



The Pump Detective

By Doug Kriebel, P.E.

The case of the non-priming self-primer.....

We had supplied a self-priming centrifugal pump to a major chemical company for rail car unloading of sulfuric acid.

There are three options for unloading rail cars: one is to bottom unload, using gravity or a pump. This is simple pump job, but has hazards if a leak develops in the line. It could be tough to stop.

Second is to "pad" the car with air or nitrogen to push the liquid out through the top outlets and into the storage tank. Again, this is simple, but if a leak develops it is hard to stop.

Third is to top unload using a self-priming centrifugal pump. This is more difficult since you need a good self-primer and tight suction pipe. But, it is safer since when you stop the pump, you stop any leak.

A sketch of the system is shown here.

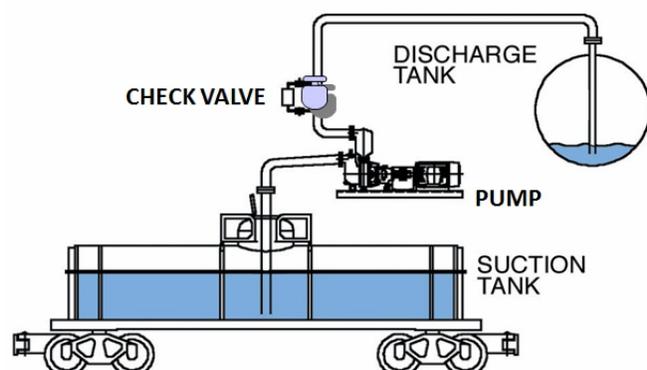
We were not invited for startup, but we did get a call the next day.

It seems the pump started up immediately, primed and pumped the acid to the storage tank. However, after they stopped the pump and waited a few hours, and went to start the pump again, it would not prime.

We visited the site and by looking at the sketch, you can see we found a check valve in the discharge line. This would be normal practice.

However, a self-priming pump has a cycle where it extracts the air in the suction piping to lift the liquid into the pump casing. In order to do this, the air must be pushed into the discharge.

Rail Car Unloading



On start up the discharge was empty and the air could be purged. However, after the pumping cycle and the pump was stopped, the head of acid on the discharge check valve prevented the air from purging out on the priming cycle.

The fix: install a small, manual by pass around the check to allow it to drain the discharge line. Also install a vacuum breaker to prevent back syphoning.

Lessons to be learned: make sure you understand your equipment when designing systems.

The transportation of materials is covered with specific specifications by the Department of Transportation. These are very detailed and cover most aspects of design and safety rules.

However, the off-loading of materials is often left to the receiving customer. He can ask the carrier, but should understand the system.