P.O. Box 689 Social Circle, GA 30025
770-464-0777
www.gpmhydraulic.com

Line 1 and Line 2 Preventive Maintenance And Consulting Report

al@gpmhydraulic.com
Mobile Phone
770-714-1400

alan@gpmhydraulic.com
Mobile Phone
770-714-0386

Press No. 1
Hydraulic Preventive Maintenance Check List

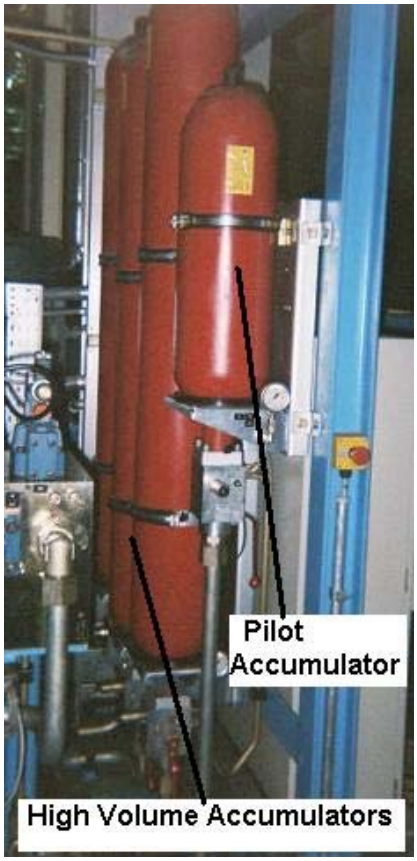
Date: May 24, 2004

1. Check the high volume accumulator pre-charge.

No. 1 135 Bar No. 2 135 Bar No. 3 135 Bar

The pre-charge on all these accumulators was below the recommended level, 140 Bar. The accumulators were all pre-charged to 140 Bar.

.



2. Check the pilot accumulator pre-charge.

55 Bar

The pre-charge on this accumulator is only 5 Bar below the recommended level of 60 Bar. This accumulator was not pre-charged.

3. Check tank line temperature of pilot accumulator's relief and manual dump valves' tank line.

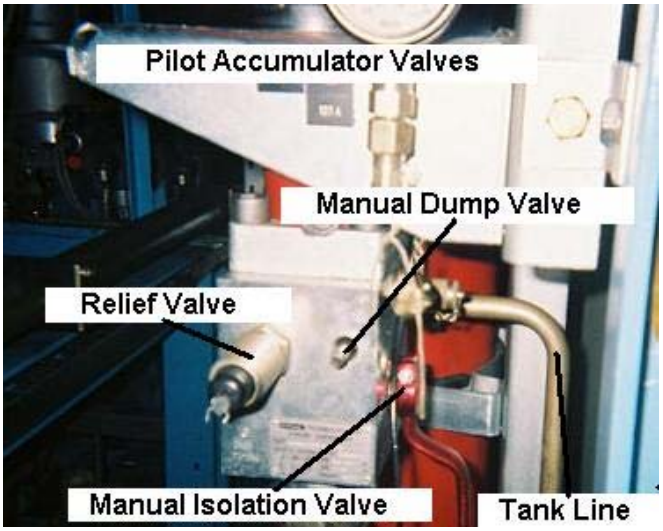
No. 1 99^0 No. 2 98^0 No. 3 92^0

The tank line of these valves should be cooler than the oil temperature (118^0F). This test indicated that there was no bypassing through the manual or relief valve in the block.

4. Check tank line temperature of pilot accumulator's relief and manual dump valves tank line.

96^0

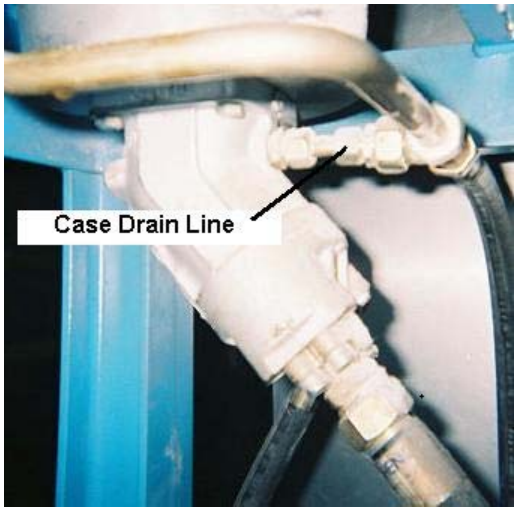
This temperature indicated there is no bypassing through the manual or relief valve in the block.



