

Blood Tests

for RVs and Towing Vehicles

JG Lubricant Services

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Discussion Topics

▶ **Introduction**

- What Do We Mean by “Blood Tests for Your RV?”
- Why do oil and coolant analysis?

▶ **About Oils**

- Engine oils
- Transmission fluids
- Degradation and Contamination
- Testing and Analysis

▶ **About Coolants**

- Types
- Source water contamination
- Testing and Analysis



Blood Tests for Your RV

- ▶ Both are based on established scientific methods and allow the analyst to “see inside” the system to determine cause and effect



Look similar to you?

Why Do Oil and Coolant Analysis?

- ▶ **Only oil and coolant analysis can “truly” protect your RV power systems**
 - Engine, transmission, cooling system and generator
- ▶ **It’s the only way to tell if your oils and coolants really need to be changed**
- ▶ You’ll have **“peace of mind”** knowing that your RV power train and generator remain as “worry free” as possible
- ▶ **It’s cheap insurance !!!**



About Oils

All Oils Must Have

Oxidation Resistance

- ▶ Enables oils to stand up to repeated heat applications without damaging the oil's molecular structure

Viscosity Coverage

- ▶ **High temperature**
 - Provides oil film thickness
- ▶ **Low temperature**
 - Allows oil to flow and be pumped



Basic Oil Formulations

- ▶ **Formulations are the “recipe” used by oil companies and oil marketers to blend oils**
 - Original formulations are produced by additive companies and are designed to pass OEM specifications
 - ▶ Formulations contain (2) basic components:
-

Base oils

- ▶ Typically a mixture of base oils
 - Accounts for 85–90% of the formulation
- ▶ Provides initial oxidation resistance and viscosity coverage
- ▶ Act as “carrier oil” for additives

Additives

- ▶ Referred to as “add pack”
 - Accounts for 10–15% of the formulation
- ▶ Additives provide “full protection”

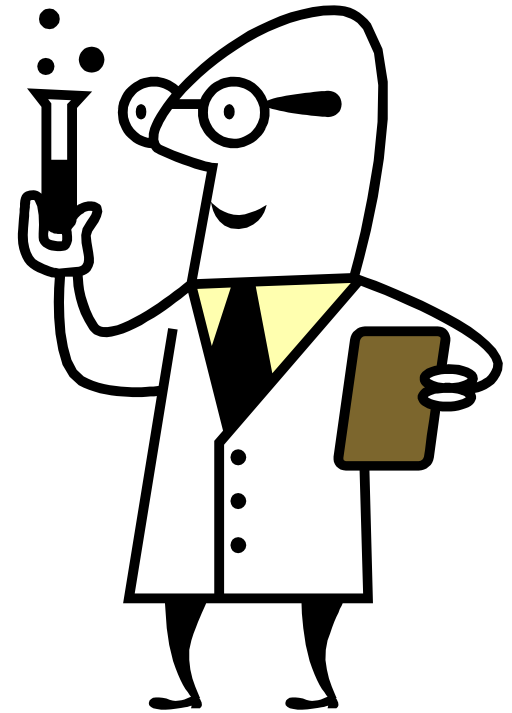


What are Additives?

- ▶ **Additives are complex chemical structures that are added to base oils to provide the performance requirements that base oils can't deliver alone**
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Additives include:

- ▶ **Antioxidants**
- ▶ **Viscosity modifiers**
 - Viscosity Index (VI) Improvers
 - Pour Point Depressants
- ▶ Dispersants/detergents
- ▶ Anti-wear agents
- ▶ Seal swell agents
- ▶ Anti-foam agents
- ▶ Rust and corrosion inhibitors
- ▶ Friction modifiers (*automatic transmissions*)



Additive company formulator
(PhD Organic Chemistry)

Engine Oil Viscosity Grades

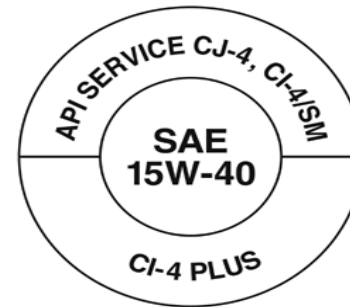
- ▶ Engine Oil Viscosity Grades are defined by the SAE* J300 standard

