

Sharing Perspectives on the Global Petrochemical Industry

a report by

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In this article, Sherman J Glass, Jr shares ExxonMobil's perspectives on this fast-growing industry. The body of the article is based on a speech presented at CMAI World Petrochemical Conference, Houston, earlier this year.

While ExxonMobil is known primarily as an oil company, I suspect that some of you may not realise that embedded within that huge enterprise is one of the world's largest chemical companies. In fact, last year ExxonMobil's chemical company earnings were almost US\$4.4 billion, and our revenues of US\$49 billion would place us among the top three publicly traded chemical companies in the world.

In fact, we are the industry leader in seven of the 12 chemical business segments in which we operate and second in four others.

ExxonMobil has been committed to the petrochemical business for a long time. We helped create the industry back in 1920 with the commercialisation of isopropyl alcohol, the first chemical product made from petroleum. We continue to make that product today. We invented butyl rubber and continue to lead the industry in that business. We developed the process of steam cracking, which many regard as the engine of most chemical complexes.

First, we are in a growth business. Demand for chemicals is growing about 2–3% above world gross domestic product (GDP). That average growth rate of about 5–6% per year is about triple the expected growth rate for energy.

This high growth reflects the continued penetration of chemicals and plastics into both existing and new uses around the world. Thus, our industry is providing valuable products that facilitate significant economic growth and improve living conditions everywhere.

Second, market demand in the developing nations, especially in Asia and specifically China, is driving most of the growth we will see over the next several decades. This means North America will shift from a net exporter of chemicals to a net importer by as early as the end of the decade.

Over the next 10 years, we expect that some 60% of the world's petrochemical growth will occur in Asia, and China alone will account for one-third of that growth. By 2015, Asia could account for 50% of global demand for commodity chemicals, and China alone will account for 25% of global demand.

Thirdly, critical to meeting future demand is innovation rooted in leading-edge technologies. As you know, our manufacturing processes are improving and becoming more efficient and we are producing higher quality products. Accordingly, our products are finding new applications and markets. Innovation continues to

provide solutions to emerging needs in transportation, packaging, construction and health care. New uses of our products improve quality of life as well as increase demand for our products.

Let's turn to some of the ways in which we in ExxonMobil Chemical are preparing to capitalise on this remarkable future.

One area on which we focus closely is feedstock management. In steam cracking, feedstocks can account for nearly half of operating costs. That's why ExxonMobil Chemical has a very active programme to expand feedstock flexibility through deployment of new technologies that enable us to process heavier, lower quality – but lower cost – feeds. For example, last year we qualified more than 100 new steam-cracking feedstocks of varying qualities from around the world to run in our plants.

The ability to process both liquid and gas feedstocks from diverse sources enables ExxonMobil to respond quickly to changing feedstock availability and cost. Feedstock flexibility captures additional value for our shareholders and strengthens our ability to reliably meet the needs of our customers in any economic environment.

We carefully manage every molecule to maximise its value, while taking advantage of synergies with ExxonMobil's refining operations, typically co-located with our major plants. This gives us the ability rapidly to respond and switch streams from fuels to chemicals and back as market conditions change. It only takes minutes to alter the mix of the streams being processed at a chemical plant and its adjacent refinery. It is difficult to overstate how important feedstock flexibility is in today's hyper-competitive and ever-changing marketplace.

Another key area of emphasis is more efficient use of energy, as more than one-third of operating costs are for fuel. Accordingly, we continually seek new ways to recover and reuse heat, reduce heat loss and improve energy efficiency.

About 60 years ago, ExxonMobil began operating the world's first steam cracker at our Baton Rouge plant. Today, that same unit consumes less than half the energy – per tons of olefins produced – that it used when it started up in 1941.

Today we are the only olefins producer with our own furnace technology. We keep improving that technology to process different feedstocks, to reduce energy consumption efficiently and to increase

product yields. Steam crackers use by far the largest amount of energy in a petrochemical plant. Over the past four years, we have reduced the energy use of our steam crackers by almost 10% – a rate that is twice the industry average. Furthermore, energy initiatives at all our operations have reduced the energy consumed per unit of output by 9%.

