

## CONGRESSMAN DON YOUNG LEADS FACT FINDING TRIP TO SOUTH AFRICA TO VIEW MOSSGAS GTL PLANT



Alaskan Congressman Don Young, Chairman of the House Committee on Natural Resources, led a delegation from Alaska, California, Colorado, Minnesota, Texas and Washington DC the end of May to visit the Moss gas facilities in Mossel Bay South Africa. Pictured with Congressman Young are (left to right) Alaskan State Representative Joe Green, Commissioner Robert Pernell, California Energy Commission, Kyle McAlister ANGTL, Congressman Young, Dave Day, Chairman of Moss gas and Dr. John Gerster, Vice Chairman Alaska Science and Technology Foundation.



During the May 2000 visit to Moss gas's GTL facility, Dave Day, CEO of Moss gas, pledged to work with California Energy Commissioner Pernell to bring its super clean diesel to California to help reduce motor vehicle emissions. Commissioner Pernell, is initiating a program to refuel California's diesel school buses with Moss gas ultra-clean diesel. Commissioner Pernell explained that " California's children are most vulnerable to pollution caused by emissions from school buses, we should not have to wait for US industry to catch up when the technology and fuel is available today". Congressman Don Young pledged his support for ultra-clean diesel and will work to insure Alaska is part of the solution to reduce sulfur, hydrocarbon and NOx emissions from diesel fueled motor vehicles.



Aerial view of the 47,000 bb/d Mossgas GTL plant located at Mossel Bay, Republic of South Africa. (Note Indian Ocean in the background). Located in the heart of South Africa's "Gold Coast" - the Mossel Bay area is very similar to California's Santa Barbara area. The Mossgas plant is the only GTL plant in the world to operate under the guidelines of the new international environmental standards set forth in ISO 14001. Utilizing Mossgas experience and operating expertise, GTL plants can safely and economically operate in some of the most environmentally sensitive areas of the world such as Alaska's arctic regions.



Night time view of the Mossgas GTL plant. Mossgas has operated its natural gas supplied GTL since late 1991 supplying South Africa and the world with ultra clean products designed to reduce pollution and greenhouse gases



Design in the mid 1980's, brought on line in late 1991, the Mossgas plant was designed with Fischer-Tropsch (F-T) technology to provide motor gasoline (petrol) for South Africa's domestic market.

While gasoline was the desired end product in South Africa, diesel, (or as it is sometimes referred to as "white diesel") the cleanest diesel in the world, is the ultimate goal of the ANGTL project. Why clean diesel? The answer is because one of the largest source of air pollution in the US is from motor vehicles. California officials state that as much as 70% of the State's air pollution comes from just 2% of its vehicles – diesel fueled vehicles. F-T diesel is essentially sulfur free and therefore can provide significant reductions in diesel emissions. F-T diesel is compatible with the existing infrastructure and can be blended with regular diesel to reduce pollution. When run exclusively in engines that include catalytic converters similar to those found on gasoline engines, the resulting reductions in NOx, CO2, hydrocarbons and particulates is very significant. While F-T diesel from GTL plants can dramatically reduce pollution from motor vehicles, domestically produced Alaskan GTL's will also reduce US dependence on foreign crude, extend the operating life of the Trans-Alaskan oil pipeline and provide thousands of jobs for Americans. This option for Alaskan North Slope stranded natural gas has more positive benefits for the US environment and economy than any other.

A second important reason for looking at the Mossgas GTL plant is environmental. The Mossgas plant stands alone in the world today as the only GTL plant conforming with and operating under the international environmental standards set forth in the ISO 14001 guidelines, standards just now being adopted by North Slope operators. This is especially important in the fragile Arctic environment of Alaska's far north. It clearly shows that today's GTL plants can operate under some of the worlds most stringent environmental standards while creating the cleanest diesel fuels the world has ever seen.

The GTL process is really a three step process, Gas Reformation; the F-T process; and final product work up, similar to the refinery process. All three steps have been around for literally 50 years or more. The challenge is how you integrate them into one process. Mossgas is a leader in this area with the most successful gas based GTL plant in the world. The present senior management at Mossgas actually was responsible for the Sasol GTL plants in operation today. Mossgas or its people have designed, built and operated the majority of the GTL plants in the world today. This places Mossgas in an unique position and makes them the ideal candidate for technology advisor and operator for an Alaska GTL project.



The first, most expensive and some say the most demanding step is gas reformation. Natural gas is un-reactive and needs to have its molecules adjusted to prepare it for the middle step or Fischer-Tropsch process. The reformation process com-

combines natural gas (methane) with oxygen and steam under pressure to produce a synthetic gas. It is potential advances in this area that hold out the greatest reductions in the capital costs of the GTL process.



Once the molecular structure of the natural gas has been modified, the synthetic gas then travels to the second step – the Fischer-Tropsch or F-T process. In this process the synthetic gas is reacted with the catalyst to produce a wax like product. Depending upon the ultimate end product desired the temperature, pressure and type of catalyst are adjusted to produce the desired results. The high temperature, high pressure synthol reactors at Mossgas are designed to produce primarily gasoline. The new

generation slurry phase reactors, operating at lower temperatures and temperatures are designed to produce 80% or better diesel.

The final stage of the process is product work up. The process is similar to the refining process. While the towers and vessels may look the same or have the same technical name, the finished product is nothing like what you will see from a “black” oil refinery. Typical sulfur levels from a “black” oil refinery are in the 150 to 500 part per million range with aromatics running in the 30% range. Sulfur levels from the Mossgas produced F-T diesel are in the range of 1 part per million or less and the aromatics range around 1%.

While state of the art in 1990, advances in reactor design and catalyst technology by such GTL companies such as Mossgas, Sasol, Exxon and Rentech have dramatically reduced the size, capital costs and operating expense of a comparably sized GTL plant today. In fact, Mossgas states that with the new reactor design, the slurry phase reactor, it could replace all three synthol reactors at their plant with one slurry phase reactor smaller in size than just one synthol reactor. The slurry phase reactor also eliminates down time for catalyst regeneration, allowing for greater plant utilization and significantly lower operating costs. Just as advances in the reactors will continue to improve efficiencies, lower capital and operating costs so too will advances in gas reformation technology, such as the ceramic membrane technology sponsored by the DOE, potentially reduce costs of GTL plants.

The DOE hopes that their ceramic membranes will be commercial in the next 10 years potentially reducing the costs of a GTL plant by as much as 30%. Only time will tell but in the mean time Mossgas, Rentech and others will continue to refine the GTL process, improving the integration process, reformation technology, catalyst designs and thermal efficiencies of the overall process.

The ultra low values of the F-T diesel are the whole point of a GTL plant

CLEAN PRODUCTS FOR A CLEANER ENVIRONMENT.

**Mossgas Ultra Diesel The product quality is cetane = 52, sulphur < 5 ppm, aromatics < 0.5%,**

Automotive and truck manufactures claim that with these new fuels, diesel emissions can be cut to levels approaching present day automobiles. GTL produced diesel represents a major reduction in engine emissions. We have seen reductions in emissions from dirty fuels of 20 years ago. Further reductions in emission levels from current levels in California represent a difficult and expensive challenge for the refining industry. Alaskan produced GTL's offer a way to meet and exceed the new ultra low levels being proposed by the EPA that "black" oil refineries may never be able to achieve.



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