R.L. DEPPMANN
Serving the industry since 1927

20929 Bridge Street, Southfield, MI 48033
4121 Brockton Drive SE, Grand Rapids, MI 49512
6200 Baron Drive, Bridgeport, MI 48722
6910 Treeline Drive, Suite A, Brecksville, OH 44141

Phone: (800) 589-6120 - Fax: (248) 354-3710
www.deppmann.com

April 23rd 2012 ~ Monday Morning Minutes:

Cooling Tower Pumps and Piping – Part 3

Where cavitation begins.

By Norman Hall

Last week the R. L. Deppmann Monday Morning Minute defined $NPSH_R$, and ended with the *Hydraulic Institute (HI)* definition as the absolute pressure that will cause the total head of the pump to be reduced by 3%, due to flow blockage from cavitation". Of importance is the fact that it does not say that $NPSH_R$ is where cavitation begins.

The place where cavitation begins is called incipient cavitation and can be from 2 to 20% greater than the $NPSH_R$ reported on the pump curve. In addition, $NPSH_R$ is a tested value, the test is with clear un-aerated water; not dirty, highly aerated, tower water and pumps have manufacturing tolerances. The $NPSH_R$ can also vary with the system fluid conditions.

So to reduce the chance of damage to the pump from cavitation, we need to use a larger number than the pump net positive suction head required. A few years ago *HI* defined some margins to apply to the published pump $NPSH_R$ with different systems and pump types. The margin depended on the application and the SUCTION *ENERGY of the pumps.* For cooling tower applications, the recommendation was to use a multiplier to $NPSH_R$ of 1.3 for low energy pumps, 1.5 for high energy pumps, and 2.0 for very high energy pumps.

SO HOW DO WE DETERMINE WHICH MARGIN TO USE?

The suction energy of a pump depends on a number of variables but it can be approximated by the formula:

$\text{Suction Energy} = D \times n \times S \times 10^{(-6)}$ Where S = Suction Specific Speed or $(RPM \times Q^{(.5)} / NPSH_R^{(.75)})$	D = Impeller Diameter n = Speed Q = Flow at Best Efficiency Point (BEP) for the maximum impeller NPSH is at the flow at BEP for maximum impeller also. Note: that for double suction pumps, you use ½ of the flow at BEP

Now you use the result to choose the margin using this chart.

Suction Energy	Pump Type	Margin for Cooling Towers
Less than 150-220	Low Energy	1.3
Between 150-220 and 250-380	High Energy	1.5
Over 250-380	Very High Energy	2.0

Next week we use an example and complete this discussion of Margin applied to NPSHR.

Click here to request a copy of the Xylem Bell and Gossett Cooling Tower Piping technical bulletin TEH-1075