capitalisation of Facilities Created at Bottling Plants**

The Facilities created as mentioned under Bottling Plant should be capitalised.



### **Internal Internal Audit of Transactions**

1. To verify that the assets are capitalised as per classification of assets
2. To verify that the assets installed are approved by the competent authority as per DOA.
3. To verify that necessary capital budget provision is available.
4. To verify that the assets are put into use and there are no idle assets.
5. To verify that the depreciation rates are charged as applicable to each category of assets and in case the plant is working more than on shift extra shift depreciation has been charged.
6. To verify that the assets which are idling are shifted to needy location or disposed of in case not needed.
7. To verify that the assets are adequately insured.

### **Production/ Purchase of Bulk LPG**

5.47 The main source of receipt of Bulk LPG is from production of own refinery or purchases from other refineries or through Imports. The quantity of measurement is in MTs (metric tonne). The Purchase cost of bulk LPG includes IPP (Import Parity Price)/RTP (Refinery Transfer Price) +excise/ customs duty+ freight + Terminalling charges paid on purchases+ taxes paid on purchases.

### **Internal Audit of Transactions**

- (i) To verify whether the product is received from own refineries/other Refineries/imports.
- (ii) To verify whether the elements of Purchase cost as mentioned above are accounted element wise in the books of accounts.
- (iii) To verify whether the quantity billed is as per Joint certificate of selling and purchasing company.
- (iv) To verify whether IPP/RTP price as prevalent at the time of despatch has been charged

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- (v) To verify whether Excise/Customs duty has been charged at the applicable rates
- (vi) To verify whether Railway /Coastal/Pipeline freight/siding charges have been charged at applicable rates.
- (vii) To verify whether Terminalling charges have been charged at applicable rates.
- (viii) To verify whether appropriate Tax rates on purchase (if applicable) has been charged.
- (ix) To verify whether the product despatched from loading location has been received at receiving location and look into the same if not received.
- (x) To verify whether the payments for purchases have been made as per contractual agreement with suppliers of product.

### **Sale of Bulk/Packed LPG**

5.48 The type of sale effected may be Bulk/packed LPG. Sale of Bulk LPG refers to sale of LPG in Large quantities to Industrial customers who will store the LPG in storage tanks in their premises. The sale of Packed LPG refers to sale of LPG filled in cylinders of various capacities of 5/14.2/19/47.5 kgs. The sales of packed LPG cylinders in capacities of 5/14.2 kg are termed as Domestic packed LPG sales. The sales of packed LPG cylinders in capacities of 19/47.5 kg are termed as Non Domestic packed LPG sales.

The sales of Bulk LPG will be made directly to the industrial customers. The sales of Packed LPG will be made through network of Distributors appointed by the company.

### **Internal Audit of Transactions**

- (i) To verify the type of sales whether it is Bulk or Packed LPG sales.
- (ii) To verify whether the sales made to Bulk LPG customers are as per the terms of sales order.
- (iii) To verify in case of Bulk LPG that the prices are charged as per selling rates prevailing on the date of supply.

- (iv) To verify the payment terms and to confirm that the payments are received as per approved payment terms.
- (v) To verify that the discounts extended to Bulk customers are within the discount policy of the company.
- (vi) To verify whether there is increase in sales volume of Bulk LPG due to extension of credit terms/discounts.
- (vii) To verify that the packed LPG sales are made through appointed Distributors only bifurcating into domestic/non domestic sales
- (viii) To verify the payment terms to ascertain that the distributors are paying accordingly
- (ix) To verify that the prices of Packed LPG are charged as per selling rates prevailing on the date of supply in respect of Domestic/Non domestic sales respectively.
- (x) To verify that fines, penalties are collected from those distributors who have violated the MDG guidelines.

### **Accounting of Stock of LPG (Bulk)**

5.49 Receiving bulk LPG at BP is shown as receipt. (In MTs)

Bulk quantity used for filling cylinders on daily basis is shown as issue (rebranding out)

Daily Stock account of Bulk LPG is maintained showing opening stock+ receipts- issues = closing stock.

The closing stock is compared with Physical stock to ascertain the loss or gain on daily basis.

Bulk LPG physical closing stock is valued at the purchase cost i.e. IPP (Import Parity Price)/RTP (Refinery Transfer Price) +excise/customs duty+ freight + Terminalling charges paid on purchases+ taxes paid on purchases.

For transportation of Bulk LPG from loading location to bottling plant, payment for transportation are to be made to Transporters.

The rates of transportation are finalised through a tendering process by way of Limited/Public tender.

### **Internal Audit of Transactions**

- (i) To verify that the quantity despatched from the Loading location is received at the bottling plant.
- (ii) To verify that shortage of product during Transit is recovered from the transporter as per the limits specified in the Transport agreement
- (iii) To verify that the product in Transit as on closing of accounts are accounted properly
- (iv) To verify that the Bulk stock is valued at purchase cost
- (v) To verify that the stock losses are within the permissible limits.
- (vi) To verify that the approval from competent authority has been obtained for stock losses incurred beyond permissible limits.
- (vii) To verify that the transportation rates/contracts are finalised by tendering procedure only
- (viii) To verify that the transportation payments are released as per the rates finalised in the tender
- (ix) To verify that the stocks are adequately are insured.

### **Packed Cylinders Accounting (Product)**

5.50 Issue from bulk LPG storage is taken as receipt (rebranding in).

The quantity shown as receipt is compared with total quantity filled in various capacities of cylinders to ascertain any loss or gain of LPG during filling of cylinders.

Despatches of LPG (filled) packed cylinders are reflected as issue. (No. of cylinders)

The difference between receipts and issues is the balance of packed LPG cylinders at Plant as on particular date after considering the opening balance.

For transportation of packed cylinders from bottling plant to Distributors premises payment towards transportation to be made to transporters.

The rates of transportation are finalised through a tendering process by way of Limited/Public tender.

Every cylinder after its filling with LPG is checked for correctness of its weight, before despatch to the Distributors.

These cylinders are called packed product cylinders and the cylinders are returned by the customers to the company for refilling.

The peculiar feature of LPG accounting is that the filled cylinders with LPG after consumption of gas by consumers, they have to return the empty cylinders to distributors and get the filled cylinder.

Accounting is to be done for LPG gas used for filling in cylinders and for cylinders also.

### **Internal Audit of Transactions**

- (i) To verify that the no. of cylinders as per the capacity of Truck used for transportation of cylinders, are loaded correctly.
- (ii) To verify that the no. of packed cylinders sent sold to Distributors are returned to Bottling plant as empty cylinders.
- (iii) To verify that the transportation rates/contracts are finalised by tendering procedure only
- (iv) To verify that the transportation payments are released as per the rates finalised in the tender.
- (v) To verify that shortage on account of safety caps are recovered from distributors.
- (vi) To verify that the product and cylinders are adequately insured.

### **Purchases and Stock of Various Sizes of Cylinders/Safety Valves**

5.51 As the LPG is highly inflammable and stored in a in a high pressure vessel, the storage vessel like cylinders and regulators to control the pressure

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of flow of LPGthe companies procure the cylinders from the reputed manufacturers.

The cylinder used for storage of LPG is fitted with safety valve fixed on the Top of the cylinder.

The requirements of Cylinders/ Safety valves are estimated on the basis of No. of connections issued and to be issued.

As the requirement of Cylinders/ safety valves is huge in number the purchase of these items are done through public tender process.

Inventory of LPG Cylinders/ Safety valves will be available at the Bottling Plants, Distributor Premises and Repairer premises.

On periodical basis the physical verification of cylinders are done as per requirement of companies Act. The difference between physical and book balances of cylinders at distributors' premises are recovered from distributors' at penal rate for shortages.

The reconciliation of LPG Equipments (Physical & book) will be done at Plant location, Distributor Premises, repairs and in-transit.

The responsibility of physical inventory (cylinders) is with Bottling Plants- Location-in-charge, Repairs- Bottling Plant, Distributors and Area Managers.

### **Internal Audit of Transactions**

- (i) To verify the estimation of new cylinders/ safety valves to be purchased.
- (ii) To verify that the proper purchase procedure has been followed for procurement of new cylinders/ safety valves..
- (iii) To verify that the distributors are returning the empty cylinders while taking the filled cylinders
- (iv) To verify that tariff costs of cylinders are recovered from Distributors in case of non return of empty cylinders
- (v) To verify that the rates for transportation of packed cylinders to distributor premises are finalised by proper tendering procedure.

- (vi) To verify that, the transportation payments to transporters are released as per the finalised Tender.

### **Accounting of Pressure Regulators (PR)**

5.52 The pressure regulator is connected to a hose connecting the Stove and the cylinder. One pressure regulator is issued for individual connection of packed LPG customers. The pressure regulators are issued to each individual connection by the Distributor after getting the supply of regulators from the company. Any defective pressure regulator should be replaced by a new pressure regulator. The pressure regulator is the property of the company and the customer should return the same to the company at time of surrender of connection.

### **Internal Audit of Transactions**

- (i) To verify the estimation of new pressure regulators to be purchased.
- (ii) To verify that the proper purchase procedure has been followed for procurement of new pressure regulators.
- (iii) To verify that tariff cost of pressure regulator is recovered from distributors in case of shortage of pressure regulators.
- (iv) To verify that unissued stock of Pressure regulators are valued properly in the books of accounts.

