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)
- 14 yrs experience
  - John Crane Inc. 11 yrs.
    - 8 yrs. Reliability engineering
    - 3 yrs. 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

NOZZLE
Static Head
74 ft (Liquid level to top of tank)
Operating Pt. with Nozzle

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

Flow = 8,400 gpm    Head = 80 Ft.    NPSHr = 25 Ft.    Hp = 232
NPSH (Net Positive Suction Head)

- \( NPSH_a = \) Vapor pressure margin of the fluid at the pump inlet.

- \( NPSH_r = \) Maximum pressure decrease as fluid flows thru the pump.

- \( NPSH_a > NPSH_r \) to prevent cavitation.
NPSH

Points along the path thru the pump

Pressure

Product Vapor Pressure @ Operating Temp.

NPSHa (Vapor pressure margin)
Findings

- **Cavitation** (NPSHa 19ft < NPSHr 25ft)
Findings

- Equipment life. MTBR = 12
Short Term Solution

CENTRIFUGAL PUMP CHARACTERISTICS

- Based on CDS
- RPM 1150
- Model: 14X14-18/14X20-18

Hp to 129
Long Term Solution

![Centrifugal Pump Characteristics Graph](image)

**Hp to 94**
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