5. Check the low volume pump case and suction line temperature by shifting the normally open valve (SOL13) closed.

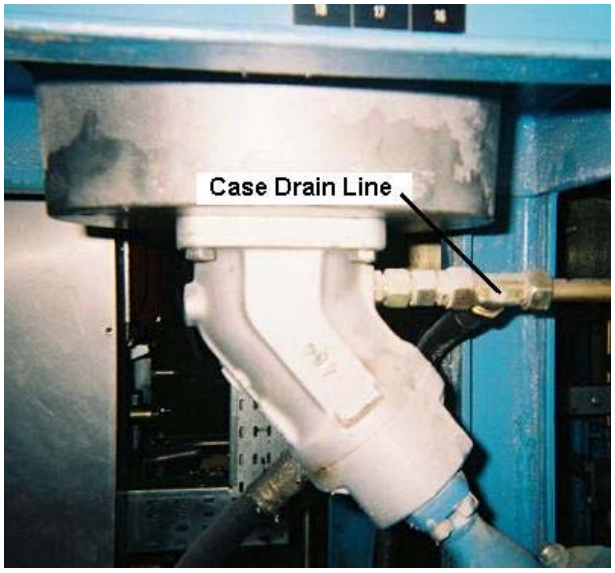
.40 GPM

The normal flow rate through the case drain line for this pump is 1/10 – 1/3 GPM. This test indicated that the pump was excessively bypassing. The pump should be changed when the case drain flow reaches 1 GPM.



6. Check the high volume pump case drain temperature by energizing the "B" solenoid on the 3-position directional valve.

1/4 GPM



The normal flow rate out of case drain line for this pump is 1/4 – ¾ GPM. The recorded flow rate, 1/4 GPM, designates that the pump is not excessively worn.

7. Check the tank line heat of SOL46, 49.1, and 49.2 when SOL14 or SOL12 is energized and SOL45 is energized. Press should be at the top when test is made.

128^0F

This line should be warmer than the oil temperature. Heat is generated as the oil in the lifting cylinders returns to tank through SOL33.

8. Check the tank line heat of valves 13, 43, 55, and 31 while operating.

Tank Line Heat 113^0F

A small amount of oil will be ported through the No. 55 relief when compressing the board. This temperature indicated that the No. 31 and 43 valves were not stuck open.

9. Energize SOL13 and check the pressure at the outlet port of the low volume pump.

310 Bar

This is 10 Bar below the recommended maximum of 320 Bar. This pressure was not changed because it only needs to be high enough to pressurize the high volume accumulators to 300 Bar.

10. Energize SOL12 and check pressure at high volume pump outlet.

320 Bar

This pressure is limited by the No. 30 and 43 spring settings. The recommended settings of both valves are 330 Bar.

11. Check pressure at the pumps' suction line.

5 Bar

This pressure is determined by the weight of the oil and the resistance of the piping.

12. Insert gauge in M8. Manually energize SOL12. Record time to build pressure at M8 gauge.

No pressure was read when a gauge was inserted in the disconnect. The connection is either defective or has trash in it.

13. Repeat procedure by energizing SOL13, then SOL14.

No pressure was read when a gauge was inserted in the disconnect. The connection is either defective or has trash in it.

14. Check pilot pressure downstream of reducing valve.

95 Bar

The recorded pressure is very near the recommended setting of 100 Bar.

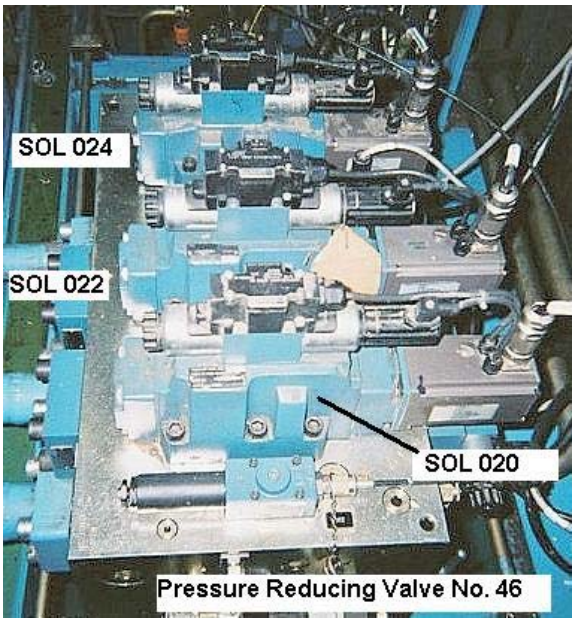
15. Insert a gauge in M33. Energize SOL31. Record time required to build to 100 Bar on M33.

