PUG

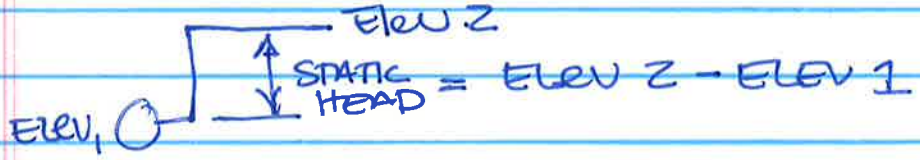
6/11/19

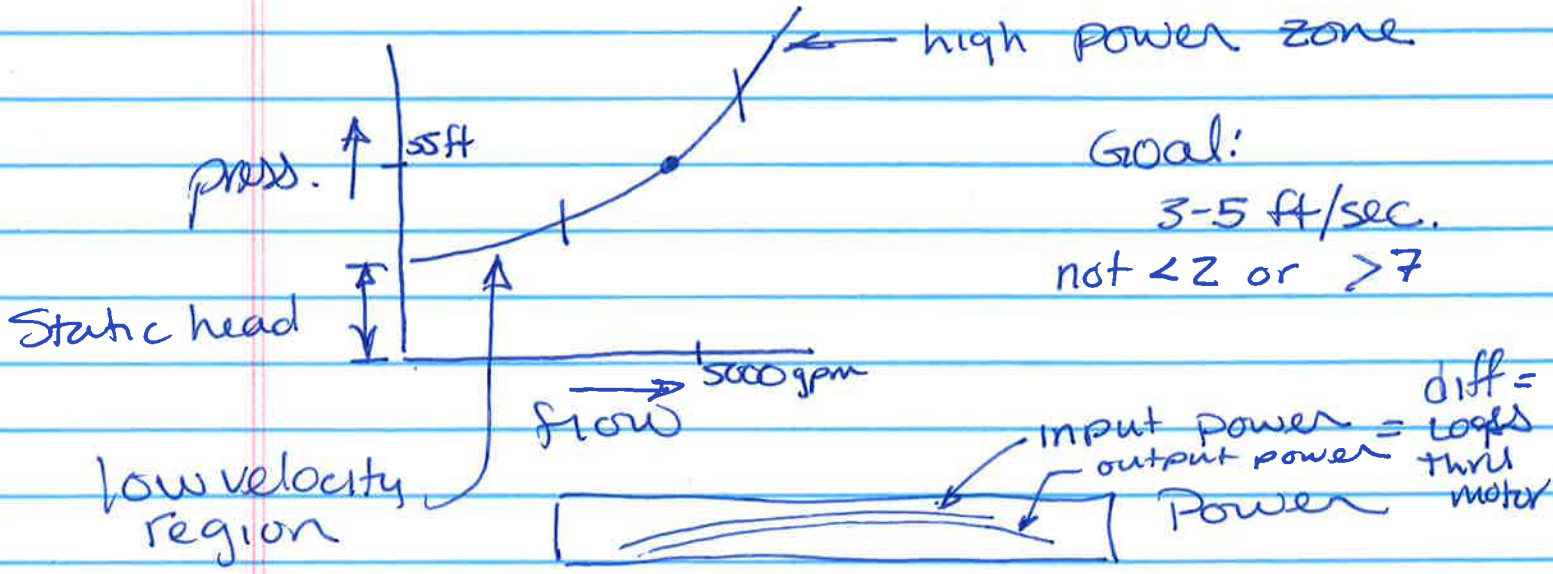
Duty Point Centrifugal Pumping Basic

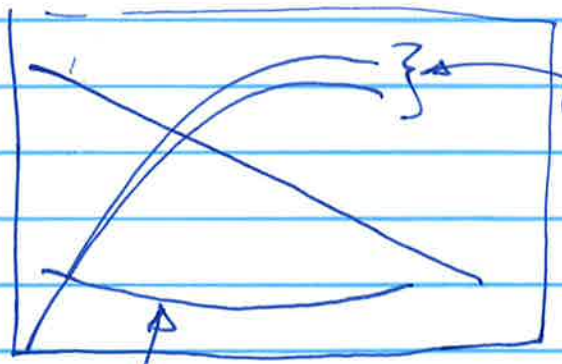
Flow Rate (gpm) & Pressure (ft)

