

How to Test Industrial and Engine Oils

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"Why is industrial oil viscosity tested at 40 degrees C while engine oil is tested at 100 degrees C?"



Several factors affect how industrial and engine oils are tested. First, there are two different governing bodies involved in the regulation of these two types of oils: the International Organization for Standardization (ISO), which governs industrial oils, and the Society of Automotive Engineers (SAE), which governs automotive oils. These governing bodies regulate how the two types of oils are tested and calibrated.

ISO 3448 is the standard for industrial oils used in factory and plant machinery. These oils have an ISO viscosity grade that ranges from 10 to 6800, with 10 being the lowest viscosity and 6800 being the highest. The viscosities are measured in centistokes (kinematic viscosity) at 40 degrees C. Oils in this group must contend with high loads, varying ambient conditions

and dusty environments.

SAE J300 is the standard for automotive oils used in combustion engines (crankcases). These are complex oils that can be divided into three categories: winter, high-temperature and multi-grade.

The winter (W) group measures the cold-cranking and pumping ability of oil temperatures as low as minus 10 to minus 40 degrees C. They are measured in centipoise (cP). However, SAE viscosity grades 0W to 20W are also measured in centistokes (kinematic viscosity) at 100 degrees C as part of the high-temperature or operating-temperature group.

Oils in the high-temperature/operating-temperature group can have an SAE viscosity grade from 20 to 60 and are measured in centistokes (kinematic viscosity) at 100 degrees C.

Multi-grade oils are a combination of winter-grade oils and high-temperature/operating-temperature oils. They can provide cold-cranking and pumping ability on cold starts as well as stable high-temperature running viscosities. They are measured in centipoise at 150 degrees C. If you buy oil for your vehicle, you likely have seen the donut symbol on the back of the bottle. In the middle of this donut is the SAE viscosity grade, e.g., 5W-30, 10W-40, etc. This group also has a high-temperature, high-shear (HTHS) subgroup.

Within these two oil classifications (industrial and engine), the operating conditions can be very different, and thus the reason for having different temperatures for measuring and testing the oils. Studies of actual operating temperatures have shown that 40 degrees C (104 degrees F) is suitable for most industrial lubricant classifications. Likewise, automotive industry studies have concluded that 100 degrees C (212 degrees F) is the industry's average operating temperature for crankcase oils.

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