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A6474X439
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Operation and Maintenance Manual

CM445 Continuous Miner

A6474X439 (Hydraulic)

Hydraulic pump assembly

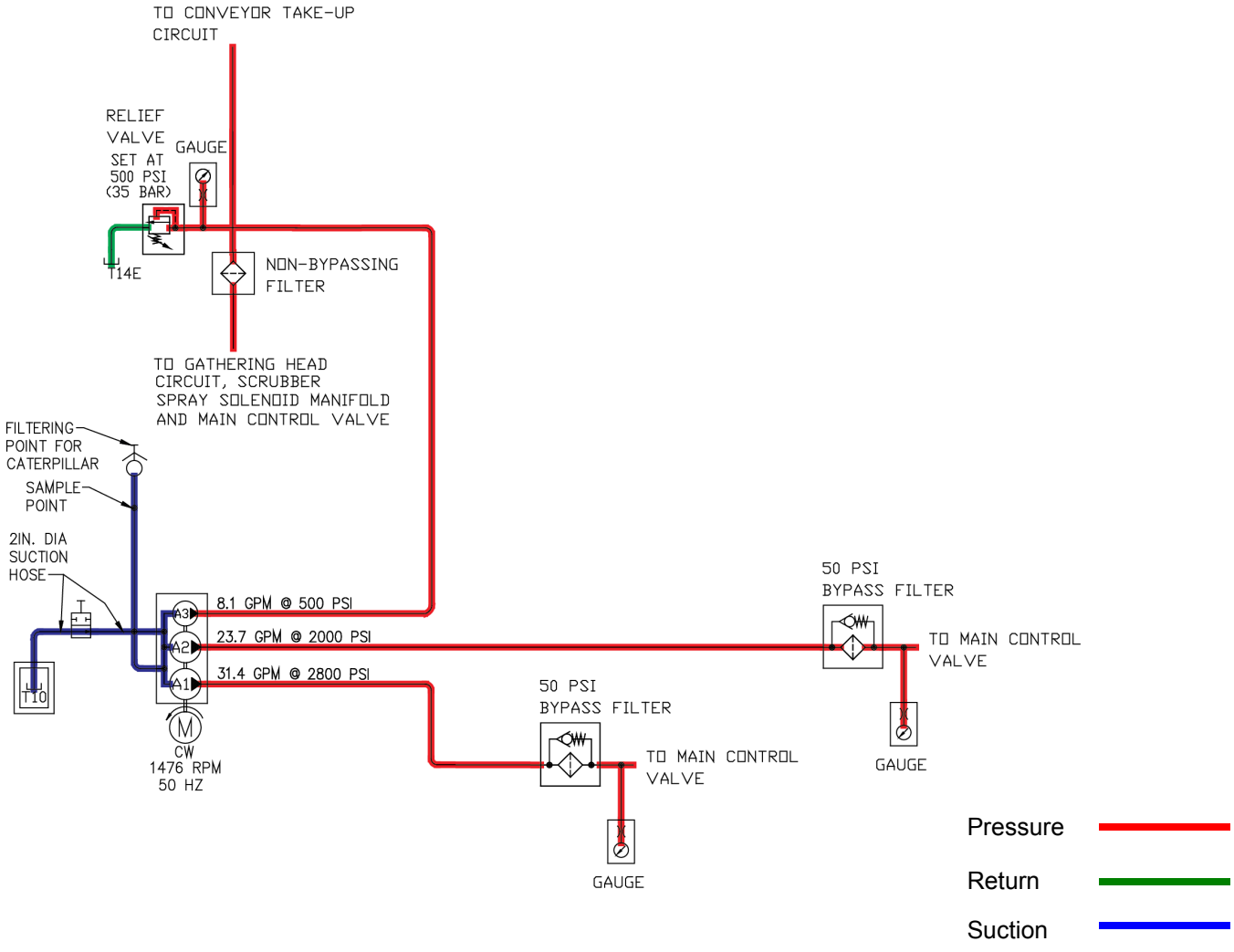
Hydraulic power for all of the hydraulically actuated functions originates with the pump assembly (Fig. 4). Always be sure the shut-off valve (if equipped) is turned to open and the locking device is replaced before starting the machine.