For Diesel Engines

- ▶ Most common is SAE 15W-40
- ▶ API** Diesel Category is CJ-4
 - “C” means commercial
 - “J” is the latest specification
 - “4” means 4-stroke

For Gasoline Engines

- ▶ Most common is SAE 5W-30
- ▶ API** Diesel Category is SM
 - “S” means “Spark”
 - “M” is the latest specification



← API
“Donut”

* Society of Automotive Engineers
** American Petroleum Institute

Transmission Fluids

Transmission fluids differ from engine oils

- ▶ Different anti-wear agents than engine oils
- ▶ Friction modifiers are needed to ensure smooth shift and acceptable clutch life

Allison Oil Recommendations:

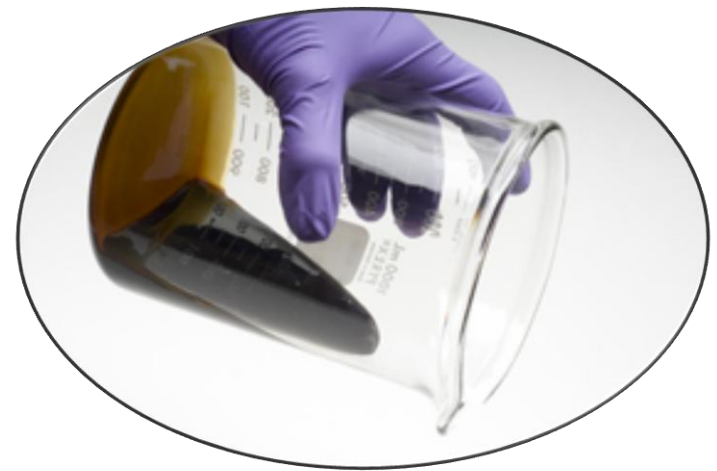
- ▶ **TES-295**
 - TranSynd, Mobil Delvac Synthetic ATF and others
 - Extended drain intervals
- ▶ **TES-389**
 - Older DEXRON-IIIH type fluids that have passed a special seals compatibility test
 - Not recommended for extended drain intervals

Note: DEXRON-VI is no longer recommended



When Good Oils Go Bad

- ▶ Engine oils and transmission fluids will degrade over time
- ▶ **Three things can affect the life of any oil product**
 - Oxidation
 - Viscosity loss
 - Contamination



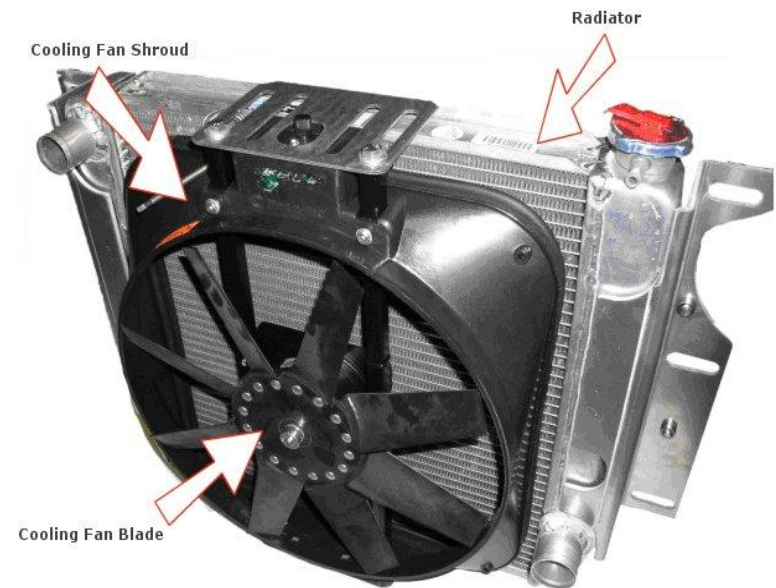
What Causes Oil Oxidation?

