Global refining margins will remain low environmental sciences essay

ASSIGN BUSTER

CHAPTER 4

Global refinery throughput and utilization dipped from the third quarter of 2008 and remained low until the third quarter of 2009. Decreased petroleum product demand in the major consuming markets, especially the US, affected refinery throughputs globally. The major reason has been the commissioning of new refineries in countries like India, China, Vietnam, Algeria and Qatar. Refining overcapacity will keep refinery utilization at a lower level and in 2009, refinery utilization reduced further.

Global Refining Margins Will Remain Low

Refining has been a low margin business for several decades and this is likely to persist. Although the industry had started witnessing higher returns since 2004, the economic downturn since mid- 2008 transformed it back to its traditional model of a high-investment, low-return business. As the demand for products like gasoline and naphtha are unlikely to recover in the coming years, global refining margins will remain low and will be sustained mainly by middle distillates, which will have steady demand. Shrinkage of profitability margins due to subsidy and interest pressures. Given this there is also a pressure on return on investment on expansion projects.

Stringent Environmental Regulations are Adding to the Costs of Refining Industry

The structure of petroleum products demand has shifted towards lighter and cleaner products. Rising environmental concerns have resulted in the enactment of strict regulatory frameworks and emission norms across the globe. This mandates a reduction in the sulfur content of the products, apart

from improving other quality parameters, which in turn calls for heavy investments for installing adequate conversion and desulfurization facilities.

Global Refining Industry is Witnessing a Change in Product Dynamics

Fuel oil consumption is decreasing worldwide, except in the Middle East and Africa, and it is gradually being replaced by natural gas. Over the years, simple refineries have become uneconomical unless they process very light crude oil. Rapidly changing nature of market demand. For example; Market structure of petcoke in India is changing as there is an increase in coking capacity in India as well as globally.

EXPECTED FUTURE TRENDS

Several trends are expected to impact sector energy use in the future:• Heavy and/or sour crudes—which require more energy-intensive processing than " premium" crudes—are expected to contribute a growing fraction of fuel oil production. As existing reserves of oil are depleted and there is greater worldwide competition for premium (e. g., light, sweet) crudes, refiners will increasingly utilize heavy and/or sour crudes to meet demand. There is expected to be increasing use of unconventional sources of oil like tar sands and shale oil. These materials also require more energy- intensive processing to separate oil from sand or rock strata. The disposal of the rock byproduct after processing is of environmental concern and would lead to further energy consumption to make the processed oil fit for refining into fuel products. Production of synthetic fuels (primarily used as blending components for diesel fuel) using coal-to-liquids (CTL), gas-to-liquids (GTL), or other processes will increase, particularly in the face of high oil prices.

Synthetic fuel production is generally a more energy-intensive form of fuel production than traditional petroleum refining processes, and is also associated with higher carbon dioxide emissions. Increasing demand for biofuels will impact transportation fuel supply. The Renewable Energy Standard requires that ethanol—currently at 3 percent of the nation's gasoline supply—grow to 5 percent by 2012, and ethanol is projected to continue growing beyond 2012. This statute will require petroleum refineries to manufacture more gasoline blending stock to support the increase in ethanol production. Ethanol production is also more energy intensive than petroleum refining.• Lastly, EPA's low sulfur regulations for on-road and off-road diesel are expected to decrease refinery efficiency because the hydrotreatment process of sulfur removal is highly energy intensive.

SEVERAL OPPORTUNITIES FOR REFINERS:

Refiners need to benchmark refineries, understand best in class execution and plan for how to bridge the gap with best in classEnsure building in flexibility in refining configuration to deal with uncertainty when planning for capacityOptimize for maximum value across the value chain by looking at net corporate realization across the chain and not just refining marginsFocus on talent management and building knowledge and capabilities of managerial talent.

