

A review of the U.S. Oil Industry from inception to 2009, its 150th Anniversary.

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ABSTRACT

The most ancient known oil wells are those at Ephrata in the Chinese province of Sychuan. These wells date back to several centuries B.C. There were also references to oil by the Ancient Greeks (IV-V centuries B.C.). However, the modern history of oil began in Titusville, Pa. in 1859 when "Colonel" Edwin L. Drake drilled the world's first successful oil well.

There is a strong parallel between the Automotive Industry and the Oil Industry. As a matter of coincidence, J.J. Etienne Lenoir built the world's first reliable combustion engine the same year in Paris, France. Therefore, the inception of both industries date back 150 years and in a very real way have transformed the world.

The first U.S. Oil Company, Standard Oil of Ohio, was established in 1870 by J.D. Rockefeller. Another important figure in the early days of the U.S. Oil Industry was Henry Flagler. Deeper wells were drilled and distribution of refined products began, mainly kerosene, as a result of their business efforts.

An important year in the Automotive Industry was 1885 when Karl Benz built

the first gasoline powered automobile utilizing a piston engine originally

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conceived by Nikolaus August Otto in 1866. Almost fifteen years later, Spindletop a “giant oil well”, was developed near Beaumont, Texas. As a result, Texaco, Gulf Oil and Sun Oil emerged, and a rapid expansion of the U.S. Oil Industry began to take place.

A milestone in the U.S. Automotive Industry was reached in 1908 when Henry Ford developed the “Model T”, which increased automobile ownership in the U.S. to 125,000 from 8,000 in 1900. The increased demand for gasoline in turn provided the incentive to Refiners to attempt to increase the gasoline yields beyond the amount naturally contained in the crude oils. This resulted in the commercial development of the “cat-cracker” by Standard Oil in 1940. In this catalytic process, the crude oil heavier fractions are literally “cracked” into lighter fractions in the range of gasoline and distillates. This was a major development in the Refining Industry. In fact, the current gasoline demand of approximately 378 million gallons per day in the U.S., could not be practically or economically met without the ability to convert heavy petroleum fractions into gasoline and diesel. The upward spiraling of crude oil prices began with the Arab Oil Embargo in 1973. Crude oil prices nearly quadrupled from an average of \$ 3 per barrel to \$ 11.65 per barrel. Oil prices doubled again in 1978 from \$ 14.50 to \$ 30/barrel. A peak of \$ 147 was reached in July 2008, but a steep decline followed immediately thereafter, and crude oil averaged \$ 50 per barrel at the end of the

same year.

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In addition to spiraling prices and disproportionate price volatility, the last 30 years have been characterized by the strengthening of Government Regulations authored and enforced by the U.S. Environmental Protection Agency. The Refining Industry responded to the “EPA mandates” by introducing in the market specialized motor fuels such as unleaded, oxygenated, reformulated and ultra low sulfur gasoline and diesel.

The global oil balance for the period 2004 to 2008 reflected an increase in total crude oil demand from 82.41 million barrels per day to 85.27 million barrels per day. The major consumers were the United States (19.68 MM), other OECD (note 1) countries (27.4 MM), China (7.94 MM), the former U.S.S.R. countries (4.49 MM), and other non-OECD countries with a combined crude oil consumption of (25.76 MM) barrels per day.

A similar increase was reflected in the supply balance for the same period (2004-2008) from 83.1 million barrels per day to 85.64 million barrels per day. OPEC (note 2) was the single largest supplier at 34.45 million barrels per day. A significant shift in World oil consumption patterns occurred during the last three decades highlighted by China and India increasing their total energy consumption from 8% in 1980 to nearly 20% in 2008.

The U.S. Oil Refining Industry stands today at a total of 150 refineries with a combined capacity of 18 million b/d. The existing refineries can be classified

into three different categories:

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(1) The simplest Refineries are “Topping Plants” where the various petroleum fractions are separated by atmospheric distillation and treated to produce saleable products such as gasoline, diesel and heavy fuel oils.

(2) The next degree of complexity in a Refinery includes a cat-cracker and/or hydrocracker for the production of additional gasoline and distillates. This type of Refinery is called a “Gasoline Type” Refinery.

(3) The highest degree of complexity adds a “coker” for the processing of heavy oils and is called a “Deep Conversion” Refinery.

