OAK SERVICES COMPANY

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PROBLEM: CONDENSATE PUMP MYSTERIOUSLY WON'T PUMP. VACUUM PUMP IS NOISY AND THROWS WATER OUT THE AIR DISCHARGE PIPE.

From time to time we receive calls describing a problem where the condensate pump will operate but not pump. Frequently the vacuum pump is noisy and throws water out the air discharge pipe. The customer takes the pumps apart and everything looks fine except for perhaps leaking shaft seals.

Upon further investigation we learn that these problems only happen when the receiver is at vacuum, AND the condensate pumps are piped to discharge into a boiler feed storage tank or other vessel that is vented to atmosphere, or pressurized with steam.

We have determined that this "won't pump" problem is due to an air or steam binding condition caused by the back flow of air or steam through a leaking discharge check valve on the condensate pump, when discharging from a vacuum. This back flow of air or steam pushes the prime out of the condensate pump and allows the impeller to spin inside a gas bubble. The absence of water in the pump's case causes the seal to run dry and fail.

This air binding condition can be proved by either bleeding off the vacuum or temporarily closing the hand valve on the condensate pump's discharge pipe. In either case we have stopped this back flow of air and the condensate pump now will pump just fine.

SOLUTIONS; TEMPORARY AND PERMANENT

Now that we have determined that our problem is due to the back flow of air past a leaking check valve on the condensate pump, the obvious solution is to change the check valve, right? Well, yes, but this solution is only temporary and the problem will return when the check valve starts leaking again.

A permanent solution to this problem is to change the piping arrangement to provide a water seal across the opening and permanently stop the back flow of air.

In the case of a vented to atmosphere boiler feed holding tank, the usual arrangement is to pipe the condensate pump discharge to the top of this tank. This arrangement provides an air gap allowing atmospheric pressure to push air past our bad check valve.

To provide our necessary water seal to stop this back flow of air, several possibilities come to mind. We can either change the outside piping and fill our boiler feed tank FROM THE BOTTOM, or, install an internal submerged inlet pipe inside the tank that dips down below the water level to within a few inches of the tank's bottom.

Another arrangement would be to run the fill pipe on the outside of the tank down to connect with a Tee at the tank drain tapping, then back up to the normal fill connection. The remaining open tapping on this Tee is connected to the boiler feed tank's drain tapping.

The flow from the drain tapping into this Tee will provide the water seal needed to prevent the back flow of air.

In any case, we now have an arrangement where the only fluid that can back flow past that leaking check valve is water. We may notice our condensate pump is short cycling and eventually come to the conclusion that we have a leaking check valve, but we won't have a condensate pump that won't pump at all. This piping change should also increase the life of the pump's shaft seal.

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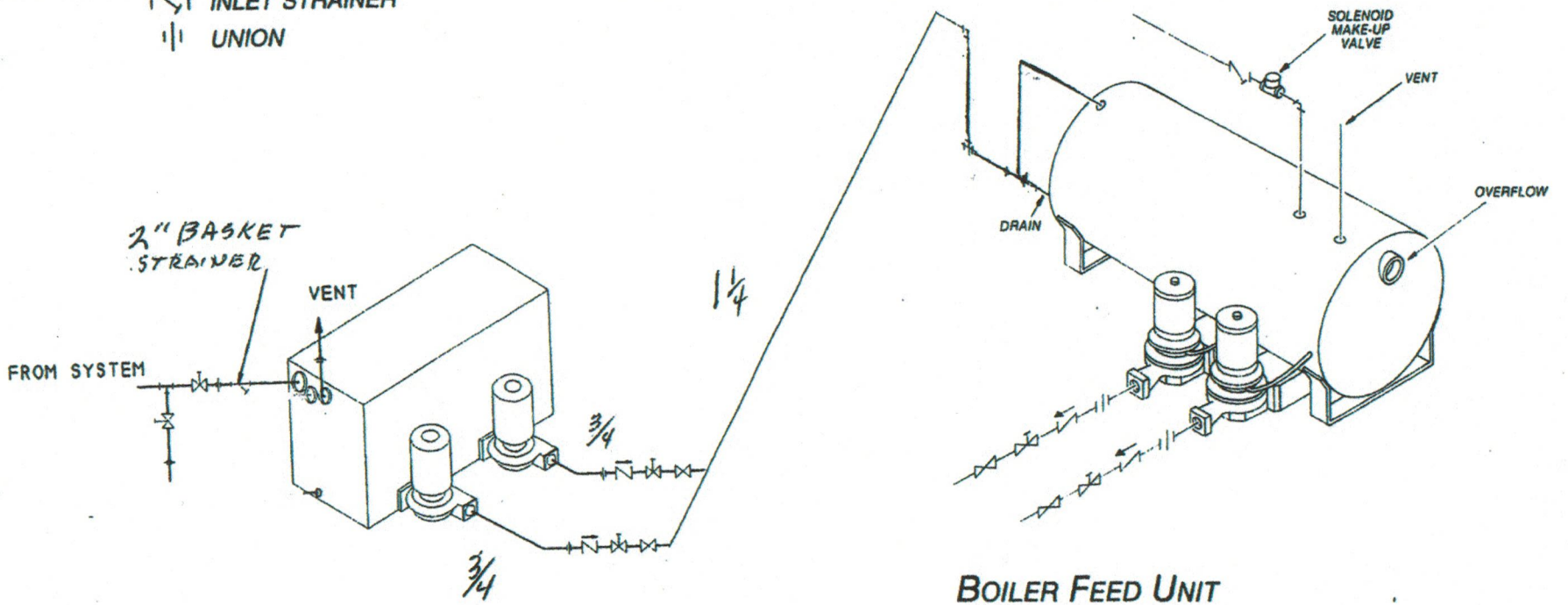
Another solution to this problem is, (if possible) to change the mounting of the condensate pump from vertical to horizontal.

When the condensate pump is horizontal, the pump's case would always be at least 1/3 full. Our experience so far is that this is enough to expel the trapped air and allow the pump to function.

WATER SEAL PIPING ARRANGEMENT TO PREVENT AIR BOUND CONDENSATE PUMPS WHEN DISCHARGING FROM VACUUM

LEGEND

- BALANCING VALVE
- GATE VALVE
- CHECK VALVE
- INLET STRAINER
- UNION



VACUUM
CONDENSATE UNIT

BOILER FEED UNIT

TYPICAL PIPING DIAGRAM Condensate Units		
Drawn by B.P.	Date 1/98	Revision .3
Piping Diagram No. 30012		