

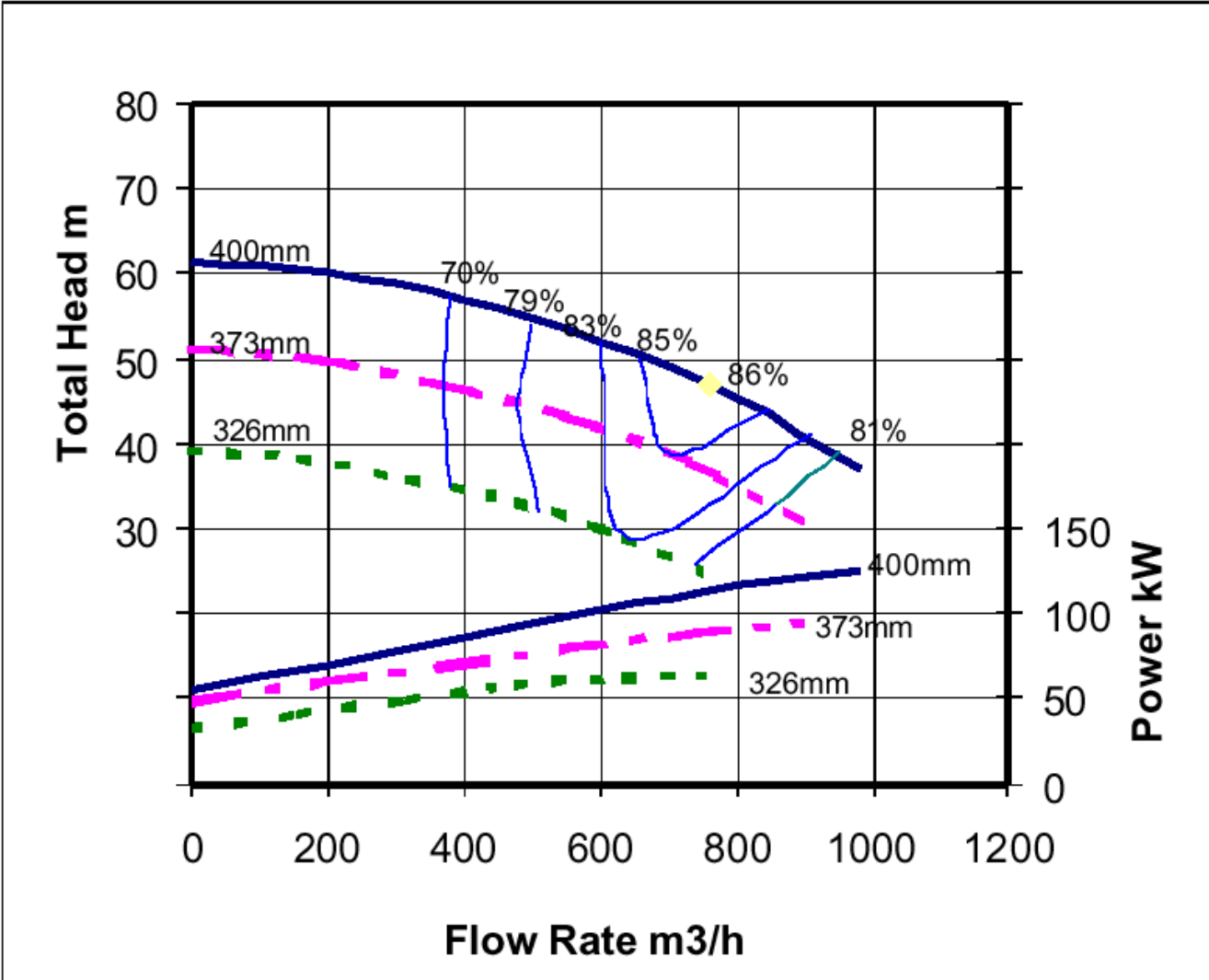
REDUCING IMPELLER DIAMETER

- **However speed change can be used over a wider range without seriously reducing efficiency**
- **For example reducing the speed by 50% typically results in a reduction of efficiency by 1 or 2 percentage points.**

REDUCING IMPELLER DIAMETER

- **It should be noted that if the change in diameter is more than about 5%, the accuracy of the squared and cubic relationships can fall off and for precise calculations, the pump manufacturer's performance curves should be referred to**

