Chapter 7
Hydraulic System Troubleshooting

General
The following troubleshooting information is provided as a general guide to identify, locate and correct problems that may be experienced with the hydraulic system of this crane.

It is expected that all troubleshooting and testing will be performed by a qualified hydraulic technician.

Troubleshooting Steps
A good troubleshooting program should include the following steps.

Know the System.
- Study the Hydraulic Schematic.
- Know what the relief valve settings and pump outputs should be.

Ask the operator.
- Ask how did the crane acted when it started to fail or what is unusual about the crane’s operation.
- Ask if any valve setting was changed.
- Discuss how the crane is being used and when preventive maintenance is being performed; many problems can be traced to abuse of the crane or poor maintenance.

Operate the Crane.
- How is the crane’s performance? Is any function slow, erratic, or not operating at all?
- Do the controls feel solid or spongy?
- Smell any unusual odors? Any signs of smoke?
- Hear any unusual noises? Where, at what speeds, and during what cycles?

Inspect the Crane.
- Inspect the entire crane for any signs of trouble.
- Inspect the hydraulic tank. Is the oil at the proper level? Is the oil foamy or milky? Does the oil smell scorched?
- Does the oil appear too thin, too thick, or excessively dirty?
- Is the filter bypassing (clogged with dirt)? If so, replace the element.
- Feel the tank and the lines. Are they hotter than normal? Are they caked with dirt, mud, or dry oil? Is the paint peeled from any components? Are there kinked or collapsed hoses or tubes?
- Inspect all lines for oil leaks.
- Check for air leaks, usually accompanied by a sucking sound.
- Look closely at each component. Inspect for cracked welds, hairline cracks in housings, and loose mounting bolts or tie bolts.

List the Problems.
- Make a list of the problems found while inspecting the crane.

Reach a Conclusion.
- Study the list of problems and determine the possible causes using the Troubleshooting List as a guide.

Note
If all of the hydraulic circuits are bad, the problem is in a component common to all circuits, such as the pump. If, on the other hand, only one circuit is bad, concentrate on the parts of that circuit.

Take Corrective Action.
- Once the problem has been isolated and the possible cause has been determined, take the necessary corrective action.
- Fully test the crane before returning it to service.

Troubleshooting List

Hydraulic Oil Condition
- Oil milky or dirty.
  - Water in oil (milky).
  - Filter failure (dirty).
  - Metal particles (mechanical failure).
  - Oil discolored or has burned odor.
  - See Oil Overheating.
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❑ System Inoperative
  ■ Power Take-Off (PTO) not engaged.
    ■ Engage PTO.
  ■ No oil in system.
    ■ Fill tank to proper level. Check system for leaks.
  ■ Oil viscosity too high.
    ■ Refer to Lubrication Chapter for proper viscosity.
  ■ Suction line plugged.
    ■ Drain oil and clean suction line. Locate source of contamination.
  ■ Ball valve closed.
    ■ Make sure this valve is fully open.
  ■ Restriction in system.
    ■ Oil lines could be dirty or have inner walls that are collapsing and cutting off the oil supply. Clean or replace lines.
  ■ Air leaks in pump suction line.
    ■ Repair or replace suction line.
  ■ Dirt in pump.
    ■ Clean and repair pump. If necessary, drain and flush hydraulic system. Locate source of contamination.
  ■ Badly worn pump.
    ■ Replace defective parts.
  ■ Badly worn components.
    ■ Examine and test valves, motors, and cylinders for external and internal leaks. If wear is abnormal, locate the cause.
  ■ Oil leak in pressure lines.
    ■ Tighten fittings or replace defective lines.
  ■ Relief valves improperly adjusted or defective.
    ■ Test relief valves to make sure they are opening at specified pressures. Refer to Hydraulic Schematic.
    ■ Examine seals for damage that could cause leaks. Clean relief valves and check for broken springs and other possible causes.
  ■ Pump rotating in wrong direction. Applies to knockdown units only.
    ■ Reverse to prevent damage.

Important Pump rotation must be matched with PTO and transmission.

❑ Operating system under excessive load.
  ■ Check Capacity Chart for load limits.
  ■ Hoses attached improperly.
    ■ Attach correctly and tighten securely.
  ■ Broken PTO.
    ■ Replace defective parts.
  ■ Pump not operating.
    ■ Check for broken pump shaft.

