PumpSmart™ Performance Services

Optimizing Pump Life Cycle Performance

For Improvements in…

Pump and Process Reliability
Energy and Maintenance Cost
Asset Management

PUMPSMART®
CONTROL SOLUTIONS

PumpSmart
ITT Industries

PUMP ASSESSMENT PROCESS

Identifying Opportunities to Optimize Pump Life Cycle Performance

Pumping system optimization has the potential for significant reductions in life-cycle-cost (LCC). Through plant assessments, the best few applications can be identified and prioritized for system improvements. Mechanical modification and variable speed control, where applicable, will allow pump operation near the best efficiency point (BEP) for a given head and flow. Operation near BEP offers significant improvements in pump and process reliability as well as energy savings. Variable speed control has the potential to lower LCC in the range of 20 – 60%. Also, speed control can lower process variability for additional improvements in material usage.

The application of intelligent drives, in lieu of standard variable frequency drives, provides embedded condition monitoring and mechanical fault protection to prevent catastrophic failures. Also, real-time monitoring allows predictive maintenance to schedule repairs before process operation is negatively affected.

ASSESSMENT SCHEDULE

Assessment planning:

- Onsite meeting
  - Planning
  - Pump Screening
- Plant representatives
- Performance Services consultant

Screening techniques provided:

- Jointly identify the best few opportunities
  - Plant-wide audit
  - Plant segment audit
  - Process unit audit

Scope of services offered:

- Pumping system assessment
  - Wet end
  - Power end
- Process variability analysis
- Application development
  - Component sizing
  - Control strategies
- Training Programs
  - VFD Application Fundamentals
  - Pump Reliability & Troubleshooting
  - PumpSmart™ Programming & Operation

Sources of Information:

- Pump curve
  - Design point
  - Flow rates
  - Static head
- Field trip to pumping system
- Operator interview
- PI&D drawings
- DCS & PI graphics and trends
- Maintenance history and repair cost

Study Deliverables:

Report with detailed assessments, recommendations and economic analysis

- Costware analysis (LCC)
- Pump System Assessment Tool (PSAT) for motor analysis
- Pump modifications, i.e. impeller trim, rerates, replacement
- Discuss benefits such as improved reliability, reduction in material usage, and improved regulatory compliance
- Control strategies

ASSESSMENT TIMETABLE

Standard assessment:

- 6 - 12 pump systems
- 2 to 4 days
- $2500/Day + T&L
- Includes time to prepare report

Major assessment:

- More than 12 systems
- 5 or more days
- Includes time to prepare report

PumpSmart

ITT Industries

ENGINEERING STRATEGIES TO IMPROVE PUMP SYSTEM PERFORMANCE

At existing plants, about 20% of installed centrifugal pumps offer 80% of the potential life cycle cost savings. In general, the best candidates for energy reduction exceed 40 HP. Although, lower HP pumps with high maintenance cost are also good candidates for optimization. As a rule of thumb, systems with static heads less than half of the pump's total dynamic head are viable candidates for speed control. Overall, pump system performance is affected by several factors:

- Efficiency of the pump as well as other system components
- Efficiency of drives (Motor and VFD)
- Efficient pump control (e.g. variable hydraulics, on-off control)
- Overall system design (sizing and balancing measures)
- Effectiveness of piping systems (e.g. reduced frictional pressure losses, matching of pump and system characteristic)
- Appropriate maintenance cycles

PLANT-WIDE ASSESSMENTS IDENTIFY THE FOLLOWING PROCESS MODIFICATIONS THAT OFFER THE MOST POTENTIAL FOR EFFICIENCY IMPROVEMENTS:

- Motor efficiency via new replacement or upgrade
- Best match between component size and load requirement
- Use of speed control instead of throttling or bypass mechanisms
- Reduced load on the motor through improved process and systems design

