Western Integrated Technologies
MECHANICAL * FLUID POWER SYSTEMS * ELECTRICAL

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Phone (503)228-6666
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HYDRAULIC SYSTEM START-UP PROCEDURE

Warranties are not valid unless proper starting and maintenance procedures are followed.

PUMP START-UP PROCEDURE

1. Make sure reservoir is filled with a suitable, premium quality, anti-wear hydraulic oil with a viscosity range of 110-250 SUS (24-50Cst) at 100°F (38°C), unless otherwise noted.
   Other:_____
2. Check coupling alignment. (Refer to coupling literature in service manual for specifications)
3. Check fittings for tightness.
4. Be sure system piping is properly sized and is clean.
5. On pumps with case drains, remove drain line from pump and fill pump case with clean hydraulic oil. On other pumps, disconnect one of the pump ports and fill pump with as much clean hydraulic oil as possible, then reconnect. This may not be required if the pump is below the fluid level of the reservoir.
6. Make sure suction line shutoff valves (where applicable) are open.
7. Jog motor briefly to check direction of rotation.
8. To be sure pump primes; jog motor 3 or 4 times for 2-4 seconds.
9. Whenever possible, do not start a pump against a blocked system.
10. If the pump does not pull a prime, temporarily loosen a fitting in the pressure line to remove any trapped air.
11. Check gauge pressure to be sure it is as specified.
12. Turn unit off if overheating is evident.
13. On systems with pressure compensated pumps, insure pressure relief is a minimum of 200 PSI above compensator setting.
14. Check oil level again after filling piping, actuators, etc.

MAINTENANCE TIPS

1. Maintain as low a system pressure as possible to give adequate performance.
2. Prohibit unauthorized personnel from making adjustments on the hydraulic system.
3. Maintain adequate oil level. When adding oil, be sure it is new and clean and if possible, pump into the unit through a 10-micron filter cart.
4. Keep fittings tightened.
5. Maintain clean fluid in system by:
   a) Changing filter elements when indicated
   b) Cleaning strainer elements
   c) Replace oil if it becomes contaminated or overheated.
   d) Clean or replace reservoir air breathers regularly
6. Lubricate motor coupling periodically if required.
7. Check system regularly for overheating. Seal damage may occur at temperatures over 170° F.
8. Keep power unit clean.
9. The three most important indicators of trouble are:
   a.) Heat
   b.) Noise
   c.) Leakage

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HYDRAULIC SYSTEM FLUSHING PROCEDURES

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Most hydraulic systems can be properly flushed by using the hydraulic pump(s) to circulate fluid through the fluid lines and returned through the filter(s) into the reservoir.

Connect all actuator and valving manifold hoses together, using flushing nipples. Your objective is to bypass the actuators and valving for proper flushing of the fluid lines. Start the pump and circulate fluid through the fluid lines. It is common to get surges of air from the fluid lines returning to the reservoir which may cause the pump(s) to be noisy as air bubbles are drawn into the pump. If the noise persists for a long period of time and the fluid is aerated or foamy, allow the fluid to settle out over night. If the noise continues beyond a reasonable period of time, consult the manufacturer.

IMPORTANT - Monitor the indicators on the system filter(s) during start up to assure that fluid does not bypass the filter elements.

Required flushing time will vary with the size and complexity of the entire hydraulic system and the degree of contamination resulting from installation. Simple systems can usually be flushed within one to two hours. Large systems may require ten to twelve hours. **Careful monitoring of the filter condition indicators will dictate the necessary flushing time required.**

It is necessary to flush all fabricated piping tubing and hoses without introducing contamination into the valving manifold or actuators (cylinder and motors). When this has been completed, reconnect the hoses to the proper ports and operate the system manually during the initial phase. Carefully check for any mechanical interference, binds, non-lubricated machinery and fluid leaks.

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HYDRAULIC SYSTEM SERVICE RECOMMENDATIONS

See instruction material for individual units.

