BHP varies as the cube or: 1.14 X 1.14 X 1.14 X 5.2 = 7.72 BHP

Whether it is a speed change or change in impeller diameter, the Laws of Affinity are not strictly accurate because of nonlinearities in flow and due to hydraulic efficiency changes that result from the modification. The Laws of Affinity give reasonably close results when the changes are not more than 50% of the original speed or 15% of the original diameter.

SECTION - 4 FLOW CONTROL IN CENTRIFUGAL PUMPS

There are three primary methods for controlling flow in HVAC systems: throttle valves, pump speed control, and multiple pump arrangements. The appropriate flow control method or the combination depends on the system size and layout, fluid properties, the shape of the pump power curve, the system load, and the system's sensitivity to flow rate changes.

Method 1: Valve Control

Using valves to control the flow is the most common and cheapest way. A throttle valve chokes fluid flow so that less fluid can move through the valve, creating a pressure drop across it. Increasing the upstream backpressure reduces pump flow; but makes the pumping system less efficient.

Commonly used valves are butterfly valve, gate valve and ball valve etc. However these are not recommended for flow control. We recommended the globe type or needle type valve design for flow control.

Effect of valves control is to modify system characteristic and induce the artificial loss.

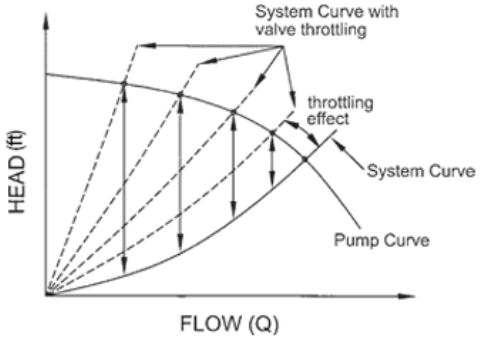

Figure - a

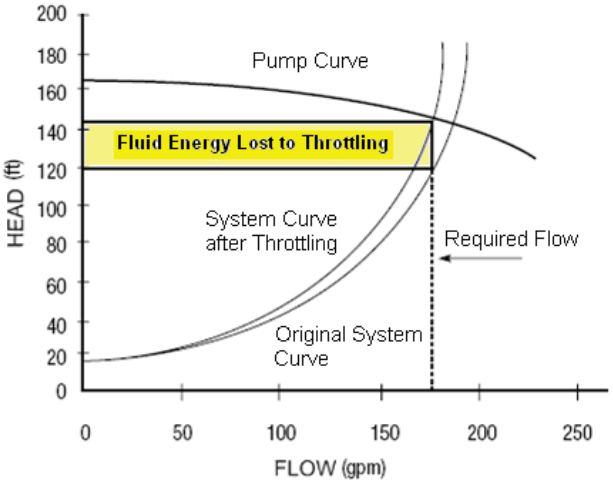

Figure - b

Figure – a shows the head loss during throttling and,

Figure – b shows fluid power lost across a throttling valve.

Method 2: Pump Speed Adjustments

Conventional chilled water plants distribute water at constant flow rate, regardless of the actual cooling demand. Since most air-conditioning systems only reach peak load a few hours a year, energy is wasted by continually running the pumps at constant flow (speed). An efficient distribution system use variable flow that tracks the variable thermal load.

Pumps that experience highly variable demand conditions are often good candidates for adjustable speed drives (ASDs). The most popular type of ASD is the variable frequency drive (VFD). VFDs use electronic controls to regulate motor speed, which, in turn, adjusts the pump's output. The principal advantage of VFDs is better matching between the fluid energy that the system requires and the energy that the pump delivers to the system. As system demand changes, the VFD adjusts the pump speed to meet this demand, reducing the energy lost to throttling or bypassing excess flow. The resulting energy and maintenance cost savings often justify the investment in the VFD.