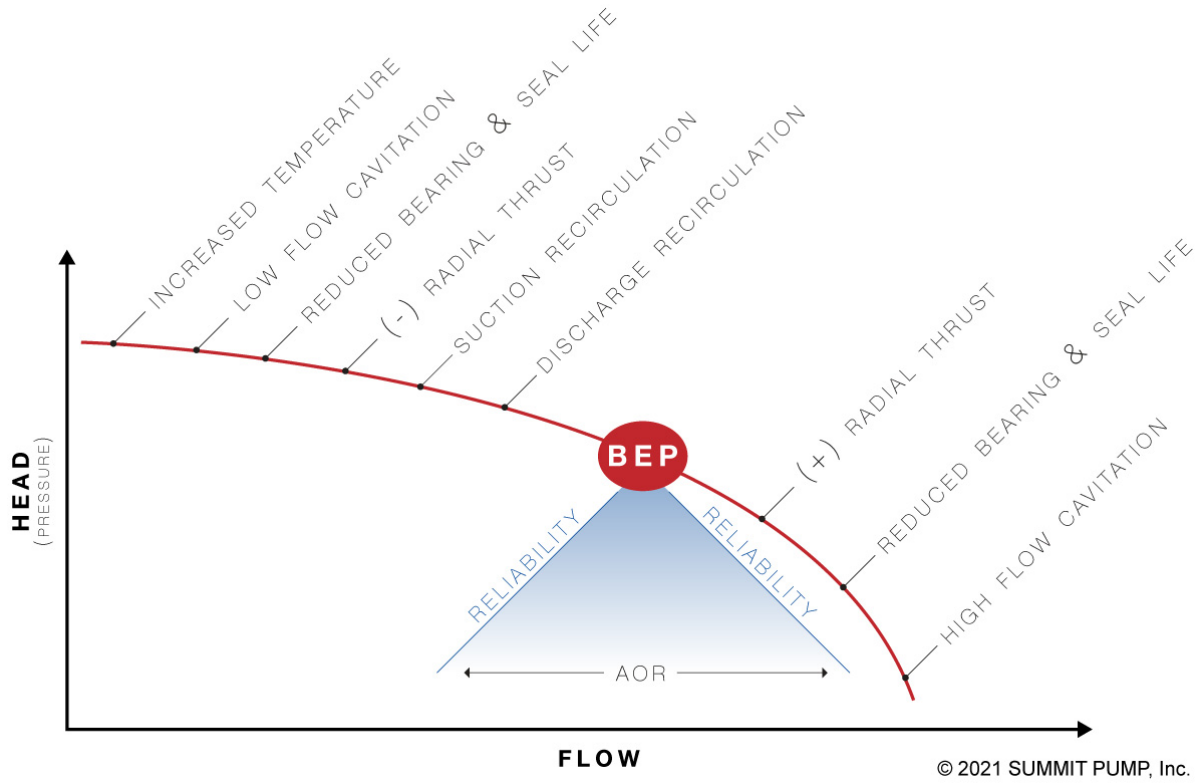
If time and money were no object, the pump OEM would be very happy to design a pump specifically for the customer's unique operating point; it happens, but not very often.

In essence, all single stage centrifugal pumps are designed for one operating point on the curve. This point is commonly referred to as the **Best Efficiency Point (BEP)**. All other operating points are a degree of compromise with efficiency, cavitation, radial thrust, and recirculation issues. Ignoring these stressors will shorten the life of the bearings and mechanical seals, thereby making the pump less reliable and more costly to operate.



Of course, most end users don't have just one operating point and normally they want to operate in a wide area that is commonly referred to as a safe or **allowable operating region (AOR)**. Therefore, most pump applications will require operation away from the area of BEP.

Reliability Management Methods

Assuming the pump selection was the best compromise (choice) for the application there are methods to mitigate the potential for the consequential negative effects. All the methods come standard with the added cost of reduced efficiency, but that cost can often be an acceptable tradeoff for reliability and reduced maintenance costs.

