The Oil Report

June 2006

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

Blackstone Online: Oh So Close!

We mentioned in a previous newsletter that we are working on getting all our reports online so you can access them any time. And we're almost there! The new service should be up and running by mid-summer.

BLACKSTONE LABORATORIES

You'll be able to log on with your user name and password to see all the reports we've done for you, and print or email them from there. You'll also be able to see your billing/invoice status and make changes to your account (new address, different email, etc.). We will be emailing you soon about this new service!

Spotlight on... Leaded Gas... Then & Now

by Jim Stark

It was a sweet thing, being young and free with my childhood behind me and nothing but hopes and dreams ahead. I worked two consecutive eight-hour jobs every workday and didn't think it a burden. Early I was a checker at a government storage depot. After grabbing a sandwich en route, I arrived for the second eight hours at a gas station. Paul Henry's Cities' Service station was a bustling success following several failures on the same corner. His secret? Charming old ladies in a nearby housing addition into buying new tires and other auto needs at his station.

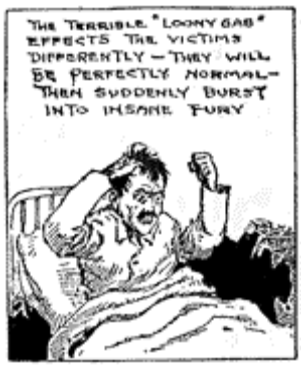
Charming as Paul could be, he ran the station with an iron fist. A car arriving on his ramp drove over a pneumatic tube that rang a bell. We had 15 seconds to get to the driver's window to ask, "Fill 'er up with ethyl?"

The gas available back then was either regular or ethyl. The ethyl was more expensive and was spiked with tetraethyl lead (TEL), a knock suppressant. Once the nozzle was set, we would wash the windows, then pop the hood to check the oil. We would also survey the engine looking for belts or hoses that needed to be replaced.

2006 is a different time. Personalized service is rare, gas prices are more than ten times what they were then, and there is no ethyl. The self-serve pumps offer up three grades and they are all marked "unleaded," as if someone was kind enough to take the lead out for you.

Lead is not a naturally occurring element in gasoline. A company named Delco began experimenting with adding lead to gas around the turn of the century (the last century, that is). GM bought Delco in 1916, and around that time Du Pont began acquiring shares of GM. In 1922, GM contracted Du Pont to supply TEL. In 1923 leaded gas went on sale in some markets, and several years later leaded fuel was introduced for aircraft.

Employees at the plant that made the TEL began calling the additive "loony gas" due to the number of workers who became



Courtesy of radford.edu.

violently insane after exposure to the TEL fumes. Though the detrimental effects of lead on human health were identified by the US public health community early on, leaded gas continued to be used. Eventually, lead's detrimental health effects were more universally recognized.

In 1972 the EPA announced a phaseout of leaded gas in the US. Health benefits were part of the reason for the change; another reason was to protect the catalytic converters that were starting to appear in cars. (Using leaded gas caused a degradation in the catalytic converters, which help control air pollution.) During the phaseout, leaded and unleaded fuels were sold side by side at the pump, with unleaded gas actually costing more. The leaded pump had a larger diameter nozzle so you couldn't pump it into a car requiring unleaded, which had a narrower gas tank neck.

Leaded gas and aircraft

Tetraethyl lead is, of course, the additive used in all aviation gas. It is also used in racing gas and a few other low-volume applications. The reason that aircraft were exempted from the EPA's ban on leaded gas is that air-cooled, high-compression engines require an additive of some type to prevent detonation, and nothing so far has met that need like TEL.

According to AOPA, there is currently one producer providing all the TEL for the nation's general aviation fleet, and that producer is not necessarily committed to producing TEL after 2010. Even if TEL is available after that, it will undoubtedly become more expensive. Airport operators and FBOs cannot feasibly afford to keep a variety of grades of aviation fuel on hand, and fuel producers are not going to be inclined to produce multiple grades of aviation fuel.

