

If it's oil, we'll run it--but people are often confused about what type of slip they should use when sending in their sample. We only print a few types of slips, so we always send out "Engine" slips with kits, even for someone who wants to sample a transmission or differential. We do have various types of slips online for you to use if you want something particular to your specific system (<http://www.blackstone-labs.com/oil-slips.php>). And if you have an Engine slip but are sending in ATF or something else, just make a note about what type of oil it is, and we'll log it in as such.

## The eBay Oils

by Ryan Stark

(with help from Cliff Clevenger)

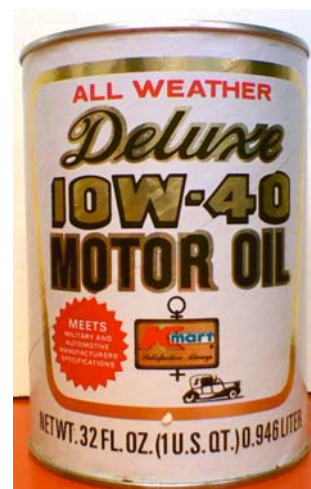
We were visiting my in-laws in November last year and needed some oil for my Passat. It just starting to clatter a little on start up and when I checked the oil, it was down two quarts. The clatter sounded something like "Sell Me" in German. Anyway, while searching for some make up oil (my father-in-law Lee had two quarts of my favorite--Super Tech), I came across an old can of Pennzoil ATF. By old I mean it was a round can made of cardboard, like a Crisco can. It brought back memories of helping my Dad change oil when I was seven or eight. (My job was jabbing the pour spout into the top of the can.) Lee said he bought it for an old 1984 Buick LeSabre. That was the last car he owned that leaked oil and when that car was gone, he was left with half a can of ATF. Working in an oil lab, I was intrigued by what it looked like. (I mean, what was in it...I knew it was red in color.) So Lee let me have the quart because he would never need it again.

When I got back home, I started looking at old cans of oil on eBay and found a lot. It turns out these are fairly collectable, and I found roughly 300 unopened cans for sale, of all different makes and years. I decided that in the interest of science, Blackstone should buy some of these and test them to see what was in them.

Now, you may think I'm crazy because once you open an old can of oil like that you ruin the value of it, but I was prepared to make this sacrifice for the good of the oil analysis community, and plus, Blackstone was buying, so it really didn't

bother me too much. If you think about it, how lucky can you get to be able to buy little time capsules of a product and test it? Can you by beer from 30 years ago and still drink it? I guess, but chances are it's long gone bad. How about a 30-year-old can of sardines, or a 5-year-old one for that matter? No way. So, I would really be a fool not to try this and see what shows up.

One thing led to another and before I knew it I had bought 28 cans of old oil and spent almost \$1,000. Pretty soon these oils started rolling in and I experienced a little buyers remorse. Did I really need to buy all this? What was I going to do with the cans? Once you open a can of oil, it's almost impossible to seal up properly. Would there be anything to even see in these samples? And, does oil go bad? We get this last question all the time, and my answer has always been no, but I was dealing with oils from the



1930s, 1940s, and 1950s here--really old stuff. Maybe all the additive in there (if any was even used) would settle out and there wouldn't be anything for us to read. Fortunately, I had bought some oil that would help answer that.

### Shaken, not stirred

Before I did any testing, I wanted to see if I would need to shake these oils up. If the additive had fallen out of suspension, then all of these old cans would need to be shaken before I even opened them. Ideally, it would be great to have two oils of the same batch, so I could run one unshaken and run one shaken and see what type of difference shows up. That's where my two antique vintage Havoline Texaco all-metal cans came into play. "SAE 20-20W" is stamped on the top of the can, and the text on the back says, "For API engine service classifications MM, MS, DG, and DM." It also assured me that it's "The finest engine protection in the world."



I bought these two for \$25.00 total, and going by what looks like a date on the can, I think they were from 1968. They were from the same seller and looked exactly the same. Chances are good they came from the same case someone bought years ago and they have been sitting on the shelf even since. I decided to run a test. I would take one to the local hardware store ([www.doitbest.com](http://www.doitbest.com)) and have them put it in the paint shaker for five minutes. Then I would crack them both open, test them, and see what differences showed up. You can see the results in figures 1 and 2.

