

Technology Delivery Products and Services



Tools

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



Standards

- Plant Certification



Training

- Basic
- Advanced
- Qualified Specialist



Information

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



Assessments

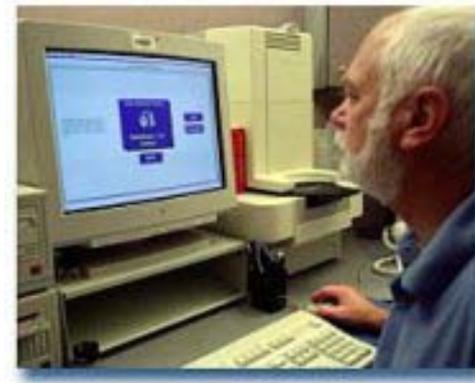
- Energy Savings Assessments
- Industrial Assessment Centers



DOE Power Based Software Decision Support Tools Available via the Website

<http://www1.eere.energy.gov/industry/bestpractices/software.html>

- ❑ **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.



DOE Fuel Based Software Decision Support Tools Available via the Website

<http://www1.eere.energy.gov/industry/bestpractices/software.html>

- ❑ **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.
- ❑ **Process Heating Assessment and Survey Tool** Assesses energy use in furnaces, ovens and kilns along with performance improvements
- ❑ **NOx and Energy Assessment Tool (NxEAT)**
- ❑ **Combined Heat and Power Application Tool (CHP)**
- ❑ **Plant Energy Profiler** profiles plant energy supply along consumption streams and identifies energy savings opportunities



Tool Metrics

2006, 2007, 2008 and 2009 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	159	3.64	\$21,934,963	0.86	\$4,344,690	50,312
Fans	41	7.86	\$46,023,860	0.09	\$503,314	5,159
Process Heating	240	49.34	\$333,236,000	5.39	\$41,180,702	287,326
Pumps	86	3.18	\$17,276,061	0.21	\$1,056,990	12,012
Steam	329	79.05	\$639,215,771	19.91	\$106,821,375	1,504,633
Multi System Paper	20	7.98	\$55,637,900	0.17	634,000	1,322
Total	875	151.05	\$1,113,324,555	26.63	\$154,541,071	1,860,764

Application of the Pumping System Assessment Tool



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An introduction to the Pumping System Assessment Tool (PSAT)

- 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



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

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, kW _e	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

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 kW_e

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; head from suction, discharge test gauges. Flow rate estimated from head curve. (Data acquired following J102 motor replacement with 6-pole motor)

Existing summary files
CREATE NEW

Log current data Retrieve Log data Create new or append existing summary file -->