CHAPTER 5

Downward Integration Of Refinery Into A Petrochemical Complex

After a four-year slump, this sector made a comeback in 2004. The petrochemical and chemical sector rallied overall, posting a return on total

assets of 6. 4% (compared to 2. 6% in 2003), its best since 1997. The chemical divisions of oil companies outperformed the chemical industry by obtaining a return on assets of 8. 2% (compared to 5. 1% for the latter), substantially higher than the 2003 figure of 3. 7%. The low cycle apparently ended in 2004 and growth is expected to continue in 2005, according to the Petroleum Economist, with a return on assets in the vicinity of 14%. Europe will not be able to profit from this recovery, owing to the fact that it is more dependent on oil prices. In 2004, demand for chemical and petrochemical products climbed substantially, especially in the United States and China, driven by economic growth. This new situation enabled American operators to increase the unit utilization rate, thus resort their problems of excess production capacity. They were able to adjust their prices to the increase in feedstock and fuel costs. Incase of refinery project, whether the product should be 'Fuels' (LPG, gasoline, diesel, kerosene etc) or 'Lubricants' is decided through the screening studies. Lubricants (major product) producing refineries are normally of small capacities. Type of crude to be processed also has a bearing on the process selection. A few units like CDU and VDU and de-sulphurisation units are normally common to all refineries. How ever there are two general routes for bottom of the barrel processing. 1. Hydrogen addition2. Carbon removalThe cost factor for feedstock and energy became less decisive in a business environment characterized by strong demand in growth and restored profit margins. On the export market, U. S. producers benefited both from the increase in the oil price and the depreciation of the dollar against the Euro. U. S. petrochemicals are based primarily on ethane, a co product of natural gas, unlike Europe, which is based on naphtha, directly tied to the oil price. In this context, exports

accounted for half of the increase in U. S. production of petrochemical products. This competitive situation was aggravated by the construction of installations in the Middle East. For these reasons, business conditions were less favorable for petrochemical activities in Europe, which posted a lower return on assets than U. S. companies: 4. 9% versus 5. 6%, respectively. In 2005, the price of feedstock, especially naphtha, soared from USD 400/t at the beginning of the year to USD 580/t at the start of the last quarter in the North West Europe zone. In 2005, the decrease in the ratio of the price of olefins (ethylene and propylene) and benzene to that of naphtha illustrated the penalizing effect of the trend in the feedstock cost. Panipat Refinery as a step towards forward integration, decided to manufacture petrochemical products like Purified Terephthalic Acid (PTA) and Paraxylene (PX) from High aromatics Naphtha produced from Panipat and Mathura refineries. M/s DuPont, UK is the licensor for the PTA plant and M/S UOP USA is the licensor for Paraxylene project. The project was originally envisaged as a Joint Venture project to be implemented at the village Baljatan adjacent to Panipat Refinery Complex. Units under PX complex. Now, the project at a cost of Rs. 4228 Crore is under implementation at Panipat Refinery Complex. 3, 57, 000 MT/annum Para Xylene and 5, 53, 000 MT/annum PTA will be produced from the complex. PTA is the basic raw materiel for producing Polyester Staple Fibre (PSF), Polyester Filament Yarn (PFY) and other resins. PTA is produced from Paraxylene. One of the by-products from the complex is 21, 000 tonnes per annum Benzene. The project was scheduled for commissioning in Aug. 2005. NAPHTHA CRACKER COMPLEXIndian oil with its long term plans to convert Panipat Refinery Complex into a central hub of its operations, desires to put up Naphtha cracker & downstream polymer units

