

Alcock Ramp Pump (ARP) Maintenance and Trouble-shooting Manual

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CREDIT: This manual was prepared by members of the Johns Hopkins University student chapter of Engineers Without-Borders USA in Baltimore, Maryland, U.S.A. We hope you find it useful.



1. A Few Things to Know Before Reading the Manual

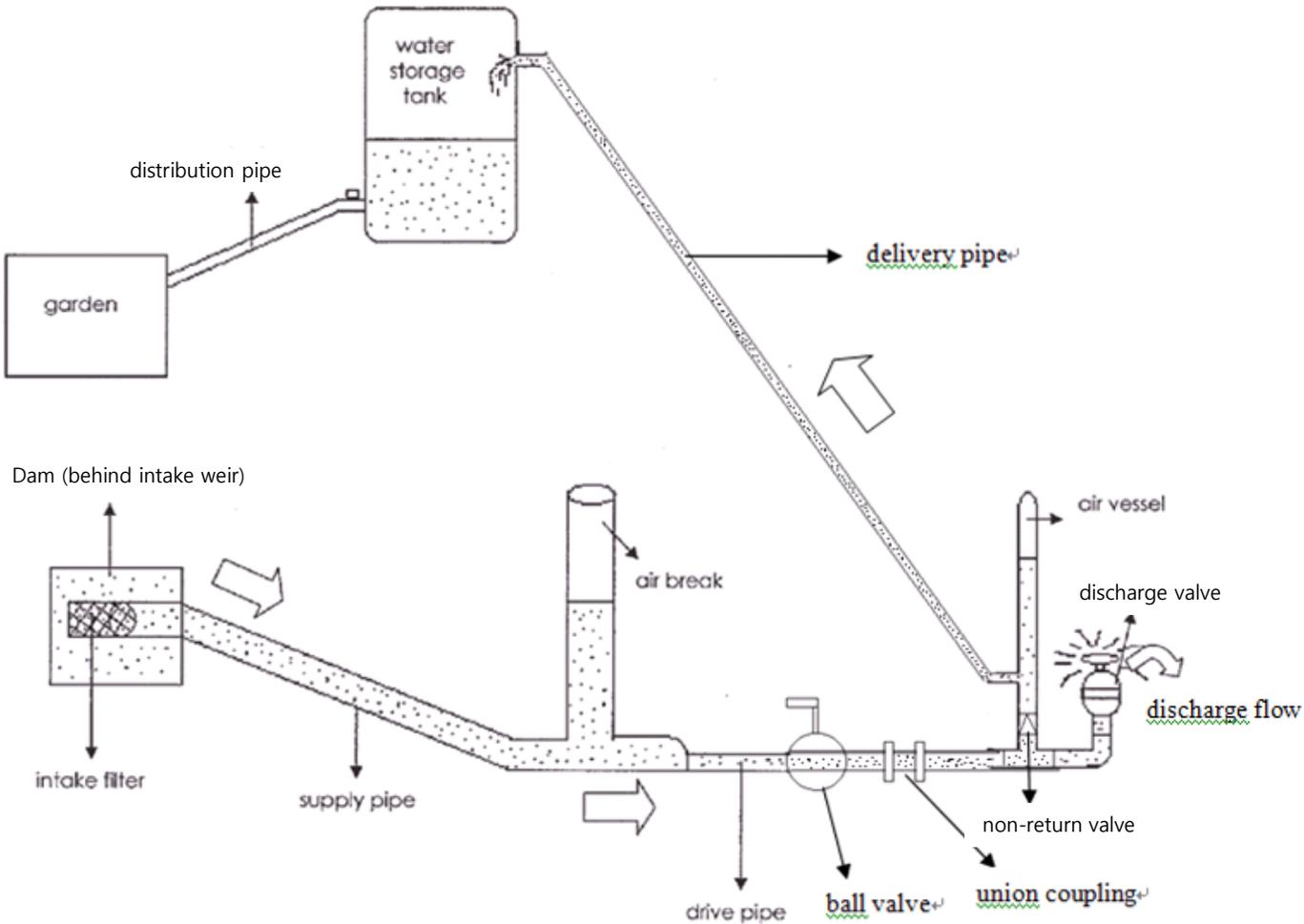


Figure 1. An overall schematic of the Alcock Ram-Pump (ARP) system

- Fig. 1 shows an overall schematic of the Alcock Ram-pump system. It informs you of the names and positions of different parts that together form the pump system..
- The two "trouble-shooting flow charts" (Fig. 2 and Fig. 3) will be helpful in locating the source of the problem when there is no water coming to the tank.
 - In most cases, the problem should be minor and Fig. 2 will be useful. Start from the box in the upper-left corner and follow the arrows.
 - Diamond boxes will ask you a question. If this answer is "yes" follow the **green arrow**. If the answer is **no**, follow the **red arrow**.
 - Rectangular boxes are action points. Do as the rectangular boxes suggest.
 - **Blue arrows** have no special meaning. Just follow them.
 - If Fig. 2 does not solve the problem, go to Fig. 3.
 - If Fig. 3. also fails to solve the problem, call for help.
- Some Abbreviations
 - ARP : Alcock Ram Pump
 - NRV: Non-Return Valve
 - DV: Discharge Valve

