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## **Consulting Report**

**Jack Weeks**  
**January 26<sup>th</sup>, 2004**

### **Reason for Consult**

My trip to \_\_\_\_\_ was a follow-up visit to my previous trip on December 17<sup>th</sup>. I had been called in to help diagnose a recurring problem of pipe fittings breaking in the hydraulic line to the load cylinders on the third calender of Paper Machine No. 1.

### **Observations**

When I inspected the fittings that had been replaced in December, I saw that they have held since that time. I also noted that the pipes have been clamped as I had recommended in my previous report. The clamps are of the correct type and appear to have been installed very well. They should serve reliably for a long time.

After my inspection of the clamps, the old accumulators, safety valves, dump valves and isolation blocks were removed and taken to the shop. It was determined that it would be much easier and faster to determine which of the old parts were salvageable and prepare the new assemblies in the shop rather than on the machine. The new assemblies could then be quickly installed as single units. Once we had the accumulators in the shop with better lighting and accessibility than at their position on the machine, it was even more apparent that replacing them was a wise choice. The shells of the accumulators

were badly corroded. It is unlikely that they can be salvaged and applying a pre-charge could have been very dangerous. It should be noted that the new accumulators will be subjected to the same environment, so the condition of their shells should be closely monitored on a scheduled basis once they are in service.



The new accumulators could not be immediately installed. Even though they are from the same manufacturer and the same capacity as the original equipment, the threads on the footings did not match the fittings that connect them to the safety valve/dump valve/isolation valve blocks. Machinist support was required to fabricate a new fitting that would match. The original valve blocks are no longer manufactured, so a pair of matching blocks had been rebuilt. Also, the new accumulator mounting brackets had to be modified to match the threaded holes in the machine.

The original installation of the accumulators provided no means of checking the line pressure at the accumulator. Since the loading cylinders are isolated from the power supply by the valves that control them, it is possible for pressure to be locked in the lines when the machine is shut down. Test ports were installed in the rebuilt valve blocks so that a gauge may be attached prior to working on the upstairs components to confirm that pressure has been bled down. These ports can also provide a means of monitoring load pressure at the cylinder for troubleshooting purposes and to determine the optimum accumulator pre-charge for shock protection.

The rebuilt valve blocks and the new accumulator mounting brackets were installed during my visit. All that remains is to install the new accumulators once the fabrication of the fittings is completed

and apply the proper nitrogen pre-charge to them. Since the safety blocks are in place, the new accumulators can be safely installed and pre-charged while the machine is running if necessary with no interruption in service.

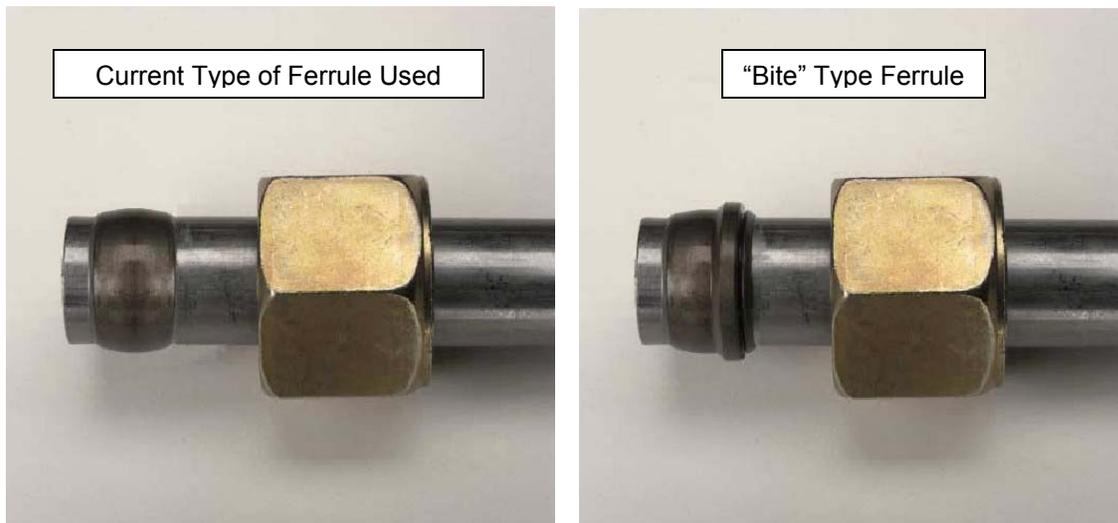
## **Recommendations**

The accumulator pre-charge recommended by the designer is 80 Bar. This should provide adequate shock protection and smooth operation of the loading cylinders. On my previous visit, however, I noted that the line pressure never approaches 80 Bar. I was told that the machine was designed for a much higher loading pressure than is currently applied. If greater shock protection is desired, the pressure at the valve block can be monitored at the new test ports that have been installed and the pre-charge can be adjusted accordingly. The rule of thumb to pre-charge an accumulator for shock protection is about 100 PSI below the maximum load pressure. Be aware that load pressure will change with different products, so if this adjustment is made, it should be made according to the product that demands the highest load pressure.

Since the new accumulators will be subjected to the same unfriendly environment as the old ones and are made of the same material, corrosion is likely to recur if steps are not taken to prevent it. The accumulator shells should be inspected on a scheduled basis and rust resistant coatings applied as necessary whenever surface rust is detected. A failure of one of these shells could be very dangerous.

During my visit, further investigation was made on the fittings that had failed. The type fittings that were installed used standard compression ferrules. These type ferrules are not the best for use on hydraulic lines. Over time, system pressure acts on these ferrules and pushes them toward the end of the pipe. Particularly on fittings subjected to shock spikes, they can be pushed entirely off the pipe resulting in a failure. It is likely that this is what has happened in the past. The new accumulators will certainly lessen the shock and decrease the likelihood of this type of failure, but all high pressure hydraulic lines should use the "bite" type ferrule instead of the standard compression type. A flareless bite type ferrule will actually

make a tighter seal as shock spikes are applied. It will dig a ridge into the pipe and become a stronger connection with each attack of a



shock spike. For future repairs, these bite type ferrules should be considered. Most hydraulic fitting manufacturers can provide these type ferrules and the necessary tools for their installation.

As always, my visit to \_\_\_\_\_ was enjoyable and productive. I received a warm welcome and was provided excellent support. In particular I would like to thank \_\_\_\_\_ for his diligent preparation and hard work during my visit. He had anticipated many of the problems we might have and saved a lot of time by his readiness. I would also like to thank \_\_\_\_\_ for expediting machinist support when we found that the threads would not match between the accumulator footings and the valve blocks.

We at GPM know that you have a choice of contractors and appreciate you calling on us for support. We look forward to any future assistance we may provide.

Sincerely,



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Consultant

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