Accounting of amount received towards deposit of Cylinders and Pressure regulators:

5.53 As the cylinders/pressure regulators are the property of the company, the customers are required to pay a specified deposit amount per cylinder/pressure regulator to the company. The amount collected by the company towards deposit of cylinders/pressure regulators are accounts current liability in the books of accounts as the deposit amount is refundable to Customers in case of surrender of LPG connection by customers. The amount from the customers will be collected by distributors as when new connection is given. The distributors are required to deposit the amount collected towards deposit with the company on weekly basis. At any point of time the amount to be remitted by distributors should not be more than one week. In case there is default by distributors in remitting the amount to the company, the distributors are liable to pay interest for delay in remitting amount.

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The customers / consumers are required to pay the security deposit for cylinders and regulator as a onetime payment which are accounted as liability in the books of the company and the amount received towards cylinders & regulator will be returned to customers when they surrender the gas connection to the company.

As the consumers are supplied gas with cylinder (Storage container), one time security deposit per cylinder is to paid for the no. Of cylinders held by customers.

Various reports are prepared for reconciliation and control of transactions between locations and distributors / repairs / reconciliations of inventory of equipment, deposit recoverable.

### Internal Audit of transactions

- (i) To verify that the amount payable per cylinder/pressure regulator as per the rates fixed by the company are paid by customers.
- (ii) To verify that the distributors are remitting the deposit amount to company on weekly basis.
- (iii) To verify that the amount received from the customers are shown as current liability in the books of accounts.
- (iv) To verify that in case of surrender/termination of connection the amount is refunded to the customer.

#### 5.55 Pricing

Domestic	Supplies (House hold sector) - Controlled by MOP&NG Commercial supplies (Industrial/Hotel sector) - Free Pricing, NDNE, Bulk
Auto LPG	(Transport sector) - Free Pricing

#### Pricing of Bulk LPG per MT

1. FOB Price at Arab Gulf (AG) of LPG
2. Ocean Freight from AG to Indian Ports



3. C&F (Cost and Freight) Price (1+2)
4. Import Charges (Insurance/Ocean loss/LC Charges/Port Dues)
5. Customs Duty
6. Import Parity Price (IPP) (3+4+5)
7. Import Parity Price is the Refinery Transfer Price (RTP) Charged by Refinery to Marketing Companies
8. Inland Freight and Delivery Charges
9. Marketing cost
10. Marketing margin
11. Filling charges
12. Total price (7+8+9+10+11)
13. Excise duty
14. VAT/Sales Tax
15. Selling price per MT (12+13+14)

Pricing of Packed LPG cylinder (Domestic-14.2 kg))

1. FOB Price at Arab Gulf (AG) of LPG – per MT
2. Ocean Freight from AG to Indian Ports – per MT
3. C&F (Cost and Freight) Price (1+2) –per MT
4. Import Charges (Insurance/Ocean loss/LC Charges/Port Dues) - per MT
5. Customs Duty- advalorem
6. Import Parity Price (IPP) (3+4+5) - per MT
7. Import Parity Price (IPP) (3+4+5)-per Cylinder (14.2 kg) – (6/1000 kg \*14.2 kg)

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Import Parity Price is the Refinery Transfer Price (RTP) Charged by Refinery to Marketing Companies -per cylinder

8. Inland Freight and Delivery Charges-per cylinder
9. Marketing cost –per cylinder
10. Marketing margin –per cylinder
11. Bottling charges (Filling and Cylinder cost) –per cylinder
12. Total price (7+8+9+10+11) –per cylinder
13. Less: Subsidy by Central Govt. –per cylinder
14. Less: Under recovery by PSU Oil Marketing Companies–per cylinder
15. Price Charged to Distributor (Bottling Plant Price) (12-13-14) –per cylinder
16. Add: Excise duty–per cylinder
17. Add: Distributor Commission–per cylinder
18. Add: VAT (including VAT on Distributor Commission) –per cylinder
19. Retail Selling Price–per cylinder.

Pricing of Packed LPG cylinders (Non domestic (Commercial) - 19 and 47.5 kg)

1. FOB Price at Arab Gulf (AG) of LPG – per MT
2. Ocean Freight from ZAS AG to Indian Ports – per MT
3. C&F (Cost and Freight) Price (1+2) –per MT
4. Import Charges (Insurance/Ocean loss/LC Charges/Port Dues) - per MT
5. Customs Duty- advalorem
6. Import Parity Price (IPP) (3+4+5) - per MT

7. Import Parity Price (IPP) (3+4+5)-per Cylinder (19/47.5 kg) – (6/1000 kg \*19/47.5 kg)  
  
Import Parity Price is the Refinery Transfer Price (RTP) Charged by Refinery to Marketing Companies -per cylinder
8. Inland Freight and Delivery Charges-per cylinder
9. Marketing cost –per cylinder
10. Marketing margin –per cylinder
11. Bottling charges (Filling and Cylinder cost) –per cylinder
12. Total price (7+8+9+10+11) –per cylinder
14. Less: Discount -per cylinder
15. Price Charged to Distributor (Bottling Plant Price)(12-13-14) –per cylinder
16. Add: Excise duty–per cylinder
17. Add: Distributor Commission–per cylinder
18. Add: VAT (including VAT on Distributor Commission) –per cylinder
19. Retail Selling Price–per cylinder

### **Internal Audit of Transactions**

- (i) To verify that the pricing of the product has been done as per end use of product i.e. Domestic use, Commercial (NDNE and Bulk) and Auto LPG
- (ii) To verify that Pricing masters are maintained separately as per above three categories.
- (iii) To verify that the Pricing masters are updated immediately whenever there are changes in Pricing Elements.
- (iv) To verify that the Pricing Masters are sent to locations where billing is done.

## Hot Repair of Cylinders

5.56 Hot repair of LPG cylinders means repairing of valve protection ring (VP ring) or foot ring because of very deformed VP rings or foot rings. Hot repair Process includes accessories for cutting and surface welding of VP rings and foot rings as well as equipment for normalizing LPG cylinders.

LPG cylinder found requiring repairs is put to Hot repairs once in its lifetime as per IS code of practice. Each and every Hot repaired cylinder is also certified for use by BIS and is accordingly put into circulation. Any LPG cylinder which has undergone one Hot repair, if it is found damaged subsequently deformed and scrapped. New LPG cylinders are purchased as replacement to the cylinders scrapped.

## Internal Audit of Transactions

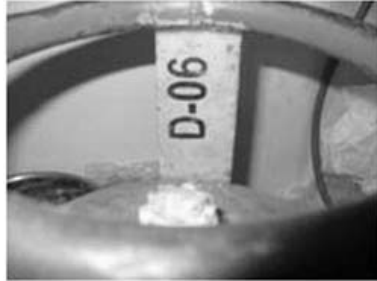
- (i) To verify whether the process of segregation of cylinders requiring Hot repairs is in vogue at each bottling plant.
- (ii) To verify that the quantity of cylinders requiring Hot repairs are kept separately.
- (iii) To verify whether in house facility is available for Hot repairs.
- (iv) To verify that in case of there is no in house facility for Hot repairs, whether Tendering process (Public or Limited) is followed for allocation of hot repair work.
- (v) To verify the record keeping for movement of cylinders is updated on regular basis.
- (vi) To verify that the contractors for Hot repairs are uplifting the cylinders for repairs as per the work order terms.
- (vii) To verify that the cylinders which cannot be repaired are deformed and scrapped.
- (viii) To verify that the scrapped cylinders are disposed off on regular basis by following tendering process (public or limited).
- (ix) To verify that the quantity of sale of scrapped cylinders are removed from books of account.

## Statutory Testing of Cylinders

5.57 LPG Cylinders are manufactured as per BIS 3196 through manufacturers approved by the Chief Controller of Explosives, Nagpur (CCOE) and having BIS license. Each and every new LPG cylinder is checked at various manufacturing stages and marked by BIS (Bureau of Indian Standards) after various tests carried out as per the BIS codes and Gas Cylinder Rules, 2004, before putting them into circulation by the Public Sector Oil Companies. Thereafter, each LPG cylinder is checked at the LPG Bottling plants and only the ones which are meeting the Standards as specified in the Gas Cylinder Rules are filled, checked and sent to the Distributors for distribution to the customers. All new LPG cylinders are required to be put to first Statutory Testing after 10 years. Thereafter, the cylinders are put to statutory testing every 5 years. Such testing of LPG cylinders is done through agencies approved by CCOE as specified in The Gas Cylinder Rules 2004 and once again put into circulation only if the cylinders pass the required Pressure Tests.

On one of three vertical stay plates (side stems) of the LPG cylinder, the date is coded alpha numerically as A or B or C or D and a two-digit number following this e.g. D10. The alphabets stand for quarters - A for Qtr. ending March (First Qtr), B - Qtr. ending June (Second Qtr), C-Qtr. ending Sept (Third Qtr), & D for Qtr. ending December (Fourth Qtr). The digits stand for the year when the cylinder is due for Statutory testing as explained above. Hence D10 would mean that the particular cylinder is to be taken for the next Statutory Testing by December 2010. In any case, this is not the date of EXPIRY of PHYSICAL LIFE of the CYLINDER. It is further clarified that, during service, every empty LPG cylinder when it comes from the Distributor to the Bottling Plant for filling, is checked for its condition including the marked date for Statutory Testing due. Cylinders due for testing are segregated and sent for testing. Every cylinder after its filling with LPG is checked for correctness of its weight and soundness, before despatch to the Distributors. Every care is taken to ensure that cylinders which are safe for use are only sent to our Distributors for further distribution. It means if a customer gets a cylinder in June 2010 with marking as B10, it does not indicate that the physical life of the cylinder has expired. It only means that this cylinder is due for Statutory testing by end June 2010.

