



HOLC: A Bigger Future for Ethanol?

5 Billion Reasons Why You Should Care About High Octane Low Carbon Fuel

Ethanol usage could increase by 5 billion gallons or more.
Five billion gallons of ethanol takes about 1.8 billion bushels of corn,
roughly equivalent to the 2019 corn carryout.

Corn-based ethanol is the lowest cost,
highest quality, non-toxic source of octane
available in the world.

Ethanol's carbon footprint is 50–80% smaller
than gasoline and shrinking, while gasoline's
carbon footprint purportedly is growing.

While demand is down for both corn and ethanol, the Kansas Corn Commission is investing checkoff dollars to take on the demand side of the profitability equation with innovative approaches, supporting efforts to design High Octane Low Carbon (HOLC) fuel, a future fuel to power future vehicles designed with high compression engines to improve efficiencies and reduce harmful greenhouse gas (GHG) tailpipe emissions that contribute to climate change.

Internal combustion engines are more efficient and cleaner than ever, yet the transportation sector is still responsible for 27 percent of GHG emissions, with half of all transportation emissions coming from light-duty passenger vehicles, like the ones we all drive every day. The Energy Information Administration predicts the internal combustion engine will be the dominant engine for the next several decades, making both fuel and engine efficiency critical pieces in reducing the GHG intensity of the transportation sector.

Corn Ethanol as Octane

By increasing the compression ratios of engines and optimizing them to run on HOLC fuels, automobile manufacturers can increase vehicle efficiency and reduce emissions. That needed octane should come from corn-based ethanol—the best and most cost-effective octane available. The U.S. Department of Energy's national labs have confirmed that these new engines operating on mid-level blend ethanol fuels could achieve, depending on the octane level, 5-10 percent improvement in vehicle efficiency with even larger reductions in greenhouse gas emissions. The introduction of HOLC liquid transportation fuels into North America will expand ethanol markets for Kansas corn farmers.

5 billion gallons of ethanol

Analyses show that with a 50 percent adoption rate of E25 in new vehicles with high compression engines, ethanol usage in 2030 and beyond could increase as much as 5 billion gallons or more. Five billion gallons of ethanol would create a market for about 1.8 billion bushels of corn.

Researchers from Argonne National Laboratory, the National Renewable Energy Laboratory and Oak Ridge National Lab have been conducting coordinated studies to address the opportunities and challenges of deploying high octane fuels with mid-level ethanol blends to the passenger vehicle fleet. They are finding that fuels that blend between 20 and 40 percent ethanol (E20 to E40), instead of the current 10 percent ethanol blend (E10), can lead to greater fuel efficiencies and lower overall GHG emissions in vehicles. Additionally, the introduction of this high-octane mid-level ethanol fuel could provide an optimized fuel source for the more efficient internal combustion engines being developed by carmakers.

HIGH OCTANE

Octane is the number you see at a gas pump, most frequently indicated by a yellow label with the numbers 87, 88, 89, or 91 AKI. HOLC fuel would be in the 98 to 100 RON octane rating. (See octane definitions below)

Higher engine compression leads to increased fuel economy. The higher the octane number, the higher the compression a fuel can withstand without pre-igniting, or knocking, in an engine's cylinder. Knocking causes severe engine damage. Fuel blends like E20 or E40 could deliver the same, or better, fuel economy as regular gasoline when paired with an optimized engine, but with less energy expended per mile and fewer emissions.

Corn-based ethanol is the lowest cost, highest quality, non-toxic source of octane available in the world. Working with other state and national organizations, Kansas Corn is doing the legwork to make sure corn ethanol-based octane in liquid fuel remains in the discussion. We are proving that our corn fields are growing octane for the fuels and vehicles of the future.

OCTANE DEFINITIONS

- **RON** Research Octane Number — Low Load Knock Resistance (highway driving); posted on pumps in most of the world.
- **MON** Motor Octane Number — High Load Knock Resistance (acceleration, hauling)
- **AKI** Anti-Knock Index (RON+MON/2) — Octane rating posted on pumps in North America

LOW CARBON

Studies by key automakers suggest high octane 30 percent ethanol fuel (E30) would allow them to boost both fuel efficiency and reduce tailpipe carbon emissions from non-renewable sources by 7 percent.

In its 2010 fuel "life cycle" analysis, EPA recognized that carbon emitted from the combustion of ethanol is the same carbon that the corn plant absorbed from the atmosphere as it grew.

Unlike gasoline tailpipe emissions, ethanol tailpipe emissions do not alter the carbon cycle and thus do not endanger public health or welfare, treating these emissions differently makes sense under clean air rules.

USDA studies confirm that high-yield corn acres sequester or trap far more atmospheric carbon than previously believed. New data suggests that corn ethanol's carbon "footprint" is 50-80% smaller than gasoline and shrinking, while gasoline's carbon footprint purportedly is growing.