BLACKSTONE LABORATORIES

The Oil Report
February 2014

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The Fine Art of Comments

by Kristin Huff

We were knee-deep in reports on a Wednesday afternoon when the phone rang, someone wanting to speak with us about a report. "Who's calling, please?" It was Continental on the line — that's right, the same Continental that built half the general aviation engines in use in the United States. The call, understandably, went to Ryan Stark, Blackstone's president.

Over the course of the call, a technical advisor on the other end let Ryan know that they did not appreciate this report, which we sent out over the summer of 2010. The report was on an IO-550 in a Cirrus, and it was making a lot of metal (see Figure 1).

"This guy just spent $600,000 on this aircraft!" said the technical guy. "Now he's demanding a new one because his wife is afraid to fly in it! And there's nothing wrong with his engine!"

A Balancing Act

The comments section is what sets us apart from most of the other labs out there (well, in addition to our good looks and winning personalities, that is). Most of you probably use us because of the comments section: it's where we offer our opinion about what's going on and let you know if the data looks like a problem or not.

We have used comments from the very beginning. Blackstone's founder, Jim Stark, had seen a two-line comments section in reports from fuel labs, but when he started Blackstone he found that two lines sometimes wasn't enough room to say what he wanted to say. He expanded the section to six lines, though those early comments -- back in the 1980s when Jim was the only analyst and typed each one on a typewriter, correcting errors with white-out by hand -- were sometimes brief. (Here's one from 1994: "RAY: Exxon Turbine oil in this sample was clean and dry. No significant wear or additive found in the oil.") Writing reports is, of course, easier these days, but we're still true to Jim's original vision for reports. "We can talk to customers as if we're having a conversation with them," he explains.

But it's a fine line we walk when the data is nebulous. Sometimes wear is bad, and we aren't sure whether that's because of a problem or because of some unknown factor that we aren't aware of. Maybe the owner just bought it and the last person neglected it. Maybe the engine has had an overhaul and new parts are wearing in. Or maybe, just maybe, the engine has a problem.

When the Report is "Bad"
When we report that metals are higher than average, we often don't know why they're out of line. If the data looks really weird we will have the sample re-run, just to make sure there's not been an error on our end. If the data is correct and the engine is not looking good, we'll generally give you a call to see if there's something we need to know, and to give you a heads up about the results. These calls are usually illuminating for us: we can find out if the car is a beater, the aircraft has been inactive, the engine has just had an overhaul, or if there's some other mitigating factor that will change what we say in the comments section.

ELEMENTS IN PARTS PER MILLION	MI/HR on Oil	49	UNIT/ LOCATION AVERAGES	11	40	UNIVERSAL AVERAGES
	MI/HR on Unit	940		849	837	
	Sample Date	08/03/10		04/23/10	03/26/10	
	ALUMINUM	7	6	5	8	7
	CHROME	23	15	13	21	9
	IRON	102	76	47	88	48
	COPPER	26	17	9	16	6
	LEAD	8618	5913	3377	6882	6176
	TIN	3	5	2	2	1
	MOLYBDENUM	6	5	3	5	4
	NICKEL	42	25	23	33	11
	POTASSIUM	0	0	0	0	1
	BORON	0	1	2	0	1
	SILICON	7	5	5	7	5
	SODIUM	1	1	0	1	1
	CALCIUM	2	2	0	2	34
	MAGNESIUM	2	1	0	1	1
	PHOSPHORUS	833	818	1118	1045	668
	ZINC	13	6	4	8	7
	BARIUM	0	0	0	0	0

Figure 1: That's a lot of metal. Enough to warrant a new engine? Maybe. Or maybe not.

If the reason for the metal isn't obvious, a "bad" report might be just the start of an investigative process on your end to see what's going on. The Report of the Month (page 4 of this newsletter) is a good example. The owner of that F150 had been seeing steady wear trends for years, so when he got his report back and saw the significant jump in metal, he decided to check into it further. (Read the caption on the Report of the Month to see what went wrong in that case.)