There is an **expiry** date for LPG cylinders that are used in India to supply gas used in our household for cooking.



For instance, in the example shown above with the number D06, the LPG cylinder life expires by Dec of 2006 (The picture is one of empty cylinders. Hope they don't return it to our house again!



The second example with D13 allows the cylinder to be in use until Dec 2013.

Hence, the codes ABCD followed by the year only indicates the period before which the vessel or the cylinder has to be tested & inspected to ensure safety. It means if a customer gets a cylinder in June 2006 with marking as B06, it does not indicate that the physical life of the cylinder has expired. It only means that this cylinder is due for Statutory testing by end June 2006.

The LPG inside will never misbehave in its physical or chemical properties (as in the case of a pill or a dairy product)

Every empty LPG cylinder when it comes from the Distributor to the Bottling Plant for filling is checked for its condition including the marked date for Statutory Testing due. Cylinders due for testing are segregated and sent for testing.

Every cylinder after its filling with LPG is checked for soundness, before despatch to the Distributors. Every care is taken to ensure that cylinders which are safe for use are only sent to our Distributors for further distribution.

### **Internal Audit of Transactions**

- (i) To verify that the cylinders are segregated for statutory testing as per statutory norms

- (ii) To verify that the quantity of statutory due cylinders are kept separately.
- (iii) To verify that the selection of parties for doing the statutory testing are selected based on the tendering process (Public or limited)
- (iv) To verify the record keeping for movement of cylinders is updated on regular basis.
- (v) To verify that the contractors for statutory testing are uplifting the cylinders for testing as per the work order terms.
- (vi) To verify that the cylinders which cannot be tested are deshaped and scrapped
- (vii) To verify that the scrapped cylinders are disposed off on regular basis by following tendering process (public or limited)
- (viii) To verify that the quantity of sale of scrapped cylinders are removed from books of account

## **Natural Gas**

5.58 It is colourless, shapeless and odourless in its pure form. Natural gas is combustible and when burned it gives off a great deal of energy. Natural gas is clean burning and emits lower levels of potentially harmful by-products into the air. Natural gas is a combustible mixture of hydro carbon gases. While natural gas is formed primarily of methane it can also include ethane, propane, butane and pertane. Natural gas is considered as "dry" when it is almost pure methane and other commonly associated hydrocarbons are removed with other hydro carbons present, the natural gas is wet. Natural gas is environmental friendly in nature making a competitive fuel / feed stock in power and fertilizer sectors.

## **Production**

5.59 Found in reservoirs underneath the earth, associated with oil deposits with sophisticated technology that helps to find the location of natural gas and rig wells in the earth where it is likely to be found. Once brought from underground, the natural gas is refined to remove impurities like water, other gases, sand and other compounds. Some hydrocarbons are removed and sold separately including propane and butane. Other impurities are

also removed like hydrogen sulphide (through refining of which can produce sulphur, which is also sold separately). After refining the clean natural gas, it is transmitted through network of pipelines, thousands of miles. From these pipelines natural gas is delivered to its point of use.

## Measurement

5.60 Measured in cubic feet. Production and distribution company measure gas in thousands of cubic feet (Mcf), Millions of cubic feet (Mmft), Trillions of cubic feet (Tcf) also commonly measured and expressed in British thermal Units (BTU). One BTU is the amount of natural gas that will produce enough energy to heat one pound of water by one degree at normal pressure. One cubic feet of natural gas contains about 1027 BTUs. When natural gas is delivered to a residence it is measured by the gas utility in “therms” for billing purposes. A therm is equivalent to 1,00,000 BTUs or just over 97 cubic feet of natural gas.

## Compressed Natural Gas (CNG)

5.61 CNG is a Substitute for gasoline (petrol), diesel, or propane/LPG. Although its combustion does produce greenhouse gases, it is a more environmentally clean alternative to those fuels, and it is much safer than other fuels in the event of a spill (natural gas is lighter than air, and disperses quickly when released). CNG may also be mixed with biogas, produced from landfills or wastewater, which doesn't increase the concentration of carbon in the atmosphere.

CNG is made by compressing natural gas (which is mainly composed of methane [CH<sub>4</sub>]), to less than 1% of the volume it occupies at standard atmospheric pressure. It is stored and distributed in hard containers at a pressure of 200–248 bar (2900–3600 psi), usually in cylindrical or spherical shapes.

CNG is used in traditional gasoline internal combustion engine cars that have been converted into bi-fuel vehicles (gasoline/CNG). Natural gas vehicles are increasingly used in the Asia-Pacific region, Latin America, Europe, and America due to rising gasoline prices. In response to high fuel prices and environmental concerns, CNG is starting to be used also in pickup trucks, transit and school buses, and trains.



The cost of this conversion is a barrier for CNG use as fuel and explains why public transportation vehicles are early adopters, as they can amortize more quickly the money invested in the new (and usually cheaper) fuel. In spite of these circumstances the number of vehicles in the world that use CNG has grown steadily at a 30 per cent annual rate.

### **Advantages**

1. Due to the absence of any lead or benzene content in CNG, the lead fouling of spark plugs is eliminated.
2. CNG-powered vehicles have lower maintenance costs when compared with other fossil fuel-powered vehicles.
3. CNG fuel systems are sealed, which prevents any spill or evaporation losses.
4. Increased life of lubricating oils, as CNG does not contaminate and dilute the crankcase oil.
5. CNG mixes easily and evenly in air being a gaseous fuel.

### **Drawback**

Compressed natural gas vehicles require a greater amount of space for fuel storage than conventional gasoline powered vehicles. Since it is a compressed gas, rather than a liquid like gasoline, CNG takes up more space for each gasoline gallon equivalent (GGE). Therefore, the tanks used to store the CNG usually take up additional space in the trunk of a car or bed of a pickup truck which runs on CNG. This problem is solved in factory-built CNG vehicles that install the tanks under the body of the vehicle,

### **CNG compared to LNG**

5.62 Compressed Natural Gas is often confused with liquefied natural gas (LNG). While both are stored forms of natural gas, the key difference is that CNG is gas that is stored (as a gas) at high pressure, while LNG is stored at very low temperature, becoming liquid in the process. CNG has a lower cost of production and storage compared to LNG as it does not require an expensive cooling process and cryogenic tanks. CNG requires a much larger volume to store the same mass of gasoline or petrol and the use of very high pressures (3000 to 4000 psi, or 205 to 275 bar). As a consequence of

this, LNG is often used for transporting natural gas over large distances, in ships, trains or pipelines, and the gas is then converted into CNG before distribution to the end user.

CNG can also be confused with LPG, which is liquefied propane. Unlike natural gas (mostly methane), propane can be compressed to a liquid without continual refrigeration. LPG is commonly used to fuel vehicles in Australia.

### **Liquefied Natural Gas (LNG)**

5.63 Natural gas at  $-161^{\circ}\text{C}$  transforms into liquid. When natural gas is cooled below  $-161^{\circ}\text{C}$  where it liquefies can be stored as a boiling liquid in insulated tanks as an alternative means of transportation to pipelines for natural gas.

This is done for easy storage and transportation since it reduces the volume occupied by gas by a factor of 600. LNG is transported in specially built ships with cryogenic tanks. It is received at the LNG receiving terminals and is regassified to be supplied as natural gas to the consumers. LNG projects are highly capital intensive in nature. The whole process consists of five elements:

- (i) Dedicated gas field development and production.
- (ii) Liquefaction plant.
- (iii) Transportation in special vessels.
- (iv) Regassification Plant.
- (v) Transportation & distribution to the Gas consumer.

LNG supply contracts are generally of long term nature and the prices are linked to the international crude oil prices. However, the LNG importing countries in recent times had started asking for medium/short term contracts with varying linkages.

### **Marketing and Distribution**

5.64 Domestic gas supply is not likely to keep pace with demand most of gas requirements are to be met imports either via pipeline or LNG tanker. LNG projects are high-risk. Capital intensive in nature and the critical

requirement for successful implementation of such projects is the identification and aggregation of linked bankable market which can pay for expensive LNG as long term basis. Since the power sector would be the anchor market for LNG terminals, the present structure and pricing / tariffs of Indian Electricity Sector may dampen the new power generation capacity creation programme and thus the demand for fuel.

Among the gas import options, generally the pipeline gas imports are economically superior to LNG imports. The success of transnational gas pipeline projects critically hinges on various geo political aspects involving the supply, transit and importing countries etc.

Natural Gas is expected to be the fastest growing energy source for a variety of reasons including environmental concerns, fuel diversification for energy security issues, price and market deregulation. Three key customer segments for Natural Gas are power, fertilizer and industrial users. Share of residential and transportation seems which are currently minimal likely to increase due to creation of infrastructure for supply of CNG to vehicles and piped gas to households. Growing environmental concerns against the use of diesel and the convenience of using gas as a domestic fuel will drive the proliferation of gas usage in these scenes.

