Case History

Power Savings on Recycle Applications

By: Mike Wisnoski & Jeremy MacClure

Personal Background

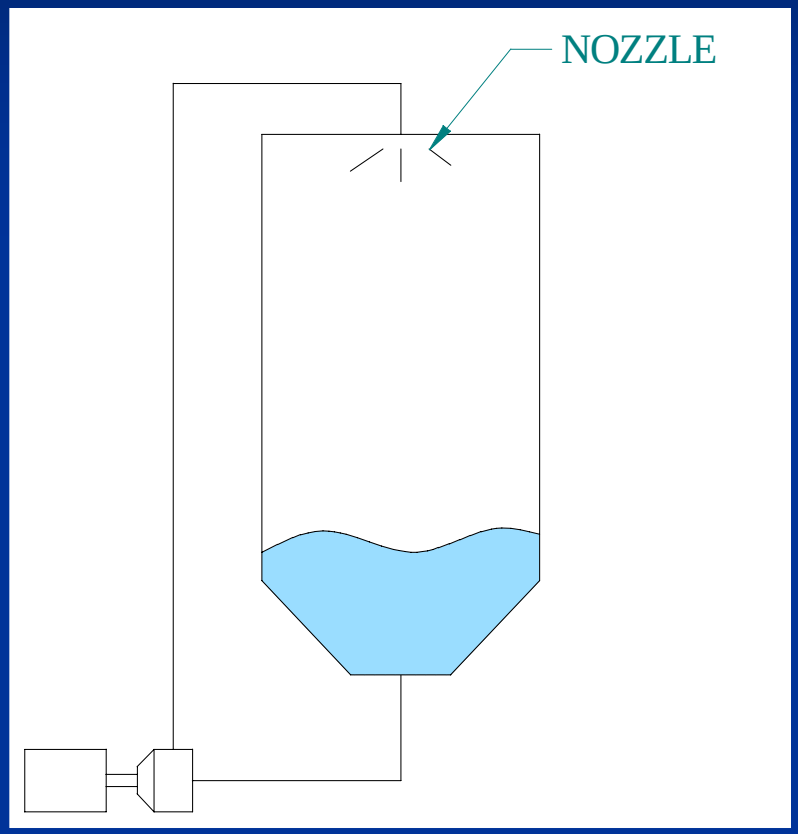
- Mike Wisnoski (Mechanical Engineer)
  - BSME UIC (University of Illinois at Chicago)
- 14yrs experience
  - John Crane Inc. 11 yrs.
    - 8yrs. Reliability engineering
    - 3yrs. Seal design/applications engineering
  - NTN Bearing Corp. 3 yrs
    - Bearing design, testing & QA.

Personal Background

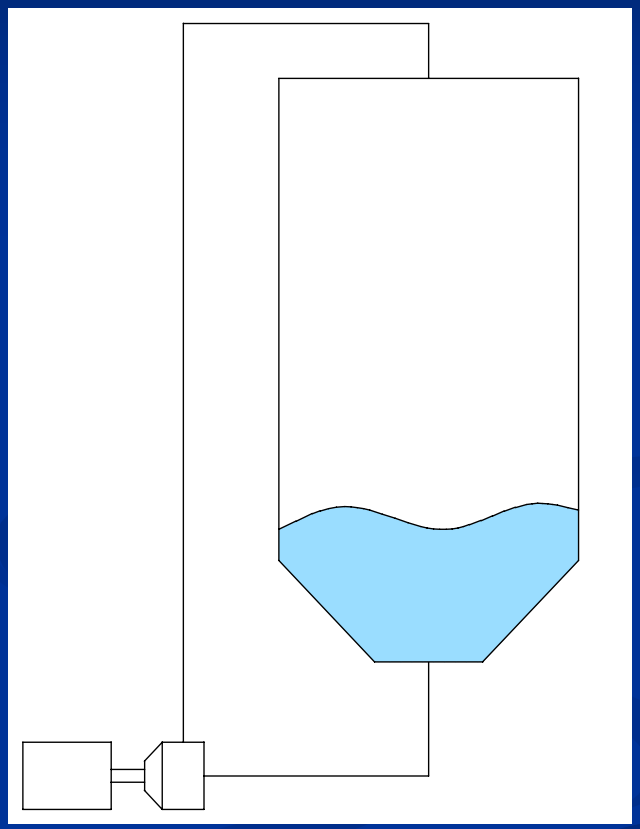
- Jeremy MacClure (Mechanical Engineer)
  - BSME South Dakota State University
- 9.5 yrs experience
  - Archer Daniels Midland
    - 7yrs. Reliability engineering
  - Dynegy Midwest Generation
    - 2.5yrs. Reliability/Performance engineering

