

What is the best oil for your 6.0 ?

Oil viscosity is the measure of shearing in a HUIE fired injection system and 6.0 Powerstroke creates the most shearing of any engine, thus viscosity is the most important factor when looking at a used oil analysis (UOA) report for the average 6.0 owner. According to bobistheoilguy.com, "Shear stability is a measure of the amount of viscosity an oil may lose during operation. Oil experiences very high stresses in certain areas of the engine such as in the oil pump, cam shaft area , piston rings, and any other areas where two mating surface areas squeeze the oil film out momentarily... Most multigrade engine oils contain special types of additives, called Viscosity Index improvers, which are composed of very large, viscosity-controlling molecules. As the oil passes through the engine, these molecules are permanently sheared or torn apart over time, causing the additive to lose its viscosity." When looking at your UOA anything below 12.49 on a cSt viscosity @ 100* C scale means your 40 weight oil has turned into 30 weight. ¹

Viscosity at 100°C		Viscosity at 40°C	
Motor oils and hydraulic oils		ISO grade	
SAE grade range (cST)		ISO grade range	
5	3.80–*	32	28.8–35.2
10	4.10–*	46	41.4–50.6
20	5.60–9.29	68	61.2–74.8
30	9.30–12.49	100	90.0–110
40	12.50–16.29	150	135–165
50	16.30–21.89	220	198–242
60	21.90–26.09	320	288–352
80	7.0–11.00	460	414–506
90	13.50–23.99	680	612–748
140	24.00–40.99	1000	900–1100
250	41.00–UP	1500	1350–1650

A 40 weight oil is recommended by Ford for optimal performance and durability. Now the real question is which oil to use:

Results of UOAs

¹ <http://www.bobistheoilguy.com/viscosity-charts/>

Motorcraft 15W-40²

Motorcraft oil is the Ford Motor Company recommended oil for all their engines and is supposed to perform the best. In appendix A & B there are two UOA using Motorcraft 15W-40 oil with oil change intervals of 5200 and 7410 miles. The cSt viscosity is close to “acceptable” values according to Blackstone at 11.59 and 11.65 respectively but both tests have dropped below a 40 weight.

Shell Rotella T6 5W-40³

The next Blackstone Lab report shows three UOAs done using Rotella T6 in the same 6.0 Powerstroke. The oil change mileage interval spans 3600-4250 miles. The cSt viscosity numbers are 11.72, 11.14 and 12.14 (on the 3600 mile oil change). All are well below the 12.49 of a 40 weight oil and the first two are well below what are Blackstone’s acceptable numbers for viscosity. This indicates that Rotella T6 needs to be changed every 3000 miles to maintain a proper viscosity level.

Amsoil AME 15W-40⁴

Amsoil, which is touted as the best synthetic oil, according to their website, performs better in a 6.0 than the Rotella T6 or Motorcraft, especially considering the interval between oil changes. According to Appendix D and E, the oil change interval was 9500 and 11000 miles respectively and the cSt viscosity of the oil was only lowered to 12.7 and 11.8. The 11.8 is barely lower than Blackstone’s suggested viscosity number and the 12.7 is even within the 40 weight range. Possibly running the Amsoil out to 11000 miles is pushing it too far but 9500 miles seems to keep the oil within acceptable viscosity ranges.

Valvoline Premium Blue Extreme 5W-40⁵

The Blue Extreme oil’s cSt viscosity level (12.17) fell within Blackstone’s acceptable range but was still below the 12.49 of a 40 weight oil. The real downfall was the rapidity within which the viscosity level fell. The oil change interval was only 3700 miles. This indicates that the Blue Extreme oil is on par with the Rotella T6; however, there is only one UOA worth of data as compared with the two or three UOAs for the other oils discussed.

Schaeffer’s 9000 5W-40⁶

All Pro Diesel has made no secret that the oil we believe to be the best for a 6.0 is the Schaeffer’s 9000; however, up to this point all the evidence to support our claim has been anecdotal. Appendix F and G are two 6.0 Powerstrokes running Schaeffer’s 9000 with oil change intervals of 4000-5100 miles. The cSt viscosity levels were by far the highest of any of the oils presented here. The cSt viscosity numbers for the Schaeffers were within the range of 12.44-13.51 which means that the oil held its viscosity better than any of the other oils. It stayed not only with in Blackstone’s acceptable range but also above the

² Appendix A & B

³ Appendix C

⁴ Appendix D & E

⁵ Appendix G

⁶ Appendix F & G

12.49 of the 40 weight oil. We could not find an independent UOA that tested Schaeffer's 9000 out to 10000 miles at this time.