1 Second

This time reflects the speed that the SOL31 spool shifted open. This time is controlled by one of the adjustments between the SOL31 pilot and main spools. The adjustments are shown in the "Recommendations" section of this report.

16. Insert a gauge downstream of each proportional valve. Record the amount maximum pressure.

SOL020 - 280 Bar
SOL022 - 275 Bar
SOL024 - 250 Bar



17. With the gauge in the same line, record the amount of time to drop from maximum pressure to 20 Bar.

All gauges dropped to 20 Bar and below in one second.

This is controlled by the voltage to the proportional valves when compressing.

18. Check the tank line of prefill valves for heat (if possible) while operating.

The tank lines of all prefill valves (mounted on top of the main rams) were less than 117^0F. This indicates that the valves were not bypassing oil when in compression.

19. Check the temperature of full piston side line of each cylinder when in the raised position. SOL45 and SOL12 should be energized.

Standing on the side of the hydraulic unit (the left side), the left side cylinder line was 116^0F. The temperature of the line on the right side was 129^0F. This may indicate that the seals in the cylinders are bypassing. This can be verified by raising the press and turning the hydraulic unit off. If the right side drifts down, the seals are bypassing.

20. Record time required to open the press.

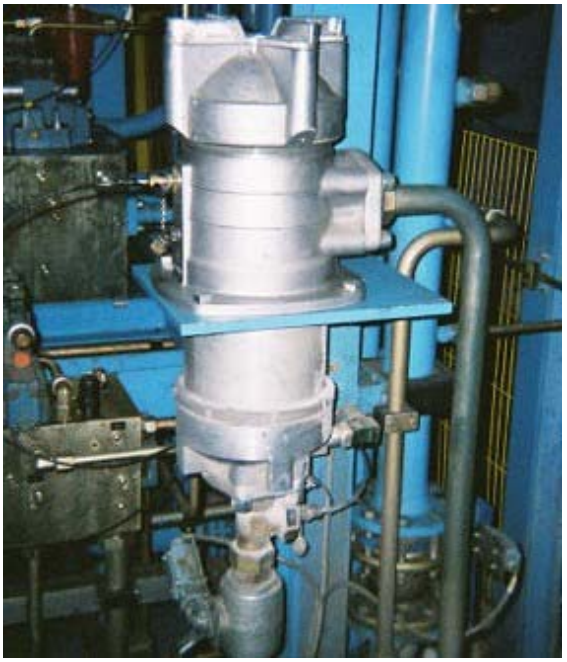
Less than 1 second

21. Check cooling pump outlet pressure.

4 Bar

This pressure represents the resistance of the cooler and filter. This should always be below the cooling pump's relief setting, 15 Bar.

22. Check cooler fins for good air flow.



One fan had no air flow in one area.

