

MDM-DOE ITP Webcast

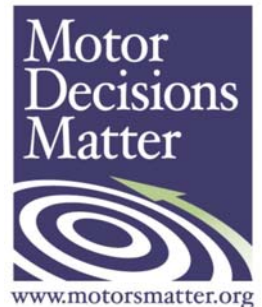
April 20, 2011

2 - 3 p.m. Eastern

Tools for Motor System Management : An Introduction to the DOE ITP Tool Suite

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



Today's Web cast

- MDM Campaign
 - Tools to get started with motor management
- DOE Tools for Motor System Management
 - Quick Plant Energy Profiler (QuickPEP)
 - Fan System Assessment Tool (FSAT)
 - Pumping System Assessment Tool (PSAT)
 - AirMaster+
- Questions and Answers

MDM Sponsors

Efficiency Programs

- Alliant Energy
- BC Hydro
- Efficiency Vermont
- Long Island Power Authority (LIPA)
- MidAmerican Energy Company
- National Grid USA
- New Jersey Office of Clean Energy
- NYPA
- NYSERDA
- Northwest Energy Efficiency Alliance
- Pacific Gas & Electric (PG&E)
- Southern California Edison (SCE)
- Tennessee Valley Authority (TVA)
- Xcel Energy

Manufacturers – Motor & Drive

- ABB
- Danfoss
- GE Energy Motors
- TECO-Westinghouse Motor Company

Other Organizations

- Advanced Energy
- Copper Development Association, Inc. (CDA)
- Electrical Apparatus Service Association (EASA)

For more information, visit: <http://www.motorsmatter.org/sponsors/>

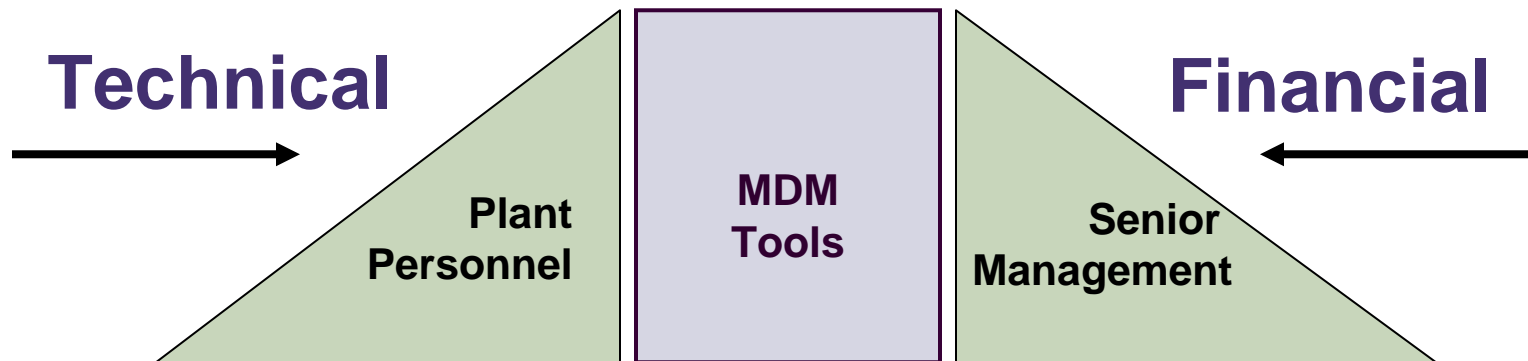
Motor Decisions MatterSM

Managed by CEE, a national awareness campaign to:

- Encourage sound motor management, including:
 - Demonstrate financial benefits of life cycle cost analysis
 - Inform repair/replace decision-making
 - Promote premium efficiency motors and best practice motor repair
- Collaborate nationally to enhance local effectiveness

MDM Scope

To promote **proactive** motor management to both facility and senior-level managers



Get Started with MDM Tools

Concept Tools

- Motor Planning Kit
- How-to Guide
- Case Studies
- MDM e-Newsletter

Calculation Tools

- 1*2*3 Spreadsheet
- 1*2*3 User's Guide
- Simple Savings Chart
- MotorSlide Calculator

www.motorsmatter.org

Save Energy Now Tools and Resources

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



Save
ENERGY
Now®

Bill Orthwein, CEM
Industrial Technologies Program
Office of Energy Efficiency & Renewable Energy
U.S. Department of Energy