To my surprise, there was actually more of some additive in the oil that I didn't have shaken. Also, the additives really weren't that different from what we see in today's oil. The oil was supposed to be a straight 20W and it was. Also, it had a strong TBN, so the additive that was present was still active. About the only unusual thing was that phosphorus was higher than zinc. Those two elements are normally from the ZDDP additive, but maybe there were using a different formula back in 1968. It's hard to say, but from that test I learned that when it's done right, the additives actually become part of the oil during blending and time/gravity alone won't cause them to separate back out.

That settled it. I didn't need to shake all of these oils and could just start running them. That's good because some of these old cans were bound to break open during shaking and spray oil all over Norm and his paint department.

### But is it still good?

However, that really didn't get down to answering the question: Is this oil still good to use? For that, I was going to have to run another test. Of all the oils I bought, one of the most expensive was some very rare - according to the seller,



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### Havoline, not shaken

ELEMENTS IN PARTS PER MILLION	ALUMINUM	1
	CHROME	0
	IRON	4
	COPPER	1
	LEAD	0
	TIN	0
	MO LYBDENUM	0
	NICKEL	0
	PO TASSIUM	3
	BORON	2
	SILICON	5
	SODIUM	8
	CALCIUM	3483
	MAGNESIUM	7
	PHOSPHORUS	1664
ZINC	1205	
BARIUM	19	

PROPERTIES	SUS Visc @210°F	55.6
	cSt Visc @ 100°C	8.94
	Flashpoint in °F	435
	Fuel %	-
	Antifreeze %	-
	Water %	0.0
	Insolubles %	0.0
	TBN	11.8
	TAN	4.2
	cSt Visc @ 40°C	73.82

### Havoline, all shook up

ELEMENTS IN PARTS PER MILLION	ALUMINUM	2
	CHROME	0
	IRON	3
	COPPER	0
	LEAD	2
	TIN	0
	MO LYBDENUM	0
	NICKEL	0
	POTASSIUM	8
	BORON	2
	SILICON	4
	SODIUM	19
	CALCIUM	3458
	MAGNESIUM	9
	PHOSPHORUS	1482
ZINC	1214	
BARIUM	28	

PROPERTIES	SUS Visc @210°F	55.9
	cSt Visc @ 100°C	9.04
	Flashpoint in °F	415
	Fuel %	-
	Antifreeze %	-
	Water %	0.0
	Insolubles %	0.0
	TBN	10.8
	TAN	4.2
	cSt Visc @ 40°C	73.13

Figure 1

Figure 2

antique Renuzit Certified, Premium Quality 2500 Mile oil. Not only does this oil offer the ability to run the oil 2500 miles in between oil changes (“Cut your oil bills in half!”), but it claims to provide a longer engine life, smoother motor, stronger oil film, and best of all, “a faster getaway.” They don’t actually advertise it as the best oil for bank robbers, but they should have.

It cost \$75.00 + \$25.00 shipping, but I got a whole gallon of it. Unfortunately, the can had some rust on the bottom of it and it started leaking during shipping. The good news was, I now needed to do something with this oil and I wasn’t going to dump it in a waste barrel. So I am going to actually run this in my engine. Not my Mini (it’s still under warranty), but my trusty old GM 350, rebuilt twice by yours truly. I know what you are thinking--this SOB is out of his mind!--but don’t try to talk me out of it. I’m going to run this oil and decide once and for all, if running old oil really hurts anything. Will my engine blow-by and leave me stranded on the side of the road? Will the seals start leaking like mad a leave a slick of oil behind for other cars to slip on and spin off into the ditch (a la Spy Hunter)? Will this be the end of my beloved 1984 Chevy Custom Deluxe? Well, like the monkey said after he shit in the corner--that remains to be seen!