2. Preliminary Trouble-Shooting Flow Chart

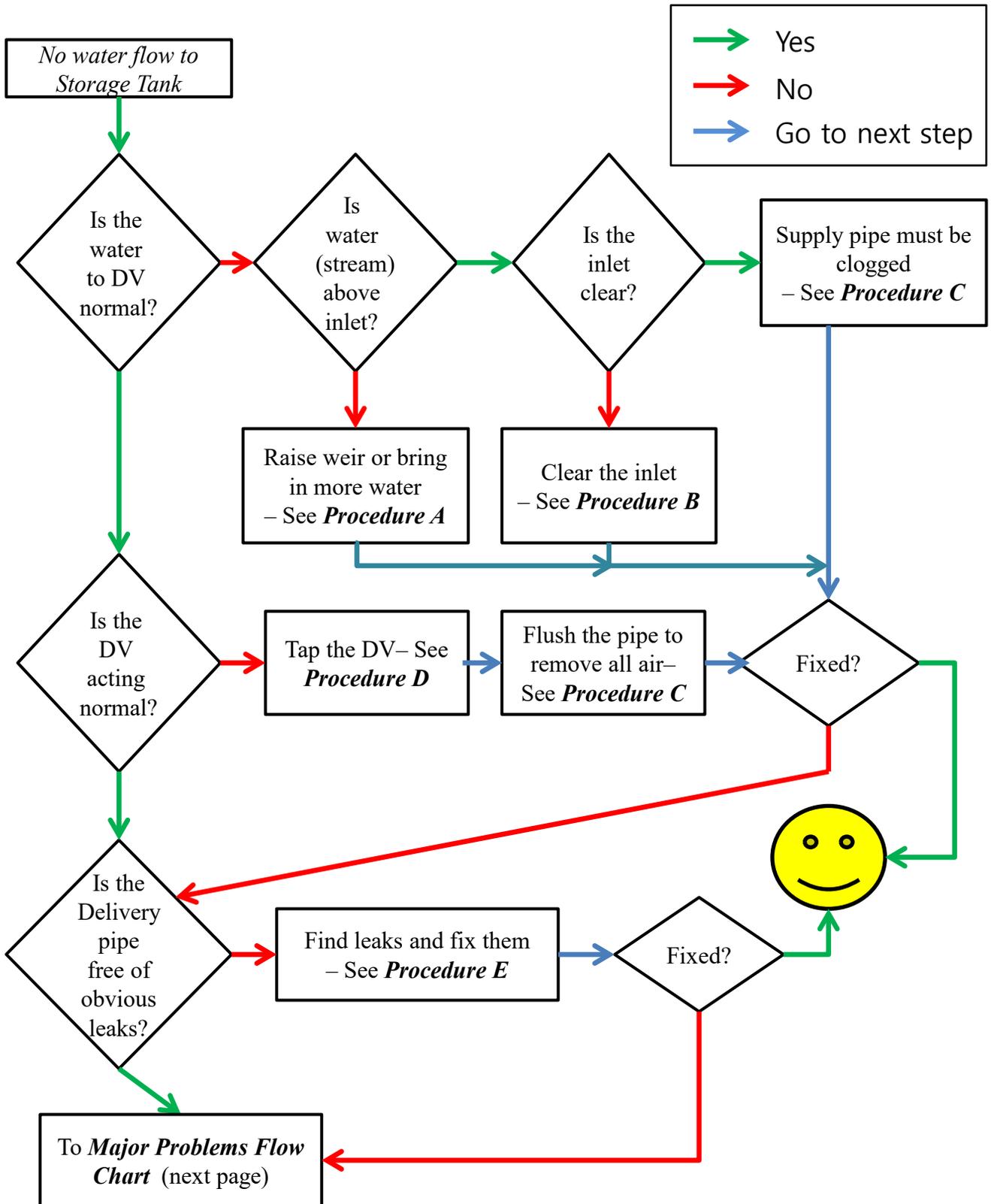


Figure 2. Preliminary Trouble-Shooting Flow Chart

3. Major Problems Trouble-Shooting Flow Chart

If you are here, one of the following 4 major problems likely apply:

- 1) The NRV (non-return valve) is not functioning
- 2) The DV (discharge valve) is not functioning
- 3) Air is trapped in the supply pipe
- 4) There is an underground break in the delivery pipe between pump and tank

We suggest that you tackle the problems in the order shown below.