The combined yield of the U.S. Oil Industry in 2007 resulted in gasoline (45.5%), distillates such as heating oil and diesel (26.1%), jet fuel (9.1%), and other products including petrochemical feedstocks (19.3%). In contrast, a gasoline yield of only 15% could have been achieved by topping refineries in the absence of cat-cracking, hydrocracking and coking technology. Therefore, the current gasoline demand (9 million b/d) would have required an enormous amount of crude oil far beyond the current U.S. production of 8.75 million barrels per day. Crude oil prices in general are established through “futures contracts” traded daily at the New York Mercantile Exchange. These contracts are traded in multiple amounts vs. the “physical barrels” produced and consumed each day. Simply stated, oil prices are the outcome of decisions by traders at the “MERC” and other trading centers around the world who are assessing/reacting to market conditions (their view) and market fundamentals (supply and demand). Market

conditions such as OPEC decisions, civil strife, weather, etc. create “price

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volatility”. Market fundamentals (supply and demand) signal market direction in a pure market situation void of speculation. Inventories of crude oil and petroleum products are regularly published and closely monitored by Traders and Refiners. Gasoline prices based on September 2008 figures are broken down as follows: Crude oil price related (67%), Refining (14%), Marketing and Distribution (8%) and Taxes (11%). It can be seen that crude oil prices have a substantial impact on gasoline prices. However, there are other factors such as refinery outages, seasonal variations, specialized fuels, weather (hurricanes), and transportation costs.

Far beyond the impact of the U.S. Oil Industry on the economy is the consideration that the U.S. National Security depends to a large extent on its Energy Security. While the largest supplier to the U.S. is Canada (1,912 MM b/d) the combined OPEC supply is a multiple of that amount. If nothing else, there are crude oil transportation “choke points” such as the Strait of Hormuz between Iran and Oman, which add vulnerability to the oil supplies.

There has been a marked decrease in all primary air pollutant levels as a result of EPA regulations and the billions of dollars invested by the U.S. Oil Industry. Looking at the future, it is imperative that the current levels of oil consumption be curtailed for economic and security reasons. Actions to be taken must include the supply side as well as the demand side. It is my belief that all sources of energy must be considered, including expanded use of coal, nuclear energy and natural

gas together with non-hydrocarbon sources such as solar, wind and geothermal

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energy. We must be mindful that whatever decisions are made today, particularly concerning new drilling and new refineries will affect the availability and pricing of crude oil and petroleum products ten years from now. In summary, to eliminate the current deficit of approximately 10 million barrels per day of crude oil, which is expected to grow in the future depending on the population growth and the economy, the only option that must be rejected is “business as usual”.

SUMMARY AND CONCLUSIONS

The oil industry has been in existence in the United States for 150 years. At the beginning, the main end use of petroleum was kerosene used in lamps. However, with the advent of the automobile, gasoline sales surpassed kerosene sales in 1911. Today, there are well over 250 million cars in the U.S. consuming 378 million gallons of gasoline per day. The gasoline is mostly produced in 150 petroleum refineries in the U.S. with a combined capacity of 18 million barrels per day of crude oil. In addition to gasoline, the U.S. Oil Industry supplies diesel for automobiles and trucks, aviation gasoline and jet fuel for airplanes, home heating oil, asphalt for roads, industrial fuels and feedstocks for the petrochemical industries including plastics, rubber, paints and textiles. The oil industry employs approximately 6

million people directly and indirectly and paid a total of \$ 92 billion in taxes in the year 2006 alone. In addition, the oil industry is the leading investor in emerging technologies which will expand the availability of energy from sources other than crude oil as well as non-hydrocarbon sources such as solar, wind and geothermal energy. As a result, the oil industry is vital to our quality of life as well as the economy of the United States. The continued expansion of the U.S. oil industry is necessary to support our future economic growth. Furthermore, our National Security depends largely on the oil industry. At the present time, the U.S. imports about 10 million barrels of crude oil per day. A substantial portion of these imports is shipped from the Persian Gulf through the Strait of Hormuz and the Suez Canal, which are considered to be possible "choke points" and add significant vulnerability to the oil supplies. These imports must be curtailed for economic and security reasons. To this effect, the domestic supply of oil must be increased and the demand for petroleum products decreased through energy conservation measures, renewable fuels, non-hydrocarbon sources of energy including nuclear energy and fuel efficient transportation. We can not be satisfied as a Nation to accept an energy goal short of self-sufficiency being mindful that whatever decisions we make today, particularly the development of new drilling sites, will affect the availability of energy and the price we pay for it 10 years from now. In conclusion, we need a

comprehensive Energy Policy and we need it now.

NOTES

- (1) OECD (Organization for Economic Cooperation and Development)
countries: Australia, Austria, Belgium, Canada, Check Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, South Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.
- (2) OPEC (Organization of Petroleum Exporting Countries): Algeria, Angola, Ecuador, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, Venezuela.