23. Check No. 9 filter condition.

OK

24. Check pilot filter condition.

OK

25. Check the pressure to the rod sides of the lifting cylinders. This should build to 300 Bar.

300 Bar

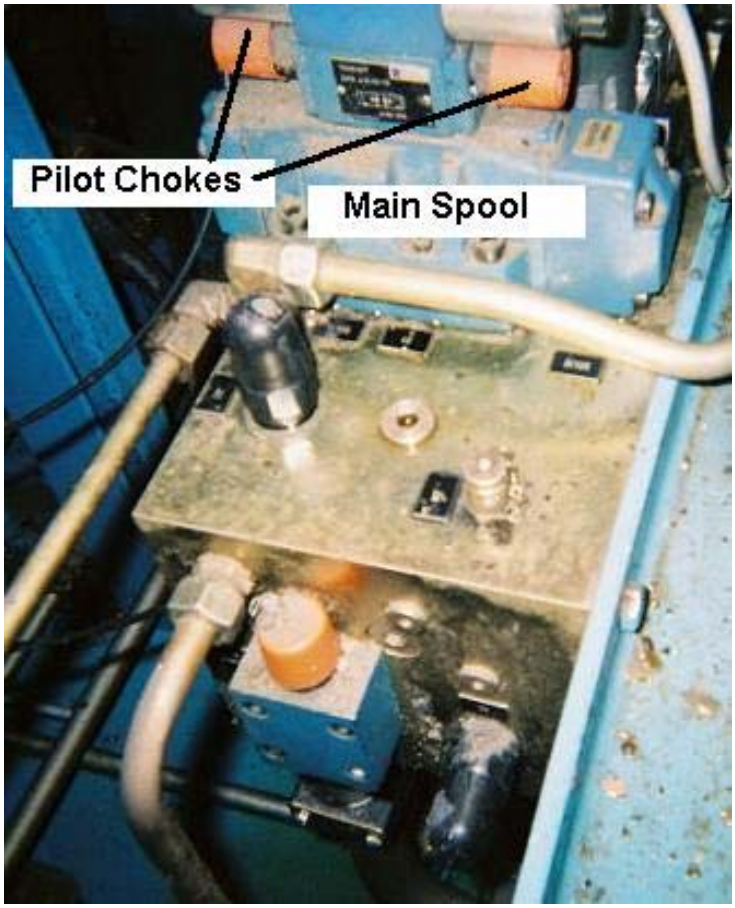
Recommendations

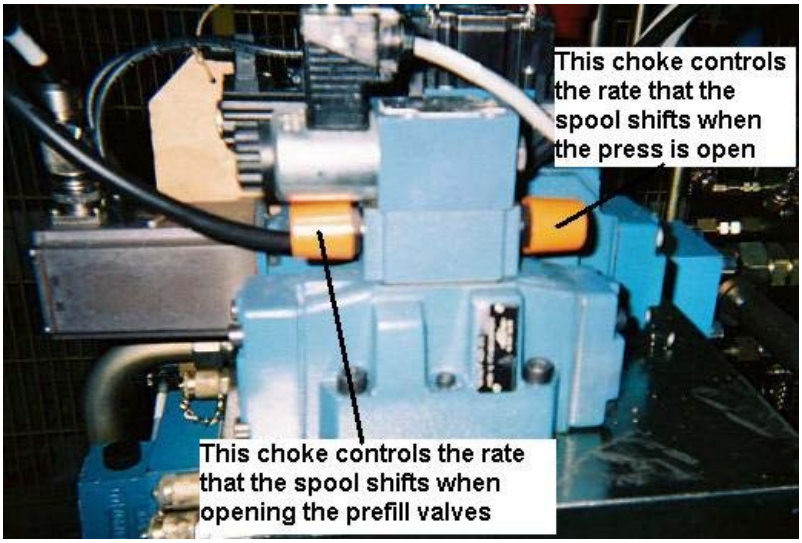
The high volume accumulators were all pre-charged too low. Over a period of time, the nitrogen will seep through the rubber bladder. The pre-charge should be checked quarterly to ensure the proper operation of the press. The accumulators are used to supply a high volume of oil when compressing the board and opening the press. We pre-charged each accumulator to the recommended level, 140 Bar. We found that the Hydac charging rig was not the proper size for accumulators. (We used our charging rig when re-filling.) The proper size should be ordered.

The low volume pump was found to be slightly worn. The normal flow rate out of the case drain line should be 1/10 – 1/3 GPM. The recorded flow rate was .40 GPM. Although the pump is not bypassing enough to be changed, it should be monitored regularly (once per month). When the bypassing increases to 1 GPM, the pump should be changed.

The lifting cylinder on the right side (when viewed from the hydraulic unit) may have worn piston seals. Perform the test as indicated in No. 19.

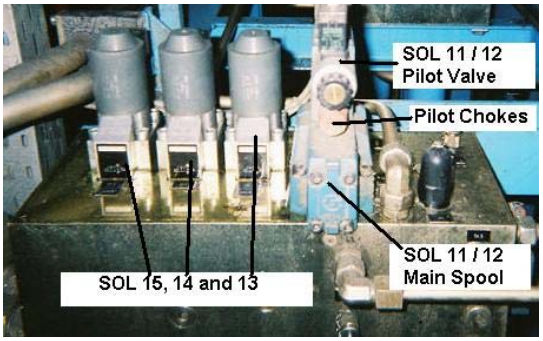
The return line from the pumps' control valves had extreme shock when SOL12 de-energized after filling the accumulators. There are pilot chokes located between the SOL11/SOL12 pilot valve and main spool. These pilot chokes control the rate that the main spool shifts. These chokes were found to be fully open on this valve. This allowed the main spool to rapidly shift. We rotated both chokes clockwise several rotations. This allowed the spool to gradually shift when the solenoids energized and de-energized. Once the chokes were properly set, no shock was visible in the return line.