## Gas Pricing

5.65 At present there are broadly two regimes for pricing of gas in the country a. gas priced under Administrated Pricing Mechanism (APM) and b. Non APM or free market gas. APM gas relates to gas produced in fields nominated by the government prior to NELP regime adopted since 1999. There is around 48 % of gas produced by ONGC and OIL under APM. The gas is produced from nomination fields of National Oil Companies (NOCs) viz. Oil and Natural gas Corporation (ONGC) & Oil India Limited (OIL). Prices of natural gas from the nominated fields has been revised in 2010, according to which the APM price for gas produced by NOCs like ONGC / OIL has been fixed at \$4.2/MMBTU(except for North East wherein the consumer price applicable is \$2.4 MMBTU). This gas is supplied to power, fertilisers, court mandated consumers and consumers having total requirement of less than 50 thousand SCMD. The price of gas supplied to consumers other than the above mentioned categories has been fixed at non APM rate. This rate varies in each gas zone. The APM and non APM rates are fixed by the government from time to time.

The other major chunk of gas is from the pre NELP fields of various joint ventures like PMT/Ravva etc. The price of this gas has been fixed based on PSCs signed with Government of India (GOI). The basic prices range between \$3.5-5.7/MMBTU. Gas price for NELP blocks is determined at arm's length by contractor and post that, approval for price is sought from GOI. Accordingly, the price of RIL KG basin gas has been fixed at \$4.2/MMBTU ex-Kakinada by EGOM till March 2014.

The other source of gas is RLNG (Regasified LNG) imported through term contracts. Price of long term LNG imported from Qatar at PLL Dahej has been linked to Japanese Crude Cocktail (JCC) and varies on monthly basis. Spot RLNG prices are based on market conditions, which are hovering around \$12-16/MMBTU. As per GOI policy, any one is free to market 'Market determined Priced Gas' for gas produced from new domestic fields. LNG Import is under Open General Licence (OGL) and hence freely importable.

## Storage

5.66 The most important type of gas storage is in underground reservoirs. There are three principal types — depleted gas reservoirs, aquifer reservoirs and salt cavern reservoirs. Each of these types has distinct physical and economic characteristics which govern the suitability of a particular type of storage type for a given application.

**Depleted gas reservoir:** These are the most prominent and common form of underground storage. They are the reservoir formations of natural gas fields that have produced all their economically recoverable gas. The depleted reservoir formation is readily capable of holding injected natural gas. Using such a facility is economically attractive because it allows the re-use, with suitable modification, of the extraction and distribution infrastructure remaining from the productive life of the gas field which reduces the start-up costs. Depleted reservoirs are also attractive because their geological and physical characteristics have already been studied by geologists and petroleum engineers and are usually well known. Consequently, depleted reservoirs are generally the cheapest and easiest to develop, operate, and maintain of the three types of underground storage.

**Aquifer reservoir:** Aquifers are underground, porous and permeable rock formations that act as natural water reservoirs. In some cases they can be used for natural gas storage. Usually these facilities are operated on a

single annual cycle as with depleted reservoirs. The geological and physical characteristics of aquifer formation are not known ahead of time and a significant investment has to go into investigating these and evaluating the aquifer's suitability for natural gas storage.

**Salt Cavern reservoir:** A salt cavern offers an underground natural gas storage vessel with very high deliverability. Cushion gas requirements are low, typically about 33 percent of total gas capacity. Salt caverns are usually much smaller than depleted gas reservoir and aquifer storage facilities. A salt cavern facility may occupy only one one-hundredth of the area taken up by a depleted gas reservoir facility. Consequently, salt caverns cannot hold the large volumes of gas necessary to meet base load storage requirements. Deliverability from salt caverns is, however, much higher than for either aquifers or depleted reservoirs.

## Natural Gas Markets

5.67 The critical feature of most gas markets is the cost and nature of transportation, moving gas from the point of production to the point of use is highly capital intensive, expensive relative to the cost of commodity itself and characterised by important economies of scale.

There are two distinct markets (1) Spot market (2) Futures Market. Spot market is the daily market where natural gas is bought and sold right now. To get the price of natural gas on a specific day, it is the spot market price which is most informative. Futures market consists of buying and selling natural gas under contract at least one month and upto 36 months in advance. Two types of natural gas marketing and trading are (1) Physical and (2) Financial Trading. Physical trading involves buying and selling the physical commodity. Financial trading involves derivatives and sophisticated financial instruments in which the buyer and seller never take physical delivery of the natural gas.

## Uses of Natural Gas

The uses of natural gases are as follows:

- (i) Residential Uses : For heating (water heater) and cooking – self ignition, temperature control and self-cleaning, cool houses through natural gas powered air conditioning and home appliances.

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- (ii) Commercial Uses : Private / Public Sector enterprises – office building, schools, churches, hotels, restaurants and govt. Buildings for space heating, water heating, cooling and cooking and lighting.
- (iii) Industrial Uses : Natural gas as ingredients for varied products such as plastic, fertilizer, anti freeze and fabrics, for lighting and cooking, in pulp & paper, metals, chemicals, stone, clay and glass, plastic and food processing, fertilizer, pharmaceuticals and Petrochemicals.
- (iv) Transportation : As alternative fuel à CNG (compressed natural gas) – cleanest burning alternative transportation fuel., being lighter than air, in the event of accident natural gas simply dissipates into the air instead of forming a dangerous flammable pool on the ground like other liquid fuels prevents the pollution of ground water in the event of spill.
- (v) Power Sector : Natural Gas is the major input for generation of electricity.

Natural gas is much cleaner burning than traditionally fuelled vehicles due to chemical composition of natural gas while natural gas is primarily methane, gasoline and diesel fuels contain numerous other harmful compounds that are released into the environment through vehicle exhaust.

The primary impediments to the public proliferation of NGV (Natural Gas Vehicle) include the high initial cost, limited refuelling infrastructure and automobile performance characteristics. NGV's despite being cheaper to refuel and maintain are more expensive initially than gasoline powered counterparts. As the technology is more advanced, the cost of manufacturing should drop, which may be then be passed on to consumers.

### **Internal Audit of Transactions**

- (i) To verify the production/purchase contracts for production/purchase of Natural gas.
- (ii) To verify the production cost/purchase cost of gas.
- (iii) To verify the sale contacts entered for sale of gas
- (iv) To verify the method of pricing adopted for different types of consumers.

- (v) To verify the cost benefit analysis for putting up of LNG terminals.
- (vi) To verify that the prices of gas are determined based on the supply and demand factors.

## Pipelines and its Accounting

5.70 Pipelines refer to a facility used to transport products / commodities from point of production/receipt to the point of delivery. Crude oil and petroleum products are the most common products / commodities transported by pipelines.

Comparison of pipelines as a mode of transport with other modes of transportation.

Head	Pipeline	Rail	Road
Energy Cost	Low	High	Very High
Operating Cost	Low	High	Very High
Pollution	Nil	Low	High
Movement / Congestion	Nil	Low	High
Handling Loss	Negligible	Low	High
Safety Hazards	Negligible	Low	High
Reliability	100%	Low	Low

Advantages of pipeline transportation:

1. Lower cost of transportation
2. Lower transit losses
3. Lower energy intensiveness
4. Economics of scale
5. Safety & reliability – minimum disruptions
6. Environment – Friendliness

7. Multi product handling
8. Flexibility]
9. Stationery carrier
10. Augmentation at low cost
11. Minimal land cost
12. Decongestion of surface transport systems.

Pipelines are the best suitable mode of transportation of large volumes of petroleum products over long leads. The crude oil pipelines transport waxy crude as well as low sulphur high sulphur crude. The finished product pipelines transport primarily light and middle distillates including ATF, in multi-product pipelines.

### **Disadvantages**

1. Capital intensive
2. Viability depends on utilisation
3. Once laid it is sunk cost / No alternative use
4. Less flexibility regarding batch size.
5. Inverting carrying costs
6. Interface and contamination of product
7. Door to door delivery not possibl

### **Pipelines Tariff Mechanism**

#### 5.71 Tariff Constitutes

- Operating cost including depreciation
- Return on net worth and borrowings
- Weighted average interest rate on borrowed capital



1. Operating Cost:
  - a. Variable Costs – Chemicals (protection against internal corrosion, utilities – power & fuel)
  - b. Variable cost prorated to stand throughput levels.
  - c. Fixed Costs – Salaries & Wages, Repairs & Maintenance, other expenses (administration), depreciation.
2. Return on net worth and borrowings.
3. Standard thruput in MT as divisor.

$$\text{Pipeline tariff Rs. per MT} = \frac{1+2}{3}$$

Standard thruput as divisor in case of the following

- (a) For product pipelines- 70% of installed capacity of pipeline for first year of operation. - 95 % of installed capacity of pipeline from second year of operation.
- (b) For crude oil pipelines – 70% of installed capacity of pipeline for first 2-3 years of operations. Thereafter installed capacity of pipelines.

Alternative Tariff Fixation:

1. Tariff equivalent to freight of alternate mode
2. As per market forces
3. As per take or pay contract

Present Pipe line Tariff:

75% of rail freight is the present tariff rate for pipeline distribution.