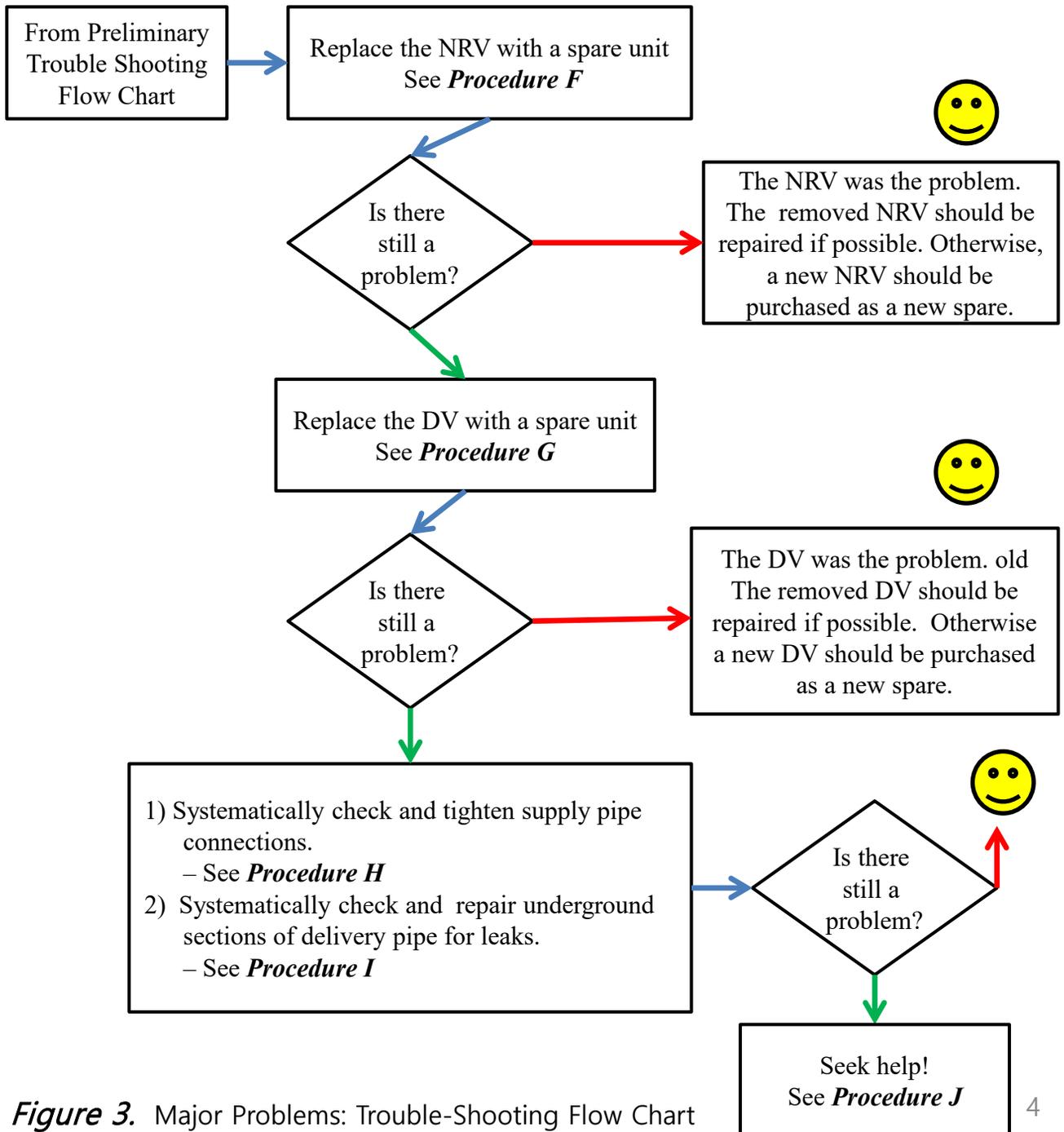


Figure 3. Major Problems: Trouble-Shooting Flow Chart

4. Procedures

A. Procedure A: Raise the weir or bring in more water

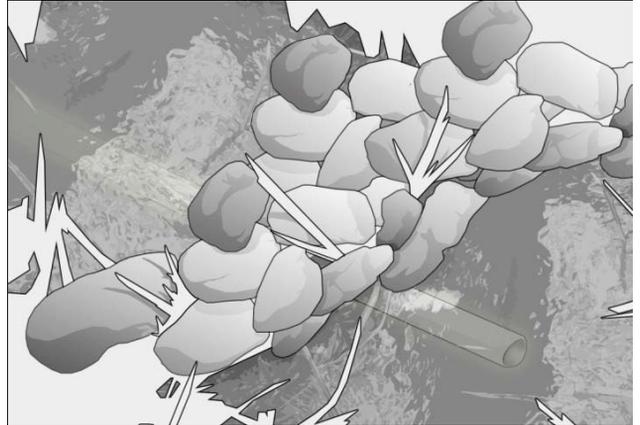


Figure 4. Build a weir with rocks so that it will raise the intake water level

Make sure that the intake is fully submerged in the water. If the water level is too low, do one or both of the following:

- a) Build a weir to raise the intake water level (Fig. 4) A weir is a small barrier made of rocks, mud, and possibly concrete that is used to raise the intake water level and submerge the pipe intake.
- b) Dig Feeder ditches that can bring more water flow to the dam behind the weir (Fig. 5).

