The Future of the Oil and Gas Industry

By Chris Faulkner

TABLE OF CONTENTS

Executive Summary................................................................. 3
Introduction.................................................................................. 4
  Description.............................................................................. 4
  History..................................................................................... 4
  Organization............................................................................ 5
  Governmental or Environmental Factors..................................... 6
Market Structure........................................................................... 6
Industry Demand.......................................................................... 7
  Key Determinants of Demand.................................................... 8
  Future Expectations of Demand............................................... 8
Industry Analysis......................................................................... 10
  Threat of entry by new competitors....................................... 10
  Rivalry among existing competitors.................................... 11
  Pressure from substitute products....................................... 11
  Bargaining power of buyers............................................... 11
  Bargaining power of suppliers........................................... 12
EXECUTIVE SUMMARY

The United States is a leading producer of refined petroleum and a major player in the global decision regarding this industry. Our country is beset by a shrinking supply or decline in production, pressures of environmental concerns, yet increase in demand.

These problems are not unique to our country. Globally, we are dealing with a resource that will eventually be depleted. Increasingly, avenues for other countries to offset the demand of the United States have caused the domestic industry to burden the need of increasing supply. The main areas of the large entity of the petroleum industry analyzed were:

• Government and environmental regulations
• Decline in US production
• Increase in global demand
• Competitive forces of the industry

The oil and gas industry is an oligopoly with regards to OPEC and there are few countries who dominate global oil production. By definition, an American firm with desire to enter the industry, must first evaluate the major sectors of the industry and determine their philosophy considering them. The focus of entrance should incorporate a common ground where the concerns within the areas analyzed are corrected or compromised.

After analyzing the aforementioned factors, there is doubt as to whether entrance into this industry would be a) sustainable and/or b) appropriate. Though initial strategy derived through analysis varies, the action attained by prospective is to avoid the pitfalls faced by the industry. Due to thorough investigation of the government and environmental implications with the decrease in supply due to
regulations, the recommendation is to avoid the industry as a potential and perhaps delve into alternative fueling resources for long-term sustainability.

INTRODUCTION

Description

Petroleum is the single largest source of energy used in the U.S. The petroleum industry, crucial to the U.S. economy, is extensively reported, measured, and analyzed. The industry includes the global processes of exploration, extraction, refining, transporting and marketing petroleum products. Before petroleum can be used it is sent to a refinery where it is physically, thermally, and chemically separated into fractions and then converted into finished products. The largest volume end-user products of the industry are fuel oil and gasoline. Refineries also produce non-fuel products, including petrochemicals, asphalt, road oil, lubricants, solvents, and wax. Petrochemicals are shipped to chemical plants, where they are used to manufacture chemicals and plastics.

The U.S. is the largest producer of refined petroleum products in the world, with 25 percent of global production and 163 operating refineries. In 1997, refineries supplied more than 6 billion barrels of finished products and employed about 65,000 people [DOE 1998, DOC 1997]. U.S. refineries are also the largest energy consumers in manufacturing and spend $5-$6 billion annually in pollution abatement costs [MECS 1994, DOE 1998]. The broad Standard Industrial Classification (SIC) for oil and gas exploration falls under SIC 13. In this paper, we explore oil extraction in the U.S., SIC 1311.

History

The petroleum industry has been in existence in various forms for several centuries. Ancient Persian tablets indicate the existence of petroleum; historical references point out to the use of asphalt in the construction of walls in Babylon more than four thousand years ago. Oil wells were drilled in China in 347 C.E., to a depth of around 200 meters, using drilling bits attached to bamboo poles. Japan also used oil during ancient times. Early historical references point out the use of tar for paving the streets of Baghdad, derived from the easily available petroleum in the region. In the 9th century, oil deposits in and around the area of what is now Baku in Azerbaijan were exploited for the extraction of petroleum and the production of naphtha. The earliest account of petroleum in America points to oil springs in the region around Trinidad Pitch Lake in 1595. Peter Kalm, a Russian traveler, also points to oil springs in the region of Pennsylvania in his works published in 1748.

The modern history of the petroleum industry began when the process of refining kerosene from raw coal was discovered by Abraham Pinoe Gesner in 1846. The first Russian refinery came up at Baku during the year 1861. At this time, Baku accounted for around 90% of the world oil production. The petroleum industry in the United States of America was started by the establishment of the Seneca Oil Company near Titusville in 1859. During the 1800s, market growth was gradual and slow. Demand was mainly created by oil lamps and kerosene. Once the internal combustion engine was discovered,
however, demand surged. By the early 1900s, oil fields were also discovered in places such as Canada, Iran, Mexico, Venezuela and Peru.

