In this chapter a detailed discussion on Petroleum Products, their genesis, their different forms, supply and distribution and Pricing of the product worldwide has been undertaken. The evolution of petroleum pricing in Indian Economy followed by advantages and pitfalls of the current pricing regime and perspectives has been discussed.
Chapter 3. Petroleum Pricing

What are petroleum products? Why are they useful to us? What are their uses in the modern society? What is the source? Where from the product comes? How does it reach us? Where is the market? Where do we buy the product from? Who are the people who deal in it? Why are governments involved in the trade? Are we paying the right price for the product? These are some of the pertinent questions which come to our mind when we talk about pricing in petroleum products. In this chapter, a sincere attempt to answer these questions is being made.

3.1 Petroleum Products

Petroleum products are commercially marketable materials with inherent calorific values which provide energy derived from crude oil (petroleum) which is processed in oil refineries.

3.1.1 Crude Oil

The generally-accepted origin of crude oil is from plant life predominantly from 100 to 600 million years ago. The molecular structure of the hydrocarbons and other compounds present in fossil fuels can be linked to the leaf waxes and other plant molecules of land and sea plants believed to exist at that time. Crude oil is a mixture of different hydrocarbons. It is usually found with deposits of natural gas which is about 92% methane.

Crude is usually black or dark brown in appearance, although it may be yellowish, reddish, or even greenish. They vary greatly in appearance depending on its composition. Crude is found naturally in different sedimentary basins and geological strata and in varied forms. The location of their presence naturally is known as reservoirs. In the reservoir, it is usually found in association with natural gas which being lighter forms a gas cap over the petroleum, and saline water which, being heavier than most forms of crude oil, generally sinks beneath it. Crude oil naturally is found in viscous form and in certain parts of the world they occur in semi-solid form mixed with sand and water. Athabasca oil sands in Canada are one such example where it is usually referred to as crude bitumen. In Canada, bitumen is considered a sticky, black, tar-like form of crude oil which is so thick and heavy that it must be heated or diluted before it can flow. World over, the Middle East is the cradle of Oil. More than 50% of known oil reserves of the world are found in this belt.

Figure 3.1 Crude Oil
3.1.1.1 Exploration

As mining process of any other minerals, crude is also secured through extensive geological and geophysical survey of land mass and areas under water. The reservoirs found on land are referred to as on shore and ones found under the sea or lakes / rivers are known as offshore. After detailed mapping of the area, also known as geological surveys of the region, reservoir studies are carried out through sophisticated computer modelling, seismic studies, satellite imaging, and sonar echo modelling and then drilling is carried out physically to ascertain presence of crude / gas. Subsequent to finding out of crude / gas, the reservoir is reassessed for commercial viability of production and then the well is either commissioned for commercial production or capped to maintain status quo. This entire process very simply stated is known as Oil Exploration and production which is a multi-Billion Dollar high technology, high risk business area.

Leading multinational Oil companies and even national governments are actively involved in this business which is characterised by high risk / high gain. Governments are involved not because of gains but to ensure national energy security.

After exploring the crude oil, drilling platforms are put to place to extract the liquid gold from the reservoir. This in itself is a very sophisticated activity as securing crude from depths of nature has its own challenges. The examples are North Sea oil platforms, Bombay High, etc. where withstanding the nature itself is a challenge.
3.1.1.2 Crude Logistics

The oil so extracted is then transported to terminals / collection centres also known as group gathering stations with the help of pipelines, ocean freighters, Wagons and Tank Trucks on the land.

The crude freight logistics is very important to understand. The size of crude carriers internationally available is:

- Handy Size – 10,000 to 30,000 DWT
- Handy Max – 30,000 to 50,000 DWT
- Panamax - 50,000 to 80,000 DWT
- Aframax - 80,000 to 119,000 DWT
- Suezmax - 80,000 to 150,000 DWT
- VLCC – Very Large Crude Carriers - 200,000 to 299,999 DWT
- ULCC – Ultra Large Crude Carriers - 300,000 to 550,000 DWT
The larger the carrier, the lesser will be the per ton cost of freight. The difference in freight per ton between a Handy Size parcel and a VLCC parcel normally is around 10% and sometimes can go up to 20% depending on the voyage. The constraints are handling of the large cargos and port facilities. The VLCCs need high draft at the port for discharge or loading. Similarly the on shore storage facilities should support the discharge of such large parcels. The freight economics is a subject by itself.

These terminals are normally located at port heads or near the refinery for further processing or trade. The sheer volume of the product and nature of the product itself lends a challenge of handling the liquid gold.

3.1.1.3 Refining

The crude oil undergoes a process known as fractional distillation which is essentially an industrial process carried out in the refinery. According to the crude composition and demand of various downstream products, refineries produce different shares of petroleum products. Fractional distillation separates crude oil into more useful hydrocarbons. These hydrocarbons are separated by their boiling points, each of these sections are called fractions. The largest share of these fractions are used to blend to give gasoline, jet fuel, diesel fuel, heating oil, and heavier fuel oils. Heavier (less volatile) fractions can also be used to produce asphalt, tar, paraffin wax, lubricating and other heavy oils. Refineries also
produce other chemicals as by-product. Seventy percent of all organic chemicals are produced by the oil refineries world-wide, some of which are used in chemical processes to produce plastics and other useful materials. Since crude mostly contains some element of sulphur, sulphur is also produced as petroleum by-product. Hydrogen and carbon in the form of petroleum coke is also produced as petroleum products. The hydrogen produced is generally used as an intermediate product for other oil refinery processes such as hydrogen catalytic cracking (hydrocracking) and hydrodesulphurization. The typical refining process is illustrated in the figure 3.9.

The main products commercially marketed by the oil companies are LPG, Naphtha, Gasoline i.e. Motor Spirit, Paraffin Oil i.e. Kerosene and Aviation Turbine Fuel also known as Jet Fuel, Diesel i.e. High Speed Diesel i.e. HSD and HHSD i.e. High Flash High Speed Diesel Oil, Light Diesel Oil i.e. LDO, Lubricating base stocks, Heavy Oils, Bitumen and Petroleum Coke.