### Castrol with Tungsten

My first purchase was Castrol with Tungsten. Tungsten! What the hell? Since when did they start putting light bulb filaments in oil? Or maybe a better question would be, “When did they stop?” The bottle was partly in French, so I’m

#### Castrol 20W/20 w/Tungsten Kmart 10W/40

ELEMENTS IN PARTS PER MILLION	ALUMINUM	1
	CHROME	0
	IRON	3
	COPPER	1
	LEAD	4
	TIN	0
	MOLYBDENUM	0
	NICKEL	0
	POTASSIUM	1
	BORON	4
	SILICON	6
	SODIUM	20
	CALCIUM	4518
	MAGNESIUM	12
	PHOSPHORUS	712
	ZINC	760
	BARIUM	3

PROPERTIES	SUS Visc @210°F	52.4
	cSt Visc @ 100°C	7.99
	Flashpoint in °F	460
	Fuel %	-
	Antifreeze %	-
	Water %	0.0
	Insolubles %	TR
	TBN	
	TAN	
	cSt Visc @ 40°C	63.51

ELEMENTS IN PARTS PER MILLION	ALUMINUM	0
	CHROME	0
	IRON	1
	COPPER	0
	LEAD	4
	TIN	0
	MOLYBDENUM	0
	NICKEL	0
	POTASSIUM	1
	BORON	1
	SILICON	2
	SODIUM	9
	CALCIUM	2053
	MAGNESIUM	4
	PHOSPHORUS	1522
	ZINC	1540
	BARIUM	3

PROPERTIES	SUS Visc @210°F	73.7
	cSt Visc @ 100°C	13.91
	Flashpoint in °F	400
	Fuel %	-
	Antifreeze %	-
	Water %	0.0
	Insolubles %	0.0
	TBN	6.4
	TAN	5.1
	cSt Visc @ 40°C	103.40

#### Kmart Dexron ATF B-11441

ELEMENTS IN PARTS PER MILLION	ALUMINUM	2
	CHROME	0
	IRON	2
	COPPER	0
	LEAD	0
	TIN	0
	MOLYBDENUM	0
	NICKEL	0
	POTASSIUM	0
	BORON	3
	SILICON	1
	SODIUM	3
	CALCIUM	111
	MAGNESIUM	7
	PHOSPHORUS	353
	ZINC	49
	BARIUM	92

PROPERTIES	SUS Visc @210°F	50.1
	cSt Visc @ 100°C	7.29
	Flashpoint in °F	380
	Fuel %	-
	Antifreeze %	-
	Water %	0.0
	Insolubles %	0.0
	TBN	0.4
	TAN	1.3
	cSt Visc @ 40°C	37.953

guessing it was from Canada, and that makes sense; the oil blenders up there will put anything in the oil and if the engine breaks, they just blame it on the cold. (Juuuust kidding, Canadians! You know we love you guys.) I had to buy the single element standard to run Tungsten and set our spectrometer to run it, but after a little messing around, we got some results. You can see them in figure 3.

#### Kmart 10W/40 Motor Oil (API SE) and DEXRON ATF

Back before Wal-Mart dominated the world, there was Kmart, and when I was in 4th grade, there was no greater crack on someone than “You buy your underwear at Kmart.” Well, I wonder

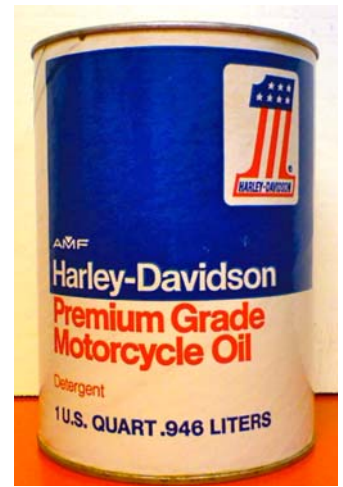
Figure 3: Tungsten read 13 ppm.

Figure 4

Figure 5



what those boys would say if they found out I bought my oil at Kmart too. The motor oil is listed as Deluxe and it says on the side of the can that this is specially blended multi-viscosity oil containing the finest approved additives and base oils. So you can't go wrong there, right? Looking at the results, I'd say this oil is indeed deluxe. The viscosity is pretty strong for a 10W/40, and the additives would be suitable for diesel use. The oil does have a CC rating as well as an SE rating, and those put the date of this oil as being made sometime in the 1970s. The ATF has a standard additive package until you get down to barium. That's not used much anymore. See figures 4 and 5 for the analyses.