Today almost 90 percent of the energy requirements of the transportation sector are met by the petroleum industry; and many economies are substantially affected by minute shifts in price. Wars have been fought for petrol in recent times. The top three countries today in production of oil are Saudi Arabia, Russia and the US.

Organization

The petroleum industry is usually divided into three major components: upstream, midstream, and downstream. The upstream sector refers to exploration, development and production of oil crude or natural gas. Most upstream work in the oil field or on an oil well is contracted out to drilling contractors and oil field service companies. Midstream and Downstream sectors are most often seen by the public, as they encompass refining, storage, distribution and marketing of petroleum products to domestic and industrial consumers.

Relevant governmental or environmental factors

Environmental regulation is among the most important modern influences on the U.S. petroleum industry, with many requirements added in the 1980s and 1990s. These requirements affect market outcomes, making certain areas more prone to price spikes than others in the event of a logistical problem such as a pipeline break. Regulations also may influence the number of competitors in a market, and, for a particular competitor, the array of products it is willing to supply.

Petroleum is a non-renewable natural resource, with an inevitable eventual depletion of the world's supply. Resource economists argue that oil prices will rise as demand increases relative to supply, and that this will spur further exploration and development. However, this process will not increase the amount of oil in the ground, but will rather temporarily prolong production as higher prices to make it economical to extract oil that was previously not

MARKET STRUCTURE

The Market Structure for petroleum, crude oil and gas, is characterized as an oligopoly; a few firms dominate the market, and market decisions must be made with the other dominating firms in mind.

The Organization of Petroleum Exporting Countries (OPEC), formed in 1961, by Iran, Iraq, Saudi Arabia and Venezuela seeks to unify the policies controlling the prices and supply of petroleum to consumers in order for its member countries to have a fair return on their investment in the industry. It took only a few years for OPEC’s five member countries to grow and include more of the world’s leading oil producers such as, Qatar, Indonesia, Socialist People’s Libyan Arab Jamahiriya, United Arab Emirates, Algeria, Nigeria, Ecuador, Angola and Gabon. As of 2007, OPEC’s share of world crude oil reserves equaled 78% while Non-OPEC oil reserves equaled 22%. See, appendix, Table IV.1

There are, however, competitive forces within the market. In the U.S., there are many independent firms which are competitive in nature, with little market power. The product is one which
would lend itself to a competitive market: many buyers/sellers; a homogeneous product; perfect information regarding price; and no insurmountable barriers to entry in the long run (although there are extremely high barriers to entry in the short run). Also, crude oil is traded as a commodity.

The industry has a vast buying and selling market and is an extremely large industry. Oil supplies over 40% of U.S. energy needs. The major competitors in the U.S. market are: Exxon Mobile, BP, Shell, and Chevron/Texaco. The chart attached in appendix IV, table IV.2 gives an idea of the size of the market according to data provided in 2003.

According to a Seeking Alpha article published on July 31, 2008, Exxon Mobile made a little fewer than 11.7 billion in profit on $130 billion in revenue, a record high for any U.S. company. Profits grew 14% ($2.22/share vs. $1.83/share in 2007) from the lasting effects of record high oil prices. Barriers to entry are high for the industry. For example, in previous years, most of the known reserves worldwide were fully open to the international oil companies. Today that number has decreased to 16%. Much of the world's oil and gas is either restricted or entirely economically recoverable.

THE INDUSTRY DEMAND

As noted in the introduction, the modern petrochemical industry began around 1861 with the successful drilling of the Drake well in western Pennsylvania. The industry has therefore been in existence for nearly a century and a half, and worldwide, appears mature. (See Table, Total World Oil Consumption, Barrels per Day), World consumption has been relatively consistent over the ten year period, as charted moving from 60 to 71 barrels per day during the period. See, Appendix, Graph V.1 With a stable growing production pattern from the early 80’s to the mid 90’s, it is surprising that the U.S. production has been decreasing, indicating that the U.S. market is in decline. The U.S. has become an importing nation, according to the Energy Information Administration of the Federal Government. Further, during the period from 2002 to 2007 the U.S. increased oil imports by 16%. Demand is increasing.

