BLACKSTONE LABORATORIES

The Oil Report
July 2011
Oil the News that's Fit to Print!

What's the best oil to use? Everyone has an opinion, and the truth is, there isn't one best answer. We've written about this very issue here. Got some time on your hands? Feel free to click around on our vast trove (er...maybe only somewhat vast) of other oil-related articles.

The Many Faces of Silicon

by Ryan Stark

When you hear the word silicon, what comes to mind? Maybe silicon computer chips, dirt, glass, gel-filled implants? It's the most abundant element on earth, mainly in the form of dirt and sand, though there are numerous other compounds that can be made of silicon. The compound **silicone** is made by Dow Corning and is the most common other form of silicon, at least that we deal with. It usually either comes in the form of spray lubricants or sealers and is harmless to a certain extent.

A big part of our job is distinguishing the source of the silicon that we find in industrial samples. We only read the elements and not compounds, so when we see high silicon, we have to look for other clues to know if it's a problem or not. Mostly we look at wear metals. If silicon reads high and wear metals are high, then silicon is often from dirt of some sort. If wear metals are low, then it's a safe bet to assume the silicon is from a harmless source like a sealer. Of course, it's possible the silicon had just entered the system when the sample was taken, and didn't have time to cause any extra wear. It's also possible there was contamination in the bottle itself before the oil was added, though that would be a rare occurrence.

Another common source for silicon in the oil as dirt is the environment around the machine. If your hydraulic machine is located in a foundry, then dealing with dirt and sand is just part of the job. But if that's not the case, then maybe a cap was left off of a reservoir and the oil is being exposed to shop air. Dirty rags used to clean parts are another source of dirt contamination. Because it's so common, it's impossible to avoid all the sources for dirt, though if you look at a machine with an eye toward keeping dirt levels low, you would be surprised how many possible sources there are.

Anti-foam additives in the oil itself are another source of silicon. If you see high silicon in all of the samples from your facility, take a look at the incoming oil. Chances are good it will have some anti-foam additive present to start with. In those cases it's helpful to get a baseline of silicon in your new oil, so you can get any idea of what's normal and what's not. This will help you decide whether or not the oil actually needs to be changed, potentially saving you thousands of dollars in oil, labor, and disposal cost.

Report of the Month

These two samples both have a lot of silcon in them, but only one is a problem.
Can you figure out which one? Look at the data, then read the caption below.

To learn more about where the elements are coming from, click here.

Sample A

ELEMENTS IN PARTS PER MILLION		UNIVERSAL AVERAGES
MI/HR on Oil	18	
MI/HR on Unit	18	
Sample Date	05/09/11	
ALUMINUM	4	5
CHROME	1	1
IRON	29	29
COPPER	24	13
LEAD	3	4
TIN	11	6
MO LYBDENUM	182	112
NICKEL	0	0
PO TASSIUM	5	4
BORON	64	57
SILICON	229	126
SODIUM	15	10
CALCIUM	1919	2302
MAGNESIUM	24	242
PHOSPHORUS	714	962
ZINC	856	1176
BARIUM	1	1

PROPERTIES		Values Should Be
SUS Viscosity @210°F	59.1	56-63
cSt Viscosity @ 100°C	9.95	9.1 - 11.3
Flashpoint in °F	420	>365
Fuel %	<0.5	<2.0
Antifreeze %	0.0	0.0
Water %	0.0	<0.1
Insolubles %	0.1	<0.6
TBN		
TAN		
ISO Code		

Sample B

ELEMENTS IN PARTS PER MILLION		UNIVERSAL AVERAGES
MI/HR on Oil	27	
MI/HR on Unit	170	
Sample Date	02/23/11	
ALUMINUM	2	1
CHROME	0	0
IRON	7	7
COPPER	9	5
LEAD	6	2
TIN	0	1
MO LYBDENUM	9	31
NICKEL	6	1
PO TASSIUM	5	1
BORON	5	40
SILICON	52	29
SODIUM	257	12
CALCIUM	1760	1788
MAGNESIUM	28	418
PHOSPHORUS	775	976
ZINC	849	1166
BARIUM	0	0

PROPERTIES		Values Should Be
SUS Viscosity @210°F	52.3	46-59
cSt Viscosity @ 100°C	7.96	6.0-10.2
Flashpoint in °F	400	>355
Fuel %	<0.5	<2.0
Antifreeze %	0.0	0.0
Water %	0.0	<0.1
Insolubles %	0.3	<0.6
TBN		
TAN		
ISO Code		

Sample A has a whopping 229 ppm silicon in it, along with high wear. Sample B has just 52 ppm silicon — still high, but not nearly as high as the other one. Plus, wear is lower in Sample B. Yet Sample B is the one in which silicon is abrasive and causing poor wear. Sample A is a wear-in sample — note that the oil and the engine both have just 18 hours. Most of that silicon is harmless, coming from sealers, and the metals are from new parts wearing in. Sample B, however, is well past wear-in at 170 hours, and it should have avreage silicon and wear. Instead silicon is causing elevated wear (see lead, from bearings, and nickel, which is an alloy in steel parts).