Piping System

Prior to Change

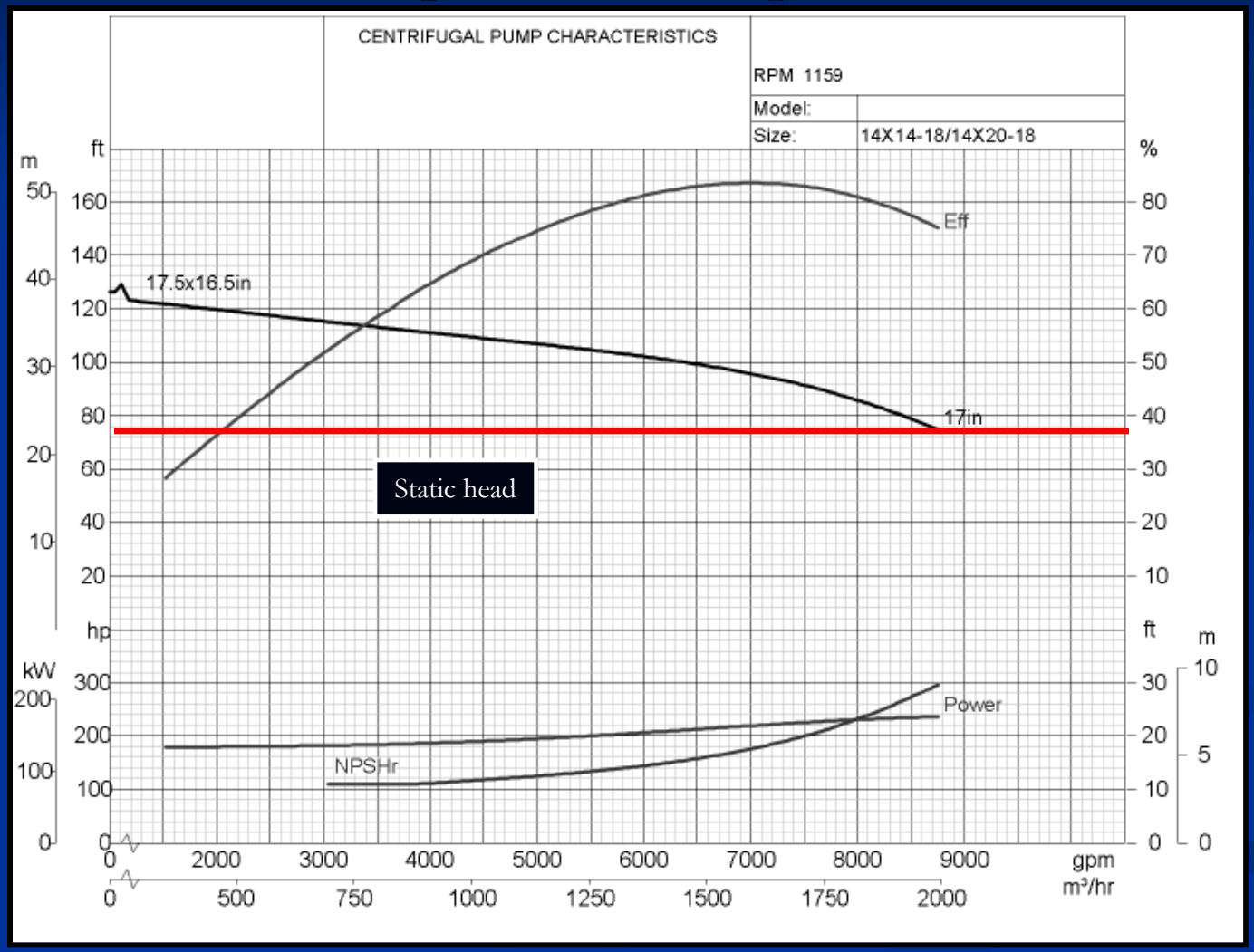


After Change

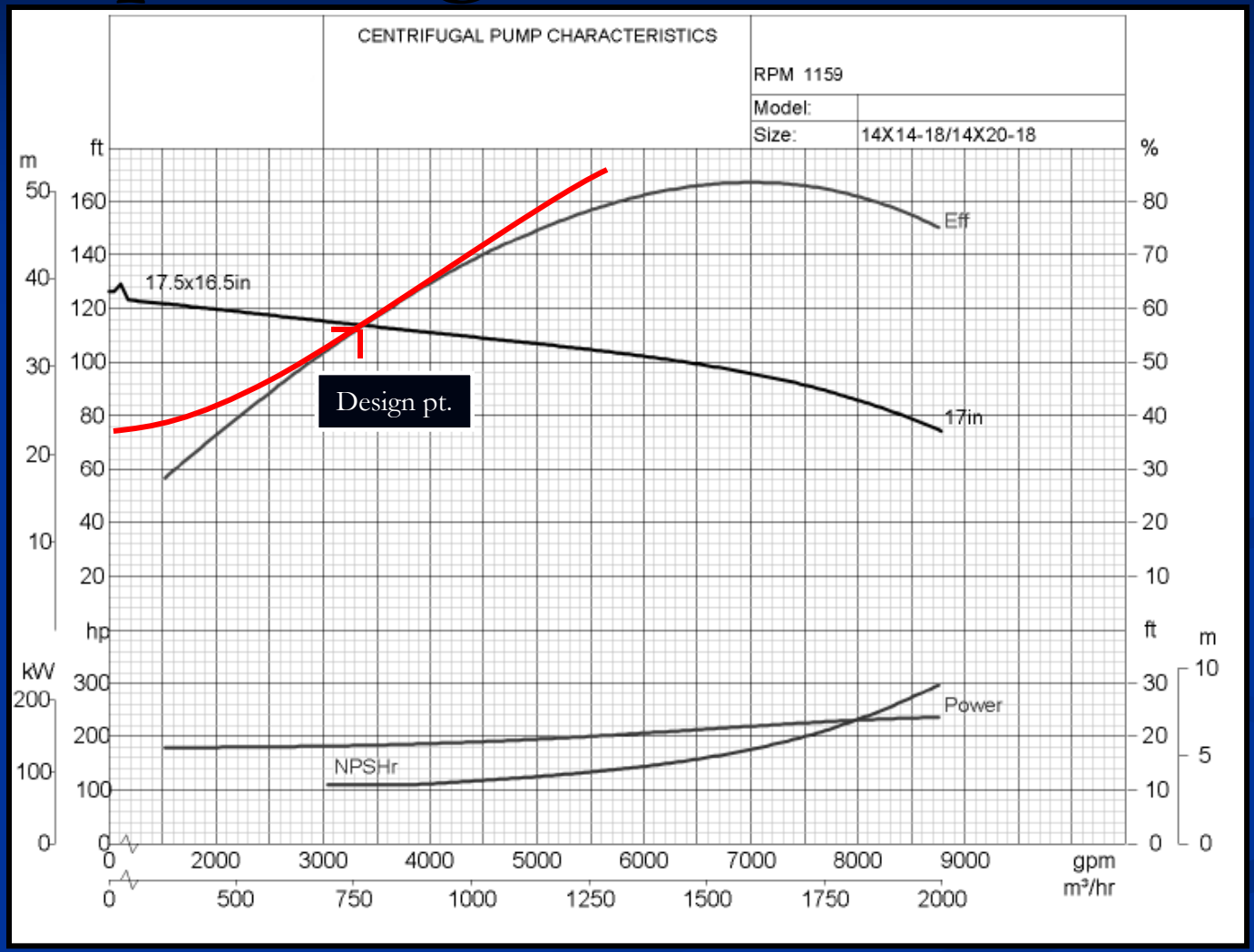


Static Head

74 ft (Liquid level to top of tank)