So if leaded gas is on the decline, what will the GA fleet use for fuel in the coming years? As the APOA stated in one of its regulatory briefs, 100LL is a "specialty fuel" that is produced in relatively small amounts. At best, "100LL will become increasingly more expensive relative to other petroleum products. At worst, it could be unavailable altogether," therefore, a replacement fuel must be found soon. The search for 100LL's replacement is underway, though it may be years before an acceptable alternative is found.

When it is found, it will make our job analyzing your oil a lot easier. The lead in your oil report is primarily an accumulation of lead blow-by products. The problem with it being there at several thousand ppm is, it obscures bearing wear from your engine. Bearings are coated with babbit, which is lead alloyed with copper and tin (usually, though other metals are occasionally used).

Doing an analysis on any unleaded gas or diesel engine makes reading bearing wear a piece of cake. Bearings are the heart of an engine. If they start wearing poorly, a catastrophic engine failure isn't far down the road. This would be nice information to provide pilots and aircraft operators everywhere, but lead from bearing wear generally measures at less than 100 ppm, and it is simply covered up when leaded gas is used. We still have copper and tin to work with,

but both these metals can also come from bronze wear.

Leaded fuel's long and sometimes dark history in the US will be coming to an end at some point in the future, and when it's gone it will likely be to the benefit of the health of everyone who comes in contact with it. It will also benefit your oil reports, since we'll be able to tell you about the health of one more critical component of your engine—the bearings.

Note: We drew on several sources for this article, including:
http://www.aopa.org/whatsnew/regulatory/regunlead.html
http://www.radford.edu/~wkovarik/ethylwar/
http://www.thenation.com/doc/20000320/timeline
http://en.wikipedia.org/wiki/Gasoline

Report of the Month

What's unusual about this TCM C-65 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.)

Elements in Parts Per Million

MI/HR ON OIL	20	UNIT/ LOCATION AVERAGES	25	25	25	25	UNIVERSAL AVERAGES
MI/HR ON UNIT	184		114	89	64	39	
SAMPLE DATE	10/12/05		4/20/04	9/04/03	6/03/03	6/17/02	
ALUMINUM	3	3	**2**	2	4	4	7
CHROMIUM	4	6	3	3	7	11	4
IRON	31	34	**23**	**25**	**40**	49	44
COPPER	5	7	5	5	11	9	14
LEAD	32	41	**28**	**27**	**53**	63	310
TIN	1	1	0	2	2	1	3
MOLYBDENUM	0	0	0	0	0	0	0
NICKEL	1	1	0	0	1	1	1
POTASSIUM	0	0	0	0	0	0	0
BORON	0	0	0	0	0	0	0
SILICON	7	7	5	5	10	6	8
SODIUM	1	1	0	1	2	1	7
CALCIUM	2	2	0	1	3	2	9
MAGNESIUM	0	0	0	0	1	0	4
PHOSPHORUS	9	220	25	96	944	126	366
ZINC	1	2	2	1	5	3	7
BARIUM	0	0	0	0	0	0	1

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				86-105	>460	<1.0	-	0.0	<0.6
TESTED VALUES WERE				78.3	405	2.8	-	0.0	0.5

As you probably guessed, this is one of the rare instances where an aircraft is running solely on unleaded, so we can see bearing wear. The bearing metals are primarily lead, copper, and tin. They appear to be wearing well; after wear-in passed back in 2003, lead has been fairly steady and low. We are, however, finding quite a bit of fuel in the oil from this C-65. We don't like to see any more fuel than 1.0% of the sample, and we found 2.8% here. It has lowered the viscosity quite a bit. Although it's relatively rare to find fuel system problems in aircraft, it does sometimes happen. Fuel can come from other sources besides a problem, though, including excessive priming, short flights in cold weather, and plug fouling. Serious fuel problems tend to leave more fuel than this in the oil.

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