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Fuel Data...what can it tell you?

If you have been a follower of this newsletter over the past 9 1/2 years you already know that I log fuel data throughout the year as a part of my vehicle preventative maintenance plan. Not only will this provide me with an early indiction of looming issues but it can also provide information on the quality of gasoline and driving style changes. Over the next three months, I will be taking a look at the fuel data for three vehicles; 2019 Jeep Compass, 2008 Hyundai Elantra, and 2001 Ford F150. These three, regularly driven, vehicles span three different automobile manufacturers and account for three different types of driving environments. Analysis of gasoline data for these three vehicles should help form some generalizations about fuel economy as it relates to similar vehicles and driving environments.

This month we will be taking a look at the 2019 Jeep Compass. This vehicle has a 2.4 Liter, Multi-Air, 4 cylinder engine. We purchased this vehicle new in April 2019 with 172 miles on the odometer.

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2019 Jeep Compass, 2.4L Multi-Air Engine

What's Inside This Issue?

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I first talked about the purchase of this vehicle in June 2019 - Issue 94. Specifically, I discussed the purchase as well as my switching the oil to Amsoil Signature Series 0W-20 after the initial break-in cycle had ended at 500 miles.

Again, I spoke about this vehicle in July 2019 - Issue 95. At the time, I used the data collected during the break-in cycle, running on OEM oil, and compared it to the data collected after having changed the oil over to Amsoil Signature Series 0W-20. It was determined that under similar driving conditions the fuel economy rose from an average of 22.9 mpg (on the OEM oil) to 24.4 mpg (using Amsoil), an increase of 1.5 mpg. It was clear that increased lubricity equals increased fuel economy. Comparatively, running low-grade, sub-standard oil reduces the lubricity and increase friction which causes a diminishing of fuel economy.

After having collected an additional 18 months of data we can assess how the vehicle is performing and if it is still maintaining the fuel economy as per the manufacturer specifications.

The chart at the bottom identifies the key data points over the previous two yeas. Upon initial glance, there appears to be a slight concern with the fuel economy diminishing from 24.22 mpg to 22.41 mpg. Initially I spoke about switching to Amsoil and seeing my gas mileage increase from 22.9 mpg to 24.4 mpg. Based upon the raw data, that increase has reverted back to the OEM oil numbers. However, raw data only tell one side of the story. More to come on that in a bit.

The manufacturer's window sticker identifies fuel economy for city driving as 22 mpg and highway driving as 30 mpg. During the first year of ownership we drove this vehicle to South Padre Island, TX. It was during this trip that we achieved a maximum fuel economy calculation of 29.45 mpg. This was, of course, when the vehicle was loaded with 750 pounds of people and cargo. Due to the COVID situation this past year, we did not take the vehicle on any road trips beyond a couple trips from Omaha to Lincoln, Nebraska. During these trips we spend about 35 minutes on the Interstate. The 2020 Average Miles Per Gallon (located in yellow) at the bottom of the page reflect about 95% city driven miles, whereas the 2019 values include a 2500 mile road trip consisting of 18 continuous hours of highway driving. As noted previously, in Issue 95, fuel economy during this trip averaged 27.5 mpg.