Save Energy Now Services



Goal: Drive a 25% reduction in industrial energy intensity in 10 years

Tools

- Process Heating
- Steam Systems
- Plant Energy Profiler
- Motors & Pumps
- Fans



Standards

- SEP Plant Certification



Training

- Basic
- Advanced
- Qualified Specialist



Information

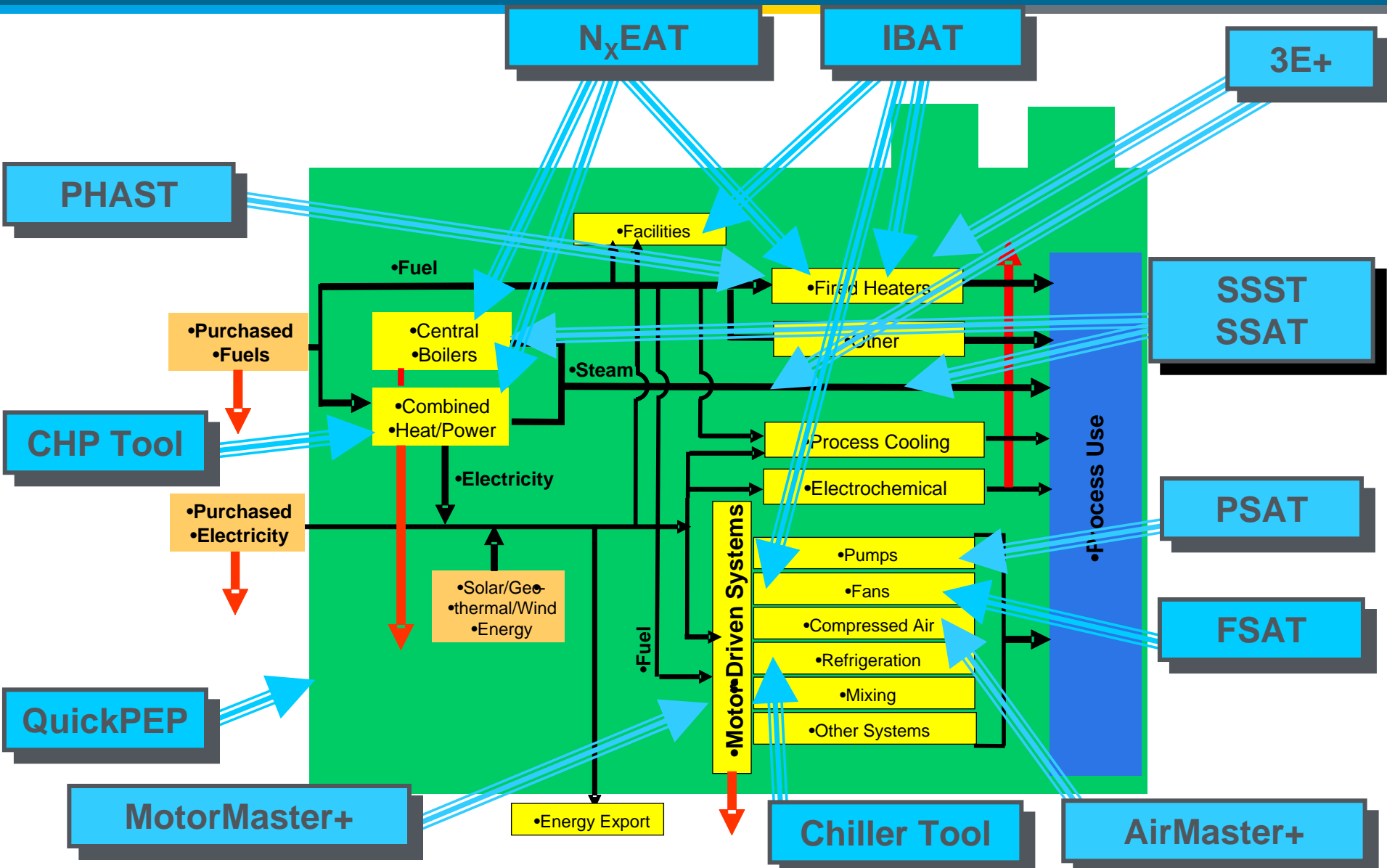
- Website
- Information Center
- Tip Sheets
- Case studies
- Webcasts
- Emerging Technologies



