Cavitation in centrifugal pumps

Cavitation is a common occurrence but is the least understood of all pumping problems.

Your pump is cavitating if knocking noises and vibrations can be heard when it is operating. Other signs may be erratic power consumption and fluctuations or reductions in pump output.

If you continue to operate your pump when it is cavitating, it will be damaged. Impeller surfaces and pump bowls will pit and wear, eventually leading to mechanical destruction.

What is the cause?

When water enters a pump, its velocity increases causing a reduction in pressure within the pumping unit. If this pressure falls too low, some of the water will vaporise, forming bubbles entrained in the liquid. These bubbles collapse violently as they move to areas of higher pressure creating the noise and vibration from the pump.

The pressure required to operate a pump without causing cavitation is called net positive suction head (NPSH). Therefore the pressure head available at the pump inlet should exceed the NPSH required. This is specified by the pump manufacturer, and is a function of the pump design

How to avoid cavitation

As cavitation relates only to the suction side of the pump all prevention measures should be directed at this area.

Suction lifts that are too high will only encourage cavitation. As a general rule, centrifugal pumps located less than 4 metres above the water level should not experience cavitation.

The following guidelines should be applied to avoid the problem:

- minimise the number of valves and bends in the suction line
- use eccentric reducers, not concentric
- ensure the straight side of the eccentric reducer is installed along the top of the suction line
- suction length should be as short as possible
- suction pipe should be at least the same diameter as the pump inlet connection
- use long radius bends
- increase the size of valves and pipework
- do not allow air into the suction line
- ensure adequate submergence over the foot valve. The submergence should be at least 5.3 times the suction diameter.

Alternative solutions

One solution may be to reduce the required net positive suction head. This can done by lowering the pump speed. However, this will also result in reduced output from the pump which may not suit your system.

If pump suction conditions cannot be improved, you should seek expert assistance. It may be that your pumping system needs to be redesigned.

Assistance

Your local office of the Department of Natural Resources and Water may be able to assist you further with this topic or water supply, irrigation or drainage generally. Call them for details of other fact sheets, available services and associated charges.

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For further information phone 13 13 04

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