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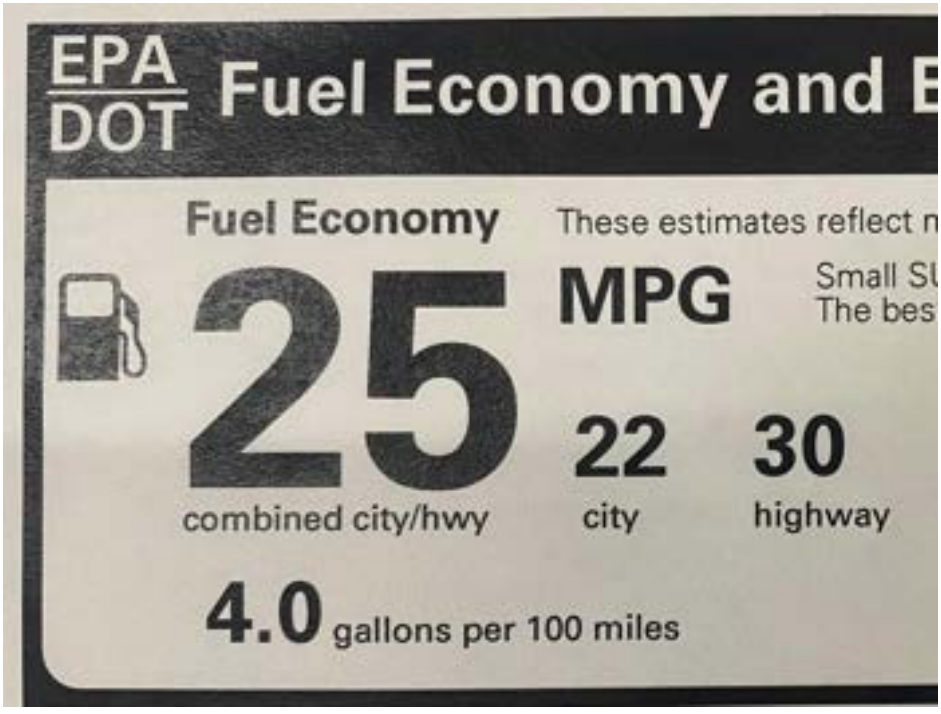

Year	Total Mileage Traveled	Average Tripmeter	Average Cost Per Gallon	Total Spent on Gasoline	Average Miles Per Gallon
2019	7279	214.10	$2.33	$703.62	24.22
2020	5441	216.39	$1.83	$459.29	22.41

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It is evident that the extensive road trip improved the overall fuel economy when averaged throughout the year. However, not taking into account the road trip, the 2020 average miles per gallon was still well below the initial data that was collected after the break-in cycle and before the trip to Padre Island.

The other variable that was changed between these two calculations was the functionality of the start-stop system. The start-stop system automatically shuts down and restart the engine to reduce the amount of time the engine spends idling, thereby reducing fuel consumption and emissions. This is a feature that is incorporated on many vehicles nowadays which allows the vehicle manufacturers to 'cheat' on the CAFE requirements.

In our 2019 Jeep Compass, the start-stop system is installed. This system worked flawlessly for about 8 months. Thereafter, I noticed that the engine would not shut off at stop lights every once in a while. Over the next 4 months, the system worked less and less until it eventually never shut off the engine. Right about February of 2020 was when it was evident that the system had completely malfunctioned.

I scheduled an appointment with the Dealership in June 2020 and brought the vehicle in to have it looked at. It was determined by the mechanic that the start-stop battery was not charging. With these systems, there is a second, smaller battery and a modified starting system, all controlled by a computer, based upon predefined variables within the system. The mechanic informed me that there was a malfunction with the intelligent sensor that is connected to the start-stop battery which tells the computer the current state of charge on the battery. I said "Great! So you replaced the sensor." For which he responded by telling me that he did not replace sensor because when he hooked his computer up to the computer

