



Cavitation in Centrifugal Pumps

The exact nature of cavitation in pumps is very complex. Most pumps have some cavitation occurring within them at all times.

Cavitation means that cavities or bubbles are forming in the liquid that we're pumping.

Cavitation damage is mostly observed at the impeller inlet since this is where the lowest pressures occur in the pump.

Liquid entering the impeller eye turns and is split into separate streams by the leading edges of the impeller vanes, an action which locally drops the pressure below that in the inlet pipe to the pump.

If the incoming liquid is at a pressure with insufficient margin above its vapor pressure, then vapor cavities or bubbles appear along the impeller vanes just behind the inlet edges and cause the following results:

1. The cavities or bubbles will collapse(implode) when they pass into the higher regions of pressure, causing noise(see video below), vibration, and damage to many of the components.
2. We experience a loss in capacity.
3. The pump can no longer build the same head (pressure)
4. The pump's efficiency drops.

To increase the margin you must either increase the suction head, lower the fluid temperature, or decrease the NPSH(net positive suction head) required. Reducing the flow rate through a pump by throttling a discharge valve decreases the NPSHR(net positive suction head required). The NPSHR is also dependent upon pump speed. The faster the impeller of a pump rotates, the greater the NPSHR. Therefore, if the speed of a variable speed centrifugal pump is reduced, the NPSHR of the pump decreases. However, since a pump's flow rate is most often dictated by the needs of the system on which it is connected, only limited adjustments can be made. To increase the suction head you can move the pump closer to the source, increase suction line diameter, decrease the suction lift requirement, increase the discharge pressure, fully open the suction line valve, raise the level of the liquid in the tank, reduce the piping losses or install a booster pump.



Click photo for short 29 sec video with sound of cavitation in pump



Two photographs above of the same impeller.

Suction cavitation has damaged the leading edge and suction side of the vane, and also damage is observed on "corner" surfaces leading into the vane.