- ▶ **Exposure to heat in the presence of oxygen for long periods of time**
 - Hydrocarbon bonds break and oil molecules lose hydrogen to become **“radicals”**
 - Radicals combine with oxygen to form peroxides and organic acids
- ▶ **End result**
 - Acid formation
 - Thickened oil (sludge)



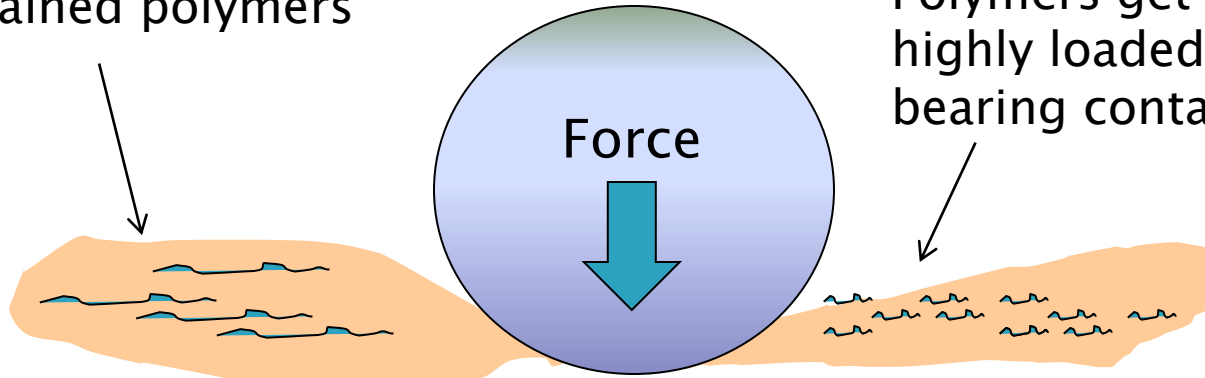
Oxidation “Rule of Thumb”

- ▶ **Oxidation rate doubles for every 10°C (18° F) increase in oil temperature”.**
- ▶ Engine and transmission OEMs specify cooling system capacities to protect the equipment and oil from overheating



Viscosity Change

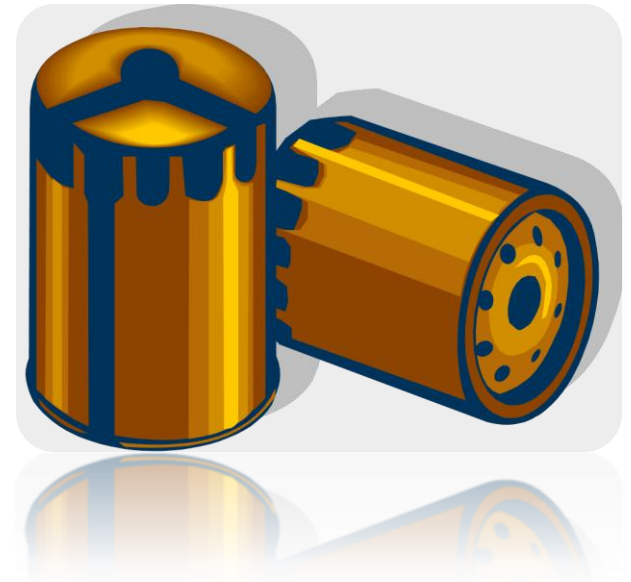
Long chained polymers



- ▶ Fresh (new) oil contains long chained polymers (called VI Improvers) that make oil thicken with temperature
- ▶ High pressure in gears and bearings causes these long chain polymers to be cut up and shortened over time
- ▶ This thins the oil over time until it eventually reaches the Base Oil Viscosity (BOV)
- ▶ **Thinned oil cannot produce the required oil film thickness to properly separate gears and bearings under load**

Contamination

- ▶ **Typical contaminants may include:**
 - Solid road debris (dust, dirt, sand)
 - Fuel and soot (engine)
 - Coolant (anti-freeze); ethylene or propylene glycol
 - Water (humidity); can form sludge can contribute to sludge formation



