Under The Hood, November 2020

Racing engines, from monstrous to diminutive. If you are a Top Gear fan, you might have seen the Jeremy Clarkson episode featuring Brutus. Brutus was built on a 1908 American LaFrance fire truck chassis and was powered by a 46 liter BMW post WWII fighter plane engine. That 46 liters equates to about 2,800 cubic inches. Clarkson raced Brutus against a modern BMW. There was also a Jay Leno episode that featured his 27 liter Bentley. Both of these autos were built because someone decided to explore the extreme. However, in the earlier years of auto racing, there were many race cars powered by monstrous engines. In 1924 Sir Malcom Campbell took his 18 liter V12 powered Sunbeam to the new land speed record of 150 mph. In 1950, Kestrel Racing Cars created a 21.2 liter (almost 1300 cubic inches) rear engine race car. These are just a few of the examples. I doubt that any of these huge engines would be what we would consider to be high revving engines, but I also imagine that they could produce huge torque numbers. In the Leno episode, there were comments suggesting that the engine should be producing about 3,000 ft-lbs of torque. Compare that to the C8 Corvette engine with its 470 ft-lbs torque. These early race cars had very primitive tires, tall with very narrow widths, which could be problematic in trying to put the torque to the pavement. I have seen several of the earlier race cars with dually rear tires; an attempt to solve the torque-narrow tire problem. So how different are our current racing engines? In Formula One, the current standard is a 1.6 liter (slightly less than 100 cubic inches) V6. The F1 engine is turbocharged to the max, and most are running 60-70 psi of boost. Few passenger vehicles have boost levels above 20 psi. The F1 engine relies on the turbo boost levels and extreme rpm to produce the racing horsepower. Closer to home, Indy Car has announced that they are enlarging their engine standard for 2021 to a 2.4 liter V6. Indy is trying to hold down costs and their engines run less turbo boost and less engine revolutions than what is expected in F1. The C8R Corvette race car is powered by a 5.5 liter, flat plane crankshaft engine. The C8R is naturally aspirated, meaning there is no supercharger or turbocharger boost to help with horsepower development. That 1924 Sunbeam had twice the cylinder count, and 16 times the engine displacement compared to the modern F1 racer. Some of you might already be viewers, but I recently discovered the Amazon Prime series “The Racing Years”. In watching the first feature about the 1950 racing season, I was introduced to the Kesler race car which got me thinking about this Monster engine topic. If you like vintage racing, check out these Amazon Prime features.

We all drive, and I suspect we all care about the condition of our highways. I have written before about various efforts to help make our pavement “green”. Asphalt is basically crushed rock and heavy petroleum tar. Heated to melt the tar like material, it solidifies as it cools. It is still a relatively soft material which is why we have the large grooves in freeway lanes which are generally created by constant truck traffic. I won’t get into an argument whether the trucking industry should pay more for their road use, partly because we all know that we, the consumer, will ultimately pay the price. However, if we can recycle that worn out removed asphalt, it is better for our pocketbook and better for the environment. A typical asphalt specification might allow up to 25% ground up and properly graded recycled asphalt in the new asphalt. Two private companies are testing a plant-based additive (called Anova) with the Minnesota Dept of Transportation. The additive is a vegetable oil developed in a specialty plant. The additive is designed to rebalance and replenish (they use the term “rejuvenators) the chemical aspects of asphalt lost to aging. Minnesota DOT is conducting tests with up to 45% recycled asphalt. After 1.5 years of testing the engineers have not seen any difference in the controlled sections and Anova additive sections. Minnesota, in conjunction with 8 other DOTs, has tested various

other rejuvenators based upon soy and corn based products. To date Anova, the specialty plant vegetable oil, seems to show the most promise. Stay tuned.

PACCAR isn't the only truck manufacturer to innovate with electric or hydrogen fuel cell heavy duty trucks. Germany's Liebherr has introduced the first fully electric concrete mixer truck. Similar to PACCAR and their local wine delivery example, concrete ready-mix trucks have a duty cycle that includes multiple relatively short trips, with constant return to the plant. With each return they have the opportunity for a quick squirt of electrical energy while waiting for their next batch of concrete mix. The typical ready-mix truck on our highways has a revolving drum to keep the concrete mixed during transit. Years ago, a truck would have a separate small diesel or gasoline engine to power the revolving drum. Most trucks today will have a large hydraulic pump take-off on the main engine and hydraulic pressure powers the revolving drum. The Liebherr truck naturally uses an electric motor and gearbox to revolve the drum. Ready-mix trucks carry heavy loads (note that some of the trucks you see have as many as 6 axles, including the boost-a-load axle that drops down behind the truck). For mobility, almost all ready-mix trucks are built on a single chassis; you will seldom see the more normal truck tractor and separate trailer combination. The job site terrain can also be difficult. The combination of factors requires rather high horsepower requirements. The Liebherr truck is rated 680 horsepower. I would expect to see a similar unit introduced by PACCAR in the near future.

The past few years Corvette has competed with the C7R or C8R in IMSA's GTLM (LeMans) class. IMSA events (similar to LeMans) typically have four different classes of vehicles on the track at the same time. Some manufacturers will field cars in both GTLM and GTD (Daytona), which are the two classes that look closer to the respective street cars. For 2021, both Ford and Ferrari have announced that they are leaving GTLM. This will result in only BMW and Corvette remaining in the class. Chevrolet is considering changing to GTD (a slightly slower class) as there is more competition, which implies more visibility for the brand. GTD already includes entries from Porsche, BMW, Mercedes AMG, Ferrari, Lamborghini, McLaren and Aston Martin. There are significant differences between GTLM and GTD classes, so this is not as simple as changing a few stickers and a wing. Stay tuned as we watch our favorite marque.