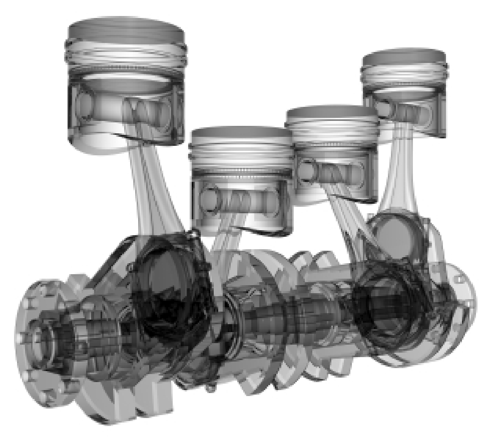
The Oil Report

October 2009



Oil the News that's Fit to Print!

We have a new website! If you haven't seen it yet, take a tour of www.blackstone-labs.com. Same great information, same great humor, but better functionality and a new look.

What We Meant Was...

by Jim Stark

We often make statements like, "Your higher than average wear may have been caused by racing" or "If you are pulling heavy loads up mountains that may be the cause of at least some of the excess wear…." These statements are true as far as they go but they skip the "why" of the matter (primarily because we only have six lines in the comment section). To better understand why hard operation of an engine can (but doesn't always) cause more wear, think about how oil works.

People often think "slick." Slick is the operator trying to sell you an additive. When someone tries to sell you "slick" you should run the other way. Oil works on the basis of surface tension. That is the quality of a liquid to hold itself together—to pool or form droplets. You can see this quality on a humid day when a glass of ice water will lift itself from a smooth surface (and slide away if the surface is atilt) when condensed water pools under it. Imagine that! A heavy glass of water is actually lifted by something as weak as a minute amount of pooling water.

If you've ever sweated copper pipe you have seen another example of surface tension in action. When the solder hits its critical temperature and liquefies, it slips itself into the tightest seam and fills every nook and cranny of it. If you don't over heat the joint and boil the solder back out surface tension will give you a perfect joint every time when the solder returns to its solid phase.

Oil does the same thing inside your engine. By its very nature it coats everything it touches, clings to all surfaces and keeps the metal parts from touching one another. Engine wear is not between two metal surfaces. It is between the oil and two surfaces. When you hear a click or knock coming from an engine at least two of the parts are touching. That isn't good. Somehow the oil film that is supposed to protect those parts has been violated. This type metal-to-metal contact usually makes metal on a larger order than wear. The wear we read with a spectrometer is less than 15 microns in size. A particle large enough to be visible is greater than 40 microns.

The inside of an engine is a veritable dynamo of hot splashing oil. The crankshaft splashes through the sump oil at (say) 2,000 rpm or 33 times a second and oil flies everywhere. Small engines and automotive and truck engines of the past were lubricated solely by this splash effect. Modern car and truck engines have an oil pump that delivers oil under high pressure to critical parts, mostly in the lower end but many also deliver oil pressure up the push rods to the head area and some even have rods that carry oil up to the rings and pistons. The purpose is to get oil everywhere it is needed and to keep replenishing the supply continuously.

A mechanically normal engine will wear and eventually wear out but at such a gradual rate many years will pass before you will see any change in the engine's efficiency. Internal combustion engines are a marvel of mechanical technology. All engines of a type will make normal wear metals in a balance or pattern that we can recognize as normal by comparing with averages for that particular type engine. Any change to that balance suggests something untoward is going on and the longevity of the engine is being compromised.

What the above comments skip is the actual process inside the engine that is causing the wear imbalance. You can run a normal engine at red line all you want (once it is thermally stabilized, ie, warmed up properly) and it won't cause poor wear. You can pull tons of load up steep hills and wear won't change appreciably. But here is what does cause poor wear. Since wear is between the oil and parts, an oil that carries debris of hard particles will pass through fat oil films and not affect wear. But those same particles will take Babbitt off the bearings (and other parts) when clearances are squeezed to smaller clearances than the particles. That is where excess wear comes from in harder than normally working engines. When you work an engine hard and the oil is dirty (hard debris) the dirt in the oil itself causes increased wear. You can work any engine in a reasonably hard fashion on clean oil and the wear we see in your oil won't tell about the operational difficulty. The harder you work an engine the more often you need to change the oil. That is the 'why' we pass over when we suggest racing or any other hard operation will cause increased wear.

