Contamination

Contaminant in Hydraulic Systems is now recognized as the most frequent cause of malfunction or failure of hydraulic equipment. Dependent on the nature, size and/or amount of contaminant it can cause:-

- Reduced component service life.
- Machine malfunction, particularly when operating near maximum capacity.
- Risk of frequent breakdowns under the same conditions.
- Production rates below schedule.
- High product scrap rates and quality faults.

NATURE OF CONTAMINANT

Contaminant can be either particle contaminant or the product(s) of fluid degradation.

Particle contaminant can be metal, rubber, plastic, dirt, dust, fibre, sand pant etc.; several types may be present at any time. It can enter the fluid at any time after the fresh clean fluid has been produced by the fluid manufacturer. There is usually little likelihood that fresh fluid became contaminated during the refining and blending processes.

Fluid degradation results in:

- Oxidation and/or the formation of gummy deposits and sludge from the combined effects of high temperatures, air, water and particle contaminant.
  These can increase viscosity, cause gummy deposits to coat moving parts, clog orifices and small passages, thus impairing smooth mechanical movements and form sludge.
- Unstable emulsions of poor lubricity formed when water accidently emulsifies with oil. These impair smooth movements and promote wear.
- Aeration or air bubbles in the fluid, particularly at low pressures. In excess, they cause noise in pumps and valves leading to erratic or spongy machine movements, premature wear and failure.

CONTROL OF CONTAMINATION

The following table prescribes preventive measures relative to the different common types and causes of contamination. **See Pg. 71**

Good Assembly Practices

1. Most important - cleanliness.
2. All openings in the reservoir should be sealed after cleaning.
3. No grinding or welding operations should be done in the area where hydraulic components are being installed.
4. All cylinder, valve, pump and hose connections should be sealed and/or capped until just prior to use.
5. Mineral spirits should be kept in safety containers.
6. Air hoses can be used to clean fittings and other system components. However, the air supply must be filtered and dry to prevent contamination of the parts.
7. Examine pipe fittings and hose assemblies prior to use to be certain that burrs, dirt and/or scale are not present.
8. All pipe and tubing ends should be reamed to prevent restriction and turbulent flow.
9. Do not use Teflon tape or compound on pipe thread or straight thread connections.
10. When installing pumps or motors, always align coupling halves as closely as possible, within 0.007 inch.
11. When using flexible couplings follow the manufacturer's recommendations or allow 1/32 to 1/16 inch clearance between the coupling halves.
12. Do not drive couplings on pump or motor shafts. They should be a slip fit, or shrunk on using hot oil.
13. Always use a dry spray-on lubricant on splines when installing. This prevents wear and adds to the life of the splines.
14. When using double universal joint couplings, the shafts must be parallel and the yokes must be in line.
15. When installing V-belt pulleys on pumps or motors, line up both pulleys as closely as possible. Always install the pulleys with a minimum amount of overhang as close to the pump or motor face as possible. This increases bearing service life.

Preventive Measures	Solid Contam.	Fluid degradation by		
		High Temp.	Water	Air
For Storage Drums:				
● Store in cool, dry location.		●	●	
● Ensure that closures fully seal-in the fluid.	●		●	
● Wipe away any dirt and moisture from around the closure before loosening and emptying.	●		●	
● Use a portable filtration and transfer unit for emptying and re-filling	●		●	
For Storage Tanks:				
● Install in cool, dry location.		●	●	
● Ensure that all covers and stop valves effectively seal-in the fluid.	●		●	
● Keep filling lines clean; cap ends when not in use.	●		●	
● Use a portable filtration unit for filling and emptying.	●		●	
For Hydraulic Systems:				
● Provide fluid filter(s) in location(s) that assure the required protection.	●			
● The ideal steady-state flow conditions through an off-line filter make a “must” for most application.	●			
● Whenever possible, use filters having element condition indicators.	●			
● Vented systems must be fitted with an air breather appropriate to the environment(s) in which the machine is to be operated and the requirements of the system.	●		●	●
● Fit strainers to pump inlet lines if there is risk of large contaminant particles (i.e. string, rag, screws etc.) entering the lines.	●			
● Prevent air entering the system, particularly through pump inlet lines. Ensure air-tight joints in any sub-atmospheric zone or pump inlet lines. Also make sure that those lines and all return and drain lines terminate below the minimum fluid level in the reservoir; pump inlet lines should be sufficiently below to prevent air entering through a vortex at low fluid levels.				●
● Design for, and maintain, fluid temperatures at optimum levels for the application. Apply coolers if necessary.		●		
● Locate or screen hydraulic systems away from high temperature sources (e.g. furnaces).	●	●		
● Assemble system in clean conditions using clean practices.	●		●	
● Pre-clean pipes and reservoir immediately before installation. Cap any ends that cannot immediately be connected to mating components (e.g. between shifts)	●		●	
● Remove protective caps only just before connecting mating components.	●		●	
● Use a portable filtration and transfer unit to fill the reservoir system.	●			
● Flush new systems, and those that undergone major repairs, before starting up. temporarily remove actuators and replace with flushing manifolds or valves. Servo valves and similar high precision units should also be replaced with flushing manifolds or valves for flushing operations. make sure that actuators are clean internally before connecting to the system.	●			
● Make sure that air breathers and reservoir covers are at all times properly installed and tightly secured.	●		●	
● Stop any leakage of water into the system from coolers or other sources. Make a leak-tight repair.			●	
● By planned maintenance, ensure that clean filter elements are applied (or metallic elements cleaned when appropriate) when indicator or visual inspection show this to be necessary.	●	●	●	
● Take fluid samples periodically and analyze to determine whether effects of particle contaminant, heat, water and air indicate need for more control of those factors or replacement of the fluid.	●	●	●	●
● Whenever the reservoir is emptied, clean it out thoroughly and remove all residual contaminant. If necessary, restore protective paint or other finishes. On completion, cap all openings unless the system is to be refilled immediately.	●		●	