3.1.1.3.1 Liquefied Petroleum Gas

LPG as commonly known is a Propane / Butane mixture liquefied under normal ambient temperature and moderate pressures. It is a safe, clean burning, reliable, high calorific value fuel. In addition to its use as a domestic fuel, it is also widely used in industries where there is a requirement of low sulphur content fuel and fine temperature controls.

3.1.1.3.2 Naphtha

Naphtha is lighter fraction of petroleum crude and is used primarily used as feedstock for producing high octane gasoline (via the catalytic reforming process). It is also widely used in the petrochemical industry for producing olefins in steam crackers and in the chemical industry for solvent (cleaning) applications. Common products made with it include lighter fluid, fuel for camp stoves and some cleaning
solvents. They are extensively used as fuel for gas turbines in Power sector. The Fertilizer Industry also uses it as feed stock when natural gas is not available.

3.1.1.3.3 Gasoline (Petrol)

Also known as MOGAS, Petrol is the most common transport fuel for light passenger vehicles like cars and scooters. The world over this fuel is available and standardized as auto fuel. AVGAS is the fuel for aviation. The petroleum feed stock is the same but they have different specifications to suit fuel applications.

3.1.1.3.4 SBP

This product is known as Special Boiling Point spirit, technically known as Solvent 1425 which is widely used by tyre, paint and adhesive industry.

3.1.1.3.5 Kerosene

Commonly known in India as “Mitti ka tel”, SKO has wide application as cooking fuel for the poor, lighting of wick lamp and petromax hurricane lamps. In certain parts of Asia where the price of kerosene is subsidized, it fuels outboard motors rigged on small fishing craft. Kerosene is also widely used to power jet-engine aircraft (jet fuel) ATF, Jet A 1 and some type of rockets. This is also used to manufacture N paraffin, base stock for the production of LAB (linear alkyl benzene) which goes into manufacturing of detergents.

3.1.1.3.6 Diesel

The most widely used petroleum product worldwide is also called HSDO High Speed Diesel Oil i.e. Gasoil. The fuel is the main stay for commercial vehicles, heavy transport sector, railway locos, agricultural pump set engines, marine engine fuel and feed to gas turbines as start-up fuel in power sector. This fuel accounts for more than 40% of total petroleum product consumption in India. The ratio remains same worldwide and only increases where Natural Gas is not available.

3.1.1.3.7 Light Disel Oil (LDO)

This fuel is unique to Indian market. As India being an agricultural economy, the Indian government wanted to provide agriculturists with a cheap fuel as against Diesel for agricultural pump sets. This resulted in formulation of LDO, a blend of HSD and heavy fuel. The fuel had served the intended purpose very well during seventies when electric power to rural belts was erratic and absent in most remote areas of the Indian sub-continent. The product is slowly but steadily being demarked as price of the fuel which was lower than Diesel has now become costlier due to price controls in Diesel.
3.1.1.3.8 Mineral Turpentine Oil (MTO)

This fuel is known as Mineral Turpentine Oil, technically known as Solvent 2425 which is widely used in paint industry. They have other applications such as industrial cleaners and medium for dry cleaning.

3.1.1.3.9 Hexane

This is a type of solvent used for extraction of oil by expellers.

3.1.1.3.10 Benzene

This type of solvent is used in manufacture of synthetic rubber, detergents and polyester resins.

3.1.1.3.11 Toluene

This is another type of solvent used in Pharmaceutical, pesticide, perfume and dye – stuff industries.

3.1.1.3.12 Lubricating Oils

This is a very critical high value petroleum product having wide applications in industry, agriculture and automotive sector. The applications are mainly to reduce friction by lubrication and specialized applications like heat transfer, quenching, transmit power, corrosion resistance, sealing for gases, base for spray oils, etc. They account for only 1% of the total petroleum sales but are the most profitable product lines of the oil companies.

3.1.1.3.13 Heavy Oils

These are the fuel product lines used by industry, heavy marine engines, and power plants. In U.S.A, Canada, Europe and certain cold parts of the World, they are also known as Heating Oils, as they are used for domestic boiler fuel. The typical commercial names are HFO - Heavy Furnace Oil, RFO - Residual Fuel Oil, LSHS - Low Sulphur Heavy Stock or simply heavy oils. The manufacturing sector, Fertilizer industry and core sector are users of this product the world over.

Figure 3.16 Heavy Oil

3.1.1.3.14 CBFS

This product is known as Carbon Black Feed Stock. It is widely used for manufacturing of carbon black, axle oil blends for railways, rubber processing and ink and varnish industry.
3.1.1.3.15 Bitumen

The refinery bottom is what we call the Bitumen or asphalt. This product is extensively used in road construction and to a limited extent in civil construction and news ink industry. This product line accounts for 4% of the total petroleum products sold in India.

Figure 3.17 Bitumen

3.1.1.3.16 Petroleum Coke

Petroleum coke (often abbreviated Pet coke) is a carbonaceous solid derived from oil refinery Coker units or other cracking processes. The refinery markets it as a separate product which is directly used by industry for heating purposes. They are an excellent and better substitute to coal.

Figure 3.18 Pet Coke

3.1.1.3.17 Sulphur

Elemental sulphur was once extracted from salt domes where it sometimes occurs in nearly pure form, but this method has been obsolete since the late 20th century. Today, most of the elemental sulphur is produced as a by-product of removing sulphur-containing contaminants from natural gas and petroleum. The commercial uses are primarily in fertilizers and in the manufacture of sulphuric acid, a primary industrial chemical. Other well-known uses of the element are in manufacturing matches, insecticides and fungicides. They have a ready market and are quite profitable for the refineries.

Figure 3.19 Sulphur

3.2 Pricing Of Petroleum Products

3.2.1 Crude

3.2.1.1 Historical perspective

Crude oil is like any other commodity and its price behaviour is also very similar. Crude oil prices display wide price swings in times of shortage or oversupply. The crude oil price cycle may extend over several years responding to changes in demand and supply of OPEC and non-OPEC nations. This is truly one product which is global in character and recognizes no political barriers as far as its usages and pricing
is concerned. Gone are the days when a clutch of producers could control the prices. Today, the market mechanism decides the price and any political or natural phenomenon has its impact globally.

