The Oil Report

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"Oil the News That's Fit to Print!"

Which Oil is Best? *Really* the Best?

When the friendly folks at Paradise Garage got tired of the different oil companies all declaring their oil was the best, they decided to create a test and find out for themselves. The test works like this: They take a fill of oil and run it as long as they can, having the oil analyzed every 1000 miles to gauge the condition of the oil and the engine. When things start to look ugly, they change it out.

BLACKSTONE LABORATORIES

The test started with Mobil 1, and they just pulled this fill out of the engine after a whopping 18,000 miles. Next in line is Amsoil, then Red Line, then Royal Purple. To learn more and see the results of the test so far, visit http://oilstudy.spacebears.com **Disclaimer!** They are using Blackstone for their testing lab. But we didn't even ask them to! To see the laboratory comparison they conducted before beginning the test, click here: http://neptune.spacebears.com/cars/stories/labtest.html

Spotlight on... Insolubles

by Jim Stark

Once upon a time I lived in primitive conditions as a soldier in a war zone. We had few amenities, eating our three daily meals from a can. The morning coffee routine wasn't very refined, either. The cooks worked in a tent. They heated water for coffee in large 15-gallon pans over a gasoline-fired stove. To make coffee they simply dumped tins of ground coffee beans into the boiling water, and after it steeped for a while, the water turned brown. When it appeared to be the right color, the heat was turned down and the churning grounds—at least most of them—settled to the bottom. If you were early when you passed through the chow line, you got a top-of-the-brew serving that wasn't bad. If you were late and your cuppa joe came from somewhere near the bottom, you could chew it.

We enjoyed the coffee grounds in our coffee as much as your factory machines enjoy insoluble materials in their oil. These days, there's usually only one reason I find grounds in my coffee: the coffee filter failed for one reason or another. Usually, one or more of the filter pleats has laid down, letting grounds overflow the rim. But the insolubles in your engine's oil are not quite as simple as the grounds in my Mr. Coffee machine. There are many reasons that insolubles form in an industrial oil sample.

What are Insolubles?

Insolubles are the total solids we find in an oil sample. Insolubles are often caused by oxidation, which is a natural process that occurs when oil is exposed to heat or oxygen (in the air). Oxidation leaves free carbon in the oil when the oxygen molecules combine with hydrogen. Virgin oil usually doesn't have any insoluble materials in it. When it occasionally does, the most we normally find is a trace level. The insolubles in virgin oil are from the normal oxidation process of the oil. Keeping insolubles low is an important factor in preventive maintenance.

Measuring Insolubles

There are various methods of measuring insolubles in oils. One way is to draw the oil through a very fine filter (½ micron) and then weigh the filter. The filter's weight gain is reported as a percentage of insoluble materials by weight, compared to the weight of the sample that was drawn through the filter. Another measuring method rates the darkness of the filter patch compared to a standard.

The insolubles test we use at Blackstone is a centrifuge method. A measured volume of oil is mixed with a heated solvent, agitated, and spun

at high speed. Insoluble materials collect at the bottom of a tapered glass tube and can are quantified as a percentage of volume. The insolubles test is a fair measure of how fast the oil is oxidizing and receiving contaminants, and how effectively the system's oil filtration is functioning.

How Much is too Much?

Industrial oils normally contain very low insolubles due to the few and relatively mild heat cycles the oil experiences (heat cycles accelerate the oil's normal tendency to oxidize). Further, oil filtration on industrial machines may filter particles as small as 210 microns, keeping the oil extremely clean for a very long time, often years.

We limit insolubles in hydraulic and spindle oils to 0.1% of the sample. The insolubles limit for compressor oils varies with the type of compressor. High speed centrifugal units, like turbine oil samples, need to read at <0.1% if the oil is to be considered serviceable. Reciprocating compressors are not nearly as vulnerable to problems from insolubles. These compressors may reach 0.3% insolubles before we think the oil needs to be filtered or removed from service for a fresh fill. Insolubles limits for screw compressors are normally set at 0.1–0.2%. In gear lubes we like to see insolubles at 0.5% or less before making the determination that the oil is okay for further use.

Causes of High Insolubles

If we found high insolubles in one of your machine's oil samples, but we found no contamination in your oil and your change intervals are normal, we often mention a problem at oil filtration as a possible cause of higher insolubles. Insolubles may be forming because the oil has been run too long for the condition and operating environment of the machine. Or, the oil filter may be inferior. It is also possible (with some types of filter set-ups) that the oil filter bypass valve has relived if the filter media was restricted. The filter system bypass may also open upon cold starts when the oil is too thick to pass through the filter media, which may be partially restricted. Once the bypass relieves, the filter is effectively out of the system.

Insolubles are just one of the tests we provide to determine the serviceability of your industrial oils. It's an important test that helps us gauge the condition of the oil in your machines, helps you extend the life of your oil fills, and helps keep your equipment running for years to come!

Report of the Month

See if you can figure out what was wrong with this oil sample before reading the caption below.

(To learn where the various elements might be coming from, click here.)

MI/HR ON OIL		UNIT/ LOCATION AVERAGES					UNIVERSAL AVERAGES
MI/HR ON UNIT							
SAMPLE DATE	09/10/03						
ALUMINUM	64	0					4
CHROMIUM	2	0					1
IRON	319	23					44
COPPER	10	17					29
LEAD	6	2					21
TIN	5	1					3
MOLYBDENUM	8	0					4

Elements in Parts Per Million

NICKEL	1	1					1
POTASSIUM	8	5					3
BORON	12	3					0
SILICON	2793	58					27
SODIUM	514	7					63
CALCIUM	40	44					228
MAGNESIUM	23	2					40
PHOSPHORUS	42	208					395
ZINC	21	154					304
BARIUM	3	2					11

Properties

TEST	cST VISCOSITY @ 40 C	SUS VISCOSITY@ 100 C	cST VISCOSITY@ 100 C	SUS VISCOSITY @ 210 F	FLASHPOINT IN F	FUEL %	ANTI-FREEZE %	WATER %	INSOLUBLES %
VALUES SHOULD BE				51-62	>430	-	-	<0.05	0.1
TESTED VALUES WERE				47.7	BOIL	-	-	POS	2.0

Several contaminants caused the high insolubles in this sample. Sodium is usually a water-based contaminant, possibly a coolant, that has caused the oil to oxidize and form high insolubles. Silicon is an abrasive contaminant of some sort that has contributed to the insolubles level. Since we really don't like to see any more than a trace of insolubles present in a hydraulic machine while the oil is in use, these insolubles are definitely too high. The oil needs to be changed, and the machine may have some lasting damage from the abrasive contaminant (note aluminum and iron wear, probably from gear teeth and the case).

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