In addition, we have steadily increased our use of co-generation – the simultaneous production of electrical power and steam. We have interests in about 100 co-generation installations around the world at more than 30 chemical plants, refineries and natural gas processing plants. These operations, fuelled primarily by clean-burning natural gas, have reduced greenhouse gas emissions by over 10.5 million metric tons per year versus conventional power generation. That's equivalent to taking about two million cars off the road each year. As a result of this and many other advances in technology, the air, land and water around our operations are much cleaner today than they were in the past.

In an industry that is always subject to ongoing margin pressure, we believe that effective cost management is essential to success over the business cycle. A relentless focus on operating costs must continue in both market peaks and valleys. At ExxonMobil, every part of the organisation has well-defined cost targets and clearly understands their role in delivering sustainable cost reductions. Progress in meeting these targets is stewarded systematically to the highest levels of the company.

Running plants at full capacity with fewer outages also results in

At ExxonMobil Chemical we believe the following factors are important to long-term success in this business:

- flexibility to capitalise on differences in the availability, quality and cost of feedstocks;
- a steady reduction in the use of energy, which also has the benefit of lower emissions;
- a relentless focus on costs, efficiency, reliability and safety; and
- the use of state-of-the-art technologies to improve competitiveness and reliability to meet the changing needs of our customers.

Energy Overview

In large measure, the health of the chemical industry depends on the health of the oil and gas industry. As I see it, our futures are inextricably linked. Consider that 99% of our feedstocks come from oil and natural gas – commodities for which other industries, most notably transportation and utilities, also compete.

Throughout its history, the oil and gas industry has fulfilled an important role. It has provided the energy needed for economic development and for people to improve their standard of living. However, it has taken significant investment and constant innovation to deliver the energy the world needs. This must continue and increase as more and more people inhabit our planet. In fact, the World Bank projects that the Earth's population will increase from more than 6 billion today to 8 billion by 2030. Most of that

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safer and lower cost operations. It also enables us to increase our manufacturing capacity at little to no additional capital.

In terms of focus on safety, we believe a company's commitment to and performance in the areas of safety, health and the environment are closely tied to outstanding performance in all other aspects of operations.

Finally, underpinning all of these efforts is the use of the most advanced technology. At ExxonMobil Chemical we build technology innovation into every aspect of our business, from manufacturing to marketing and sales. That means researchers and scientists are integrated into the teams that focus on the needs of customers and how to meet them. They help us to find the best ways to make our products, improve their properties and give customers exactly what they want.

growth will come in developing nations, where over 80% of the world's people live today. Over the same period, the global economy is expected to more than double in size to about US\$70 trillion. Again, much of that growth will occur in places such as China and India.

As populations expand and living standards improve, the use of energy, chemicals and related products for homes and businesses will increase. As a result, we expect global energy demand will grow by 40% by the year 2030 versus what we use today, reaching close to 325 million barrels per day on an oil-equivalent basis.

Today oil, gas and coal play a dominant role in meeting global energy needs and we at ExxonMobil believe they will continue to do so well into the future. This is because they are affordable and reliable. Oil, gas and coal will provide about 80% of the world's

energy needs over the next quarter-century and beyond. This is despite double-digit growth in emerging energy sources such as wind and solar.

Key cost drivers for the chemical industry are oil and gas for both feedstocks and fuel. Today, the chemical industry's use represents a relatively small portion of global energy use – about 7.5%. Energy demand by the chemical sector is growing at a rate of 1.6% each year. While this might not sound large, it is essentially the same as the rate of growth ExxonMobil projects for transportation energy demand.

The world is on the move and liquid fuels are essential to meet that demand. The growth in global liquids demand through to 2030 will be led by the transportation sector – mostly cars and trucks but also planes, ships and trains. For example, between 2000 and 2030 the world's light-duty vehicle fleet will grow by almost 500 million or about 85%. Total transportation demand in 2030 will be about 65 million barrels per day – about 50% higher than today.

This is important to the petrochemical industry for several reasons:

- we will continue to compete directly with the transportation sector for liquids from crude that we need as feedstocks;
- we will continue to be a significant supplier of raw materials to produce all of these additional cars and light trucks; and
- the quality of motor fuels will change in response to growing

and the Russia/Caspian region. Also significant will be increased flows of oil and gas to Europe and Asia-Pacific.

This begs the question: does the Earth contain enough oil to meet this growth? The simple answer is yes.