EACH SHIFT

CHECK	POSSIBLE TROUBLES	CORRECTIVE ACTION
Reservoir level	Excessive heat, air in system.	Fill as required
Fluid leaks	Fluid loss, Pressure loss, Air in system, excessive heat Dirty equipment, safety hazards.	Repair as required
Fluid temperature	Deterioration of fluid, excessive Pump wear	Trouble-shoot cause and correct.
Erratic operations	Erratic operation is often a Warning of impending component failure. Corrective measures can be taken to prevent shutdown. This also provides some time to secure replacement parts before a complete failure occurs.	Report in detail

WEEKLY

CHECK	METHOD	REMEDY	POSSIBLE TROUBLES
Fluid filters	Filter indicators	Change element	Contaminated oil, component wear, pump cavitation (when using inlet filters)
Heat exchanger	Leaks, corrosion	Repair/replace	Excessive heat, fluid loss, Water in fluid
Heat exchanger Water valve	Check fluid temperature when valve opens	Re-adjust as necessary	Excessive heat, excessive water consumption.
Hoses	Visually inspect for cracking, abrasions, kinks and leaks	Replace hose	Personal injury, machine down time fluid loss, dirty equipment.

MONTHLY

Check	Possible troubles	Corrective Action
Air Breathers	Dirt in hydraulic system, cavitation.	Clean or replace.
Hydraulic tube connections	Loss of fluid, loss of pilot pressure, air entering system, dirty equipment, safety hazard.	Tighten or repair as required.
Solenoids	Valve failure, loss of production and fire hazard	Replace broken wires or covers. Tighten connections and covers.
Dirty Equipment	Dirt entering system, failure to notice leaks, safety and fire hazard.	Clean as required, remove rags etc.

THREE MONTHS

Check	Possible troubles	Corrective Action
Filters	Contaminated oil, eventual component failure.	Replace all elements in use for over 3 months.
Fluid Condition	Component failure due to excessive wear, erratic operation due to sticking valves caused by varnish buildup, gumming, etc.	Send oil sample to fluid supplier to be analyzed for contamination and viscosity breakdown. Unacceptable results will require oil to be drained from the entire system and replaced with new, appropriate hydraulic oil. New oil most always contains unacceptable amounts of particulates and must be filtered prior to placing into the system. 10-micron filtration is usually acceptable.
Hydraulic connections and pipe braces	Leaks, broken pipes, noise, dirty equipment.	Tighten connections and clamps.
Relief valves, Pressure switches, timers	Erratic operations, heat buildup, slow moving equipment, machine crashes due to timing discrepancies.	Check settings and adjust as required.
Heat Exchanger	Heat buildup, water in system.	Refer to heat exchanger service literature in service section of manual.

SIX MONTHS

Check	Possible troubles	Corrective Action
Pump/motor coupling alignment	Shaft and bearing failure, coupling failure, excessive noise and vibration.	Remove coupling guards and check alignment. Refer to Coupling literature in service section of manual for specifications.
Pump, motor and valve mounting bolts	Vibration, noise, leaks, Coupling wear, extruded o-rings, and machine failure.	Tighten to proper torque. Tighten Directional valve mounting bolts evenly to prevent binding spool in valve body.
Cartridge Valves	Leaks, erratic operation, drifting equipment, personal injury	Tighten to specified torque. Refer torque specifications located in the general information section of the manual.