Oil Tests Include

The Big Three

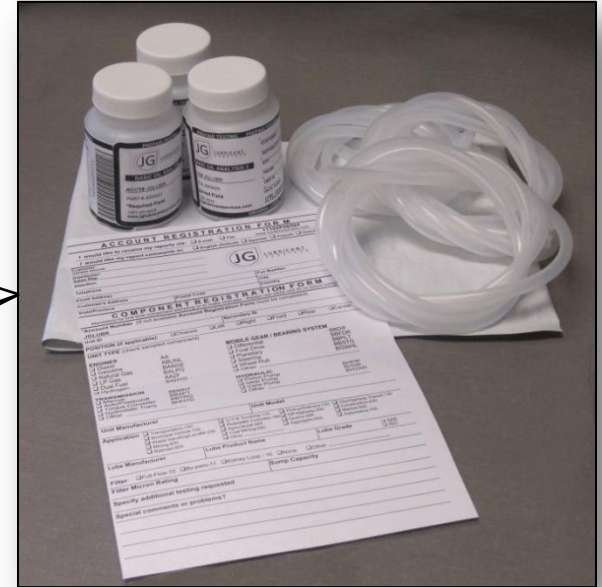
▶ **Oxidation**

- Total Acid Number (TAN)
 - Transmissions
- Total Base Number (TBN)
 - Engines
- Oxidation/Nitration

▶ **Viscosity change**

▶ **Contamination**

- Glycol (Na and K)
- % Water
- % Fuel Dilution
- % Soot
- Wear Metals Content
- Particle Count (Ultimate Kit Only)

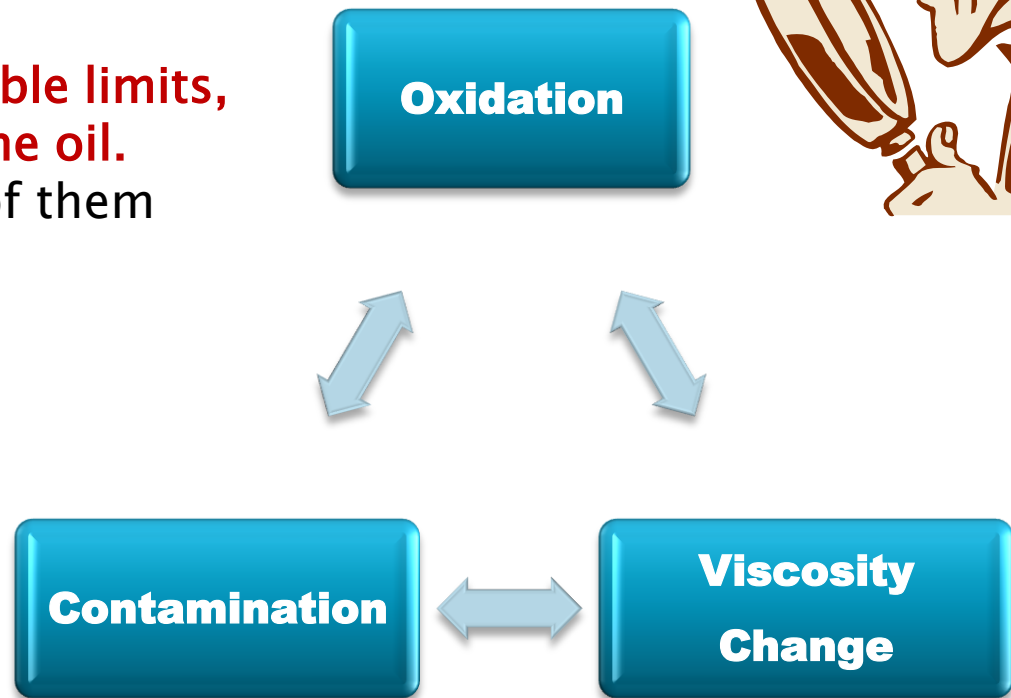


The Importance of Oil Analysis

RV and towing vehicles oils (*engine, transmission, differential, generator, etc.*) should be tested on a periodic basis for oxidation, viscosity change and contamination.

If all (3) are within acceptable limits, it's safe to keep running the oil.

Change the oil when one of them goes out of limits.



