Chapter 1

Growth Prospects of Petroleum Industry in Gujarat

1.1 Introduction

Crude Oil or Crude Petroleum or simply Crude is the common name used for rock oil in petroleum industry. Crude oil is the mixture of many substances an often difficult to separate from which a number of products are manufactured. They mainly contain element like Carbon and Hydrogen. Other elements presents in crude are sulphur, nitrogen and oxygen.

I. Crude Oil can be classified into three types

1. Paraffin base crude oil
2. Asphalitic base crude oil

II. The development of petroleum industry is taking place in four stages

1. Exploration
2. Refining
3. Storage and Transportation
4. Marketing

During the first stage, exploration of crude oil is taking place. The second stage consists of refining of crude oil. The storage and transportation of petroleum products take place during the third stage. The fourth stage consists of the marketing of the petroleum products.

1.2 The products and fractions of crude oil

The products and fractions resulting from the process of crude oil are

(1) Gasoline
1.3 Refined products and its value

Refined products are valuable from the point of view of profit. These products viz. gasoline, middle distillates (including diesel fuels) and residual fuels make up the bulk of the output of the oil industry both in terms of value and volume. Among these three, gasoline is the most important one on account of its high value to the industry. The other petroleum derivatives viz. diesel and natural gas, compete with other fuels.

During the early days of the development of Petroleum Industry, straight-run fractions were directly used as saleable products. In the case of straight distillation, 20 percent of crude oil appears to be gasoline and this straight run gasoline has only poor "anti knock" properties. Hence, further processing of crude is a must to improve quality and quantity of petroleum. But, at present all petroleum products have to be specially tailored in terms of properties and free from impurities to meet the market demand.

1.4 History of India's oil industry

The history of Indian's oil industry initiated during 1889, when a commercially significant volume of oil was found in Assam. However, the development of petroleum industry started in India after independence. During the year 1954, Oil and Natural Gas Commission (ONGC) was setup. During, the second five year
plan, Government of India nationalized the Indian Petroleum Industry. Subsequently, in 1962 the Government established first refinery, that is, Guwahati refinery under Indian Oil Corporation. Later on, during 1980's on account of the denationalization policy of the Government of India few oil refineries that is, ESSAR and Reliance Petroleum refineries were set up in private sector. At present India has 17 petroleum refineries out of which 7 refineries are under Indian Oil Corporation. Indian Oil Corporation holds about 40 percent of the market share of petroleum industry in India.

1.5 The Indian petroleum sector categories

The Indian petroleum sector is broadly divided into three categories.

1. **Oil and Gas Exploration**: Dominated by ONGC, OIL, RIL and Cairn companies.

2. **Refining and Marketing**: This category is further sub divided into three categories as (a) Pure Refiners with companies like CPCL, KRL, BRPL, NRL and MRPL (b) Refined Products with company like IBP with only sells refined oil products. (c) Integrated refining and marketing: This section is led by IOC, HPCL, BPCL, RIL and Essar.

3. **Natural Gas distribution**: The distribution is done by companies like GAIL, Gujarat Gas, RIL, GSPC and Mahanagar Gas.
1.6 Development of Petroleum Industry in Gujarat.

Gujarat is oil and gas capital of India. Gujarat is the only state in India with around 2200 km integrated gas grid that is operated on an open access. The petroleum development in Gujarat initiated in early 1960's by finding oil and gas in Gujarat. Due to economic liberalization in 1991, many private sector refineries were developed in Gujarat.

In public sector, Oil and Natural Gas Commission has made extensive exploration work in India after its set up. ONGC has oil field at Ankleshwar and Gandhar in Bharuch district. ONGC has struck oil and gas block in Charade, three offshore block in Combay basin, Motar and Karjan taluka area of Vadodara district in Gujarat. ONGC Petro Addition Limited (OPAL), joint venture company promoted by Oil and Natural Gas Commission Limited and Gujarat State Petroleum Corporation (GSPC) are working as an anchor tenant in petroleum sector in Gujarat.

Oil and Natural Gas Commission has made extensive exploration work in India after its set up. During April 1961, the first oil well at Kalol was spudded in and in May-1961, oil was stuck in September-1961. The trial production of crude oil from Ankaleshwar oil fields started. Subsequently oil and gas was stuck at Cambay, Nawagaon, Sobhasan, Kosamba, Sanand Oil pad, Hazira, Kathana, Nasana and Khadi in Gujarat State.

In February 1962 an agreement was signed with Soviet Union for the preparation of project report for the initiation of Gujarat Refinery at Koyali, as all the location as factors are favorable for its set up at Koyali village of Vadodara district. At three stages, this refinery was developed. At present this refinery is having a high capacity of 13700 thousand tons.

