SPEEDiagnostix
How To Know You're Good To Go.

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:	Aaron Lapp	**Sample Type:**	Engine
Unit ID:	Chester	**Condition:**	**Monitor**

Sample Information		Previous Samples			
Sample ID #:	AAC-2444	-	-	-	
Sample Date:	5/4/26	-	-	-	
Oil Brand:	ROTELLA	-	-	-	
Viscosity Grade:	15W-40	-	-	-	
Odometer:	81,050	0	0	0	
Sample Mileage:	8,800	0	0	0	

Oil Health	Test Results	Previous Sample Results			Legend
Viscosity @ 100C:	15.15	-	-	-	cSt Flow Measurement
Oxidation Value:	17.76	-	-	-	Oil Life
Fuel Dilution:	3.71	-	-	-	Contamination
Soot:	0.63%	-	-	-	Contamination
Water:	Negative	-	-	-	Contamination
Glycol:	Negative	-	-	-	Contamination
Potassium:	16	-	-	-	Contamination / Coolant
Silicon:	5	-	-	-	Anti-Foam, Dirt
Additives (ppm):					
Calcium	2113	-	-	-	Detergent
Sodium	5	-	-	-	Detergent
Magnesium	88	-	-	-	Detergent
Phosphorus	1120	-	-	-	Anti-Wear
Zinc	1240	-	-	-	Anti-Wear
Molybdenum	1	-	-	-	Friction Reducer
Boron	102	-	-	-	Dispersant / Friction Reducer

Equipment Health	Test Results	Previous Sample Results			Legend
Wear Trend:					
Iron	52	-	-	-	Valvetrain, Cylinder Bore Wear
Chromium	3	-	-	-	Piston Ring Wear
Copper	1	-	-	-	Bushing, Bearing Wear
Tin	0	-	-	-	Moly Additive / Bearing Wear
Lead	1	-	-	-	Bearing Wear
Aluminum	14	-	-	-	Piston, Aluminum Bore Wear
Manganese	0	-	-	-	Valve Guide Wear/Octane Booster
Nickel	1	-	-	-	Nikasil Bore Wear
Titanium	0	-	-	-	Wrist Pin, Retainer Wear
Total Metals:	72	-	-	-	Total Wear Metals
Wear / 1000 Miles:	8.2	-	-	-	Wear Metals / 1000 Miles

Comments / Recommendations

All measured results are within normal ranges, but the wear rate per 1,000 miles is above our target of 5 ppm or less. No signs of abnormal external contamination, so rreduce the oil change interval and resample at next oil change (4,000 to 5,000 miles) to monitor and establish the trend analysis.

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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	
Sample ID #:	ID Number from the sample bottle. Each SPEEDiagnostix sample kit features a unique ID number that provides traceability for each sample.
Sample Date:	5/4/26
Oil Brand:	The brand of the oil used. This information can be used to compared the used oil results to the specifications of the new oil (if available).
Viscosity Grade:	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.
Mileage:	The number of miles on the oil. This is critical information in the evaluation and calculation of the wear rate.

Oil Health	Test Descriptions
Viscosity @ 100C:	Viscosity measurement to check whether or not the oil is still in the correct viscosity range.
Oxidation Value:	Oxidation is the chemical breakdown of the oil. The higher the number, the greater the oxidation, which means greater oil degradation.
Fuel Dilution:	Fuel dilution lowers the viscosity of the oil and indicates fuel delivery problems. Over 5% indicates abnormal fuel dilution levels.
Water:	The presence of water in the oil indicates a problem. Water can come from a coolant leak or from extended low temperature operation.
Glycol:	POSITIVE indicates glycol contamination, which typically comes from a coolant leak. Glycol will destroy the lubricating properties of the oil.
Potassium:	Potassium can also indicate coolant contamination, and it can also come from fuel additives. Potassium levels under 10 are normal.
Silicon:	Silicon can come from the anti-foam additive in the oil, airborne dust entering the engine, silicone sealants, or piston and Alusil bore wear.
Additives (ppm):	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
Wear Trend:	**Wear Metals (ppm):**	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.
	Total Metals:	The total of all wear metals in parts per million (ppm) from the sample. This is helpful in determining the overall wear rate.
	Wear / 1,000 miles:	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.

