Ethanol is the Best High Octane Fuel for Vehicle GHG Standards

On April 2, EPA issued its final determination on the appropriateness of vehicle emissions standards, effectively triggering a new process to revise the standards for automakers. This process could be an opportunity for high octane fuel to play a role in helping automakers reduce GHG emissions from automobiles. In August, EPA and Department of Transportation's National Highway Traffic Safety Administration (NHTSA) announced proposed amendments to current fuel economy and missions standards in its Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks, which included seeking comments on the "ideal octane level," the "benefits of increasing fuel octane," and specifically how higher octane fuel can play a role in "engine technologies and product offerings" and "improvements to fuel economy and CO_2 reductions." ACE submitted comments in October, and a final rule is expected spring 2019.

ACE members are encouraged that EPA has sought information on the "impact of GHG standards on advanced fuels technology, including…the potential for high-octane blends."[1] We believe EPA should take steps to unlock the octane, efficiency, and environmental advantages of high octane fuel from ethanol.

With a blending octane rating of 113, American-made ethanol is the lowest-cost source of fuel octane on the planet, and with rising gasoline prices over the past year, adding ethanol would help bring down the cost of a new premium fuel. What's more, comparative research by the Department of Energy to find the most promising fuel to help automakers comply with future GHG standards shows ethanol ranks the highest.[2]

To be more exact, high octane fuel comprised of 25 to 30 percent (98 to 100 RON) ethanol is a cost-effective, low-carbon solution to successful implementation of the standards. Some oil refiners are in support of a transition to a new 95 RON (91 AKI) fuel approximate to today's premium (91-93 AKI) fuel. As we understand this concept, it would limit ethanol's contribution to just 10 percent by volume, falling short of the need to reduce tailpipe emissions and save consumers money at the pump. Increasing octane should not come at the expense of air quality, carbon emissions, or human health. According to both the EIA and AAA, premium gasoline today costs on average 50 cents per gallon more than regular unleaded.[3][4] It is foolish to move forward on a new high octane fuel which will impose these costs on American consumers by limiting ethanol's contribution.

Discussion draft legislation was made public by Representatives John Shimkus of Illinois and Bill Flores of Texas in November, drawing attention to why higher octane fuel is needed but fails to chart a sufficient course for how to get there. The draft proposes requiring automakers to warranty their vehicles to operate on a minimum 95 RON fuel (about the same as today's premium) in exchange for effective repeal of the RFS. This will not improve fuel quality by increasing ethanol use, rather, it is a mechanism to undo the competition-forcing core of the RFS and limit ethanol use to current volumes. In fact, while the legislative draft implies support for E20 blends, a recent study commissioned by the Energy Information Agency (EIA) concluded refiners could easily meet a 95 RON standard using just 10 percent ethanol.

Ethanol is already improving air quality and helping refiners boost the octane of finished fuel. Rather than modifying their operations to produce expensive octane from petroleum, most refiners make a sub-octane gasoline blendstock (84 AKI) and add 10 percent ethanol to make an 87-AKI finished fuel. Adding ethanol to boost octane saves them money and cuts back on refinery emissions.

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[1] Request for Comment on Reconsideration of the Final Determination of the Mid Term Evaluation of Greenhouse Gas Standards of 2022-2025 MY Vehicles. https://www.gpo.gov/fdsys/pkg/FR-2017-08-21/pdf/2017-17419.pdf

[2] https://transportationtodaynews.com/news/8229-ethanol-based-fuels-good-fuel-economy-environment/

[3] https://www.eia.gov/todayinenergy/detail.php?id=31732

[4] https://gasprices.aaa.com/state-gas-price-averages/

Just as refiners have optimized to benefit from ethanol's octane value, automakers want to take advantage of how 25 to 30 percent ethanol can help them realize efficiency gains from technologies such as turbochargers and higher compression ratios in engines which recommend or require the use of high octane fuel.

Since 2011, the Auto Alliance has been asking EPA to increase the octane rating of fuel: "…we also recommend increasing the minimum market gasoline octane rating, commensurate with increased use of ethanol. Adding ethanol to gasoline increases its octane rating. To attain necessary octane levels, it is important that refiners not be permitted to reduce base gasoline octane ratings in light of the additional octane contribution from higher ethanol."[5]

Experts from the Department of Energy and Original Engine Manufacturers (OEMs) who study the relationship of fuels and engines believe high ethanol blends offer the most octane benefits.

In July 2016, three scientific laboratories operated by the Department of Energy released the Summary of High-Octane, Mid-level Ethanol Blends Study.[6] "The results of this study show that mid-level ethanol blends (E25-E40) could offer significant benefits for the United States. These benefits include an improvement in fuel efficiency in vehicles designed and dedicated to use the increased octane. The improved efficiency of 5-10% could offset the lower energy density of the increased ethanol content, resulting in volumetric fuel economy parity of E25-E40 blends with E10. Analysis of the market reveals that the automotive OEMs, consumers, fuel retailers, and ethanol producers all stand to benefit to varying degrees as high-octane fuel increases its market share."

According to a study by J.E. Anderson of Ford Motor Corporation, "The high-octane rating of ethanol could be used in a mid-level ethanol blend to increase the minimum RON of regular grade gasoline. We estimate that large increases (4 to 7 points) in the RON of U.S. gasoline are possible by blending in an additional 10 to 20 percent by volume ethanol above the 10 percent ethanol already present."[7]

BMW already recommends the use of E25 (98-99 RON) in some models of the MINI Cooper and other vehicles. BMW took this action in response to fuel economy requirements and says, "it is MINI's intention that all new models will be E25 compatible."[8]

Below are recommendations ACE encourages EPA to take during its final rulemaking to enable high octane fuel to play a role in helping automakers meet the 2021-2026 standards:

1. Establish a minimum octane standard for fuel in the range of 98-100 RON with 25-30 percent ethanol and provide automakers a corresponding certification fuel so they can test engines on high octane fuel.
2. In setting the new minimum octane rating, phase out 85 Anti-Knock Index (AKI) fuel used in some Mountain states; no automaker recommends the use of the substandard low octane fuel in their engines.
3. Restore CAFE-GHG compliance credits for Flexible Fuel Vehicles (FFVs) and consider a new incentive for engines designed to achieve optimal efficiency on high octane fuel.
4. Adopt the latest GREET model assessment of the lifecycle GHG emissions of corn ethanol.

[5] Letter from Mitch Bainwol, Alliance of Automobile Manufacturers, to The Honorable Lisa Jackson, EPA Administrator. October 6, 2011. (attachment A) https://www.regulations.gov/document?D=EPA-HQ-OAR-2010-0799-9574

[6] Summary of High-Octane, Mid-level Ethanol Blends Study. July 2016. ORNL, NREL, ANL. U.S. Department of Energy. http://info.ornl.gov/sites/publications/files/Pub61169.pdf

[7] "High octane number ethanol-gasoline blends: Quantifying the potential benefits in the U.S." Anderson, J.E. et al, Ford Motor Company. July 2012. http://www.sciencedirect.com/science/article/pii/S0016236112002268

[8] "MINI Cooper Shares E25 Know-How with BMW," Canadian Report on Fuel Ethanol, Vol. 6, No. 5, September 14, 2016.