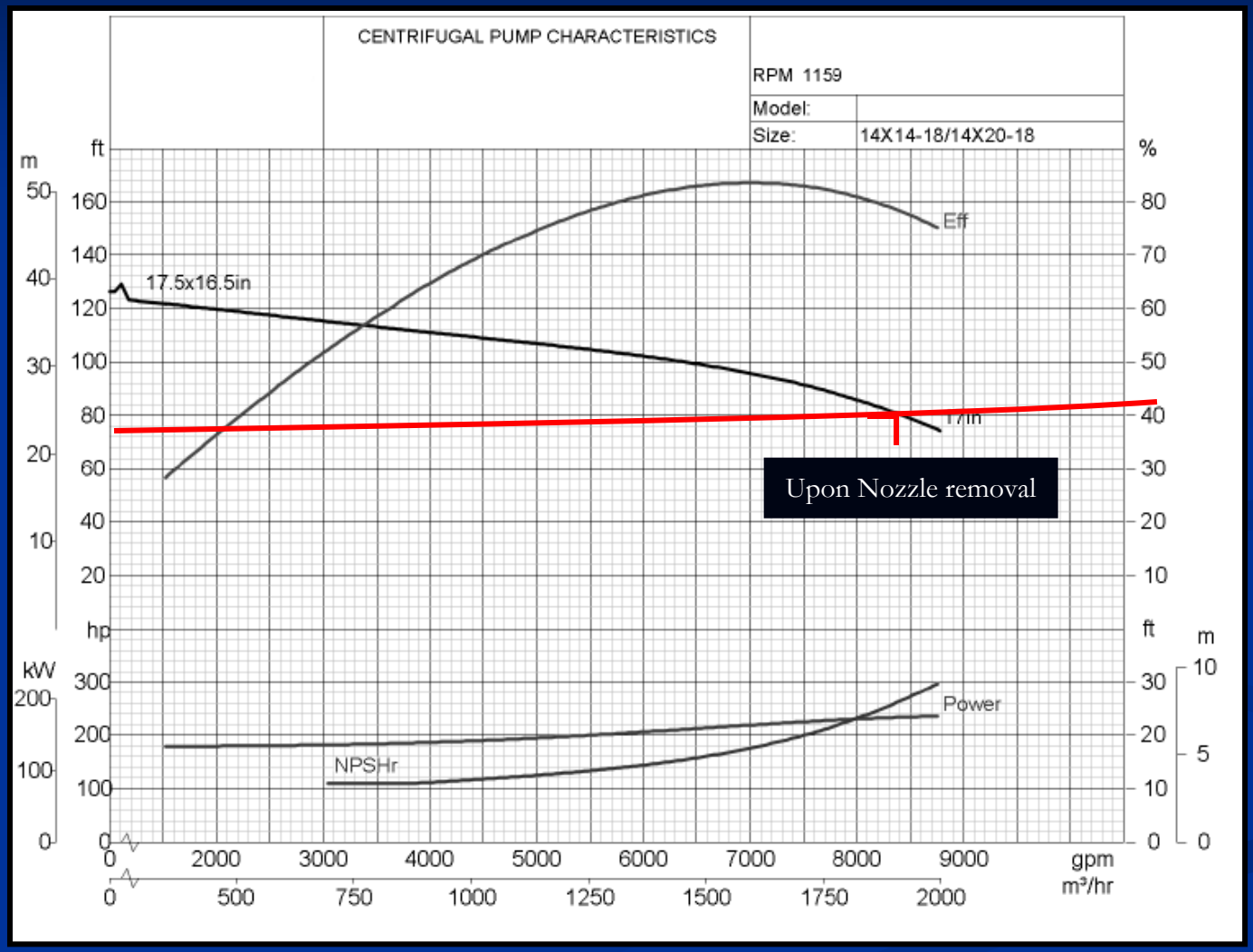


Operating Pt. with Nozzle



Flow = 3,250gpm Head = 112 Ft. NPSHr = 11Ft. Hp = 180

After Nozzle removal

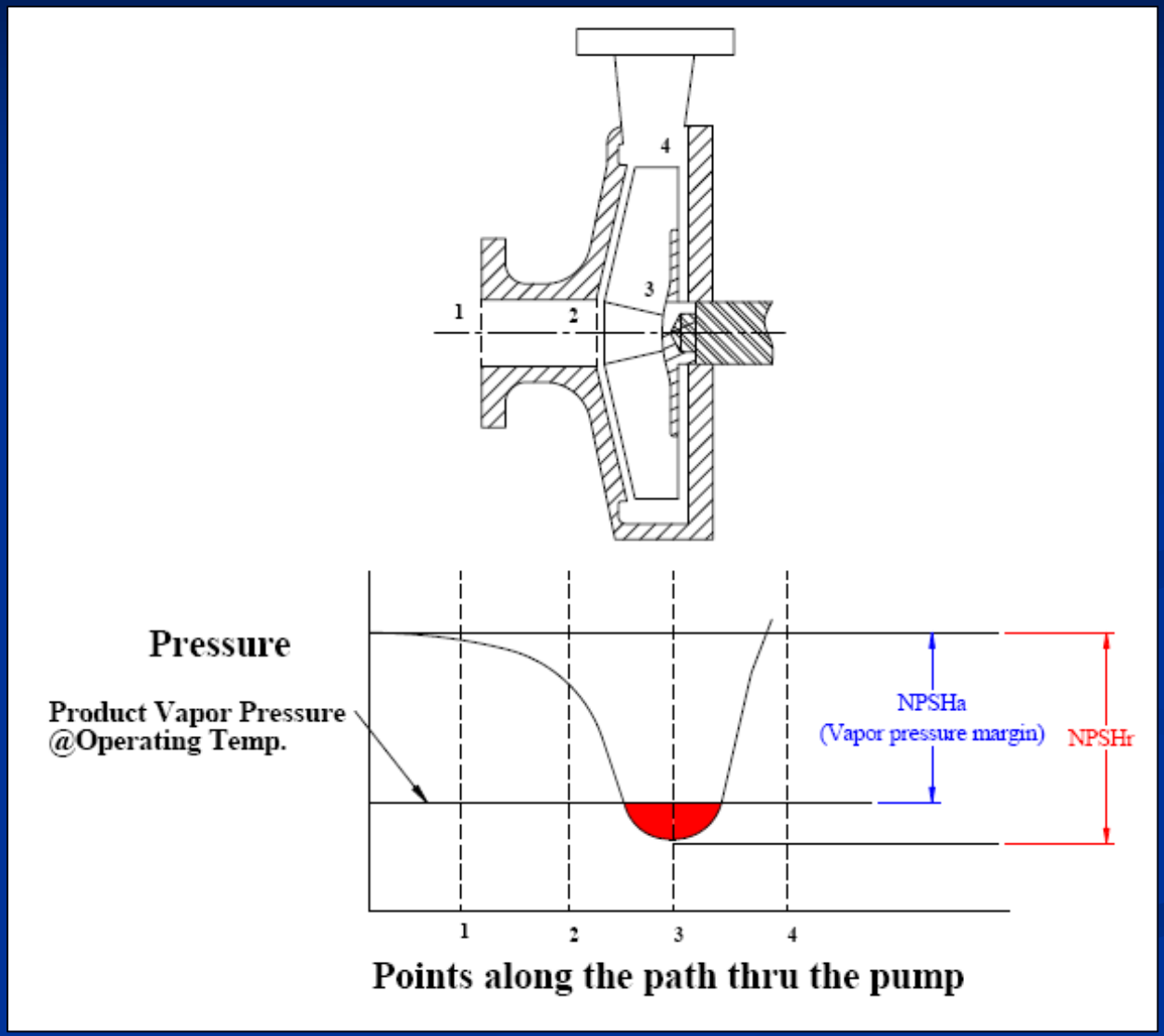


Flow = 8,400gpm Head = 80 Ft. NPSHr = 25Ft. Hp = 232