5.72 Fixed Assets - Assets can be Tangible and Intangible.

Intangible Assets :

- a. Right of way
- b. Licences (expenditure on technical knowhow / licence / Engineering fees relating to plant design / facilities)
- c. Computer software
- d. Right of way (ROW): right of way for laying of pipelines shall be recognised as intangible asset. Since the ROW is perpetual in nature, the same shall continue to be non depreciable asset and hence no amortisation is to be provided on ROW.

Tangible Assets:

- a. Plant & Machinery → Main line, single buoy mooring (SBM), pump station and terminals, tank farm, tele communication, tele supervising, fire fighting equipments, equipments & appliances, construction equipments.
- b. Pump Station Facilities → Pumping Units (diesel or crude oil division engines or motors coupled to single / multiple stage centrifugal pumps), Booster pumps (motor driver) fire fighting facilities, DG set, Air compressor, Control Panel and allied instrumentation, Communication system, Oil water separator and sump tank.
- c. Terminal facilities → Delivery manifold, scraper receiver, surge relief system, control panel and allied instrumentation, DG set, Fire fighting facilities, communication system, OWS and sump tank.
- d. Tank Farm facilities → Storage tanks ( fixed / floating roof), fire fighting facilities, control panel and allied instrumentation, oil water separator and sump tank, Communication system Etc.

5.73 Profit/ (Loss) Determination.

Income: Tariff rate 75% of railway freight for pipeline distribution.

Cost of throughput (COT) = Quantity delivered x tariff rate / MT

Profit: COT – operating expenses.

5.74 Internal Audit of transactions:

- (i) To verify that the Board approval has been taken for laying of new pipelines.
- (ii) To verify that cost benefit analysis has been done for laying of pipelines.
- (iii) To verify that fixation of pipeline tariff has been done taking into account all the operating expenditure (variable and fixed) and amount of investment in pipelines.
- (iv) To verify that the pipeline tariff is revised wherever there is need for revision due to change in operating expenditure or expiry of tariff period.
- (v) To verify that the assets are capitalised as per the classification of the asset.
- (vi) To verify that maintenance schedule of pipelines are adhered to so that the pipelines are used for transportation of products with minimal disruption
- (vii) To verify that the contracts of laying the pipelines are awarded after following proper purchase procedure
- (viii) To verify that procurement of materials for laying pipelines are finalised after following proper purchase procedure
- (ix) To verify that the COT (Cost of throughput) are collected as terms of agreement entered with the companies who utilise the facilities.
- (x) To verify whether the pipelines and its facilities are idling due to non maintenance or non availability of product for pipeline transportation.

## **Enterprise Resource Planning (ERP)**

5.75 ERP is an integrated enterprise wide information system. It integrates the information system of an organisation and automates most of the business

functions. A properly implemented ERP system can dramatically improve the efficiency and competitive advantage of an organisation.

In the ERP scenario, the complete audit trail is protected. The transaction in the ERP software is being recorded with user identification, time and date. No transaction is deleted or erased. Any erroneous transaction can only be rectified or reversed. This helps in identifying the full path of transaction from its origin to completion.

With introduction of ERP in the organisation the Audit has access to integrated consistent online, real time information.

#### **Comparison of Pre-ERP and Post- ERP Scenario**

<b>Pre-ERP</b>	<b>Post-ERP</b>
Islands of inconsistent information	Integrated, consistent and concurrent information
Distributed information processing, data transfer from different locations and functions	Centralised information processing, online, real time updated information
Duplication of jobs due lack of information and connectivity	Integrated information, data once entered updates all relevant records
Local processing	Remote Processing on central server

In the pre ERP scenario or legacy system, the audit was required to collect the hard copies of all the documents to start the audit. If for any reason, the required information not made available to audit, the job of audit is held up.

### **Purpose/ Advantages of ERP System**

5.76 The main advantages of ERP packages are improved efficiency, information integration for better decision making faster response time to customer queries etc. The indirect benefits include better corporate image, improved customer goodwill, customer satisfaction and so on. Other benefits are business interpretation, flexibility, better analysis and planning capabilities and use of latest technology.

The activities supported by ERP systems include all core function of enterprises, including financial management, human resources management and operations.

ERP packages if chosen correctly, implemented judiciously and used efficiently have the ability to raise productivity and profits of companies dramatically. But many companies fail in this because of incorrect selection of a package, in competent and haphazard implementation and inefficient or ineffective usage. The most crucial factor that decides the success of an ERP implementation is how the employees use the system. Even best ERP system can fail if the employees are not interested in using it or using it wrongly or inefficiently. To receive total and complete employee support and participation the organisation must make it a point to educate its employees about the potential benefits and provide them the requisite training.

ERP systems help to make this task easier by integrating the information systems, enabling smooth and seamless flow of information across departmental barriers automating business process and functions and thus helping the organisation to work and move forward as a single entity.

ERP means the techniques and concepts for integrated management of business as a whole from the view point of the effective use of management resources to improve the efficiency of enterprise management. ERP packages are integrated (covering all business functions) software package that support the ERP concepts.

ERP is a set of tools and process that integrates departments and functions across a company into one computer system. ERP runs off on a single data base, enabling various departments to share information and communicate with each other. ERP system comprises function specific modules designed to interact with the other modules like accounts receivable, accounts payable, purchasing, manufacturing, sales etc.

ERP offers a means of effectively increasing and managing the required resources (materials, equipments, tools, labour, money etc.) for each of these resources ERP can identify what is required, when it is needed and how much is needed, thus making the operation of the organisation efficient and effective.

ERP systems serve an important function by integrating separate business functions, materials management, production planning, production, sales distribution, financials, human resources and others into a simple application.

## Limitations of ERP System

5.77 ERP systems have their significant limitations.

1. Managers cannot generate custom reports or queries without help from a programme and thus inhibits managers from obtaining information quickly so that they can act on it for competitive advantage.
2. ERP systems provide current status only, such as open orders. Managers often need to look past the current status to find trends and patterns that aid better decision making.
3. The data in the ERP application is not integrated with other enterprises or division systems and does not include external intelligence.

There are many technologies that help to overcome these limitations. These technologies when used in conjunction with the ERP package will help in overcoming the limitations of standalone ERP system and thus help the employee in making better decisions. Some of these technologies are data warehousing & data marts, data mining, online analytical processing (OLAP), Supply chain management (SCM), Customer relationship management (CRM), geographical information system (GIS), intranets, extranets, electronic data interchange (EDI), digital cash, cryptography etc.

## Functional Modules of ERP Software

5.78 ERP software is made up of many software modules. Each ERP software module contains major functional area of an organization. Common ERP modules include modules for Finance, manufacturing, production planning, human resources, plant maintenance, materials management, quality management, marketing, sales and distribution, purchasing, inventory control, product distribution, order tracking, accounting, marketing and HR. Organizations often selectively implement the ERP modules that are both economically and technically feasible. Some of these modules are as follows:

- Financial Module – This module consists of areas relating to Trial balance, Balance sheet, Profit and loss account, General Ledger,

Treasury, Accounts receivable and Payable, cost centre accounting, Funds management (Budgetary control system), Investment Management (Capital Budgeting), Assets Accounting.

- HR Module– This Module consists of areas relating to Employee master records like personal data like education, Job profile, Training details, leave history, family details and salary details.
- Materials Management Module– This module consists areas relating to Purchasing, Store keeping and inventory management of raw materials, stores and spares, procurement of services, works contract, quantity accounting and materials management information system.
- Production Planning Module – This Module consists of areas relating to Production process including control and costing. Production planning optimizes the utilization of manufacturing capacity, parts, components and material resources using historical production data and sales forecasting.
- Manufacturing Module – This module consists of areas relating to manufacturing methods that can be combined
- Plant Maintenance Module – This Module consists of areas relating to Preventive maintenance and service management, maintenance order management, history of equipment and technical aspects and plant management information system. . It also forms the basis for defining an optimum maintenance strategy.
- Sales and Distribution Module – This Module consists of areas relating to Customer master maintenance, Price master maintenance, supplies at concessional rates, movements of products including in transit, transport vehicles utilisation and Sales and distribution management information system.
- Quality Management Module - This Module consists of areas relating to Quality planning, inspection, control, notification, certificates, test equipment management and quality management information system.
- Project Management Module- This Module consists of areas relating to Basic data about projects like planning, approval, execution and integration and project information system.

## Available ERP packages

5.79 The available ERP packages are

1.SAP AG, 2.Oracle, 3.Peoplesoft, 4.JDEdwards, 5.QADInc. 6. SSA Global, 7.Lawson software, 8.Epicor and 9. Intuitive.

## Internal Audit of ERP Transactions

5.80 The audit in ERP scenario will be done by selecting various Transaction (T) codes available in the ERP software for the particular area of transactions.

- (i) To view the trial balance
- (ii) To view the General ledger
- (iii) To view bank/cash book
- (iv) To view vendor balances
- (v) To view Customer balances
- (vi) To view assets ledger
- (vii) To view stock/ stores ledger
- (viii) To view Balance sheet
- (ix) To view Balance sheet schedules
- (x) To view Profit and loss account
- (xi) To view Profit and loss account schedules
- (xii) To view Purchase/work orders
- (xiii) To view Bank reconciliation
- (xiv) To view debtors ageing
- (xv) To view surplus/non-moving/slow-moving stock/stores
- (xvi) To view cost/profit centre report



- (xvii) To view Budget vs Actuals comparison for capital and revenue expenditure
- (xviii) To view sales reports
- (xix) To view production reports

By selecting the relevant T codes the particular area of transaction can be viewed and checked.

