Pump repair options & alternatives

Presented by Bob Gaskey of Pumping Solutions
My background

• Worked in a foundry and machine shop
• 27 years in aftermarket pump industry
• Worked for a Sturm Machine distributor-traveling drafting team
• Expertise with older vintage pumps
• Expertise with pump retrofits
My background

- Project manager on several wastewater cso deep tunnel pump repairs
- Worked in a foundry and machine shop
- Worked for a large full service pump distributor
- Currently the Pump Repair Manager with Pumping Solutions in Blue Island, IL.
Course Overview

• Emphasis on large water pumps typically found in fresh water, wastewater, power, steel & general manufacturing.

• Promote awareness of options to consider when faced with the decision to repair or replace pumps.
Goals of the course

- Machining principles
- How centrifugal pumps are made
- Stabilizing your pump and motor train
- Take ownership & responsibility of your pumps
- Establishing warranty clarity
- Tracking and logging your pumps
- Application scenarios
Why keep older pumps running?

- Capital budgets
- Piping changes
- Foundation changes
- Pumps may not be able to be taken off line
- Build quality of older pumps-mass
Reasons for replacing pumps?

- Completely different technologies
- Efficiency/energy savings
- Manufacturer out of business
- Parts are obsolete
- Worn out beyond repair
- Duty point has changed
Pump repair considerations
Pump repair shop check list

- Crane capacity
- Press configuration/capacity
- Balancing capabilities
- Horizontal/vertical lathe capacity
- Cleaning methods
- Experience of personnel
- Engineering capabilities
- Experience repairing similar pumps
Balancer capacity
Balancer capacity
Balancer capacity
Balancer capacity
Press capacity
Horizontal lathe capacity
Vertical lathe capacity
Welding equipment & procedures
Repairs-on site inspections

- Inspect shop before repair is awarded
- Inspect pump after initial disassembly & cleaning
- Inspect pump when rotor is assemble and ready for final assembly
Repair documentation - establishing warranty clarity

- Repair documentation
- As found sizes
- As built sizes
- Shaft TIR
- Balance report
- Bearing housing sizes/concentricity
- Casting NDE report
- Metal certification
- Hardness report
- Alignment report
Repair documentation

- Accurate reports help narrow the troubleshooting process.
Shaft TIR
Balance report
Metal certification
Alignment report

INSTRUMENTATION: Laser 200 Alignment Set

EQUIPMENT IDENTIFICATION:

EQUIPMENT: Pump 1
OPERATING RPM: 600 Motor

600 Pump

MEASUREMENTS
Laser Alignment Initial Readings:
- Parallel: 0.1144
- Angular: 0.0006/1°

Laser Alignment Final Readings:
- Parallel: 0.0029
- Angular: 0.0001/1°

OBSERVATIONS
Alignment - Indications of misalignment.

ACTIONS
Actions Taken - Motor misalignment corrected to within acceptable levels.
Taking pump out of standard

- Impeller bores
- Wear ring sizes
- Pump case machining
- Design upgrades
Parts swapping in repairs

- Newer pumps lend themselves to a parts swapping philosophy.

- Older pumps that have been repaired and re-machined repeatedly do not lend themselves to a parts swapping philosophy.
All or nothing strategy
Evolution of pump metallurgy

- Bronze fitted pumps
- 1970’s pressure from aftermarket pump part companies.
Rotor stabilization

- Pump, motor (or turbine) gear box
Vibration analysis can expose:

- Multiple types of unbalance
- Eccentric rotor
- Bent shaft
- Multiple types of misalignment
- Resonance
- Mechanical looseness
- Rotor rub
- Journal bearing issues
Vibration analysis can expose:

- Rolling element bearing failure
- Hydraulic & aerodynamic forces
- Gear issues
- AC induction motor issues
- AC synchronous motor issues
- DC motor and control issues
Vibration analysis can expose:

- Belt drive issues
- Pulley issues
- Beat frequency vibration
- Soft foot, sprung foot & foot related resonance
Seal Advantages

- Seals-less drag on shaft sleeve thus saving energy
- When applied, installed with an appropriate piping plan-housekeeping
- Run dry capabilities
Packing Advantages

- Can help stabilize the rotor
Pump machining principles

- Centrifugal pumps are made up of individually machined components that mate together with register fits to form one common concentric centerline.
Pump part machining

- Faces must be flat, parallel & perpendicular
- Accurate sizes
- Most important-concentric common centerline
Application scenario #1
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Application scenario #9
Application scenario #9
Technical Data Sheet

Corrosion Resistant Type CA-6NM

Type CA-6NM is an iron-chromium-nickel-molybdenum alloy that is hardenable by heat treatment. It is similar in general corrosion resistance to type CA-15. Although the tensile strength properties of CA-6NM are comparable to those of CA-15, the impact strength is about twice as high, as is the resistance to damage from cavitation effects.

The alloy is normally used in the normalized and tempered condition in which the microstructure is essentially 100% martensite. This structure provides the optimum combination of strength, ductility, hardness and toughness.

Advantages of 13% Cr-4% Ni-Mo, CA-6NM

1. Better corrosion and cavitation resistance.

2. Improved toughness.

3. Decreased sensitivity to cracking during and after solidification of heavy sections. Section size changes as great as 5:1 have created no cracking problem with the alloy.

4. Good weldability with minimum necessity for repair welding because of lower sensitivity to cracking.

5. Preheating or postheating is unnecessary for repair welding of sections 2 to 3 inches thick and in some cases up to 5 inches thick.

Summary of Properties

Chemical Composition:

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<th>Mn</th>
<th>Si</th>
<th>P</th>
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<td>0.04%</td>
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