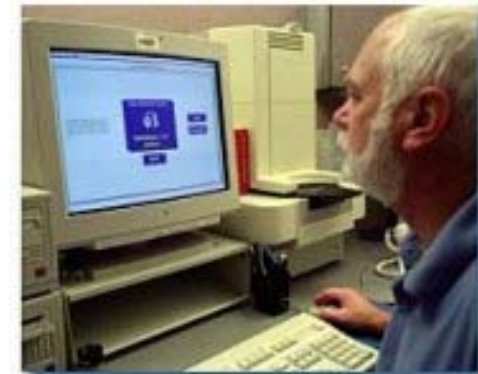
Assessments

- Energy Savings Assessments
- Industrial Assessment Centers





- **Motor Master +** Assists in energy-efficient motor selection and management. (International)
- **Pumping System Assessment Tool** Assesses the efficiency of pumping system operations.
- **Fan System Assessment Tool** quantifies potential benefits of a more optimally configured fan system.
- **Air Master+** Provides comprehensive information on assessing compressed air systems.
- **Industrial Facilities Tool** Assesses HVAC, Lighting .. upgrade opportunities.



- **Steam System Scoping Tool** Profiles and grades large steam system operations/management.
- **Steam System Assessment Tool** Assesses potential benefits of specific steam-system improvements.
- **3EPlus Insulation Assessment Tool** Calculates most economical thickness of insulation for a variety of operating conditions.
- **Plant Energy Profiler** profiles plant energy supply along consumption streams and identifies energy savings opportunities.
- **Process Heating Assessment and Survey Tool** Assesses energy use in furnaces, ovens and kilns along with performance improvements.
- **Energy Management Tool Suite** integrates ITP's technical solutions system based tools along with additional Energy Management Best Practice support capabilities.

Plant Energy Profiler (PEP) and Integrated Tool Suite

Provides a mill or plant a quick method for answering these questions:

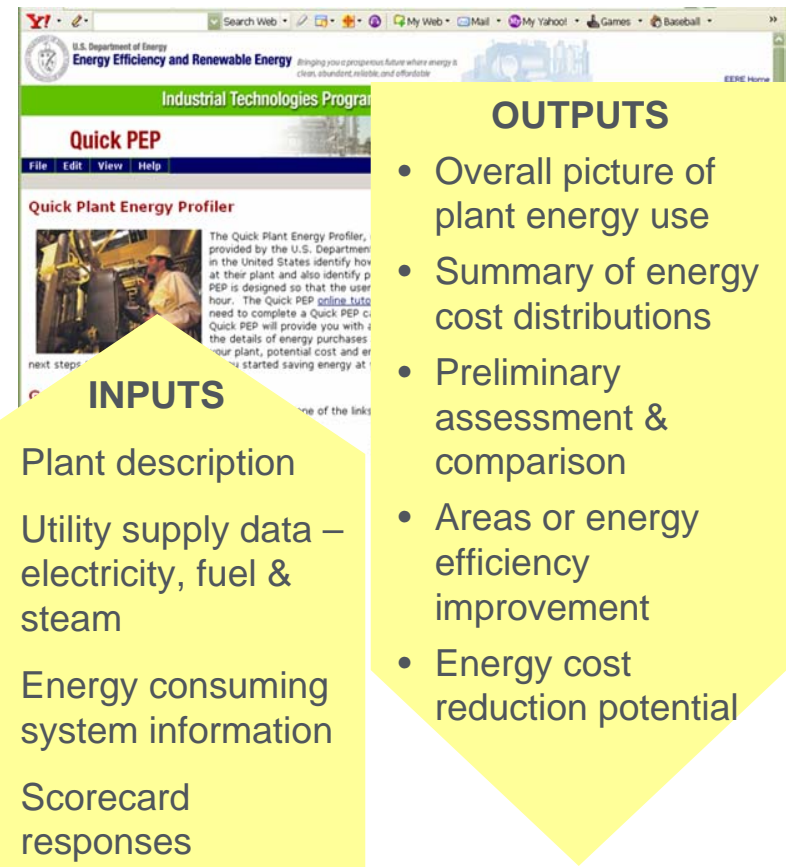
- Where is my energy going?
- What is my potential for improvement?
- What resources are available to help me?

