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Kriebel Engineered Equipment, Ltd.

The Pump Detective

By Doug Kriebel

The Case of the Overloaded Motor

We were contacted by a customer very upset because his “new” pump was overloading the motor. Although we had not supplied the pump, this was a friend and we visited the site to help resolve the problem.

A new raw materials handling system was just installed and being started up. The new system consists of a large (35’ high) storage tank with a new pump. The new pump moves raw material from the new bulk storage tank to a day tank inside the building and on an upper floor. The feed pump is controlled by level switches in the day tank; when the day tank level is low the low level switch starts the feed pump, when it reaches the upper limit, a high level switch stops the pump.

When they started the system up, the feed pump started but the motor immediately tripped on overload. Their electricians checked the motor and starter and could find nothing wrong. Since all the “usual” suspects were ruled out by their electrical guys we figured there was a hydraulics issue. We asked to see the documentation. There was not much. However, there was a pump curve.

The name plate of the pump read 550 gpm at 100’ TDH and the motor was 20 HP. Using the performance curve the BHP for the nameplate conditions was 17.6 and under the 20 HP. So we looked at the application. Remember that TDH = H = (Pressure in discharge vessel – Pressure in suction vessel) + (discharge elevation – suction elevation) + system friction losses all expressed in feet of the pumped liquid. In this case both suction and discharge vessels are vented to atmosphere so there is no Pressure component . Therefore the system head was the static elevation difference plus friction.

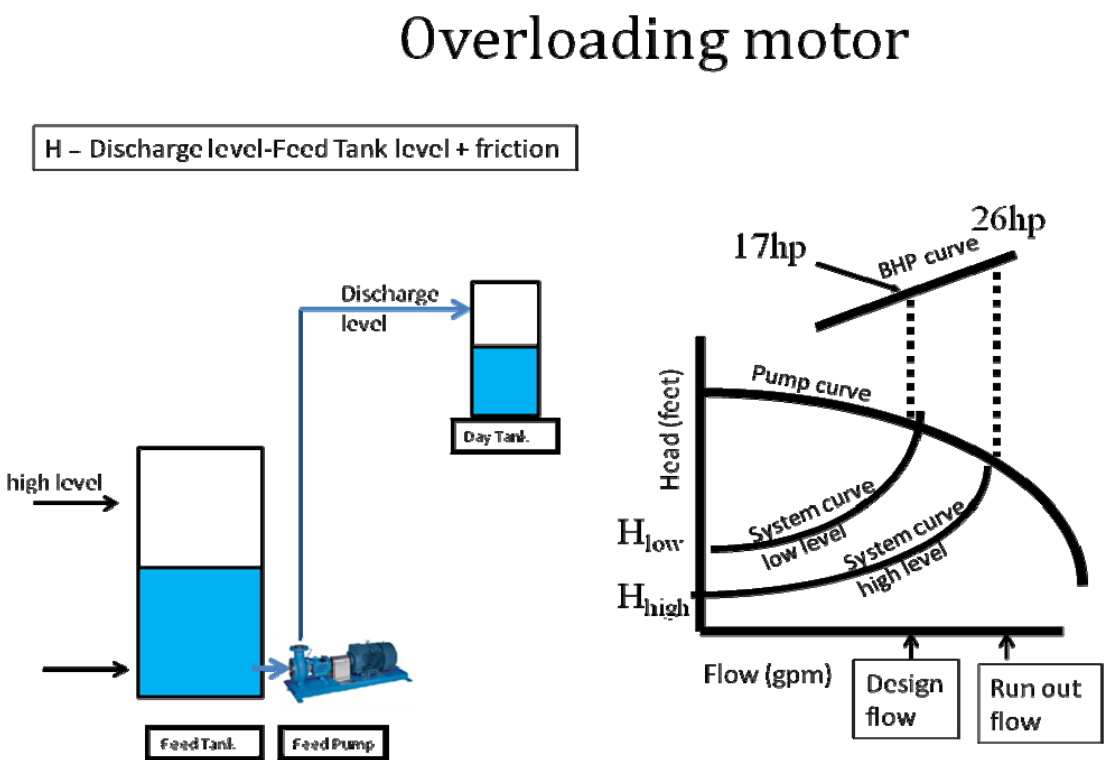
The day tank inlet was 80’ above the low level in the feed tank. Using our “Cameron” we estimated the system friction at less than 20’. Both tanks were vented. So the 100’ TDH made sense……for the “worst” case condition of pumping from the bottom of a near empty tank. However, we were starting with a FULL tank at the high level. Therefore the static head was 30’ less (50’ not 80’) and the TDH was therefore, lower than 100’.

This meant the pump could run out on the curve. All centrifugal pumps operate where the system curve and the pump curve intersect (not where the nameplate says). In this case the system head curve for the lower static head condition allowed the pump to run out to a higher flow and higher HP (26 BHP in this case) which over loaded the motor.

Since the control was start/stop there was no control valve to throttle the pump back to its design operating point. The fix is to add a control valve or change the motor to 30 HP, if the base plate and motor control will allow a larger motor.

The lessons to be learned:

- Always check all operating conditions when specifying a pump to make sure that it has sufficient motor HP to operate under all conditions.
- Sometimes it makes good sense to specify a non-overloading motor/pump which means that the supplier includes a motor large enough to supply any horsepower at any point on the pump curve for the design impeller.



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