(Naphtha Cracker complex) at Panipat. After storming into the field of petrochemicals with the PX-PTA project, Panipat Refinery is now consolidating its position in this sector by setting up of Naphtha Cracker Complex with an estimated capital investment of Rs. 6300 crore. The site finalized for the project is near village Baljatan, which is on the southern side of the existing Panipat Refinery Complex. The Naphtha Cracker complex is scheduled for commissioning in the year 2007-08. This project aims at utilizing the Naphtha available from IOCL refineries and creating valuable polymer products. The Naphtha Cracker Complex will consist of a World scale Naphtha Cracker Unit and its Downstream Polymer units. ABB Lummus Global, USA has been chosen as the licensor for the Naphtha Cracker Unit. The primary feed for Naphtha Cracker Unit is Naphtha, which will be thermally cracked to produce polymer grade ethylene and propylene, which will then undergo processing in downstream units such as LLDPE, HDPE, Polypropylene and Mono Ethylene Glycol (MEG) to give a range of polymers like polyethylene, polypropylene, butadiene, Mono Ethyl Glycol etc. These polymers find application in a wide range of products. 1. Polyethylene: Films, bags, sacks, bottles and containers, wires and cables, house ware, flexible pipes, thermoware, toys etc. 2. Ethylene glycol: Polyester fibre, yarn, film, explosives, resins, printing ink, pesticides and insecticides, paints, varnishes etc. 3. Polypropylene: Tapes, sacks, yarn, pipes and sheets, film, medical use products, bottles, moulded luggage etc. 4. Polybutadiene: Tyres, sports goods, footwear, rollers, battery boxes, gaskets, hoses, mechanical goods etc. PTA and MEG are used for the production of Staple Fibre, Yarn, PET bottles, Tapes etc. The Naphtha Cracker complex along with the PX-PTA project will have synergic impact in the growth of downstream industries for

the production of Polyester Staple Fiber (PSF), Polyester Filament Yarn (PFY) and Textiles. Based on the above raw material availability, there will be steady growth of related industries in this region and Panipat is going to develop as a world scale petrochemical hub of the country.

CHAPTER 6

Stringent Environmental Regulations

CAA requirements include: National Ambient Air Quality Standards (NAAQS) are health-based standards applied to six " criteria polluants": carbon monoxide, lead, nitrogen oxides, ozone, particulates and sulfur oxides. National Emission Standards for Hazardous Air Pollutants (NESHAP), which are also health-based standards, apply to 188 hazardous pollutants not covered by NAAQS including, but not limited to, asbestos, benzene, beryllium, inorganic arsenic, mercury, radionuclides and vinyl chloride. New Source Performance Standards (NSPS) are technology-based minimum standards that limit emissions of regulated pollutants from newly built facilities and some existing facilities that undergo modification. Regulations that phased out stratospheric ozone depleting chemicals: CFC, halons, carbon tetrachloride, methyl chloroform and hydro fluorocarbons. Reduction in hazardous pollutant emissions. Major sources of hazardous air pollutants may be subject to Maximum Achievable Control Technology (MACT) (new and existing sources) and, if so, will be expected to reduce hazardous pollutant emissions by 90 percent or more. Urban smog decreased by reducing missions from small businesses as well as large factories and vehicles. Petroleum releases that exceed 50 gallons of a liquid or 300 cubic feet of gas must be reported to the state. Any petroleum release that enters

or threatens waters of the state must be reported. Petroleum releases from underground storage tanks exceeding 25 gallons must be reported as well. Specific threshold amounts have been established for reporting CERCLA and EPCRA hazardous substance releases. Used oil is defined as petroleum-derived and synthetic oils that have been spilled into the environment or used for lubrication or cutting oil, heat transfer, hydraulic power or insulation in dielectric transformers. Oils used as solvents and used ethylene glycol are not defined as used oil. A used oil generator is any business that produces used oil through commercial or industrial operations, or that collects it from these operations or from private households and exempted farmers. Householders who change their own oil are not covered by the used oil regulation. Farmers who generate an average of 25 gallons or less of used oil per month from farm vehicles or machinery in a calendar year are also exempt. Used oil generators must comply with the following requirements:• Keep storage tanks and containers in good condition and labeled " used oil."• Keep tanks and containers that are exposed to rainfall closed except when adding or removing used oil.• Clean up any used-oil spills or leaks to the environment. Pollution prevention is simply not making the waste (or pollutant) in the first place. It means doing what can be done to reduce the amount and toxicity of the pollution generated or the amount of energy consumed. Preventing pollution may be something as simple as buying products with little or no packaging or something as complex as redesigning an operation to increase efficiency and reduce waste. Simple things like choosing non hazardous solvents and cleaners can protect the environment and reduce the number of environmental regulations a manufacturer faces. Pollution prevention means thinking about the environmental impact of

actions and trying to limit that impact. Once generated, waste or pollution must be safely and legally managed. Whether it is household trash or waste from a business, managing wastes costs money. Usually the discarded items were purchased in the first place. A good example is paper towels. They are bought, used once and discarded, which also costs. Reducing the amount of waste generated saves money. Reducing costs is a major reason to prevent pollution. Here are a few others:• Improved work environment and worker safety• Reduced liability• Increased efficiency• Fewer regulatory requirements• Better environmental protection• Enhanced marketing and public relations opportunities

