The Oil Report

August 2005

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

Coming Soon: On-line Reports!

We are currently working on a program that will allow all Blackstone clients to access their current and past reports over the internet. For the time being, we are still planning on emailing your report to you when it's finished, though at some point in the future we may switch to sending an informational email that alerts you when your report is done. Then you can log in and view the report. If you have an opinion either way about whether you'd like to get an email with the actual report, or get an email letting you know it's ready, let us know! We want to know what works best for you. (Just reply to this email to let us know your thoughts.) Of course, hard copies will still be available to those who want them.

Spotlight on...

Total Acid Number

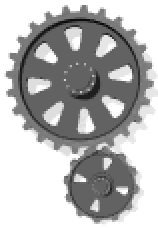
by Jim Stark

When I first opened Blackstone, the very first report form I designed had a spot to report the pH of oil. Then I wasted a few months trying to find a pH meter that was sensitive enough to accurately read the pH of oil. Had I paid better attention in chemistry class, I would have remembered that you can't run a pH on oil because it doesn't have a bipolar molecule. Water molecules, for instance, have a positive charge on one end and a negative on the other. Determining pH is possible with such molecules. But if a salesman should ask you to buy a pH meter to determine the acidity of your oil, ask him what he has in the way of bridges to sell.

There's Water in my Oil?

Oil is made up of hydrocarbon chains that are enough at peace with themselves that they suffer no bipolarity. So, although we speak of oil as being acidic, it is only for ease of expression. What we really should say is, "Although oil doesn't actually become acidic, there is always a little moisture in oil, and the tiny droplets of moisture can and do become acidic, and therefore…" Or, "A perfectly dry oil can't become acidic, but because there is no such thing as a perfectly dry oil…"

Wait, there's no such thing as dry oil? In the fuel laboratory I put together before starting Blackstone, we had a machine called a Karl Fischer that measured moisture in parts per million (ppm). The driest I can recall any fuel or oil being was about 40 ppm. At Blackstone we run tests that identify moisture down to 400 ppm, which for all practical purposes is the level at which moisture can start to be a problem for some types of systems. We call 400 ppm a trace. Below that level we refer to the oil as dry. Most industrial types of oil will contain moisture at 40–400 ppm. (If you need to know the exact ppm water present in a sample, we can run a Karl Fischer water test for you, though it takes a little longer to get the results since we send it out.)



Oil & Water Don't Mix…Right?

Oil and water don't mix on the molecular level. But let oil sit out in the open and it sucks up moisture (usually from the air) like a sponge. The moisture that exists in oil resides in minute droplets, each with the propensity for becoming acidic. An oil-wetted system that stays in motion will never suffer internally from a corrosion problem. When the motion ceases, the oil drains to a reservoir or sump, leaving a very thin skim of oil on the surface of the parts. The tiny (microscopic, usually) droplets of moisture stay there too. If they are left on the part's surface too long, surface pitting begins where the droplets have taken up residence. If the droplets are acidic, the corrosion begins immediately.

The additives in industrial oil tend to be alkaline in nature. They are usually sulfur or phosphorus compounds that will neutralize acids for long periods of use, as long as there isn't too much moisture present. After long-term use, traces of the additives can become free molecules that join with moisture to become sulfuric or phosphoric acids. It's bad practice to leave oil in place that will eat, rather than protect, the vital parts of a machine.

Where TAN Comes into Play

The Total Acid Number Test (TAN) is an accurate measure of how acidic a sample of oil has become. Different types of oil start out with different levels of acidity, so it's good to know the starting point for your oil. If you tested the acidity of the oil in a machine that has a history of corrosion problems, you will probably find the TAN increasing month to month.

Only the onsite oil maintenance manager can determine which oils need TAN testing. Most oil doesn't require the test. But when the test is needed, there is no other test we can offer you that can help determine the acidity of the oil like the TAN.

Report of the Month

What's wrong with this press? 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		UNIT/ LOCATION AVERAGES					UNIVERSAL AVERAGES
MI/HR ON UNIT							
SAMPLE DATE	3/16/05		12/15/04	10/13/04	10/22/03	10/13/02	
ALUMINUM	13	0	**1**	0	1	1	1
CHROMIUM	0	0	0	0	0	0	0
IRON	47	15	**44**	**5**	**41**	44	24

Elements in Parts Per Million							
COPPER	339	17	19	11	17	20	34
LEAD	45	4	**3**	**0**	**2**	6	7
TIN	21	1	0	0	2	1	2
MOLYBDENUM	1	0	0	0	0	0	0
NICKEL	4	0	0	0	0	0	0
POTASSIUM	0	0	0	0	0	0	0
BORON	0	0	0	0	0	0	0
SILICON	2	1	3	0	3	3	2
SODIUM	8	7	5	4	5	9	15
CALCIUM	19	23	9	11	10	23	30
MAGNESIUM	6	3	1	2	1	3	4
PHOSPHORUS	204	195	230	177	198	209	97
ZINC	29	29	30	26	29	33	57
BARIUM	0	2	0	0	1	1	3

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				88-99	>455	-	-	<0.0	<0.6
TESTED VALUES WERE				87.8	460	-	-	0.0	0.5

Note that they had been samping once a year in the fall; they suspected a problem, which led to more frequent sampling at the end of 2004 and early 2005. Sure enough, the abrupt upturn in wear shows a bronze bushing rapidly deteriorating. We found visible bronze shavings in the insolubles. Fortunately, the company was able to repair the machine quickly, avoiding unexpected downtime and losses.

416 E. Pettit Ave. Fort Wayne IN 46806 (260) 744-2380
bstone@blackstone-labs.com