NPSH (Net Positive Suction Head)

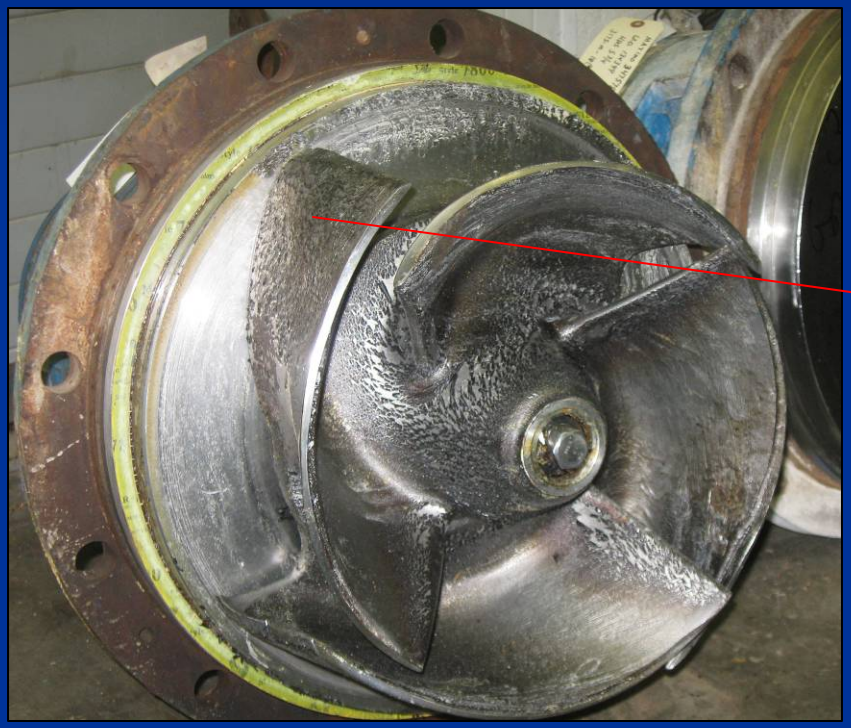
- NPSHa = Vapor pressure margin of the fluid at the pump inlet.
- NPSHr = Maximum pressure decrease as fluid flows thru the pump.
- NPSHa>NPSHr to prevent cavitation.

