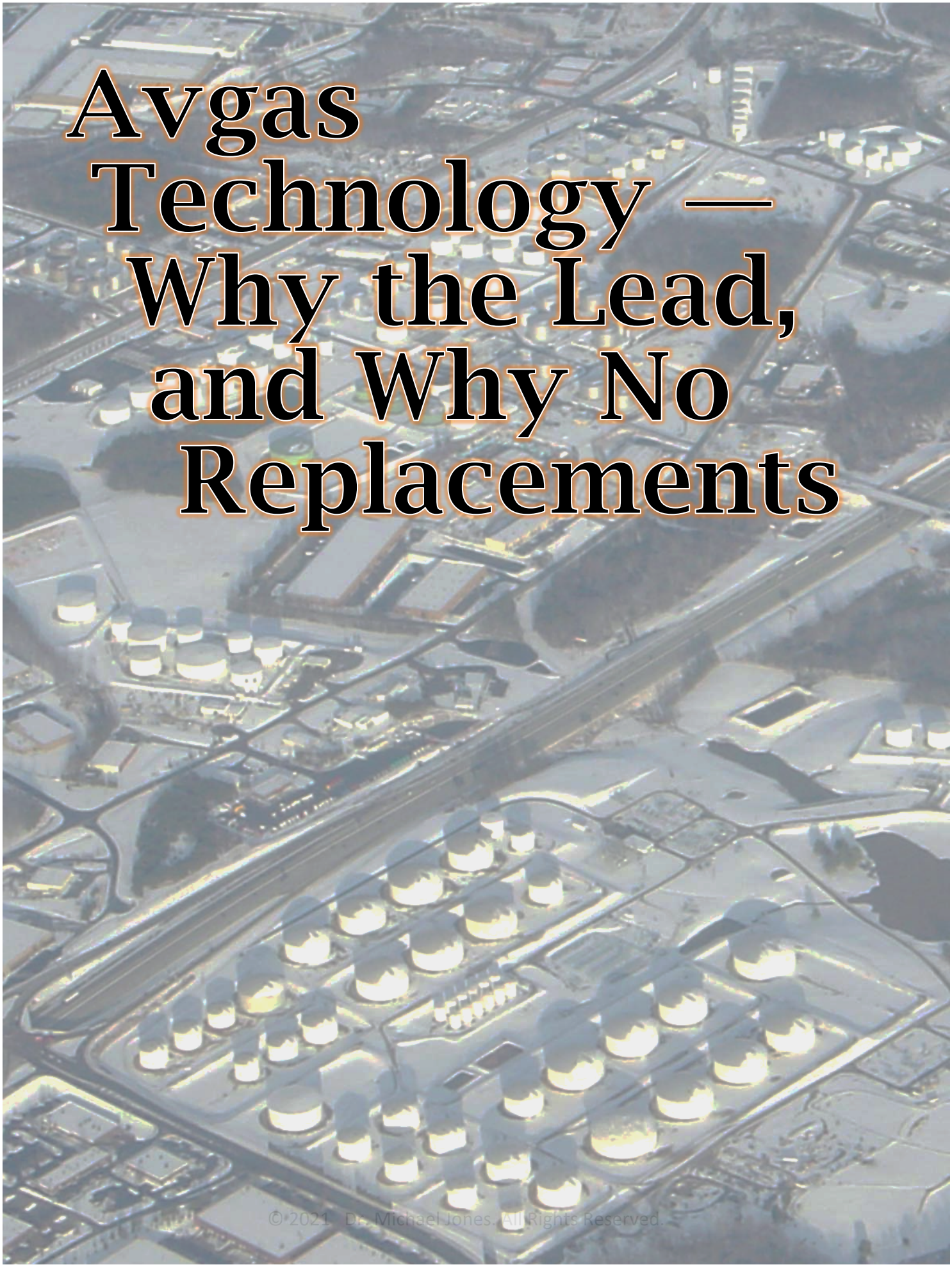

Avgas Technology — Why the Lead, and Why No Replacements

AvGas Technology: Why the Lead? Why No Replacements?