#### 5.81. Internal Audit of Implementation of ERP Software

- (i) To verify that there is a Board approval for implementation of ERP software
- (ii) To verify that cost benefit analysis has been carried out before implementation of ERP.
- (iii) To verify that proper purchase procedure has been adopted for selection of software.
- (iv) To verify that the particular ERP software has been chosen for implementation only after evaluation of the available ERP Softwares in the market.
- (v) To verify that proper training has been imparted by the software supplier to the power users
- (vi) To verify that proper training has been imparted by the power users to all users of software.
- (vii) To verify that the updation of software committed by the supplier within the warranty, has been done.

### **Strategic Reserves**

5.82 In view of the country's high import dependence for its oil and gas needs, Government of India has accorded high priority to securing India's energy security objectives. Today major portion of country's crude oil requirements is met from imports mainly from oil rich Middle East countries. It has therefore, become necessary for India to construct a reserve for buffer supply of crude oil, to deal any disruption in the supply chain due to external reasons such as political instability, war naval blockade, abnormal

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spike in the world oil prices for other reasons. The projects are under execution at three locations at Visakhapatnam, Padur and Mangalore.

To implement and manage the proposed strategic crude oil storage projects, a Special Purpose Vehicle, namely, Indian Strategic Petroleum Reserves Limited (ISPRL) was formed on 16/06/04 which became a 100 % owned subsidiary of Oil Industry development Board (OIDB) on 09/05/06.

To strengthen the country's energy security , the Ministry of Petroleum & Natural Gas is engaged in oil diplomacy through Government to Government negotiations, Inter- Governmental Commissions, Joint working Groups and region-specific events such as India –Africa Hydrocarbon Conference. Indian oil PSUs are being encouraged to adopt global vision in their pursuit of raw materials and raw material –producing assets abroad and to vigorously pursue acquisition of oil and gas assets overseas.

With rapid economic growth and the increasing energy intensity in Indian households, the issue of Energy security has assumed importance. The integrated Energy policy recommends that a reserve equivalent to 90 days of imports should be maintained for strategic cum buffer stock purposes and /or buy options for emergency supplies from neighbouring large storages such as those available in Singapore. The buffer stocks should be used to address short term price volatility. Operating the strategic/buffer reserves in cooperation with other countries, which maintain such reserves, should also increase their effectiveness.

It is expected that with the concerted efforts of the oil refining & marketing companies as well as the strategic storage facilities being created by the Central Government, around three months storage capacity would be available before the end of the next decade. In addition, the refineries and oil marketing companies are enhancing their storage capacity.

The required funds for filling up of crude oil at the three locations would be treated as Plan expenditure and funds would be made available through plan scheme of Ministry of Petroleum & Natural Gas.

Oil Industry Development Board (OIDB) is to carry out a prefeasibility study, for the additional storages in Phase II of the Strategic Reserve program. The additional Locations identified for Phase II storage are 1. Bikaner, Rajasthan, 2. Chandikhol, Orissa, 3. Rajkot, Gujarat and 4. Padur, Karnataka.

## **Regulatory Authorities**

### **Ministry of Petroleum & Natural Gas (MOPNG)**

5.83 The Ministry of Petroleum & Natural Gas is entrusted with the responsibility of exploration and production of oil and natural gas, their refining, distribution and marketing, import, export, and conservation of petroleum products and Liquefied Natural Gas.

The Petroleum Industry or Sector works under the Administrative Control of Ministry of Petroleum & Natural Gas.

### **Petroleum and Natural Gas Regulatory Board (PNGRB)**

5.84 The Petroleum and Natural Gas Regulatory Board (PNGRB) was constituted under The Petroleum and Natural Gas Regulatory Board Act, 2006 (NO. 19 OF 2006) notified via Gazette Notification dated 31st March, 2006. Petroleum and Natural Gas Regulatory Board, a body set up as downstream regulator under the PNGRB Act, 2006.

The Act, inter alia, provides for a legal framework for downstream gas sector regulation, as also development of natural gas pipelines and city/local distribution network. The PNGRB has been empowered to give authorisation to entities for (a) Laying, building, operating or expanding any pipeline as common carrier or contract carrier or (b) Laying, building, operating or expanding any city or local natural gas distribution network.

The Act provide for the establishment of Petroleum and Natural Gas Regulatory Board to protect the interests of consumers and entities engaged in specified activities relating to petroleum, petroleum products and natural gas and to promote competitive markets and for matters connected therewith or incidental thereto.

Further as enshrined in the act, the board has also been mandated to regulate the refining, processing, storage, transportation, distribution, marketing and sale of petroleum, petroleum products and natural gas excluding production of crude oil and natural gas so as and to ensure uninterrupted and adequate supply of petroleum, petroleum products and natural gas in all parts of the country.

The Board shall consist of a Chairperson, Member (Legal) and three other members to be appointed by Central Government.

5.85 Functions of Board

The Board shall-

- (A) Protect the interest of consumers by fostering fair trade and competition amongst the entities;
- (B) Register entities to-
  - 1. market notified petroleum and petroleum products and, subject to the contractual obligations of the Central Government, natural gas;
  - 2. establish and operate liquefied natural gas terminals;
  - 3. establish storage facilities for petroleum, petroleum products or natural gas exceeding such capacity as may be specified by regulations;
- (C) Authorise entities to-
  - 1. lay, build, operate or expand a common carrier or contract carrier;
  - 2. lay, build, operate or expand city or local natural gas distribution network;
- (D) Declare pipelines as common carrier or contract carrier;
- (E) Regulate, by regulations,
  - 1. access to common carrier or contract carrier so as to ensure fair trade and competition amongst entities and for that purpose specify pipeline access code;
  - 2. transportation rates for common carrier or contract carrier;
  - 3. access to city or local natural gas distribution network so as to ensure fair trade and competition amongst entities as per pipeline access code;

- (F) In respect of notified petroleum, petroleum products and natural gas
  - 1. ensure adequate availability;
  - 2. ensure display of information about the maximum retail prices fixed by the entity for consumers at retail outlets;
  - 3. monitor prices and take corrective measures to prevent restrictive trade practice by the entities;
  - 4. secure equitable distribution for petroleum and petroleum products;
  - 5. provide, by regulations, and enforce, retail service obligations for retail outlets and marketing service obligations for entities;
  - 6. monitor transportation rates and take corrective action to prevent restrictive trade practice by the entities;
- (G) Levy fees and other charges as determined by regulations;
- (H) Maintain a data bank of information on activities relating to petroleum, petroleum products and natural gas;
- (I) Lay down, by regulations, the technical standards and specifications including safety standards in activities relating to petroleum, petroleum products and natural gas, including the construction and operation of pipeline and infrastructure projects related to downstream petroleum and natural gas sector;
- (J) Perform such other functions as may be entrusted to it by the Central Government to carry out the provisions of this Act.
- (K) Determination of Marketing Margin

5.86 Powers regarding complaints and resolutions of disputes by the Board

- A. The Board shall have jurisdiction to-
  - a. Adjudicate upon and decide any dispute or matter arising

amongst entities or between an entity and any other person on issues relating to refining, processing, storage, transportation, distribution, marketing and sale of petroleum, petroleum products and natural gas according to the provisions of Chapter V, unless the parties have agreed for arbitration;

- b. Receive any complaint from any person and conduct any inquiry and investigation connected with the activities relating to petroleum, petroleum products and natural gas on contravention of-
  - i. Retail service obligations;
  - ii. Marketing service obligations;
  - iii. Display of retail price at retail outlets;
  - iv. Terms and conditions subject to which a pipeline has been declared as common carrier or contract carrier or access for other entities was allowed to a city or local natural gas distribution network, or authorisation has been granted to an entity for laying, building, expanding or operating a pipeline as common carrier or contract carrier or authorisation has been granted to an entity for laying, building, expanding or operating a city or local natural gas distribution network;
  - v. Any other provision of this Act or the rules or the regulations or orders made there under.

- B. While deciding a complaint under sub-section (1), the Board may pass such orders and issue such directions as it deems fit or refer the matter for investigation according to the provision of Chapter V.

## Carbon Credits

5.87 Carbon dioxide, the most important greenhouse gas produced by combustion of fuels, has become a cause of global panic as its concentration in the Earth's atmosphere has been rising alarmingly.

Carbon credits are a tradable permit scheme. A permit that allows the holder to emit one ton of carbon dioxide. Credits are awarded to countries or groups that have reduced their greenhouse gases below their emission quota. Carbon credits can be traded in the international market at their current market price. It is a simple, non-compulsory way to counteract the greenhouse gasses that contribute to climate change and global warming. Carbon credits create a market for reducing greenhouse emissions by giving a monetary value to the cost of polluting the air. The Carbon Credit is this new currency and each carbon credit represents one tonne of carbon dioxide either removed from the atmosphere or saved from being emitted. Carbon credits are also called emission permit. Carbon credit is in the Environment and Pollution Control subject. Carbon credits are certificates awarded to countries that are successful in reducing emissions of greenhousegases.