We suggest extended oil use intervals. We can safely provide this service because we can see the actually wear of the engine in the used oil. Of the many factors to consider, one - how hard you operate the engine – is a vital one that we don't often know about. most of you don't tell us about. Neither can it be a variable of the oil change program (light) supplied by the engine's manufacturer. But we don't need to know this to safely recommend a longer (or often shorter) oil use interval. All we have to know is if you are getting into the bearing Babbitt material more than is average. When you are and it's not being caused by a contaminant in the oil or an oil compatibility issue, you are running your oil too long for the way you operate it.

Working with industrial manufacturers over the years, we have determined that more than 70% of the oil they routinely change out is perfectly serviceable. That is not only a serious waste of a limited resource but also a costly and avoidable error. After looking at the oil data from hundreds of thousands of gas and diesel engines I would suggest that (70%+) is a conservative estimate of the waste caused by auto and truck owners by prematurely changing the oil. If you can run your oil longer without compromising the longevity of the engine, why wouldn't you?

A startling fact I stumbled across many years ago is neither the engine manufacturers nor the oil suppliers have any idea about how long an oil can be run in your engine. Accordingly, they will always err on the conservative side; the manufacturers to prevent warranty issues and the oil companies to sell more oil. At Blackstone we can safely tell you how long you can run the oil in your engine. It is truly amazing how long that interval is for most engines that are normally operated.

What time is it?

On our oil information slips, you may have noticed the switch from "Miles on the Oil" and "Miles on the Engine" to "Time on the Oil" and "Time on the Engine." This switch was not meant to confuse anyone; we just wanted to let you know what we aren't one-trick ponies here. Outside of the United States, most people track their oil use in kilometers, and we wanted to let our customers from other countries that we can indeed track kilometers on the oil. No need to break out the calculator and convert kilometers to miles (though this can be a fun math refresher).

Some new engines keep track of hours in addition to miles. If yours does, then you may want to give us hours instead of miles or km. Tracking hours on the oil can be helpful because that gets all of the time that the engine is running and the wheels are not moving, like when you are sitting at a stop light or letting the engine warm up in the winter.

Although miles, hours, and kilometers are the most popular ways to track oil time, we have also seen other methods. Racers often track their oil use in laps, runs, or passes, while our industrial customers often track the oil use in weeks, months, or years. And then there's my personal favorite: Blue Moons.

One of our customers tracks his oil use in gallons of fuel used. This may be the best way I have heard of so far because not only does this get the time the engine wheels aren't moving, it also takes into account the RPM of the engine, though I have to say, I don't know of anybody else that keeps records good enough to keep track of that for very long. The most important thing is to be consistent. If you have been giving us miles, or hours, or Blue Moons, please continue to do so.

--Ryan Stark

Report of the Month

What we have here is barber shop chair oil. The problem is, the chair doesn't go up and down smoothly any longer. Can you figure out why not?

ELEMENTS IN PARTS PER MILLION		UNIT/ LOCATION AVERAGES					UNIVERSAL AVERAGES
MI/HR on Oil							
MI/HR on Unit							
Sample Date							
ALUMINUM	0	0					0
CHROME	0	0					0
IRON	348	382					382
COPPER	71	72					72
LEAD	17	18					18
TIN	1	1					1
MOLYBDENUM	0	0					0
NICKEL	17	23					23
POTASSIUM	2	2					1
BORON	0	0					1
SILICON	5	5					5
SODIUM	26	25					25
CALCIUM	176	180					180
MAGNESIUM	3	4					4
PHOSPHORUS	1	2					2
ZINC	19	22					22
BARIUM	0	0					0

PROPERTIES		Values Should Be*					
SUS Viscosity @210°F	51.6						
cSt Viscosity @ 100°C	7.75						
Flashpoint in °F	365						
Fuel %	-						
Antifreeze %	-						
Water %	0.0						
Insolubles %	8.0						
TBN							
TAN							
ISO Code							

*THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

The problem is that this oil is **old**. Seriously old. It was put into the chair on November 11, 1933, and has been working to push the chair up and down ever since. Presumably, the shaft the chair rides on is steel or a steel alloy, which is why iron and copper read so high. The guy didn't know what type of oil this is, which is why there are not any values in the "Should Be" column of the Physical Properites. But back in the '30s they didn't have much in the way of additive packages, so calcium is the only element that showed up in force. The other elements are presumably trace elements from the steel shaft.

Do you see how high insolubles are? Insolubles are solids that are formed when the oil oxidizes. In your car or truck, this mostly happens from heat, use, and blow-by. In this case the solids were formed mostly from years and years of use and being exposed to oxygen. People often wonder if it will hurt anything to leave their oil in place for a year or more in a car or truck, and our answer to that is, no. Even leaving it in place for two to three years isn't usually a problem, if you're drving at least a little. But leaving the oil in place from now until 2085...well, that might just pose a problem.