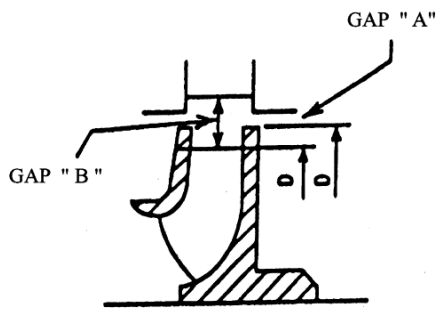
Subject : Increasing the centrifugal pump performance by modifying the impeller.

The following information applies to closed, semi-open and open impellers:



- We will be using the term Gap "A" to describe the clearance between the impeller shrouds to the volute or casing and
- Gap "B" describes the clearance between the impeller vanes and the casing or volute.
- "D" describes the diameters of the vanes and shrouds

What happens when you reduce the impeller vane diameter? Several things :

- The affinity laws predict the result of this action, but they are not as accurate as we would like them to be, especially if we are making more than a 10% reduction in impeller diameter. There are several reasons why this is true :
  - The affinity laws assume the impeller shrouds are parallel. This is true only in low specific speed pumps.
  - There is increased turbulence at the vane tips as the impeller is trimmed because the shroud to casing clearance (Gap "A") is increasing. This is sometimes referred to as "slip" .
  - The liquid exit angle is changed as the impeller is cut back, so the head/capacity curve becomes steeper.
- The greater the impeller reduction and the higher the specific speed of the impeller, the more the pump efficiency will decrease with impeller trimming.
- Excessive shroud to casing clearance (Gap "A") and the resultant recirculation to the low pressure side of the pump will produce "eddy flows" around the impeller causing low frequency axial vibrations.
- For many years pump people have been machining the vane tips to reduce the vane passing frequency vibrations (Gap "B") while carefully maintaining Gap "A". The pulsating forces acting on the impeller can be reduced by 80% to 85% by increasing gap "B" from 1% to 6%.
- For impeller diameters up to 14 inches (355 mm) gap "B" should be at least 4% of the impeller diameter to prevent "Vane passing syndrome cavitation" problems. Above 14" (355 mm) Gap "B" should be at least 6% of the impeller diameter to prevent this type of cavitation.