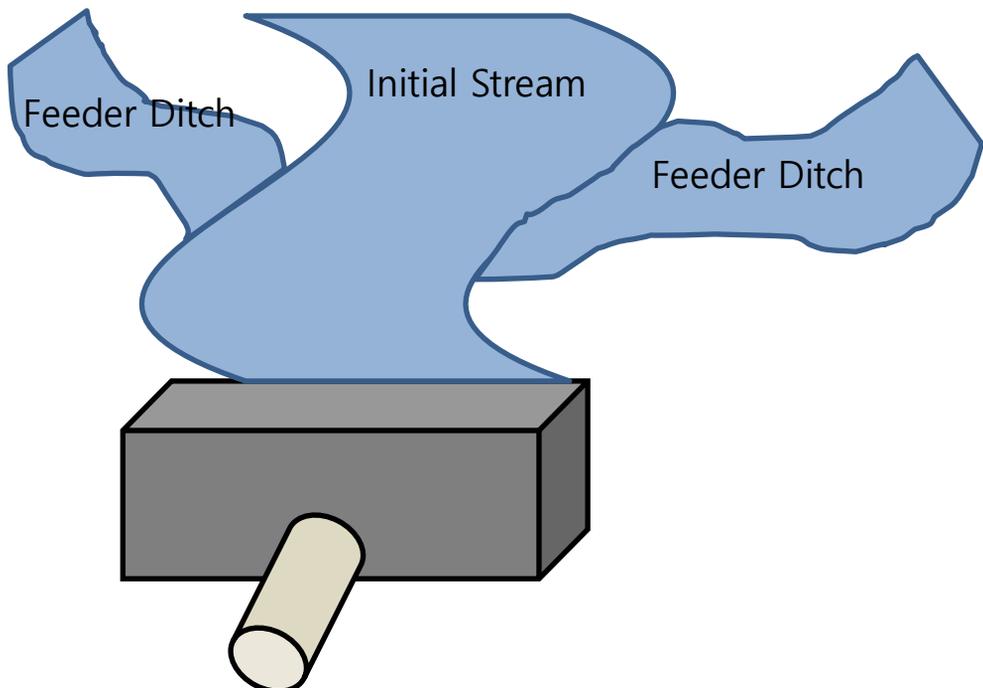


Figure 5. Dig and connect feeder ditches using nearby water sources

Procedures - *continued*

B. Procedure B: Clear inlet

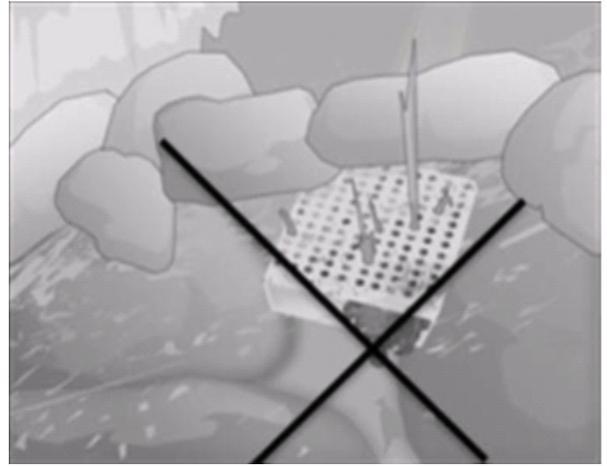


Figure 6. Filter at the supply pipe inlet

Figure 7. Inlet filter should not be clogged

Make sure that the intake filter is not clogged. Remove any sticks, leaves, trashes that are blocking water flow into the intake of the supply pipe. If intake pipe is buried in mud or silt, dig it out and take measures to prevent further mud build up in the future.

C. Procedure C: Flush and clear the supply pipe



Figure 8. Loosening the discharge valve from the rest of the pump

Figure 9. Water flushing out of the valve from the supply pipe