According to the US Geological Survey, the Earth is estimated to contain more than 3 trillion barrels of recoverable, conventional oil. This estimate has grown steadily over the years as the oil industry has developed new, more sophisticated technologies to both find and produce these resources.

If we add estimated 'frontier' resources such as heavy oil and shale oil, this recoverable volume rises to more than 4 trillion barrels. Considering that, to date, mankind has used about 1 trillion barrels of oil over its history, the outlook for future supplies is positive. However, it will require significant investment as well as access to many different regions of the world.

While oil is closely linked to transportation fuels, gas – another major petrochemical feedstock – is largely tied to needs for electrical power. Global growth in natural gas will continue to reflect the advantages that natural gas has as an efficient, low-emissions fuel for electrical power generation. We anticipate that demand growth in the chemical sector for natural gas – about 1.6% per year – will be about equal to the growth rate for natural gas in other sectors.

Historically, most natural gas has been supplied via pipelines from

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concerns over emissions, changing the molecules available for our industry to use as feedstocks.

We must be vigilant to take advantage of the opportunities this significant growth in the transportation sector brings. But where will these molecules come from?

International trade is a feature of any global market, and oil is perhaps the best example. Currently, about 40% of the oil consumed in one region originates in another. North America is a good example, with one-third of its petroleum supplies coming from outside the US.

Looking forward to 2030, we expect global liquids trade will grow dramatically. Raw material sources will become increasingly diverse, and we will see even more oil and gas originating in the Middle East

gas fields located near major consuming areas, but local supplies are declining in many parts of the world. Accordingly, new supplies of imported gas will be required. So, the challenge lies in being able to deliver gas from distant locations to where it is needed.

While pipelines will remain an efficient means to transport the majority of natural gas, the world will increasingly rely on liquefied natural gas (LNG) transported in large-volume ocean-going tankers. In North America, LNG imports are expected to increase to about 25% of supply by 2030 compared with less than 5% today. This is despite additional supplies via northern pipelines and other developments. In Europe, natural gas imports are expected to increase from about 45% to about 85% of supply by 2030. Pipeline imports – primarily from Russia and the Caspian – will more than double. Natural gas demand in Asia-Pacific will also double over the next 25 years. Local production will meet a large part of this

increased demand, but pipeline imports and increased volumes of LNG are expected to meet over 30% of demand by 2030.

The point is – with the dramatic, increased use of LNG in the future – natural gas markets will become more connected and more of a global commodity, similar to oil.

Technological advances, effective resource management and government–business co-operation will continue to be essential to meet the ongoing challenge of increased demand by both the oil and chemical industries. In fact, the International Energy Agency (IEA) estimates that the total investment required in the oil and gas sectors over the period 2005–2030 will amount to more than US\$8 trillion.

Our challenge will be to understand how the dramatic growth in need for oil and gas and the diversity in supply locations will impact on our ability to access and compete for those molecules. Clearly, feedstock flexibility and nimbleness will enhance one's ability to capitalise on this changing energy world.

For the foreseeable future, traditional crude oil and natural gas will be the predominate sources of energy for the world and the predominate sources of feedstocks for our industry. Their nature will change in source and cost, but with these changes, opportunities will exist for those who capitalise on technology and expand their manufacturing flexibility, just as we have over the last several decades.

Conclusions

The health of the petrochemical business depends to a significant degree on the health of the global petroleum industry, which operates in a world characterised by complexity, geopolitical uncertainty, questions about future energy supplies and concerns about the risk of climate change. Yet, for all this complexity, the petroleum industry's fundamental mission remains unchanged: that is, to meet the world's growing need for affordable, reliable energy in a manner that is economic, safe and environmentally responsible. The industry's track record demonstrates that the mission can be accomplished.

Turning to the chemical industry, we face similar challenges. There is no question that we operate in a challenging environment, but that is not new. The world's developing nations will require more of our products to raise their standard of living. The opportunities for our businesses are significant. To take advantage of those opportunities, our approach should remain founded on a long-term view of the business, a disciplined approach to investments and continuing advances in technological innovation. We must base our decisions on business fundamentals and remain committed to our business strategies through the inevitable business cycles that all regions and industries experience.

Above all, we must prepare for the changes to come in feedstock availability, in the technologies at our disposal and in customer needs. In the end, if problems are to be solved and opportunities seized, the industry has to prepare for the future and embrace the opportunities that lie before us. ■

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