

Synthetic Future

USAF Pushes Ahead With Fuel Production Despite Price Drop

DefenseNews

By William Matthews

Published: 2 March 2009

After topping off at almost \$150 a barrel last July, oil now sells for less than \$40. But the price collapse hasn't altered U.S. Air Force plans to fly its jets on fuel made from coal, natural gas, even animal fat.

"We are still on track to complete certification of all aircraft to fly on synthetic fuels by 2011," Air Force spokesman Gary Strasburg said. And by 2016, the Air Force wants half of the jet fuel it uses in the United States to be synthetic.

That means about 400 million gallons of fuel made from coal, biomass, natural gas and other nonpetroleum sources. And that may be a problem.

At present, there are no U.S. plants producing enough synthetic fuel to meet more than a fraction of the Air Force needs. Several companies have plans to build plants for turning coal and biomass into synthetic fuel. But the plans were developed when high-priced oil made alternative fuels much more appealing, at least in terms of cost.

In January, the Air Force itself pulled the plug on plans to let a private company build a plant for turning coal into 25,000 barrels of jet fuel a day on federal property at Malmstrom Air Force Base, Mont.

The service declared plans for the plant "not viable," but cited security concerns, not cost, as the fatal flaw.

Still, the push toward synthetic fuel goes on.

"We have completely certified the B-52 and B-1" bombers and C-17 cargo planes to fly on synthetic fuel, Strasburg said. In addition, the Air Force has flown F-22 and F-16 fighters, B-2 bombers, KC-135 refueling tankers, C-5 cargo planes and T-38 trainers using a 50-50 mixture of synthetic fuel and standard JP8 military jet fuel.

For testing and certification purposes, the Pentagon's Defense Energy Support Center has been buying synthetic fuel from South African synfuel producer Sasol.

Ultimately, though, the Air Force wants domestic sources, Strasburg said. The intent is to boost national security by reducing dependence on imported oil.

Synthetic oil becomes competitive when petroleum costs about \$60 or \$70 a barrel, said Tim Edwards, a senior chemical engineer at the Air Force Research Laboratory's Propulsion Directorate.

OIL COST COULD SURGE AGAIN

Despite the relatively cheap price of oil today, pursuing synthetic fuel "is still a good idea," Edwards said. As long as the United States continues to import about 70 percent of the oil it burns, "there's no way to prevent oil from going to \$170 a barrel," he said.

The Air Force hopes its considerable appetite for oil provides the economic foundation for a U.S. synthetic oil industry.

Airlines are beginning to experiment with synthetic fuel, too. And the International Air Transport Association, which represents airlines around the world, has said it wants to replace a quarter of petroleum-based fuels with synthetics by 2025.

In January, the Air Force began buying fuel from Rentech, a Los Angeles-based synfuel company that claims to have the only working Fischer-Tropsch fuel plant in the United States.

For now, Rentech turns natural gas into jet fuel at a rate of 10 barrels - 420 gallons - a day at a plant in Colorado. But the company plans to build a plant in Mississippi that will eventually produce 30,000 barrels of synfuel a day from coal, petroleum coke and biomass. Rentech also plans to produce jet fuel from purely renewable feedstocks.

Rentech makes synfuel using the Fischer-Tropsch process. That involves heating the feedstock - coal, petroleum coke, wood, corn stalks or other biomass - to about 1600 degrees Fahrenheit until it turns to gas.

Various unwanted products in the gas, such as mercury, sulfur and others, are removed, leaving carbon monoxide and hydrogen. The carbon dioxide (CO₂) and hydrogen are fed into a reactor where a catalyst of iron particles suspended in liquid wax converts them into a form of synthetic fuel called wax.

The synthetic wax is then refined into jet fuel, diesel fuel and similar products using essentially the same process used for turning petroleum into those products.

The process produces a lot of carbon dioxide, and that is a major drawback.

Petroleum-based fuel produces about 27 pounds of CO₂ per gallon of fuel. Coal-based synthetic fuel produces about 50 pounds, according to the Natural Resources Defense Council.

Carbon dioxide is produced when the coal is turned into gas. More is created when the finished fuel is burned in an engine. CO2 is the most abundant of the greenhouse gases believed responsible for global warming, and the goal is to produce less of it, not more.

Concerned that liquid fuel made from coal would increase CO2 emissions, Congress passed a law in 2007 to make it illegal for the U.S. government to buy synthetic fuels that emit more greenhouse gases than do fuels already in use.

Rentech and other Fischer-Tropsch advocates offer at least two solutions to the CO2 problem.

CAPTURING CARBON

One is carbon sequestration. Instead of releasing CO2 into the atmosphere, it is captured and buried underground. Rentech proposes capturing CO2 and piping it to oil fields near the company's Mississippi plant. Pressurized CO2 would be pumped underground into partially depleted oil wells, where it would push unrecoverable oil into locations where it can be pumped out.

If the carbon dioxide can be captured and then injected into the ground, the fuel produced by the Fischer-Tropsch process can produce 11 percent to 23 percent less CO2 than standard jet fuel, said Julie Dawoodjee, Rentech's director of investor relations.

Another way to reduce CO2 emissions is to use biomass along with coal to produce liquid fuel.

Biomass is considered to be carbon-neutral. That's because when it grows, biomass takes carbon dioxide out of the atmosphere. When it is burned as fuel, it is simply returning what had been removed from the air by growing plants. It's often referred to as carbon recycling.

The U.S. Energy Department estimates there are 1.3 billion tons of biomass available annually - from plants, grain crops and wood residue to animal manure and garbage - that could be turned into liquid fuel.

And it's not just for airplanes, Edwards said. The Air Force plans eventually to use synthetic fuel to power trucks, generators and heaters, he said. ■

E-mail: bmatthews@defensenews.com.