Troubleshooting Hints For Hydraulic Systems

Individual Component Service Bulletins May Contain Additional Information

PROBLEM	PROBABLE CAUSE AND CORRECTIVE STEPS
Noisy pump	a) Low fluid level in reservoir, air entering system; Fill reservoir to proper level. b) Leaking fittings, hose and tube connections on inlet side of pump, allowing air to enter system. Use system compatible grease or oil to coat the fitting/connection suspected of leaking (while system is running). Pump should quiet momentarily after application if connection is leaking. c) Inspect suction strainers for cleanliness. Clogged strainers or obstruction in suction line will likely cause pump cavitation and severe pump damage.
Low system pressure	a) Relief valve setting too low. Relief valve may have been re-adjusted. If setting is too low, fluid will be diverted back to reservoir, resulting in heat build-up and low system pressure, Re-adjust relief valve to proper setting. b) Worn or damaged pump or actuators. Plug work ports at power unit and check pressure. If relief valve is set properly and pressure is still low, the pump most likely needs repair. If pressure is normal, isolate each actuator in the system one at a time to identify the failing component. Repair as needed. c) Unloading circuit malfunctioning. If using a fixed displacement pump in conjunction with an unloading circuit, make sure circuit is functioning as intended. Contamination, wear or damage could cause unloading valve to remain partially or completely open. Inspect valve, repair/replace as necessary. d) Pump compensator set too low. Variable displacement pumps with pressure compensation controls may have been re-adjusted. Re-adjust compensator to proper setting; use care when adjusting compensator, the system relief valve may need re-adjusted to maintain a higher setting than the compensator (usually around 200 PSI higher than the compensator setting).
Erratic operation	Valves, pistons, etc. sticking or binding. Inspect suspected part for mechanical deficiencies such as misalignment of shaft, worn bearings, etc. Also look for signs of dirt, sludge, varnishes caused by fluid deterioration.
Relief valve stuck open	Depressurize hydraulic system and remove valve. Inspect for contamination and clean as needed. Physically operate moving parts in valve to test for sticking or broken bias springs. Replace if needed.
Leakage in the system	Check the whole system for escaping fluid. Serious leaks in the open are easy to find, however, leaks often occur in concealed piping. Install pressure gauge in discharge line near pump and then progressively block circuit downstream until leak is located. A high leakage path through a valve or a component generates heat. A hot spot in the circuit often indicates the point of leakage.
Aerated hydraulic fluid	Low fluid level prevents entrained air from having sufficient time to settle out of the oil. Check oil level in reservoir daily.
Cavitation	Cavitation is the formation of a vacuum inside the pump. This is usually caused by a restriction on the inlet, too high a viscosity (cold fluid), or insufficient head pressure (atmospheric pressure is required to push the oil into the pump, at high elevations, there is less pressure available to do the work). Pseudo cavitation is similar to cavitation, but is caused by air entering the pump inlet, which will have similar effects as cavitation. Look for loose/leaking components on all suction lines. Un-corrected cavitation conditions will cause severe damage to pump components.
Loose/worn pump parts	Look for worn gaskets and packing. Replace if necessary. Usually there is no way to compensate for wear in a component; it is always best to replace it.
Stuck valves	Parts may be stuck by metallic chips, bits of lint, carbonized fluid etc. If so, disassemble and clean thoroughly. Avoid the use of files, emery cloth, steel hammers etc. on machined surfaces. Products of fluid deterioration such as gums, sludge, varnish, may also cause sticking. Use solvent to clean parts and wipe dry before reassembly. If parts are stuck by corrosion or rust, they will probably have to be replaced.
Overheating	1. Water shut off or heat exchanger clogged. 2. Continuous operation at relief setting. a. Stalling under load, etc. b. Fluid viscosity too high. 3. Excessive slippage or internal leakage. a. Check stall leakage past pump, motors and cylinders. b. Fluid viscosity too low. 4. Reservoir sized too small. 5. Reservoir assembled without baffling or sufficient baffling. 6. Case drain line from pressure compensated pump returning oil too close to suction line. 7. Pipe, tube or hose I.D. too small causing high fluid velocities. 8. Valving too small, causing high fluid velocity. 9. Improper air circulation around reservoir. 10. System relief valve set too high. 11. Power unit operating in direct sunlight, or ambient temperature is too high. 12. Pressure compensated pumps require the system relief be set 150-200 PSI higher than compensator setting.