Since most of the industries rely on fossil fuels and are responsible for a great amount of greenhouse gas emissions, the Intergovernmental Panel on Climate Change(IPCC) decided to come up with a practical solution to increase awareness regarding these gas emissions and make 'going green' feasible for industrialists- Carbon Credits. When the countries came together to sign the Kyoto Protocol, they voluntarily decided to reduce the amount of Carbon they emit into the atmosphere. A financially viable way out was the concept of Carbon trading and Carbon credits.

## **Need for Carbon Credits**

5.88 Over millions of years, our planet has managed to regulate concentrations of greenhouse gases through sources (emitters) and sinks (reservoirs). Carbon (in the form of CO<sub>2</sub> and methane) is emitted by volcanoes, by rotting vegetation, by burning of fossil fuels and other organic matter. But CO<sub>2</sub> is absorbed, by trees, forests or by some natural phenomenon like photosynthesis and also oceans to some extent.

In modern times the burning of fossil fuels like coal, oil and natural gas – in which carbon has been stored for millions of years – combined with accelerated land clearance has led to exceptional levels of greenhouse gas emissions. Vegetation, largely forest, is already absorbing about one-third of human-induced emissions, planting more forests could increase absorption. Carbon sinks can't keep up, and concentrations of greenhouse gases in the atmosphere have risen dramatically leading to an enhanced greenhouse effect which will result in very rapid warming of the world's climate.

## **Existence of Carbon Credits**

5.89 The concept of carbon credits came into existence as a result of increasing awareness of the need for pollution control.

Carbon credits were one of the outcomes of the Kyoto Protocol, an international agreement between 169 countries. The Kyoto Protocol created legally binding emission targets for developing nations. To meet these targets, nations must limit CO<sub>2</sub> emissions. The very phrase "Kyoto Protocol" has become synonymous with the idea of saving the planet from the global meltdown. This can be accomplished by either reducing emissions or by absorbing emissions through processes such as tree-planting and sequestration.

Under the protocol, each country is given a quota of the amount of greenhouse gases they are allowed to emit, and in turn these countries set limits on the amount of greenhouse gases run by their corresponding local operators. So these operators can save up on the amount of greenhouse gases they emit, and if they have carbon credits left over from the quota allotted to them, they can sell it to another company that needs carbon credits owing to it emitting greenhouse gases in excess to the quota allotted to it. This allows for flexibility while making sure that the entire amount of emissions still stays within the cap. Under the this policy called the Clean Development Mechanism(CDM),big companies (usually from developed countries) that are exceeding their assigned quota of carbon credits can tie up with another company, or with its own subsidiary(usually in a developing nation) and make it more environmental friendly. Thus , an operator investing in carbon credits can go for the most cost-effective way to reduce emissions, either by investing in eco-friendly machinery and equipment ,or by purchasing carbon credits from another operator who has not reached his quota of greenhouse emissions.

## **Trading of Carbon Credits**

5.90 Buying carbon credits is not a charitable donation, but a retail action. Trade in carbon credits has the potential to make forestry more profitable and to sustain the environment at the same time.

One of the primary solutions for climate change being thought by global warming alarmists is the purchase and sale of carbon credits. For trading purposes, one credit is considered equivalent to one tonne of CO<sub>2</sub> emissions.



Credits can be exchanged between businesses or bought and sold in international markets at the prevailing market price

## Generation of Carbon Credits

5.91 Many types of activities can generate carbon offsets. Renewable energy such as wind farms, or installations of solar, small hydro, geothermal, and biomass energy can all create carbon offsets by displacing fossil fuels. Other types of offsets available for sale on the market include those resulting from energy efficiency projects, methane capture from landfills or livestock, destruction of potent greenhouse gases such as halocarbons, and carbon sequestration projects (such as reforestation) that absorb carbon dioxide from the atmosphere.

One carbon credit is equivalent to one tonne of CO<sub>2</sub> emissions. Credits can be sold in the international market at the prevailing prices via certain credit exchanges. Formalised in the Kyoto Protocol, carbon credits help developing/underdeveloped countries as they traditionally have lower per-capita carbon emissions than developed countries and will need to emit CO<sub>2</sub> owing to increasing industrial growth. At this point though, these countries can sell their carbon credits to other countries and reap the economic benefits of not polluting the planet. Under a basic cap-and-trade scheme, if a company's carbon emissions fall below a set allowance, that company can sell the difference in the form of credits to other companies that exceed their limits.

## Monetary Value of Carbon Credits

5.92 Carbon credits create market for reducing greenhouse emissions by giving a monetary value to the cost of polluting the air such as carbon emitted by burning of fossil fuels. This means that carbon becomes cost of business and seen like other inputs such as raw materials or labour.

Carbon credits are measured in tonnes of carbon dioxide (CO<sub>2</sub>).

1 credit = one tonne of CO<sub>2</sub>

Each carbon credit represents one metric ton of CO<sub>2</sub> either removed from the atmosphere or saved from being emitted. The carbon credit market creates a monetary value for carbon credit and allows the credits to be traded. For each tonne of carbon dioxide that is saved or not emitted carbon credit producers may sell one carbon credit.

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This devil, however, is now turning into a product that helps people, countries, consultants, traders, corporations and even farmers earn billions of rupees. This was an unimaginable trading opportunity not more than a decade ago.

Carbon credits are a part of international emission trading norms. They incentivise companies or countries that emit less carbon. The total annual emissions are capped and the market allocates a monetary value to any shortfall through trading. Businesses can exchange, buy or sell carbon credits in international markets at the prevailing market price.

India and China are likely to emerge as the biggest sellers and Europe is going to be the biggest buyers of carbon credits. India is one of the countries that have 'credits' for emitting less carbon. India and China have surplus credit to offer to countries that have a deficit. Waste disposal units, plantation companies, chemical plants and municipal corporations can sell the carbon credits and make money.

Carbon, like any other commodity, has begun to be traded on India's Multi Commodity Exchange. MCX has become first exchange in Asia to trade carbon credits.

Developed countries, mostly European, had said that they have decided on different norms to bring down the level of emission fixed for their companies and factories.

A company has two ways to reduce emissions. One, it can reduce the GHG (greenhouse gases) by adopting new technology or improving upon the existing technology to attain the new norms for emission of gases. Or it can tie up with developing nations and help them set up new technology that is eco-friendly, thereby helping developing country or its companies 'earn' credits.

India, China and some other Asian countries have the advantage because they are developing countries. Any company, factories or farm owner in India can get linked to United Nations Framework Convention on Climate Change and know the 'standard' level of carbon emission allowed for its outfit or activity. The extent to which I am emitting less carbon (as per standard fixed by UNFCCC) I get credited in a developing country. This is called carbon credit.

These credits are bought over by the companies of developed countries — mostly Europeans — because the United States has not signed the Kyoto Protocol.

## How does it work in real life?

5.93 Assume that British Petroleum is running a plant in the United Kingdom. Say, that it is emitting more gases than the accepted norms of the UNFCCC. It can tie up with its own subsidiary in, say, India or China under the Clean Development Mechanism. It can buy the 'carbon credit' by making Indian or Chinese plant more eco-savvy with the help of technology transfer. It can tie up with any other company like Indian Oil or anybody else, in the open market.

## India and Carbon Credits

### *Analyzing Indian Scenario*

5.94 India being a developing country has no emission targets to be followed. However, she can enter into CDM projects. As mentioned earlier, industries like cement, steel, power, textile, fertilizer etc. emit greenhouse gases as an outcome of burning fossil fuels. Companies investing in Windmill, Bio-gas, Bio-diesel, and Co-generation are the ones that will generate Carbon Credits for selling to developed nations. Polluting industries, which are trying to reduce emissions and in turn earn carbon credits and make money include steel, power generation, cement, fertilizers, waste disposal units, plantation companies, sugar companies, chemical plants and municipal corporations.

### *Benefits For India*

5.95 By, switching to Clean Development Mechanism Projects, India has a lot to gain from Carbon Credits:

- (a) It will gain in terms of advanced technological improvements and related foreign investments.
- (b) It will contribute to the underlying theme of greenhouse gas reduction by adopting alternative sources of energy
- (c) Indian companies can make profits by selling the Carbon credits to the developed countries to meet their emission targets.

## Chapter 6

# Cost Audit

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6.1 Central Government has notified Cost Accounting Records (Petroleum Industry), Rules 2002 vide G.S.R. 686(E), dated the 8th October, 2002 for the financial year commencing on or after first day of April 2003 to be followed by petroleum companies is superseded by G.S.R. No. 870(E) dated 7th December 2011 - Cost Accounting Records (Petroleum Industry) Rules 2011. It is applicable to every Company engaged in production, processing and manufacturing of crude oil, gases (including Compressed Natural Gas or liquefied natural gas and re-gasification thereof) or Biogas or any other petroleum product or included under Chapter 27 of the Central Excise Tariff Act, 1985 (5 of 1986), including the intermediate products and articles or allied products or activities thereof and includes storage, transportation or distribution of crude oil or gases or biogas or any or all of the petroleum products. Every Company to whom the rules are applicable shall in respect of each of its financial year commencing on or after first day of April 2003 keep proper books of accounts relating to the utilization of materials, labour and other elements of cost in so far as they are applicable to any of the products or activities referred in the rules.