NPSH

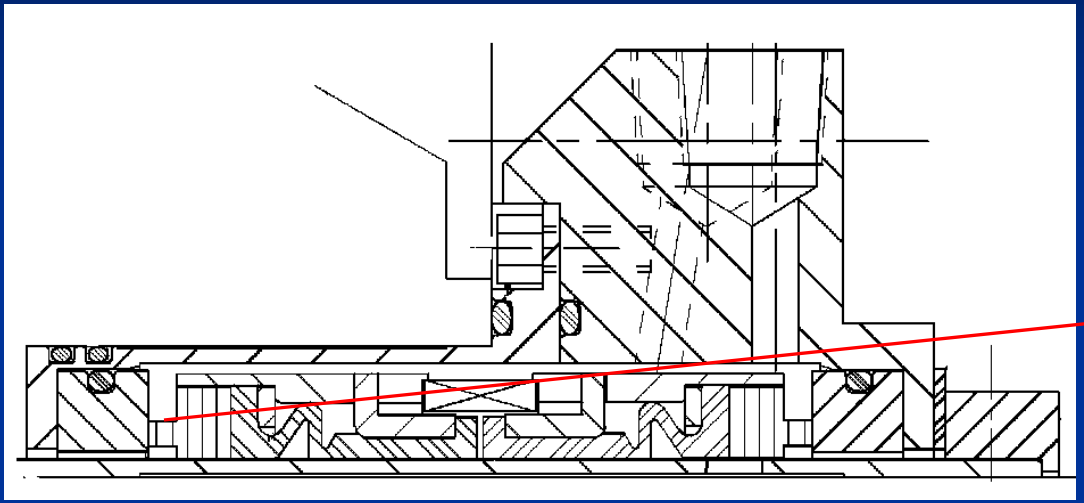

4
3
1
2
Pressure
Product Vapor Pressure
@Operating Temp.
NPSHa
(Vapor pressure margin)
NPSHr
1
2
3
4
Points along the path thru the pump

Findings

- Cavitation (NPSHa 19ft < NPSHr 25ft)