We are giving you our opinion in the comments section, but even that is a balancing act. In the Continental-disputed report, Jim wrote that the engine might not last as long as it should at the rate the engine was producing metal. Now that's the kind of report that gets your blood going. But the point wasn't that we were telling him to try and get a new engine. Instead we wanted to draw his attention to a potential problem. We would rather err on the side of caution and have someone investigate something that doesn't turn out to be a problem, than let something slide that turns into a major headache or a serious catastrophe.

We've heard from lots of people who don't agree with our comments, so it's best to keep in mind that the comments are just our opinion. We got a call from Amsoil once when they took issue with my suggestion that a user try a different oil, in hopes that his wear would improve. It took me a long time to convince Amsoil that we weren't trying to bad-mouth their oil, but that in some cases a different oil might be warranted. I never did convince the guy, but at least Blackstone and Amsoil are still on speaking terms.

When the Report is Good
Good reports are easy to write, and fortunately for us, most of them really are good. Cars, trucks, and other land-borne engines don't usually have problems with corrosion and can typically run the oil a lot longer than they used to. Aircraft engines are a bit more sensitive, though those reports too are overwhelmingly positive. And good reports are fun to write.

We like to be creative, so any information you give us on the oil slip can be a launch pad for us to write

something interesting back. Here's a sample I got back when I did the oil from my lawn mower (a Toro): KRISTIN: Este bull, late el corazón con la sangre de un guerrero. Puede vivir para siempre. Viva el Toro! (This bull beats the heart with the blood of a warrior. It can live forever!)

We tend to be more merciless with each other than we would be with our customers. I wrote this one for Alex when I found out his Honda Fit is named "Ivy Plumberry": ALEX: Ivy Plumberry sounds like the name of a Cabbage Patch Kid, or possibly someone from Barbie's Fairytopia. Admittedly, both are geared toward a younger set, so if you are unfamiliar with them I'll be happy to loan you my 8-year-old daughter for a couple of hours. Alternately, you could rename your car.

Information is Gold

So back to Continental. The owner dropped way back on his oil changes and as a result had less metal in the oil, though it never did settle down (see Figure 2). That engine is still making more metal than most, but it was still running as of last summer. But whether or not our comment was inflammatory is beside the point. We always have and always will strive to provide good information to our customers, and you know that you are not getting results that are biased in favor of any oil or company.

What we (and you) can take away from this is two things. One, high wear doesn't necessarily mean you need or deserve a new engine. (In some cases it might, but as my grandma says, you catch more flies with honey than vinegar.) And two, give us as much information as you can. If you or your mechanic is the sort who might be lucky to remember to write down your name but leaves everything else off the oil slip (time on the oil or engine, oil type, or any work or inactivity that might shed light on the report), try to remedy the situation. We do our best to provide accurate reports, but we do a lot better when we have all the information.

Ryan's conversation got a little heated that day in August. From the next office over, I could hear his voice, sometimes getting worked up, sometimes not. In the end, we call it like we see it. Engine and oil manufacturers might not agree with what we're saying, and heck, even you may or may not end up following our recommendations. "A lab's business is answering a question, either asked or implied," concludes Jim Stark. "The report answers that question, and usually it can be done in one line. That allows us five lines to talk, or explain what we're thinking." In the end, we try to give you the information you need -- in plain English -- to make an informed decision about your engine.