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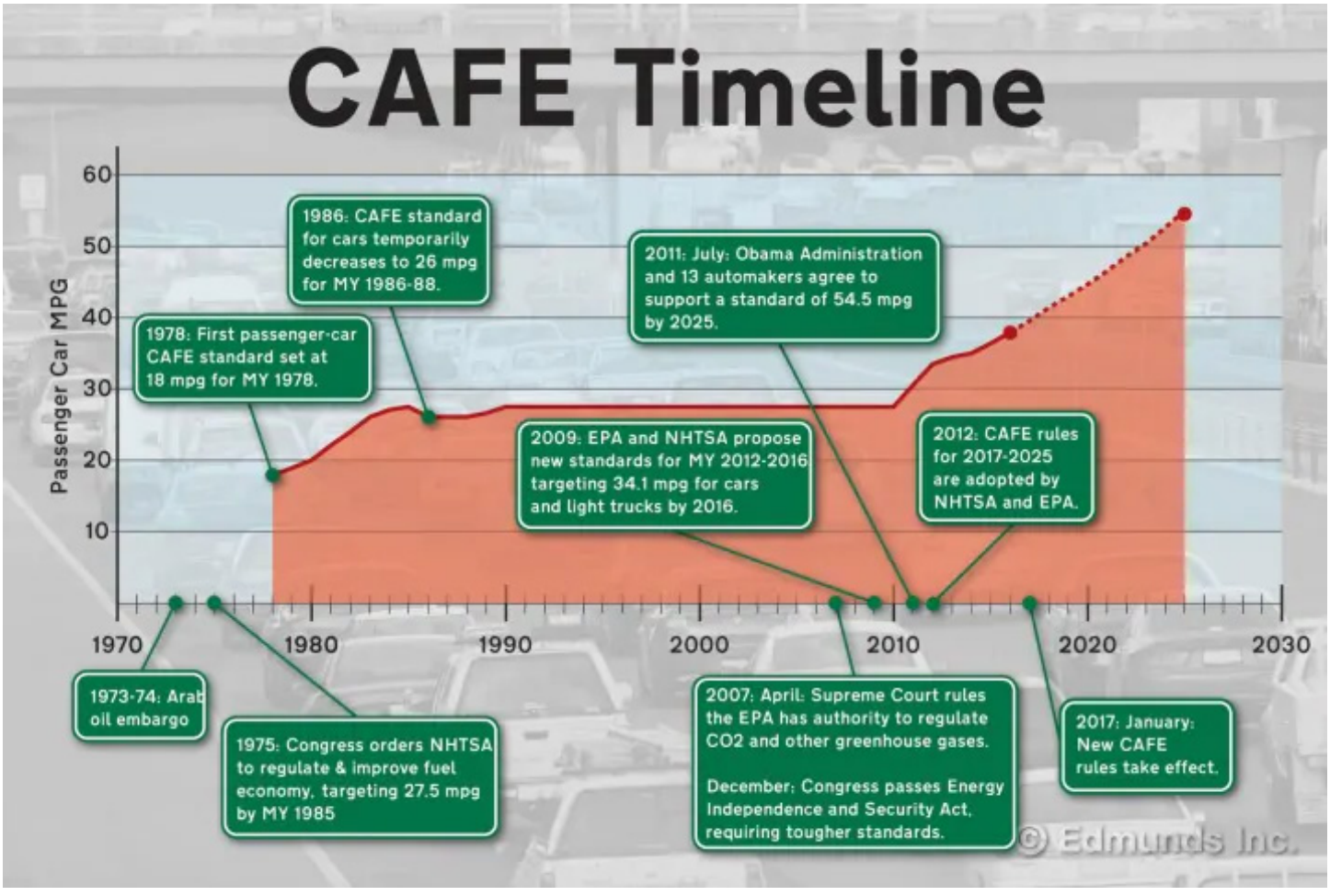

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on my vehicle, his computer did not say that there was a malfunction at the exact moment he hooked the computers together, and thus he cannot replace the part because the computer didn't say he could replace the part.

I said, "But you just told me that the part had malfunctioned and is possibly faulty. So isn't this just going to happen again?"

He proceeded to tell me that he basically reset the computer and the car will magically fix itself within 6 weeks. I was very skeptical but had no other option than to leave the dealership.

Over the course of the next 3 weeks the start-stop system slowly started working...sometimes. I think there was one day at about the 3 week mark when it actually worked all day. After the 3 week mark it began to slowly quit working to the point where it completely stopped working by about week 6.

During that time frame I did some further research into the start-stop system. In general, the hardest thing for an engine is the initial startup. Much of the oil has dripped off of the internal parts and starting the engine causes the moving parts to run "dry" for an extremely short period of time, until the oil begins flowing. Additionally, after talking with the dealership mechanics, there is not enough research into the start-stop systems to determine the life of the start-stop battery or starter. Furthermore, the start/stop battery itself costs about $150. So the hypothetical question now is, "Will I save more than $150 dollars in fuel over the life of the start/stop battery?"