SOL 31 Adjustments

There was oil on top of the pumps' controls valves manifold.



In operation, SOL13 and 15 are energized when compressing the board. Once the compression timer elapses, SOL13 de-energizes, creating a flow path for the pump volume to the tank. One-tenth of a second later, SOL15 de-energizes, which blocks flow from the pump to the system. Due to the short duration between the de-energizing of both solenoids, pressure is still at a high level when SOL15 is de-energized. This causes the pump flow to be rapidly deadheaded to SOL15. This causes damage to the valve.

A better design would have been to use the same type valve as No. 27 to unload the low volume pump. In an effort to reduce the leakage and valve damage, the timer should be lengthened if possible. This would allow SOL13 to fully open, reducing the outlet pressure of the low volume pump to 0 PSI prior to de-energizing SOL15.

Press No. 2
Hydraulic Preventive Maintenance Check List

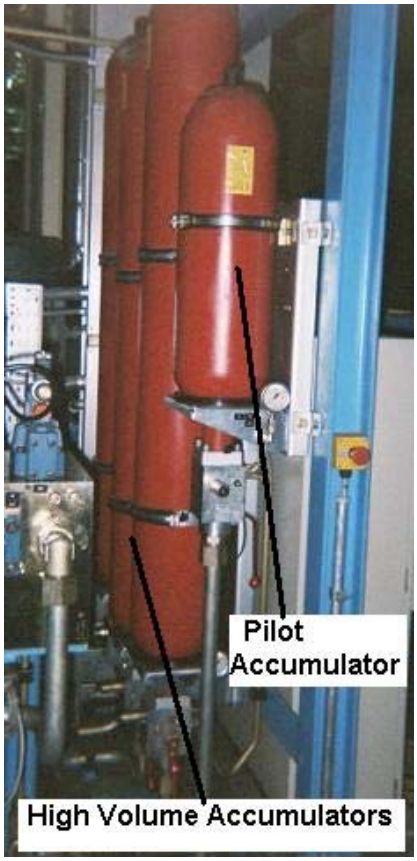
Date: May 10 and May 24, 2004

1. Check the high volume accumulator pre-charge.

No. 1 130 Bar No. 2 132 Bar No. 3 132 Bar

The pre-charge on all these accumulators was below the recommended level, 140 Bar. The accumulators were all pre-charged to 140 Bar.

.



2. Check the pilot accumulator pre-charge.

59 Bar

The pre-charge on this accumulator is only 1 Bar below the recommended level of 60 Bar. This accumulator was not pre-charged.

3. Check tank line temperature of pilot accumulator's relief and manual dump valves' tank line.

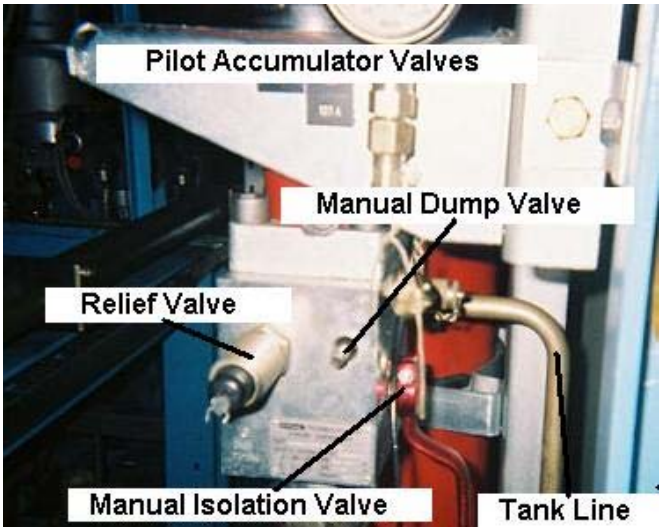
No. 1 80^0 No. 2 91^0 No. 3 88^0

The tank line of these valves should be cooler than the oil temperature (118^0F). This test indicated that there was no bypassing through the manual or relief valve in the block.

