

Cavitation is the formation of small vapor bubbles in a liquid which then collapse almost as quickly as they form. In a pump, cavitation occurs when the liquid in a pump turns to a vapor at low pressure. It occurs because there is not enough pressure at the suction end of the pump, or insufficient Net Positive Suction Head available NPSHa. When cavitation takes place, air bubbles are created at low pressure. As the liquid passes from the suction side of the impeller to the delivery side, the bubbles implode. This creates a shockwave that hits the impeller and creates pump vibration and mechanical damage, possibly leading to complete failure of the impeller at some stage.

Cavitation causes pump performance deterioration, mechanical damage, noise and vibration which can ultimately lead to pump failure. Vibration is a common symptom of cavitation, and many times, the first sign of an issue. Vibration causes problems for many pump components, including the shaft, bearings and seals.

How to avoid cavitation.

Reading a pump curve, system design, details and understanding NPSH are required to understanding how to avoid cavitation. It is critical to ensure that the NPSHa is greater than the NPSHr in the system. The NPSHa at the pump inlet is what remains after elevation difference to the source, friction loss, velocity head loss and inlet and outlet losses have been considered within the suction pipework of the pumping system.

NPSHr is the absolute pressure that must be present in a liquid for a pump to avoid cavitation while pumping the liquid. NPSHr varies from one impeller and casing design to the next. NPSHr is also influenced by the pump's materials of construction, wear within the pump, and the operating speed of the pump.

The golden rule is to ensure that there is always enough margin between NPSHr and NPSHa to avoid cavitation. The value of the margin is often specified in-house by design consultants, but pump manufacturers will always offer advice. Typically, a margin of approximately 5 feet will be enough.

See the accompanying video: [NPSH Calculator](#)