The chemicals and petrochemicals including petroleum is the main source of industrial development in Gujarat. The manufacturing of chemicals and petrochemicals contribute to 52 percent of capital investment in industry and 29 percent of employment in industries in Gujarat. The bulk of exports of industrial products go to markets such as Europe, USA, and other developed nation. These are the clear sign of the global competitiveness of petroleum industry development.
in Gujarat. The main productions of this industry are chemical and petrochemical products.

The share of chemical and petrochemical production of Gujarat is presented in table number 1.1.

Table Number 1.1
Share of Chemical and Petrochemical products of Gujarat state

<table>
<thead>
<tr>
<th>Chemical and petrochemical products</th>
<th>Gujarat production</th>
<th>All India production</th>
<th>Share of Gujarat percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical and petrochemical</td>
<td>23.60</td>
<td>75.5</td>
<td>31</td>
</tr>
<tr>
<td>Refined petroleum product</td>
<td>12.20</td>
<td>32.1</td>
<td>38</td>
</tr>
<tr>
<td>Basic chemical</td>
<td>10.60</td>
<td>35.6</td>
<td>30</td>
</tr>
<tr>
<td>Rubber and plastic</td>
<td>0.80</td>
<td>7.9</td>
<td>10</td>
</tr>
<tr>
<td>Dyes and intermediates</td>
<td>0.80</td>
<td>1.5</td>
<td>50</td>
</tr>
<tr>
<td>Agro chemical</td>
<td>0.25</td>
<td>0.6</td>
<td>40</td>
</tr>
<tr>
<td>Pharmaceuticals</td>
<td>3.60</td>
<td>8.00</td>
<td>45</td>
</tr>
</tbody>
</table>


In 1991, due to economic liberalization policy, two new refineries, that is, Essar and Reliance petroleum were set in private sector. Thus, the state has high potential of the growth of petroleum industries.

1.7 Petroleum and Gas Companies in Gujarat and India

(a) Role of GSPC in petroleum development in Gujarat

GSPC (Gujarat State Petroleum Corporation Limited) have very significant role in petroleum development in Gujarat. It is a group of company in various aspects of gas transmission, gas distribution, and power generation in Gujarat.
Today, Gujarat is one of the largest oil and natural gas producing state in the country. It is 51 percent of total oil and 32.3 percent of India’s total natural gas producing state. Gujarat not only has competing natural gas supplier but also has competing pipeline network operator.

GSPC has various objectives for development of oil and gas generation in Gujarat. These are as follows:

1. GSPC has objectives of maximizing the proven reserve of oil and gas and exploiting them optimally to increase production in the state Gujarat.

2. GSPC has an objective of developing of global association and incorporating modern technology for highly efficient operation and service.

3. GSPC's aim towards state Gujarat is to maintaining high standard of accountability and economic profitability.

4. GSPC contribution towards customer is to provide prompt, courteous and efficient service and Quality product at fair and reasonable price.

5. The contribution of GSPC towards supplier is to ensure prompt dealing with integrity impartiality and courtesy and prompt ancillary industries in Gujarat

6. The role towards communities is to co-exist with society and lives of individuals, GSPC also provide financial support to the medical centre and humanitarian organization to enhance the life of lesser privileged section of the society and state.

GSPC has six subsidiary companies and three other joint venture companies.

The following are the subsidiary company of GSPC:

1. Gujarat State Petronet Limited (GSPL)
2. GSPC Gas Company (GGC)
3. Gujarat Info Petro Limited (GIPL)
4. GSPC Pipavav, Power, Company Limited (GPPCL)
5. GSPC LNG Limited (GLNGL)

6. GSPC (JPDA) Limited

7. GERMI (Gujarat Energy Research and Management Institution)

These following are the Joint venture companies

1. Sabarmati Gas Limited (SGL)

2. Krishna Godavari Gas Network Limited (KGGNL)

3. Gujarat State Energy Generation Limited (GSEG)

1. The subsidiary company GSPL (Gujarat State Petronet Limited) is the first company in India to transport natural gas on open access basis and is a pure natural gas transmission company in Gujarat. The company was incorporated in 23rd December in year 1998 and obtained its certificate of commencement of business in 7th April of the year 1999. GSPL operates a medium to high pressure gas transmission grid comprising approximately 1130 km of natural gas pipeline from Hazira to Kalol in Gujarat.

