

## Report of the Month

Something went wrong in this F350's 6.4L 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	5,000	UNIT/ LOCATION AVERAGES	5,000	5,000	5,000	5,000	UNIVERSAL AVERAGES
	MI/HR on Unit	145,000		140,000	135,000	130,000	125,000	
	Sample Date	12/01/13		04/07/13	11/16/11	04/04/09	12/24/05	
	ALUMINUM	277		53	128	79	110	
	CHROME	5	3	3	3	4	4	1
	IRON	157	93	81	89	106	80	31
	COPPER	2	2	1	1	1	1	1
	LEAD	2	3	0	1	0	2	2
	TIN	0	1	0	4	0	3	1
	MOLYBDENUM	66	56	53	73	81	70	25
	NICKEL	3	2	1	2	4	3	1
	POTASSIUM	4	8	1	0	3	2	10
	BORON	53	97	82	40	56	118	56
	SILICON	17	11	9	8	96	10	7
	SODIUM	5	4	5	5	6	6	5
	CALCIUM	849	1173	838	953	939	937	1722
	MAGNESIUM	1188	766	1203	1414	1386	983	395
	PHOSPHORUS	1031	993	1079	1237	1206	1013	992
	ZINC	1324	1189	1289	1450	1467	1105	1151
	BARIUM	0	0	0	0	0	0	2

Values  
Should Be\*

PROPERTIES	SUS Viscosity @210°F	75.8	66-78	71.2	73.6	74.7	73.2
	cSt Viscosity @ 100°C	14.45	11.9-15.3	13.27	13.89	14.17	13.80
	Flashpoint in °F	420	>410	425	425	455	440
	Fuel %	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5
	Antifreeze %	0.0	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	<0.8	0.2	0.3	0.1	0.3
	TBN						

A pattern of poor wear wasn't new for this engine, but trends show that aluminum and iron were getting progressively worse. As it turns out, the engine had several issues. Two injectors were bad, which caused piston damage. Also, all the rocker arms were severely worn. With the rocker arms not seating the valves well, the cylinders were losing compression. The #8 cylinder was particularly worn -- the owner could see the hash marks (which help hold oil on the cylinder walls) were getting worn off. His only notice that there was a problem was a slight knock when the truck was warmed up -- and, of course, the analysis.