By Mike Jones

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In the midst of all the hangar-flying and reminiscing, Stallings spent a minute explaining the technology and economics of avgas. Delivering fifty gallons of 100LL to your Cessna isn't easy. There are approximately 167,000 aircraft in the United States that rely on 100 low lead avgas for safe operation, using about 180 million gallons of 100LL each year. Sounds huge, right? But Jet-A is by far more common, with about 60 million gallons used *each day* in the US. Because the avgas market is so small, it complicates the logistics of producing, moving and storing high-purity avgas in such a high-volume network.

Straight out of the ground, crude oil is a dark, sticky molasses of hydrocarbons that needs to be refined to be usable. The process of refining it is called "cracking." There are different cracking methodologies and different processes produce different proportions of finished products. Catalytic cracking produces a high yield of autogas, as an example, while hydrocracking produces more jet fuel, diesel, naphtha and propane. In this way refineries tailor their output to customer demand.

The general procedure is to "boil" the crude at 1,400˚F (760˚C). This actually shatters the heavy, low-value molecules into smaller, more useful products. The gaseous vapors (think "steam" but with oil) are inserted in an enormously tall machine called a "distillation column." The boiling vapors rise inside the column; the heaviest and hottest molecules linger at the bottom and lighter, more flammable molecules float at the top. As the gases cool they return to a liquid state and can be separated at different heights in the column, just like tapping syrup from a maple tree in the spring.

The author snapped this photo of the 73-tanks of the Colonial Pipeline tank far in Greensboro, NC one winter day a couple of years ago. This node on the huge Colonial network moves about 18% of all the petroleum products used in the US on any given day safely and quickly. The small size of the market for avgas means it cannot use any of these efficiencies.

Once you've got the avgas, the problems aren't over. There are three problems with avgas chemistry: the demand is small, it's hard to transport, and the lead (tetraethyl lead) which protects our engines is an environmental pollutant. Companies simply don't want tetraethyl lead in their pipelines.

Consider the 73 storage tanks on the 320-acre Colonial Pipeline tank farm in Greensboro, NC. Colonial delivers 83 million gallons of gasoline, diesel fuel, home heating oil, and jet fuel *each day* through Greensboro, which is about 18% of all the petroleum consumed in the United States. The pipeline itself is 5,519-miles long, running from Louisiana to New York. Competing pipelines are operated by Plantation, with 3,000 miles of network, and Williams with a 10,500- mile network.

"You remember that Colonial Pipeline? Jet fuel goes in that pipeline, straight to the big airports. Plus autogas, and diesel and heating oil; there are pipelines all across the country for the big-volume products," Stallings explained. "But the demand for avgas is so small, it can't be shipped by pipeline. It's just not feasible. Plus, nobody wants lead in their pipelines; it would contaminate the other products. There's been no lead in US pipelines for 25 years."

Without economies of scale, moving avgas is more expensive than regular fuels. 100LL is shipped by rail or barge from refineries in Louisiana close to the oil fields. It gets off-loaded into the smallest tanks in the giant regional storage terminals. Eighteen-wheel tanker trailers bring it to airports where it is stored in smaller "fuel farms" until needed but, because of the purity required by avgas, those eighteen-wheel tankers need to be dedicated to avgas or Jet-A; they can't be mixed with other petroleum products. Another complexity, in these COVID days, is the scarcity of long-haul truck drivers; many are making over a hundred thousand dollars a year. All of these costs add up.

Titan airports are provided specialized fuel trucks, carrying the Titan logo, which bring the fuel out to the individual airplanes. Each truck costs close to $300,000 and only lasts a decade or so. "They don't get a lot of miles on them," Stallings explains, "but they get thousands of hours on the seats, the engine, pumps and filters. Eventually everything just wears out."

"You don't get any of the efficiencies with avgas," Stallings summarized. "All that handling just costs a lot more than pumping it through a pipeline."

About the Author

Having survived two thunderstorms at Oshkosh 2021, plus helping to prepare scrambled eggs and grits for 200 Cessna flyers at the Cessna Base Camp, and a wild night of Mexican margaritas with two crazy Canadian pilots, Jonesy is excited about the way the airshows and the G.A. industry are bouncing back from the pandemic. He is a 3,000 hour flyer with more than thirty types of airplanes in his logbook. He's been writing for this magazine for nearly a decade, flown 800 Young Eagle missions, and put 4,000 hours in his logbook. He's always accessible at PilotMike2012@gmail.com.