2. GSPC Gas Company Limited has promoted gas for development of city gas distribution network in state Gujarat. Turnover of GSPC Gas increased from Rs 345.25 crores in 2007-08 to Rs 878.89 crores in 2008-09. GSPC Gas effort towards taking natural gas to every household in Gujarat.

3. GIPL (Gujarat Info Petro Limited) has been promoted by GSPC for providing IT related service with specific focus on energy sector. GIPL is an IT arm of GSPC which has always remained in the vanguard of taking initiatives which transform the lives of people in Gujarat.

4. GPPCL (Gujarat Pipavav Power Company Limited), GSPC has promoted this company for special purpose vehicle for setting up a 700 MW combined cycle power plant at Pipavav.
5. GLNG Limited, the company has been incorporated in February 2007 for developing LNG receiving, storing and re-gasification, terminals in the state of Gujarat with an initial capacity of 5 MMTPA to ensure energy security for the state Gujarat.

6. GSPC (JPDA) Limited has been incorporated for carrying out exploration activities in the block awarded to the company in joint petroleum development area by Timor sea designated authority.

7. GSEG (Gujarat State Energy Generation Limited) is operating 156 MW power plants in the state Gujarat. It has initiated activities for expanding its capacity by further 350 MW which will be completed in April 2010.

8. GERMI (Gujarat Energy Research and Management Institution) was registered with a vision to establish as a leading one stop institution for the entire gamut of educational, training and research requirement of the energy sector in Gujarat. It started with Pundit Deen Dayal Petroleum University in Gujarat. It is conceived as world class educational institution in oil and gas sector through the system of education.

9. SGL (Sabarmati Gas Limited) has been formed under joint venture agreement between GSPC and BPCL for setting up the infrastructure for city gas distribution network in specific area in North Gujarat.

10. KGGNL (Krishna Godavari Gas Network Limited), the company GSPC has acquired equity stake in this KGGNL. It was incorporated for developing gas transmission distribution network in the state Andhra Pradesh.

Apart from this, GSPC is recognized for its social responsibility and keen contribution towards development of social infrastructure. GSPC has set up a community development programs it has set up primary school at Hazira and Dholka. It also provides financial support to medical centre and humanitarian organization to enhance the life of lesser privileged section of the society in Gujarat.
(b) Cairn India

Cairn India has a Scottish heritage. The year was 1979 when Sir Bill Gammell, chairman, founded Castle Cairn Financial Services. By 1986, the majority of its work was in the expanding gas and oil industry and a new company was formed by the name Cairn Energy Management.

In India, Cairn has been developing its interests for more than a decade. Cairn India is now one of the biggest private exploration and production companies currently operating in the region.

As the Indian oil and gas market deregulated in the early 1990s, Cairn turned its focus to South Asia, acquiring Command Petroleum Ltd in 1996, an Australian-quoted company with interests in India. Ravva, in Eastern India, was the first offshore oil and gas field to be developed. This was followed by the Lakshmi gas field in Western India, which was discovered in 2000 and commenced production in 2002.

In January 2004, following the largest oil discovery by any company in India since 1985, the Mangala oilfield in Rajasthan which commenced production in August 2009. Pioneering the use of cutting-edge technology, the company began production from its Mangala oilfield in August 2009. The company operates the largest producing oil field in the Indian private sector and has pioneered the use of cutting-edge technology to extend production life. Today, Cairn India has a world-class resource base, with interest in 10 blocks in India, Cairn India has operations in Andhra Pradesh, Gujarat and Rajasthan. The pipeline section from Barmer to Salaya is operational and sales have commenced to Essar, RIL and IOC.

In Andhra Pradesh and Gujarat, Cairn India on behalf of its joint venture (JV) partners operates two processing plants, 11 platforms and more than 200 km of sub-sea pipelines with a production of approx. 50,000 barrels of oil per day (bopd).

Pipeline is lifeline to business operations and has been commissioned for transportation of crude oil traversing through two districts of Rajasthan and six districts of Gujarat.

These successes have created a company with more than 1295 employees in India alone, and world class oil reserves in one of the fastest-growing economies in the world.
(c) Reliance Group

The Reliance Group, founded by Dhirubhai H. Ambani, is India's largest private sector enterprise, with businesses in the energy and materials value chain. Group's annual revenues are in excess of US$ 58 billion. Backward vertical integration has been the cornerstone of the evolution and growth of Reliance. Starting with textiles in the late seventies, Reliance pursued a strategy of backward vertical integration - in polyester, fiber intermediates, plastics, petrochemicals, petroleum refining and oil and gas exploration and production - to be fully integrated along the materials and energy value chain.

