Written by Dr. Lube, AKA Ken Bannister
Wednesday, 15 August 2012 16:15


**Symptom:**

*"Dear Dr. Lube, I have worked in fleet maintenance for many years and have always used multi-grade oils for engine oil changes, but have never questioned how they work. Could you explain? And what does the letter W stands for?"*

**Diagnosis:**

The primary function of any lubricant is to reduce and control friction and wear by providing/sustaining a load-carrying oil film that's strong enough to separate two surfaces moving over one another. The load-carrying ability is determined by the lubricant's viscosity rating.

What's the right viscosity grade for an automotive-engine crankcase? That depends on where the vehicle is operated. For example, Northern winters subject oil to cold temperatures on startup, resulting in poor flow and lack of full-film lubrication until the oil reaches operating temperature. This leads to drag on the engine and excessive wear during the startup/warmup stage.

**Prescription:**

Automotive manufacturers used to recommend mono-grade (single viscosity grade) crankcase lubricants for their vehicles, and changing to a lower viscosity grade for winter driving (the choice of which would depend on typical temperatures where the vehicle would be operating). Grades were set by the SAE (Society of Automotive Engineers) system that designates oil viscosity with a number followed by the letter W to denote winter-use oil, eg. 10W, 15W or 20W weight, or just a number on its own for summer-grade products, eg. 20, 30, 40 or 50 weight. That changed in 1952 with the introduction of the first multi-grade oil that allowed a driver to use one type of oil year-round.

The multi-grade designates its working range by first indicating the base oil viscosity designed for cold weather-performance, then the viscosity at which the oil will perform (or emulate) once it

reaches operating temperature. For example, a 20W50 has relatively thin SAE20W winter base oil that “thickens up” and acts like a thicker SAE50-weight oil at operating temperature to provide full-film protection over a wider temperature range. This is achieved by blending polymeric viscosity improver additives with low-viscosity base oil. These additives are long-string polymers that curl up like a ball at low temperatures and move freely among the oil molecules. Once the oil heats up, the polymer strings unfurl and expand to restrict the oil’s flow and raise its apparent viscosity.

Having explained all this, I would still remind of you of a cardinal rule: When selecting oil for a vehicle, always read the operator’s manual! **MT**

*Lube questions? Ask Dr. Lube, aka Ken Bannister, author of the book* Lubrication for Industry *a nd the Lubrication section of the 28th edition*
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