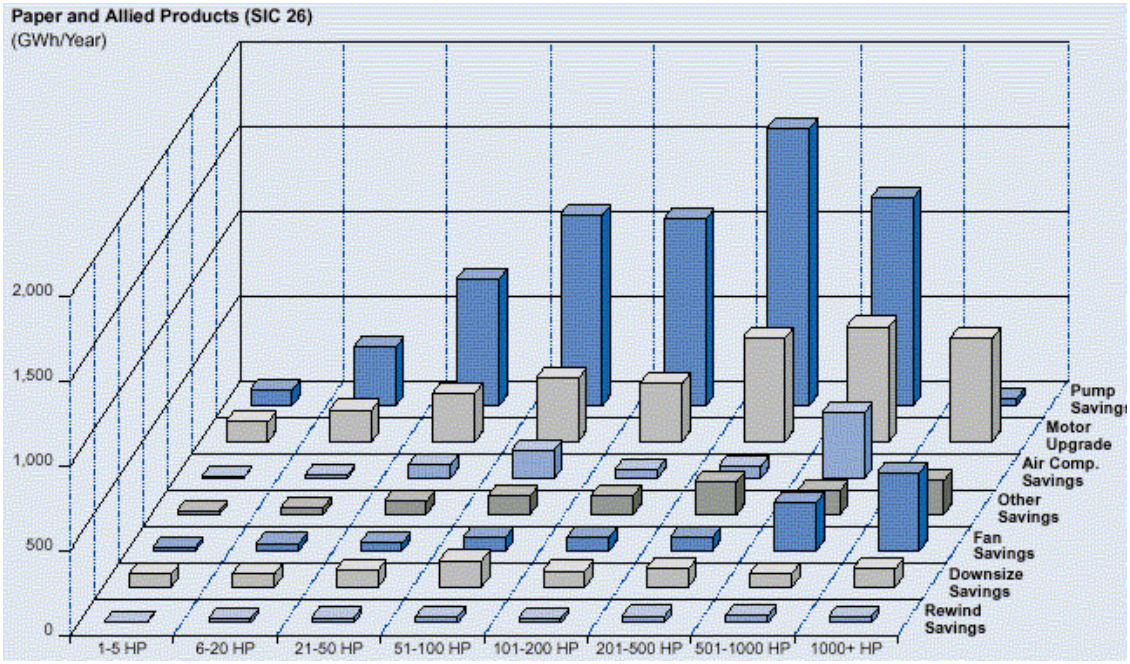
SYMPTOMS THAT INDICATE OPPORTUNITY FOR PUMP OPTIMIZATION:

- Presence of cavitation noise
- Throttled valve-controlled systems
- Bypass (recirculation) lines normally open
- Multiple parallel pump system with same number of pumps always operating
- Constant pump operation in a batch environment or frequent cycle batch operation in a continuous process

PUMP EFFICIENCY & ENERGY IMPROVEMENT TABLE

Pump System Efficiency Measures	Range of Savings *(% of System Energy)*
Reduce Overall System Requirements:	
• Equalize flow using holding tanks	• 10 – 20%; depends on variation in flow
• Eliminate bypass loops and unnecessary flows	• 10 – 20%; depends on initial design
• Increase piping diameter to reduce friction	• 5 – 20%; depends on initial design
• Reduce "safety margins" in design system	• 5 – 10%
• Reduce system effects due to piping bends	• NA
Match Pump Size To Load:	
• Install parallel systems for highly variable loads	• 10 – 30%; depends on initial design
Reduce or Control Pump Speed:	
• Reduce speed for fixed loads; trim impeller; lower gear ratios	• 5 – 40%; depends on initial design
• Replace throttling valves with speed controls to meet variable loads	• 5 – 50%; depends on initial design
Component Purchase:	
• Replace typical pump with most efficient model	• 1 – 2%
• Replace typical motor with most efficient model	• 1 – 2%
• Replace belt drives with direct coupling	• 1 – 3%
Operation and Maintenance:	
• Replace worn impellers, especially in caustic of semi-solid applications	• 1 – 5%

PULP & PAPER MOTOR ENERGY SAVINGS POTENTIAL



PumpSmart

ITT Industries