PRO services

Energy Performance Services

ITT

ENGINEERED FOR LIFE

Optimize

Studies show that the centrifugal pumps moving fluids throughout your operation are, typically, the largest consumers of electrical motor energy when compared to other rotating assets. Depending on the industry segment, pump systems will consume from 10 to 60% of total plant motor energy. Furthermore, these surveys found that the average pumping efficiency is less than 40%, with 10% of the pumps operating below 10% efficiency. Pump over-sizing and throttled valves were identified as the two largest contributors to this sizable efficiency loss.

Engineering Strategies to Improve System Efficiencies

Pump system assessments help qualify and quantify the best opportunities to improve system energy efficiency and reliability. The following system modifications 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

Also, when performing system assessments, the following pump symptoms are good indicators of potential opportunity:

- Throttled valve
- Bypass line normally open
- Presence of cavitation noise
- Constant pump operation in a batch environment
- Multiple parallel pump system with the same number of pumps always operating

Energy Savings Opportunities in Pump Systems

Pump System Efficiency Measures	Range of Savings (% of System Energy)
Reduce Overall System Requirements:	
Equalize flow using holding tanks	10 – 20%; depends on initial design
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%

Source: Department of Energy, Office of Industrial Technology

Case Study

Appleton Coated, a large paper manufacturer with over 1,000 centrifugal pumps

An Energy Performance Services assessment yielded recommendations for 23 pumps, with a projected savings of $1.1 million in energy and maintenance costs, over a three-year period, based on a capital investment of $591,000.

Pump System Assessment

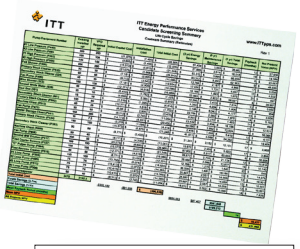
Pump System Assessment process overview

You can reduce pump system energy usage by 20 to 60 percent just by optimizing energy efficiency. Where there is excess energy usage, higher maintenance costs follow. In many cases, the maintenance costs savings are greater than the energy savings available through system optimization. These types of fundamental process improvements offer quantum leaps in performance.

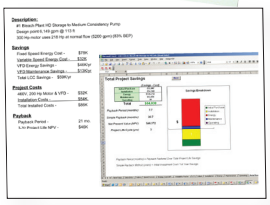
Pump System Assessment

The pump system assessment involves interviewing key personnel, collecting system data and analyzing system optimization alternatives. Detailed actionable reports, return on investment (ROI) estimates and implementation recommendations are key deliverables.

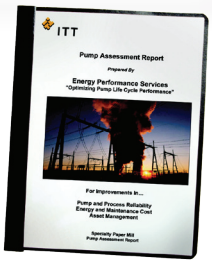
Technical and Economic Reports
A survey that collects summary system and enterprise data that are compiled into a financial analysis and recommendation report.



Pumping System Efficiency Assessment
A process that includes interviewing key personnel, collecting system data and analyzing system optimization alternatives.



Pump System Screening
ITT performs an initial survey to collect pump information and system drawings. The data are reviewed to prioritize savings opportunities.



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Key Performance Indicators

- Determining where you operate on the head-capacity (HQ) curve will help pinpoint system reliability and excess energy issues.
- The primary goal of the assessment is recommending mechanical and control changes that allow continuous operation near Best Efficiency Point (BEP).

Maximizing Reliability

- Automatically adjusting pump speed to control flow rate offers significant reductions in vibration, heat and noise.
- Closing bypass lines and eliminating control valves, through speed control, provides significant reductions in system head and extends MTBF.

Study Deliverables:

Report with detailed assessments, recommendations and economic analysis...

- **Economic Analysis (LCC)**
- **Pump modifications, i.e. impeller trim, rerates, replacement, VFD Control**
- **Reliability Improvement Index (Increase MTBF)**
- **Control strategies, potential raw material reduction and regulatory compliance**

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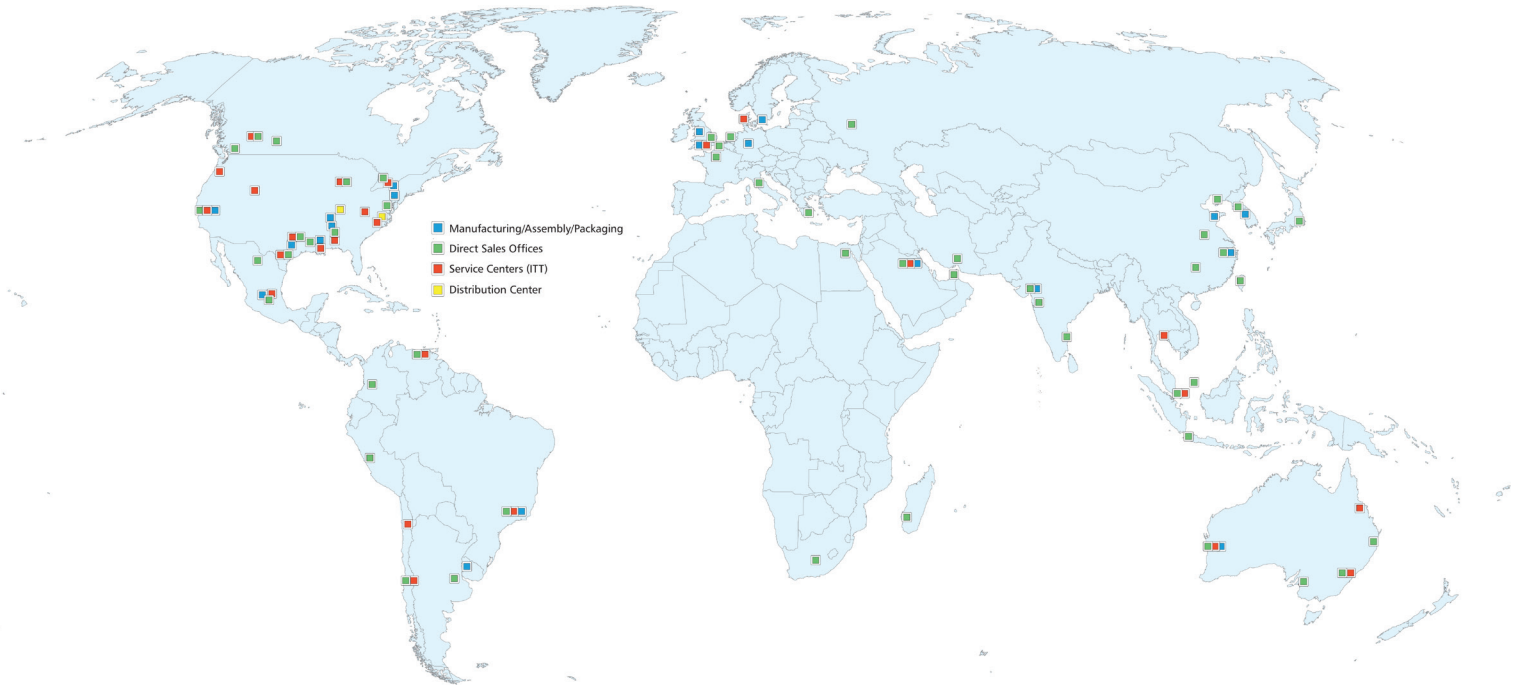

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