Remove discharge valve (Fig. 8) and let water run through the pipes (Fig. 9) at high flow rate. Flush the pipe until the water coming out becomes clear. This process also removes possible air in the pipe. In addition, if there seems to be too much mud or debris in the water coming out while flushing, consider installing an improved inlet filter or sediment trap.

Procedures - *continued*

D. Procedure D: Tap the DV (discharge valve)

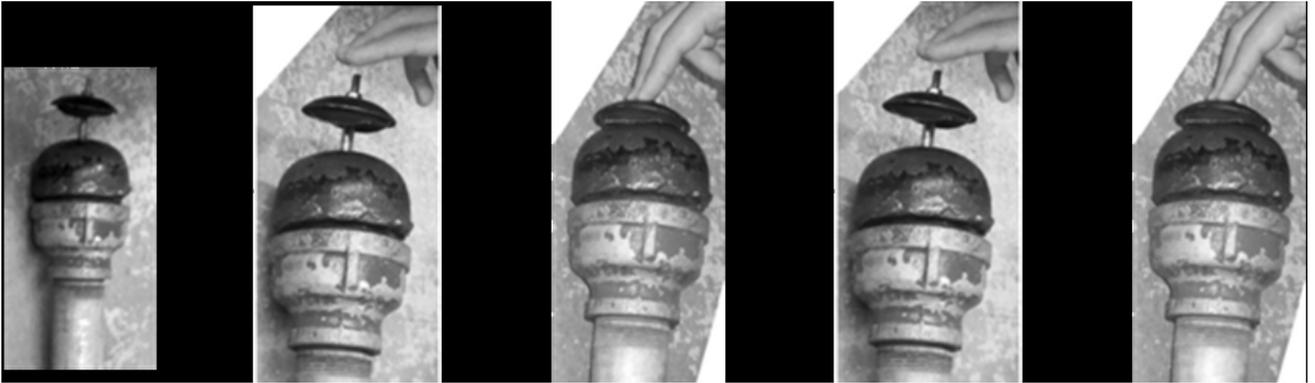


Figure 10. Tap the discharge valve cap up and down with your hand to see if it can be re-started. You may need to do this multiple times.

If the threaded rod on the discharge pump is "stuck," the discharge valve will not move up and down. See if the pump can be re-started: tap the rod up and down many times to rebuild the pressure – see Fig. 10. If the pump restarts and keeps running, you are done. But if it stops again soon, there may be other problems.

