

Everyone's favorite part of the newsletter is the Report of the Month, so we thought this month we'd give you what you really want to see -- interesting engines and problems that you don't have to deal with! We'll start with this completely stock '49 Ford running Mobil 1 10W/30 Extended Performance oil, driven by the owner cross-country. He was sampling just to see how bad the engine beat up the oil. The car did not use enough oil to have to add any. It's a non-PCV motor running a stock carb that got hot going through the mountains. See the owner's comments below.

Report of the Month

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

ELEMENTS IN PARTS PER MILLION	MI/HR on Oil	8,100	UNIT/ LOCATION AVERAGES			UNIVERSAL AVERAGES
	MI/HR on Unit	25,000				
	Sample Date	9/28/2017				
	ALUMINUM	6	6			5
	CHROME	3	3			1
	IRON	112	112			44
	COPPER	12	12			18
	LEAD	22	22			82
	TIN	0	0			2
	MOLYBDENUM	85	85			73
	NICKEL	1	1			0
	POTASSIUM	0	0			9
	BORON	53	53			42
	SILICON	9	9			14
	SODIUM	33	33			110
	CALCIUM	1399	1399			2062
	MAGNESIUM	740	740			117
	PHOSPHORUS	758	758			1381
	ZINC	900	900			1537
	BARIUM	1	1			1
Values Should Be*				From the owner: In September 2017 I embarked on a trip across The Great Northern Route Two to the Western National Meet of the early Ford V8 Club of America in Salem, Oregon. The route goes from Bar Harbor, Maine to Everett, Washington. Other than a couple of cities it is basically rural -- there may be speed limit signs, but not much else. Along the way I stopped at the head of the Mississippi River as well as Glacier National Park. Upon arriving in Washington I had to have tires put on the car, but other than that no breakdowns. After the meet I proceeded south and took tour of the redwoods and across the Golden Gate Bridge. Route 1 in northern California was one of the curviest hilly roads I ever drove. It was probably my lowest average speed for the whole trip. From San Mateo I proceeded east through Yosemite National Park and into Nevada. I hit my high point at the Vail Pass at 10,666 feet, and while the car was anemic and vapor-locking a bit as well as overheating, I made it to the top. I cooled on the downhill but still needed a fair amount of water. The rest of the trip was problem-free! Total fuel cost was \$1230 for 431 gallons of fuel. Average mpg for trip was 18.8. The engine is bone stock and I run a GPS off the 6-volt positive ground by floating a power point with the correct DC orientation. All mileage numbers and driving times came from the GPS. Here is a link to my Facebook page: https://www.facebook.com/groups/134503040494452/		
PROPERTIES	SUS Viscosity @210°F	80.3	58-68			
	cSt Viscosity @ 100°C	15.60	9.7-12.7			
	Flashpoint in °F	365	>365			
	Fuel %	TR	<2.0			
	Antifreeze %	0.0	0.0			
	Insolubles %	0.2	<0.6			

Report of the Month

This 2012 Mustang's problem wasn't immediately obvious, but it's there. What's wrong?

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

ELEMENTS IN PARTS PER MILLION	MI/HR on Oil	6,552	UNIT/ LOCATION AVERAGES	5,750	7,912	7,600	3,800	UNIVERSAL AVERAGES
	MI/HR on Unit	7,681		26,180	20,427	12,515	4,858	
	Sample Date	1/19/2017		7/11/2015	7/20/2014	7/21/2013	9/27/2012	
	ALUMINUM	7	12	10	14	14	13	4
	CHROME	1	1	1	1	1	1	0
	IRON	26	44	49	69	47	31	19
	COPPER	12	8	6	7	6	11	4
	LEAD	0	0	0	0	0	0	1
	TIN	0	1	0	0	5	0	1
	MO LYBDENUM	18	99	118	147	149	65	67
	NICKEL	0	1	0	1	1	1	0
	PO TASSIUM	2	3	2	4	0	7	3
	BORON	60	77	75	72	81	96	78
	SILICON	18	15	9	12	15	19	11
	SODIUM	7	18	60	8	8	8	53
	CALCIUM	2077	3249	3377	4073	4042	2674	2047
	MAGNESIUM	10	14	14	16	18	13	249
	PHOSPHORUS	689	765	709	824	849	753	738
	ZINC	754	843	794	903	911	855	843
	BARIUM	0	2	0	0	1	9	1

Values
Should Be*

PROPERTIES	SUS Viscosity @210°F	50.5	46-57	58.5	57.1	54.6	52.1
	cSt Viscosity @ 100°C	7.42	6.0-9.7	9.80	9.38	8.65	7.92
	Flashpoint in °F	385	>385	395	385	405	400
	Fuel %	TR	<2.0	<0.5	TR	<0.5	<0.5
	Antifreeze %	0.0	0.0	?	0.0	0.0	0.0
	Water %	0.0	0.0	0.0	0.0	0.0	0.0
	Insolubles %	0.3	<0.6	0.3	0.3	0.2	0.5
	TBN				3.0	2.1	

From the owner: The car ran well from the start and there were no obvious signs of a problem. The first oil report showed high wear metals, as you would expect for a new engine. Aluminum was out of line, and when it stayed high for the next three oil samples, I was definitely suspicious that there was an issue. The engine seemed to consume a little bit of excess oil, but never showed smoke from the exhaust. I began to hear a slight knocking noise when the engine was fully hot at idle. But it would come and go. I tried multiple times to get the Ford service people to hear it, but was not successful for some time. Finally, I brought it by on a day when the knocking was slightly louder and they heard it. The car was brought in for inspection. They had it for the better part of a week, as they pulled a valve cover and the oil pan to look for evidence of an issue. They reassembled it without finding anything wrong, but I pushed them to keep looking and used the oil analysis as evidence. Finally, running a cylinder deactivation test identified the issue. A piston wrist-pin bore was failing and allowing the piston to rock in the cylinder bore. This was causing the excess wear metals and oil blow-by. Ford replaced the short block under warranty. I did a short run on the new short block without analyzing the oil, and the next sample I took already showed a big improvement in the metal content.

