



World Energy Interviews

Ken Agee, Chairman and CEO of Syntroleum Corporation



Prior to founding Syntroleum Corporation in 1984, Mr. Agee worked 15 years in crude oil refining and natural gas processing for Texaco, Cities Service and Transok, Inc. At Syntroleum, Agee researched Fischer-Tropsch technology and developed the Syntroleum Process[®] for converting natural gas into synthetic liquid fuels. Mr. Agee is an inventor and is credited on most of the company's patents. He holds a B.S. degree in chemical engineering from Oklahoma State University.

World Energy: Currently, everyone's talking about more foreign natural gas heading to the U.S. via liquefied natural gas. But you have a different plan, correct?

Ken Agee: My company is commercializing a natural gas technology we call gas-to-liquids, or GTL, which can be used to bring processed natural gas to the U.S. principally in the form of clean diesel fuel. But it doesn't compete with LNG. Matter of fact, we see the two technologies as complementary.

World Energy: With LNG production facilities overseas and receiving terminals here ramping up, how is GTL going to command any attention?

Ken Agee: LNG is getting a lot of attention because the U.S. needs more gas and there are very large resources of stranded gas (approximately 2,500 TCF) that have no market. With a growing imbalance of supply and demand in the U.S. gas market, there is a good opportunity for LNG in the U.S. GTL serves a totally different market, the middle distillate market, which includes diesel fuel. The middle distillate market is about 10 times larger than the LNG market. GTL will command

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the same kind of attention because, like LNG, it monetizes stranded gas. And it makes ultra clean fuels. Additionally, Syntroleum is developing the GTL barge, which is aimed at smaller gas fields that will never get LNG treatment.

World Energy: *Never* is a strong word.

Ken Agee: I agree, but show me a gas field with less than 3 TCF of proven reserves out in the middle of nowhere, and then tell me somebody's going to invest a billion dollars in a liquefaction plant to monetize it. The economics for liquefaction only work with the big gas fields.

World Energy: OK, what are the economics like for GTL?

Ken Agee: Our approach is a floating GTL processing facility we call GTL barge. We're looking at unit production cost in the neighborhood of \$12/Bbl. And the GTL barge capital cost is around \$400 million. This capital cost is an order of magnitude less than the smallest LNG project being planned.

World Energy: Is this a ship that will operate on the high seas?

Ken Agee: I suppose we could build one, but our approach is to locate in quiet, sheltered waters, because then we don't need the expense of additional seaworthiness.



World Energy: How many fields match your criteria as appropriate for GTL barge technology?

Ken Agee: We hired an independent consulting firm to look at gas fields in the 1-3 TCF range worldwide. They identified over 100 fields. From those, we high-graded the list to include fields that are close to shore with a low development cost. If all of these fields were developed with the GTL barge, it would result in 8 billion barrels of reserves.

World Energy: Eight billion barrels of crude would look pretty good on the balance sheet.

Ken Agee: It gets better. We're not talking about unrefined crude. We're talking about refined product ready for market.

World Energy: That is better. Describe the product mix.

Ken Agee: Our primary product is what we call superclean synthetic diesel. It has no sulfur, no aromatics and high cetane, which is where air quality regulations are going. We also produce naphtha with a high paraffin content. Its high olefin yields in a cracker make it valuable as a chemical feedstock. In addition, we would produce NGLs and condensate that are naturally associated with the field.

World Energy: How is this possible?

Ken Agee: Simplistically speaking, we extract the naturally occurring liquids (propane and heavier) with the remaining methane and ethane going to the Fischer-Tropsch reactor. We reconfigure the hydrogen and carbon atoms into longer molecules that are liquid. Our proprietary technology uses compressed air – a step improvement over earlier GTL processes that used pure oxygen. This simple yet critical step makes it possible to compress the footprint and put the process on a barge.

World Energy: Have you actually operated a GTL plant?

Ken Agee: We have operated a 2 b/d pilot scale plant for about 10 years. We have recently started operating a 70 b/d demonstration scale plant in Catoosa, Oklahoma that was financed by Syntroleum, Marathon Oil and the Department of Energy. This is a fully integrated plant that does everything from natural gas to finished fuels in one location, and it's large enough to scale up.

World Energy: It's quite interesting that you're proposing a new source of clean diesel at a point in time when emission levels for diesel engines are about to go way down.

Ken Agee: Diesel engines account for about 40 percent of the light duty cars and trucks in Europe, where the high efficiency of a diesel engine is appreciated and utilized. In the U.S., diesel engines only account for about 4 percent of the light duty market, but that is expected to grow to 16 percent in the next decade. Current diesel regulations are targeting sulfur reduction, but diesel performance is greatly impacted by cetane. We believe future regulations will target both cetane and aromatics. With a high cetane and low aromatic content fuel made possible by GTL technology, U.S. consumers can have the high efficiency of diesel technology and the high performance and low emissions they demand as well.

World Energy: It appears you have a better mousetrap.

Ken Agee: Well, we're ready for that path to be beaten to our door.

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