The Group's activities span exploration and production of oil and gas, petroleum refining and marketing, petrochemicals (polyester, fiber intermediates, plastics and chemicals), textiles, retail and special economic zones.

The Company's operations can be classified into four segments namely:

1. Petroleum Refining and Marketing business
2. Petrochemicals business
3. Oil and Gas Exploration and Production business
4. Others

Jamnagar

Jamnagar Manufacturing Division is located near Jamnagar, Gujarat. It comprises of a petroleum refinery and associated petrochemical plants. The refinery is equipped to refine various types of crude oil (sour crude, sweet crude or a mixture of both) and manufactures various grades of fuel from motor gasoline to Aviation Turbine Fuel (ATF). The petrochemicals plants produce plastics and fiber intermediates.

The Jamnagar Manufacturing Division has a 33 million tons per annum refinery that is fully integrated with downstream petrochemicals units which manufacture naphtha-based aromatics as well as propylene-based polymers.

Situated on the northwest coast of India, the integrated refinery-cum-petrochemicals complex is located at Motikhavdi, Lalpur Taluka, Jamnagar.
District, in the state of Gujarat. It is in proximity to the Gulf of Kutch, a sheltered bay close to the Middle-East crude oil sources. The location of RIL's refinery on the west coast of India supported by world-class logistics and port facilities provides the Company with freight advantages. Most of the crude imported is transported on Very Large Crude Carriers (VLCC).

The refinery has operated at near 100 percent utilization with minimal downtime, consistently outperforming the average utilization rates of refineries in the Asia Pacific region, the European Union and North America, as reported by PEL Market Services, Biannual Refining Report, July 2005. The existing refinery complex at Jamnagar has more than 50 process units, which together process the basic feedstock, crude oil, to obtain various finished products deploying the following major refining processes:

- Crude oil distillation (Atmospheric as well as vacuum distillation)
- Catalytic cracking (Fluidized Catalytic Cracker)
- Catalytic reforming (Plat forming)
- Delayed Coking

RIL's new refinery in the Special Economic Zone at Jamnagar is the world's sixth largest. The refinery has a capacity of processing 580,000 barrels of crude oil per stream day (BPSD).

Vadodara

Vadodara manufacturing division located in Vadodara, Gujarat. It comprises of a Naphtha cracker and 15 downstream plants for the manufacture of polymers, fibers, fiber intermediates and chemicals.

Dahej

Dahej manufacturing division is located near Bharuch, Gujarat. It comprises of an ethane / propane recovery unit, a gas cracker, a caustic chlorine plant and 4 downstream plants, which manufacture polymers and fiber intermediates.

Hazira

Hazira manufacturing division is located near Surat, Gujarat. It comprises of a Naphtha cracker feeding downstream fiber intermediates, plastics and polyester plants.
Naroda

Naroda complex was started in 1966 with just four warp knitting machines and 68 people. Reliance policy of backward integration had ensured that the original manufacturing activities, which were confined to fabric, finally encompassed everything that went into fabrics, viz. crude to fabric.

(d) Indian Oil Corporation Limited

Indian Oil Corporation Ltd. is India's largest company by sales with a turnover of Rs. 271074 crores and profit of Rs. 10221 crores for the year 2009-10.

Indian Oil is India’s flagship national oil company with business interests straddling the entire hydrocarbon value chain from refining, pipeline transportation and marketing of petroleum products to exploration percent production of crude oil percent gas, marketing of natural gas and petrochemicals. With over 34,000-strong workforce, Indian Oil has been helping to meet India’s energy demands for over half a century.

Indian Oil and its subsidiary account for over 48 percent petroleum products market share, 34.8 percent national refining capacity and 71 percent downstream sector pipelines capacity in India. The Indian Oil Group of companies owns and operates 10 of India's 20 refineries with a combined refining capacity of 65.7 million metric tons per annum (MMTPA), i.e. 1.30 million barrels per day approx.). Indian Oil’s cross-country network of crude oil and product pipelines, spanning 10899 km and the largest in the country, meets the vital energy needs of the consumers in an efficient, economical and environment-friendly manner. It has a portfolio of powerful and much-loved energy brands that includes Indane LPGas, SERVO lubricants, Xtra Premium petrol, XtraMile diesel, etc. Indian Oil is currently investing Rs. 47,000 crores in a host of projects for augmentation of refining and pipelines capacities, expansion of marketing infrastructure and product quality upgradation.

