

# **Predictive and preventive maintenance for Pumps**

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# Two Main Causes of Pump Failure

- Seals
- Bearings
- These Account for 80% + of pump Failures

# Four areas to Concentrate PM Programme

- Vibration
- Lubrication
- Operation
- Maintenance

# Vibration

- Three Categories of Pump
  - Large Unspared Pumps
  - Smaller and Spared Pumps
  - Very small or unimportant Pumps

# Large Unspared Pumps

- Continuous monitoring via a permanent system.

## Reasons:

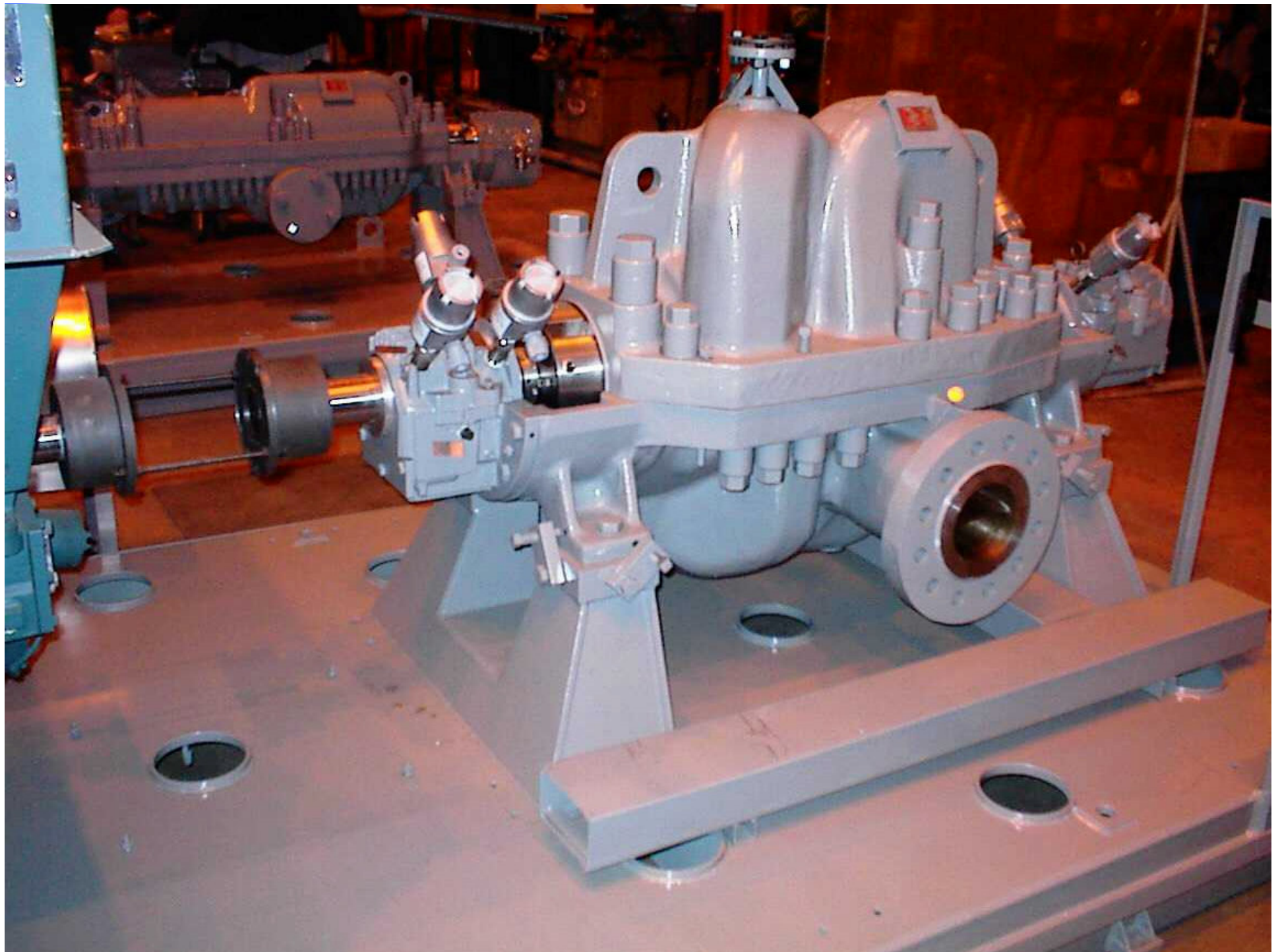
Want to catch problems early as may have an effect on Production - big \$\$\$

