

Possible Wear Element Sources

	Engine	Transmission	Hydraulic	Final Drive	Differentials
Copper (Cu)	Oil Additives (No Failure) Cooler Core Leaching (No Failure) Bushing/Bearings: - Turbocharger - Governor - Oil Pump - Wrist pin - Rocker Arm - Cam Roller Shaft - Air Compressor - Fuel Injection Pump - Idler/Timing Gears - Water Pump - Oil Pump Drive - Service Meter Drive Gear - Thrust Bearing	Oil Additives (No Failure) Cooler Core Leaching (No Failure) Torque Converter Bushing Speed And/Or Direction Clutch Discs Lockup Clutch Discs (Sintered Bronze Only) Steering/Brake Discs (Common System Using Sintered Bronze Discs)	Oil Additives (No Failure) Cooler Core Leaching (No Failure) Pump Bushing Pressure Plate (Gear Pump) Slippers & Port Plate (Piston Pump) Bronze Flex Plates (Vane Pump)	Oil Additives (No Failure) Thrust Washers (Wheeled Machines) Bronze Sleeve Bearings (Some Wheeled Machines)	Oil Additives (No Failure) Thrust Washers Bronze Sleeve Bearings (Some Wheeled Machines)
Iron (Fe)	Cylinder Liners Gears Crank or Cam Shafts Wrist Pins Oil Pump Valve Train Air Compressor Cam Follower	Gears Clutch Plates Bearings Pump Housing Splines Shafts Transmission Housing Steering/Brakes (Common System)	Cylinder Pumps	Gears Bearings Splines Shafts Carriers Housings Thrust Buttons	Gears Bearings Splines Shafts Housings
Chrome (Cr)	Roller/Ball Bearings (Some) Air Compressor Piston Rings Exhaust Valves Crank Shaft (Field Salvage)	Roller/Ball Bearings (Some)	Roller/Ball Bearings (Some) Bent Cylinder Rod Pump Ring Wear	Roller/Ball Bearing (Some)	Roller/Ball Bearing (Some)
Aluminum (Al)	Main Bearing Rod Bearing Camshaft Bearing Balancer Shaft Bearing Crank Thrust Bearing Rocker Arm Bracket Oil Pump Bearing Timing Gear Bearing Air Compressor Pistons Fuel Pump Injector Lifter Dirt Entry (Clay Soil)	Torque Converter Impeller Pump Bushings Dirt Entry (Clay Soil)	Cylinder Rod Bushing Pump Body Dirt Entry (Clay Soil)	Duo Cone Seal Retainer Bronze/Aluminum Alloy Sleeve Bearings (Some Wheeled Machines) Dirt Entry (Clay Soil)	Thrust Washers Bronze/Aluminum Alloy Sleeve Bearings (Some Wheeled Machines) Dirt Entry (Clay Soil)
Lead (Pb)	Main & Rod Bearing Overlay Camshaft Bearing Overlay Turbocharger Bearing	Binder in Clutch Discs	N/A	N/A	N/A
Molybdenum (Mo)	Top Rings (Some Engines) Moly Greases	Moly Greases	Moly Greases	Moly Greases	Moly Greases
Silicon (Si)	Dirt Entry Silicon Grease Anti-Foam Oil Additive	Dirt Entry Silicon Grease Anti-Foam Additive	Dirt Entry Silicon Grease Anti-Foam Additive	Dirt Entry Silicon Grease Anti-Foam Additive	Dirt Entry Silicon Grease Anti-Foam Additive
Sodium (Na)	Cooler Leak Water Entry Condensation Oil Additive (No Failure)	Cooler Leak Water Entry Condensation Oil Additive (No Failure)	Cooler Leak Water Entry Condensation Oil Additive (No Failure)	Cooler Leak Water Entry Condensation Oil Additive (No Failure)	Cooler Leak Water Entry Condensation Oil Additive (No Failure)

NOTES

ENGINES

- Some of the components listed will not be present in all engines.
- Crankshaft thrust bearings, oil pump bearings and air compressor bearings may be made of either aluminum or bronze (copper).

TRANSMISSIONS

- Some transmissions use sintered bronze discs (copper) in various clutches. Some use fluoroelastomers, graphitics and cellulose fibers which cannot be qualified by AA, ICP or DCP spectrophotometer instrumentation.
- In some vehicles, the lock-up clutch and torque converter oil is obtained from different sumps.

HYDRAULICS

- All pumps have bronze/brass/copper components which will produce copper wear particles. Trending of copper and other elements will identify pump problems.

FINAL DRIVES/DIFFERENTIALS

- Bronze thrust washers/plates are used in the differentials in some vehicles.
- Some wheeled machines use bronze sleeve bearings with high aluminum content in the final drives and differentials.

GENERAL

- Copper & aluminum can result from anti-seize compounds used during repair or oil "treatments."
- Molybdenum can be the result of some greases.
- Lead can sometimes be attributed to some types of oil "treatments." It can also be caused by extreme pressure (E.P.) gear oil formulation.
- Be aware that some compartments may have a common sump on some machines (e.g., transmission/torque converter/brakes)
- Oil transfer between compartments may occur on certain machines due to seal damage or failure (e.g., brakes to final drive, engine to transmission, etc.).