The world of petroleum is divided into two groups from the supply side, OPEC – Oil Producing and Exporting Countries and non OPEC countries. OPEC was established in 1960, with five founding members Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. It took over a decade to establish its influence in the world market. By the end of 1971, six other nations had joined the group: Qatar, Indonesia, Libya, United Arab Emirates, Algeria and Nigeria. Subsequently Angola, Ecuador and Saudi Arabia joined them. Amongst these groups of nation, they almost control 41% of the total world supplies. The interesting fact to note is, U.S.A in 1965 had a share out of 27% of the total crude production. During pre-world War II, the share was quite high which in 2009 came down to only 8.5%.

The U.S.A from the beginning of oil trade was controlling the crude prices through a mechanism of controlling production by restricting or increasing the crude output. Texas Railroad Commission (Texas, Oklahoma and Louisiana) till 1970 effectively controlled the crude prices through this supply side control method. However as production capacities of U.S.A came down and OPEC capacities increased, the power of balance changed. In March 1971, their control passed on to OPEC as they were effectively controlling 50% crude production of the entire world.

The U.S.A by virtue of being the largest consumer of petroleum products has the most profound impact on its prices. The U.S. petroleum industry was heavily regulated through production side price controls during early twentieth century. In the post-World War II era, U.S. oil prices at the wellhead averaged $26.64 per barrel adjusted for inflation to 2008 dollars. In the absence of price controls, the U.S. price would have tracked the world price averaging $28.68. Over the same post war period, the median for the domestic and the adjusted world price of crude oil was $19.60 in 2008 prices. This means that only fifty per cent of the time from 1947 to 2008 have oil prices exceeded $19.60 per barrel (refer Table A-8). OPEC, the largest producers of oil in the world, till the March 2000 had maintained the $22-$28 price band for basket of crude and only during the Middle East conflict, oil prices exceeded $24.00 per barrel in response to war. OPEC abandoned its price band in 2005 and with their limited spare production capacity

3.9
the oil prices surged. This was reminiscent of the late 1970s. From then onwards, the crude prices have remained above the $ 50 mark.

In mid-2002, there was over 6 million barrels per day of excess production capacity and by mid-2003 the excess was below 2 million. During much of 2004 and 2005 the spare capacity to produce oil was under a million barrels per day. A million barrels per day is not enough spare capacity to cover an interruption of supply from most OPEC producers.

In a world that consumes over 90 million barrels per day of petroleum products that added a significant risk premium to crude oil price and this is largely responsible for prices in excess of $40-$50 per barrel.

During the end of the decade, the crude prices fluctuated violently. They hit the unheard of levels $ 130 – 140 and then tumbled to sub $ 50 a Bbl. This reflected the acute demand and supply imbalance arising out of the reality of China and India, emerging as major consumer of petroleum products sometimes competing with the U.S.A.

Another major factor impacting the crude price is the strategic crude storages built by major consuming nations and in particular the U.S.A. The inventory levels of these storages directly have price impacts on the spot rates of crude. To understand the phenomenon, let us have a look on the storage capacities of some major nations which are declared (refer Table 3.1). Certain storage capacities for strategic reasons have not been declared and are not under preview of civil societies. These are meant for military purposes and hence details are not known. However, experts estimate the stocks to be in the range of 40% to 50% of the declared commercial stocks which sometimes are scaled up to double the capacity in times of national exigencies like natural calamities or wars (refer Table A-49).

<table>
<thead>
<tr>
<th>Country</th>
<th>Storage Capacity</th>
<th>Number of days Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>727</td>
<td>40</td>
</tr>
<tr>
<td>European Union,</td>
<td>350.8</td>
<td>22</td>
</tr>
<tr>
<td>excluding UK and Ireland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taiwan</td>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td>Singapore</td>
<td>96.3</td>
<td>46</td>
</tr>
<tr>
<td>South Korea</td>
<td>76</td>
<td>34</td>
</tr>
<tr>
<td>Japan</td>
<td>324</td>
<td>73</td>
</tr>
<tr>
<td>India *</td>
<td>37.4</td>
<td>12</td>
</tr>
<tr>
<td>China</td>
<td>271.9</td>
<td>36</td>
</tr>
<tr>
<td>South Africa</td>
<td>45</td>
<td>90</td>
</tr>
</tbody>
</table>

Source: Respective govt sites and cons data from BP year book data
Data: As of end of 2010

Table 3.1 Strategic Reserves as declared by countries
3.2.1.2 Pricing

3.2.1.2.1 International

As any other product, crude is priced as per quality and origin of the product. The specific gravity of the product is denoted by the API index. The definition of light and heavy crude varies because the classification is based more on practical grounds than theoretical ground. The New York Mercantile Exchange (NYMEX) defines light crude oil for domestic U.S. oil as having an API gravity between 37° API (840 kg/ m³) and 42° API (816 kg/m³), while it defines light crude oil for non-U.S. oil as being between 32° API (865 kg/ m³) and 42° API (816 kg/ m³).

The different types of important crude oils with their API indices and reference prices are mentioned in Table A-48. However the main types of crude traded and quoted in the market are:

- Light Arabian, also known as Dubai Crude, it has an API gravity of 31° API (871 kg/ m³).
- Brent, Europe, it has an API gravity of 38.06° API (835 kg/ m³).
- Bonny Light, Nigerian, it has an API gravity of 37.00° API (812 kg/ m³).
- WTI, West Texas Intermediate, it has an API gravity of 39.6° API (827 kg/ m³).
- Tapis Crude, Singapore, it has an API gravity of 44.00° API (965 kg/ m³).

These are also known as Crude oil benchmarks or oil markers which were first introduced in the mid-1980s. However the three primary benchmarks are WTI, Brent Blend, and Dubai (refer Table A-8, 48).

