

### Results Color Codes

Results outside the normal range are highlighted red

Results with borderline values are highlighted yellow

Results within the normal range are highlighted green

## Oil Analysis Report

**Name:** Total Seal Piston Rings      **Sample Type:** Engine  
**Unit ID:** Break-In Oils      **Condition:** **New Oil Report**

Sample Information		Sample Information				
<b>Sample ID #:</b>	SDS-430		SDS-422	SDS-423	SDS-424	SDS-425
<b>Sample Date:</b>	12/27/2019		12/30/2019	12/27/2019	12/27/2019	12/27/2019
<b>Oil Brand:</b>	Maxima		Motul	HPL	Torco	Jegs
<b>Viscosity Grade:</b>	10W-30		10W-40	5W-30	30	10W-30

Oil Properties	Test Results	Legend	Test Results			
<b>Viscosity @ 100C:</b>	✓ 10.1	cSt Flow Measurement	✓ 15.7	✓ 10.3	✓ 10.5	✓ 10.4
<b>Oxidation Value:</b>	✓ 4.8	Oil Life	✓ 4.7	✓ 7.2	✓ 7.9	✓ 8.1
<b>TBN:</b>	✓ 4.87	Total Base Number	✓ 3.99	✗ 9.51	✗ 8.76	⚠ 6.95
<b>Silicon:</b>	✓ 6	Anti-Foam Additive	✓ 2	✓ 6	✓ 5	✓ 10
<b>Additives (ppm):</b>						
Calcium	2592	Detergent	2	3151	3598	2333
Sodium	0	Detergent	0	0	0	0
Magnesium	6	Detergent	992	370	14	151
Phosphorus	2681	Anti-Wear	1342	1094	1126	4218
Zinc	3731	Anti-Wear	1303	1262	994	4110
Molybdenum	0	Friction Reducer	0	82	0	45
Boron	25	Friction Reducer	0	204	0	63

Sample Information		Sample Information				
<b>Sample ID #:</b>	SDS-426		SDS-427	SDS-428	SDS-429	AAA-0400
<b>Sample Date:</b>	12/27/2019		12/27/2009	12/27/2019	12/27/2019	12/30/2019
<b>Oil Brand:</b>	Blueprint		Edelbrock	Royal Purple	VP Racing Fuel	zMax Break-In
<b>Viscosity Grade:</b>	30		30	10W-30	10W-40	15W-50

Oil Properties	Test Results	Legend	Test Results			
<b>Viscosity @ 100C:</b>	✓ 11.0	cSt Flow Measurement	✓ 9.5	✓ 11.3	✓ 14.8	✓ 20.2
<b>Oxidation Value:</b>	✓ 23.3	Oil Life	✓ 7.1	✓ 12.0	✓ 27.3	✓ 28.0
<b>TBN:</b>	✓ 2.38	Total Base Number	✗ 8.45	✗ 8.9	⚠ 6.55	⚠ 5.13
<b>Silicon:</b>	✓ 11	Anti-Foam Additive	✓ 5	✓ 6	✓ 4	✓ 3
<b>Additives (ppm):</b>						
Calcium	2509	Detergent	4461	2392	2212	1695
Sodium	0	Detergent	0	0	0	204
Magnesium	9	Detergent	28	324	7	18
Phosphorus	3408	Anti-Wear	1156	1116	1309	2471
Zinc	3667	Anti-Wear	1421	882	575	2251
Molybdenum	0	Friction Reducer	0	0	555	62
Boron	0	Friction Reducer	0	0	0	149

**Comments / Recommendations**  
 Values in Red indicate levels higher than ideal for break-in, especially for piston ring seal.

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## Oil Analysis Report

Name: Total Seal Piston Rings Sample Type: Engine  
 Unit ID: Break-In Oils Condition: **New Oil Report**

### Sample Information

### Sample Information

Sample ID #:	SDS-0467		SDS-0463	SDS-0465	SDS-0446	SDS-0449
Sample Date:	11/23/2019		11/23/2019	11/23/2019	11/23/2019	11/23/2019
Oil Brand:	Swepeco		Driven BR40	Rotella T	Valvoline Pro-V	Schaeffer's
Viscosity Grade:	15W-40		10W-40	15W-40	10W-30	15W-40

### Oil Properties

### Test Results

### Legend

### Test Results

Viscosity @ 100C:	✓ 13.5	cSt Flow Measurement	✓ 14.5	✓ 14.8	✓ 10.5	✓ 15.0
Oxidation Value:	✓ 8.1	Oil Life	✓ 3.6	✓ 14.6	✓ 7.2	✓ 12.7
TBN:	✗ 11.01	Total Base Number	✓ 1.64	⚠ 6.93	✓ 4.86	⚠ 6.64
Silicon:	✓ 4	Anti-Foam Additive	✓ 1	✓ 5	✓ 11	✓ 6
Additives (ppm):						
Calcium	3543	Detergent	353	2337	2040	1922
Sodium	2	Detergent	1	4	484	12
Magnesium	8	Detergent	8	12	12	15
Phosphorus	1502	Anti-Wear	2879	1252	2308	2820
Zinc	1265	Anti-Wear	2870	1347	2109	2509
Molybdenum	100	Friction Reducer	2	0	1188	339
Boron	73	Friction Reducer	1	165	3	77