Refineries under Indian Oil Corporation

I. Digboi Refinery (Upper Assam)
II. Guwahati Refinery (Assam)
Barauni Refinery
Haldia Refinery
Mathura Refinery
Panipat Refinery
Bongaigaon Refinery
Gujarat Refinery (Near Ahmedabad)

I. Digboi Refinery (Upper Assam)

The Digboi Refinery in North Eastern India is India's oldest refinery and was commissioned in 1901. Originally a part of Assam Oil Company, it became part of Indian Oil in 1981. Its original refining capacity had been 0.5 MMTPA since 1901. After modernisation the capacity of the refinery has been enhanced to 0.65 MMTPA. The Digboi refinery produces distillates, heavy ends and excellent quality wax from indigenous crude oil produced at the Assam oil fields.

II. Guwahati Refinery (Assam)

Guwahati Refinery, the first public sector refinery of the country, built with Romanian collaboration, was inaugurated by Late Pt. Jawaharlal Nehru, the first Prime Minister of India, on 1st January 1962. The Refinery symbolizes the Nation’s march towards indigenisation of the refining technology. With a capacity of 1.0 million metric tons per annum, Guwahati Refinery processes crude oil received from the Upper Assam Oil Fields and caters to the requirements of the petroleum products of the North Eastern Region. Its major products are LPG, Motor Spirit (Petrol), Aviation Turbine Fuel (ATF), Kerosene, High Speed Diesel, Light Diesel Oil and Raw Petroleum Coke.

III. Barauni Refinery

Barauni Refinery was built in collaboration with Russia and Romania. Situated 125 kilometers from Patna, Barauni Refinery was commissioned in 1964 with a refining capacity of 1 Million Metric Tons Per Annum (MMTPA). It was dedicated to the Nation in January 1965. After de-bottlenecking, revamping and expansion projects, its current capacity 6 MMTPA. With various revamps and expansion projects at Barauni Refinery, capability for processing high-sulphur crude has been
added, thereby increasing not only the capacity but also the profitability of the refinery.

IV. Haldia Refinery (Near Kolkata, West Bengal)

Haldia Refinery, one of the eight operating refineries of Indian Oil, was commissioned in January 1975. It is situated 136 km downstream of Kolkata in the district of Purba Medinapur, West Bengal, near the confluence of river Hoogly and Haldi.

From an original crude oil processing capacity of 2.5 MMTPA, the refinery is now operating at a capacity of 5.8 MMTPA at present. Capacity of the refinery was increased to 2.75 MMTPA through de-bottlenecking in 1989-90, and to 3.75 MMTPA in 1997 with the installation/commissioning of the second Crude Distillation Unit of 1.0 MMTPA capacity. Petroleum products from this refinery are supplied mainly to eastern India through two product pipelines as well as through barges, tank wagons and tank trucks. Products like MS, HSD and Bitumen are exported from this refinery. Haldia Refinery is currently the only coastal refinery of the corporation and the lone lube flagship, apart from being the sole producer of Jute Batching Oil. Diesel Hydro Desulphurisation (DHDS) Unit was commissioned in 1999, for production of low Sulphur content (0.25 percent wt) High Speed Diesel (HSD).

V. Mathura Refinery (Near Delhi)

Mathura Refinery, the sixth refinery of Indian Oil was commissioned in 1982 with a capacity of 6.0 MMTPA to meet the demand of petroleum products in north western region of the country, which includes National Capital Region. Refinery is located along the Delhi-Agra National Highway about 154 KM away from Delhi. With the commissioning of Once Through Hydrocracker Unit (licensed from Chevron, USA) in July 2000, capacity of Mathura Refinery was increased to 8.0 MMTPA.

VI. Panipat Refinery (Near Delhi)

Panipat Refinery has doubled its refining capacity from 6 MMT/year to 12 MMT/year with the commissioning of its expansion project. Panipat Refinery is
the seventh refinery of Indian Oil. It is located in the historic district of Panipat in the state of Haryana and is about 23 km from Panipat City. The original refinery with 6 MMTPA capacity was built and commissioned in 1998 at a cost of Rs. 3868 crores.

VII. Bongaigaon Refinery

Bongaigaon Refinery became the eighth refinery of Indian Oil Corporation Limited after merger of Bongaigaon Refinery and Petrochemicals Limited with IOCL with effect from 25th March 2009. It is located at Dhaligaon in Chirang district of Assam, 200 Kms west of Guwahati. The present crude processing capacity of the refinery is 2.35 MMTPA. The refinery has two Crude Distillation Units of 1.35 MMTPA and 1.00 MMTPA capacities, two Delayed Coker Units each of 0.5 MMTPA capacity, one Coke Calcination Unit of 0.075 MMTPA and a Catalytic Reformer of 160,000 MTPA naphtha feed capacity and an LPG Bottling Plant.