Worldwide crude is traded physically and in futures Ex Port locations from where these products are loaded on Ocean Tankers for onward shipment worldwide. The important port locations are:

- Dubai
- U.S.A
- Singapore
- Rotterdam
- Ras - Tanura, Saudi Arabia

The price quotes are reported and quoted intraday 365 days a year. The typical quotes are basis international trading Ex the port of loading. The logic for quotes Ex major ports is the element of freight rates which can be 0.5 to 12% of the crude prices. Further all quotes are FOB as a standard practice. Most trades are basis
geographic location of consumption centres and prices quoted are influenced by the demand pattern of the area.

The quotes are published in trade journals and commodity exchanges. They are also available online. The two most important journals and media companies dealing with Oil prices are Platts, Oil Gram Price Report, (McGraw Hill Company) and Argus Crude by Argus Media Company (refer Table B-71, 72). All sale and purchases are quoted and reported basis volume weighted averages over the time period.

The Bible for crude prices is taken as Argus Crude. The standard quotes are for the following locations:

- North Sea
- Russian Caspian
- Mediterranean
- West Africa
- Mideast Gulf
- Asia Pacific
- Canada Pipe Lines
- Americas Cargoes

The quotes follow the standard of bid price and Ask price. It follows with a detail of last 3 months average, 3 days intraday details, details of all loadings scheduled, major buyers, tenders, Future markers and forward spreads. Demurrages of various cargo sizes are also mentioned in case of port constraints. Details of all US and major World deals transacted on the day, basis crude grades, location, delivery, price decided basis month and details of premium / discount on price are quoted. The report also has a descriptive part which details the trends of each location and important developments impacting demand and supply situation of crude at the location (refer Table B-71).

The Platts, Oilgram Price Report, has a different format. The main focus of the report is on finished products, Crude Prices are reported as quick reference for the basis of price determination of finished products (refer Table B-72). Hence serious buyers and sellers of crude worldwide refer to Argus Crude for all major decisions.

3.2.1.2.1.1 Spot Prices

The spot prices are finalized basis last 3 days quotes Ex the port for the particular crude depending on the parcel size. The buyer on finalization opens an LC, detailing dates of delivery and other commercial details like currency and payment terms.
Typical quotes are Date 16th August 2010, Dubai, for supplies, Bid price $72.32, Ask price $72.42 and last column is differential to the benchmark on the date (refer Table B-71).

3.2.1.2.1.2 Long term contract Prices

These prices are finalized basis the following formula:

1) Spot prices on date of delivery, +/- premium.
2) Future Price as on date, +/- premium.
3) Combination of above two.
4) Fixed rate on the basis of the spot rate.

3.2.1.2.1.3 Trading through Commodity Markets

The western markets have very well developed commodity markets. New York Mercantile Exchange is one such market which has a very high trade of crude on the board. The index is known as NYMEX index and is widely reported and traded in. Certain physical trade of crude is also based on this index. As any major commodity index, NYMEX has an overall crude index and separate for certain crudes. The mainly traded are:

1) NYMEX Light Sweet Crude
2) NYMEX US Gulf Sour Crude
3) NYMEX No 2 Oil

They are traded in spot and in futures (refer Table A-50). To summarize, crude prices are internationally market determined in a very transparent manner. They are reported online as well as through the commodity markets. The actual trade takes place mostly on long term contracts with the spot trades accounting for less than 20% of the total trade. The transaction sizes are very large, they in fact constitute more than 20% of the total commodity trade by value world-wide.

3.2.1.2.2 Domestic

World over crude has been priced on a cost plus basis by respective governments for their domestic market through an administered mechanism. The countries where this product is surplus follow a principle of normative cost, recovering the operating cost and a part of premium at which the product is exported. This is in consonance with the principle of common wellbeing, whereby the natural rent occurring to the producing nation is shared with the citizens of the nation. The surplus is exported with the Export parity formula. The OPEC countries follow this principle.
The rest of the world follows the principle of import parity and a premium to domestic crude producers so that they tend to become self-reliant.

India prior to 1981 was heavily depended on crude imports. This is prior to Bombay high fields starting production. The crude was priced based import parity as most of the Oil majors were foreign companies. After the nationalization, the government followed the pricing concept of import parity with long run marginal cost. The crude oil prices were revised administratively with government fiat in 1981 and remained fixed till 1992. The crude prices were fixed to Rs. 1506/Mt in 16.09.1992, revised to Rs. 1796/Mt in 01.04.1993 and then to Rs. 2119/Mt in 01.04.1996 on normative basis. Thereafter the government reviewed the prices and allowed the domestic companies to charge import parity prices to the refining companies. The transition from fixed price of crude to import parity was scaled and graded to avoid price shocks to the economy from 1998 to 2002. The crude oil producers were paid a pre announced increase in percentile basis 75% for 1998 – 99, 77.5% for 1999 – 2000, 80% for 2000 – 2001 and 82.5% for 2001 – 02 of the international FOB prices on year on year basis subject to a floor price of Rs. 1,199/Mt and a ceiling of Rs. 5570/Mt till 2001 and revised ceiling of Rs. 6470/- till March 2002.

Consequently after de regulation post April, 2002, the oil producing companies determine the prices of indigenous crude in consultation with the refiner’s basis Crude Oil Sales Agreement (COSA) benchmarking various indigenous crude oils to equivalent international crude oils with their FOB prices. The import parity principle is applied and final price arrived.

The typical price formula will be:

**FOB Middle East (Indian Crude Basket equivalent, average of last 30 days) + (Ocean Freight, Insurance, Customs Duty, CVD, Ocean Loss, port charges, Warf ages and Demurrages) + premium / discount.**

It is important to note that, after de regulation of the sector, private players have also entered the market. Players like Crain energy who have stuck oil in Barmer, Rajasthan are also to be governed by these price agreements. Thus a fair return with opportunity cost will only boost prospects in this high technology and high risk area.