Within a few hours you will have :

- An overall picture of plant energy use
- A summary of energy cost distribution
- Estimated energy cost savings potential

At minimum, you will need :

- A monthly bill for each purchased energy stream (electricity, fuel & steam)
- Plant production data for the same month (optional)



The screenshot shows a web browser window displaying the 'Quick PEP' (Quick Plant Energy Profiler) interface. The page header includes the U.S. Department of Energy logo and the text 'Energy Efficiency and Renewable Energy'. Below the header, there is a navigation menu with 'File', 'Edit', 'View', and 'Help'. The main content area features a title 'Quick Plant Energy Profiler' and a sub-header 'The Quick Plant Energy Profiler, provided by the U.S. Department of Energy...'. A yellow callout box labeled 'INPUTS' is overlaid on the left side of the screenshot, listing the required data for the tool. Another yellow callout box labeled 'OUTPUTS' is overlaid on the right side, listing the results generated by the tool.

INPUTS

- Plant description
- Utility supply data – electricity, fuel & steam
- Energy consuming system information
- Scorecard responses

OUTPUTS

- Overall picture of plant energy use
- Summary of energy cost distributions
- Preliminary assessment & comparison
- Areas or energy efficiency improvement
- Energy cost reduction potential

ITP's online QuickPEP and off-line Integrated Tool Suite provide baselining, and profiles plant energy purchases along with major systems that consume energy so as to help industrial plant personnel understand how their energy is being utilized and how they can save energy and money.

QP and Integrated Tool Suite have Enhanced Base Lining Capability

- Multiple units of production within one or more plants
- Applicable to both 25 in 10 pledge and non-pledge end users

QP and Integrated Tool Suite have a Carbon Footprint Calculator

- Based on up to 24 energy sources
- Tracks absolute changes of annual energy use
- Tracks absolute changes in annual CO2 emissions

http://www1.eere.energy.gov/industry/quickpep_ml/

Motor Decisions are made easier by MotorMaster+

Decide correctly with a motor systems management plan.



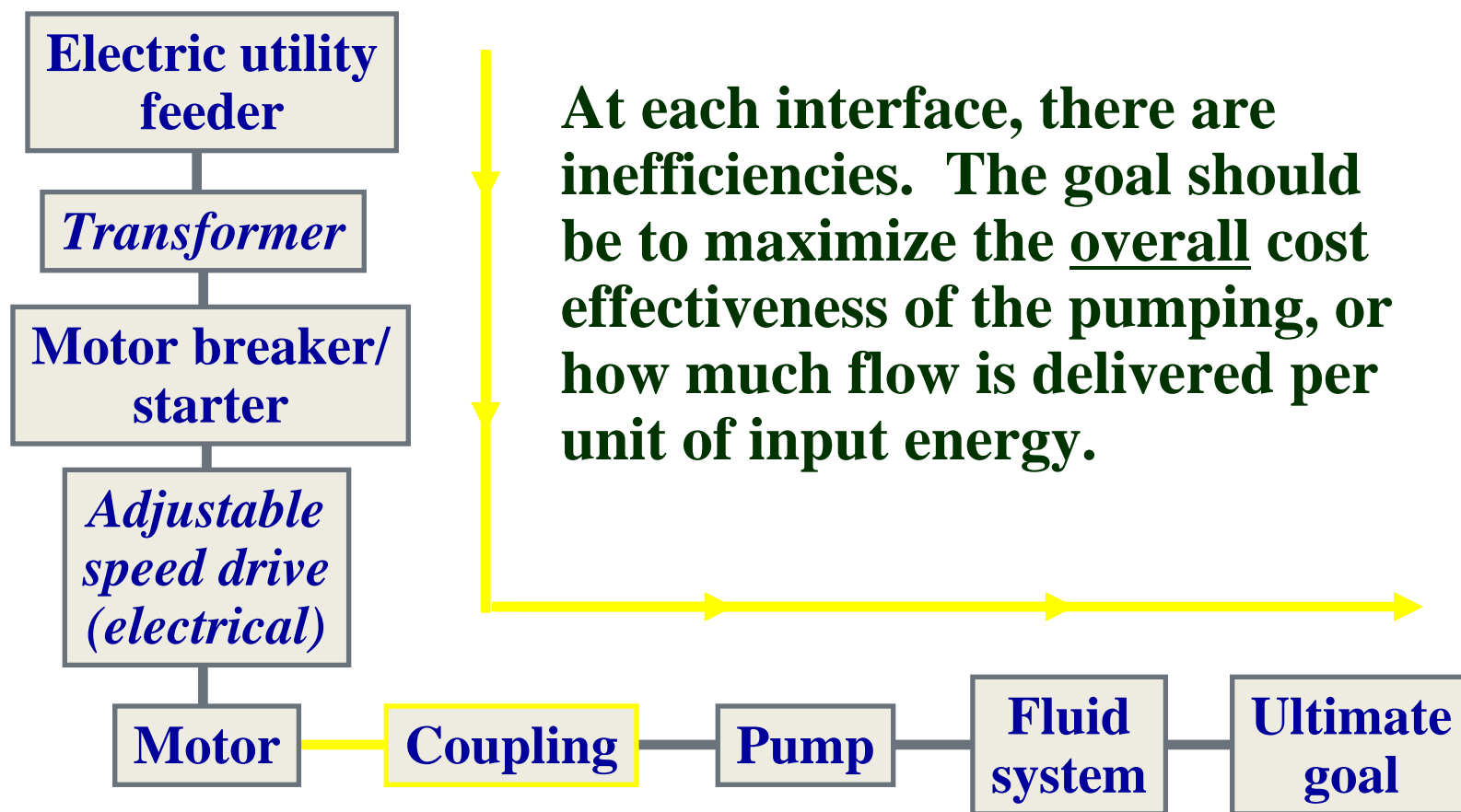
- Fan System Assessment Tool
 - Developed by the U.S. Department of Energy (DOE)
- FSAT will:
 - Calculate fan system energy use
 - Determine system efficiency
 - Quantify optimization savings

