# The Pump Detective

By Doug Kriebel, PE

## Boiler feed water pump mystery:

A major pharmaceutical company has a boiler for heating, chiller use, general steam and also to run a steam turbine generator (STG).

The boiler pressure is 400 psig and fed with (3) Boiler Feed Water Pumps (BFWP), two with motors and one with a steam turbine.

The steam driven BFWP experienced two failures. Post mortem examination of the pumps didn't reveal any manufacturing defects.

Both had rubs toward the suction end, failure of the thrust bearing and indication of running dry.

We discussed the operation and maintenance history with the plant operators and mechanics. Nothing seemed out of the ordinary.

However, as we probed and found out more about the operation we discovered there were several modes of operation:

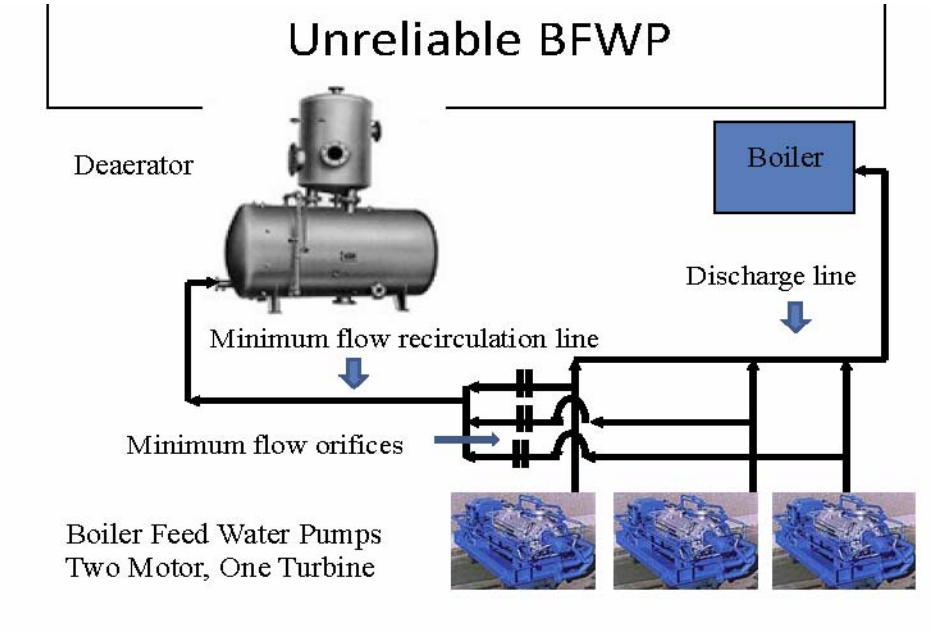
(1) One Pump running at low loads
(2) Two Pumps Running when the STG is in operation
(3) The third pump is installed spare.
(4) Operation can be with any combination of Motor driven and steam driven pumps

It was revealed that the STG occasionally trips (this is a relatively new unit and still having the I&C gremlins removed)

When this occurs, the boiler load drops suddenly and the BFWPs need to quickly reduce flow to the boiler.

If the steam driven pump is running with one of the motor driven pumps and the load is suddenly redu ced due to a STG trip, it will slow down (reducing flow and pressure) quickly, but the motor driven pum p will not. Since the motor driven pump will put out more pressure into the discharge line, it will push the turbine driven pump back on its curve to no flow.

This should not be a problem since the pumps are supplied with minimum flow recirculation lines with fixed orifices back to the deaerator (DA). These protect the pumps from running at no flow.




However, a “value added” decision turned out to be the culprit.

Investigation found that the lines were manifolded together at the pumps and only one common line ran back to the DA rather than 3 individual lines! Individual lines were recommended by both the En gineer and the pump manufacturer. Individual lines protect each pump from being “shut off” by anot her pump running at a higher pressure.

By connecting the recirculation lines at the pump, it allowed the pump running at the higher pressure to prevent the minimum recirculation flow from the lower pressure pump, thereby causing it to run with n o flow which caused the pump to seize.

This decision was a “value” added cost reduction at time of installation by the contractor. It saved the c ost of running two additional recirculation lines to the deaerator. But this savings was lost by the need t o rebuild a pump twice.

This demonstrates two important facts:

When running pumps in parallel make sure the head/capacity curves are the same, especially at low flows!

Make sure your pumps always have sufficient flow and are protected by minimum flow devices in the event they could be forced back to either low or no flow.

That’s all for today!

HOME

***Kriebel Engineered Equipment, Ltd.***
*9 Humphreys Dr. - Warminster, Pa. 18974*
*Phone: 215-364-3400 - Fax: 215-364-4401*
**www.Kriebel-Ltd.com**