An important aspect of crude pricing is the government taxes in the form of royalty and cess. Royalty is state revenue but decided and imposed by the central government. Cess is levied by the Central government and accrues to the central kitty. Currently the typical rates are of royalty are 20% ad valorem and cess is specific (Rs.2500/Mt levied on pre NLP acreages) on the well head price of crude. In certain states octroi is also levied on the crude, like Maharashtra, 3% ad valorem *(refer Table B-46).*
3.2.2 Finished Product Pricing

3.2.2.1 Pricing Structures

All the finished products have an active and vibrant commodity and physical market. As in the case of Crude oils, finished products are also traded Ex the ports and near the refining centres. The entire product range is defined by API standard specifications and is traded in Barrels or MT denominations. The Bible of finished product prices are Platts Oilgram Price Report. This report is a daily post of wholesale prices of all petroleum products, U.S.A district and county wise, with quotes of different grades, with five day rolling averages, quotes Ex all major ports.

Reports all trading’s and cargo shipments from respective port locations, provides spot rates of ocean tankers, demurrages if any at locations, pipeline transfer charges and news / development details of all refineries world-wide which may have any impact on the prices of the products.

They also publish an index of all products individually, known as Platts Index, which reflects value of various baskets of oil products with reference to a base equal to 100, using average prices for the period Jul 1987 to Dec 1988. These indexes have been published since July 1987 and are not indexed to inflation (refer Table B-72).

World-wide buyers and sellers use these as standard indexes for price calculations, by quoting premium or discounts on them.

The industry calculates prices at the whole sale level basis three different methods.

- Import Parity Price
- Export Parity Price
- Trade Parity Price

World-wide prices are fixed basis these concepts, with necessary changes in the variable factors.

3.2.2.1.1 Import Parity Price (IPP)

This price concept provides the method of price calculation for import cargos of finished / crude / any product. This concept is followed where the economy is import dependent and majority of the product are import parcels.

The typical pricing follows the following formula:

\[ IPP = FOB + Freight + Insurance + Ocean Losses + Exchange conversion to local currency + Warf ages + Port charges + Berthing charges + Piloting charges +Custom Duties + Octroi. \]
The FOB prices are normally the Platts quote for the particular grade + premium / discount and thus the price is arrived. Typical example is referred in (refer Table-B30).

Here the local producers enjoy a rent equivalent to all elements other than FOB price and excise if any.

3.2.2.1.2 Export Parity Pricing (EPP)

This price concept provides the method of price calculation for export cargos of finished / crude / any product. This concept is followed where the economy is exporting majority of the product i.e. the economy is product surplus.

$$EPP = \text{FOB price of the product.}$$

Thus under this pricing method the market enjoys the price which is completely market driven without any additional loading (refer Table-B30).

3.2.2.1.3 Trade Parity pricing (TPP)

This pricing concept was developed by Indian Petroleum policy planners to capture the uniqueness of Indian petroleum market where finished products were both being imported and exported simultaneously. After decontrol of Petroleum sector, private players had set up refineries. As the domestic market was under price control, the private refiners were forced to export product rather than selling the product at a loss. This led to a situation where state oil marketers were importing products and private refiners were exporting the products in the same time frame.

To address this peculiar situation, trade parity pricing was developed. It is a weighted average of IPP and EPP decided by administrative fiat basis the ratio of exports and imports in the economy.

Suppose the exports are 20% and imports are 80% then,

$$TPP = (0.8 \times IPP) + (0.2 \times EPP)$$

Thus criss cross movement of product could be avoided due to price arbitrage between domestic and international market.

This type of pricing in petroleum sector is unique to India.

Table A-51 shows quotes of whole sale rates of MOGAS ex major ports.

3.2.2.2 International Market

Petroleum products as seen in case of crude are just like any other commodities that are actively traded physically and on commodities exchanges throughout the world daily. Thus price fluctuations are continuous on a daily basis and especially volatile in periods of uncertainty influenced by emerging world events.
The U.S.A has been pioneers in the field of petroleum products manufacturing and are also the largest consumers worldwide. Their transport sector is very well organized and so is the petroleum trade. They had in the early stages i.e. pre-World War era adopted controlled pricing mechanism, wherein the prices moved within set price band. This was achieved by supply side interventions of crude itself. No direct price control on finished products was exercised.

In present day scenario, the pricing is free floating and retailers are free to charge any price. Despite high demand in the country and despite rising fuel costs, gasoline prices were low in the United States when compared with most other Western countries. As of December, 2010, the United States average price of self-serve regular unleaded gasoline was $ 3.05/gal ($1/litre). Finished motor gasoline amounts to 44% of the total US consumption of petroleum products. Table A-52 shows gasoline rates of certain major European countries.

In most European countries the prices have traditionally been three to four times the price in the United States, this was mainly on account of high taxes, the European countries impose on gasoline. The sales of gasoline in Europe also consist of more than 40% of total petroleum sales in these countries. In general the OECD countries have market driven prices whereas the Asian economies generally has some or the other kind of price controls.

In rest of the world, China, India, Pakistan, Bangladesh, Indonesia, Mexico and Eastern European countries, there are price subsidies which insulate the consumers from the price volatility of petroleum products particularly gasoline and kerosene. The forms in which it is done may vary, but the substance remains cross subsidization or direct subsidy from the budget.

### 3.2.2.3 Domestic Market

#### 3.2.2.3.1 Historical Perspective

In pre independence period, foreign oil companies only operated in India. After independence in 1948 nothing much changed. The realization to oil companies was linked to the ‘import parity’ price of products, known as Value Stock Accounting (VSA). This was basically a cost plus formula based on import parity. All elements of cost such as ocean freight up to Indian ports, insurance, ocean loss, remuneration, import duty and other levies and charges were added up to the import parity cost and thus the pricing was established.

As India was predominantly dependent on imports, the government from time to time appointed committees to examine the whole gamut of petro pricing. The first of such committee was headed by K.R.Damle, constituted in the early ’60s. It studied the question of foreign exchange conservation, particularly as the refining and product imports were in the hands of foreign oil companies. The committee proposed incentives for the domestic oil companies to increase gross profits by lowering their operating and other costs besides recommending that ‘discounts to
be reduced from the FOB prices. Platt’s oil gram was taken as a reference to fix the FOB prices.

In view of the multiplicity of products and usages, lubes and greases were kept out of the pricing formula, which was essentially applied to bulk products. For lubes and greases the committee recommended a block control system under which a ceiling was fixed for blending charges, packaging and marketing costs and profit margins.