VIII. Gujarat Refinery (Near Ahmedabad)

The Gujarat Refinery at Koyali in Western India is Indian Oil’s largest refinery. The refinery was commissioned in 1965-1966. Its facilities include five atmospheric crude distillation units. The product slate includes besides fuels, petrochemical products such as Linear Alkyl Benzene (LAB), Polypropylene Feed Stock, Food and Polymer Grade Hexane. Gujarat Refinery, operating with an installed crude processing capacity of 13.7 million metric tons per annum, processes indigenous and imported, both low sulphur and high sulphur grades of crude oil.

1.8 Statement of the Problem.

The development of the petroleum refineries in both public and private sectors in Gujarat has ample economic benefits not only to Gujarat State but also to the entire country. Even though, it is a capital intensive industry, it generates employment opportunities at the up stream and down stream industries. On account of the value
of the petroleum products both the central and state exchequers are having the opportunities to increase their income from these activities. Further, the State Government too gets due share from the Central Government as a petroleum royalty for producing crude oil from Gujarat State. Over and above this, industry helps infrastructural developments too in the State. Therefore a study relating to the growth potential of the petroleum industry in Gujarat will highlight the importance of this industry in Gujarat.

1.9 Objectives of the Study.

The following are the objectives of the present study:

1. To examine the trends in the production of crude oil and natural gas in India and Gujarat.

2. To examine the trends in the Petroleum refining capacity in Gujarat and India.

3. To study the investment and employment generation in Petroleum Industry in Gujarat.

4. To study the income generation to the exchequers of both Gujarat and India from petroleum industry from Gujarat.

5. To examine the income generation from petroleum royalty in Gujarat.

1.10 Review of literature

Many studies were undertaken in the field of petroleum industry. The some of these studies are explained in brief below.

1.6.1 Dean A Bangsund and F. Larry Leistatz. (2006)

Economic contribution of the petroleum industry to North Dakota. (http://purl.umn.edu/51989)

The purpose of this study was to estimate the economic contribution of crude oil and natural gas exploration extraction, transportation and processing in North Dakota in 2005, survey were used to collect production expenditure and employment data for the petroleum industry in North Dakota.

This study provides a holistic examination of pricing and investment dynamics in India’s downstream petroleum sector. It analysis the pricing practice and highlight the tremendous fiscal cost of pricing and regulatory arrangements and examines the sectoral investment dynamics. It also gives the potential path towards market based reforms along which the Indian government may move, while, at the same time protecting energy market excess from India’s large poor population.


The report provides an overview of each of the key sub-segment of the energy industry in India. It details the market structure, regulatory environment, and infrastructure and provides historical and forecasted statistics related to the supply demand balance for each of the key sub-segment. It also provides information relating to the oil and gas assets (oil and gas fields, exploration blocks, refineries, pipelines, LNG terminals and storage terminals) in the India. The report also analyses the fiscal regime relevant to the oil and gas assets in India and compares the investment environment in India with other countries in the region. The profile of the major companies operating in the oil and gas sector in India together with the latest news and details are included in the report.

1.6.4 Kamal Poria (2007)4: Petroleum industry in India.

It deals with the stages of development of petroleum industry. The petroleum industry started in the north eastern part of India with the discovery of oil in the place called Digboi in the state of Assam. The development of the Indian petroleum industry began on a very slow rate. Until the 1970 the production of petroleum and the exploration of new location for extraction for petroleum were mainly restricted to the north eastern state in India. In the later years, the discovery of oil and gas in Bombay High lead to new efforts by the state public sector
company Oil and Natural Gas Corporation (ONGC) to explore both on offshore and onshore.

1.6.5 Raphael Sauterand Shimon Awerbuch, Ph D IEA research paper IEA Paris (August 2003). Oil price volatility and economic activity. A survey and literature review.

The study highlights the oil price movement and their effect on economic and financial performance in IEA countries. They correlate negatively with economic indicator, future oil and natural gas price stream represent a highly risky obligation for energy consumers. Every time oil and natural gas price rise economic activity e.g. people’s income and value of assets decline by some measure. The research has included not only the effect of change in oil price level but also the effect of volatility as well.

1.6.6 Strengthening MENA (Middle East and North Africa) trade and investment links with China and India by social and economic development group Middle East and North Africa, (September 2, 2008).

This study is related to China and India’s spectacular economic rise a over the last two decades has accelerated their trade with Africa, Latin America and middle east and north Africa (MENA). Their demands for oil and gas, other natural resources have been driving new relationship with (MENA) countries based not only on energy but on trade, investment and political ties both group of (MENA) countries need to foster a culture for growth to overcome the complacency instilled by oil windfalls and government subsidies.