Troubleshooting Hints For All Types of Pumps

Individual pump instruction bulletins may contain additional information

Symptom	Possible Cause
Pump not delivering fluid	1. Insufficient fluid in reservoir. 2. Suction line or strainer clogged. 3. Air leaking into suction line preventing pump from priming. 4. Pump rotating too slowly. 5. Oil viscosity too high. 6. Oil lift too high, preventing pump from priming. 7. Improper pump rotation. 8. Sheared pump shaft or other broken internal pump parts. 9. Excessive contamination in pump. 10. Improper stroke adjustment on variable delivery pumps.
Oil accumulating around pump	1. Worn shaft seal. 2. Head pressure on suction line causing oil to escape through loose or damaged connections. 3. Pump housing bolts improperly torqued or loose. 4. Case drain line restricted or too small causing shaft seal to leak (excessive case pressure). 5. Pump housing cracked from being struck or over-pressurized. 6. Leaking pressure line or connection.
Excessive pump wear	1. Oil not properly filtered, causing it to get contaminated with dirt and other abrasive materials. These circulate through pump and other components causing rapid wear. 2. Viscosity of oil too low. 3. Pump not rated for pressures at which system is operating. 4. Pump/prime mover misalignment or drive belt too tight. 5. Air being drawn into pump from a leaking suction line or fitting, or low reservoir fluid level.
Excessive pump noise	1. Check for air leaks in the suction line. Flood inlet connections with oil from reservoir; when oil is poured over a leak point, pump noise should be reduced momentarily. 2. Poor alignment of pump/prime mover. 3. Verify compatibility of oil to components in the system. 4. Unloading valve or relief set too high. Use a reliable, calibrated pressure gauge to check operating pressure. Relief valves may have been adjusted with a damaged gauge and be out of acceptable operating range. Check any unloading devices for proper operation. 5. Reservoir oil aerated, caused by low fluid level in reservoir or return lines terminating above fluid level inside reservoir. 6. Sticking or worn vanes, damaged cam ring (vane pumps). 7. Damaged or worn gears or housing (gear pumps) 8. Other damaged pump components. 9. Failing bearings. 10. Improper Pump rotation. 11. Components installed improperly. 12. Suction line restriction, causing cavitation. 13. Oil too thick because it is cold or improperly selected. 14. Pump turning at excessive speeds. 15. Air entering pump through shaft seal. 16. Inlet line too small. Inlet lines should be sized too keep fluid velocity under 5 feet per second. 17. Shutoff valve on flooded suction systems not fully opened. 18. Bolts on pump housing loose or torqued improperly during assembly. 19. Case drain port improperly positioned during pump installation, allowing air to be trapped inside pump housing. Case drain should be oriented so it is at the highest possible point on the pump.

DOCUMENT 39510
CLIMAX HYDRAULIC POWER UNITS
OIL AND TEMPERATURE SPECIFICATIONS

1) The hydraulic hoses supplied with your Climax HPU are rated for operation down to –40°F (–40°C)
2) The seals in the pump and motor are rated for operation down to –10°F (–23°C) Below that temperature the seal material loses elasticity and will wear rapidly and cause premature seal failure.
3) Both the Oilgear Pump, Parker Pump and the Char-Lynn Motors are rated to operate at no more than 200° F (93°C) with a minimum oil viscosity of 70 SUS.
4) Allowable oil viscosity range on Oilgear pumps, Parker Pumps and Char-Lynn motors is 65-2000 SUS.
5) In order to stay within the required viscosity range use the recommended grade of hydraulic oil listed in the chart below.

OIL	Minimum oil Temp Deg F (Deg C)	Maximum oil Temp Deg F (Deg C)
Chevron AW22 Mobile DTE22	14 (-10)	132 (56)
Chevron AW32 ** Mobile DTE24	27 (-3)	155 (68)
Chevron AW46 Mobile DTE25	39 (4)	172 (78)
Chevron AW68 Mobile DTE26	50 (10)	190 (88)
Chevron AW100 Mobile DTE Heavy	60 (16)	190 (88)

** CLIMAX RECOMMENDED STANDARD

6) If an HPU is to be operated at ambient temperatures lower than the minimum allowable oil temperature it will be necessary to provide a tank heater to ensure oil stays warm.
7) Under continuous operation at moderate to high loads it can be anticipated that the hydraulic oil temperature will rise between 80-90° F (27-32° C) above ambient temperature. This should be taken into consideration when selecting the grade of oil to be used in your HPU, and oil temperature should be monitored carefully if it is likely to approach the maximum allowable temperature.
8) Under normal conditions all HPUs ship from Climax with no oil in the reservoir. Upon special request some HPUs are shipped with oil. Those Climax hydraulic power units which are supplied from the factory with hydraulic oil in the reservoir, will be supplied with AW32 oil unless specified otherwise.