Since the validity of the ceilings recommended by the Damle committee was only till March 1965, the government set up another committee under the chairmanship of T.N. Talukdar. The broad terms of reference were:

1) The manner of determination of Ex refinery prices of products including bitumen produced by the refiners.

2) The manner of determination of landed prices in respect of similar products, which may be imported.

3) Determination of marketing and distribution charges of the products.

4) Determination of ceiling selling prices in respect of lubricants, oils and specialities.

The Talukdar committee extended the concepts laid down by the Damle committee, i.e. prices were to be based on the principle of import parity with fixed formula of build-up up to the CIF. The price formula was firm and had the twin advantages of being reasonable and encouraged the domestic oil companies to enhance their profitability by lowering costs. Additionally, it created the potential of a lower cost basis for fixing margins in the future.

The recommendations of the Talukdar committee were retained till December 1965, when the government appointed a committee under the chairmanship of Shantilal Shah. This committee was required to determine the landed cost of imported petroleum products and oils and lubricants. Look into feasibility of making all refineries, including inland refineries, as pricing points. Recommend marketing and distribution charges, profit on distribution and marketing operations product wise, and determination of dealer commissions for petrol, high speed diesel oil, kerosene oil and light diesel oil.

The recommendation of this committee was to be implemented from June 1970 for a period of three years, continuing till the views of the next committee were known.

It may be noted that the Shantilal Shah committee did not regard import parity to be a sound basis for fixing prices, but was constrained to adopt the practice because of the government’s commitment to the oil companies. The lubes and greases continued to be under block control.
The 1973 oil crisis made the government to constitute another high powered committee, the oil price committee (OPC) under the chairmanship of S. Krishnaswamy in March 1974.

The recommendation was clear and unambiguous, discontinuation of the ‘import parity’ principle and start of the Administered Pricing Mechanism (APM) for pricing of petroleum products, both Ex refinery gates, as well as to consumers.

These recommendations paved the way for implementation of APM in 1977. The mechanism was further amended in 1986 based on the recommendations of the Oil Costs Review Committee (OCRC).

This system mandated the pricing of petroleum products to be based on the retention concept wherein oil-marketing companies were to be compensated normative operating costs and 12% post tax return.

Refineries, under the APM were also compensated on a cost plus formula, including acquisition cost of crude and other operating costs with an assured 12% post tax return on net worth. The question of price for imported crude oil and discounts thereof was to be negotiated by Indian Oil Corporation which was to import crude oil and finished petroleum products on behalf of the petroleum industry.

To manage pool accounts on behalf of the government, an OCC (oil coordination committee) was set up.

The dealer commissions and margins were also regulated to maintain uniformity in commission rates at distributor / dealer level. As part of the scheme of things, freight for imported crude was paid to Indian shipping companies at cost plus rates. The market share of public sector oil companies was administered and controlled through sales plan entitlements approved by the Ministry of Petroleum and Natural Gas.

The recommendation of the OPC were:

1) Introduction of a retention price concept.

2) Price fixation of indigenous crude produced onshore and offshore and a separate price for imported crude.

3) Creation of a COPE account - which will act as buffer account and will also stabilize product-selling prices, enhance market stability and provide funds for the growth of oil companies.

The APM regime ensured government controlled price of crude oil and petroleum products while the oil producers, refineries and marketing companies were insulated from international price fluctuations. The market share of all the players was fully protected and the indigenous crude oil was priced using a cost plus
formula wherein producers were compensated for their operating expenses and allowed a 15% post-tax return on the capital employed.

The APM operated a system of self-balancing accounts through which the entire pricing mechanism was implemented. There were four major oil accounts in which the oil companies adjusted their claims arising out of administrative pricing and retention margins.

1) Crude oil price equalization account.
2) Cost and freight adjustment (C&F) account.
3) Freight surcharge pool (FSP) account.
4) Product price adjustment (PPA) account.

The oil pool account helped the OCC meet any claims from oil companies rising from the price mechanism. The pool was designed as an equalization fund to absorb inflows and outflows from price fluctuations of imported crude and petroleum products. A special surcharge was inbuilt to recover some expenses from consumers on a uniform basis, while allowing actuals to the oil companies.

This arrangement broke down due to the one-way movement of surpluses to the government exchequer, who appropriated them while there was insufficient recovery under the various heads of pool accounts. Consequently, deficits in the oil pool account mounted and the burden was passed on by the OCC to the oil companies. The oil companies started defaulting in making timely payments of claims related to retention margins and approved audited costs. This resulted in the issuance of low coupon rated non-tradable oil bonds to the oil companies and thus the beginnings of the dismantling of the APM had set in.

The moot point here is, the Administered Pricing Mechanism had performed extremely well and had served the purpose intended. The face and structure of the Oil industry today, was essentially formed during the APM days. The country during the period had never faced product shortages, which was an achievement by itself. The entire distribution network of the oil industry was also established during this phase.

In 1996 the R group (strategic planning group on restructuring the oil industry) was formed to formulate principles and plan for phased deregulation of the downstream oil industry. The R group planned the phased dismantling of the APM and marketing controls. The ETG Group proposed rationalization of the tariff structure and total freedom of refineries to decide their product mix to optimize profitability through better refinery yields and value added products.

The dismantling of APM had started with the decontrol of pricing and marketing of lubricants as early as November 1993. This had been decided through an executive decision of the Ministry of Petroleum and Natural Gas.
In November 1997, the government notified a phased dismantling of APM with full dismantling by April 2002. The prices of petrol and diesel were to be fixed on import parity basis. The subsidy on PDS kerosene and LPG (domestic), which under APM was cross-subsidized through MS and ATF prices, was to be met out of the government’s fiscal budget. Accordingly, the government announced the ‘PDS kerosene and domestic LPG subsidy scheme, 2002 in January 2003. The subsidy was to continue for 3-5 years beginning 2002-03.

The OCC was wound up consequent to the decision to dismantle the APM. A new body, the Petroleum Planning and Analysis Cell under the aegis of Ministry of Petroleum and Natural Gas was set up.