Hydraulic pump on circuit

This pump utilizes three working sections: one main flow, one auxiliary and one pilot flow. Oil is supplied from the oil reservoir through a suction line to the pump inlet ports. A quick disconnect allows oil sampling before the flow enters the pump. The main and auxiliary flow lines move through bypass filters set at 50 psi each before entering the main control valve, which is monitored by a pressure gauge. After leaving the pump, the pilot flow continues on to the conveyor take-up circuit, which is monitored by a pressure gauge, and flows through a relief valve set a 500 psi before returning to the tank. The pilot flow also flows through a non-bypassing filter before entering the gathering head circuit, the scrubber spray solenoid manifold and the main control valve.

IMPORTANT **The two inch locking ball valve must be locked open in normal operation.**

Fig. 4: Hydraulic pump circuit



Gathering head raise/ hold/float/lower circuit

Oil is supplied by the hydraulic pump to the gathering head working section of the main control valve. By manual or remote solenoid control, the valve spool allows oil to enter the gathering head raise circuit.

Circuit operation - Raise (extend)

Reference Fig. 13: To manually raise the gathering head pan (extend the cylinder), pull the valve's handle. Remote operation is achieved by energizing the gathering head up solenoid (GHU). Oil free flows through the check valve in counterbalance valve designated "VR" in the gathering head float valve block and is directed to both cylinder extend ports. At any time while raising the gathering head, the operator can stop the gathering head pan by centering the handle on the valve (or de-energizing the solenoid) and the pan will hold in position. The gathering head raise circuit is protected by a port relief that is set at 1,700 psi (117 bar).

Circuit operation - Lower (retract)

Reference Fig. 14: To put the gathering head pan in the lower mode, push the valve's handle. Remote operation is achieved by energizing the gathering head down (GHD) solenoid. This vents the port labeled "V" on the gathering head float valve block to tank and allows control of the gathering head lower via the valves in the block. The counterbalance valve "VR" is set to relieve at 1,200 psi to allow the gathering head to drift down at a controlled rate of speed. This valve is adjustable and the rate of retract speed for the cylinders can be increased by decreasing the pressure setting of the valve.

Conversely, the retract speed for the cylinders can be decreased by increasing the pressure setting of the valve. When in the float condition, the cylinders carry some of the gathering head pan weight to prevent the gathering head leading edge from digging into the soft bottom of the mine and moves the machine's center of gravity forward when mining. The gathering head lower circuit is protected by a port relief that is set at 1,700 psi (117 bar).

The counterbalance valve that is designated "CR" is set to relieve at 1,800 psi (124 bar). This setting will relieve pressure directly to the tank in the event of a forced movement of the gathering head.

The pilot pressure supply for the gathering head float comes from the hydraulic pump through a 3 micron non by-pass filter to the gathering head float valve. The pilot pump provides make up oil for the gathering head cylinders. When the pan goes over uneven terrain, it may raise quickly and extend the gathering head cylinders at a rapid rate. This temporary condition can create high demand for pilot oil supply. In extreme cases, the pilot pressure may decrease to the point where the main control valve may not have sufficient pilot pressure to shift when the solenoids are engaged. It is, therefore, possible to experience a momentary loss of radio control of the machine.

To minimize the chance of the occurrence, a restrictor orifice is installed in the pilot supply for the valve block. This orifice is protected from contamination by an upstream filter. A downstream check valve keeps system pressure from entering the pilot pressure lines. An adjustable needle valve allows for the bleeding off of pressure for maintenance. This needle valve is to remain closed except for performing maintenance. A gauge is incorporated into the valve block for maintenance and troubleshooting.

Water supply circuit

Mine water is supplied to the miner from a connection located on the right side of the miner (typical). The water supply to the miner is controlled through a 2 position, manually-operated ball valve. Immediately after are connections for two optional wash down hoses, one on the left hand side of the miner and one on the right side. The mine water then passes through a strainer that is equipped with an automatic back-flush feature.