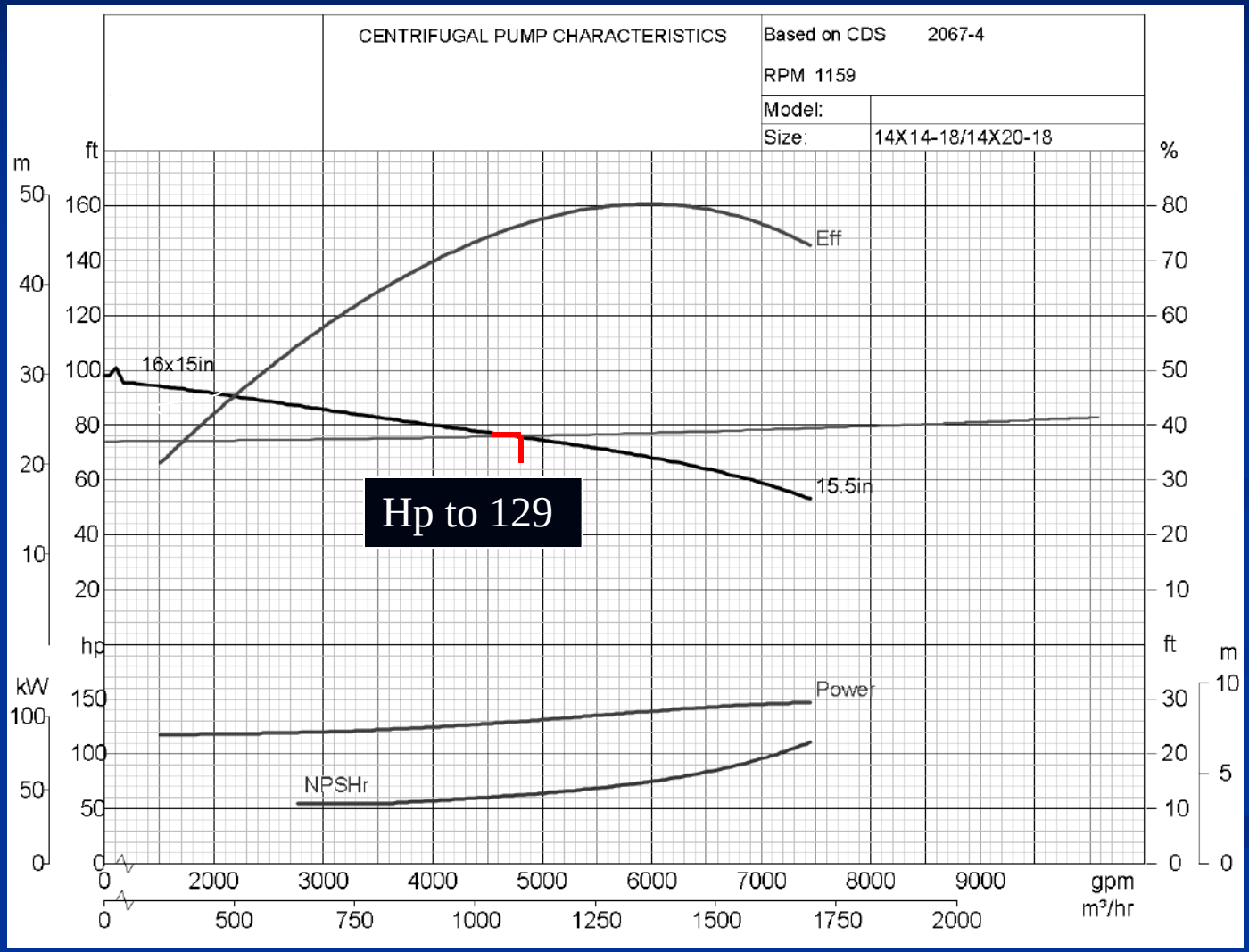


Findings

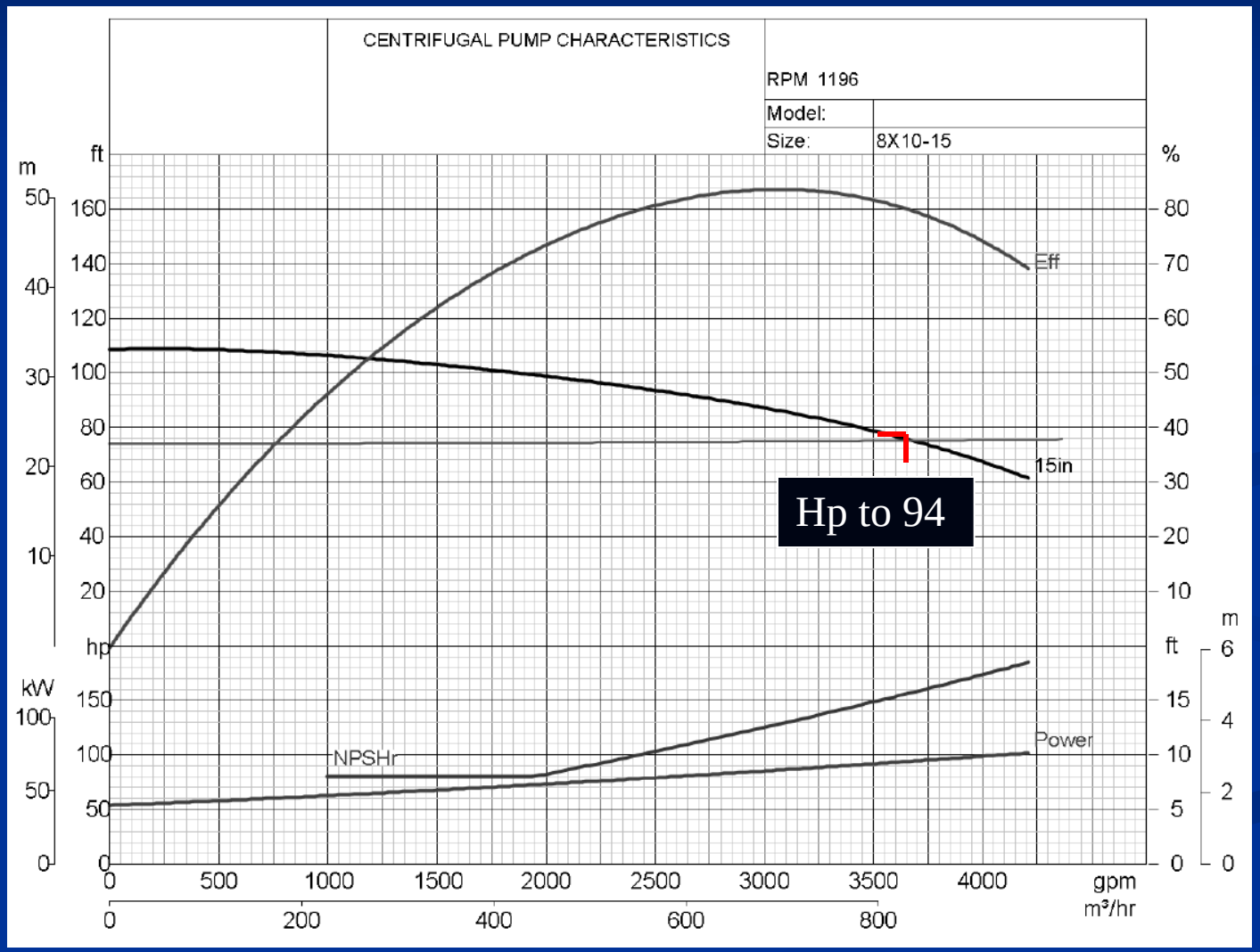


- Equipment life. MTBR =12

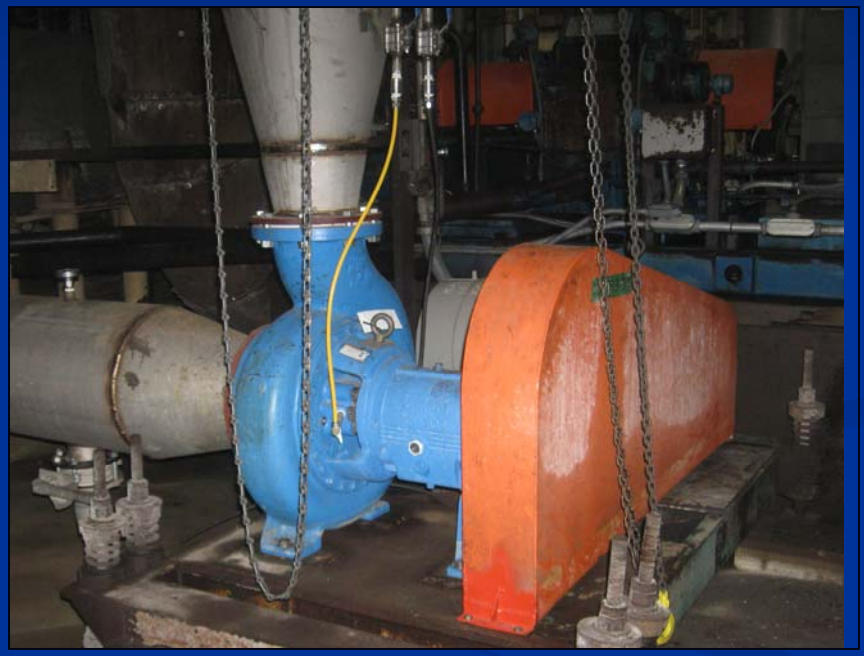
Short Term Solution



Long Term Solution



Results



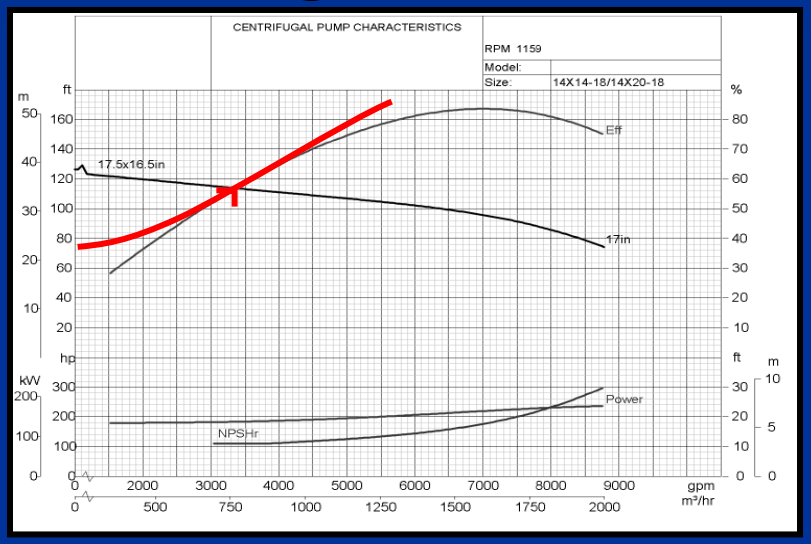
Results