Transparency⁷

When comparing technical data sheets of the most popular oils, Schaeffer's offers the most information about their oil. In fact they list 8 different viscosity test results for their oil. Motorcraft doesn't even bother to post their technical data sheets online. All of these oils start out with the same cSt viscosity numbers from the factory, a range of 13.5-14.5. The drop in viscosity seen in the UOAs can be then directly related to the shearing factor of the 6.0 engine.

Anecdotal Evidence

All Pro Diesel installs a larger number of injectors in 6.0 Powerstrokes than any other diesel engine. Injectors are a well-documented problem for 6.0s. Nine out of ten 6.0s that need injectors replaced in our shop have been running Rotella oil, synthetic or dino oil, for the duration the owner has had the truck. Whether this is correlative or causative would be difficult to prove but the viscosity tests prove that Rotella does have a much lower ability to hold up the shearing factors present in the engine which can lead to stiction issues.

Also from observations, when running Schaeffer's 9000 in a 6.0s the engines run quieter and generally increase fuel mileage and decrease oil consumption as compared with Rotella. We have no anecdotal evidence to compare Schaeffer's 9000 to Amsoil.

Conclusion

After all this research, All Pro Diesel still feels 100% comfortable recommending Schaeffer's 9000 to our customers. The research and the anecdotal evidence supports this stance. What you do with the information is up to you.

⁷ Appendix H

APPENDIX A

3/27/13

E296052.jpg (790x1023)



OIL REPORT

REPORT DATE: 10/9/2010

UNIT ID: 06 F350

UNIT	MAKE/MODEL: Navistar 6.0L Power Stroke	OIL TYPE & GRADE: Ford 15W/40
	FUEL TYPE: Diesel	OIL USE INTERVAL: 5,200 Miles
	ADDITIONAL INFO:	

CLIENT

COMMENTS: STEPHEN: Thanks for the note on the recent engine work. Wear metals look great compared to universal averages, which show typical wear levels for this type of engine after about 5,300 miles on the oil. From what we can see, this engine is doing well mechanically. The silicon is from shop supplies used when making the repairs. Sodium can be marker for coolant, but it can also be additive in the oil. We'll keep an eye on it next time. Low viscosity isn't uncommon for this engine and it's not a problem. The TBN was 7.2, which is strong; less than 1.0 is low. Try 7,500 miles.

ELEMENTS IN PARTS PER MILLION	MILHR on Oil	5,200	UNIT / LOCATION AVERAGES					UNIVERSAL AVERAGES
	MILHR on Unit	62,000						
	Sample Date	09/30/10						
	Make Up Oil Added	0 qts.						
ALUMINUM	2	2						
CHROMIUM	1	1						
IRON	19	19					21	
COPPER	2	2					3	
LEAD	2	2					3	
TIN	0	0					1	
MOLYBDENUM	6	6					34	
NICKEL	0	0					0	
MANGANESE	0	0					0	
SILVER	0	0					0	
TITANIUM	0	0					0	
POTASSIUM	2	2					4	
BORON	16	16					50	
SILICON	26	26					12	
SODIUM	24	24					4	
CALCIUM	2129	2129					2798	
MAGNESIUM	29	29					145	
PHOSPHORUS	970	970					1114	
ZINC	1040	1040					1292	
BARIUM	10	10					2	

Values Should Be*

PROPERTIES	SUS Viscosity @ 210°F	64.9	69-78					
	cSt Viscosity @ 100°C	11.59	12.7-15.3					
	Flashpoint in °F	405	>415					
	Fuel %	1.0	<2.0					
	Antifreeze %	?	0					
	Water %	0.0	<0.1					
	Insolubles %	0.3	<0.8					
	TBN	7.2						
	TAN							
	ISO Code							

*THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

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Motorcraft 15-40

A

APPENDIX B

3/27/13

Oil%2520Analysis%2520124735%2520miles.jpg (618x800)