Size margin (%) for optimal pump motor: 25

Optimization rating

70.2

Click for background information

Potential annual savings ~ \$22K





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

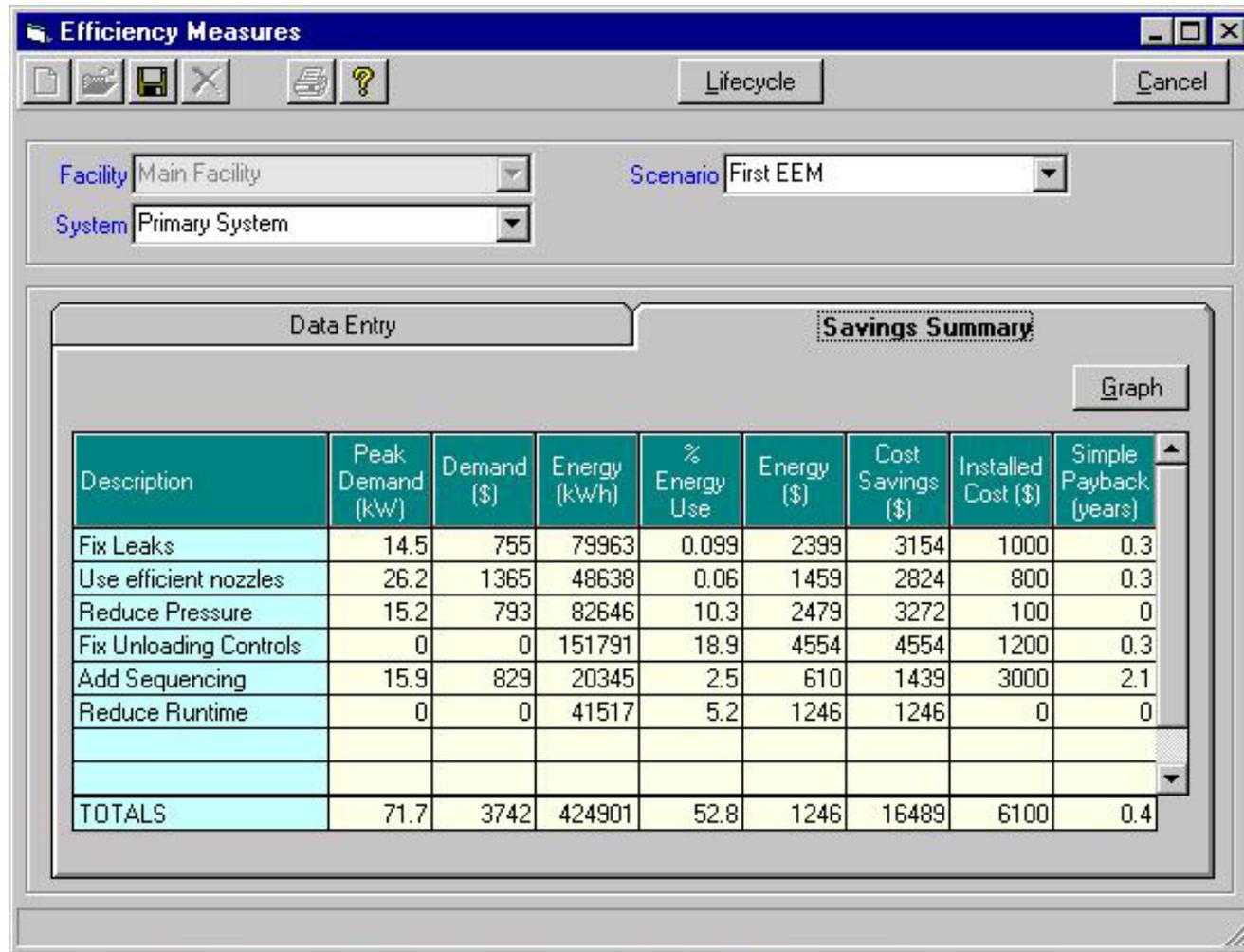


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Savings Summary Report



Steam System Assessment Tool (SSAT)

□ PURPOSE:

- Demonstrate the magnitude of energy, cost, and emission savings related to specific steam system improvement opportunities

□ AUDIENCE:

- Engineers involved with operation and/or improvement of steam systems



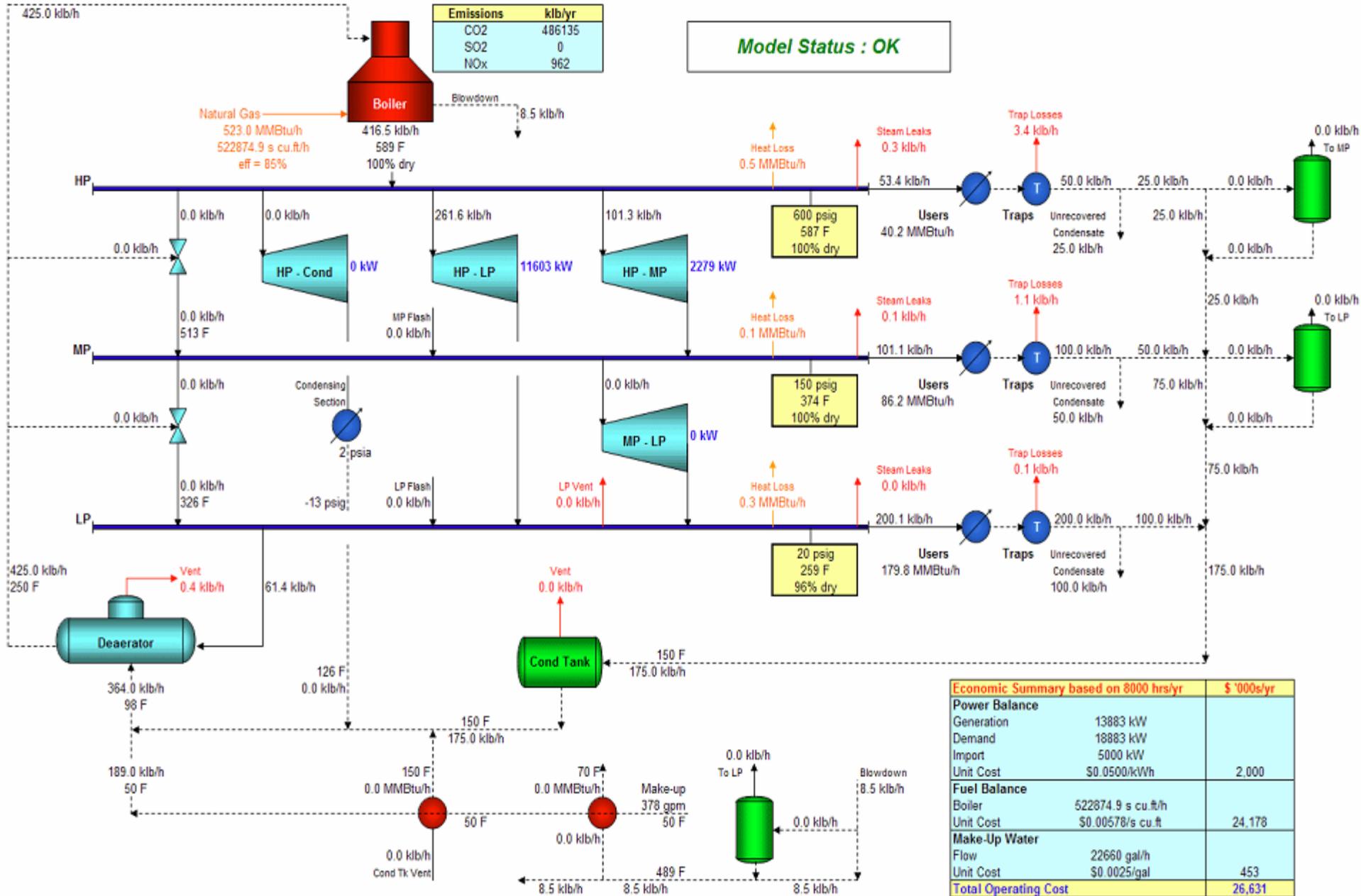
Steam System Assessment Tool

SSAT Default 3 Header Model

Current Operation

Emissions	klb/yr
CO2	486135
SO2	0
NOx	962

Model Status : OK



Economic Summary based on 8000 hrs/yr		\$ '000s/yr
Power Balance		
Generation	13883 kW	
Demand	18883 kW	
Import	5000 kW	
Unit Cost	\$0.0500/kWh	2.000
Fuel Balance		
Boiler	522874.9 s cu.ft/h	
Unit Cost	\$0.00578/s cu.ft	24.178
Make-Up Water		
Flow	22660 gal/h	
Unit Cost	\$0.0025/gal	453
Total Operating Cost		26,631

You Can Use SSAT To Evaluate These Key Steam Improvement Initiatives

- ❑ Real Cost Of Steam
- ❑ Steam Quality
- ❑ **Boiler Efficiency**
- ❑ Alternative Fuels
- ❑ Cogeneration Opportunities
- ❑ Steam Turbines vs PRVs
- ❑ Boiler Blowdown
- ❑ **Condensate Recovery**
- ❑ **Steam Trap Operating Efficiency**
- ❑ Heat Recovery
- ❑ Vent Steam
- ❑ Steam Leaks
- ❑ Insulation Efficiency
- ❑ Emissions Calculations