### Sunoco DX Diamond motor oil – API SB

After seeing Castrol with Tungsten, I was ready for anything, but when I saw Sunoco's Diamond oil, I didn't really think they put diamonds in there. That would be one expensive additive. I did want to see what was in this SAE 40W oil though. The case says it has an API rating of SB, which was used from 1930 to 1963. Several websites state that this oil can cause equipment harm. All I can say to that is, too bad I don't have five quarts of this stuff, because I love a challenge. It doesn't look so harmful in the oil analysis. The viscosity wasn't quite in the 40W range and it didn't have much in the way of detergent/dispersant additive present, but then again, it does state on the can that it is "Recommended for vehicles that do not require detergent oil." Sometimes those oils don't have any additive at all, but there was quite a bit of phosphorus and zinc here (figure 6).

### Sunoco Diamond 40W

ELEMENTS IN PARTS PER MILLION	ALUMINUM	0
	CHROME	0
	IRON	0
	COPPER	0
	LEAD	1
	TIN	0
	MOLYBDENUM	0
	NICKEL	0
	POTASSIUM	0
	BORON	1
	SILICON	0
	SODIUM	0
	CALCIUM	4
	MAGNESIUM	20
	PHOSPHORUS	776
	ZINC	796
	BARIUM	0

PROPERTIES	SUS Visc @210°F	67.8
	cSt Visc @ 100°C	12.36
	Flashpoint in °F	500
	Fuel %	-
	Antifreeze %	-
	Water %	0.0
	Insolubles %	0.0
	TBN	0.7
	TAN	1.3
	cSt Visc @ 40°C	142.96

### Harley Davidson 40W

ELEMENTS IN PARTS PER MILLION	ALUMINUM	0
	CHROME	0
	IRON	0
	COPPER	0
	LEAD	1
	TIN	0
	MOLYBDENUM	0
	NICKEL	0
	POTASSIUM	1
	BORON	0
	SILICON	6
	SODIUM	0
	CALCIUM	7
	MAGNESIUM	1
	PHOSPHORUS	1257
	ZINC	1232
	BARIUM	3262

PROPERTIES	SUS Visc @210°F	73.0
	cSt Visc @ 100°C	13.75
	Flashpoint in °F	485
	Fuel %	-
	Antifreeze %	-
	Water %	0.0
	Insolubles %	0.0
	TBN	2.3
	TAN	2.5
	cSt Visc @ 40°C	144.32

### Arco Graphite 10W/40

ELEMENTS IN PARTS PER MILLION	ALUMINUM	0
	CHROME	0
	IRON	11
	COPPER	0
	LEAD	3
	TIN	0
	MOLYBDENUM	0
	NICKEL	0
	POTASSIUM	1
	BORON	4
	SILICON	7
	SODIUM	11
	CALCIUM	2013
	MAGNESIUM	19
	PHOSPHORUS	1441
	ZINC	1433
	BARIUM	1

PROPERTIES	SUS Visc @210°F	75.7
	cSt Visc @ 100°C	14.44
	Flashpoint in °F	420
	Fuel %	-
	Antifreeze %	-
	Water %	0.0
	Insolubles %	0.5
	TBN	6.6
	TAN	4.2
	cSt Visc @ 40°C	77.799

### Harley-Davidson Premium Grade Motorcycle Oil (SAE 40) 75-P

This can caught my eye because it reminded me of Evel Knievel. In fact, the logo on the can is the same as what is on Evel's website, so the two were heavily linked back in 1970s. What's interesting is that Harley-Davidson actually came up with their own oil weight specifications. This can is 75 Medium Heavy and is for use in all motors at temperatures above 40°F. They also made 58 Special Light, which is good for temperatures below 40°F, and 105 Regular Heavy--good for all motors operating under severe conditions at high (?) temperatures.

Figure 6

Figure 7

Figure 8

Apparently, it was up to us to decide what high temperatures are; also, neither the 75 or 105 was “special.” I’m sure the special label added some extra cost and that made it special to Harley-Davidson. Looking at the report, you’ll see this was a 40W oil and WOW look at the barium. That was likely some sort of detergent additive (figure 7).