500 gpm @ 55 ft

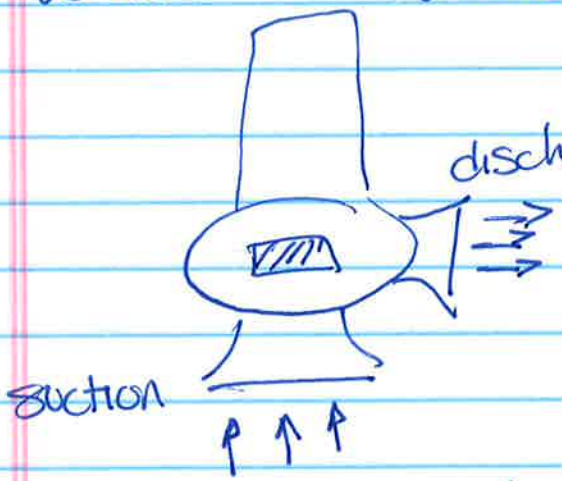
TDH = Static + Dynamic Head







Wire to water efficiency



@ 90% efficient pump
@ 90% efficient motor

wire to water efficiency
= .90 x .90 = 81% efficient

Cavitation - where water boils

* increase velocity ⇒ lowers pressure
  if fluid moves through pump fast enough the pressure drops to point where no heat reqd for boiling
* Need min pressure @ impeller to keep water from vaporizing

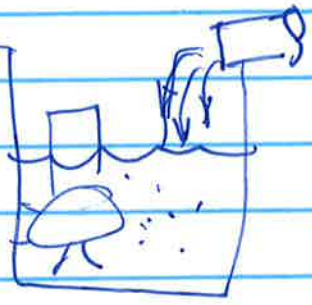
total $NPSH_a \geq NPSH_R$

$NPSH_a = 34' + 2' - \text{Suction losses}$

Cavitation Damage

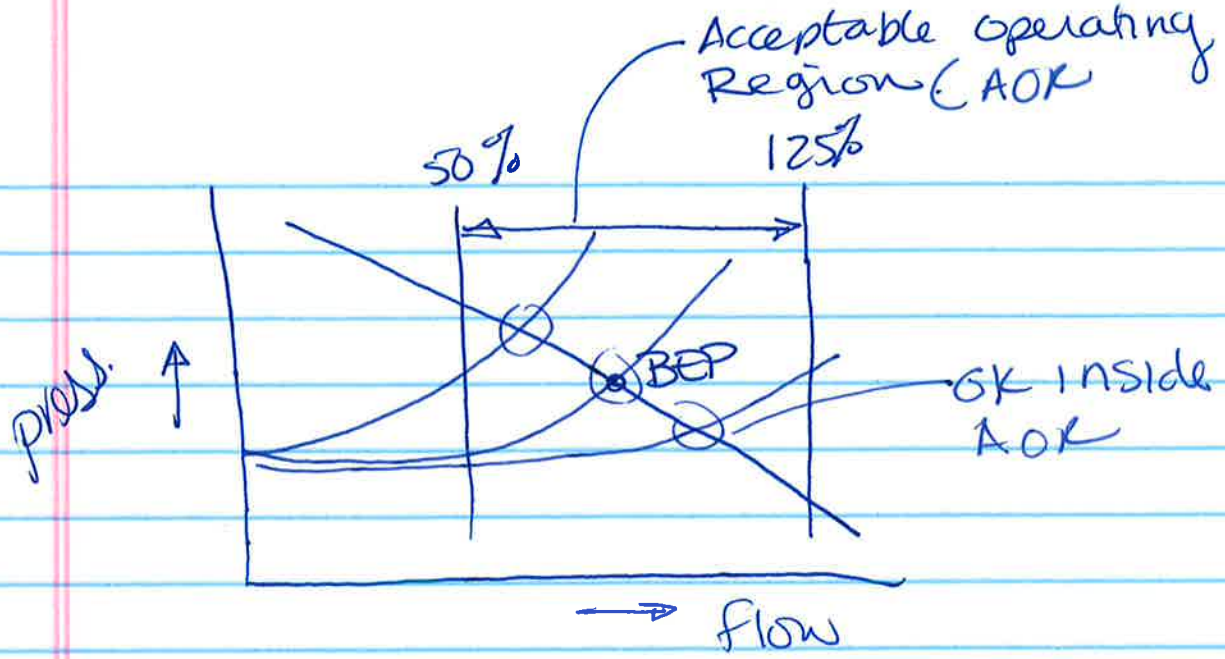
* on Right hand side of curve
  - insipient cavitation
  - stops pumping - starts again > cyclical
  - damage inside impeller
* on left hand side of curve
  - constant sound
  - more vibration
  - even though very low velocity difference in pressures cause recirculation
  - damage on tips of impeller

* Air induced cavitation
  - entrained air due to turbulance from falling water
  - damage on outside of impeller