Steam System Assessment Tool

3 Header Model

Results Summary

SSAT Default 3 Header Model

Model Status : OK

Cost Summary (\$ '000s/yr)	Current Operation	After Projects	Reduction	
Power Cost	2,000	2,000	0	0.0%
Fuel Cost	24,178	22,835	1,343	5.6%
Make-Up Water Cost	453	453	0	0.0%
Total Cost (in \$ '000s/yr)	26,631	25,288	1,343	5.0%

On-Site Emissions	Current Operation	After Projects	Reduction	
CO2 Emissions	486135 klb/yr	459127 klb/yr	27007 klb/yr	5.6%
SOx Emissions	0 klb/yr	0 klb/yr	0 klb/yr	N/A
NOx Emissions	962 klb/yr	909 klb/yr	53 klb/yr	5.6%

Power Station Emissions	Reduction After Projects		Total Reduction	
CO2 Emissions	0 klb/yr		27007 klb/yr	-
SOx Emissions	0 klb/yr		0 klb/yr	-
NOx Emissions	0 klb/yr		53 klb/yr	-

Note - Calculates the impact of the change in site power import on emissions from an external power station. Total reduction values are for site + power station

Utility Balance	Current Operation	After Projects	Reduction	
Power Generation	13883 kW	13883 kW	-	-
Power Import	5000 kW	5000 kW	0 kW	0.0%
Total Site Electrical Demand	18883 kW	18883 kW	-	-
Boiler Duty	523.0 MMBtu/h	494.0 MMBtu/h	29.1 MMBtu/h	5.6%
Fuel Type	Natural Gas	Natural Gas	-	-
Fuel Consumption	522874.9 s cu.ft/h	493826.3 s cu.ft/h	-	-
Boiler Steam Flow	416.5 klb/h	416.5 klb/h	0.0 klb/h	0.0%
Fuel Cost (in \$/MMBtu)	5.78	5.78	-	-
Power Cost (as \$/MMBtu)	14.65	14.65	-	-
Make-Up Water Flow	22660 gal/h	22660 gal/h	0 gal/h	0.0%



Process Heating Assessment and Survey Tool (PHAST)

Process Heating Assessment and Survey Tool (PHAST)



Introduction Plant/Equipment Information Furnace Analysis - Heat Balance

Reports Import Plant Information Export Plant Information

Click on the Desired Button For Information

[Exit Application](#)

  [Development supported by E3M Inc.](#)

Phone : 240.715.4333 E-Mail : athekdi@e3minc.com
Fax : 301.208.9077

This Application is developed by Oak Ridge National Laboratory in cooperation with Industrial Heating Equipment Association (IHEA) and a subcommittee consisting of members from major industries and equipment suppliers acting as advisor for the tool development.



Process Heating Assessment and Survey Tool (PHAST)

