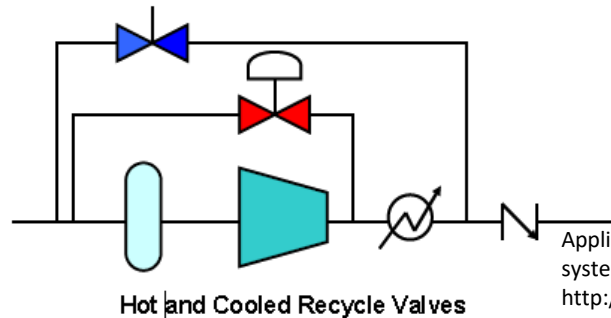
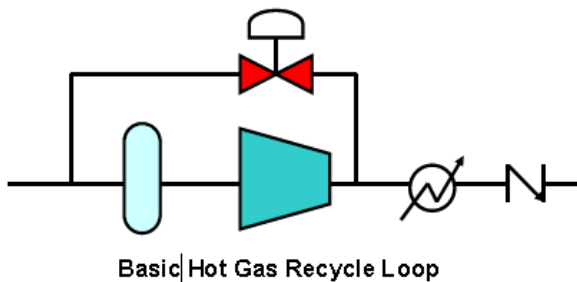
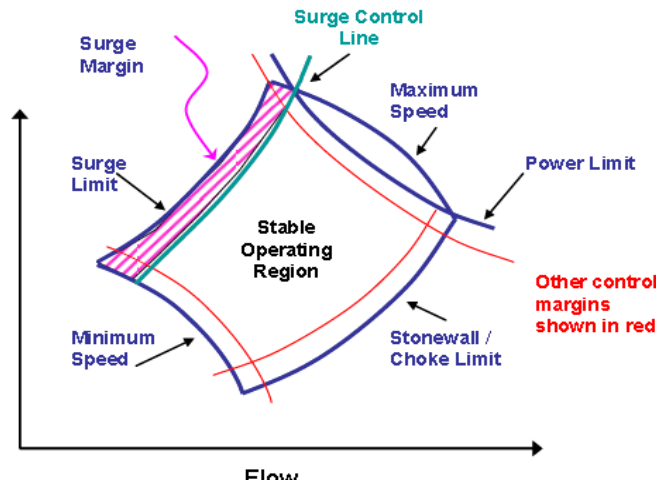
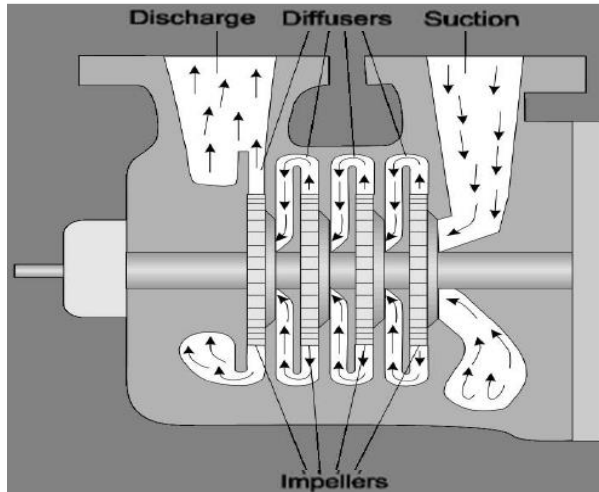