OIL REPORT

LAB NUMBER: E78453

UNIT ID: 05 EXCD

REPORT DATE: 11/10/2011

CLIENT ID: 51622

CODE: 44/75

PAYMENT: CC: MC

UNIT	MAKE/MODEL: Navistar 6.0L Power Stroke	OIL TYPE & GRADE: Motorcraft 15W/40
	FUEL TYPE: Diesel	OIL USE INTERVAL: 7,410 Miles
	ADDITIONAL INFO:	

CLIENT	PHONE: <input type="text"/>
	FAX: <input type="text"/>
	ALT PHONE: <input type="text"/>
	EMAIL: <input type="text"/>

COMMENTS
MARK: Thanks for the notes. It looks like you have yourself a pretty solid engine here. Universal averages show normal wear levels after about 5,300 miles on the oil. This oil run was longer, yet metals generally read at-or lower than-averages, which is certainly a testament to how well this engine is wearing. The slight fuel dilution here isn't anything to worry about since operational factors (idling, frequent starts, city driving, etc.) probably contributed to it. The viscosity was fine and there was no coolant, water, or dirt found. You could try up to 9,000 miles, if you'd like.

ELEMENTS IN PARTS PER MILLION	MI/HR on Oil	7,410							
	MI/HR on Unit	124,735							
	Sample Date	11/07/11							UNIVERSAL AVERAGES
	Make Up Oil Added	0 qts							
	ALUMINUM	3	3						
	CHROMIUM	1	1						
	IRON	17	17						2
	COPPER	2	2						
	LEAD	2	2						
	TIN	0	0						
	MOLYBDENUM	13	13						3
	NICKEL	1	1						
	MANGANESE	0	0						
	SILVER	0	0						
	TITANIUM	1	1						
	POTASSIUM	0	0						
	BORON	19	19						5
	SILICON	6	6						1
	SODIUM	3	3						
	CALCIUM	2207	2207						269
	MAGNESIUM	177	177						17
	PHOSPHORUS	1095	1095						110
	ZINC	1168	1168						127
	BARIUM	4	4						

PROPERTIES	Values		Should Be*					
	Should Be*							
	SUS Viscosity @ 210°F	65.1		65-75				
	cSt Viscosity @ 100°C	11.65		11.5-14.5				
	Flashpoint in °F	400		>410				
	Fuel %	1.0		<2.0				
	Antifreeze %	0.0		0				
	Water %	0.0		0.0				
	Insolubles %	0.3		<0.7				
	TBN							
TAN								
ISO Code								

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APPENDIX C



OIL REPORT

LAB NUMBER: D23677 **UNIT ID:** 06 F250
REPORT DATE: 11/20/2007 **CLIENT ID:** 25698
CODE: 83/284 **PAYMENT:** CC: Discover

MAKE/MODEL: Navistar 6.0L Power Stroke
FUEL TYPE: Diesel
ADDITIONAL INFO:

OIL TYPE & GRADE: Shell Rotella T 5W/40 (Syn)
OIL USE INTERVAL: 4,250 Miles

SETH SCHALLER
 8601 NW 23RD STREET
 PEMBROKE PINES, FL 33024

PHONE: (954) 303-8515
FAX:
ALT PHONE:
EMAIL: seth199@bellsouth.net

SETH: You ran this oil longer than the other two that we've analyzed for you and wear looks better than ever! We weren't sure if wear was going to get any better than what we've seen in past samples, so this was a pleasant surprise. We see no signs of any obvious mechanical problems developing at 24,000 miles. Only a slightly low viscosity kept this from being a perfect report. It's not a problem and is a common find in this engine model. No fuel, coolant, or moisture was found and the air and oil filters are working well. Your F250 looks great!

M/HR on Oil	4,250	UNIT / LOCATION	4,019	3,609				UNIVERSAL AVERAGES
M/HR on Unit	24,000	AVERAGES	19,750	15,731				
Sample Date	11/12/07		09/08/07	02/24/07				
Make Up Oil Added	0 qts		0 qts	0 qts				
ALUMINUM	2	2	3	2				3
CHROMIUM	1	1	1	1				1
IRON	20	23	25	24				22
COPPER	3	4	5	4				3
LEAD	3	2	3	1				3
TIN	0	0	1	0				1
MOLYBDENUM	3	3	3	3				31
NICKEL	1	1	1	1				0
MANGANESE	0	0	0	0				0
SILVER	0	0	0	0				0
TITANIUM	0	0	0	0				0
POTASSIUM	3	3	3	3				4
BORON	1	1	2	1				33
SILICON	8	9	10	10				11
SODIUM	3	3	4	2				3
CALCIUM	3454	3324	3419	3098				3104
MAGNESIUM	11	18	15	27				83
PHOSPHORUS	1378	1270	1203	1229				1120
ZINC	1667	1517	1505	1378				1288
BARIUM	0	0	0	0				2