Some common mitigation methods are as follows:

- Variable Speed Drive or Variable Frequency Drive (VSD/ VFD)
- Bypass loop (manual or auto-process controlled) if operating too far left on the curve
- Throttling control (manual or auto) if running to the right of BEP
- Operating a different number of pumps in either series or parallel
- Using different size pumps in the same system to accommodate system

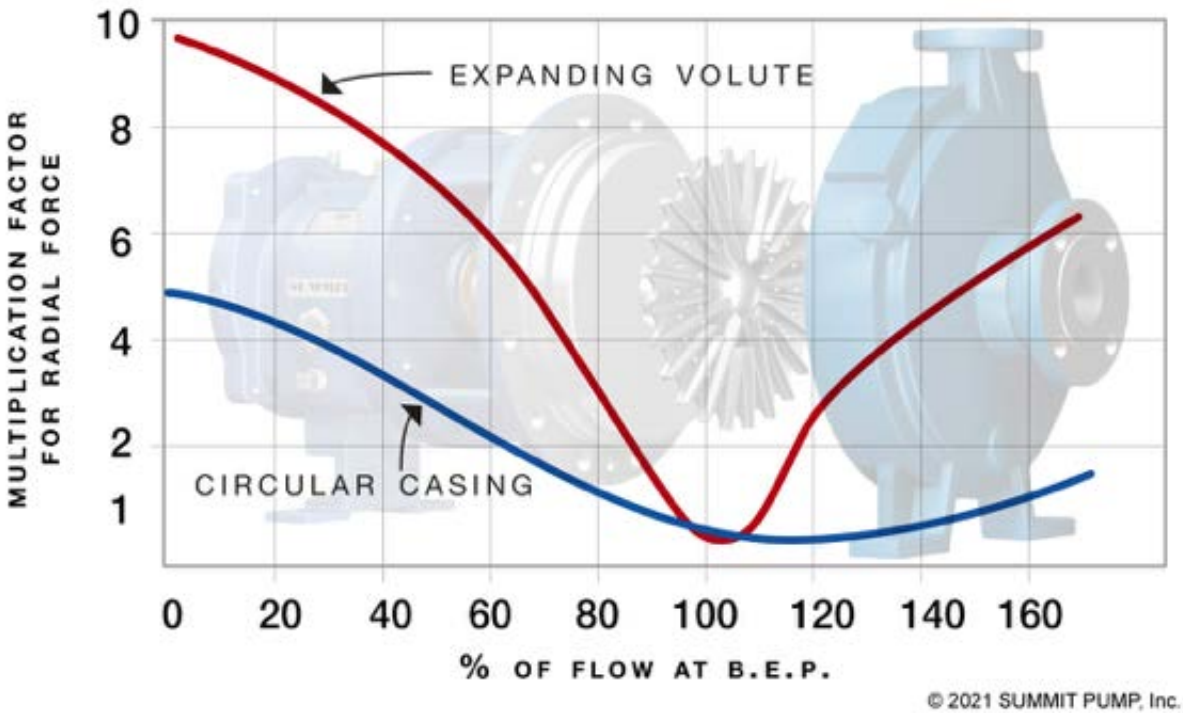
outliers

There are also common methods to manage the symptoms versus the problem:

- Balance the impeller to a stricter standard
- Ensure a proper alignment is conducted
- Ensure the shaft runout and the radial/axial allowable movements are within OEM tolerance
- Establish and maintain operating clearances to specification
- Reduce or eliminate pipe stress at the pump flanges
- If possible, choose a pump with dual volute or a diffusor style casing
- Upgrade the pump shaft to a more robust design to reduce deflection (Reduces the L over D ratio)

Another Possibility - Low Flow

In cases where the pump is operating on the left side of the curve it may be feasible to replace the pump with a low flow version. Standard single stage centrifugal pumps are typically of an ***expanding volute*** design. Expanding volute designs have the benefit of being more efficient, but the downside is increased radial thrust if you operate the pump away from the design point.



Low flow pumps utilize a ***circular casing*** where the casing is concentric to the impeller. By utilizing this design the radial thrust component can be appreciably reduced by amounts, normally in the range of 65 to 85%. In many cases using a low flow pump will reduce the need and cost for the more robust shaft (lower L over D ratio) and bearing system.

These are just some of the more common methods to reduce stress on the pump. If you are faced with an application that seems to have a "*no right fit pump solution"* Summit Pump can offer assistance.

Jim Elsey

& The Summit Pump Team

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