

# Report of the Month

This 2002 Toyota Avalon had a problem repaired between the first and second samples. So why is wear higher in the second?

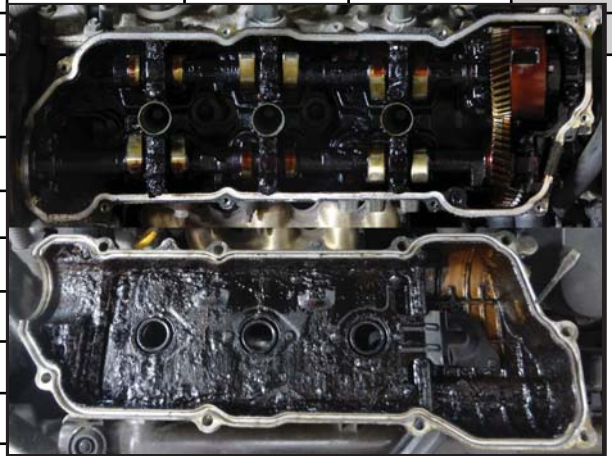
To learn more about where the elements are coming from, [click here](#).

ELEMENTS IN PARTS PER MILLION	MI/HR on Oil	3,247	UNIT/ LOCATION AVERAGES	3,077				UNIVERSAL AVERAGES
	MI/HR on Unit	151,884		146,847				
	Make-up Oil	0 qts.		14 qts.				
	ALUMINUM	2	4	5				3
	CHROME	2	1	1				0
	IRON	12	9	12				7
	COPPER	1	1	1				2
	LEAD	10	4	2				3
	TIN	12	5	4				1
	MOLYBDENUM	6	60	103				69
	NICKEL	0	0	0				0
	POTASSIUM	2	1	0				2
	BORON	13	115	110				47
	SILICON	162	75	50				17
	SODIUM	14	11	11				36
CALCIUM	1025	1947	2853				1982	
MAGNESIUM	381	133	11				185	
PHOSPHORUS	674	721	789				706	
ZINC	698	772	858				818	
BARIUM	0	0	0				0	



Values  
Should Be\*

PROPERTIES	SUS Viscosity @210°F	55.9	54-63	60.7
	cSt Viscosity @ 100°C	9.04	8.5-11.3	10.41
	Flashpoint in °F	390	>375	380
	Fuel %	<0.5	<2.0	<0.5
	Antifreeze %	0.0	0.0	0.0
	Water %	0.0	0.0	0.0
	Insolubles %	0.8	<0.6	0.2
	TBN	1.8	>1.0	12.3



**Toyota's infamous sludge problem.**

The owner had had good luck with two similarly old Avalons in the past. He bought this one for this son and was surprised to find that it not only smoked on start-up (unless parked uphill), but the engine was using a ton of oil, especially on the highway - in that first sample the engine blew through 14 quarts in 3,000 miles. So the first sample's metals were severely diluted. (All that make-up oil is also the reason the TBN read so high.) He suspected the problem was the valve guides, but when he looked at the spark plugs, #2 was clearly worse than the others, with ash deposits bridging the plug gap. However, the plug was iridium and was still able to fire under the terrible conditions. It only generated an error code under hard highway acceleration. According to the owner's research, cylinder #2 is the sludge canary in the coal mine for this type of Toyota. The rear valve cover was so sludged up that sludge was preventing internal engine air from getting to the PCV valve. The pressure was forcing oil out every place it could, mostly through the valve stem seal. Replacing the valve cover fixed the oil consumption problem. So why is wear so high in the second sample? It turns out that fixing the first problem may have uncovered a second issue. Lead and tin typically indicate bearing wear; those metals were being masked by the excessive oil being added in the first sample. Silicon is from sealers used in the fix.