Values
Should Be*

SUS Viscosity @ 210°F	65.4	66-78	63.3	67.0			
cSt Viscosity @ 100°C	11.72	11.9-15.3	11.14	12.14			
Flashpoint in °F	435	>410	445	405			
Fuel %	<0.5	<2.0	<0.5	TR			
Antifreeze %	0.0	0.0	0.0	0.0			
Water %	0.0	<0.1	0.0	0.0			
Insolubles %	0.3	<0.8	0.3	0.2			
TBN							
TAN							
ISO Code							

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APPENDIX D

Amsoil AME 15W40, Ford F-250 6.0L

March 3/ 09 sample

Amsoil AME 15W40

Truck has 63681 km

Oil has 17765 km on it

Physical tests

Oil was not changed

Water - none

Glycol % - none

Visc 40 degrees Celsius cSt - 70.3

Visc 100 degrees Celsius cSt - 11.08

Fuel % - 0.50

Soot% - 0.26

Spectro - Chemical (ppm)

Silicon - 18

Sodium - 6

Potassium - 3

Iron - 51

Chrome - 1

Lead - 11

Copper - 7

Tin - 3

Aluminum - 0

Nickel - 0

silver - 1

Titanium - 0

Boron - 2

Phosphorus - 1170

Zinc - 1380

Calcium - 3610

Barium - 1

Magnesium - 9

Molybdenum - 7

Vanadium - 1

Antimony - 6

Lithium - 0

Beryllium - 0

APPENDIX E



OIL REPORT

LAB NUMBER: E37749 UNIT ID: 01 F350
REPORT DATE: 12/8/2010 CLIENT ID: 41601
CODE: 20/501 PAYMENT: CC: Visa

MAKE/MODEL: Navistar 7.3L Power Stroke
FUEL TYPE: Diesel
ADDITIONAL INFO:

OIL TYPE & GRADE: Amsoil 15W/40
OIL USE INTERVAL: 9,000 Miles

JACOB WAGNER
1604 HEDGEROW DR.
VIRGINIA BEACH, VA 23455

PHONE: (757) 274-7877
FAX:
ALT PHONE:
EMAIL: jvwagner@cox.net

JACOB: This oil was in use longer than the last sample, and lead (from bearings) has increased. The lead could show a harmless particle streak, and if so it will likely disappear next time. In any case, we doubt it shows a problem developing but is something to watch next time. The viscosity was a bit low but that probably did not cause any added wear. The TBN showed plenty of active additive remaining at 7.6. Try going up to 11,000 miles next oil. We don't see any real differences between synthetic and conventional oil in used oil analysis. Both types work equally as well.

MI/HR on Oil	9,000	UNIT /	6,300					
MI/HR on Unit	235,000	LOCATION						
Sample Date	12/02/10	AVERAGES	08/09/10					UNIVERSAL
Make Up Oil Added	1 qt		2 qts					AVERAGES
ALUMINUM	2	1	1					2
CHROMIUM	1	1	1					1
IRON	21	17	14					17
COPPER	7	4	3					4
LEAD	8	6	5					4
TIN	0	2	0					1
MOLYBDENUM	8	4	3					24
NICKEL	1	1	1					1
MANGANESE	0	0	0					0
SILVER	0	0	0					0
TITANIUM	0	0	0					0
POTASSIUM	1	1	1					2
BORON	14	12	11					84
SILICON	3	3	2					9
SODIUM	4	4	4					4
CALCIUM	3086	3303	3176					3017
MAGNESIUM	196	148	108					112
PHOSPHORUS	1140	1159	1089					1115
ZINC	1217	1453	1609					1295
BARIUM	0	0	0					1

Values
Should Be*

SUS Viscosity @ 210°F	66.4	68-80	70.3					
cSt Viscosity @ 100°C	12.00	12.4-15.8	13.03					
Flashpoint in °F	430	>410	470					
Fuel %	<0.5	<2.0	<0.5					
Antifreeze %	0.0	0	0.0					
Water %	0.0	<0.1	0.0					
Insolubles %	0.2	<0.8	0.2					
TBN	7.6		10.1					
TAN								
ISO Code								

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APPENDIX F

Schaeffer 9000 5W40: UAO Report - 6.0L F250

Just got my UAO from Blackstone after 5088 miles on the oil (almost 20,000 miles on engine).