CHAPTER 7

CONCLUSION

The share of clean products like gasoline and diesel has increased in oil consumption and it is likely to increase further although the distribution between gasoline and diesel increasingly varies according to region. At the same time these products are subject to tighter environmental constraints requiring substantial downstream capacity in refineries to be able to extract the maximum amount of light products at low sulfur levels from every barrel of crude oil. Worldwide refinery investment for these units has not kept pace with the speed at which mandates are taking effect, and outright crude capacity growth is lagging global oil demand growth.• With refinery utilization in China at high levels already, the Chinese will have to increase imports of finished products to satisfy the growing demand unless new refinery capacity is quickly added. This will increase competition for any extra processing capacity in the world again putting upward pressure on

refining margins. Moreover, China and India’s growth may pull gasoline being exported from Korea and Taiwan away from the U. S. West Coast, further impacting either supply or price to West Coast consumers.• Barring a radical and immediate initiation of major refinery projects, there will be a competition for available supply as the decade draws to a close. The ‘ winning’ bidders will pay a premium for products which could make today’s prices look very reasonable; the ‘ losers’ may be required to slow down economic growth. The overall effect of both may be that global economies will suffer until refinery capacity gets back in alignment with demand.• The price differential between sweet and sour crude oils is at a historical high. It is likely to stay substantially higher than historical levels given the continued pressure of sulfur mandates, and the fact that any incremental Saudi production to meet global crude demands is likely to be sour crude.• The positioning of new refinery capacity will be directed more to the Far East and Middle East regions due to perceived cost advantages. The U. S. market, despite strong refining margins, may be a less economic choice due to higher environmental costs, and a less welcome view of new refinery construction in many areas of the country. This places the United States at even greater risk of supply disruption as the volume of imports becomes a greater percentage of product supply. All these factors lead to believe that the global oil product market will remain tight in the near future. Refinery capacity and capability will play a major part in maintaining high product prices as new environmental regulations come into effect and refiners scramble to catch up. It is more important than ever to look at the fundamentals and determine a long-term strategy to reduce or slow down the growth of petroleum demand, and to prepare for the future. If nothing is

done, the best that could happen is that consumers will have to pay a much higher price to live in a cleaner world and yet continue to maintain their lifestyles. The worst that could happen is a world of higher prices, supply shortages, and slower global economic growth. The domestic players in the downstream petroleum sector have seen several emerging challenges in the recent times, the most important being the regulatory risks arising from an inability to raise retail prices. Increasing competition from new entrants, surplus situation in the domestic market and exposure to volatile, though currently buoyant, refining margins are also set to fundamentally change the landscape for the sector participants. While PSU oil companies still enjoy several sustainable competitive advantages, the success of their upstream and downstream diversification initiatives are likely to have a critical bearing on their prospects, going forward. The thrust in Refining operation has not been only capacity expressions/ revamps, but maximization of distillates, their quality improvement and upgrading the lower value bottom products. The Refining scheme and configuration have changed a lot since majority of the refineries came into existence. The refineries have gradually changed form a simple hydro-skimming / thermal cracking refinery to complex refineries with combination of major secondary processing units like Fluid Catalytic Cracking (FCC), Hydrocracker (HCU), Delayed Coker (DCU), and Catalytic Reforming (CRU) along with Hydrogen generation and Hydro-treatment facilities. While there is much improvement in distillate yield, product quality & value addition, some of the refineries are achieving distillate yield at par with best in the world with reduced residue generation.