Anti-surge control valve design

- Surge: a reverse or cyclic flow due to low flow or too high discharge pressure



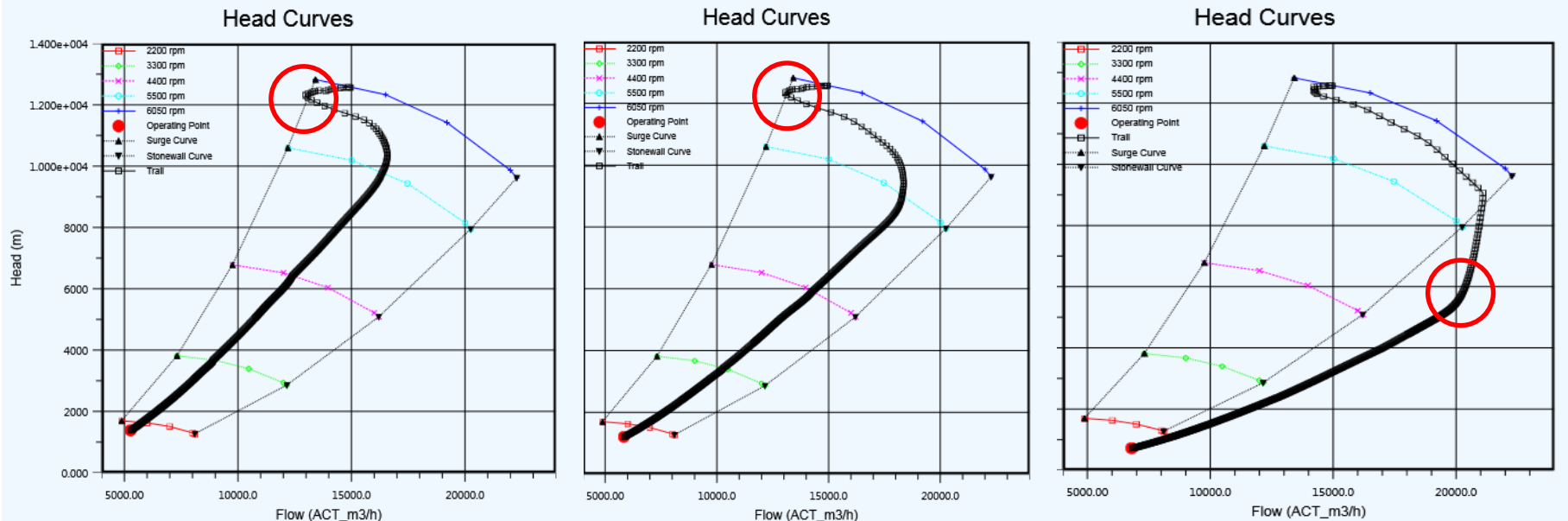
Damage to Impeller
 Application Guideline for centrifugal compressor surge control systems. Southwest Research Institute, 2008.
http://s4wiki.com/wiki/Compressor_map
 Anti-surge control. Control theoretic analysis of existing anti-surge control strategies. Terje Kvangardsnes. NTNU
<http://forum.miata.net/vb/showthread.php?p=7174076>

Current design procedure

- The recommended sizing method does not consider dead time and actuation time.
 - Ex) Recommended to be 1.8–2.2 times larger than instantaneous opening
- Even the recommended design may cause surge.
 - Repeated validations by using dynamic simulation are required.
- Often oversized → not economic

Lower bound (1.8 times)

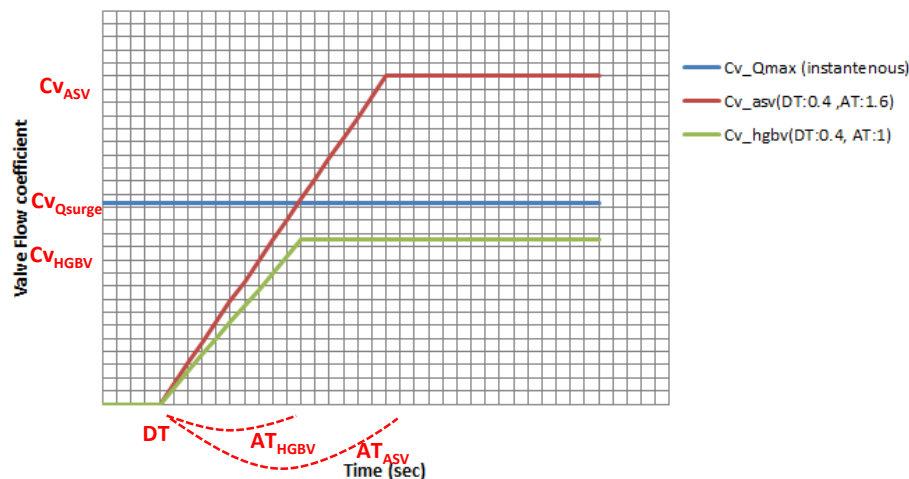
Upper bound (2.2 times)



Simple Graphical method to automate the sizing

- Because the flow rate is roughly proportional to the valve size (Cv) simple integral of Cv function can decide proper recycle valve sizes.

Valve Flow coefficient (Cv) vs Time



$$\int_0^{DT+AT_{ASV}} f(CvQ_{surge}) dt$$

$$= \int_0^{DT+AT_{ASV}} f(Cv_{ASV}) dt + \int_0^{DT+AT_{ASV}} f(Cv_{HGBV}) dt$$

Head Curves