Aluminum 3

Chromium 1

Iron 23

Copper 3

Lead 2

Tin 1

Molybdenum 195

Nickel 0

Manganese 0

Silver 0

Titanium 0

Potassium 2

Boron 6

Silicon 13

Sodium 6

Calcium 3141

Magnesium 7

Phosphorous 1155

Zinc 1390

Barium 0

Vanadium

SUS vis at 210 F 72.1

cSt at 100 C 13.51

Flashpoint 415

Fuel <0.5

Antifreeze 0

Water 0

Insolubles 0.2

APPENDIX H

Popular Oil Technical Data Sheets

Motorcraft 15W-40:

- Not listed on the internet

[Shell Rotella T6 5W-40:](#)

[Amsoil AME 15W-40:](#)


[Valvoline Premium Blue Extreme 5W-40:](#)

[Shaeffer's 9000 5W-40:](#)

APPENDIX G

3/27/13

bismic-146250-albums-oil+analysis-210-picture-march-2009-uoa-3466.jpg (573x741)


OIL REPORT

LAB NUMBER:
REPORT DATE: 3/9/2009

UNIT ID: 06 F250

UNIT MAKE/MODEL: Navistar 6.0L Power Stroke OIL TYPE & GRADE: Valvoline Prem. Blue Extreme 5W/40
 FUEL TYPE: Diesel OIL USE INTERVAL: 3,680 Miles
 ADDITIONAL INFO:

CLIENT

COMMENTS MARK: Nice improvement at lead. It's can still be considered slightly high at 5 ppm, though we like this reading a lot better, and since all other wear remained in the normal range, we think this engine is doing just fine mechanically at 43,469 total miles. Fuel did show up, though 0.5% isn't enough to lose any sleep over. It didn't affect the viscosity, and will likely disappear next sample, but if it doesn't, we'll let you know. Insolubles were almost non-existent at 0.1%, showing excellent oil filtration and no blow-by or soot problems. All in all, a very nice report here.

Schaeffers 9000

	3,680		4,000		4,613		5,093		5,173		5,088	
	MI/HR on Oil	43,469	39,500	34,690	30,677	24,984	19,811					
Sample Date	03/02/09	11/29/08	09/11/08	05/19/08	02/12/08	11/17/07						
Make Up Oil Added	0	0 qts	0 qts	0 qts	1 qt	0 qts						
ELEMENTS IN PARTS PER MILLION												
ALUMINUM	3	3	2	3	3	3						
CHROMIUM	1	2	1	1	1	1						
IRON	29	29	29	26	28	23						
COPPER	2	4	3	3	3	3						
LEAD	5	4	8	7	7	2						
TIN	1	1	0	0	0	1						
MOLYBDENUM	104	137	270	283	263	195						
NICKEL	0	0	0	0	1	0						
MANGANESE	0	0	0	0	0	0						
SILVER	0	0	0	0	0	0						
TITANIUM	0	0	0	0	0	0						
POTASSIUM	2	8	3	3	4	2						
BORON	68	12	7	7	7	6						
SILICON	8	16	7	7	10	13						
SODIUM	11	6	6	6	6	6						
CALCIUM	2041	2892	3099	3689	3267	3141						
MAGNESIUM	769	84	6	6	7	7						
PHOSPHORUS	1113	1134	1111	1312	1140	1155						
ZINC	1287	1303	1406	1453	1324	1390						
BARIUM	0	0	0	0	0	0						
PROPERTIES												
SUS Viscosity @ 210°F	67.1	65-76	71.2	69.6	68.1	72.1						
cSt Viscosity @ 100°C	12.17	11.6-14.8	13.28	12.85	12.44	13.51						
Flashpoint in °F	405	>410	430	390	430	415						
Fuel %	0.5	<2.0	<0.5	2.0	<0.5	<0.5						
Antifreeze %	0.0	0	0.0	0.0	0.0	0.0						
Water %	0.0	<0.1	0.0	0.0	0.0	0.0						
Insolubles %	0.1	<0.8	0.3	0.2	0.3	0.2						
TBN												
TAN												
ISO Code												

Values Should Be*

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