E. Procedure E: Find leaks in the delivery pipe and fix them



Figure 11. Tightening a hose clamp around a pipe connection using a screw driver

There can be leaks in the delivery pipe going to the pump. If leaks are found, tighten hose clamps and other fittings as necessary (Fig. 11). Leaks can also be fixed by tying strips of inner tube rubber very tightly around the leaking joints

Procedures - *continued*

F. Procedure F: Replace NRV



Figure 12. Loosen air vessel, tee, and NRV (everything above and including the non-return valve) from the rest of the pump.

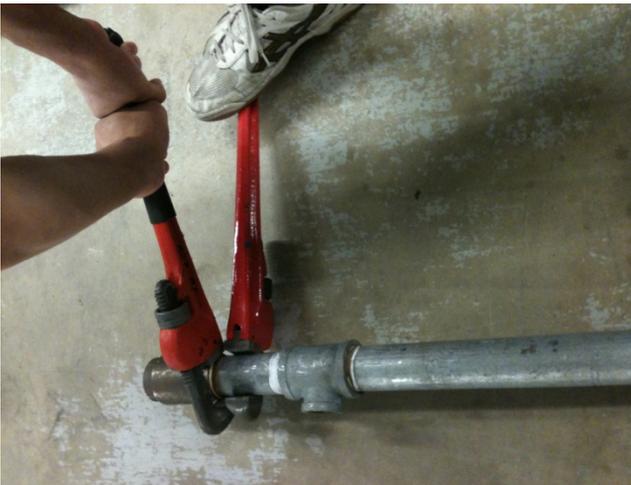


Figure 13. Loosen and isolate the NRV

The NRV (non-return valve) can become non-functional. In this case, we have to replace the NRV.

Close the shut-off valve on the delivery pipe and disconnect the delivery pipe. (**Note:** If there is no shut-off valve on the delivery pipe, then disconnecting this will allow the delivery pipe from the tank to drain).

Loosen the NRV (Figs. 12 and 13) and replace the NRV with a spare one. Then re-assemble the parts.

Note: If you determine that the old NRV was not functioning, be sure to repair it, have it repaired, or purchase a new NRV, so that you will always have a spare.

G. Procedure G: Replace DV

The DV (discharge valve) can become non-functional. In this case loosen the DV (Fig. 8) and replace it with a spare one. Once replaced, check the pump.

Note: If you determine that the old DV was not functioning, be sure to repair it, have it repaired, or purchase a new DV, so that you will always have a spare. For instructions on DV assembly and repair, refer to the *ARP Discharge Valve Assembly Guide*.

Procedures - *continued*

H. Procedure H: Check and tighten supply pipe

There can be air in the supply pipe due to non-tight supply pipe connections. These can be difficult to locate. Systematically check and tighten all supply pipes. Start from one position and scan through each and every part of the pump. Do not skip any part.

I. Procedure I: Check and tighten delivery pipe

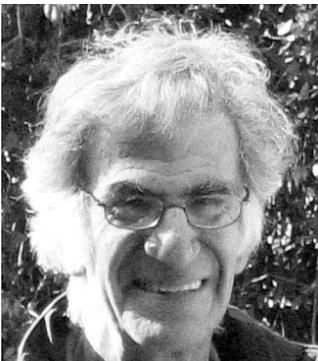
There can be breaks in the underground delivery pipe sections. These can also be difficult to locate. Look for evidence of water leaks. Wet soil or small water pools can be evidence of water leak. Look for locations where gardeners may have dug or plowed into the pipe. If no evidence is found, it may be necessary to very carefully excavate around the pipe in order to systematically check it.

Note: Underground pipe breakage is very rare and is not expected unless there has been digging or plowing into the pipe.

J. Procedure J: What to do if all else fails ...

If all else fails, you should seek assistance from an expert. We hope to provide local "service centers" in the near future, where trained service technicians will have access to the necessary tools and information to help repair and replace major parts, such as non-return valves or discharge valves. At the time of this writing, these centers have not yet been established.

In the meantime, you may be able to find some assistance by calling the ram pump designer, Mr. Dave Alcock. Dave can perhaps point you to a knowledgeable repair person in your area and he can also provide information about where to buy parts for the pump. He lives just outside of Durban.



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