Oil Analysis Can Detect

Oil Degradation

- ▶ Excessive oxidation
- ▶ Excessive viscosity loss
- ▶ Contamination
 - Fuel and/or coolant leaks
 - Water infiltration
 - Soot/nitration
 - Excessive blow-by or mixture problems



Internal Part Wear

- ▶ Bearings, piston rings, cylinder walls

About Coolants

About Coolants

▶ Coolants consist of:

- Water = 45%
- Base (*carrier fluid*) = 50%
- Inhibitors and additives = 5%

Types

▶ Conventional

- Ethylene glycol (**green dye**)

▶ Extended Life Coolants (ELC)

- Organic Acid Technology (**Orange dye**)



Coolant Analysis Can Detect ...

- ▶ Metal corrosion
- ▶ Combustion gas leaks
- ▶ Contamination
- ▶ Electrical ground problems
- ▶ Localized overheating
- ▶ Air contamination
- ▶ Chemical breakdown



The Importance of Source Water

- ▶ **What does water do?**
 - Acts as the heat transfer fluid
 - Provides freeze point properties
 - Carrier fluid for supplemental coolant Additives (SCAs)
- ▶ Source water (*depending on area of the country*) can contain large amounts of dissolved contaminants (*calcium, silica, chlorides and sulfates*)
 - Contaminated source water can lead to excessive scaling and corrosion
- ▶ **We recommend you only purchase and install premixed coolants**



Coolant Tests Include

- ▶ Elemental metals
- ▶ pH
- ▶ % Glycol
- ▶ Freeze Point (*ant-freeze*)
- ▶ Boiling Point (*coolant*)
- ▶ Nitrite
- ▶ SCA Number
- ▶ Total Dissolved Solids
- ▶ Specific Conductance
- ▶ Total Hardness
- ▶ Visuals
 - Color, oil, fuel, magnetic and non-magnetic precipitate, odor & foam

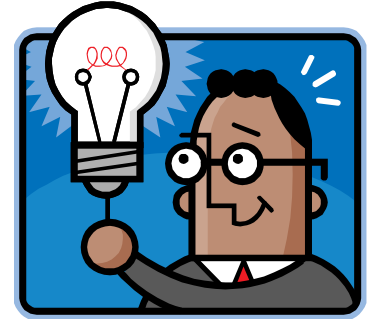


Let's Do a Quick "Check List"

- ▶ **Run through this mental "check list"**
- ▶ **Ask yourself these questions**
 - How do I know my oils and coolants are standing up to my operating demands?
 - Could my oil be too thin?
 - Is my coolant contaminated?
 - Am I running them too long or is there life still left in them?
 - Do I have any wear or contamination issues in my engine, transmission, or cooling system?
- ▶ **If you don't know the answer or feel uncomfortable, then it may be time to consider oil and coolant analysis !!!**



Oil Analysis ... a SMART Thing to Do



Saves you money

Makes maintenance more effective

Allows extended drains with confidence

Results in increased equipment reliability

Takes the guess work out maintenance

OIL ANALYSIS KIT DESCRIPTIONS

Analysis Kit Type	TESTS INCLUDED IN KIT								
	Basic Protection					Additional Diagnostics			Debris Analysis
	Elemental Analysis (ICP)	% Water	% Fuel Dilution	% Soot	Viscosity at 100C	Total Base Number (TBN) ³	Total Acid Number (TAN) ⁴	Oxidation and Nitration (IR)	By Particle Count or Particle Quantifier
BASIC¹	●	●	●	●	●				
ADVANCED²	○	○	○	○	○	○	○	○	○
ULTIMATE⁵	○	○	○	○	○	○	○	○	○

1. Not recommended for extended drain interval sampling (*consult JG Lubricant Services*)
2. Recommended for extended drain interval sampling
3. Engine oil samples are tested for TBN (*not included on transmission and gear oil samples*)
4. Transmission and gear oil samples are tested for TAN (*not included on engine oil samples*)
5. Debris Analysis by Particle Count (*if gearbox is filtered*); Debris Analysis by Particle Quantifier (*if gear box is unfiltered*)