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MAINTENANCE TIPS

Jaw Crusher Flywheel Inspection: Detect Cracks Before Catastrophic Failure

Inspect jaw crusher flywheels for cracks and damage. Non-destructive testing methods, inspection frequency, and replacement criteria.

Author: Sivabalan Selvarajan

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The hydraulic system is the nervous system of a mobile jaw crusher, controlling critical functions from CSS adjustment to tramp iron relief. When hydraulics fail, the entire machine stops—and troubleshooting in the field without proper understanding can turn a minor issue into a major repair. Understanding hydraulic system operation and systematic troubleshooting approaches enables rapid diagnosis and repair that minimizes downtime and prevents secondary damage.

Understanding Mobile Crusher Hydraulic Systems

System Architecture

Mobile jaw crusher hydraulic systems typically include multiple circuits:

CIRCUIT	FUNCTION	TYPICAL PRESSURE	FLOW REQUIREMENT
CSS adjustment	Toggle position control	200-280 bar	Low (positioning)
Tramp iron relief	Overload protection	280-350 bar	High (fast response)
Feeder drive	Feeder motor power	200-280 bar	Medium-high
Conveyor fold	Transport configuration	150-200 bar	Low
Track drive	Machine mobility	280-350 bar	High
Auxiliary	Lubrication pump, cooling	50-150 bar	Variable

Key Components

Hydraulic pump: Usually axial piston, load-sensing design for efficiency. Typical flow: 80-200 L/min depending on machine size.

Control valves: Proportional directional valves for precise control of cylinder movement and motor speed.

Accumulators: Bladder or piston type, store energy for tramp iron relief response. Pre-charge pressure typically 60-70% of system pressure.

Cylinders: Double-acting for most functions; CSS cylinders may include position feedback.

Filters: Return line filtration (typically 10-25 micron) and sometimes pressure line filtration (3-10 micron).

Common Hydraulic Problems

Problem: No Cylinder Movement

When a cylinder doesn't move despite control input:

SYMPTOM	PROBABLE CAUSE	DIAGNOSTIC STEP	SOLUTION
No movement, no pressure	Pump failure, relief stuck open	Check pump output, relief setting	Repair pump, adjust/ replace relief

SYMPTOM	PROBABLE CAUSE	DIAGNOSTIC STEP	SOLUTION
No movement, pressure OK	Valve not shifting, blocked line	Check valve spool position, line continuity	Replace valve, clear blockage
Slow movement	Low flow, internal bypass	Measure flow rate, check for heating	Address pump or valve wear
Intermittent movement	Electrical signal, contamination	Check solenoid, filter indicators	Replace solenoid, change filters

Problem: Cylinder Drift

When a cylinder slowly moves without command (particularly CSS cylinders):

SYMPTOM	PROBABLE CAUSE	DIAGNOSTIC STEP	SOLUTION
Drift under load	Check valve leak, cylinder seal	Isolate circuit, pressure test	Replace check valve, reseal cylinder
Drift both directions	Spool wear, pilot pressure	Check valve centering	Replace valve or seals
Temperature-related	Thermal expansion, viscosity change	Measure temperature effect	Check oil grade, accumulator precharge

Problem: System Overheating

Hydraulic systems should operate at 40-65°C. Overheating indicates energy loss:

SYMPTOM	PROBABLE CAUSE	DIAGNOSTIC STEP	SOLUTION
Gradual temp rise	Cooler ineffective, low oil level	Check cooler airflow, oil level	Clean cooler, add oil
Rapid temp rise	Relief valve passing, internal leak	Check relief setting, pump case drain	Adjust relief, repair pump
High temp one circuit	Restriction, blocked return	IR scan for hot spots	Clear restriction, repair return line
Cycling temperature	Thermostat or cooler bypass	Check bypass valve operation	Replace thermostat or bypass valve

Problem: Tramp Iron Relief Not Working

Tramp iron relief system must respond within milliseconds to protect the crusher:

SYMPTOM	PROBABLE CAUSE	DIAGNOSTIC STEP	SOLUTION
No relief, crusher stalls	Accumulator failed, valve stuck	Check accumulator pre-charge, valve operation	Recharge or replace accumulator, replace valve
Slow relief response	Low pre-charge, orifice restriction	Check accumulator pressure, flow path	Recharge accumulator, clear orifice
Relief trips too easily	Pre-charge too high, setting low	Check pre-charge ratio, relief setting	Adjust pre-charge, reset relief pressure
Chattering relief	Contamination, worn seat	Inspect valve, check oil cleanliness	Replace valve, filter oil

Systematic Troubleshooting Process

Step 1: Gather Information

Before touching the machine:

- What exactly is the symptom? (No movement, slow, hot, noisy?)
- When did it start? (Sudden or gradual?)
- What changed? (New oil, filter change, repairs?)
- What were operating conditions? (Load, temperature, running time?)
- Are there any error codes or alarms?

