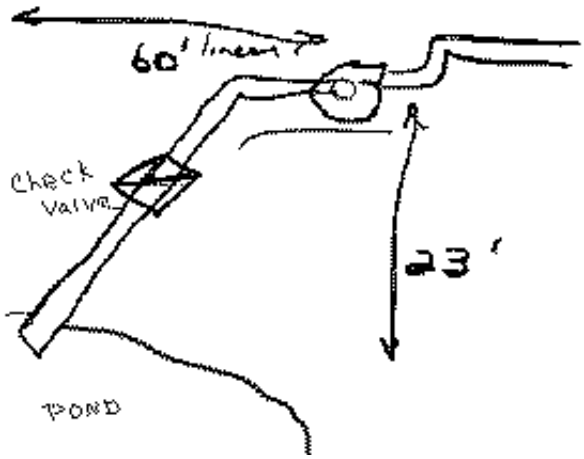
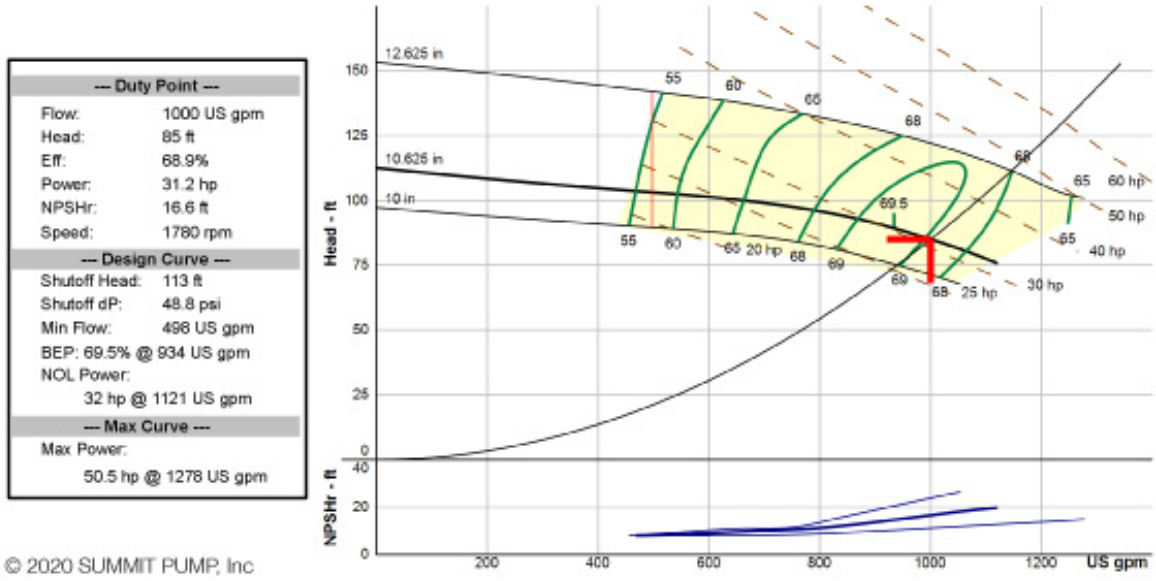
I recently received a phone call and subsequent email stating “my self-priming pump is not priming”. Both the phone call and the email were detailed with pictures and appropriate information to start the troubleshooting process.



The pump was a model 2796 MTO 6 X 6 – 13 with a 10.625” diameter impeller turning at 1750 RPM. The design point was 1000 GPM at 85 feet of head and the liquid was pond water at ambient temperature. The 6-inch suction piping was approximately 60 feet long and extended down to the pond with a check valve located only 30 feet from the pump. We did not know the depth or submergence of the suction piping into the pond. The suction “*lift*” was 23 feet. The issues with this application are at the end of the article.



In pump school we review self-priming "*do's and don'ts*" and have developed a check list of items to review if you are having a problem:

- **Even a self-priming pump must be primed initially.**
  Fill the priming chamber with liquid.
- **Is the required lift is too high?**
  No more than 25 feet: lower depending on temperature and altitude.
- **Pump distance from the liquid source.**
  25 to 30 feet maximum.
- **Is there a leak in the suction line?**
  It will pull air in; you will not see the leak.
- **Air vent.**
  The air in the suction side of the system being displaced by the liquid must have somewhere to go, otherwise the pump will air bind.
- **Pipe size and geometry.**
  The suction piping should be the same size as the pump suction because of the air volume that needs to be evacuated. The suction pipe should rise continuously to the pump and not create any high

points that will trap air.

- **Submergence.**
  The sump or source you are drawing from will likely have operating levels that are constantly changing. If you reach minimum submergence, it will be possible for air to be drawn into the pump and affect performance.

- **$NPSH_A$.**
  Calculating the $NPSH_A$ for self-primers, is a great method to identify potential problem areas. Remember, everything except atmospheric pressure is working against you (Static Lift, Vapor Pressure and Friction).

And Now for the Rest of the Story - The Issues with the Application

A wise man once told me you can not violate the rules of physics and 95% of pump problems are on the suction side of the pump.

Issue #1 - $NPSH_A$ is ≈ 6.5 feet. $NPSH_R$ at BEP is 14.6 feet. $NPSH_A$ must always be more than $NPSH_R$ with as much margin as possible.

Issue #2 - Suction pipe is ≈ 60 feet. Too much air to evacuate.

Issue #3 - Submergence Unknown. Minimum submergence required is ≈ 8 feet (without a bell mouth setup).

Issue #4 - Check / Foot Valve located 30 feet from the pond. If you are going to use a foot valve it should be located at the bottom end of the suction pipe.

As a general guideline, if your pump takes more than four minutes to prime

than you should shut the pump down and look for and correct the cause of the problem.

For More Information Reference These Pump & Systems Articles by Jim Elsey:

[10 Common Self Priming Pump Issues]

[Guidelines for Submergence & Air Entrainment]

[Calculate NPSHa for a Suction Lift Condition]

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