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Hydraulic Fluid Conversion Procedure

Converting To Water Glycol Hydraulic Fluids From Mineral Oils

Compatibility of Water Glycol Fluids With Mineral Oils

Water glycol hydraulic fluids are not compatible with mineral oil based hydraulic fluids. Water glycol hydraulic fluids are dependant on ionic species with affinities for metal surfaces in order to provide anti-wear properties. Oily films interfere with the anti-wear chemistry of water glycol fluids. The principle anti-wear additive in most anti-wear mineral oil based hydraulic fluids is zinc dialkyldithiophosphate. These zinc based additives react with fatty acids contained in all water glycols, thereby tying up required water glycol additives and forming a white ?soap?, which can plug filters and strainers. Mineral oils are only soluble in water glycol fluids in small concentrations. Oxidation products of mineral oils are more polar than mineral oils themselves, and consequently, are more easily suspended in water glycols. These sludges continue to oxidize and can plug filters, strainers and valves. They also interfere with water glycol hydraulic additives.

The suggested changeover procedure is designed to:

- minimize competitive interference of mineral oils and their additives through adequate drain and flush procedures
- prevent filter, strainer and valve plugging and consequential system damage, through the avoidance of “soap” formation and elimination of mineral oil sludges
- recommend special design and equipment considerations
- recommend hydraulic system maintenance to avoid leakage, promote both system maintenance and effective operation

Special Design & Equipment Considerations

Water glycol hydraulic fluids are different, chemically and physically, from mineral oil hydraulic fluids. The following differences have some bearing on conversions of existing systems.

Water glycol hydraulic fluids have:

- higher densities than mineral oils.

- higher vapour pressures than mineral oils

- a higher tendency to entrain air than most mineral oil hydraulic fluids.

For a full discussion of seal and material compatibility, refer to the bulletin "Hydraulic System Design Considerations When Using Water Glycol Hydraulic Fluids". The following issues should be considered when reviewing the above document and during the conversion process:

- the inside of reservoirs should be left unpainted and/or the old paint should be removed

- even compatible seal materials should be replaced wherever possible, because used seals may be damaged or may react unpredictably when exposed to a combination of otherwise compatible fluids

- zinc and cadmium plated parts should be replaced

- because of the higher density and vapour pressure of water glycols, care should be taken to avoid poor suction conditions on hydraulic pumps and marginal design pressure drops and fluid velocities

- accumulators should, wherever possible, contain a bladder to separate air and hydraulic fluid

Conversion Procedure

1. While the mineral oil is at operating temperature, drain all system components including pipelines, cylinders, accumulators, pumps, filter housings & coolers. Where feasible:

    - blow down all lines with dry, pressure regulated, compressed air to remove any fluid trapped in inaccessible places
    - disassemble all valves and clean thoroughly

2. Clean the system of residual sludge and deposits; steam or high pressure water cleaning is advisable. Cleaning should be as complete as existing conditions will permit. Drain all waste water from the system.

3. Remove and dispose of existing filters. Clean and inspect all strainers.

4. Reconnect the system.

5. Install a fresh charge of Forsythe No-Fire Water Glycol Fire Resistant Hydraulic Fluid or a No Fire Water Glycol Flush Fluid as recommended by your Forsythe Representative. Flush the system by operating without load or at minimum pressure. Bring the fluid up to a normal operating temperature range, but maintain pressure appropriate for the flush fluid being used. Continue to

flush as long as practical to ensure complete circulation and to fully exploit the solvent and cleaning characteristics of No Fire Water Glycol fluids.

6. Immediately, drain the flush fluid as completely as possible including pipelines, cylinders, accumulators, filter housing, pumps and coolers.

7. Install new filter cartridges. Refer to "Hydraulic System Design Considerations When Using Water Glycol Hydraulic Fluids" for filter, seal, gasket and packing recommendations.

8. Examine pump parts and auxiliary equipment; worn pump parts should be repaired.

9. Replace seals, gaskets and packing wherever possible. Reconnect the system and tighten all joints and connections.

10. Fill the system with the appropriate grade of Forsythe No Fire WG Series Fire Resistant Hydraulic Fluid.

11. Operate at reduced pressure to ensure proper lubrication of the hydraulic pump then increase to standard operating conditions.

12. Obtain a representative sample of fluid from the system and refer it to your Forsythe Representative for analysis and recommendations.

13. Regularly inspect filters and strainers to detect sludge, deposits and soaps left over, or formed as a result of residual mineral oil contamination. Replace filters as often as needed and clean strainers.

14. Inspect surface of both return and working side of reservoir to detect mineral oil on the surface of the water glycol hydraulic fluid. This is best done after a period of system shutdown. Skimming or syphoning residual oil may be necessary. Alternative oil removal processes include the use of wound polypropylene filter elements and/or draining the system. Consult your Forsythe Representative for recommendations.

15. Consult with your Forsythe Representative to devise a technical service program suitable for your applications. A good sampling/maintenance routine can reduce lubricant related problems and extend the life of the fluid and equipment. Refer to "Care and Maintenance of Water Glycol Fluid Systems" for more information