- Use the Fan System Optimization checklist to:
 - Identify poorly performing fan systems
 - Justify resources to develop project ideas into implementation plans
- Use the FSAT Tool at your plant to:
 - Identify cost impacts of poorly performing fan systems
 - Identify cost effective projects
 - Justify capital projects at corporate level
 - Benchmark individual systems at the plant level

Application of the Pumping System Assessment Tool

- Goal: to assist pump users in identifying pumping systems that are the most likely candidates for energy and cost savings
- Requires field measurements or estimates of flow rate, pressure, and motor power or current
- Uses pump and motor performance data from Hydraulic Institute standard ANSI/HI-1.3 and MotorMaster+ to estimate existing, achievable performance

Big picture perspective of energy flow for pumping systems



Applying the PSAT tool to the measured conditions shows significant potential savings

Pump, motor, system information:

Pump style: API double suction

Pump nameplate speed, rpm: 1785

Fluid viscosity (cS): 1.0 Specific gravity: 1.00

Number of stages: 1

Std nameplate hp: 350

Motor nameplate speed, rpm: 1785

Existing motor class: Standard efficiency

Nominal motor voltage, volts: 2300

Operating parameters:

Operating fraction: 1.000

Electricity cost, cents/kwhr: 5.40

Measured or required conditions:

Measured flow rate: 1200 gpm

Measured head: 367.0 ft

Load estimation method: Power

Measured power: 154.0 kWe

Measured bus voltage: 2370

Input basis:

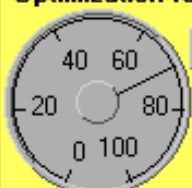
Measured Required

STOP

	Existing pump, motor	Existing pump, EE motor	Optimal pump, EE motor
Pump efficiency, %	57.4	57.4	72.5
Motor rated hp	350	350	200
Shaft power, hp	193.6	193.6	138.6
Motor efficiency, %	93.8	95.3	95.6
Motor power factor, %	79.6	79.7	82.5
Motor current, amps	47.1	46.3	31.9
Electric power, kWe	154.0	151.5	108.2
Annual energy, MWhr	1349.0	1327.3	947.4
Annual cost, \$1,000	72.8	71.7	51.2
Annual savings, \$1,000	0.0	1.2	21.7

Size margin (%) for optimal pump motor: 25

Optimization rating



70.2

Click for background information

Potential annual savings ~ \$22K

Existing summary file: CREATE NEW

Facility: Y-12, Fusion System: Demineralized water Date: January 26, 1999

Application: Low pressure pump J104 Evaluator: Don Casada

Notes: Current and voltage monitored from secondary of CT's, PT's; head from suction, discharge test gauges. Flow rate estimated from head curve. (Data acquired following J102 motor replacement with 6-pole motor)

Using the required head estimate instead of the actual operating head could yield much greater savings

Pump, motor, system information:

