The Oil Report

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

New! Aircraft Oil Change Stickers

One of the problems with changing aircraft oil -- especially if you change it yourself -- is that you have to dig out the log book to remind yourself when the oil was changed last. Wouldn't it be nice if someone came up with a handy oil change sticker, like they put in your car when you get it changed at a quick lube place?

BLACKSTONE LABORATORIES

As a matter of fact, we've come up with just that! We have created our own oil change stickers that you can use as a reminder for when to change your airplane's oil in the future. We will include one with each sample kit we send out. Look for yours in the next batch of kits you receive! We hope you'll find them helpful.

Spotlight on... the Nature of Oil

by Jim Stark

Long before Ray Kroc and others dotted the landscape with fast-food franchises, we had drive-in restaurants with limited menus that laid the foundation for today's fast-food venues. This was in the 1950s and early 1960s. The drive-ins had both a drive-up (where you ate in your car with a tray attached to the window) and inside service, and the restaurants catered mostly to the tastes of young people. That is probably one of the reasons why the drive-in didn't really make it in the long run — young people, as much as they loved to work on their social skills at places like drive-ins, were, in that period, remarkably broke.

I frequented a drive-in called Dale's. The seating in the dining room was at lopsided, linoleum-topped tables surrounded by cracked, vinyl-clad booths. These restaurants (always at the lower end of the food-service chain) were not air-conditioned. On a humid summer evening you could observe a unique phenomenon that demonstrated an interesting property of oil.

As we sat there joking with friends, our cold glasses of soda would sweat, causing water to pool beneath the glasses. Before your very eyes, your glass, as if by magic, would start to move across the uneven tabletop. Water would collect in a pool at the base and underneath the glass, and the water's surface tension was strong enough to overcome the weight of the glass and its contents. The water became a lubricant.

Oil has the same ability (only to a greater extent) to collect in a pool on a surface or between two parts and keep the surfaces from touching. This is one of the properties of oil that makes it so useful: It coats and protects parts, virtually eliminating friction between surfaces.

The Liquid That Acts Like a Solid

Oil has several purposes in a machine. It lubricates, cleans, and cools, carrying heat and debris away from surfaces of the parts it lubricates. Though a machine such as an internal combustion engine is made of metal parts, none of the parts actually touch, thanks to the oil. (If you hear a ticking or knock from your engine, that means parts are probably overcoming the lubricant and touching, and the engine may be headed toward failure.)

Oil, like any liquid, is non-compressible. It is this property that allows hydraulic systems to work. If you put oil in a closed vessel like a cylinder and press down on it with a piston, the oil will apply equal pressure to all the surfaces containing it. You can apply as much pressure as you want,

but the oil will not compress. In this respect, the oil acts like a solid: although it is constantly flowing, it serves as a “wall” between the machine’s parts, keeping them from touching.

Imagine the oil in your engine. It’s under pressure, so it’s acting like a soft, solid cushion and keeping the crankshaft from touching the friction bearings in which it rotates. In this scenario, the “solid” nature of the oil can be helpful or harmful, depending on its condition. When we find wear metals in your oil, it’s the oil that’s causing the parts to wear, not (usually) contact between metal parts. If the cushion of oil between the rotating shaft and the bearings is clean, it’s like a slick tongue of Teflon. If it’s dirty, it acts more like an abrasive pad. That is why it is vital to keep your oil clean if you expect to get long life from an engine or any other type of oil-wetted machine.

Well, you might think, that is why we use oil filters. And indeed, oil filters do help keep the oil clean, but only a little. Early engines didn’t have filtered systems, and there was debate for many years after they were introduced whether they were really necessary and whether people would be willing to pay for them. Filters can only filter out the largest particles from the oil. The finer particles pass on through and cause abrasion at the oil-wetted parts. Dirty oil in an unfiltered system could be thought of as a 50-grit pad at the bearings. Dirty oil in a filtered system would still be a 220-grit pad.

What is this and what does it have to do with your oil sample? To find out, read our new article on how oil analysis works by clicking here.

The Importance of Viscosity?

The viscosity, or thickness of the oil, is not nearly as important as many people think. Oil retains its nature no matter what thickness it is. Think about this: automakers are continually recommending lighter multi-grade oil in new engines. The reason is increased efficiency. It takes power to pump oil through an engine, and the lighter the oil, the less power required to pump it. The oil’s ability to act like a solid and protect parts is not related to its thickness.

If that doesn’t sound quite right, consider this: The gears in a heavy duty Allison automatic transmission are doing the same work as the same machine equipped with an Eaton manual transmission. Due to the hydraulics of the automatic, it runs on a 10W automatic transmission oil. But the manual transmission uses a very thick (sometimes up to 90W) gear lube oil. The gears of both types of transmissions will have a similar life span. We don’t find any significant differences in wear, regardless of oil thickness.

Oil’s Fourth Function

Oil is a wonderful substance that allows machines to work. It lubricates, cleans, and cools. If you use oil analysis, your oil has a fourth function too: The ability to provide information about how a system is wearing. Machines of similar manufacture will wear similarly. The wear levels present in a machine’s oil can provide useful information about the unit’s mechanical health. A poorly wearing machine will fail sooner. A really badly wearing machine may be in the process of failing, but if you catch the problem in time, you might be able to fix it, giving the engine new life.

Oil analysis is a relatively new technology compared to the many decades the industrial revolution has been with us. As its benefits become more clearly understood, we are only left to wonder, why didn’t someone think of this sooner?

Report of the Month

What's wrong with this 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	26	UNIT/ LOCATION AVERAGES	25	25	25	25	UNIVERSAL AVERAGES
MI/HR ON UNIT	1,322		1,296	1,271	1,246	1,221	
SAMPLE DATE	10/26/03		08/25/03	06/24/03	05/22/03	02/19/03	
ALUMINUM	3	3	**2**	3	3	3	5
CHROMIUM	2	3	2	2	3	3	6
IRON	9	11	9	8	10	10	13
COPPER	3	3	3	3	2	3	4
LEAD	2605	2620	2452	2357	2658	2831	2810
TIN	0	1	1	2	3	0	1
MOLYBDENUM	0	0	0	0	0	0	0
NICKEL	1	1	1	1	0	1	1
POTASSIUM	0	0	0	0	0	0	0
BORON	0	0	0	0	0	0	0
SILICON	5	6	5	7	5	6	6
SODIUM	1	1	1	1	0	0	1
CALCIUM	2	2	1	1	1	5	5
MAGNESIUM	3	3	3	3	3	4	4
PHOSPHORUS	1111	1055	1183	1083	1130	1101	915
ZINC	6	4	3	4	3	4	4
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				82-105	>440	<1.0	-	<0.0	<0.6
TESTED VALUES WERE				91.0	470	<0.5	-	0.0	0.4

It was a trick question -- nothing is wrong with this engine! In fact, this is a perfect oil analysis report. When we are trying to determine whether an engine is normal, we not only compare the sample data to universal averages (which show typical wear for that type of engine), but we look to see whether the engine is producing steady wear trends. This engine, a Lycoming O-540-A1A5, is wearing perfectly, and the owner is obviously taking good care of it. We think the owner could even run more hours on the oil, though the 25-hour oil change is serving the engine well. We couldn't find a thing wrong with this engine. We thought you might enjoy seeing a perfect report for once, but don't worry -- you'll find a wretched one again in the next issue of *The Oil Report*.

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