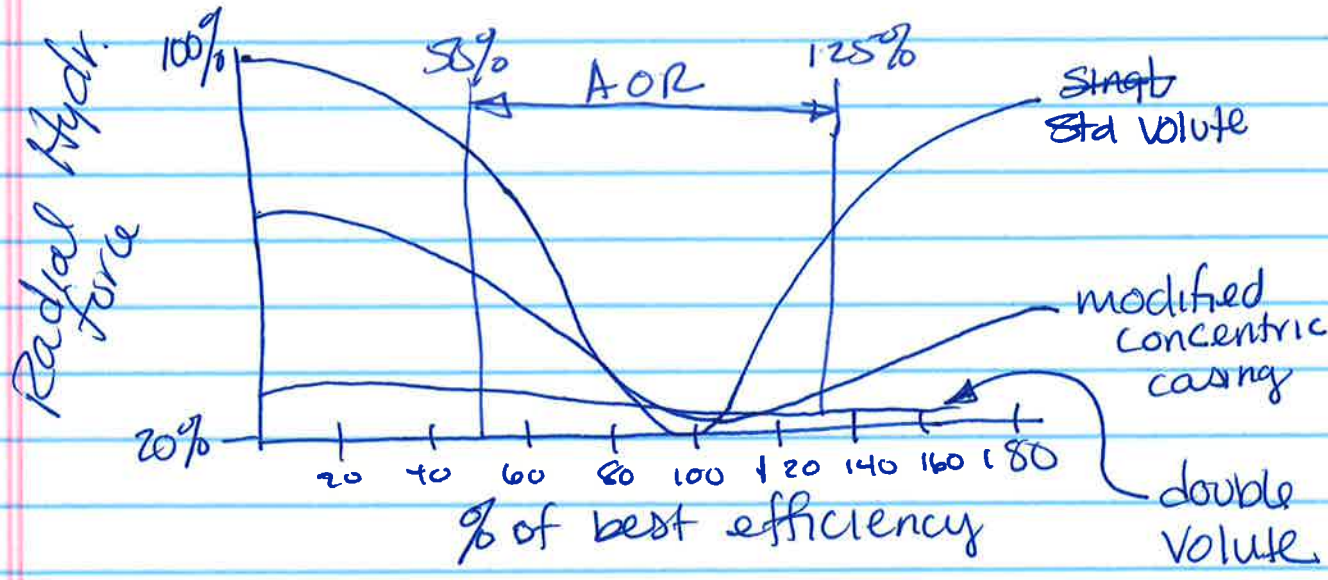


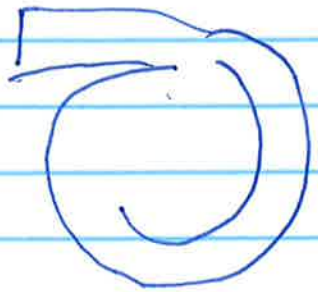
Cavitation can be caused by partially closed valve because velocity increases greatly

Tangential velocity



BEP = Best efficiency point
lowest amount of energy per gal pumped

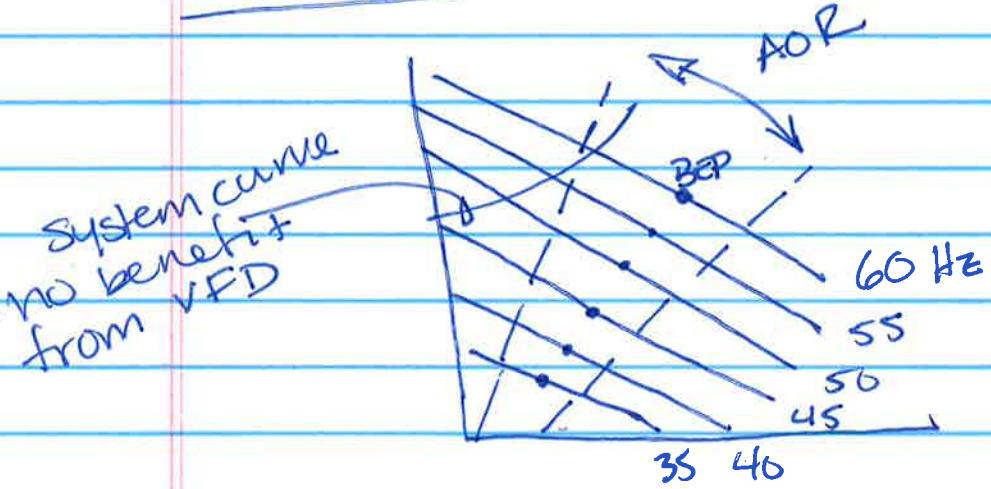




Hydraulic Institute
80% → 115%

Check w/ pump manufacturer.

VFDs



BEP is proportional to speed of pump

Adding VFD to existing system
System curve must fit with
VFD AOR or turn down will
not be possible

radial hydraul loading
goes down with the square
of the speed