Pump style: API double suction

Pump nameplate speed, rpm: 1785

Fluid viscosity (cS): 1.0 Specific gravity: 1.00

Number of stages: 1

Std nameplate hp: 350

Motor nameplate speed, rpm: 1785

Existing motor class: Standard efficiency

Nominal motor voltage, volts: 2300

Operating parameters:

Operating fraction: 1.000

Electricity cost, cents/kwhr: 5.40

Measured or required conditions:

Required flow rate: 1200 gpm

Required head: 140.0 ft

Load estimation method: Power

Measured power: 154.0 kWe

Measured bus voltage: 2370

Input basis:

Measured

Required

Facility: Y-12, Fusion System: Demineralized water Date: January 26, 1999

Application: Low pressure pump J104 Evaluator: Don Casada

Notes: Current and voltage monitored from secondary of CT's, PT's. Flow rate estimated from head curve. (Data acquired following J102 motor replacement with 6-pole motor). The head and flow rate represent estimate requirements (head is conservatively high).

STOP

	Existing pump, motor	Existing pump, EE motor	Optimal pump, EE motor
Pump efficiency, %	21.9	21.9	79.3
Motor rated hp	350	350	75
Shaft power, hp	193.6	193.6	52.9
Motor efficiency, %	93.8	95.3	94.7
Motor power factor, %	79.6	79.7	81.2
Motor current, amps	47.1	46.3	12.5
Electric power, kWe	154.0	151.5	41.7
Annual energy, MWhr	1349.0	1327.3	365.0
Annual cost, \$1,000	72.8	71.7	19.7
Annual savings, \$1,000	0.0	1.2	53.1

Size margin (%) for optimal pump motor: 25

Optimization rating

Click for background information

Potential annual savings ~ \$53K

AirMaster+: A Compressed Air Systems Assessment Tool

AirMaster Plus can be used to baseline a compressed air system and then evaluate the energy savings from seven EEM's:

- Reduce Plant Air Leaks
- Adjust Manual Staging
- Use Unloading Controls
- Reduce System Pressure
- Sequence Compressors
- Reduce Run Time
- Add Primary Storage

Savings Summary Report

Efficiency Measures

Facility: Main Facility Scenario: First EEM
System: Primary System

Data Entry **Savings Summary** Graph

Description	Peak Demand (kW)	Demand (\$)	Energy (kWh)	% Energy Use	Energy (\$)	Cost Savings (\$)	Installed Cost (\$)	Simple Payback (years)
Fix Leaks	14.5	755	79963	0.099	2399	3154	1000	0.3
Use efficient nozzles	26.2	1365	48638	0.06	1459	2824	800	0.3
Reduce Pressure	15.2	793	82646	10.3	2479	3272	100	0
Fix Unloading Controls	0	0	151791	18.9	4554	4554	1200	0.3
Add Sequencing	15.9	829	20345	2.5	610	1439	3000	2.1
Reduce Runtime	0	0	41517	5.2	1246	1246	0	0
TOTALS	71.7	3742	424901	52.8	1246	16489	6100	0.4

2006, 2007, 2008, 2009 and 2010 Annual Saving Opportunities

System Area	Identified Annual Savings			Implemented Annual Savings		
	# of completed ESA's	Identified Source Energy Savings Upgrades (TBtu)	Identified Cost Savings (\$)	Implemented Source Energy Savings (TBtu)	Implemented Cost Savings (\$)	Implemented CO2 Savings (metric tons)
Compressed Air	180	4.16	\$25,189,079	0.95	\$4,933,793	55,448
Fans	49	7.98	\$46,799,535	0.09	\$498,984	5,001
Process Heating	251	49.82	\$336,855,383	5.7	\$43,347,439	304,025
Pumps	91	3.28	\$17,854,107	0.17	\$936,696	9,768
Steam	347	82.64	\$660,622,410	21.02	\$114,021,919	1,567,503
Multi System Paper	23	8.17	\$56,825,900	0.54	\$2,172,294	8,739
Total	941	156.1	\$1,144,146,415	28.4	\$165,911,125	1,950,482

