How Do You Choose the Right Type of Oil for Your Car?

Warrendale, PA, June 27, 2001 - Have you ever been asked, "What kind of oil do you use in your car?"

Even if you aren't a shade tree mechanic, you are likely to get this question when you drive into your quick lube shop or repair center. To come up with the right answer, you need to consider the type of driving you will do over the next oil drain cycle. Is it high-speed freeway driving, or will you be making short trips in cold weather?

Then, dig out your owner's manual and select the vehicle manufacturer recommendation that best fits your driving plans. You now have identified the most suitable SAE grade to use. It will provide the best protection for your vehicle.

But, if you don't pick the recommended engine oil grade, what can happen? To find out, you need to know something about oil viscosity and how it affects vehicle operation and performance.

Oil is graded by viscosity, which is a measurement of resistance to flow. Simply put, molasses has a much higher viscosity than water. It will flow out of a bottle at a much slower rate than water, so molasses has the higher resistance to flow.

The SAE Viscosity Standard, SAE J300, the document that establishes the various oil grades, has been in existence for over ninety years. But it has changed many times over that period. In the early days, only single grade oils were available. People used "heavy" viscous oils in the summer and "light," less viscous, oils in the winter.

By 1926, there were six single grade designations in SAE J300. Such oils, identified as SAE 10, 20, 30, 40, 50 and 60, were graded according to viscosity measurements at 130 degrees and 210 degrees Fahrenheit. The car owner used a low viscosity oil in the winter, such as SAE 20, so the vehicle would start on cold mornings, and a more viscous grade in the summer, such as SAE 40, which offered better lubricant protection during the hotter months of the year. The owner had to remember to change oil before the cold weather season began, for the SAE 40 might become so viscous at low temperature that the engine could not be started.

But it wasn't too long before car manufacturers realized that this system was inadequate. While the high-temperature viscosity measurement might be okay to separate "light" and "heavy" oils, a low-temperature viscosity test was needed to more correctly estimate an oil's ability to help an engine to start in cold weather.

To correct this problem, a new low-temperature classification was eventually added to the Standard in 1950, and it became possible to grade oils by a low-temperature W-grade designation, such as SAE 5W, 10W, or 20W. Now the consumer could ask specifically for an SAE 5W grade, at that time the lowest of the three low-viscosity SAE W-grades, for cold weather driving, or an SAE 40 grade, for example, for summer operation.

But more changes were needed. Lubricant additives were being invented which allowed engine oil manufacturers to develop "all-season" engine oils. Such oils had good low-temperature viscosity performance for engine starting in the winter, yet they retained some of the more viscous high temperature engine benefits of non-W grade oils, such as SAE 30 and SAE 40. These "all-season" oils become known as multigrade oils, and SAE 10W-30 and SAE 10W-40's gradually became popular among the driving public. However, on close inspection, these products had much different viscometric properties than single grade oils.

Consider a small pipe through which oil is being pumped at a constant pressure. At a relatively low rate of flow, an SAE 30 or SAE 10W-30 will pass through at the same speed. Now constrict a portion of the pipe to a very small diameter and increase the pressure. Under these conditions, more SAE 10W-30 oil will flow out the end of the pipe in a given time period. Why? In the case of the multigrade oil, there has been a reduction in resistance to flow, a reduction in viscosity in the narrow, constricted portion of the pipe. Since there is less resistance, more SAE 10W-30 can be pumped through. But this is only a temporary loss of viscosity. Remove the constriction and both oils again flow through the pipe at the same speed.

Temporary viscosity loss limitations were added to SAE J300 to ensure that adequate thin-film lubrication is provided in engine journal bearings. If the oil's temporary viscosity loss is too high, the oil film can fail between two load-bearing surfaces, and metal-to-metal contact occurs. This can reduce engine life, and on occasion, cause catastrophic engine failure.

A better low-temperature viscosity measurement, called "cranking" viscosity, was eventually incorporated into J300 to separate W-grades according to their ability to permit engine starting in cold weather. The lower the W-grade, the lower the temperature where the engine will start. But just because an engine starts at low-temperature does not necessarily mean that the oil's viscosity is suitable for pumping to areas of the engine that require lubrication.

About 20 years ago there were several outbreaks of catastrophic engine failures in both the United States and Europe due to unusually severe cold weather. Cold temperatures were sometimes low enough to turn the oil into a gel. Engines would sometimes start with these oils, but the engine pumping systems were not strong enough to pull the oil out of the oil pans. The vehicles would run for a while, with oil pressure warning lights ablaze; then there would be catastrophic failure. The result was an abundance of engine failures, warranty claims, and engine lubricant recalls. To fix this problem, a low-temperature test was added to measure "pumping viscosity," and to insure that an oil did not become gelled after two days of exposure to very low temperatures.

This test simulates the slow-cooling that an engine oil might experience when a driver leaves his vehicle over a weekend in an airport parking lot where a severe drop in temperature may be experienced. The measurement temperature used depends upon the W-grade. For example, SAE 5W grade oils must be evaluated at -35 degrees Celsius (C.), while an SAE 10W grade oil must meet J300 limits at -30 degrees C.

Recently, completed industry-sponsored programs have provided additional data on modern vehicles, and SAE low-temperature W-grade requirements have again been modified to better protect your engine, according to Dr. Robert Rhodes, chair of SAE's J300 Committee.

So what does all this mean to you? When an engine manufacturer recommends a multigrade oil, it is based on its knowledge of the design and operational characteristics of the engine. The manufacturer best understands the high- and low-temperature viscosity requirements that will ensure satisfactory operation and long engine life.

However, the one thing the manufacturer does not know is the type of operating condition will you be exposing your vehicle to. For example, what are the ambient temperatures where you drive your car or truck? The engine oil recommendations depend on that information. So, look up your condition in the owner's manual before your next oil change. And remember, the SAE J300 grading system has evolved to provide a variety of SAE grades that vehicle manufacturers can choose from to select the best SAE grade for your vehicle. Rely on it.

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