From the strainer, the water is directed to the inlet of a booster pump. The booster pump is driven by a hydraulic motor that is controlled by the booster pump/high speed cutter head raise working section of the main control valve (see the hydraulics section of this manual for further details). There is a valve piped in parallel with the booster pump which allows mine water to continue to the remainder of the miner when the booster pump is not running. When the booster pump is running the check valve is closed because the water pressure on the outlet side of the pump is greater than the pressure on the suction side. The high pressure side of the booster pump is equipped with a relief valve that is set at 125 psi (8.6 bar).

From the booster pump, the water is directed to the water distribution manifold where it supplies the dust spray/cooling and scrubber back flush control valves. The supply to the water distribution manifold from the booster pump is monitored with a flow switch and a pressure switch to provide protection to the booster pump and other critical components on the machine. Please refer to the electrical control section of this manual for further information.

Gauges measure the pressure of the mine water, booster pump inlet water and booster pump outby water.

Introduction

1. Always refer to the hydraulic schematic in the parts book supplied with your miner.
2. Most relief valves are set to factory specifications and should require no further adjustment.
3. Generally speaking, when adjusting relief valves, turning the adjusting screw in (clockwise) will increase the pressure setting.
4. If the valve pressure setting is unknown, always adjust the valve fully counterclockwise prior to initiating any action that will create flow and prove the potential for pressure.

WARNING **Use extreme caution when performing test procedures and making adjustments. Unless noted in the procedures, all controls are to be in the neutral position.**

Gauges

The miner is equipped with seven (7) hydraulic pressure gauges to aid in setting relief pressures. The gauges measure the following pressures:

1. mine water pressure
2. main pressure (all functions of the MCV)
3. pilot pressure
4. gathering head float/relief pressure
5. anti-chatter/maintenance (shear down) pressure
6. conveyor chain take-up pressure
7. stabilizer shoe down pressure

Setting relief valves

Setting relief valve pressure is necessary when a relief valve is replaced with a new unit or when an existing relief valve needs to be adjusted. To properly adjust a relief valve, the circuit must be “dead-headed”.

Setting hydraulic pressures

The adjustment procedure should start with the pilot pressure circuit. This system will build pressure as soon as the pump is started. The main relief valve on the main control valve (MCV) and high speed cutter head raise control valve, as well as the pilot pressure relief and brake cooling circuit pressure reducing valve, should all be adjusted to their lowest setting prior to initial start up and adjustment. Reference circuit descriptions, abbreviations, and terms in the Hydraulic Components section of this chapter.

8. utilizing filter carts to maintain oil cleanliness standards;
9. properly training personnel on the importance of clean oil and best practices for storage and handling; and
10. monitoring the program closely and looking for continuous improvement.

Eliminate contamination source through “clean” maintenance practices best achieved by maintenance and troubleshooting given below:

1. always clean the area around the component that is to be removed and inspected;
2. store components in a plastic bag after inspection and prior to replacement on machine;
3. cap off all open hoses/fittings;
4. never touch a filter with bare hands when installing it back onto the machine; and
5. pay close attention to the filler/breather cap and replace it when damaged or in the recommended time frame.

Multi-function failure

If more than one function fails to operate on the machine, check the output of the pumps. Since this is an “open center” circuit, the normal pressure (with all directional control valves in the center position) should be less than 100 psi. This pressure reading illustrates the necessary pressure to circulate the oil through the system. If the pressure reading under these conditions is significantly greater than 100 psi, it is likely that one of the control valves is trying to direct oil to one (or more) of the circuits on the machine.

The next step in troubleshooting a multi-function failure is to check the pilot pressure on the main control valve manifold. This pressure should be between 400 - 500 psi. If the pilot pressure is significantly below 350 psi, start with the General Troubleshooting Flow Chart IV - Incorrect Pressure. Another step to resolve multi-function failure is to have an electrician check for power to the solenoid circuits.

Check for correct pump rotation if electrical work has been performed (such as trailing cable replacement).