**ENE 327 – Pumps and Compressors**

# WEEK 10: THE SPECIFIC SPEED OR TYPE NUMBER

## ***THE SPECIFIC SPEED OR TYPE NUMBER [1]***

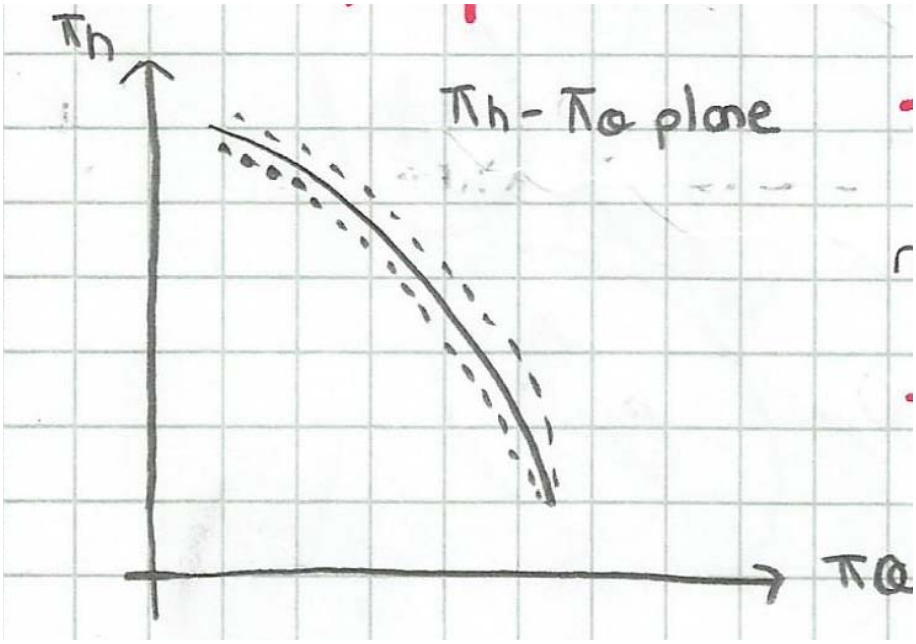


Figure 1. Performance characteristics

The scatters in Figure 1 is due to the experimental errors and the Reynolds number effect [1]

Different sized geometrically similar turbomachines running at different N.

The families of geometrically similar turbomachines can be classified by using the non-dimensional type number or specific speed.

Every turbomachine is designed for a  specific task to operate at the design point.

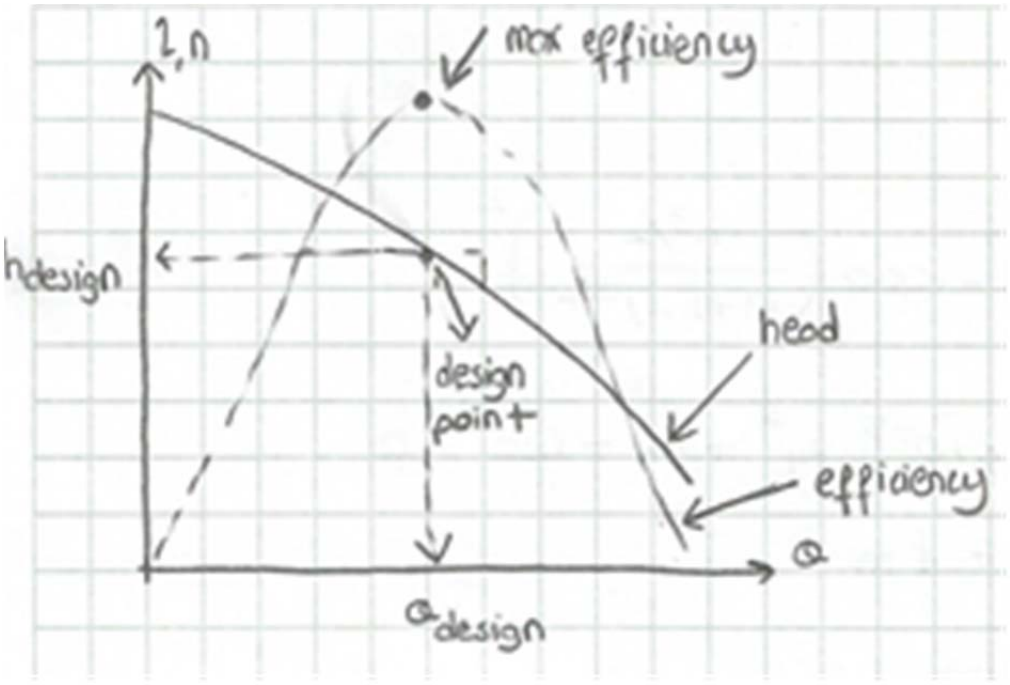


Figure 2. Design point of a pump

Turbomachines can be compared using the values of $\Pi_Q$, $\Pi_h$ and $\Pi_P$ of the design point.

For pump $\Pi_Q$ and $\Pi_h$.

If the impeller diameter is eliminated as the ratio of $\Pi_Q$to $\Pi_h$is obtained, the comparison will be independent of machine size, such a ratio, known as the “type number” or the “specific speed”, $N_s$is obtained by dividing $\Pi_Q$raised to the power ½ to $\Pi_h$to raised to the power ¾.

Hence,

$$N_s = \frac{\Pi_Q^{1/2}}{\Pi_h^{3/4}} = \frac{\left(\frac{Q}{wd^3}\right)^{1/2}}{\left(\frac{gh}{w^2d^2}\right)^{3/4}} = \frac{wQ^{1/2}}{gh^{3/4}}$$

**REFERENCES**

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3. FOX, R. W. and MCDONALD, A. T., *Introduction to Fluid Mechanics,* 6th ed., John Wiley and Sons, Inc., New York, 2005.

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