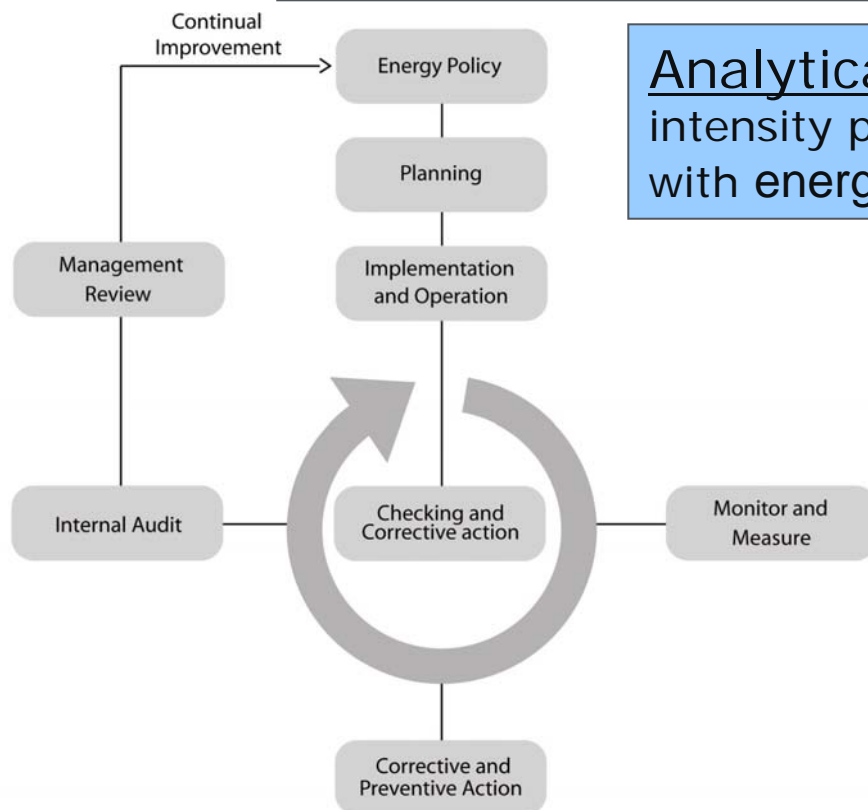
Strategy: Continual improvement using ISO 50001 framework supporting Save Energy Now Leaders and ANSI plant certification through step-by-step energy management planning process

Multi-User Capability: Energy specialists, plant managers, energy champions, plant technicians, suppliers, utilities

Analytical focus: Energy & carbon footprint, energy intensity performance tracking, carbon reduction along with energy systems analysis.

Example Outputs:

- Energy management plan
- Simple energy saving project analysis
- Energy system assessments
- Documented energy/carbon reduction



- EMTS to support sustained energy management through a sequence of planning, doing, checking, and acting activities.
- EMTS user to allow a flexible drilled process of profiling, scorecards, detailed energy project and or systems analysis, and implementation solution analysis so as to enable the user to continually implement of energy savings projects in the long-term.
- Project Tracker spreadsheet that prioritizes potential and completed energy efficient and CO2 reduction projects within a plant based on payback and IRR.

ITP Energy Management Portal: The entire system/delivery mechanism for information on *Save Energy Now LEADER activities*, Energy Management Solutions including self-paced technical assistance, *and* ITP's Software Tools.

Energy Management Toolkit:

Self-Paced Technical Assistance: module allows companies to systematically walk through various aspects of energy management best practices such as: energy management plan development; baseline/profiling; project prioritization; implementation-financing; purchasing tracking progress, etc.

Energy Plan Generator: Access database tool designed to generate energy management plans