4. Check tank line temperature of pilot accumulator's relief and manual dump valves tank line.

90^0

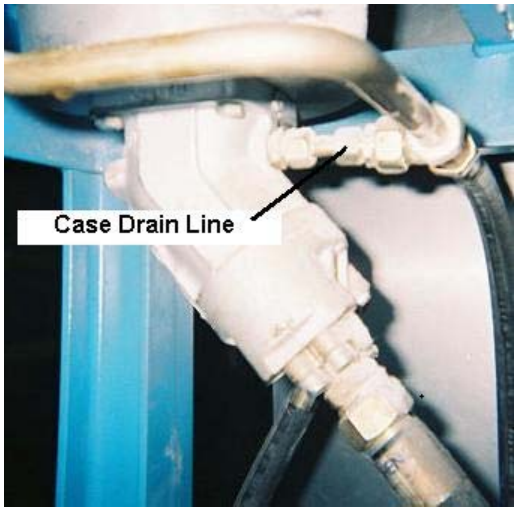
This temperature indicated there is no bypassing through the manual or relief valve in the block.



5. Check the low volume pump case and suction line temperature by shifting the normally open valve (SOL13) closed.

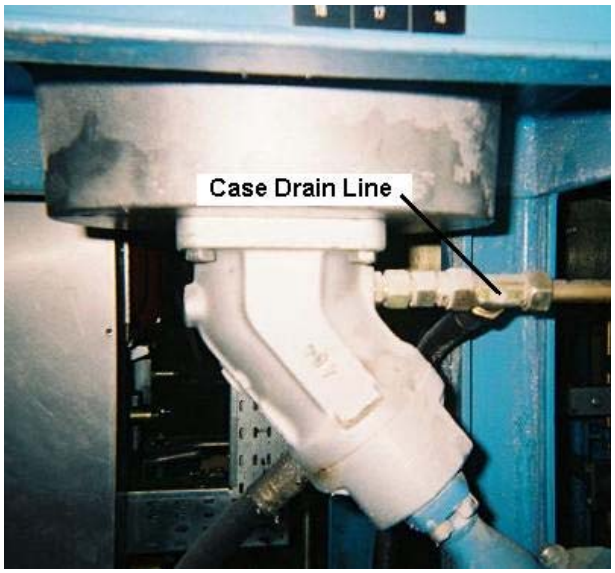
1/10 GPM

The normal flow rate through the case drain line for this pump is 1/10 – 1/3 GPM. This test indicated that the pump was not badly worn.



6. Check the high volume pump case drain temperature by energizing the “B” solenoid on the 3-position directional valve.

1/8 GPM



The normal flow rate through the case drain line for this pump is 1/4– 3/4 GPM. This test indicated that the pump was not badly worn.

7. Check the tank line heat of SOL46, 49.1, and 49.2 when SOL14 or SOL12 is energized and SOL45 is energized. Press should be at the top when test is made.

133^0F

This line should be warmer than the oil temperature. Heat is generated as the oil in the lifting cylinders returns to tank through SOL33.

8. Check the tank line heat of valves 13, 43, 55, and 31 while operating.

Tank Line Heat 110^0F

A small amount of oil will be ported through the No. 55 relief when compressing the board. This temperature indicated that the No. 31 and 43 valves were not stuck open.

9. Energize SOL13 and check the pressure at the outlet port of the low volume pump.

310 Bar

This is 10 Bar below the recommended maximum of 320 Bar. This pressure was not changed because it only needs to be high enough to pressurize the high volume accumulators to 300 Bar.

10. Energize SOL12 and check pressure at high volume pump outlet.

330 Bar

This pressure is limited by the No. 30 and 43 spring settings. The recommended settings of both valves are 330 Bar.

11. Check pressure at the pumps' suction line.

10 Bar

This pressure is determined by the weight of the oil and the resistance of the piping.

12. Insert gauge in M8. Manually energize SOL12. Record time to build pressure at M8 gauge.

6 Seconds

This test reflected the amount of time that the No. 27 valve shifted.

13. Repeat procedure by energizing SOL13, then SOL14.

4 Seconds

This indicated that SOL13 and SOL14 were not bypassing or stuck partially closed.

14. Check pilot pressure downstream of reducing valve.

99 Bar

The recorded pressure is very near the recommended setting of 100 Bar.