If machine fails, the cost of repair is very high thus the cost of Monitoring system easily Justified

Consider pumps 750 kW and larger (unspared)  
1000kW and larger (spared)













# Criteria

- Radial Bearings  
Alarm at 50-60% of bearing clearance  
Trip at Bearing clearance
- Thrust bearings  
Alarm at 50% of Babbitt  
Trip at 100% of Babbitt + .25mm (.010")  
Dual Voting
- Other alarms/ trips within capability of Monitoring System

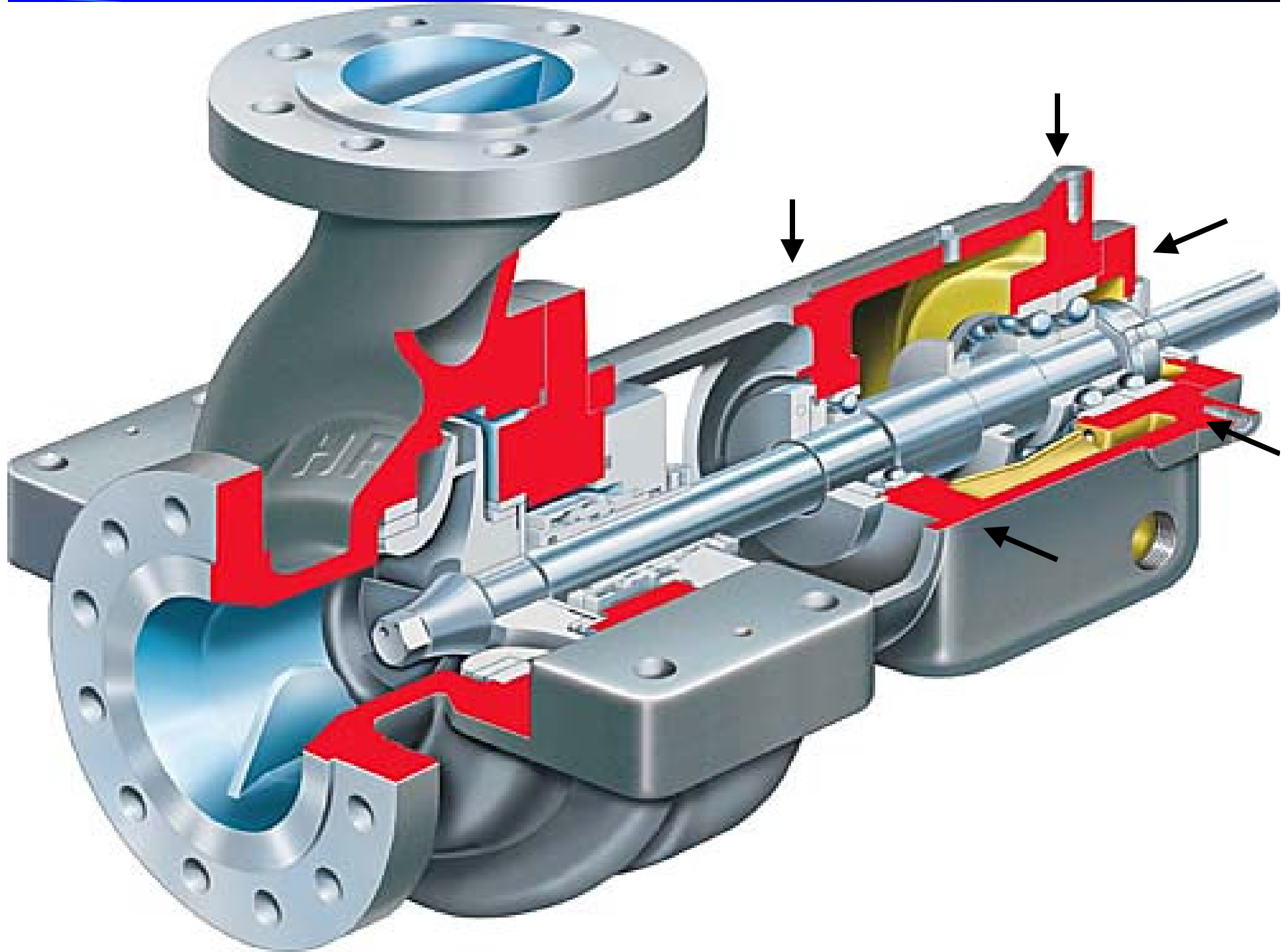
# Bearing Temperatures

- Large unspared pumps should have RTDs in bearings
- Set alarm at 10-20°C over normal
- Trip depending on Plant Philosophy

# Smaller Spared Pump

- Use a Walk About Hand Held programme
- Set frequency of checks based on site MTBM (monthly, 2 months, 3 months)
- Need to set a schedule for running the spare Pump  
1 day every month, 1 day every 2 months, 50/50





# Very Small or Unimportant Pumps

- Not included as part of a vibration programme





# What We Are Looking For

- An increase in vibration level (sudden or Trending)
- An indication from readings as to the Cause of Vibration

# Criteria

- Well Balanced and aligned pump should run at 1 mm/sec.
- Should consider removal for correction at levels above 8 mm/sec
- Use spectral analysis to determine cause

# Lubrication

- Grease
- Self Contained Bath with ring or Slinger
- Oil Mist
- Circulating or pressurized Systems



# Grease

- Sealed for Life
- Re-greasable

# Re-Greasable bearings

- Need to be installed correctly  
*One shield only - on inboard side, Grease passages both sides of Bearing cavity.*
- Grease flushed on Regular intervals  
*say 3 months. Outlet passage open, add new grease till new grease is seen coming out of outlet.*

# Self Contained Bath with ring or Slinger

- Need to monitor level
- Need to change oil periodically
- Oil change in conjunction with running of Spare Pumps
- No oil analysis required (not economic)



# Oil Mist

- Clean cool constant supply
- No changing of oil required
- Provides best environment for bearings and thus longest life.
- System may be costly to install

# Circulating or pressurized Systems

- Need to monitor Oil system for:  
Level, Pressure, Temperature and Filter dP
- Need to test oil Periodically  
Test for Viscosity, Metal, dirt and water

