Multi-Viscosity Crankcase Lubricants for Racing

Summary: Multi-vis oils offer far more engine protection than straight grade oils, and can provide more horsepower to the flywheel.

The jury is **NOT** out on the use of multi-viscosity oils for racing; it's just that some people are not yet up to speed on the benefits of new technology crankcase lubricants for racing applications. Some still adhere to the "straight grade" oils that can do the job in some situations but also leave something to be desired.

This is probably a good time to explain what the oil viscosity numbers mean and how they can relate to the real world of racing. Viscosity is a measure of oil's ability to flow through a certain size orifice at a designated temperature. Let's use typical SAE 20W/50 oil as an example as to what the numbers mean. The viscosity grade number of this oil (20W/50) can be divided into two parts; "20W" and "50". The first part (20W) means that 100 milliliters of oil must flow through a certain size orifice within a given amount time at 14^{o}F. The test temperature varies with the viscosity grade, but all are at or below 32^{o}F. The "50" part of the viscosity grade number means that the oil must flow through a certain size orifice within a given amount of time at 212^{o}F for all viscosity grades from 20 to 60. As the grade numbers get higher, the oil is thicker and flows at a slower rate.

To summarize this, multi-viscosity means the oil meets two viscosity requirements, one at a low temperature depending on the first number of the viscosity grade, and a second at 212^{o}F for the second number in the viscosity grade. What all of this means is that an SAE 20W/50 oil flows like an SAE 50 oil at 212^{o}F and flows like an SAE 20W oil at 14^{o}F. This provides the best of both worlds; good lubricant flow at low temperatures to get to the critical areas quickly, and adequate film thickness to protect those same critical areas at high temperatures because the oil does not "thin-out".

Let's take a look at straight grade oil used in a racing engine and see if there are any undesirable conditions that develop. A good example of this is the racer that uses a straight grade SAE 50 oil, then heats it to 212^{o}F with a heating blanket around the dry sump tank or has a heating element in the tank. The engine is cold and is fired up for qualifying and run one lap to warm up and one lap for time. But what happens to that 212^{o}F oil when it hits that 70^{o} or 80^{o} cast iron block? You can bet pole money that it cools down significantly and gets thicker. Cool (thick) oil does not flow as freely as hot oil, so the pump may max out on pressure and start to bypass. Why heat oil up only to have it cool down? When it cools down after hitting the cold cast iron and pressure increases to the point of bypassing, power is wasted pumping and bypassing thick oil when that power could have been more effectively used at the rear wheels. Bypassing oil at the pump also reduces oil flow to the bearings.

If SAE 20W/50 oil were used in place of the SAE 50, flow characteristics would be like an SAE 20W oil at the low temperatures and like SAE 50 oil at higher temperatures. If the SAE 20W/50 hits the cold cast iron block and drops to 100°F like the SAE 50, it will still flow well because it has thin oil characteristics at low temperatures. The bypass will probably not be opened and the oil pumped is all going to lubricate engine parts.

These same benefits exist with other multi-viscosity oils like SAE 10W/30 or SAE 10W/40. One thing to be aware of with lower viscosity oils (especially SAE 10W/30 or thinner) is that the oil film thickness (the ability to lubricate bearings and to carry load) is less then a SAE 20W/50 and on some engines may not protect as well as higher viscosity oil. This can be due to a number of variables that include engine speed, horsepower output, bearing clearances, oil system efficiency, and oil temperature.

Another item to watch for on the label of the container is "Energy Conserving". This information is found on the label inside the API doughnut that also indicates the API service designation and the viscosity grade. In the lower part of the doughnut will be the words "Energy Conserving" which means the oil improves fuel economy in a standard test by reducing internal engine friction in a passenger car engine. In a race engine, this relates to increased horsepower.

Many of the Nextel Cup teams use SAE 10W/30 for qualifying then switch to SAE 20W/50 for the race. On restrictor plate engines that develop about 430 horsepower, some of the teams use SAE 10W/30 or SAE 10W/40 motor oil at Daytona and Talladega. Frequently, SAE 10W/40 is used in unrestricted engines early or late in the season when the weather is cold.

In summary, the use of multi-viscosity oils in racing applications is advantageous. Reliability is improved since the oil flows well when it is cold and gets to critical areas quickly. It also protects the engine well under high speed, high output, and high temperature conditions.

All of this information applies to gasoline racing engines only. Racing engines that use methanol or nitro-methane fuel is another subject.