Thus, I concluded that although the start-stop system is a neat and innovative idea, in practice it has some faults. For my vehicle, since it is inoperable and the dealership claims that magic will fix it, I am not concerned with leaving the system in its current state.

How does this information play into fuel economy for my 2019 Jeep Compass? During the 2019 calendar year, the start-stop system was mostly functional and we took a long road trip. Both contributed to elevated mpg. During the 2020 calendar year, we did not take a road trip and the start-stop function was not functioning 95% of the year.

I then asked myself, "Does the Start/Stop system really make a difference? I compiled all of my fuel data since April 2019 and created a graph (seen on the next page). There were several interesting things that I found.

First off, let me explain a few things on the chart. Each data point on the blue spiky line signifies a trip to the gas station to fill up the vehicle and each data point corresponds with the average miles per gallon attained since the previous fill-up at the gas station. The red, dashed curvy line signifies a general trend over the course of the last 22 months or so. Additionally, I have highlighted several important areas that I will provide a little extra explanation about.

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By following the red dashed line from April 2019 through April 2020, the general trend is that the fuel economy is diminishing from a high of 25.5 mpg to a low of 21.5 mpg. The start/stop system had completed stopped working around February 2020. Highlighted in green is when I took the vehicle in to the dealership to have it repaired. You will notice that the trend in increasing both before and after the system was allegedly fixed and then stopped working again. Based on both of these time periods, I can conclude that, in general, start/stop system could possibly have a statistically significant effect on the fuel economy, if the system was working properly. However, since the fuel economy trend line continues to increase well after the system had completely malfunctioned the second time, I cannot definitively say that the start/stop system is responsible for the elevated fuel economy during the 2019 calendar year.

