Refining 101: Summer Gasoline

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Just what is summer gasoline? Twice a year, in the fall and in the spring, you hear about the seasonal gasoline transition. However, most people probably don't understand what this actually means. AAA has provided a Top 10 list explaining the seasonal rise in gasoline prices, and summer gasoline checked in at #7:

> 7. The summer blend switchover. This transition from winter-blend to summer-blend fuel, a concoction that causes less smog, occurs every spring. It causes a dip in gasoline supplies as refineries in the U.S. shut down temporarily to retool their production facilities.

That's only partially correct, and is probably the extent of most people's understanding of this transition. But given that I am very keen that people should understand the energy industry, it is worth a review, and a layman's explanation. I explained the details behind this transition in Refining 101: Winter Gasoline. But let's review some concepts.

There are two key (although not the only) specifications that refiners must meet for gasoline. The gasoline needs to have the proper octane, and it needs to have the proper Reid vapor pressure (RVP). While the octane of a particular grade is constant throughout the year, the RVP spec changes with the seasons.

The RVP is based on a test that measures vapor pressure of the gasoline blend at 100 degrees F. Normal atmospheric pressure varies, but is usually around 14.7 lbs per square inch (psi). Atmospheric pressure is caused by the weight of the air over our heads. If a liquid has a vapor pressure of greater than normal atmospheric pressure, that liquid boils. For example, when you heat a pan of water, the vapor pressure increases until it reaches atmospheric pressure. At that point, the water begins to boil.

In the summer, when temperatures can exceed 100 degrees F in many locations, it is important that the RVP of gasoline is well below 14.7. Otherwise, it can pressure up your gas tanks and gas cans, and it can boil in open containers. Gas that is vaporized ends up in the atmosphere, and contributes to air pollution. Therefore, the EPA has declared that summer gasoline blends may not exceed 7.8 psi in some locations, and 9.0 psi in others. The particulars vary, but key considerations are the altitude and motor vehicle density of a specific location. The EIA

summarizes the key points:

> As gasoline evaporates, volatile organic compounds (VOC's) enter the atmosphere and contribute to ozone formation. Gasoline's propensity to evaporate is measured by Reid vapor pressure (RVP). In order to control VOC emissions, the Federal Clean Air Act Amendments of 1990 require that all gasoline be limited to an RVP maximum of 9.0 psi during the summer high ozone season, which the Environmental Protection Agency (EPA) established as running from June 1 to September 15. The Act also authorized the EPA to set more stringent standards for nonattainment areas. As a result, EPA limits areas designated as "high volatility non-attainment" to a maximum RVP of 7.8 psi during the high ozone season. Some States elected to require even more stringent restrictions to achieve local clean air goals, and require 7.2- and 7.0-psi gasolines.

Butane, which has an RVP of 52 psi, can be blended into gasoline in higher proportions in the winter because the vapor pressure allowance is higher. There are 2 advantages in doing this. First, butane is a cheaper blending component than most of the other ingredients. That makes fall and winter gasoline cheaper to produce. But butane is also abundant, so that means that gasoline supplies increase in the winter because more butane is thrown into the mix. Not only that, but this all takes place after summer driving season, when demand typically falls off. These factors normally combine each year to reduce gasoline prices in the fall (even in non-election years). The RVP is stepped back down to summer levels starting in the spring, and this usually causes prices to increase.

There are some misconceptions that I often seen repeated about this seasonal transition. One is that it is the reason that spring and fall maintenance are done. That is not the case. Most, if not all refineries can carry out this transition without shutting down or interrupting production. The reason that maintenance is done in the spring and fall is that it provides a combination of moderate weather (the inside of a vessel can be unbearable in the summer) and off-peak demand. Vessels must be inspected, new equipment must be installed, catalyst change-outs occur, etc. This is similar to tuning up your car to keep it in proper running condition. But the seasonal maintenance is unrelated to the gasoline transition. In fact, for reasons I won't get into here, seasonal maintenance often complicates the transition.

Another misconception that some have is that they can save money by buying cheap gas in the winter and storing it for the summer. Remember that winter gasoline will pressure up as the weather heats up, and the contained butane will start to vaporize out of the mix. You will end up with less gasoline than you paid for, and you will be contributing to the air pollution problem that summer gasoline was designed to avoid. If, on the other hand, you were to buy summer gasoline and try to store it until winter, you might find yourself having problems getting the fuel to ignite, due to the lower vapor pressure. This would be like putting a little bit of diesel in your gasoline – not very good for your car. So buy and use gasoline in the correct season.

The Politics of Ethanol Blending

I should also mention a bit about ethanol blending. The blending of ethanol into the gasoline pool has been controversial because (among other things) it increases the vapor pressure of gasoline blends. This has resulted in the need for a 1 psi waiver for ethanol-containing fuels. From the previously linked EIA report:

> As a part of the Clean Air Act Amendments, conventional gasoline containing 10 percent

> ethanol was allowed to exceed the Federal RVP maximums by 1 psi.

This of course means that ethanol will exacerbate smog at certain times of the year, and has resulted in a campaign by Senator Diane Feinstein to limit ethanol blending in California:

> California contends its refineries can make clean-burning gasoline without oxygenates such as ethanol or MTBE. In fact, California's Sen. Diane Feinstein contends ethanol's volatility may be the cause for increasing smog levels in Southern California since the waiver was denied and more ethanol was added to the state's gasoline supply.
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> Recently, Feinstein asked the EPA and the California Air Resources Board to investigate the impact of ethanol-blended gasoline on California's air quality.
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> She said air quality in the South Coast Air Quality Management Zone has gotten worse this year compared to last and "the switch to ethanol-blended gasoline is considered one of the main culprits in increased ozone."
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> "Since ethanol's volatility increases smog, particularly in the summer, I believe we need to look carefully at its impact on air quality," said the senator.

However, it looks like she is losing this battle for political reasons:

> In the face-off between California and Corn Belt states over ethanol, California lost again this month. Federal officials concede that the corn-based fuel additive can increase smog and soot pollution from vehicles. But in a ruling shocking in its disregard for public health, the U.S. Environmental Protection Agency refused for a second time to scrap the rule requiring California to blend ethanol in its gasoline.
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> The EPA conceded that California air quality officials are right about ethanol's polluting effect in summer. Nonetheless, in its tortured ruling, the federal agency said California had not "clearly demonstrated" that the ethanol requirement would delay or interfere with the state's ability to meet federal clean air standards. Incredibly, the ruling said that even if California had demonstrated that the ethanol rule prevented the state from meeting clean air standards, the EPA "would deny the waiver." Why? "This reduction in the use of ethanol would undermine the potential benefits vis a vis energy security and support for rural and agricultural economy that Congress expected" from its ethanol rule.
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> The EPA ruling's effect is to increase payouts to one special interest, Midwest corn producers. For that California endures higher gasoline prices and dirtier air.
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> California cannot afford to let this assault on public health, fairness and common sense stand. U.S. Sen. Dianne Feinstein, D-Calif., has persuaded the Senate Energy Committee to add a clause to a pending energy bill that would exempt California from the ethanol rule during summer months. All the state's elected officials should join her in that fight.

All energy issues seem to be completely entangled with politics, and the sad fact is that the politics often trump the science. Ethanol blending is a perfect example where we are willing to exempt

certain pollution issues "for the greater good."

Conclusion

Hopefully that was an easy-to-understand explanation of the seasonal gasoline transition in the U.S. The purpose of the transition is to curb pollution, but as the last section demonstrates the politics often interfere with the original intent. Now the next time you hear "season gasoline transition", you will know exactly what they are talking about and what the expected impact on supply and price will be.