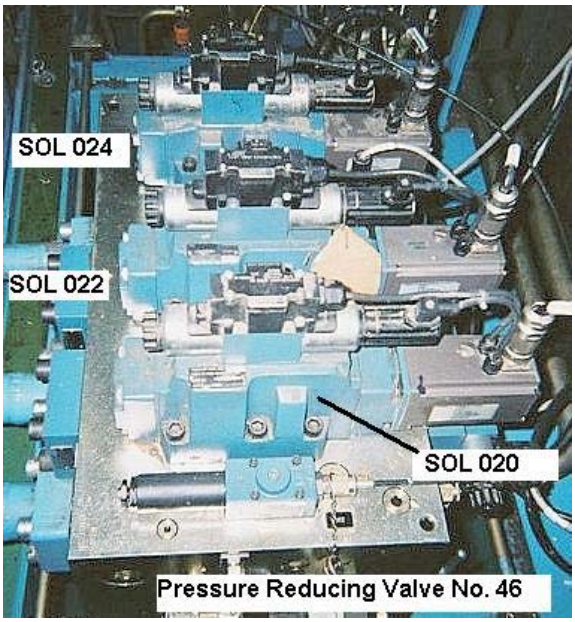
15. Insert a gauge in M33. Energize SOL31. Record time required to build to 100 Bar on M33.

1 Second

This time reflects the speed that the SOL31 spool shifted to direct oil for opening the prefills. This time is controlled by one of the adjustments between the SOL31 pilot and main spools. (See picture in "Recommendations" for exact adjustment.)

16. Insert a gauge downstream of each proportional valve. Record the amount maximum pressure.

SOL020 - 285 Bar
SOL022 - 285 Bar
SOL024 - 250 Bar



17. With the gauge in the same line, record the amount of time to drop from maximum pressure to 20 Bar.

All gauges dropped to 20 Bar and below in one second.

This is controlled by the voltage to the proportional valves when compressing.

18. Check the tank line of prefill valves for heat (if possible) while operating.

The tank lines of all prefill valves (mounted on top of the main rams) were less than 117^0F. This indicates that the valves were not bypassing oil when in compression.

19. Check the temperature of full piston side line of each cylinder when in the raised position. SOL45 and SOL12 should be energized.

The lines of both lifting cylinders were below 113^0F. This means that the piston seals are not bypassing.

20. Record time required to open the press.

Less than 1 second

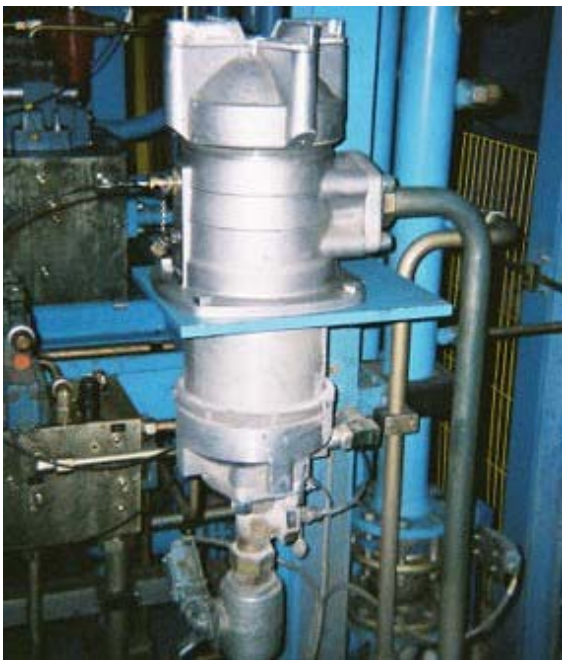
21. Check cooling pump outlet pressure.

4.5 Bar

This pressure represents the resistance of the cooler and filter. This should always be below the cooling pump's relief setting, 15 Bar.

22. Check cooler fins for good air flow.

OK



23. Check No. 9 filter condition.

Dirty

The element should be changed as soon as possible.