1.6.7 India oil and gas reported by Price Water House Pvt. Ltd for IBEF, DAVOS (2006).

India is fifth largest energy consumer in the world with primary commercial energy consumption in 2004 of 375.8 mmt in 2004 the consumption of gas and oil formal a major percentage in the world energy consumption basket in India. The largest contribution of oil and gas sector in India to the natural exchequer in 2004-05 with taxes amounting to US $ 27 billion. India is ninth largest crude oil importer in the world. India is ranked sixth in refining capacity in the world with
capacity at 2.5 million barrel of oil per day in 2004 which is 3 percent of the world’s refining capacity.

1.6.8 Shell exploration and production by North economic and institution of social and economic research, university of Alaska, USA, (March 2009)\(^8\), Economic analysis of future offshore oil and gas development beau fast sea, Chukchi sea and North Aleutian basin prepared.

The study described and quantified the potential economic benefits to the state of Alaska and local communities from developing oil and gas resources in Alaska’s outer continental shelf (OCS) area. This finding of the study is not prediction of the future for Alaska, but rather they describe a reasonable approach that one might expect for OCS developments. The finding also provide a basis for thinking about potential action that state and local government industries and other stakeholders might undertaken to deal most effectively with the effect that do occur.

1.6.9 Mohammad Sani Salisu, Semen Y. Yagudin (2007)\(^9\), Investment and vertical integration catalyst for development in the oil industries of an emerging market: The case of refining in Kuwait. Oil and Gas Business.

This study explores the possibilities of investment in the oil sector of a developing market and elaborated the advantage of vertical integration in a market, where, secondary raw material is in shortage. It details of investment appeal and values that matters in investing. It argued that relevant business plans based on vertical integration would attract opportunities for FDI investment in Kuwait, where, industries development has always been faced by formidable obstruction industry and poor resources, which limit the manufacturing industries.


This report examines Harold Dem’s (1967) prediction that property right emerge and area refined as the benefit of doing so exceed the costs in the context of oil and gas resources in the US. Their primary contribution is to demonstrate the important role of a less familiar factor, the presence in the reservoir of both oil and gas with differentially volatile price. Their analysis provide new insight regarding the nature of voluntary utilization contracts, inherent limit to producer’s ability to internalize
externalities and the welfare implications of compulsory utilization of oil price shock.


This study initially considered the problem in a general way in term of the institution arrangement between the industries and government and the selection of certain key parameters such as discount rate, price and financial obligations. It reviewed the relations between government and nationalized industries. It reviewed the government's use of its instrument of control (investment review, financial target, capital rationing and sectoral policy. It examines depth aspect of investment criteria which does lend itself to central policy making the discount rate.

1.6.12 Crook D G (1977)\textsuperscript{13}, A layman's introduction to oil refining, Indian Oil Corporation Ltd (refining division) Janpath New Delhi.

This report gives an insight into various fact of petroleum refining for producing finished product of the desired specification various refining process used in the refineries have been dealt in this module characteristics of crude and specification of various petroleum product have been explained in detail.

The study also dealing with growth and development of petroleum refining industries in India. Latest advancement in various technologies for improving profitably in the face of increasingly string at product specification for meeting environmental stipulation.

1.6.13 International energy agencies, (June 2009)\textsuperscript{13}, Petroleum price, taxation and subsidies in India.

The study examines the current pricing mechanism and taxation and subsidy regime on four key like petroleum, diesel, domestic kerosene and domestic LPG. In the study the implication of current arrangement in each of these markets for central and state government revenue and expenditure for India’s macro economic positioning as well for upstream and downstream sector development have been examined in detail.
This study seeks to show the impact of petroleum refinery on the economic livelihood of women in Africa using Niger delta region of Nigeria. The oil companies provide the male population with alternative employment in the oil industries and pay the men “stand by” referring to payment of strike for no job done. Still a majority of human bear the burden for the survival of their household unit either as primary bread winner of female headed household or of their unit within a polygamous homestead. This study argue that patriarchy and globalization subjugate women by neglecting and making female activities invisible and insignificant North or East.

1.6.15 Mattias Spies, University of Joensuu, Department of Geography Master’s thesis. (February 2004), Germany’s crude oil and natural gas supply from Norway and Russia.

This work examines the crude oil and natural gas trade from Norway and Russia to Germany. Norway and Russia are among the leading crude oil and natural gas producer and exporter in the world. The focus of the study is on the perception of and attitude towards Norway and Russia as crude oil and natural gas supplies for the domestic market in Germany.