System Operates Erratically

❑ Air in system.
  ■ Examine suction line for leaks. Make sure oil level is correct (leaks on pressure side of system could account for oil loss).
  ■ Cold oil.
    ■ Viscosity of oil may be too high at start-up. Allow oil to warm before operating controls.
  ■ Components sticking or binding.
    ■ Check for dirt or gummy deposits. If dirt is caused by contamination, locate the source. Check for worn parts.
  ■ Pump damaged.
    ■ Check for broken or worn parts. Determine cause of pump damage.
  ■ Dirt in relief valves.
    ■ Clean relief valves.
  ■ Restriction in suction line.
    ■ Suction line could be dirty or have inner walls that are collapsing and cutting off the oil supply. Clean or replace suction line.
System Operates Slowly

- Cold oil.
  - Allow oil to warm before operating controls.
- Oil viscosity too high.
  - Refer to Lubrication Chapter for proper viscosity.
- Insufficient drive speed.
  - Make sure PTO is matched to transmission. Troubleshoot engine.
- Low oil supply.
  - Check tank and add oil if necessary. Check system for leaks that could cause loss of oil.
- Air in system.
  - Check suction line for leaks.
- Badly worn pump.
  - Repair or replace pump. Check for problems causing pump wear such as misalignment or contaminated oil.
- Restriction in suction line.
  - Suction line could be dirty or have inner walls that are collapsing and cutting off the oil supply. Clean or replace suction line.
- Ball valve closed.
  - Make sure this valve is fully open.
- Relief valves not properly set or leaking.
  - Test relief valves to make sure they are opening at specified pressures. Examine valves for damaged seats that could leak.
- Badly worn components.
  - Examine and test valves, motors, and cylinders for external and internal leaks. If wear is abnormal, locate the cause.
- Valves plugged.
  - Clean dirt from components. Clean orifices. Find source of dirt and correct.
- Oil leak in pressure lines.
  - Tighten fittings or replace defective lines. Examine mating surfaces of fittings for irregularities.

Oil Overheating

- Operator holds control levers in power position too long, causing relief valve to open.
  - Return control levers to NEUTRAL position when not in use.
- Using incorrect oil.
  - Drain and refill system with proper oil. See Lubrication Chapter.
- Low oil level.
  - Fill tank to proper level. Look for leaks.
- Dirty oil.
  - Drain and refill with clean oil. Look for source of contamination.
- Engine running too fast.
  - Troubleshoot engine.
- Incorrect relief valve pressures.
  - Check and reset pressures; clean or replace relief valve.
- Internal oil leakage.
  - Examine and test valves, cylinders, and motors for internal leaks. If wear is abnormal, locate the cause.
- Restriction in pump suction line.
  - Clean or replace suction line.
  - Dented, obstructed or undersized oil lines.
  - Remove obstructions or replace defective oil lines.
- Control valve stuck in partially open position.
  - Free spool so it returns to NEUTRAL position.
- Heat not radiating properly.
  - Clean dirt and debris from oil cooler, hydraulic tank, oil lines and all other components.
  - Make sure oil cooler fans are operating properly. The oil cooler fans should turn on when the oil temperature rises above 120°F. Make sure oil is circulating through oil cooler.
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**Oil Foaming**

- Low oil level.
  - Fill tank to proper level. Look for leaks.
- Water in oil.
  - Drain and replace oil.
  - Wrong kind of oil being used. Drain and refill system with proper oil. See Lubrication Chapter.
- Air leak in suction line.
  - Tighten or replace suction line.
- Kink or dent in oil lines (restricts oil flow).
  - Replace oil lines.
- Worn seal around pump shaft.
  - Clean sealing area and replace seal. Check oil for contamination or pump for misalignment.

**Pump Makes Noise**

- Low oil level.
  - Fill tank to proper level. Check system for leaks.
- Oil viscosity too high.
  - Drain and refill system with proper oil. See Lubrication Chapter.
- Pump speed too fast.
  - Operate pump at recommended speed.
- Suction line plugged or pinched.
  - Clean or replace suction line.
- Ball valve closed.
  - Make sure this valve is fully open.
- Sludge and dirt in pump.
  - Disassemble and inspect pump and lines. Clean hydraulic system. Determine cause of dirt.
- Tank breather plugged.
  - Replace breather.
- Air in oil.
  - Tighten or replace suction line. Check system for leaks. Replace pump shaft seal.
- Worn or scored pump bearings or shafts.
  - Replace worn parts or complete pump if parts are badly worn or scored. Determine cause of scoring.
- Broken or damaged pump parts.
  - Repair pump. Look for cause of damage like contamination or too much pressure.
- Sticking or binding parts.
  - Repair binding parts. Clean parts and change oil if necessary.

**Pump Leaks Oil**

- Damaged seal around drive shaft.
  - Replace seal. Trouble may be caused by contaminated oil. Check oil for abrasives and clean entire hydraulic system. Locate source of contamination. Check the pump drive shaft; misalignment could cause the seal to wear. If shaft is not aligned, check the pump for other damage.
- Loose or broken pump parts.
  - Make sure all bolts and fittings are tight. Check gaskets and seals. Examine pump casting for cracks. If pump is cracked, look for a cause like too much pressure or hoses that are attached incorrectly.

