NewsStand - **Lubes and Additives: It's All in the Mix**

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When I order a fancy cake from the bakery, I usually don't think too much about what the cake is made of. My only real concern is that the person I'm getting that cake for appreciates it. The function of the cake is usually to be tasty, though on some occasions it's only real functions are to be edible and look nice.

So it is with motor oil. Not the edible part or looking nice. What I mean is that most people really don't give a second's thought to what the ingredients are in motor oil. They just want it to be doing what it's supposed to do, and few motorists really know for sure what even that is. But since we're in the oil industry, it's probably worth knowing something about, just in case you do have customers who want to know.

As most of us are aware, engines and their lubricants have become increasingly sophisticated since the days of your grandfather's Oldsmobile. In the early days of automotive lubrication, motor oil was just plain base oil. When wax modifier was added to the base oil in the 1930s to address the problems created by wax residue, the motor oil additive market was born. Today, motor oils contain a wide variety of additives designed to improve their protection and performance capabilities. Motor oil additives serve three essential functions: protecting metal surfaces, expanding the lubricant's application range and extending the lubricant's life.

Surface Protection Additives
Surface protection additives effectively address issues related to metal surfaces:

- Anti-wear agents protect against friction, wear, scoring and seizure.
- Corrosion and rust inhibitors protect internal metal parts against corrosion and rust.
- Detergents keep surfaces free of deposits.
- Dispersants prevent insoluble contaminants from agglomerating by keeping them dispersed in the lubricant. (I really like that word agglomerating. Even as you say it you can picture globs of material agglomerating.)
- Friction modifiers alter the oil's coefficient of friction.

Performance Additives
A second group of additives works to improve how the lubricant performs.

- Pour point depressants (used in petroleum lubricants) modify wax crystal formation and enable oils to flow at lower temperatures.
- Seal swell agents help swell elastomeric seals by causing a chemical reaction in the elastomer.
- Viscosity modifiers help reduce the rate of viscosity change when temperatures rise or drop.

Protective Additives
A third group of additives work to extend the service life of the lubricant:

- Anti-foamants reduce surface tension and speed the collapse of foam.
- Anti-oxidants reduce the oxidation rate by decomposing peroxides and terminating free-radical reactions.
- Metal deactivators reduce the catalytic effect of metals on the oxidation rate, further slowing oxidation.

Formulating a modern lubricant is more than just throwing ingredients together though. My son has been working in some fancy restaurants the past half dozen years and it has been interesting watching him put together a fancy meal while staying with us briefly this fall. It's not only a matter of having the right ingredients, but combining them at the right times

and temperatures. There are reasons why master chefs favor certain ingredients over others, and why some people with a wonderful recipe end up with leftovers fit only for Rover.

It's helpful to understand that additive chemistries can themselves have disadvantages as well as advantages. The usage of various additives involves tradeoffs. Here are just some examples of negative side effects additive may possess.

- Detergents and anti-wear additives can promote deposit formation in high temperature areas.
- Detergents and dispersants can promote foaming and minimize the effectiveness of anti-foaming additives.
- Certain additives can cause corrosion when exposed to high temperature.
- Too much anti-foaming additive will in itself result in foaming.

Bottom Line

Motor oil has a lot of stuff in it these days. It's not just a haphazard concoction of chemicals all thrown together. Some of the compounds in motor oil are designed to interact with what's going on inside an engine. But many compounds are selected so that they will not interfere with their designated functions. That is to say, formulators are chemists who must carefully consider the ways these various chemistries interact with each other, not just the context they individually work in.

In short, there are reasons some lubricants perform better than others. It's all in the mix.