The oil companies post dismantling the administrative pricing mechanism was based on the import parity principle. The oil marketing companies have two sources for obtaining petroleum products, viz. imports / procurement from domestic refineries. The pricing of petroleum products on ‘import parity’ basis at refinery gate brings parity in the cost of products from various sources. Thus a level playing field for all players is established.

The import parity price includes FOB at Arab Gulf plus ocean freight, insurance, customs duty, ocean loss, bank charges, port wharf age, etc. to reflect the most competitive alternative cost of sourcing the product. Prices are revised on a fortnightly / monthly basis to adjust to international price trends. This will enable Indian refineries to be globally sensitive and structure their operations accordingly.

### 3.2.2.3.2 Pricing as on date

The pricing pattern of petroleum products are broadly divided into two categories.

- Free trade products - where the government exercises no control direct, indirect or moral.

- Administered products - where the government exercises either direct control or indirect or moral fiats. These products are politically sensitive and constitute more than 60 % of the total sales of the oil companies. They are Kerosene PDS, LPG, Diesel and Petrol.

The pricing according to these categories are discussed as follows.

### 3.2.2.3.3 Free Trade Product

The product where the government exercises no control in the price front is described as free products in Indian context. The terminology emanated from the R committee report, the decontrolled products were referred to in the working papers as free products which the oil industry has been using as a convention.

The products covered are FO / LSHS / RFO, Bitumen, LDO, MTO, Solvent, Hexane, Benzene, Toluene, Industrial SKO, Sulphur, Naphtha and ATF.
3.2.2.3.3.1 Refinery Transfer Price – Free Trade Product

The prices typically are fixed basis previous 15 days average Platts Ex Sitra with Afra freight. The freight, insurance, ocean losses, port charges, Warf ages etc. are all averaged and added as a fixed premium to the FOB price. Then exchange conversion to TT is arrived. We then add Customs + CVD + Cess. This is treated as the Refinery gate price (RTP) (refer TableB-31, 32).

<table>
<thead>
<tr>
<th>ELEMENTS</th>
<th>Unit</th>
<th>Furnace Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOB - AG ( Including Premium)</td>
<td>$/MT</td>
<td>424.00</td>
</tr>
<tr>
<td>Freight ( Sitra to Indian Port )</td>
<td>$/MT</td>
<td>11.56</td>
</tr>
<tr>
<td>C &amp; F Price</td>
<td>$/MT</td>
<td>435.56</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>$ - Re</td>
<td>48.65</td>
</tr>
<tr>
<td>$ to Re</td>
<td>Rs / KL</td>
<td>21190.74</td>
</tr>
<tr>
<td>Customs Duty rate ----10%</td>
<td></td>
<td>0.10</td>
</tr>
<tr>
<td>Ins + Ocen Loss + Warfage etc rate</td>
<td>%</td>
<td>0.01</td>
</tr>
<tr>
<td>Other Charges ( Insurance, Ocen Loss etc.) 1% of CIF + Customs</td>
<td>Rs / KL</td>
<td>232.99</td>
</tr>
<tr>
<td>IMPORT PARITY PRICE</td>
<td></td>
<td>23542.91</td>
</tr>
</tbody>
</table>

**Price Calculation as of 16.08.10**

*Table 3.2 IPP – Free Trade Product India Typical Working*

3.2.2.3.3.2 Retail Pricing – Free Products

**EX-MUMBAI as of 01.01.2010**

<table>
<thead>
<tr>
<th>ELEMENTS</th>
<th>LDO (KL)</th>
<th>HEXANE (KL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASIC</td>
<td>30080.00</td>
<td>34500.00</td>
</tr>
<tr>
<td>ST SP COST</td>
<td>55.20</td>
<td>0.00</td>
</tr>
<tr>
<td>SUB-TOTAL</td>
<td>30135.20</td>
<td>34500.00</td>
</tr>
<tr>
<td>ED @16% (14% wef 1.3.08)</td>
<td>4218.93</td>
<td>4830.00</td>
</tr>
<tr>
<td>EDUCATIONAL CESS @ 2%, (3% WEF 1.3.07)</td>
<td>126.57</td>
<td>144.90</td>
</tr>
<tr>
<td>ADDITIONAL ED</td>
<td>2500.00</td>
<td>-</td>
</tr>
<tr>
<td>EDUC CESS @ 2%, (3% WEF 1.3.07)</td>
<td>75.00</td>
<td>-</td>
</tr>
<tr>
<td>SUB-TOTAL</td>
<td>37055.70</td>
<td>39474.90</td>
</tr>
<tr>
<td>VAT @ 12.5%</td>
<td>4631.96</td>
<td>4934.36</td>
</tr>
<tr>
<td>TOTAL</td>
<td>41687.66</td>
<td>44409.26</td>
</tr>
</tbody>
</table>

*Table 3.3 Typical Price Working Decontrolled Product Indian Market*

The subsequent sales to customers are effected from the marketing terminals / depots of the oil marketing companies.
The typical price calculation has the RTP + marketing margin = Basic Ceiling Selling Price of the product (BCSP) *(refer Table B-33).*

The marketing installations all deal with BCSP prices. The calculations are

BCSP + Excise duty + Cess + VAT = Retail selling Price (RSP)

This is how price of all the free products / decontrolled products are determined and fixed. The periodicity of the revision are every 15 days and for speciality products it is once a month *(refer Table B-33).*

All prices reflect actual market demand and supply equilibrium price position pegged to import parity.

### 3.2.2.3.4 Controlled Product

The products are Petrol, Diesel, LPG, and PDS Kerosene. The RTP of the product is determined more or less in the above manner only. The subtle differences arise due to freight neutralization element in these products. The concept of Primary and Secondary pricing point is introduced in these products. This is made to enable the government to create a uniform price band across the country. The geographic areas which are away from refinery points, economically speaking will attract higher freight and hence higher price. However to maintain a uniform pricing and to subsidize the far flung areas on fuel freight cost, the country has been divided into following primary pricing zones where the refineries are located.

