



The Pump Detective

By Doug Kriebel, P.E.

Case of the underperforming sample pump.....

We supplied a small, close coupled, centrifugal water pump to a local Electric Utility.

The service is to periodically take water from the circulating water system and run it through an analyzer and then to drain. The hydraulic conditions were 25 gpm @ 45' TDH.

The pump was shipped and installed.

The customer called to say it was not meeting performance.

When asked what was not correct, they said they felt it was not "pumping enough water"

One of our salesmen visited the site to inspect it.

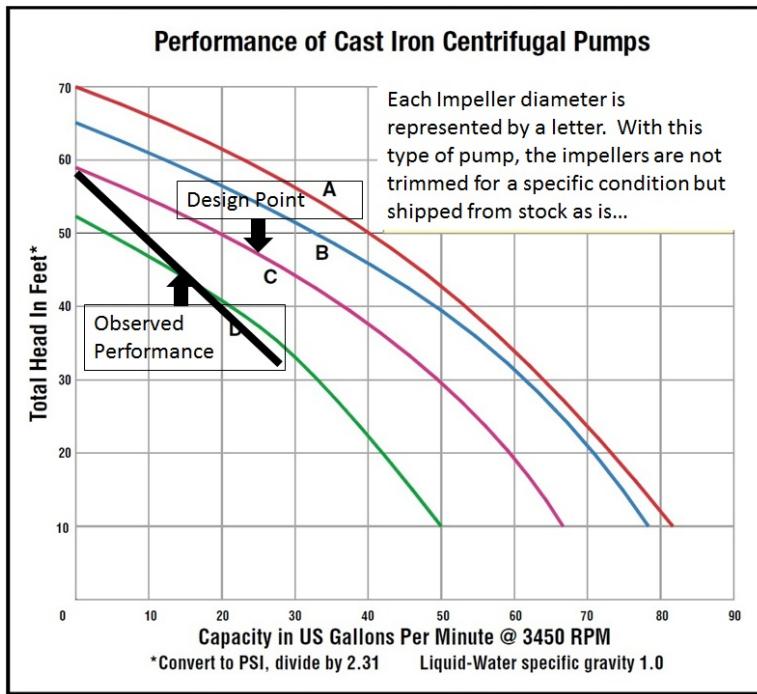
When he arrived we used a bucket/stop watch to performance test and verified it was not meeting expectations.

He reviewed all the "usual suspects": pump speed, piping, system head, voltage, correct rotation.

In doing the system head calculations, the calculated head agreed with the specified head but the pump was low on flow.

We decided to use a flow meter and suction and discharge pressure gauges to plot the performance.

A copy of the pump curve is below with the experimental performance curve shown. The pump was to be supplied with the "C" impeller which should have given 25 gpm at 46' TDH.



As you can see by the plot, the pump was not performing to spec.

The shape of the curve indicated the pump may have been running backward. A pump running backward would have nearly the same shutoff pressure, but the performance would drop off with a head of about 50% of expected. We double checked rotation and it was correct.

It also indicated there could be an obstruction in the piping. However when we disassembled and inspected, we could find no blockage.

Although it didn't appear to follow, it could have been an incorrect impeller installed.

Since we were unable to determine any possible system issues, we opened up the pump to inspect the internals and check the impeller diameter.

Surprise: the impeller diameter was correct but the casing volute had excessive flashing from the casting which was blocking the flow of water, causing a restriction in flow.

The pump was replaced under warranty and the new; replacement pump is now working as expected.

Lesson learned: small, inexpensive pumps are never factory performance tested as an order requirement. Usually a statistical sample is tested on a routine basis to confirm performance. Visual inspection of parts during assembly is usually the final check. However, it is not impossible for a material defect to be missed due to human error.