A Clean Source for Octane

Octane continues to be in high demand, and ethanol is a clean, affordable source. To meet corporate average fuel economy requirements and consumer preferences, automakers are increasingly using turbocharged, higher-compression engines in which the use of high-octane gasoline is recommended or required. As a result, premium gasoline sales in the United States has been strong over the last five years.

This higher demand has driven up the price spread between premium and regular gasoline. In 2019, premium gasoline was 16 percent more expensive than regular gasoline in the wholesale market and a lofty 29 percent more expensive at retail – reaching the highest levels in at least two decades.

However, ethanol is helping to hold down the cost of both regular and premium gasoline. According to a study by Dr. Philip K. Verleger, Jr., consumers saved an average of 22 cents per gallon from 2015 through 2018 as a result of the use of ethanol.

Moreover, ethanol has the highest octane-blending value of any major source of octane while having among the lowest market prices. Ethanol has a blending octane rating of 114, which is higher than the ratings of the main petroleum-based components. In 2019, ethanol traded at the largest discount to its blending value, as its market price remained subdued while the prices of other components rebounded. As a result, ethanol retained the title of being the most competitive source of octane in the world.

At the same time, supplies of petroleum-based components have become constrained as a result of the increasing availability of lighter shale oils, the configuration of refineries, and restrictions on the sulfur content in fuel. Additionally, aromatic hydrocarbons such as benzene are toxic and worsen air pollution.

Source: Argus Media

Source: RFA based on U.S. Energy Information Administration data
Refiners have optimized operations to reduce hydrocarbon octane production in order to take advantage of ethanol’s properties. Today, most regular gasoline in the United States is produced using blendstock with an octane rating of 84, which is then upgraded to a rating of 87 by adding 10 percent ethanol. This allows refiners to increase their throughput of hydrocarbon blendstock at a lower cost.

A recent analysis by Baker & O’Brien, Inc. for the U.S. Energy Information Administration researched prices at the distribution terminal, where ethanol is blended, and “failed to find any significant change since 2010 to account for the increasing regular-to-premium retail gasoline price spread.”

A key development in 2019 was the Trump administration’s issuance of a rule allowing E15 (gasoline containing 15 percent ethanol) to be sold year-round throughout the country. E15 sales volumes increased in response, as restrictions on offering E15 in the summertime were lifted and as the number of retail stations carrying the fuel expanded. E15 sold at retail typically has an octane rating of 88, giving consumers an added boost at a lower cost.

The demand for octane looks set to continue to grow. It is being driven in the United States by the use of advanced vehicle engines, tighter gasoline specifications, and the expansion of E15—and could be propelled further by the need for midlevel ethanol blends (e.g., E25-E30) to meet future fuel economy and emissions standards.

A fuel’s octane rating is the measure of its ability to resist “knocking” in the engine, which is caused when the air/fuel mixture detonates prematurely during combustion. According to the U.S. Department of Energy, “Using a lower octane fuel than required can cause the engine to run poorly and can damage the engine and emissions control system over time. It may also void your warranty.”