Oil production in the U.S., however, peaked in 1970, and has been declining since that time. Significant advancement in the technology within the industry seems to have had relatively little impact on U.S. production. See, Appendix, graph V.2. There are two reasons for the decline. First, those oil fields which require minimal infrastructure are for the most part tapped out. Second, the fields which are less desirable for a number of reasons, including limited capacity, undesirable locations such as deep water or near the arctic, or produce viscous oil (oil mixed with poisonous chemicals) require more resources and are less productive. Even so, demand continues. Today we consume in excess of 20 million barrels per day; 60 percent of which is imported, representing over one third of the trade deficit.

Key Determinants of Demand

The key determinants of demand include tastes, income, other goods, expectations, and number of buyers. Since there are very few alternatives to oil, tastes, income levels, and other goods, do not seem to play a significant role in the demand. Individuals could use a wood fire or coal stove for heat, and electric for heat, however, the electricity is generally a function of oil consumption and coal stoves are dangerous and inefficient. Battery power could replace automobile fuel but has not yet been
commercially viable. Bus service, a possible alternative, is not widely available or efficient. Therefore, demand for crude oil is relatively price inelastic since the product fulfills a need which cannot easily be fulfilled in a different way.

The major component for demand seems to be number of buyers in the market. Since oil is a necessity for modern societies, demand within the petrochemical industry will increase as developing nations build infrastructure and their citizens use central utilities and purchase automobiles. Energy is required to keep the factories going and to power the cities and the farms that feed the planet. It is necessary to fuel the transportation systems of the world that are necessary to get products from producer to consumer. Not only will the factories and plants be affected but also the military complex which is using increasing levels of crude.

The Organization for Economic Cooperation and Development (OECD), which include many of the developed nations of the world, consume 2/3 of the world’s petroleum production. The demand for oil within this organization has grown by 11% during the period from 1991 to 1997. The growth was somewhat masked by reductions in countries such as Russia, which dramatically reduced consumption after the fall of the Soviet Union. It is estimated by as much as 50%. However, Russia and several other countries which are outside the OECD, including China, Brazil, and India, have recently increased consumption by over 35%. This clearly is placing pressure on the demand of crude.

Future Expectations of Demand

“The world certainly won’t run out of oil anytime soon. And plenty of energy experts expect sky-high prices to hasten the development of alternative fuels and improve energy efficiency.” A society which utilizes petroleum as a primary and only source of energy is doomed since the amount of petroleum is finite. No technology is sustainable forever. Our human history suggests that we are a people of substitution. Replacing old or existing technology as new products and technology emerge. It is suggested that the petroleum reserves are greater than all previous consumption, however no one can predict the exact amount of reserves or their end. Over the next several decades, however, the market will experience short-term drops and spikes as a result of political and market interference. At some point, however, we will run out of oil. Classical economics suggests that with increased demand and subsequent higher prices there will be an influx of new producers which place pressure on prices. However, such actions are unlikely to bring about an increase in supply since the supply is finite.

ANALYSIS OF COMPETITIVE FORCES (PORTER’S FIVE FORCES)

Michael Porter’s five external forces influence a firm’s ability to compete within its industry and illustrate a complicated petroleum market, subject to high barriers to entry and substantial bargaining power by both buyers and suppliers.

Threat of entry by new competitors

Entry barriers to the petroleum industry include: i) political and governmental pressures, ii) the need for highly trained and specialized workers, iii) the need for large capital investments, iv) asset specificity,
and v) physical hazard and risk. Global political forces shape the industry and in the U.S., nearly 1/3 of all petroleum is produced from Federal lands. See, table VI.1, appendix. In addition, the production of oil is extensively regulated by federal, state and local authorities. Environment evaluations and laws regulating processes require an extensive compliance plan.

Highly trained and specialized workers are needed to operate equipment and determine key drilling decisions. Significant capital is required to enter the market, to replace reserves, and to sustain production. The firm must pay for development prospects and productive oil properties. A substantial reserve is needed to cover operations during periods of unproductive drilling and shortages of oil field equipment, services and qualified personnel.

Mineral rights to the real property acquired for drilling are expensive and asset specific. Land is not easily converted to other uses at the same price. The value of the aggregates, or farming produce, may be less than the mineral interests. Companies seem to aggressively protect their competitive position, and new entrants may be reluctant to invest the capital necessary.

Economies of scale realized by the majors act as an entry barrier. Minimum efficient level of production for the oil and gas industry is high due to up-front costs, requiring a larger market share for an entrant to be competitive. Oil drilling also can be hazardous; exposing the entrant to financial, regulatory and civil liability for personal injury; damage or destruction of property, natural resources and equipment; and environmental damage clean up responsibilities that suspend, limit or prohibit operations.