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Results Color Codes - Action Steps	
Check sampling method & Re-sample immeadiately.	Warning
Re-sample at normal drain interval - Check trend analysis.	Caution
No action required - Results are normal.	Good

Oil Analysis Report - Steps To Take

If your report comes back with either a yellow "Caution" or a red "Warning" condition, it can be alarming, especially if the equipment seems to be operating normally. Don't panic, we are here to help. This page provides the steps to take if your report displays a "Caution" or "Warning" condition.

Because of the serious nature of these decisions, it is important to be 100% certain that the data and sample submitted are accurate and representative. The first step is to review the data submitted with the sample. Please ensure the correct information was submitted. The second step is to review the method used to take the sample. An improperly taken sample can cause a false "Caution" or "Warning" condition, so review the recommended sample collection method provided at https://www.speediagnostix.com/taking-a-sample. Once the sample information and sampling method have been verified, the action required for any "Caution" level condition is to re-sample at the normal drain interval. This provides a conservative opportunity to check the trend analysis. A "Caution" level condition means the results are within acceptable levels, but on the high side of the acceptable range. For a "Caution" level, no other steps need to be taken.

A "Warning" level means the results are beyond acceptable, which means the equipment sampled is at risk. The list of test results and recommended actions below provides the correct steps to take if your report comes back with red "Warning" conditions on one or more individual tests. Besides following the recommended steps below, take another sample as soon as possible to determine the trend analysis. Two samples that both indicate

Oil Health	Recommended Action
Viscosity @ 100C:	Make sure the viscosity listed on the sample submission form is the same as the viscosity installed in the equipment. Once verified, a low viscosity reading is typically due to fuel dilution. Check the injectors/carburetor to ensure proper function and air/fuel ratio. It is good practice to periodically use a fuel injector/carburetor cleaning additive to prevent excess fuel dilution from dirty injectors. A high viscosity reading is due to oxidation.
Oxidation Value:	A high oxidation reading means the oil is past its useful life or it contains Ester base oils. If the oil is not Ester based, then reduce the drain interval. If the oil is Ester based, please submit a sample of the unused oil to establish the oxidation baseline for your oil.
Fuel Dilution:	As stated above, check the injectors or carburetor. Dirty injectors or gummed-up carburetors can cause fuel dilution problems.
Particle Count:	Putting fresh oil into the engine along with a new oil filter is the best way to clean out the system. If this doesn't resolve a high count, then that indicates high wear or contamination.
Water:	Check the coolant system for leaks. Blown head gaskets and damaged bores can introduce water into the oiling system. Also, frequently starting an engine during storage without bringing the engine fully up to operating temperature can cause a build up of water from condensation. As a result, avoid starting the engine unless it is going to run long enough to get up to a normal operating temperature (typically 20 minutes).
Glycol:	Glycol comes from Anti-Freeze contamination, so glycol indicates a coolant leak. Accordingly, check the cooling system for leaks.
Potassium:	Potassium typically comes from anti-freeze, so check for coolant system leaks and make sure any funnels used to fill the equipment were not used to fill the radiator. Cross contamination of automotive chemicals does happen by accident, and it can be the cause of "Caution" level conditions.
Silicon:	Silicon typically comes from airborne dust, so check the air filter and/or breathers on the equipment. High levels of silicon can also come from seals and sealants, so replacing or installing new parts can cause the silicon levels to spike. Continued sampling will reveal if the silicon came from sealants or from dust and dirt contamination. Good filters with proper fit greatly reduce silicon contamination.
Equipment Health	**Recommended Action**
Wear Metals (ppm):	**Any red "Warning" level wear metal results should be taken seriously. Recommended actions and investigations should be handled promptly.**
Iron	Typically indicates cylinder bore and/or valvetrain wear. Check leak down and valve lash.
Chromium	Typically indicates piston ring wear wear. Check leak down. Chromium can also come from steel alloys, so check valve lash.
Copper	Typically indicates bearing, bushing or distributor gear wear. Check filter for wear debris.
Tin	Typically indicates bearing wear. If copper, tin and lead are all high, bearing damage has likely occurred. Check filter for wear debris.
Lead	Typically indicates bearing wear. If only lead is high, check fuel to see if leaded fuel or AV gas has used.
Aluminum	Typically indicates piston wear and even cylinder bore wear in aluminum bore engines (Alusil and Nikasil). High tin and aluminum levels together can indicate bi-metal aluminum bearing wear.
Manganese	Typically indicates indicates the use of MMT based octane booster.
Titanium	Typically indicates valve spring retainer wear. Other parts such as connecting rods, wrist pins and valves can also be made from titanium. Check valve lash. Because titanium can also be an oil additive, sample unused oil to check for the presence of titanium as an oil additive in the fresh oil.
Total Metals:	Indicates the overall wear metals in the sample. A red "Warning" level on this and other individual wear metals indicates a higher level of severity. Inspect the equipment before continued use of the equipment to prevent catastrophic damage.
Wear / 1,000 miles:	A red "Warning" level indicates an elevated wear rate. Check the sampling procedure and the recorded mileage or hours on the sample to ensure the sample was taken properly and the actual mileage or hours were recorded on the sample submission form.