1) Jamnagar
2) Koyali, Baroda
3) Mumbai
4) Kochi
5) Mangalore
6) Chennai
7) Vizag
8) Haldia

These locations have uniform RTP and BCSP. The RTP is arrived at by the following method.

### 3.2.2.3.4.1 Refinery Transfer Price – Controlled Product

The FOB prices, the average fortnightly price as per Platt’s Asia Pacific and Petroleum Argus Asia product. To this is added the premium / discount for Petro / Diesel and the ocean freight based on basic freight as per World scale (WS 100) for sector Sitra to the respective ports adjusted for prevailing AFRA for MR size vessel.
Additional AFRA of 50 points is added for Haldia port in view of higher crude freight cost due to port constraints. Then customs duty is added at applicable rates, currently 10%. The other charges such as insurance, ocean loss LC charges, wharf age, etc. are also added. The Indian rupee price of IPP is determined on the basis of average exchange rates for the period of import (refer Table B-31).

3.2.2.3.4.2 Refinery Margin

The refineries calculate their gross margins known as GRMs by benchmarking the refinery transfer price realized from all products and backing out their crude purchase costs on an aggregate for a particular period. The Net Refinery Price known as NRM is computed by backing out the operating expenses for the refinery for that period from the GRM. The average GRMs for all refineries has been very good as crude prices have moved up resulting into very good returns for the refineries. Typical GRMs for refineries are mentioned in (refer Table A-12). This is also known as the Operating Spreads for the refinery.

3.2.2.3.4.3 Marketing Margins

The petroleum companies add their cost of operations of marketing and their profit margins to arrive at the basic price of different products. The difference between basic price and RTP is also known as the Marketing Spread of the oil companies. During the increasing trend of petroleum prices usually the marketing spread thins down.

3.2.2.3.4.4 Retail Pricing Controlled Product

The next stage is the retail pricing. The marketing companies add their marketing margins to RTP and then arrive at BCSP. Then to BCSP, Excise, Cess, Dealer commission, Delivery charges, misc. expenses like retail outlet rentals if applicable are added, VAT, Toll and then the RSP i.e. retail selling price is arrived at. The Typical calculation is given below (refer Table B-35).

Now comes the question of under recovery. The deficit between RSP and the RTP is the under recovery to the oil company. The value gap is what the oil company asks from the government as subsidy (refer Table B-34, 35, 49).

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This in totality is the entire pricing gamut of petroleum pricing. The sheer volume of transaction and quantum of trade itself lends the trade a mammoth size and complexity which is unique to this industry.

3.2.2.3.4.5 Retail Logistics

The logistics at refinery and retail level constitute an important element in the pricing chain. The golden principle of freight economics, the larger the parcel size, lower is the freight holds well. The challenge is the multi-level, multi-product and volumes. The cheapest mode of transport in the order is pipeline, Barge / Coastal movement, Wagon Movement and then Road Tankers. The industry has extensive pipeline network to feed the major terminals and depots. Coastal movement is resorted to where ever feasible. Railway Wagon movement is optimized again for inland depots. The balance movement is by Road Tankers. The freight differentials are again a subject in itself. The measure of extent broadly – Pipeline costs are roughly 3% of the road movements, the comparison being on a very rough scale. Hence oil industry world-wide prefers pipeline movement, being clean, efficient and cheap where ever feasible.

3.3 Conclusion

The world today is witnessing severe volatility of petroleum prices. The developed countries, namely the OECD nations have uniformly adopted import parity pricing for all petroleum products. The transport fuel is normally taxed heavily in these nations to discourage usage of private vehicle. The fact that these nations have well developed public transport system, goes well with this policy of high taxation of transport fuel without impacting the mobility of the population and thereby the economic activity of the nation. The other concept of the user pays is also properly reflected in the policy of import parity pricing.

The OPEC nations are the oil producing nations, and petroleum pricing is basis export parity levels. This is the most reflective of market driven pricing policy. However most of these nations do subsidize fuel costs for their citizens and the subsidy is adjusted in national budgets.

The developing nations and the non OECD, OPEC countries have adopted the import parity model with government control to cap sharp price spikes. These differential pricing sometime capped within a price band has its own merits and demerits. The flip side, of price control is always burdened with inefficient product usage and wastages which the pricing mechanism when left of its own tends to correct by itself with high prices.

India has moved from administered pricing mechanism (APM) to decontrol since 2002. The politically sensitive products i.e. Petrol, Diesel, Kerosene and LPG have not been left to market pricing. The cost of subsidizing the fuels has been enormous. They have drained the financial strength of the government oil companies making them limp. The situation has become so precarious that the oil companies do not have sufficient funds to even buy crude of their own. They have to
run to the government for regular doles as even bankers are wary of extending loans to them. The planners have been talking about energy security and energy horizon 2030, here we are not able to manage 2010.

The pricing policy outlined by the policy planners is appropriate with the current scenario. The market reforms set have to be adhered to if the reforms are to bear fruit. The current ad-hoc approach has already dented the sector badly and any further delay may lead to financial ruin of the government companies. The nation may face fuel shortages, which it has never seen before.

All committees appointed have strongly recommended cut back on subsidy and immediate implementation of import parity pricing. The Kiran S. Parikh committee, February 2010, have empirically proved that the subsidy provided currently on SKO, LPG are not reaching the desired strata of population and hence should be stopped. The subsidy on Petrol and Diesel is also not justified, as the users do not have economic reasons for availing subsidy at the cost of the poor. The transport sector is well capable of absorbing the price hike, since they are an intermediate sector. Alternate methods to provide subsidy, like direct financial assistance to the beneficiary to be explored.

Fuel subsidies are always fraught with risk of misuse and corruption. Indian planners have already very bad experiences on food and fertilizer subsidies. The question is why and who to subsidize. This should be dealt with direct budget interventions rather than through fuel pricing. Whether off budget or on budget, fuel subsidy is a vicious circle which the political class left by itself can never address. The economic cost to such huge subsidies will only derail the economy from its growth path and fuel inflation.

The political leadership have to face the reality and the long delayed pricing reform in the sector cleared and implemented.