Rivalry among existing competitors

In 1999, the top five producers held a 41 percent market share. The next largest five held 13 percent, and the following 50+ companies held 46 percent. The high concentration indicates a less competition. The market appears disciplined; lesser intensity is expected with increasing market growth; high exit barriers; and historically slow but steady industry growth. However, the market is more volatile than it appears, possibly due to global rivalry. Rapid global growth, high real property and storage costs, low switching costs and low levels of product differentiation foster more intense rivalry.

Pressure from substitute products

In Porter’s model, substitute products refer to products in other industries. At the present time, the search for alternative sources of fuel is prevalent; however, very few substitutes are yet commercially feasible. Coal, nuclear energy, renewables like hydro-electric power, solar power; and wind power are just a few. Pressure from substitute products is low in the short run.

Bargaining power of buyers

Oil is a commodity, and is traded as such (low bargaining power). Also, the OECD represents substantial bargaining power by buyers. The majors, while dominating the U.S. market (high bargaining power), must compete with much larger global interests as buyers (low bargaining power). Majors are both buyers and producers (high bargaining power). Producers have the ability to sell to many buyers, eg. the
emerging markets in China and India (low bargaining power), but the members of the OPEC establish prices, affecting supply and price levels (high bargaining power.) The buyers have a positive relationship to the industry: when “greener” alternatives are found, both the producer and the refiner (eg.) will find a reduction in demand, rather than a shift in power between the producer and the supplier.

Bargaining power of suppliers

Acquiring realty is a dominant cost. In the Chaparral Form S-4, it constitutes 86 percent of the total assets of the company. Suppliers of 86 percent of the assets of the firm should have high bargaining power, but realty is widely held. If one property is not attractive, the buyer buys the next. In addition, sellers/lessors may not transact business with the buyer more than once, limiting bargaining power. See, table VI.2. appendix.

The labor pool for experienced managers in the industry is aging; the median age is between 48 and 52. Few new graduates enter the field due to poor to fair job opportunities historically. There are two labor unions, the APEU and the OCAWU. Some majors employ over 100,000 people, but 53 percent of producers have fewer than five employees. The number of potential employees is small; those available for employment have relatively great bargaining power. Wages in the industry rank above average, also indicating an above average bargaining power.

CONCLUSION

The oil and gas industry extends beyond the realms of current events. There is a long history surrounding and supporting the need and demand of this industry. However, as demand increases and supply decreases, there is less of a neither long-term sustainability nor desire for entrance in the industry as we know it.

As incomes rise, economies use more energy for transport, heating and cooling and producing goods and services. A broad cross section of nearly 180 countries shows that doubling per capita income more than doubles per capita oil consumption. In this decade, new energy demand from China, India and other emerging countries has added to continue growth from the U.S., Europe and other parts of the world.

With consumption on the rise, oil markets grew tighter as suppliers neared productive capacity. Oil demand is inelastic in the short run—that is, it doesn’t react quickly to changing prices. Consumers adjust their spending to maintain consumption as prices rise, even if they have to pay more for it. Most likely, this reflects businesses’ commitment to keep up production and individuals’ need to drive to work, run errands and heat homes. When demand is inelastic, even modest tightening in markets translates into strong price movements. In recent years, this inelasticity has magnified tight markets’ impact on prices.

So, how do we sustain an industry that is on the way out? How do we enter an industry that is already exiting? One theme analyzed is that of new, alternate products or substitute products. Although,
according to Porter’s principles there are not a lot of substitute products creating pressure, there is still a need and perhaps a market in alternate products which could replace this industry in the future.

Through alternate product research and development, a firm cannot only settle the depletion state of oil and gas, but could globally affect the environmental repercussion of oil and gas. Emergence of clean, green methods of achieving fuel for the 90% of transportation currently using the petroleum industry, would aid in the global movement of cleaner air. Without the means of developing and evolving the industry, oil and gas will become mere blips on the industrial radar. Instead the development of new fueling could use oil and gas as a catapult into revolutionary industries.

As the United States stands as a global force in this industry, there is still complexity involved with the organization of the industry and the three main sectors that dictate it. There will be a challenge to streamline and restructure the current organization of the industry, but efficiency and dedication to reducing structural employment could progress towards this commerce. The gradual focus should be on the evolution of the oil and gas industry to an alternate fuel resource regardless of the implications surrounding the change. As an eager firm to enter the industry, the caution of varying the nature of this industry will be inevitable.