6.2 In case of down stream activities, Cost Accounting Records (Petroleum Industry) Rules 2002 is applicable only for Refineries/ Lube blending Units. In respect of companies having only marketing activities, the Rules do not cover such marketing activities. Pipelines used for transportation of crude would only get covered as part of refining activity. The pipelines meant for transport of finished products are considered to be a part of the marketing activity and therefore not considered for the purpose of reporting as per Cost Accounting Record (Petroleum Industry) Rules 2002. The Lube blending plants form part of the manufacturing activity and hence separate records as per the requirement of Cost Accounting Record (Petroleum Industry) Rules 2002 need to be maintained. The LPG bottling plants are part of marketing activities and do not fall under the definition of manufacturing. Hence, the Cost Accounting Record (Petroleum Industry Rules) 2002 are not applicable for LPG plants at marketing locations i.e., outside the refinery.

6.3 Under the above Rules, it is mandatory to maintain proper books of accounts and records related to manufacturing of product under reference. Further, information in the prescribed proforma 'A' to 'I' has to be furnished to the Central Government within 90 days of the close of the financial year. The records are subject to audit by a Cost Auditor under the Cost Audit Order issued by the Central Government. The statutory auditor, pursuant to the requirements of the Companies (Auditor's Report) Order, 2003, is required to comment whether the company has maintained proper cost records in conformity with Section 209 (1d) of the Companies Act, 1956.

## Chapter 7

# Information Systems Audit

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7.1 With the advent of the information technology revolution in every sphere of economic activity, it has also become necessary to obtain assurance that the IT systems in place are working as designed since the cost of errors and irregularities in the IT systems can be very high and detection of the same is also rendered difficult. Hence, the need for the information systems audit. The prime objective of information systems audit is to determine whether the procedures followed and the system design maintains data integrity and utilises resources optimally.

### Information Systems Security

7.2 Information systems security is defined as the “procedures and practices to assure that computer facilities are available at all required times, that data is processed completely and efficiently and that access to data in computer systems is restricted to authorised people only”. For any organization, the security objective is met when:

- Information systems are available and usable when required.
- Data and information are disclosed only to those who have a right to access .
- Data and information are protected against unauthorized modification.

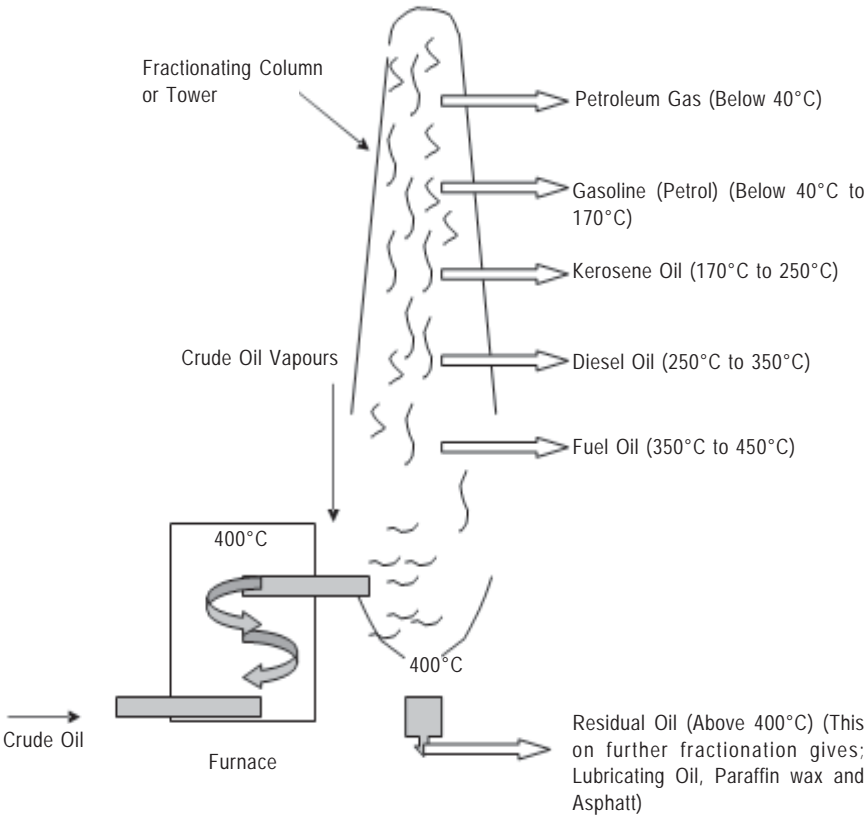
7.3 Systems security encompasses the various layers of information systems such as the physical layer and logical layer. The physical layer would encompass physical and environmental security. The logical layer would encompass security at various layers such as Operating System, Network, Database and Applications Software. The overall nature of business, organisation structure, Management philosophy and IT deployment would determine the type of security to be deployed in the enterprise.

## Types of Information Systems Audit

Type of Audit	Description
1. Application Review	<ul style="list-style-type: none"> <li>● Access control</li> <li>● User management</li> <li>● Security architecture</li> <li>● Test of adherence to policies</li> <li>● Server configuration</li> <li>● Password policy/ Standards</li> <li>● System monitoring</li> <li>● Backup and recovery</li> </ul>
2. Desk Top Management	<ul style="list-style-type: none"> <li>● Software inventory</li> <li>● Hardware inventory</li> <li>● Software license management</li> <li>● DeskTop Support (including annual maintenance contracts)</li> </ul>
3. Computer	<ul style="list-style-type: none"> <li>● Services Department Review</li> <li>● Review of changes control process</li> <li>● Authorization procedures for new users</li> <li>● Process for disabling access for terminated employees</li> <li>● Disaster recovery and business resumption plans</li> <li>● Inventory and software licensing procedures</li> </ul>
4. Network Review	<ul style="list-style-type: none"> <li>● Detailed review of network management</li> <li>● Server configurations including security parameters.</li> <li>● Routers access control list</li> <li>● User management</li> <li>● Event logging and system monitoring</li> </ul>

# Appendix A

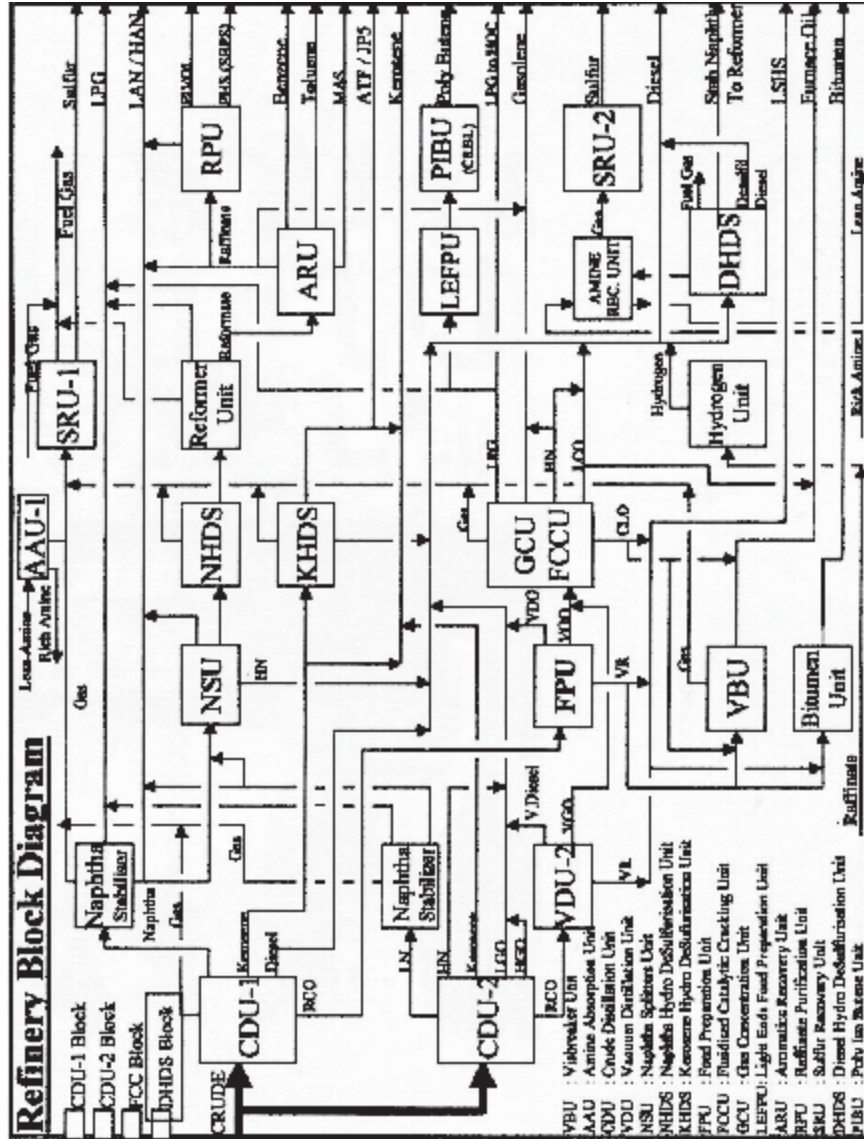
## Process of Refining





# Appendix B

## Refinery Block Diagram



# Appendix C

## Types of Products Produced from Crude Oil

