Module 5:

Centrifugal Pump Performance Characteristics

Pump Engineer is pleased to be able to bring you sample data from the HI's e-learning program. Here is module 5 in a selection of slides from each of the six course modules.

HI's e-Learning Program

Centrifugal Pumps: Fundamentals, Design and Applications

Course I: Pump basics: applications, types & construction

- Module 1: Typical applications of centrifugal pumps
- Module 2: Types of pumps
- Module 3: Centrifugal pump construction

Course II: Pump fundamentals: fluid mechanics, performance and selection

- Module 4: Fundamentals of fluid mechanics
- Module 5: Centrifugal/vertical pump performance characteristics
- Module 6: Pump selection and application

Further details

For further details, please visit www.pumplearning.org to try a free demonstration course of "How To Learn" on-line.

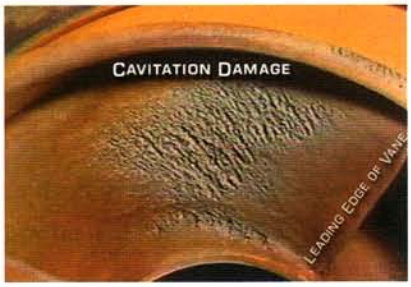
Total head, input power, efficiency, and NPSHR are all measurable characteristics of centrifugal pumps and will be described in this module.

These characteristics also vary as a function of rate of flow, resulting in characteristic curves. The effect of pump design and system design on these characteristics will also be studied.

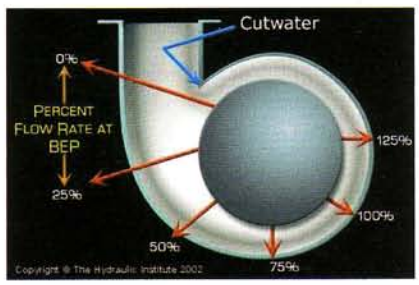
Key Pump Performance Characteristics: Total Head vs Rate of Flow

In order to properly apply different pump types to pumping systems, we must understand the particular characteristics of each type. Centrifugal pumps usually operate at a constant motor speed, and the total head developed when pumping liquid varies with the pump rate of flow. Typically, the total head is the highest at zero rate of flow, and decreases gradually as rate of flow increases.

It is also important that a centrifugal pump be operated as close as practical to its best efficiency point (B E P). Most pumps can operate safely in a preferred range from 70% to 120% of the rate of flow at BEP. A similar allowable operating region can be established by the pump manufacturer.



At rates of flow greater than allowed, the NPSH required increases substantially and cavitation damage of the impeller and high vibration levels can become problems.



At rates of flow below the allowable operating region, uneven pressure levels occur around the periphery of the impeller resulting in high radial forces on the impeller and decreased bearing life and increased shaft deflection. The arrows show the relative magnitude and direction of these radial forces at different rates of flow. ●