

The skinny on gas-to-liquids

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Natural gas is a rich source of environmentally friendly fluids. But producers must obtain the right mix of processes that take advantage of economies of scale.

I've always believed that in time the best technology prevails. And it is always the marketplace that makes that judgment. Countless times I've had salesmen extolling the virtues of their products or services implying that they embodied the best, latest or only technology that could do the job.

It is all the more interesting when salesmen from competing companies are making

those same claims—are they both right? Not likely. Is one of them lying? Not likely, as he probably believes what he is saying. Sooner or later, I'll figure out whether the product or service I just bought was the best or maybe just good enough. And sometimes I've gotten hoodwinked and bamboozled.

So let's consider the issue of raw materials for fuel (energy), and base oils for lubri-

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cants. Back in 1973 during the first “oil shortage” when the price of gasoline tripled (from 33 cents to a dollar per gallon—ah, the good old days), we were told by the sages (and trumpeted wildly by the media), that we should turn down the thermostats in our houses, sell the family station wagon and start driving Volkswagen beetles, develop nuclear power (this was prior to Three Mile Island), develop wind and solar power and that if we don’t do these things, we will run out of crude oil by 1980.

Well, the price of gasoline stabilized around a dollar for a number of years, new oil refineries were built with “the horrific windfall profits” made by the lecherous, evil oil companies (numerous politicians were calling for taxes on these windfall profits, hmm), VWs, while delivering good gas mileage, could not meet the EPA emissions regulations with their air-cooled engines and were thus discontinued from sales in the United States, minivans emerged in the market to replace the sold station wagons, Three Mile Island, and later Chernobyl, made us afraid of nuclear power and, at triple the price of crude, we magically did not run out of crude oil in 1980 and, I guess, all was well.

Does any of that sound, at least vaguely, familiar? In more recent times, we find the price of crude doubling, politicians railing about taxes on windfall oil profits, a shortage of refining capacity, a resurgence of nuclear power, more talk of windmills, sunshine and now burning our food (while others in the world starve) for fuel (ethanol from corn), and the family has got to lose the SUV and the macho pickup truck.

Now the political situation in the Middle East seems to have replaced the prediction that we will run out of crude by XYZ date. All accompanied by the cacophony of sound from sages, pundits, politicians and the media or, as Shakespeare so aptly put it, “all sound and fury and signifying nothing”—because, as before, the marketplace will put things in balance.

This time around, there are some interesting opportunities made available by higher crude oil prices. Nuclear power is still a possibility, with the higher crude prices justifying the higher engineering and operating costs of producing electricity more safely. Substantial oil reserves have been located in Siberia. Because of its location, the cost of extraction is higher than the Middle East, but now within the realm of possibility.

At last year’s annual meeting in Calgary, we heard about the massive oil shale reserves in northern Canada—again, now, within the realm of possibility. Yet, aside from these, there is still another possibility.

This past October I taught an education course on base oils for the STLE North Texas Section. When I got to the part on future technologies, I noticed that my slides on gas-to-liquid (GTL) technology were in need of a brush-up. So I decided to read again Peter Fairley’s GTL article published in TLT.¹ I was again struck by how the marketplace, with today’s crude oil prices, environmental and political concerns, could really put this emerging technology on the map.

First, it is important to note that we have found fairly vast reserves of natural gas. Second, in the early 1920s, the so-called Fischer-Tropsch process was developed, which can convert natural gas into liquid hydrocarbons. Like PAOs, these hydrocarbon liquids are essentially pure, in that they are synthesized from basic building blocks rather than refining something containing many impurities.

The result is liquids virtually free of sulfur, aromatics and related unwanted compounds. This means that gasoline and diesel fuels can be made from GTLs, which produce far less onerous emissions. And base oils can be produced from GTLs that

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These base oils have a lower viscosity, run cleaner and last longer—base oils that can compete with PAOs. GTLs are produced with two processes: a slurry process and a fixed bed reactor. The first is cheaper to build, but produces less of the longer chain molecules needed for base oils. The other more expensive process produces longer chain molecules needed for base oils. Part of the trick in producing GTLs is for producers to correctly pick the right mix of process types and build these plants in sufficient size to take advantage of economy of scale—a big gamble to win. Due to the size of the investment, this is not a gamble for the faint-of-heart.

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like GTLs. It seems to me that a technology like GTLs has the potential to rise to prominence in the eyes of the marketplace, because it can produce something that the marketplace has continually said it wants: fuel and lubricants of better quality, better performance and lower environmental impact at reasonably competitive cost. <<

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Reference

1. Fairley, P. (2003), “GTL Transforming the Future of Lubricant Production,” *Tribology & Lubrication Technology*, **59**, (10), pp. 32-38.