# Operation

- Pump Performance
- Mechanical Seal Auxiliaries

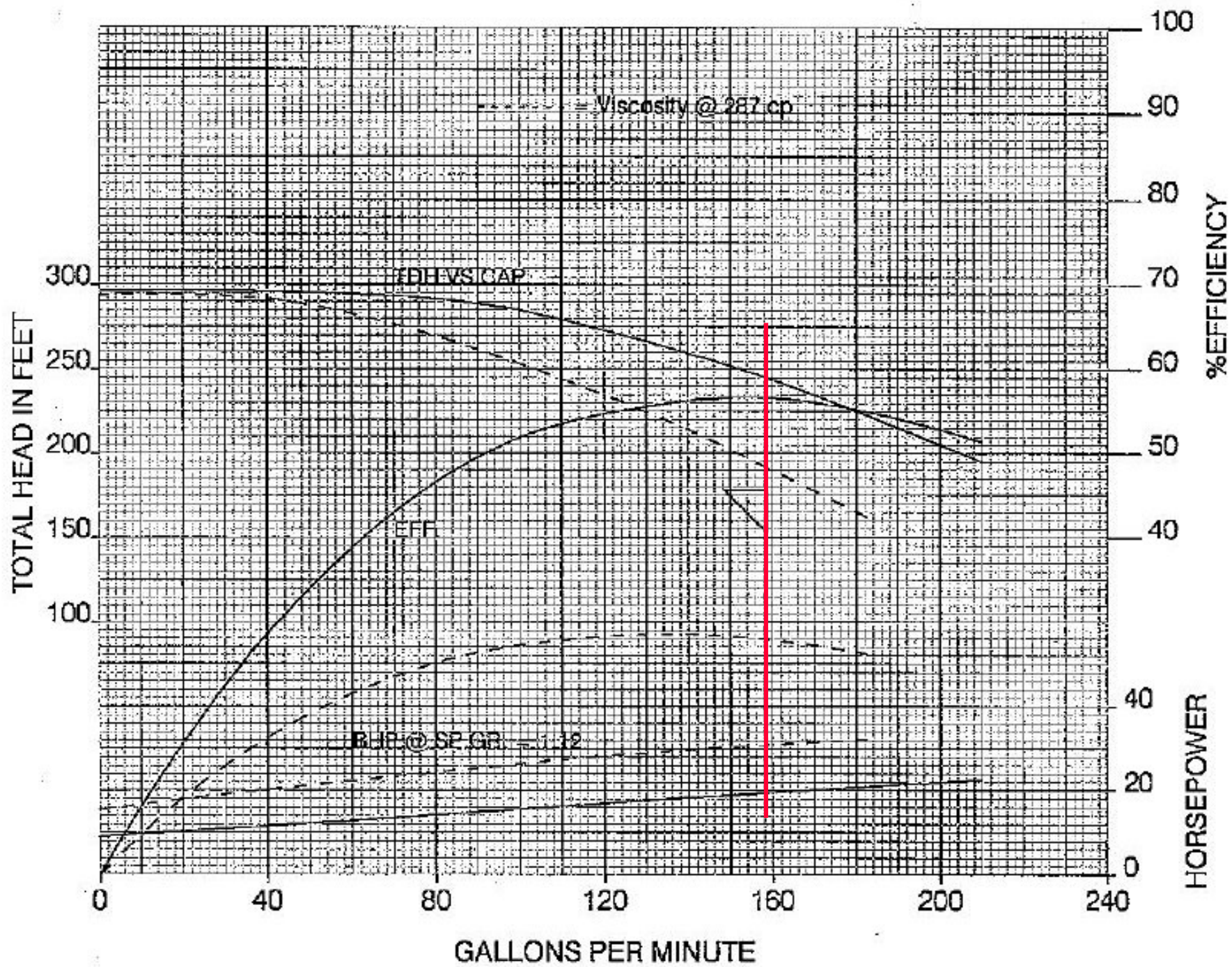
# Pump Performance

- Performance test done periodically

- Verify Pump on curve

- Ensure suction screen not plugged

- Ensure no internal wear or damage





# Seal Auxiliaries

- Check that flush lines are flowing
- Steam quenches are operating and at the right rates
- Seal pot levels are correct
- Done daily by Operators (training)

# Maintenance

- Ensure all fits and tolerances are to OEM std.
- Take care in mounting Rolling Element Bearings (Temperature <120°C)
- Ensure rotor is well balanced to API 4W/N in-oz or 6350W/N gm-mm
- Do a Precise alignment (.002" or .05mm TIR)  
Use Laser tools



# Training

- Important that Operators and Millwrights be Trained if we expect high pump Reliability
- Operators: Pump operation, Seal operation  
(What to do & what not to do)
- Millwrights: Vibration analysis, Alignment,  
Lubrication Maintenance techniques