### Sample Information

### Sample Information

Sample ID #:	SDS-0444		SDS-0445	SDS-0443	SDS-0442	SDS-0441
Sample Date:	11/26/2019		11/26/2019	12/27/2019	12/27/2019	12/27/2019
Oil Brand:	PennGrade		Comp Cams	Lucas	Amsoil	Brad Penn
Viscosity Grade:	20W-50		10W-30	30	30	30

### Oil Properties

### Test Results

### Legend

### Test Results

Viscosity @ 100C:	✓ 21.4	cSt Flow Measurement	✓ 10.6	✓ 11.5	✓ 11.1	✓ 11.2
Oxidation Value:	✓ 11.4	Oil Life	✓ 9.6	✓ 2.5	✓ 8.3	✓ 7.9
TBN:	✗ 9.4	Total Base Number	✗ 9.6	✓ 3.67	⚠ 5.35	⚠ 6.66
Silicon:	✓ 1	Anti-Foam Additive	✓ 3	✓ 6	✓ 5	✓ 3
Additives (ppm):						
Calcium	1980	Detergent	3765	1735	2266	2299
Sodium	516	Detergent	1	0	0	14
Magnesium	649	Detergent	12	0	11	15
Phosphorus	1610	Anti-Wear	2568	4809	2340	904
Zinc	1781	Anti-Wear	2264	4466	2716	769
Molybdenum	0	Friction Reducer	140	0	0	0
Boron	1	Friction Reducer	3	0	13	0

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## Oil Analysis Report

**Name:** Total Seal Piston Rings      **Sample Type:** Engine  
**Unit ID:** Break-In Oils      **Condition:** **New Oil Report**

### Sample Information

### Sample Information

<b>Sample ID #:</b>	SDS-468		SDS-472	SDS-469	SDS-470	SDS-471
<b>Sample Date:</b>	12/30/2019		11/20/2019	12/30/2019	12/27/2019	12/27/2019
<b>Oil Brand:</b>	Shell ND		Valvoline VR1	GP-1 Break-In	GP-1 Race	BR10
<b>Viscosity Grade:</b>	30		20W-50	30	20W-50	10W

### Oil Properties

### Test Results

### Legend

### Test Results

<b>Viscosity @ 100C:</b>	✓ 11.9	cSt Flow Measurement	✓ 20.4	✓ 9.8	✓ 18.9	✓ 5.1
<b>Oxidation Value:</b>	✓ 4.0	Oil Life	✓ 9.3	✓ 5.8	✓ 7.8	✓ 13.9
<b>TBN:</b>	✓ 0.9	Total Base Number	✗ 7.6	✓ 1.4	⚠ 6.7	✓ 1.1
<b>Silicon:</b>	✓ 0	Anti-Foam Additive	✓ 9	✓ 3	✓ 3	✓ 9
<b>Additives (ppm):</b>						
Calcium	0	Detergent	1090	209	2144	267
Sodium	0	Detergent	0	0	0	0
Magnesium	0	Detergent	528	0	0	0
Phosphorus	0	Anti-Wear	1303	1965	1591	3184
Zinc	0	Anti-Wear	1475	1888	1617	3922
Molybdenum	0	Friction Reducer	50	0	359	0
Boron	0	Friction Reducer	176	0	139	0

### Sample Information

### Sample Information

<b>Sample ID #:</b>	SDS-473		0	0	0	0
<b>Sample Date:</b>	12/27/2019		1/0/1900	1/0/1900	1/0/1900	1/0/1900
<b>Oil Brand:</b>	John Deere Break-In		0	0	0	0
<b>Viscosity Grade:</b>	10W-30		0	0	0	0

### Oil Properties

### Test Results

### Legend

### Test Results

<b>Viscosity @ 100C:</b>	✓ 10.2	cSt Flow Measurement	✓ 0.0	✓ 0.0	✓ 0.0	✓ 0.0
<b>Oxidation Value:</b>	✓ 12.2	Oil Life	✓ 0.0	✓ 0.0	✓ 0.0	✓ 0.0
<b>TBN:</b>	✗ 7.52	Total Base Number	✓ 0	✓ 0	✓ 0	✓ 0
<b>Silicon:</b>	✓ 6	Anti-Foam Additive	✓ 0	✓ 0	✓ 0	✓ 0
<b>Additives (ppm):</b>						
Calcium	1429	Detergent	0	0	0	0
Sodium	0	Detergent	0	0	0	0
Magnesium	833	Detergent	0	0	0	0
Phosphorus	1119	Anti-Wear	0	0	0	0
Zinc	957	Anti-Wear	0	0	0	0
Molybdenum	251	Friction Reducer	0	0	0	0
Boron	273	Friction Reducer	0	0	0	0

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## Oil Analysis Report - Explained