IMPELLER DIAMETER REDUCTION ON CENTRIFUGAL PUMP PERFORMANCE

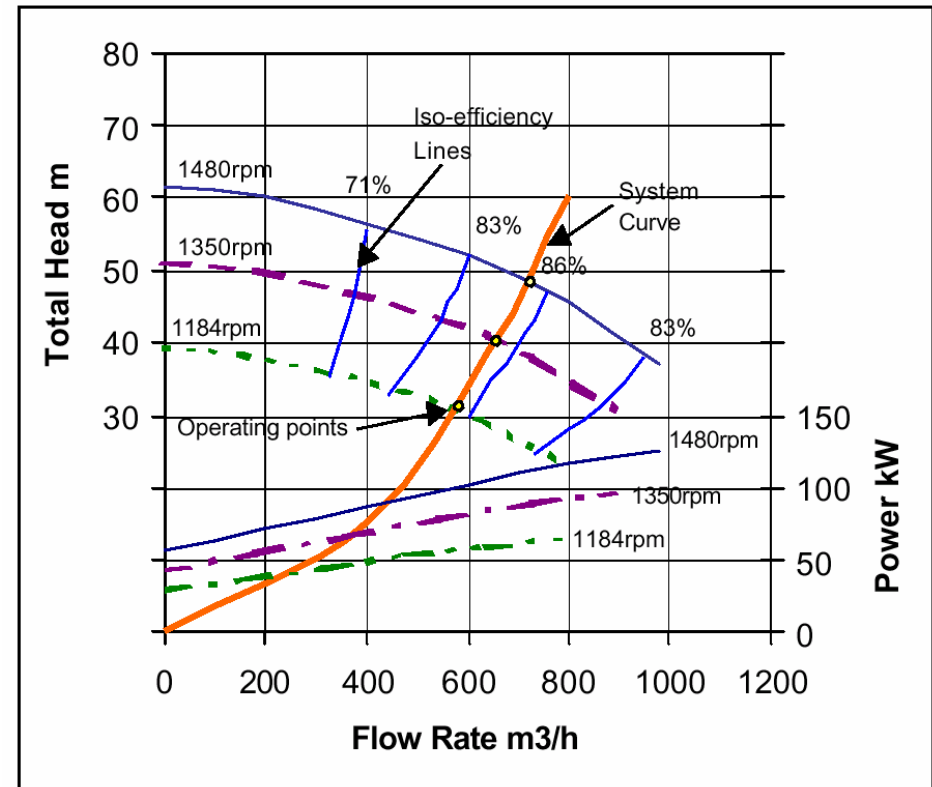


PUMP SUCTION PERFORMANCE (NPSH)

- Net Positive Suction Head Available – (NPSHA)
- NPSH Required – (NPSHR)
- Cavitation
- NPSHR increases as the flow through the pump increases
- as flow increases in the suction pipework, friction losses also increase, giving a lower NPSHA at the pump suction, both of which give a greater chance that cavitation will occur

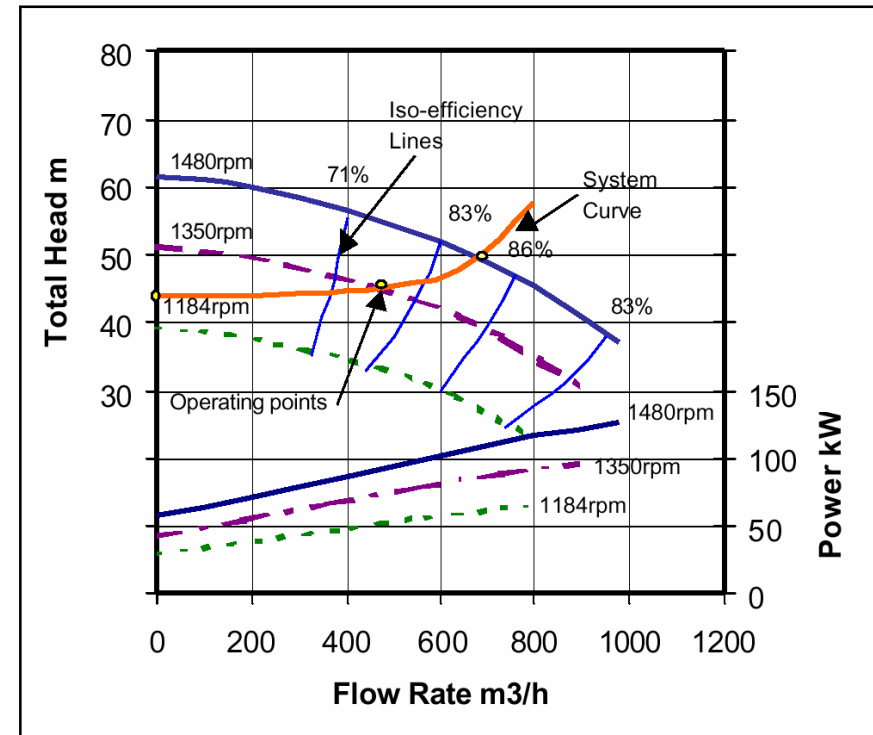
PUMP CONTROL BY VARYING SPEED: PURE FRICTION HEAD

- Reducing speed in the friction loss system moves the intersection point on the system curve along a line of constant efficiency
- The affinity laws are obeyed