### ARCO graphite SAE 10W/40 (API SE-CC)

After seeing the word graphite in the name, I had to check this stuff out. True to its label, there was a lot of graphite in the oil (figure 8), and if you’re the kind of person who likes clean oil on your dipstick, this wasn’t the brand for you. Graphite is known as a lubricant, but I wonder how this stuff did in engines. Looking at the report, you can see the graphite at the insoluble reading of 0.5%. That’s extremely high for virgin oil, so the stuff doesn’t stay in suspension very well. On the plus side, the can says this oil provides

- Improved gasoline mileage
- Reduced piston ring and cam wear
- Easy low temperature starting and excellent lubrication at low and high operating temperatures

The oil is also “Patent Pending” and I’m wondering how that application is progressing down at the Patent office these days.

### Valvoline SAE 20W - API SB

The big marketing claim for this oil says it “Contains Miracle ChemAloy.” Miracle! Really! Does the Pope know about this?

There were no miracles in the additive package that I can see, but maybe that’s the miracle of it--you can’t see it, but it’s in there and it works. This oil doesn’t have much of a TBN because it doesn’t contain much calcium, but the old stand-bys of phosphorus and zinc are there, and at pretty much the same levels we see today (figure 9).

### Valvoline 20W

In Parts 2 and 3 of “The eBay Oils” we’ll be looking at old cans of Amsoil, Mobil, Sinclair, Quaker State, and more. Look for the next installments this summer!

ELEMENTS IN PARTS PER MILLION	ALUMINUM	0
	CHROME	0
	IRON	0
	COPPER	0
	LEAD	0
	TIN	0
	MO LYBDENUM	0
	NICKEL	0
	POTASSIUM	2
	BORON	0
	SILICON	1
	SODIUM	0
	CALCIUM	29
	MAGNESIUM	1
	PHOSPHORUS	739
	ZINC	774
BARIUM	1	

PROPERTIES	SUS Visc @210°F	55.1
	cSt Visc @ 100°C	8.80
	Flashpoint in °F	440
	Fuel %	-
	Antifreeze %	-
	Water %	0.0
	Insolubles %	0.0
	TBN	0.2
	TAN	1.4
	cSt Visc @ 40°C	68.79



Figure 9

## Report of the Month

This practically-new Wrangler wasn't wearing very well in April, but the owner fixed the problem between April and July. Can you figure out what was wrong?

To learn more about where the elements are coming from, [click here](#).

ELEMENTS IN PARTS PER MILLION	MI/HR on Oil	1,000	UNIT/ LOCATION AVERAGES	3,000	2,900		UNIVERSAL AVERAGES
	MI/HR on Unit	28,112		27,001	26,900		
	Sample Date	07/15/11		04/28/11	04/23/11		
ALUMINUM	6	3	31	31			3
CHROME	2	1	11	11			1
IRON	18	11	49	55			17
COPPER	11	28	17	17			12
LEAD	2	17	0	0			1
TIN	0	2	2	5			0
MO LYBDENUM	99	237	8	8			74
NICKEL	1	0	2	21			1
PO TASSIUM	0	0	9	0			2
BORON	120	67	109	128			42
SILICON	14	5	88	94			15
SODIUM	2	3	2	8			41
CALCIUM	2031	1842	1863	2157			2232
MAGNESIUM	7	5	14	15			85
PHOSPHORUS	680	818	593	679			693
ZINC	834	942	722	834			848
BARIUM	0	0	0	0			0

Values  
Should Be\*

PROPERTIES	SUS Viscosity @210°F	52.4	46-59	51.2	53.1		
	cSt Viscosity @ 100°C	7.99	6.0-10.2	7.63	8.20		
	Flashpoint in °F	400	>355	410	410		
	Fuel %	<0.5	<2.0	<0.5	<0.5		
	Antifreeze %	0.0	0.0	0.0	0.0		
	Water %	0.0	0.1	0.0	0.0		
	Insolubles %	0.2	0.6	0.4	0.3		
	TBN						
	TAN						
	ISO Code						

\*THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

In searching for the reason for the high wear, the owner of this Wrangler checked out the air filtration system and found a loose clamp downstream of the air filter. It wasn't entirely disconnected, but it was loose enough to allow quite a bit of dirt into the system, and it was causing all kinds of cylinder, ring, and piston wear. The owner suspects it was loose at the factory