The Oil Report

Sept. 2004

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

Ho Ho Ho!

If you're like us, you've noticed subtle (or not-so-subtle) Halloween displays popping up around town. And you know what comes next—the holiday season! Although it's early, we're bringing this up because we're not sure we will get another newsletter out before December rolls around.

BLACKSTONE LABORATORIES

So here's a thought—oil analysis as a gift! For yourself or for someone who's hard to buy for, an oil analysis will make a great gift. Simply include payment for an extra sample when you send in your next one, or call us up an order one especially for that purpose. Be sure to let us know it's a gift for someone else. You can pay for it with a check or credit card, and we'll send you the kit, along with instructions on how to use it. If you would like someone

Spotlight on... Landslide!

by Jim Stark

Imagine the awesome event of a landslide. There's no doubt it's a brutal force of nature. If you're unfortunate enough to be caught in one, you might not survive. A landslide is gravity pulling terra firma down a slope with such force that it takes all things, natural and manmade, with it. The very earth that supports us unmoors from its surroundings, changes shape, and becomes destructive. While it may not be obvious at first glance, this landslide can help us understand oil analysis.

Take a picture

Back to your mental image of the landslide: it starts off with a few pebbles rolling down a hill. Those pebbles strike others, and the dirt slide gains momentum. The process escalates and the mass of the movement increases. Larger rocks and patches of earth are dislodged, and the process continues until the whole hillside is involved, taking trees, boulders, and anything else in the way. Now stop: Take a mental picture of the landslide in full force. Step back and look at the frozen picture. Everything on the hillside that started off peacefully and at rest is in the process of roaring toward the bottom of the slope.

If you looked at your picture of the landslide from afar, you'd see a cloud of dust and dirt at the front edge of the sliding mass, and lingering far behind it. The dust cloud itself would actually hide much of the larger detail of rocks and trees crashing along the slope. Without looking at the larger debris contained in the mess, could you determine the makeup and extent of the landslide from the dust cloud alone? For the most part you could, and that's how oil analysis works.

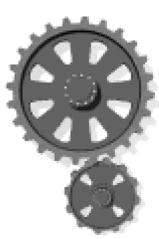
Normal vs. abnormal

One of the limitations to oil analysis is that we can only tell you about the wear metals that we can see with the spectrometer, which are between about 1 and 15 microns in size. (How big is a micron? One-millionth of a meter. One inch contains 25,400 microns. The period in this sentence is about 615 microns.)

If you have a mechanical problem with your engine, the oil filter or screen should collect the larger metallic particles (usually those larger than 40 microns). These are the boulders in the landslide. There is also a wide range of rocks and stones present in the landslide that don't become airborne. They still ride the slide to the bottom of the hill, but they don't hang suspended in the dirt cloud. These are the particles that else to get *you* an analysis for the holidays, find subtle ways to work it into the conversation: “Say, honey, you know what would be cheaper to get me than a new Bonanza? How about an oil analysis?”

Blackstone and the holidays—who knew gift buying could be so great?

PS—The response was overwhelmingly positive for keeping the oil change stickers, so look for them in your next batch of kits! Thanks to everyone who responded.



fall out of suspension and don’t make it to the lab with your oil sample.

Then there’s the dust cloud. We compare the “dust” we see in an oil sample to what is average for a particular type of aircraft engine. We expect all mechanical machines to produce wear in the course of normal operation. But there is normal wear, and there’s abnormal wear. When we find abnormal wear in your “dust cloud,” we may be looking at a potential landslide in your engine.

Avoiding the trees

Fortunately, we don’t have to wait for a landslide to occur before we can determine what’s going on your engine. While the dust cloud accompanying the slide is a one-time occurrence, we can repeatedly analyze the oil from your engine and see trends developing. One snapshot gives you a look at whether the dust we find appears normal or abnormal. But a series of snapshots gives us a clearer picture of the condition of the engine. By trending the results from one oil change to the next, we can see whether the dust cloud is growing or subsiding. If it’s growing, eventually there will be boulders and you’ll need to take action to save the engine.

Occasionally we are asked about the dust: How much is too much? In other words, when someone has a particular metal that’s reading high, they often want to know how high it needs to be before they really start to worry. The answer is, there’s no single answer.

Lots of things affect the amount of wear we find — the type of engine it is, how it’s flown, and what conditions it’s operated in. What’s more important than the level of wear is the wear *trend* that’s developing. Someone who flies more than 30 hours a month is going to find different, and lower, wear than someone with the same engine who only gets airborne once a year. If the occasional pilot’s wear is always high, and it always reads at about the same high levels from sample to sample, we’d probably consider it normal for that particular engine. If the frequently operated engine was producing low, steady wear, and then wear suddenly increased, we’d worry. That’s why it’s important to establish wear trends for your particular engine, and why we can’t always say, “Okay, when iron gets to X level, it’s a definite problem.”

Avoiding the full-on, catastrophic landslide is not hard to do if you practice routine oil analysis. To keep the boulders and trees out of your oil, pay attention to what you find when you change the oil and look at the filter. Some metals are normal in new engines, but once past about 100 hours, you should not be normally finding any metals that you can see. If you do find metal, it’s probably not too late to stop the slide — but it’s better to avoid it in the first place, if you can, through the trend analysis of your engine’s wear.

Report of the Month

What’s wrong with this O-470-R engine? See the caption below for an explanation.
Don’t look right away -- take a good look at the report first.

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

MI/HR ON OIL	35	UNIT/ LOCATION AVERAGES	34	35	34	33	UNIVERSAL AVERAGES
MI/HR ON UNIT	805		793	736	701	667	
SAMPLE DATE	6/1/04		2/20/04	12/11/03	10/15/03	9/12/03	
ALUMINUM	34	18	**10**	11	14	17	8

CHROMIUM	17	12	12	11	10	10	9
IRON	140	105	95	90	119	141	40
COPPER	9	8	7	7	7	7	5
LEAD	5024	3942	3962	4181	4029	3795	2643
TIN	1	1	1	0	0	0	1
MOLYBDENUM	5	4	4	4	4	3	1
NICKEL	23	13	16	13	11	10	4
POTASSIUM	0	0	0	0	0	0	0
BORON	0	0	0	0	1	0	0
SILICON	1	1	0	0	0	1	1
SODIUM	1	1	0	0	0	1	1
CALCIUM	4	5	4	8	8	4	2
MAGNESIUM	2	1	1	2	1	2	1
PHOSPHORUS	886	876	859	955	896	862	389
ZINC	4	4	2	5	6	3	6
BARIUM	0	0	0	0	0	0	0

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				89-105	>445	<1.0	-	<0.0	<0.6
TESTED VALUES WERE				99.9	495	<0.5	-	0.0	0.6

Iron and nickel had been reading high for many months in this TCM engine. Although they were higher than average, they did not show any changes that would indicate a new problem developing, and since the engine was running well, we recommended simply monitoring wear -- until things changed. When aluminum and chrome suddenly increased and the iron and nickel started inching up, the entire report turned cautionary and we recommended having a mechanic take a closer look at the engine. As it turns out, the gap on the piston rings was too tight, which caused piston scuffing (aluminum, chrome, and iron), and the valve stems were going bad (nickel). Wear increased either because the owner changed the way he operated the engine, or because the poorly wearing parts finally took a toll and started producing more metals.

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