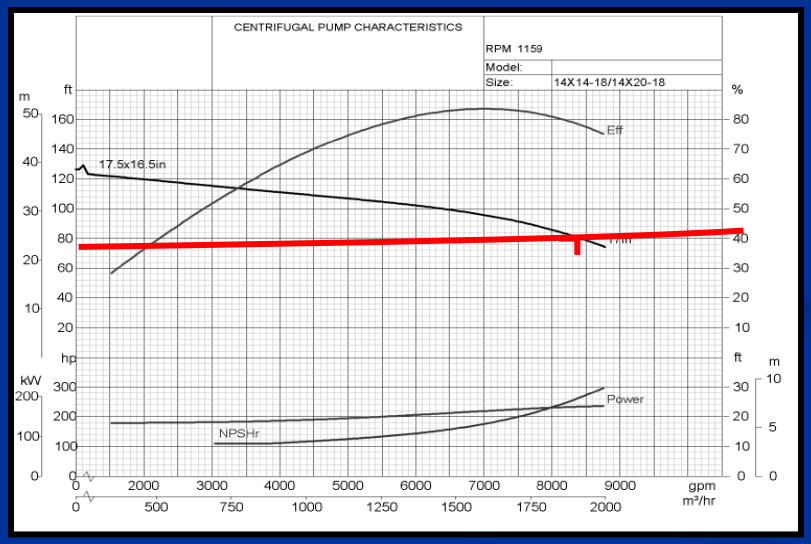
- Equipment life MTBR: 12 → 18 months (No failures since)
- Cavitation ceased
- Hp reduction
  - Short Term Solution:
    - From: 232 hp
      To: 129 hp
      Net Saving/yr = $18,031
  - Long Term Solution:
    - From: 232 hp
      To: 94 hp
      Net Saving/yr = $24,159

[1] Assuming power cost of $.03/Kwh

Summary/Conclusions

- Be conscientious of flat pump curves and effects of changes in resistance.





- Insure pump operation reflects actual requirements.

Questions/Discussion