Improve the Energy Efficiency of Pump Systems

Pumping System Assessment Tool (PSAT) Saves Energy

The Pumping System Assessment Tool (PSAT) software uses data that is typically available or easily obtained in the field (e.g., pump head, flow rate, and motor power) to estimate potential energy and dollar savings in industrial pump systems. The software, developed by the U.S. Department of Energy (DOE) Industrial Technologies Program (ITP) is available at no cost for evaluating industrial pump systems.

Benefits of PSAT

- Establish system efficiency
- Quantify potential energy savings
- Examine the economic and energy impacts of different operating scenarios
- Provide data for trending system performance
- Clarify impacts of operational changes on demand charges
- Identify degraded or poorly performing pumps

Pump Prescreening

Use the PSAT prescreening filter to identify areas that are likely to offer the greatest savings. Look for symptoms associated with inefficient energy consumption:

- Throttle-valve control for the system
- Cavitation noise or damage in the system
- Continuous pump operation to support a batch process
- Constant number of parallel pumps supporting a process with changing demands
- Bypass or recirculation line normally open
- High system maintenance
- Systems that have undergone change in function.

Quantifying Potential Savings

PSAT identifies energy savings opportunities in pumping systems and quantifies those opportunities in both dollars and electrical energy savings. Although PSAT does not tell how to improve systems, it does prioritize attractive opportunities and supports broader or narrower searches for improving efficiency.

PSAT assesses current pump system operating efficiency by comparing field measurements of the power delivered to the motor with the fluid work (flow and head) required by the application. It estimates a system's achievable efficiency based on pump efficiencies (from Hydraulic Institute standards) and performance characteristics of pumps and motors (based on the MotorMaster+ database). Subsequent comparison of the actual and achievable efficiencies distinguishes systems with lower levels of opportunity from those that warrant additional engineering analysis.

Resources

To download the PSAT other free software tools and learn more about DOE Qualified Specialists and training opportunities, visit the ITP Web site, www.eere.energy.gov/industry/bestpractices.

Additionally, you can contact the EERE Information Center at 1-877-EERE-INF (1-877-337-3463), or via the Web at www.eere.energy.gov/informationcenter.

PSAT Gets Results

Large savings may come from one large application or process, but may also develop from multiple small applications that, when combined, keep total consumption low enough to avoid increased utility charges based on threshold demand.

At a gold mine, the PSAT prescreening filter identified three pumping systems for further analysis. More than $170,000 per year (2,398,200 kWh) in potential savings was identified.

Prescreening at a paper mill identified one system that presented a significant energy savings opportunity. The identified potential savings of more than $64,000 per year (2,252 MWh) were traced to inefficient operating practices rather than pump degradation.

Smaller facilities are not exempt from energy savings. An aluminum rolling mill applied PSAT to four related systems and identified more than $38,000 per year (1,015,000 kWh) in potential savings.

A pumping system assessment for an Alcoa plant in Pennsylvania identified savings in three systems. After prescreening, a PSAT analysis of the three systems identified $110,000 per year in potential savings.

A USX steel mill employed PSAT to examine its hood spray application that used bypass flow control. The mill discovered an opportunity to save $41,700 per year and use 13% less energy. The bypass flow control set-up was replaced with a properly sized pump and energy-efficient motor that would operate only when productive.

Pumping System Savings Identified by Industry*

Industry (No. of Assessments)	Average Energy Savings (Million Btu/year)	Average $ Savings (Annual)
Automotive (4)	24,105	$97,514
Cement (1)	3,005	$21,300
Chemical (5)	65,516	$416,422
Electronics (1)	13,287	$194,659
Food Processing (4)	3,445	$25,967
Forest Products (13)	23,075	$113,805
General Manufacturing (13)	25,702	$131,946
Glass (7)	9,792	$104,000
Mining (1)	387,609	$1,282,500
Petroleum (1)	49,865	$181,150
Steel (9)	74,990	$251,000

**As of September 2008.*

ITP provides U.S. industries with software assessment tools, training, technical information, and assistance. These resources and energy management practices help plants improve the energy efficiency of their process heating, steam, pumps, compressed air, and other systems; reduce operating costs; and improve their bottom line.

Support and Training

ITP offers a 1-day workshop on the PSAT, including how the software functions, what data is required, how to use the software when measured data is not available, and what the assessment results mean. DOE has developed a PSAT Specialist Qualification as an additional level of training for industry professionals who are interested in becoming proficient in using the software tool. In addition, ITP offers an introductory 2-hour Webcast on how to use the PSAT to identify energy savings opportunities. Visit ITP's online Training Calendar for a list of upcoming sessions: www.eere.energy.gov/industry/bestpractices/events_calendar.asp.

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

For More Information, please contact:

Industrial Technologies Program (ITP)
www.industry.energy.gov

EERE Information Center
1-877-EERE-INF (1-877-337-3463)
www.eere.energy.gov/informationcenter

Prepared by NREL, a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

DOE/GO-102008-2728
December 2008