specific speed

The specific speed of a centrifugal pump is defined as the speed of a geometrically circular pump which would deliver one cubic meter of liquid per second against a head of one meter. It is denoted by 'Ns'.

Characteristics curves

The characteristics curves (pump diagram) are used to describe the performance of centrifugal pumps (Fig. 2.16). The most important is the head versus capacity curve which shows the connection between the water flow (discharge) and the head. Depending on its construction the same centrifugal pump can either be used to deliver a large water flow with a low head or a smaller water flow with a larger head. Adding a valve on the pump outlet and gradually closing it will decrease the water flow but increase the head, because the cross-sectional area through which the water is forced is reduced. As the valve is closed more pressure is needed to discharge the water; again this increases the pump head. A pump characteristics curve can be constructed by measuring the water flow that the pump delivers with different heads: if pump behaviour is ideal, the plot should be a straight line. This seldom happens because of the reduction in pump efficiency at the limits of performance, so the plot is curved. If large amounts of water are being pumped, the friction loss through the pump becomes large. In addition to the frictional losses there is so called impact loss resulting from the impact of the water molecules hitting the impeller and the inlet and outlet parts of the pump chamber. The highest losses occur with large heads and large flows at the ends of the pump characteristics curve, close to the x- and y-axes. This is to be expected, because a pump has the highest efficiency at its construction point in the middle of the characteristics curve. Normally this point is distinctly marked.

A pump's characteristics will of course depend on design and size of the chosen impeller, each of which will have individual characteristics. A centrifugal pump can normally be delivered with different impellers, and it is quite easy to change them. In many cases several pump characteristics are given in the same diagram, one for each diameter of the impeller.

The pump diagram may also show a plot of pump efficiency versus discharge. A pump that works as closely as possible to the maximum efficiency (con-struction point) should be chosen; operation away from the construction point will result in decreased efficiency. Pump efficiency may also be given in the so-called shell or muscle diagrams in which curves and/or circles represent percentage efficiency.