24. Check pilot filter condition.

OK

25. Check the pressure to the rod sides of the lifting cylinders. This should build to 300 Bar.

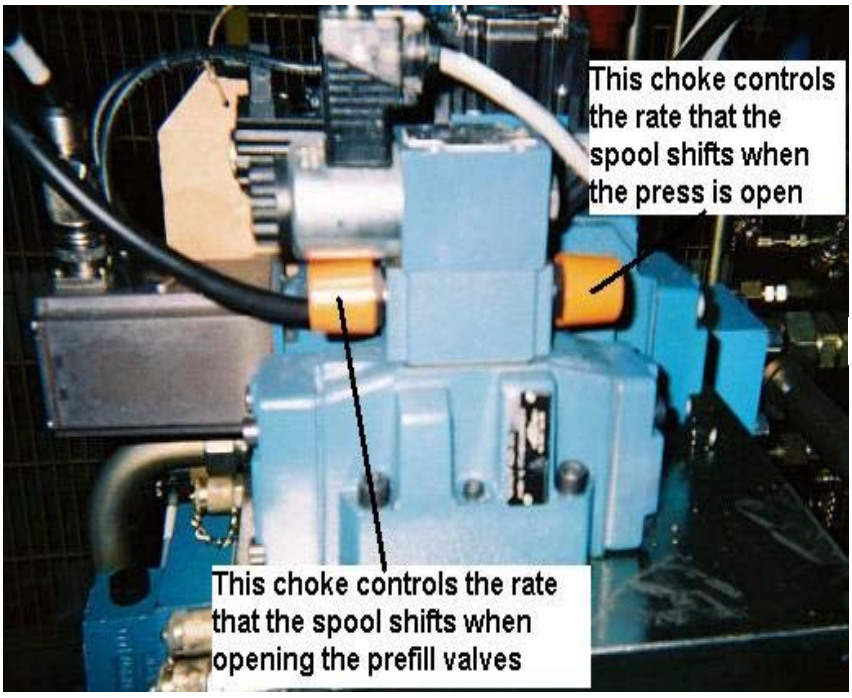
310 Bar

Recommendations

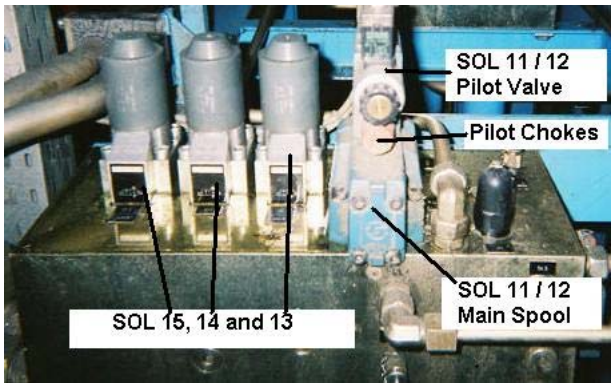
The high volume accumulators were all pre-charged too low. Over a period of time, the nitrogen will seep through the rubber bladder. The pre-charge should be checked quarterly to ensure the proper operation of the press. The accumulators are used to supply a high volume of oil when compressing the board and opening the press. We pre-charged each accumulator to the recommended level, 140 Bar. We found that the Hydac charging rig was not the proper size for accumulators. (We used our charging rig when re-filling.) The proper size should be ordered.

The filter in the re-circulating circuit was found to be contaminated. The element condition should be checked regularly and changed on a scheduled basis.

Don mentioned a reoccurring shock problem in the return line. The line jumped when the press fully opened and SOL31 de-energized. When SOL31 de-energizes, the pressurized fluid holding the prefill valves open on top of the rams is ported into the tank line. The "pilot choke" located between the SOL31 pilot valve and main spool was adjusted to control the rate that the main spool shifts open. This greatly reduced the shock in the line. A pipe clamp is missing in the piping connected to the hose in the return line. This clamp needs to be installed, which will assist in absorbing the shock when the prefill valves open.



SOL31 Adjustments



There was oil on top of the SOL13, 14, and 15 manifold. Each valve was removed from the manifold and the O'rings inspected. One of the ports on SOL15 was missing a back up ring. This ring was installed and all the O'rings replaced on the valve. Leakage still occurred after the seal replacement.

In operation, SOL13 and 15 are energized when compressing the board. Once the compression timer elapses, SOL13 de-energizes, creating a flow path for the pump volume to the tank. One-tenth of a second later, SOL15 de-energizes, which blocks flow from the pump to the system. Due to the short duration between the de-energizing of both solenoids, pressure is still at a high level when SOL15 is de-energized. This causes the pump flow to be rapidly deadheaded to SOL15. This causes damage to the valve.

A better design would have been to use the same type valve as No. 27 to unload the low volume pump. In an effort to reduce the leakage and valve damage, the timer should be lengthened if possible. This would allow SOL13 to fully open, reducing the outlet pressure of the low volume pump to 0 PSI prior to de-energizing SOL15.