Wear Trend

A red "Warning" level indicates a significant shift in the results compared to previous samples. Resample as soon as possible to determine if the abnormal result is an anomaly or indication of a change in equipment health.

Helpful Resources

To help provide context and guidance related to your resutls, we've provided these video links that go deeper on common questions and issues.

Viscosity Grades Explained:	https://youtu.be/48pviPLgaPQ
Viscosity Loss Explained:	https://youtu.be/2-ECI5uK9eE
How Motor Oil Is Made:	https://youtu.be/57ubgGVkCF8
Motor Oil Additives:	https://youtu.be/CAGT5inQScE
Diesel Fuel Additives:	https://youtu.be/2m4BBqIAUkY
Gasoline Fuel Additives:	https://youtu.be/MAAJCEatYsY
Premium Gasoline:	https://youtu.be/DAmEGI7xvBw
Motor Oil Dyno Testing:	https://youtu.be/e8dCFcF0qBQ
Motor Oil Wear Testing:	https://youtu.be/ipunDlG1k-8

Step 1 - Utilize the OEM recommended oil spec and viscosity and do two early oil changes during the break-in process (500 to 1,000 miles and again between 3,000 and 4,000 miles). If the engine is already broken-in, skip to step 3.

Step 2 - Take used oil samples at each oil change to establish the trend analysis.

Step 3 - Go 5,000 miles on the third oil change and take a used oil sample. If the wear rate per 1,000 miles is below 5 ppm, you are good. If the wear rate is between 5 ppm and 10 ppm per 1,000 miles, go another 5,000 miles on the OEM recommended oil and resample. If the wear rate is still greater than 5 ppm per 1,000 miles, then move to step 4.

Step 4 - Since the OEM recommended oil and viscosity have not produced a wear rate per 1,000 miles lower than 5 ppm, go up to next viscosity grade in that oil. Go 4,000 to 5,000 miles on that oil and then take another sample. See if the change in viscosity drops the wear rate per 1,000 miles below 5 ppm. If it does, you are good. If it does not, then move to Step 5.

Step 5 - Since the change in viscosity did not get the wear rate per 1,000 miles below 5 ppm, try a different brand of oil in the same viscosity grade of whichever oil had the lowest wear rate per 1,000 miles. You will need to use it for 3,000 to 4,000 miles to flush the OEM oil out of the system before going 5,000 miles on the new oil to take another sample. See if the non-OEM oil lowers the wear rate per 1,000 miles to 5 ppm or less. If it does, you are good. You can then use the oil analysis results to fine tune the oil change interval.

If the wear rate per 1,000 miles is still above 5 ppm, try the next higher viscosity oil of that same brand to see if that lowers the wear rate per 1,000 miles. Finding the best oil for an engine is an iterative process, but the data from the samples (viscosity, additive depletion, wear rate) will paint a picture that guides you in the right direction.