

Ag Engineering Library

AE262 Types of Oil

Matches these 2015 National AFNR Career Cluster

Content Standards:

[PST.03.01.](#)

Common Core State Standards:

Reading #1 and 4, Writing #7 and Language #4 and 6.

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MAIN IDEA: What are the various types and grades of oil? What is the proper type and grade for small gasoline engines?



THE FOUR FUNCTIONS OF OIL

1. Lubrication:

There are many moving parts in an engine. These parts move against each other and create friction. No matter how highly polished metal is, there are very minute, rough places that might not be detectable by touch. All surfaces contain tiny peaks and valleys that oppose each other when the surfaces come into contact.

Friction is the resistance between two moving surfaces that contact each other and is a result of the clash between these peaks and valleys. The smoother the surfaces are, the less resistance or friction exists. Oil makes surfaces smoother. The fluid moves into small imperfections in the metal surfaces and makes the surfaces smoother so they will glide more easily.

2. Cooling:

As engine parts move against each other, friction is inevitably created. Friction causes heat that is transmitted throughout the engine. As parts heat up, they expand and if they expand very much, they will seize up and cease to operate. As oil is circulated to all the parts, it has a cooling effect on any heat buildup.

Oil is only one way an engine is cooled. Most of the cooling comes from a cooling system such as air fins or a circulation liquid coolant system.

3. Sealing:

The thick nature of engine oil allows it to help seal the engine components. No metal surface is perfect, and oil helps make the contact between metal part surfaces tighter. This helps keep out foreign materials and also helps to absorb shock between the surfaces as they come in contact with each other.

4. Cleaning:

Combustion takes place within the engine. With any combustion, there are waste particles that can interfere with proper engine function. Also, running the engines in dirty environments can place dirt or dust particles inside the engine. Oil helps to clean the engine parts of any foreign materials associated with combustion or dirty working conditions.

PERFORMANCE RATINGS

Oil performance is rated by the American Petroleum Institute (API). The American Petroleum Institute is the largest U.S. trade association for the oil and natural gas industry. Performance ratings are then designated by code letters in the classification. These ratings denote how well the oil will perform under severe or adverse conditions.

Most manufacturers of small gasoline engines call for oil with a service classification of SA to SN. The service classification is clearly marked on every container of motor oil. The S stands for service and means that the oil is intended for use in engines with a spark ignition such as gasoline engines.

Oil grades such as CA to CK4 are intended for use with compression-ignited engines such as diesel engines. The C stands for commercial.

There is also a new category of F. The F stands for fuel efficiency and is used for compression-ignited engines that are designed to meet the latest fuel efficiency standards set by the federal government.

Always read and follow the manufacturer's recommendations regarding the type of oil to use in an engine.

VISCOSITY RATING

The Society of Automotive Engineers (SAE) sets standards and viscosity grades for automotive lubricants such as gear oils and engine oils. It is essential that the proper viscosity oil be used. Viscosity is a measure of the thickness or fluidity of an oil at a given temperature, how easily it flows. An oil that is too thin will not function or protect properly. An oil that is too thick may not properly circulate through all the parts of the engine.

Engines need lighter weight (more fluid) oil when temperatures are low. This is because oil thickens when temperatures are colder, and the oil cannot slip between tight-fitting moving parts. In areas with both colder and hotter seasons, the oil viscosity must be changed to fit the seasonal temperatures. Higher temperatures call for heavier or less fluid oils to be able to "stick" to the moving parts.

Oil can be rated as having different viscosity as the temperature changes. For example, an oil rated as 10W30 (the W stands for winter) will have the viscosity of a 10 weight oil when the weather is cold and the viscosity of a 30 weight oil when the weather is hot. This is called a multi-viscosity oil. It is important to use oil with the correct viscosity grade as rated by the SAE.

Engine oils can also be single-viscosity, such as SAE30. This means the oil is designed to perform as a 30 weight oil at all temperatures. The numbers are tabulated scientifically.

Always refer to the engine manufacturer's recommendation for the proper oil viscosity. As a general rule, for small engines operating in temperatures above 40 F, use a 30 weight oil.

OIL ADDITIVES

Oil is more than refined petroleum. It contains several additives that improve the oil's function within the engine. The following are typical additives:

- Pour point depressants: These allow oil to flow in cold weather.

- Antifoam agents: As oil is circulated under high pressure to all moving engine parts, it tends to foam. Since foam is not as effective as fluid oil, these additives prevent foam from forming.
- Oxidation inhibitors: These additives prevent the oil from breaking down because of reactions with oxygen.
- Detergents: These clean engine parts and suspend tiny contaminants in the oil.

CONVENTIONAL OR SYNTHETIC?

Small engine manufacturers have recommendations that include conventional and synthetic oils. Synthetic oils protect over a wider range of temperatures, but in most cases are quite a bit more expensive than conventional oils. The type of oil, conventional or synthetic, is not as important to the engine as the proper viscosity and service rating.

INTERNET RESOURCES:

** American Petroleum Institute - Oil Categories

<https://www.api.org/products-and-services/engine-oil/eolcs-categories-and-classifications/oil-categories>

** Pennzoil - Know Your Oil

https://www.pennzoil.com/en_us/education/know-your-oil.html#iframe=L3NvcHVzL3Blbm56b2lsLzlwMTZuZXZzbGV0dGVyLz9sb2NhbGU9ZW5fdXM=

** Popular Mechanics - How To Pick the Right Motor Oil for Your Car

Includes a comparison of conventional and synthetic oils and descriptions of additives

<https://www.popularmechanics.com/cars/how-to/a53/1266801/>

** The Repair Specialist - Engine Oil Codes Explained, SAE (Society of Automotive Engineers) Numbers Explained/Viscosity 

Note that 100 C equals 212 F.

5:14-minute video describing oil codes

https://www.youtube.com/watch?v=Hb6CX_rWoIA

** Society of Automotive Engineers

<https://www.sae.org/>

** Valvoline - Motor Oil & Other Product FAQ

<https://www.valvoline.com/about-us/faq>

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Photo credit: Retired Army Sgt. 1st Class tops off the oil in his vehicle at Fort Rucker's Auto Skills Center. U.S. Army photo.

END STUDENT SECTION