This study shows the economic development in UAE before thirty years, today it has achieved an income level comparable to that of the industrialized nation. the UAE did not pass through the hypothetical development stage that most developed countries have experienced rather its large oil revenue have allowed her to leap these stages to the stage of high mass consumption. This study shows reasons that how massive oil revenue have enable the UAE to shortcut process of serving and capital accumulation that necessary for economic development.

A considerable body of economic literature shows the adverse economic impact of oil price shock for the developed countries. This study shows that how and to what extent oil price shocks impact China’s economy. It shows that an oil price increase negatively effects output and investment but positively affects the inflation rate and interest rate.

1.11 Methodology and the source of data collection.

The present study in based on secondary data. The secondary data are collected from various Government Departments and Industries especially the Department of Petroleum, Gujarat state and the Ministry of Petroleum, Government of India. Besides, published data from the annual reports of the various petroleum refineries also are collected. The main data have been taken from Energy, Centre of Monitoring Indian Economy, February 2007.

Besides this, data of consumer wise consumption of natural gas, import of major petroleum product (light distillates) are collected from this energy report. Information of royalty of crude and natural gas has been collected from Principal Secretary of Energy and Petroleum department, Government of Gujarat and Director of Petroleum of Gujarat. The collected data were analyzed with percentages and averages.

1.12 Limitation of the Study

The study limits to the exploration and refining aspects of Petroleum industry only on account of non availability of required data, investment and employment from petroleum could not be examined and the only the royalty, revenue to central exchequer and revenue to state exchequer from sales tax at all India level is examined.
1.13 Organization of Chapters

Chapter One

The first chapter deals with introduction and importance of the study, review of literature across the world, statement of the problem, objectives of the study, review of the literature, research, methodology adopted in study, organization of chapter and limitations of study. A brief introduction of some of the important oil, gas and byproducts' producing companies located in Gujarat has also been provided.

Chapter Two

The second chapter deals with various aspects of petroleum. A detailed analysis of the nature and characteristics of petroleum industry and stages of the development of petroleum industry like exploration, refining, storage and transportation and marketing of petroleum products.

Chapter Three

The chapter three elaborates the production of crude oil in India and Gujarat from the year 1971-72 to the year 2005-06, state wise distribution of crude oil, production in India from state like Gujarat, Assam, Tamil Nadu, Arunachal Pradesh, Bombay High, private and Joint Venture Companies (JVC). Its percentage increase or decrease over the previous year, the percentage share of state from total production of crude oil in India, crude throughput of crude oil in India and Gujarat fields have been analyzed. Further, in this chapter, field wise crude oil reserves from Assam, Gujarat fields, onshore and off shore fields have been analyzed.

Chapter Four

Natural gas reserves in India life reserve of natural gas in India from year 1970-71 to 2005-06 are analyzed in this chapter. The source wise production of gas in India like onshore production and offshore production of natural gas in India are examined. The field wise natural gas reserve like Gujarat fields Assam fields
Rajasthan fields onshore and offshore total, all fields reserve are examined. In this chapter, the growth of production of natural gas in India is also examined.

In chapter four, production and utilisation of natural gas in various fields like Bombay High, Assam fields, Gujarat fields, Andhra Pradesh, Tamil Nadu fields, Tripura fields and private and JVC etc are examined.

Chapter Five

In chapter fifth, the capacity and production of all refinery in India are examined, it consists of capacity, crude throughput, percentage change in crude throughput, capacity utilisation, production and conversion loss are also examined.

Besides this, capacity and production of all refineries, import of major petroleum product (light distillates) import quantity as well as their value in rupees crores are also examined. Further, in this chapter, availability of petroleum products like liquefied natural gas production, LPG natural gas, total domestic production, import and export are also dealt with. Further, consumer wise consumption of natural gas like captive use, power utilities, tea plantation fertilizer, petrochemical, domestic use, all petroleum consumption in India are also given.

Chapter Six

The chapter gives the share of petroleum crude, natural gas and refining of Gujarat in comparison to All India is presented. In chapter six, royalty from gas of ONGC, GSPC, LIT, JII, NIKO and royalty from crude of ONGC and GSPC are also given. Further, the investment aspect of onshore crude oil and natural gas relating some companies like Cairn energy, NIKO, ONGC, shell has been shown. Besides this, petroleum project under consideration for the year 2005 has been taken from government of Gujarat official website of ministry of Petroleum and Industry (announcement detail 2007) are also given.

Chapter Seven.

It gives the conclusions and findings of the study.

The chapter II gives the general aspects of petroleum industry.