**Motor Leaks Oil**

- Damaged seal around drive shaft.
  - Replace seal. Trouble may be caused by contaminated oil. Check oil for abrasives and clean entire hydraulic system. Locate source of contamination. Check the motor drive shaft; misalignment could cause the seal to wear. If shaft is not aligned, check the motor for other damage.
- Loose or broken motor parts.
  - Make sure all bolts and fittings are tight. Check gaskets and seals.
  - Examine motor casting for cracks. If motor is cracked, look for a cause like too much pressure or hoses that are attached incorrectly.
- Back pressure too high.
  - Check if return filter is bypassing; if so, replace element.
Check for and remove any obstruction in return line.

Valve Sticks or Works Hard
- Tie bolts too tight on valve stacks.
  - Use manufacturer’s recommendation to adjust tie bolt torque.
- Valve broken or scored internally.
  - Repair broken or scored parts. Locate source of contamination that caused scoring.

Valve Leaks Oil (External)
- Tie bolts too loose on valve stacks.
  - Use manufacturer’s recommendation to adjust tie bolt torque.
- Worn or damaged O-rings.
  - Replace O-rings (especially between valve stacks). If contamination has caused O-rings to wear, clean system and look for source of contamination.
- Broken valve parts.
  - If valve is cracked, look for a cause such as too much pressure or hoses that are attached incorrectly.

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- Broken valve parts.
  - If valve is cracked, look for a cause such as too much pressure or hoses that are attached incorrectly.

Cylinder Leaks Oil (External)
- Damaged cylinder barrel.
  - Replace cylinder barrel. Correct cause of barrel damage.
- Rod seal leaking.
  - Replace seal. If contamination has caused seal to wear, look for source. Wear may be caused by external as well as internal contaminants. Check piston rod for scratches or misalignment.
- Loose parts.
  - Tighten parts until leakage has stopped.
- Piston rod damaged.
  - Check rod for nicks or scratches that could cause seal damage or allow oil leakage. Replace defective rod.

Cylinder Drifts or Will Not Hold Load
Important  See Cylinder Leaks Oil (External).
- Excessively worn or damaged piston seals.
  - Disassemble cylinder and replace faulty parts.
- Counterbalance valve or check valve stuck open.
  - Replace valve.

Cylinder Will Not Extend or Not Retract
Important  See System Inoperative.
- Counterbalance valve or check valve stuck closed.
  - Replace valve.

Boom Cannot Be Extended or Lowered
- LMI function lockout.
  - See LMI Operating Instructions.

Swing Inoperative or Erratic
Important  See System Inoperative or System Operates Erratically.
- Swing parking brake switch.
  - Brake not releasing.
  - Check for a collapsed, restricted, or leaking brake release hose. Clean or replace the hose.
Note  The brake should fully release at 250 psi.
- Improper backlash between the swing pinion and the slewing ring gear.
  - Adjust the backlash between the gears.
- Damaged slewing ring bearing.
  - Replace the slewing ring.
Swing Brake Does Not Hold
- Brake return springs broken or brake discs worn or damaged.
  - Disassemble the brake and replace the faulty parts.

Winch Will Not Lower Load or Lowers Load Erratically
*Important* See System Inoperative or System Operates Erratically.
- Brake not releasing.
  - Check for a collapsed, restricted, or leaking pilot line to the brake. Clean or replace the hose.
*Note* The winch brake should fully release at 350 psi to 450 psi.
- Counterbalance valve not opening.
  - Check for a collapsed, restricted, or leaking pilot line to the counterbalance valve. Clean or replace the hose.

Winch Will Not Hold Load in Neutral
- Excessive back pressure acting on the brake causing brake to release partially.
  - Back pressure must not exceed 150 psi. Inspect the return lines between the control valve and tank for restrictions.
- Brake return springs broken or brake discs worn or damaged.
  - Disassemble the winch and replace the faulty brake parts.
- Clutch slipping.
  - Improper oil being used in winch can cause the clutch to slip. Drain the winch and refill with proper oil, see Lubrication Chapter.
  - The clutch may be damaged or worn. Disassemble the winch and replace the clutch.

Winch Will Not Raise Load
*Important* See System Inoperative.
- Load too heavy.
  - Refer to the Capacity Chart for load limits and applicable reeving diagram.
- LMI function lockout.
  - See LMI operating instructions.

Boom Chatters When Extending or Retracting Boom
- Boom sections not lubricated.
  - Lubricate the boom sections as instructed in the Lubrication Chapter.
- Slider pads worn or improperly adjusted.
  - Check the slider pads for wear and proper adjustment.

Boom Does Not Sequence Properly
- Crowd rope system improperly adjusted.
  - Adjust the crowd ropes.