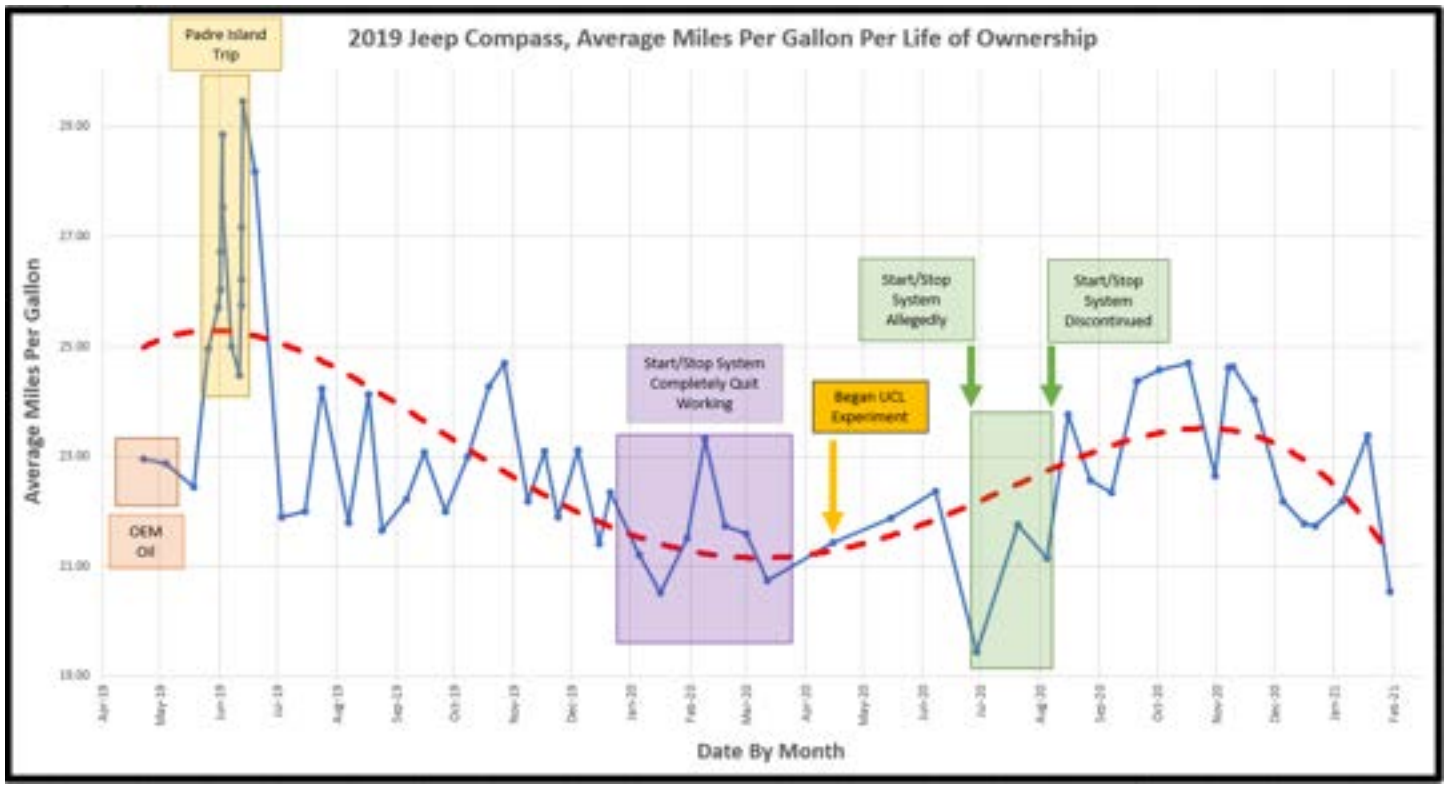
It is noteworthy to take a look at the orange square in the center. This time period marks the start of my experiment with Amsoil Upper Cylinder Lubricant. At the onset of the experiment, I ran a bottle of Amsoil Performance Improver, which is a powerful fuel additive based cleaner and has shown in the past to elevate fuel economy, initially by its formulation and long-term through cleaning the internal components within the fuel system inside the engine. Thereafter, the first fill up with using Amsoil Performance Improver and Amsoil Upper Cylinder Lubricant, I have only been using Amsoil Upper Cylinder Lubricant with each fill up. More to come on this topic after the experiment concludes in April 2021.

The last thought has to do with the last few months. There is a steady decline in the trend. This could possibly be due to a much harsher winter in conjunction with the use of the remote start to warm the vehicle. We have received a substantial amount of snow compared with last year. This often leads to extended idle times in traffic and much slower commutes.

Concluding Thoughts

Total average fuel economy for our 2019 Jeep Compass has remained about the same when taking into account the sporadic operation of the start/stop system and highway driving.

I will continue to watch and monitor fuel economy, especially over the next couple months. If the downward trend continues, it may require servicing.



Shop Talk...

with Dr. Jonathan D. Olson, EdD
(Independent Amsoil Dealer #10458)

I was provided an opportunity to work on a Kellog American 5 HP Two Stage Industrial, Electric Air Compressor this past month. This machine has an electric motor that drives a belt connected to a reciprocating compressor. The last date of service was 2004. At that time the oil was changed.

I checked with the manufacturer and Amsoil to verify the required lubricant for the engine. Amsoil Synthetic Commercial Grade Compressor Oil ISO 100 SAE30/40 was identified. The air filter and grease also took some time to identify and procure.

This engine has no combustion by-products (since it is not an internal combustion engine). The oil that I pulled out was black. I filled up the sump with new oil and ran it for a short period of time and then changed the oil again. The second oil change was very dark gray. I did this two additional times. I then put the machine back in service for two weeks, logging a total of 10 hours run time. After that, I proceeded to do an additional three oil changes following the same procedures as before. Finally, after the 7th total oil change the lubricant was at a point that I felt comfortable.

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