**Name:** The name of the customer      **Sample Type:** The type of equipment the sample was taken from  
**Unit ID:** The ID of the equipment sampled      **Condition:** The overall condition of the sample

### Sample Information

<b>Sample ID #:</b>	ID Number from the sample bottle. Each SPEEDiagnostix sample kit features a unique ID number that provides traceability for each sample.
<b>Sample Date:</b>	The date the sample was taken. Knowing when samples were taken is very important in the trend analysis process.
<b>Oil Brand:</b>	The brand of the oil used. This information can be used to compare the used oil results to the specifications of the new oil (if available).
<b>Viscosity Grade:</b>	The viscosity grade of the oil. The results of the lab viscosity test is compared to the new oil viscosity to gauge the health of the oil.
<b>Mileage:</b>	The number of miles on the oil. This is critical information in the evaluation and calculation of the wear rate.

### Oil Health

### Test Descriptions

<b>Viscosity @ 100C:</b>	Viscosity measurement to check whether or not the oil is still in the correct viscosity range. A change in viscosity means a change in oil health.
<b>Oxidation Value:</b>	Oxidation is the chemical breakdown of the oil. The higher the number, the greater the oxidation, which means greater oil degradation.
<b>Fuel Dilution:</b>	Fuel dilution lowers the viscosity of the oil and indicates tune up or fuel delivery problems. POSITIVE indicates abnormal fuel dilution levels.
<b>Water:</b>	The presence of water in the oil indicates a problem. Water can come from a coolant leak or from extended low temperature operation.
<b>Glycol:</b>	POSITIVE indicates glycol contamination, which typically comes from a coolant leak. Glycol will destroy the lubricating properties of the oil.
<b>Potassium:</b>	Potassium can also indicate coolant contamination, which typically comes from a blown head gasket. Potassium levels under 10 are normal.
<b>Silicon:</b>	Silicon can come from the anti-foam additive in the oil, airborne dust entering the engine, silicone sealants, or piston and Alusil bore wear.
<b>Additives (ppm):</b>	Different types of oil will contain various additives, so the individual additive types and levels will vary according to application.
Calcium	is a detergent additive that keeps parts clean, prevents rust and neutralizes acids. It is typically found in motor oils and transmission fluids.
Sodium	is also a detergent additive that keeps parts clean and neutralizes acids. It is found in some motor oils.
Magnesium	is also a detergent additive that keeps parts clean and neutralizes acids. It is found in some motor oils and transmission fluids.
Phosphorus	is an anti-wear additive, and it typically comes from ZDDP. Phosphorus is a key anti-wear additive, and it is limited in API licensed oils.
Zinc	is an anti-wear additive and anti-oxidant, and it also comes from ZDDP. Combined with Phosphorus, Zinc is a key anti-wear additive in motor oils.
Molybdenum	is a multi-functional additive. Molybdenum provides anti-wear protection, reduces friction and inhibits oxidation.
Boron	reduces friction and reduces wear. Boron is typically used in combination with Molybdenum and ZDDP.

### Equipment Health

### Test Descriptions

<b>Wear Trend:</b>	<b>Wear Metals (ppm):</b>	The parts per million (ppm) of metals in the oil from worn parts in the engine, transmission, gear box, etc....
	Iron	is the main element in steel and cast iron, so the presence of iron in the used oil indicates wear of cast iron and steel parts. Rust increases Iron levels.
	Chromium	is an alloy combined with iron to make steel, so the presence of Chromium in the oil indicates wear of steel parts.
	Copper	is an alloy combined with tin to make bronze, which is a common material used to make bushings. Also, copper is used to make Babbitt bearings.
	Tin	is an alloy combined with copper to make bronze, which is a common material used to make bushings. Also, tin is used to make Babbitt bearings.
	Lead	is an alloy in Babbitt bearings, which are commonly used in automotive engines. Lead is also an anti-knock compound that is found in leaded fuels.
	Aluminum	is the main element in most pistons, and some engines utilize aluminum cylinder bores. So, the presence of Aluminum indicates piston and bore wear.
	Manganese	is an alloy used in Manganese Bronze, which is a high strength bronze often used in valve guides. It is also found in Octane boosters.
	Titanium	is a lightweight metal that is sometimes used in racing engines to make parts such as valve spring retainers. Also, Titanium is an additive in some oils.
	Vanadium	is an alloy combined with iron to make steel, so the presence of Vanadium in the oil indicates wear of steel parts such as crankshafts or gears.
	<b>Total Metals:</b>	The total of all wear metals in parts per million (ppm) from the sample. This is helpful in determining the overall wear rate.
	<b>Wear / 1,000 miles:</b>	This is the wear rate, and it is a calculation of the total wear metals divided by the number of miles on the oil to yield the rate of wear per 1,000 miles.

### Comments / Recommendations

\*\*\* Wear Trend: Statistical analysis of the trend in wear rates for each wear metal over the history of samples taken from this piece of equipment. The wear trend can help detect problems before the wear levels ever reach caution or warning levels. Taking used oil samples on a regular basis is important because wear trend analysis is a powerful tool for extending the life of equipment.