Step 2: Check the Basics

Eliminate simple causes first:

1. **Oil level:** Check with machine level, engine off, all cylinders retracted
2. **Oil condition:** Color, smell, contamination (water, particles)
3. **Filter indicators:** Check bypass indicators on all filters
4. **Electrical:** Check fuses, control power, emergency stops
5. **Visual inspection:** Leaks, damage, loose connections

Step 3: Pressure Testing

Install pressure gauges at key test points:

TEST POINT	EXPECTED READING	LOW READING INDICATES	HIGH READING INDICATES
Pump outlet	Varies with load	Pump wear, relief issue	Blockage downstream
System relief	At setting (250-350 bar)	Relief stuck open, pump weak	Relief stuck closed
Pilot pressure	Per specification (20-35 bar)	Pilot pump issue	Pilot relief issue
Case drain	<2 bar typically	Normal	Pump wear, restriction

Step 4: Flow Testing

If pressure is correct but function is slow:

1. Install flow meter in suspect circuit
2. Operate function and measure flow rate
3. Compare to specification
4. Low flow indicates pump wear, valve bypass, or restriction

Step 5: Temperature Mapping

Use infrared thermometer or camera to identify heat sources:

- Hot spots indicate energy loss (leakage, restriction)
- Compare temperature across similar components
- Relief valves should be similar temperature to tank unless bypassing
- Pump case should not be significantly hotter than tank

Preventive Maintenance

Daily Checks

- Oil level verification

- Visual leak check (cylinders, hoses, fittings)
- Filter indicator check
- Operating temperature monitoring
- Function test (CSS adjustment, relief system)

Weekly Checks

- Sample oil for analysis (or monthly for less critical applications)
- Check accumulator pre-charge pressure
- Inspect hoses for wear, abrasion, routing
- Clean cooler fins if dusty
- Verify relief pressure settings

Scheduled Maintenance

INTERVAL	TASK	NOTES
250 hours	Change return filter	More frequent if indicated
500 hours	Change pressure filters	If equipped
1000 hours	Oil analysis or change	Condition-based if analyzing
2000 hours	Complete system inspection	All hoses, fittings, cylinders
Annual	Accumulator recertification	If required by regulations

Oil Analysis and Contamination Control

Oil Sampling

Regular oil analysis predicts problems before failure:

Sampling procedure:

1. Sample with machine at operating temperature
2. Sample from designated port (not drain plug)
3. Use clean sampling equipment

4. Fill sample bottle correctly (avoid air space)
5. Record operating hours, any recent changes

Key analysis parameters:

PARAMETER	NORMAL	ACTION LEVEL	INDICATES
Particle count (ISO code)	18/16/13	>19/17/14	Contamination, wear
Water content	<0.1%	>0.2%	Seal leak, condensation
Viscosity change	±10%	±15%	Wrong oil, degradation
Iron (ppm)	<50	>100	Pump, motor, cylinder wear
Copper (ppm)	<25	>50	Bushing, bearing wear

Contamination Control

Most hydraulic failures relate to contamination:

Contamination sources:

- Built-in (manufacturing debris, assembly contamination)
- Ingressed (dust through seals, breathers, during service)
- Generated (wear particles from pumps, valves, cylinders)

Control measures:

- Keep oil containers sealed until use
- Use desiccant breathers on reservoir
- Clean around ports before disconnecting
- Cap all open lines immediately
- Filter new oil before adding (kidney loop preferred)

Component Repair vs. Replacement

Field Repair Capabilities

Some repairs are practical in the field:

COMPONENT	FIELD REPAIR	REBUILD FACILITY	REPLACE ONLY
Hoses	✓ Replace with spare		
Fittings	✓ Replace with spare		
Filters	✓ Replace elements		
Cylinders	Seal kits if equipped	✓ Full rebuild	
Directional valves	Solenoid replacement	✓ Spool/seal kits	Complex valves
Pumps		✓ Rebuild kits	Often more economical
Motors		✓ Rebuild kits	Often more economical

Spare Parts Strategy

Recommended spares for field service:

Must-have spares:

- Filter elements (all sizes)
- Commonly used hose assemblies
- Fitting assortment
- Seal kits for CSS cylinders
- Solenoid coils
- Accumulator charging kit

Insurance spares:

- Main hydraulic pump
- Key directional valves
- Complete cylinder assemblies
- Hydraulic motor for feeder

Safety Considerations

Hydraulic Safety Rules

1. **Never search for leaks with bare hands:** High-pressure fluid injection causes severe injury
2. **Relieve pressure before disconnecting:** Use gauge to verify zero pressure
3. **Support raised components:** Never rely on hydraulics alone to hold loads
4. **Use proper PPE:** Safety glasses, gloves when handling oil
5. **Handle hot oil carefully:** Operating temperature can cause burns

Environmental Considerations

- Contain spills immediately
- Dispose of used oil and filters properly
- Consider biodegradable hydraulic fluids for sensitive areas
- Document and report significant releases

Conclusion

Mobile jaw crusher hydraulic systems are complex but follow logical principles. Systematic troubleshooting—starting with symptoms, checking basics, then proceeding to pressure and flow testing—enables efficient diagnosis. Preventive maintenance, particularly contamination control and regular oil analysis, prevents most failures before they occur. Keep appropriate spare parts on hand for rapid field repair. Understand the interrelation of circuits—a problem in one area may cause symptoms in another. With proper maintenance and troubleshooting skills, hydraulic downtime can be reduced by 70-80% compared to reactive approaches. The investment in training, test equipment, and preventive maintenance pays returns many times over through improved availability and reduced repair costs.

Topics: #Flywheel #Jaw Crusher #NDT Inspection #Safety

NESANS
www.nesansindia.in
SF No 20/1, Eachanary Madukkarai Road, Coimbatore, TN 641024
+91 9578 799 755