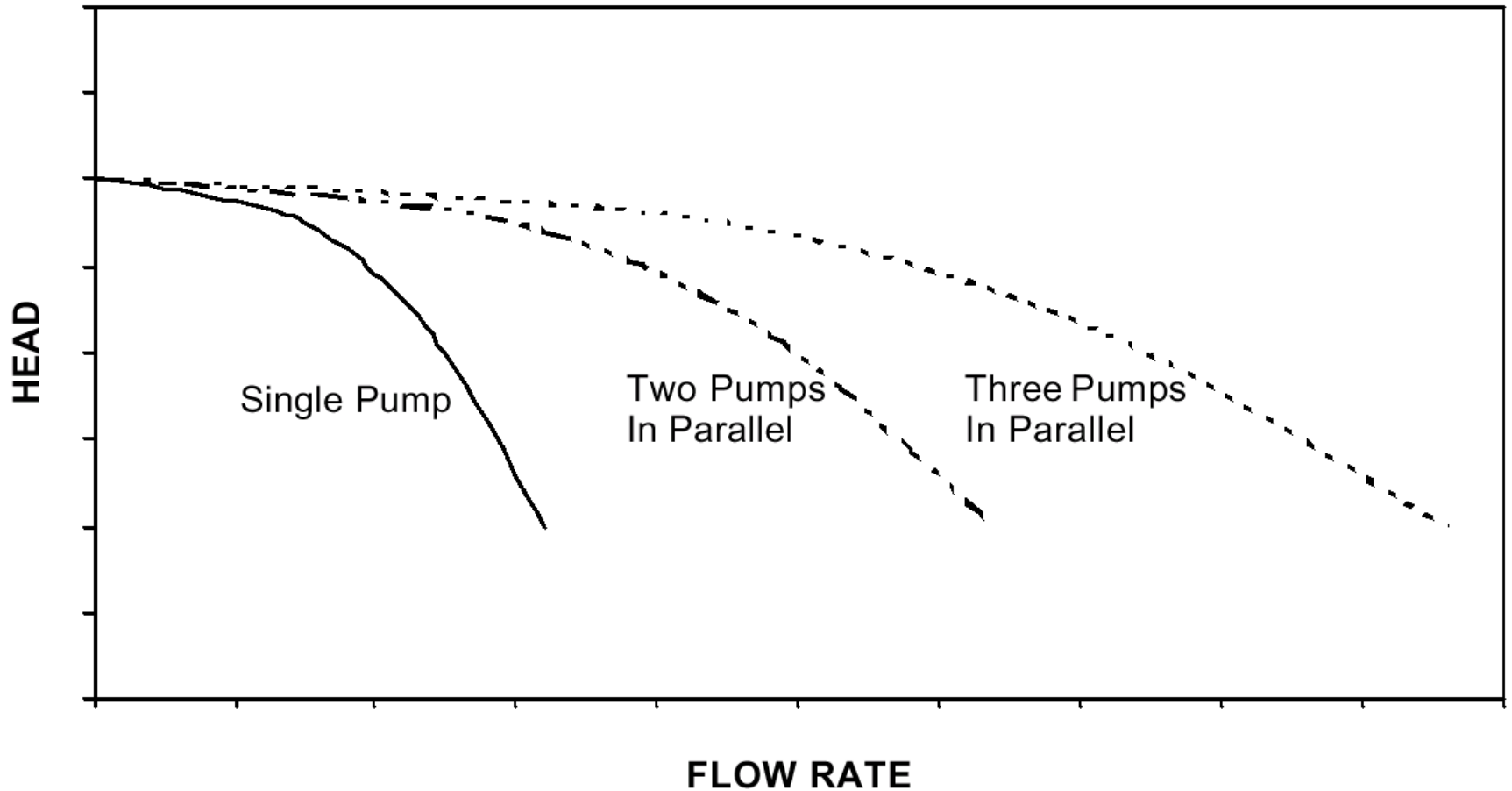


PUMP CONTROL BY VARYING SPEED: STATIC + FRICTION HEAD

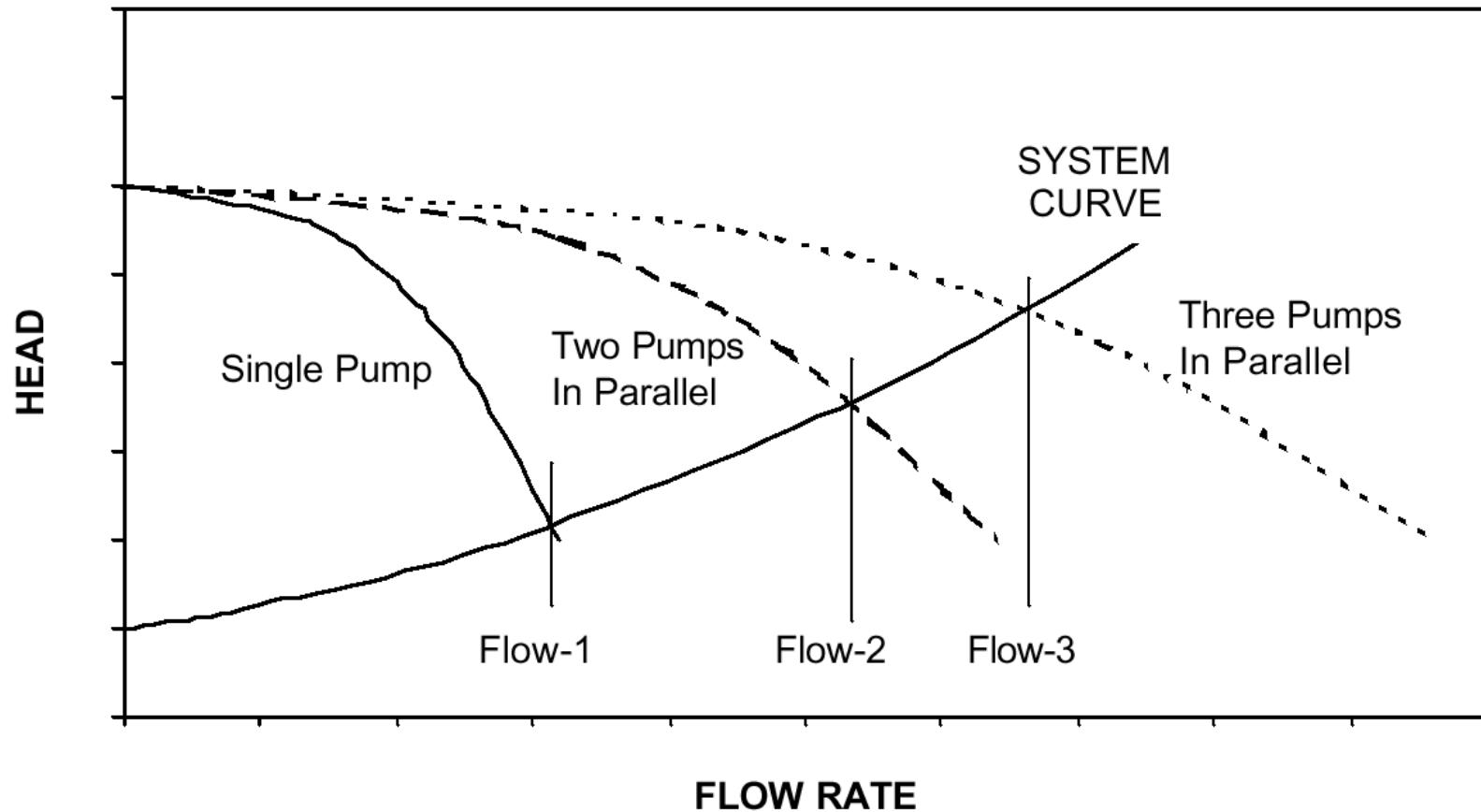
- Operating point for the pump moves relative to the lines of constant pump efficiency when the speed is changed
- The reduction in flow is no longer proportional to speed
- A small turn down in speed could give a big reduction in flow rate and pump efficiency
- At the lowest speed illustrated, (1184 rpm), the pump does not generate sufficient head to pump any liquid into the system



PUMPS IN PARALLEL SWITCHED TO MEET DEMAND



PUMPS IN PARALLEL WITH SYSTEM CURVE



PUMPING SYSTEMS

- **Ensure adequate NPSH at site of installation.**

PUMPING SYSTEMS

- **Ensure availability of basic instruments at pumps like pressure gauges, flow meters.**