Report of the Month

This 1998 BMW 540i is ailing. Can you tell what the problem is?

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

ELEMENTS IN PARTS PER MILLION	MI/HR on Oil		UNIT/ LOCATION AVERAGES					UNIVERSAL AVERAGES
	MI/HR on Unit	151,000						
	Sample Date	6/29/2017						
	ALUMINUM	122	122					5
	CHROME	6	6					0
	IRON	172	172					12
	COPPER	18	18					6
	LEAD	5	5					3
	TIN	4	4					1
	MOLYBDENUM	28	28					90
	NICKEL	2	2					0
	POTASSIUM	1	1					2
	BORON	17	17					54
	SILICON	54	54					6
	SODIUM	230	230					11
	CALCIUM	1761	1761					2272
	MAGNESIUM	100	100					204
	PHOSPHORUS	709	709					801
	ZINC	787	787					960
	BARIUM	7	7					0

Values
Should Be*

PROPERTIES	SUS Viscosity @210°F	65.2					
	cSt Viscosity @ 100°C	11.66					
	Flashpoint in °F	380	>375				
	Fuel %	<0.5	<2.0				
	Antifreeze %	0.0	0.0				
	Water %	0.0	0.0				
	Insolubles %	0.3	<0.6				
	TBN						

You might think, looking at the high silicon level, that dirt contamination was causing cylinder-area wear. And indeed, dirt could be part of the problem. But it's not the main problem. When we received this sample, the engine had been down for six weeks for repairs after the timing chain guides had failed. This can occur due to a worn timing chain tensioner, or because the plastic timing chain guide disintegrates due to age. We found an interesting video on YouTube demonstrating the difference in sound before and after the timing chain guide repairs.

Report of the Month

This 2007 Frontier belongs to Blackstone owner Kristin and her husband. He had trouble on his way back to Indiana from Colorado. Can you tell what went wrong?

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

ELEMENTS IN PARTS PER MILLION	MI/HR on Oil	12,000	UNIT/ LOCATION AVERAGES	9,400				UNIVERSAL AVERAGES
	MI/HR on Unit	128,850		116,804		87,000		
	Sample Date	10/19/2017		5/29/2017	7/15/2016	1/28/2016		
	ALUMINUM	17	7	4	4	2		3
	CHROME	58	15	1	1	0		1
	IRON	189	63	22	25	14		10
	COPPER	6	3	3	2	1		5
	LEAD	6	3	3	1	0		3
	TIN	1	0	0	0	0		1
	MOLYBDENUM	2	42	4	84	78		72
	NICKEL	1	0	0	0	0		0
	POTASSIUM	3	2	3	2	1		2
	BORON	2	31	4	27	92		44
	SILICON	33	24	22	30	12		17
	SODIUM	330	207	278	129	90		54
	CALCIUM	1607	1834	1827	2085	1816		1986
	MAGNESIUM	10	11	9	18	9		234
	PHOSPHORUS	655	656	558	712	698		678
	ZINC	796	825	675	937	890		796
	BARIUM	0	0	0	0	0		0

PROPERTIES	SUS Viscosity @210°F	59.2	58-65	57.4	57.1	54.9	
	cSt Viscosity @ 100°C	9.99	9.7-11.9	9.48	9.39	8.75	
	Flashpoint in °F	375	360	395	395	425	
	Fuel %	<0.5	<2.0	<0.5	<0.5	<0.5	
	Antifreeze %	0.0	0.0	0.0	0.0	0.0	
	Water %	0.0	<0.0	0.0	0.0	POS	
	Insolubles %	0.2	<0.6	<0.3	<0.2	<0.2	
	TBN					5.1	

The check engine light had been on and off intermittently, so before he left for Colorado, Brad took the truck to a shop and they decided the spark plugs needed to be changed. The truck drove fine on the way out to Colorado, but on his way back, after driving through hard, driving rain for hours, the light returned. He stopped for the night at a hotel, and the next morning when he resumed driving, the engine started to miss. It began to lose power and run increasingly rough. He turned around and went back to the hotel and spent the night (it was a Sunday and everything was closed). Monday morning Brad found a local shop, and they changed the coil pack in cylinder 1. He started driving again, and ~100 miles down the road it started running even worse than before. He didn't have enough power to maintain speed or even get up hills. He decided the best thing was to go to a Nissan dealer, and the nearest dealership was about 100 miles away in Columbia, Missouri. Brad drove 30 mph along the side of road with his hazards on, stopping every few miles because resting the engine seemed to help a little. When he finally arrived, the dealer determined the problem was a plugged catalytic converter and a bad O2 sensor. Our theory is, the coil pack was causing the engine to miss, and so much unburned fuel got into the CC that it eventually plugged up. And after all that, Kristin forgot to change the oil!