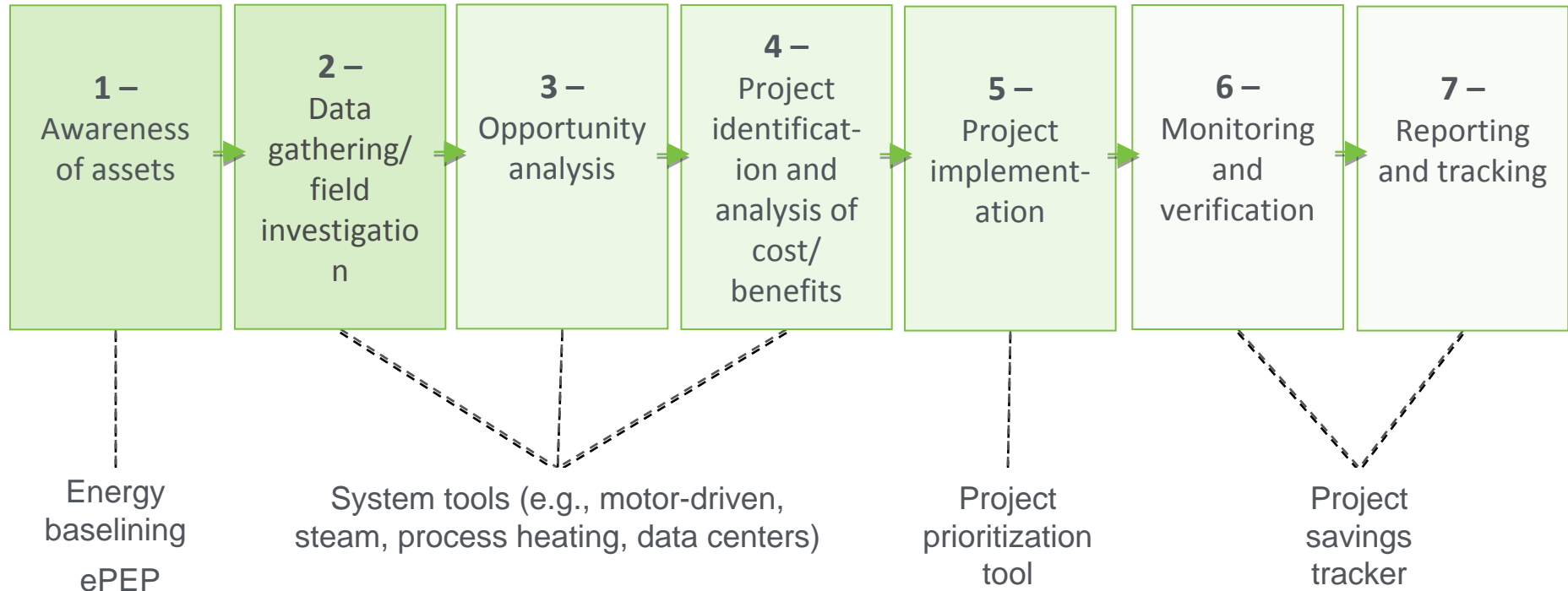
Software Tools: Access to system-focused decision support tools

Simple and advanced tools at three levels:

- **Corporate** (portfolio of industrial facilities)
 - Corporate Energy Baseline
 - Project Prioritization and Tracking
 - Self-Paced Energy Management System
- **Facility** (portfolio of projects at an individual facility)
 - Energy Use Profiler (ePEP)
 - Project Savings Tracker (energy and financial)
 - Advanced scorecards
 - Mobile apps for specific energy applications
- **Project**
 - System-level Energy Efficiency Opportunity Tools
 - Industrial plants and commercial buildings
 - Advanced scorecards
 - Mobile apps for specific



Seven Step Implementation Process for Energy Savings



ITP tools support facility staff—at all steps in the implementation process—in continually improving energy management and capturing savings

Training at several levels for:

- Awareness webcasts (*1-2 hours*)
 - Four-part energy management series
 - Tool specific
- Online, self-paced end-user training
- Qualified Specialist training and certification (*2 days*)
- Certified Practitioner training and credentialing (*2-3 days*)
 - Energy Management
 - Systems
- Data Center Energy Practitioner training and certification (*1-3 days*)



See www.eere.energy.gov/industry for details

- Energy Efficiency and Renewable Energy Information Center:
1-877-EERE-INF (1-877-337-3463) or eereic@ee.doe.gov
or <http://www1.eere.energy.gov/industry/>
- Paul Scheihing, ITP Technical Assistance Supervisor
(202) 586-7234
- Scott Hutchins, Trade Organizations and Partnerships
(202) 586-0670
- Sandy Glatt, States and Utilities
(303) 275-4857
- Bill Orthwein, Tools and Training (202) 586-3807

Contact Information

- DOE Industrial Technologies Program
 - www1.eere.energy.gov/industry/
 - www1.eere.energy.gov/industry/bestpractices
- Motor Decisions Matter Campaign
 - www.motorsmatter.org
 - Email: mdminfo@cee1.org

Upcoming MDM Webcast

Motor Management Truths and Consequences: Understanding Electric Motor Rewinds and Efficiency

- Featured Speaker: Tom Bishop, PE, Senior Technical Support Specialist, EASA
- May 25, 2-3:00 pm ET
- Participation info:
www.motorsmatter.org/events/calendar.asp