



The Pump Detective

By Doug Kriebel, PE

A large manufacturing facility was having multiple pump failures. We are often called when a pump fails and it is repaired repeatedly without improvement in the time between failures. This means the original root cause analysis is incorrect. It happens a lot.

The pump in question was one of two. One pump is operating, while the other is a standby spare. Only the "A" pump was experiencing problems, the "B" pump was ok.

The pump had experienced several mechanical seal failures. The mechanical seal people were called and their report said the seal failed most likely from overheating.

These pumps were installed in 1982 and were never an issue. There was no one who understood everything about the system. So we looked it over.

These pumps were makeup water pumps to a steam deaerator(DA) which supplied boiler feed water to a boiler running the plant.

We read the DA nameplate and it was rated for 50,000 pph outlet BFW(100gpm). The makeup pumps were rated for 200 gpm each. Which made sense since someone just took the DA flow and doubled it. In checking, there was very little condensate returns, less than 25%.

By asking questions we found the boiler supplies 20,000 pph for heating steam in the winter and 20,000 pph for steam to process line. In the winter the maximum flows were 40,000 pph in summer only 20,000 pph. But part of the process side has been idle for two years due to lack of product demand. There was only a small steam requirement for about 5,000 pph currently in the summer.

The DA storage tank was designed for 1000 gal storage. When the summer load was present there was only 10 gpm demand. The volume from high water level to low water level in the storage tank was 800 gal, so once the storage tank was up to high water level, the makeup water valve would close and stay closed until the water level reached the low level point. For 800 gal at 10 gpm, this was 80 minutes.

When the water reached low level, the makeup water valve would open and water would be pumped into the DA at about 200 gpm or for 4 minutes, at which time the makeup valve would close again.

But what was protecting the pumps from running against a closed valve? This is no good since it would cause the water to heat up and wreck the seal!

Investigation found a bypass line under insulation, which no one knew existed.

It had a bypass pipe line from the pump discharge back to the suction line. There was a pressure sensing valve which opened when the pressure rose due to the makeup valve being closed, and opened when the makeup valve opened.

Further investigation revealed the "A" pressure valve had failed, not allowing sufficient flow to protect the pump. It had only happened on one pump. The "B" valve was ok. So, there were no failures on the "B" pump.

The recirculation valves were replaced on both pumps and the system has performed well ever since.

If they had known critical valves were installed, they could have been inspected at least once in the past 28 years since installation!

Moral: know your systems and maintain them properly.