ELEMENTS IN PARTS PER MILLION								
	MI/HR on Oil	30	UNIT/ LOCATION AVERAGES		40	78	23	UNIVERSAL AVERAGES
	MI/HR on Unit	1,542				1,074	995	
	Sample Date	07/09/13		10/09/12	07/19/11	04/26/11	10/25/10	
	ALUMINUM	5	7	5	8	5	5	7
	CHROME	8	14	9	12	9	14	8
	IRON	62	78	77	70	69	66	48
	COPPER	16	16	21	17	15	13	6
	LEAD	6936	5993	6127	5188	4986	5030	5855
	TIN	0	4	1	0	25	0	1
	MOLYBDENUM	2	5	3	3	5	4	3
	NICKEL	18	25	22	21	15	25	11
	POTASSIUM	0	0	0	0	0	0	1
	BORON	0	1	2	2	2	0	1
	SILICON	3	6	3	11	5	4	5
	SODIUM	1	1	2	2	0	4	1
	CALCIUM	1	3	1	2	1	1	47
	MAGNESIUM	1	1	1	1	1	4	1
	PHOSPHORUS	1188	766	1098	1055	907	948	553
	ZINC	6	6	8	7	5	5	7
	BARIUM	0	0	0	0	0	0	0

Figure 2: The plane is still flying and wear has settled down somewhat.

Report of the Month

Something went wrong in this F150's 5.4L V-8 engine. Can you figure out what?

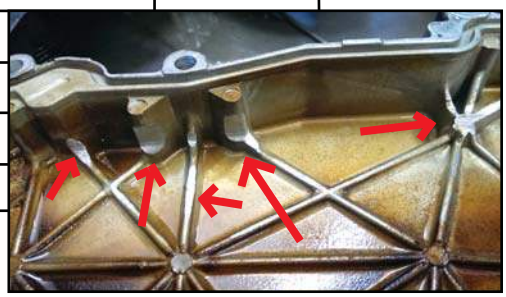
To learn more about where the elements are coming from, click here.

ELEMENTS IN PARTS PER MILLION								
	MI/HR on Oil	10,000	UNIT/ LOCATION AVERAGES	7,000	6,000	6,000		UNIVERSAL AVERAGES
	MI/HR on Unit	133,000		123,000	100,000	67,000	19,000	
	Sample Date	12/01/13		04/07/13	11/16/11	04/04/09	12/24/05	
	ALUMINUM	48	4	5	4	4	3	6
	CHROME	2	1	1	0	1	0	2
	IRON	39	14	19	11	20	12	34
	COPPER	6	4	4	9	2	2	11
	LEAD	1	1	1	1	0	0	12
	TIN	1	1	2	0	1	0	2
	MOLYBDENUM	26	61	81	71	41	37	56
	NICKEL	2	1	1	1	1	0	1
	POTASSIUM	2	1	0	3	1	0	9
	BORON	30	75	42	42	42	52	44
	SILICON	23	12	12	12	15	14	21
	SODIUM	6	5	9	7	6	3	38
	CALCIUM	2290	2078	2255	2122	2287	1887	1999
	MAGNESIUM	23	17	23	17	18	13	218
	PHOSPHORUS	680	660	694	704	670	637	790
	ZINC	724	756	753	731	753	800	944
	BARIUM	0	4	0	0	0	0	1

ES			Values Should Be*				
	SUS Viscosity @210°F	50.2	46-57	49.8	51.5	50.2	51.4
	cSt Viscosity @ 100°C	7.32	6.0-9.7	7.20	7.73	7.32	7.70
	Flashpoint in °F	365	>355	375	375	360	365
	Fuel %	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5

Broken timing chain tensioner

Tensioner, removed



The worn timing-chain cover

Although the engine had a slight rattle dating back to 37,000 miles, his wear numbers were okay for years before things went south. The noise progressed to an occasionally much longer rattle just before the December oil change, and when wear shot up in analysis the owner decided to take a closer look. Less than three hours after taking it into a shop, he got a call from the mechanic, who couldn't believe how lucky the guy was. "Half of the tensioner assembly broke and fell down into the oil pan. This allowed a significant amount of slip in the timing chain, which allowed the chain to "machine" the inside of the timing cover. He was surprised the chain was still on the sprockets. Had it fallen off, the pistons on that side would have made sweet, sweet love to the valves in that head, leaving me with four operable cylinders until the loose chain worked its way into the operating chain, to finish off the whole mess in a bang. All related timing chain parts for both banks are being replaced now. Without the oil test in December 2013, I would have just kept on driving until something catastrophic happened. Thanks for your help!"