NPSH and cavitation

$NPSH_{re} < NPSH_{av}$

$NPSH_{re} < p + h - h_{suction} - p_h$

$NPSH_{re} < p_{suction} - p_h$

The $NPSH_{av}$ value of a system refers to the actual difference between inlet pressure (in the suction flange) and vapour pressure of the liquid being pumped. The $NPSH_{re}$ value required of the pump must be smaller than the $NPSH_{av}$ value in order to prevent cavitation from occurring. A safety margin of 0.5 m must be added to the measurement value.

$NPSH_{av}$ = difference between available inlet pressure (in suction flange) and vapour pressure of liquid being pumped
$NPSH_{re}$ = NPSH value required by the pump
p = Absolute air pressure
p_h = Absolute liquid vapour pressure at the operating temperature
h = Liquid geodetic suction head
$h_{suction}$ = Pressure losses in suction pipes
$p_{suction}$ = Absolute suction pressure

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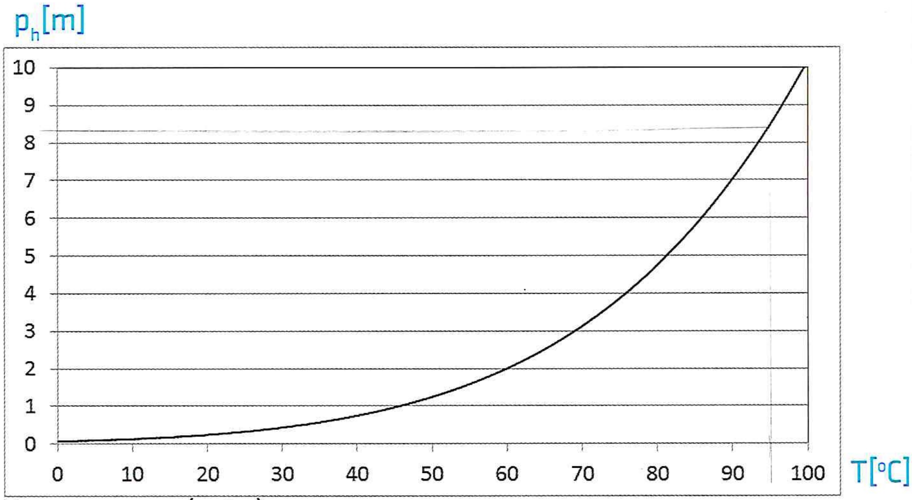

Vapour pressure (water)

At normal air pressure levels (10 m water column, 1,013 mbar = 760 mm Hg), clean water boils at 100°C. It can be seen from the curve that water boils at 60°C when the absolute pressure is 2 m wc (i.e. 8 m wc below atmospheric pressure). The boiling point of water at less than 40°C can be achieved at a very low pressure. Vice versa, at the top of Mount Everest, where air pressure is about 0.6 bar (6 m), water boils at +85°C.

Example:

Open tank (p = air pressure = 10 m) where the water temperature is + 90°C (ph = 7 m), suction pipe losses 1 m and liquid suction head flange +2 m. The pump duty point 20 l/s, 7.8 m.

Is the selected pump suitable for the use in question? An example of calculation:

Pump type: AL_-1102/4/Ø188 2,2 kW

$NPSH_{re} < p + h - h_{suction} - p_h$

$NPSH_{re} < 10\ m + 2\ m - 1\ m - 7\ m$

$NPSH_{re} < 4\ m$

When observing the safety margin 0.5 m, the $NPSH_{re}$ value of the pump must be smaller than 3.5 m in order to prevent the pump from cavitating. $NPSH_{re}$ of pump AL_-1102/4/Ø188 = 2.7 m, whereby it will not cavitate.