Evaluate your fluid with the ACUSTRIP Wear Metal Level Condition Detection Test Kit

Engineers and auto makers (OEMs Original Equipment Manufacturers) have shown that the cleaner the fluids the longer engine and the vehicle components will last. Systems are subject to failure and corrosion, requiring regular maintenance to check the systems condition to minimize impacts of system failure and corrosion. Checking the condition and level of the vehicles fluids combined with physical inspection the systems is all part of proactive maintenance.

While there are many ways to filter out metal and system contaminants, monitoring their level will assist in deciding when to change the fluids, or identify when there is potential maintenance needs that require attention. Lab Monitoring is typically time consuming, inconvenient, time delayed, and expensive. Other qualitative tests leave out quantitative evaluation of the wear metals requiring non precise interpretation of the results and color is never an indication of the condition of the fluid.[i]

Even the most expensive fluids will not prevent the damage of high levels of metal ions and particles. Excessive metals under the demand of stop and go driving can rapidly accelerate wear. Monitoring the level of metals at each preventative maintenance service, keeping an eye on the trend of their levels assists with identifying when service is required. When the condition indicates that a change is needed, corrosion damage is minimized. (See list below)

Wear Metal Typical Limits (ppm)							
	Iron	Chrome	**Nickel**	Al	**Copper**	**Lead**	Tin
Antifreeze [ii]	**10**	NA	**NA**	10	**10**	**NA**	10
Crank Case Oil	**390**	40	**30**	45	**325**	**128**	40
Diesel Oil	**390**	40	**30**	45	**325**	**128**	40
Gear Box (Trans/Diff)	**985**	25	**63**	55	**250**	**196**	50
Hydraulic (brake/power steering)	**165**	15	**14**	40	**255**[iii]	**98**	30

What role does contamination play?

Contamination of fluids is very common. Contamination can cause numerous problems. Water, air, dirt, fuel, and other hydraulic oils or lubricants can all act as forms of contamination.

Water contamination is very common. Used oil analysis often will show levels of 500-1000 ppm water in hydraulic fluid taken from an industrial application. Water is detrimental because it does not lubricate as well as oil and can cause wear. In some cases, it also can react with the additive system to form acids that can cause yellow metal corrosion. Water in the presence of air leads to rust of component surfaces and can increase the rate corrosion, decreasing the fluid life.

Air contamination results in oxidation, which can increase oil viscosity. Over time, oxidation can lead to the creation of varnish, a lacquer that coats surfaces and causes valves to stick. Even worse, air contamination can cause pumps to pit as air in the oil rapidly dissolves from heat generation, which can lead to pump loss. Dirt, metal particles, and soot are common fluid contaminants, and their presence is an indication of contamination and as levels increase, a measure of wear. Metal particles can accelerate the oxidation process, and the contaminants can in turn cause abrasion or surface fatigue on machine surfaces.

Fuel contamination introduces several changes, including lower flash point, lower viscosity, and increased vapor pressure. The viscosity change alone creates lower film strength, hampering lubrication efficiency.

Corrosion - Two potential corrosion problems must be considered: *system rusting* and *acidic chemical corrosion*. System rusting occurs when water carried by the fluid attacks ferrous metal parts. Most fluids contain rust inhibitors to protect against system rusting, but the level of rusting is detectable.

Oxidation and thermal stability - Over time, fluids oxidize and form acids, sludge, and varnish. Acids can attack system parts, particularly soft metals. Extended high-temperature operation and thermal cycling also encourage the formation of fluid decomposition products and metal ions from corrosion.

Water retention – If water is identified as an issue (can be done with ACUSTRIP Moisture Test #40002) , large quantities can be removed by draining the sump periodically. However, small amounts of water can become dissolved, particularly if the sump is small. Demulsifiers can be added to the fluid to speed the separation of water. Filters can then physically remove any remaining water from the hydraulic fluid. The water should leave the fluid without taking fluid or additives with it.

What gets into oil

Water is probably the most common chemical contaminant in Hydraulic fluid systems and condensation the most likely source. A system run in hot, humid environments ingests air containing water vapor, which then condenses upon cooling. Leaky reservoirs and seals, careless use of steam cleaners or high-pressure washers, can also introduce water. Demulsifiers in most oils help separate the heavier water portion for draining. Special coalescent materials, desiccants, centrifuges, and vacuum hydration are other ways to eliminate it. Identification of the presence of water and or the presence of corrosion products is important to maintain the integrity of the vehicle components. Water breaks down oil-additive packages, forms acids that corrode metal surfaces and, in mineral-based oils, supports oxidation. For example, hydraulic oil containing just 0.1% water by volume can cut bearing life in half, while 1% reduces projections to one-fourth of B-10 life. Further, most hydraulic pump manufacturers recommend oil contain no more than 0.1% (1,000-ppm) water. The effect of corrosion as measured in the level of metal, can identify the impact that corrosion has on a system. Water also supports biological or microbial growth, especially when systems stand idle for long periods of time. The resulting biomass tends to be corrosive, slimy, and has an unpleasant odor. Typically eradicating the bugs requires the system be professionally drained and flushed. Identifying the presence of moisture early will minimize the impact of corrosion.

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[i] AMRA/MAP UICS
[ii] ASTM 3306

[iii] AMRA/MAP UICS States 200 ppm level as requiring service