



KEY TO SOURCES OF DAMAGING ELEMENTS IN OIL

1. **Aluminum (Al)** - Pistons, bearings, bushings, pump vanes, blower/turbos, washers, dirt, shims
2. **Antimony (Sb)** - Babbitt bearings, greases
3. **Barium (Ba)** - New oils (dispersant/detergent), grease, water
4. **Boron (B)** - New oils, coolant, seals, dust, fuel dilution
5. **Cadmium (Cd)** - Bearings, platings
6. **Calcium (Ca)** - New oils (dispersant/detergent), water, grease
7. **Chromium (Cr)** - Plated parts (primarily piston rings), coolant, anti-friction bearings, shafts, gears, seals, bearing cages, fuel leaks gas turbines
8. **Cobalt (Co)** - Bearings, turbine components
9. **Copper (Cu)** - Bearings, bearing cushions, bushings, thrust washers, valves, guides, injector shields, oil cooler tubes, wet clutches, coolant (copper radiator), gears
10. **Iron (Fe)** - Rings, crankshaft, cylinder walls, valve train, pistons, anti-friction bearings, gear train, shafts, clutch plates, washers, rust, water
11. **Lead (Pb)** - Babbitt or copper-lead bearings, platings, leaded gear lubes, leaded gasoline, grease, paint, seals, solder
12. **Magnesium (Mg)** - New oils (dispersant/detergent), bearings, superchargers, water
13. **Manganese (Mn)** - Steels, shafts, valves, corrosion, blowers (exhaust & intake systems)
14. **Molybdenum (Mo)** - Additives, piston rings, electric motors
15. **Nickel (Ni)** - Shafts, valves, anti-friction bearings, gears, rings, turbine components
16. **Phosphorous (P)** - New oils, (anti-wear additives), gears, coolant leaks.
17. **Silicon (Si)** - Sand, dirt, dust, anti-foam, anti-freeze, gasket sealing compounds
18. **Silver (Ag)** - Anti-friction bearings, silver solder, wrist pin bushings, gear teeth, shafts
19. **Sodium (Na)** - Some new oils, coolant, salt water, grease
20. **Tin (Sn)** - Babbitt bearings, platings, solder, coolers, wrist pins, pistons, rings
21. **Titanium (Ti)** - Wear turbine engines, springs, valves, bearing hub, compressor discs, turbine blades
22. **Vanadium (V)** - By product heavy fuel oil, occasionally wear metal, turbine blades, valves
23. **Zinc (Zn)** - Anti-oxidant, anti-corrosive, anti-wear agent, bearings, platings, gears, seals, coolant leaks, grease.