

Made in the USA

Roy Lipski, CEO Velocys
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Cheap shale gas will turn the USA, once again, into the world's manufacturing powerhouse. Velocys is poised to take advantage of this enormous opportunity – changing how, and where, fuels are made.

U.S. shale gas is a game changer

It is hard to believe that just five years ago, natural gas prices in North America were so high that a number of chemical manufacturers abandoned their U.S. operations and moved to bases overseas.

Today, abundant supplies of shale gas have lowered American gas prices to a fraction of those in many other countries. The International Energy Agency now predicts that these supplies will fuel the U.S. economy for the next two decades. American companies in energy-intensive industries are currently enjoying a significant competitive advantage, and the same tailwind is luring manufacturers back to the USA from India, China and other developing countries where wages and other costs have been steadily rising.

The past 18 months has witnessed a surge of plans for the construction of new North American chemical plants, producing everything from ammonia for fertilizer, to ethylene and diesel fuels. Dow Chemical, for example, has a \$4 billion plan to expand its U.S. chemicals production capability, including a new plant in Texas; whilst Sasol intends to invest more than \$14 billion building a mega-scale gas-to-liquids (GTL) plant in Louisiana to convert natural gas to diesel and chemicals.

GTL makes enormous sense in the new gas-rich world, because gas itself is a poor substitute for most transportation fuel needs: airplanes can't fly on gas; and infrastructure challenges will inhibit adoption of compressed and liquefied natural gas (CNG and LNG) for most automotive purposes. In contrast, GTL is designed to make exactly the kind of liquid fuels the world most thirsts for: diesel and jet fuel.

Shale gas is a distributed phenomenon

A few multi-billion dollar projects, and the associated economic benefits for a small number of locations, is not the only route available to chemical- and fuel-producing companies looking to take advantage of the shale gas boom. Indeed, Shell's recent decision to shelve their proposed 140,000 barrel per day (bpd) GTL plant on the Gulf Coast, calls into question the economic and practical viability of large-scale GTL projects as opposed to smaller-scale ones, given their huge capex and resource demands, long time to construct, and significant complexity and risk.

Shale gas is a mass-produced and distributed phenomenon. With thousands of small, quick wells being drilled across North America, smaller-scale GTL is a perfect complement to the shale revolution. In contrast the traditional centralized large-scale model used by the likes of Shell and Sasol, can only be deployed where huge volumes of natural gas and heavy infrastructure are available.

Recently, Pinto Energy announced plans to build one of the new breed of smaller-scale GTL plants in northern Ohio, near Ashtabula on Lake Erie. Constructed from modules using technology developed by



Velocys, the plant will produce 2,800 bpd of high value specialty products (solvents, lubricants and waxes), as well as ultra clean transportation fuels.

Similar smaller-scale GTL factories could be rolled out across the continent, bringing the economic benefits of gas-to-liquids to remote shale production sites (where gas pipelines have not yet been installed), and capturing waste gas that is otherwise disposed of through the environmentally damaging practice of flaring.

Path of least resistance for the world's resurgent manufacturer

Sasol's Lake Charles mega-scale GTL plant is expected to come on-stream in 2019. In contrast, the modular construction methods used to build smaller-scale GTL plants mean that developers could be reaping the benefits of the shale gas boom for longer by creating high-value products as little as two years after making a final investment decision.

As well as being faster to build, smaller scale GTL facilities require considerably less capital and much smaller reserves of gas. They can be deployed in remote locations rather than exclusively on the coast, involve less risk and are easier to permit, supply and operate. As such, smaller-scale distributed GTL is the path of least resistance, resulting in the potential for faster and more widespread adoption than conventional large-scale GTL.

The development of shale gas was made possible by the large number of independents operating across North America. This same pioneering mindset will drive the distributed monetization of shale gas, with smaller-scale GTL at its heart.

North America today is uniquely advantaged by a combination of low cost feedstock, cheap energy, highly developed infrastructure, skilled labor, advanced technology, capital and a stable business environment. The USA is thus set to become the world's manufacturer of value-added finished goods, including refined products such as diesel. Gas-based refineries, enabled by GTL, especially at smaller scales, will become a major player in this revolution. And whilst North America is set to sell more gas and oil, it is the export of finished products that will transform the U.S. economy and shake markets worldwide.

The child of the GTL industry

Electricity gave birth to General Electric; computing gave birth to Apple; the telecoms revolution gave birth to Vodafone. In each case, a technological breakthrough resulted in the birth of a new industry, as well as a dominant player within that industry.

Low gas prices in North America are giving rise to a GTL industry that will spread across the globe. After nearly 20 years of research and development and over \$300 million of investment, Velocys is poised as the dominant player in the fast-emerging sector of smaller-scale GTL.

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