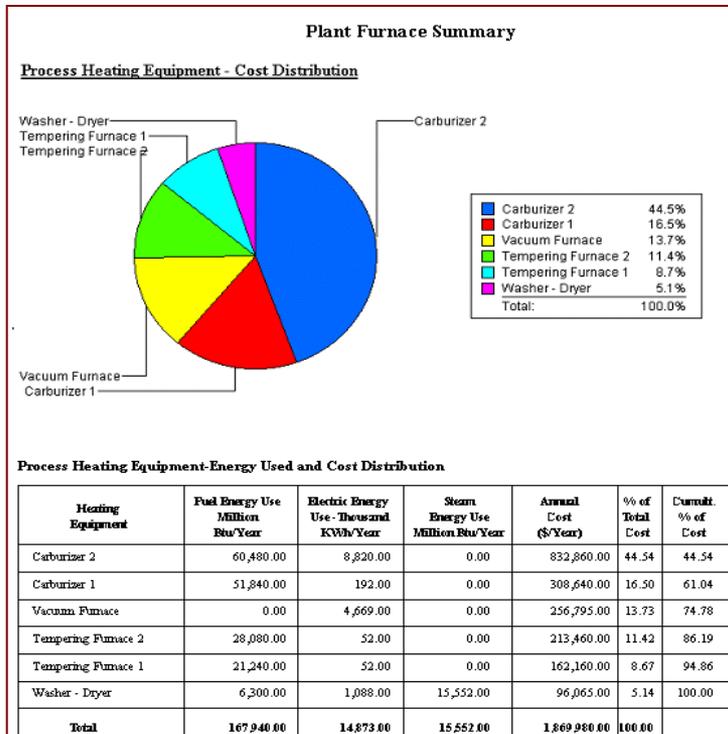


What is PHAST?

- ❑ A tool that can be used to:
- ❑ Estimate annual energy use and energy cost for furnaces and boilers in a plant
- ❑ Perform detail heat balance and energy use analysis that identifies areas of energy use, efficiency and energy losses for a furnace
- ❑ Perform “what-if” analysis for possible energy reduction and efficiency improvements through changes in operation, maintenance and retrofits of components/systems
- ❑ Obtain information on energy saving methods and identify additional resources



Plant Energy Use and Cost Distribution Report*



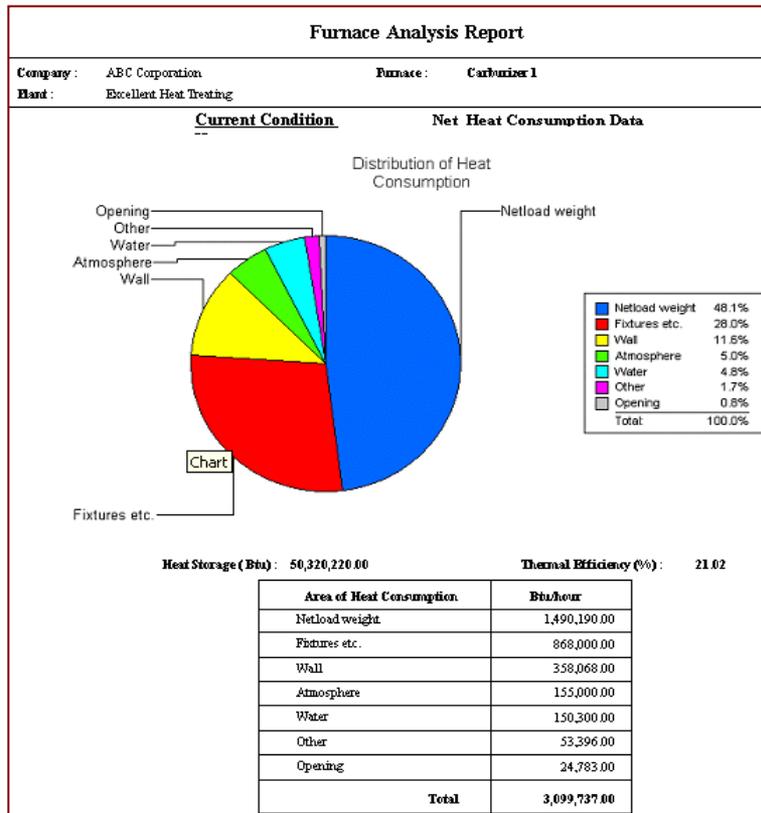
The report shows

- Estimated annual energy use and estimate annual cost of energy for heating equipment (furnaces, ovens etc.)
- List of heating equipment and % of total energy cost used for each equipment in order of annual cost of energy used.

* for the Surveyed Process Heating Equipment



Furnace Heat Balance Energy Use – Losses Distribution



The report shows

- Analysis of energy used in various parts of a furnace under a given operating condition.



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Plant Name Test Petroleum plant - US **Furnace Name** Cat Cracker

Other Losses
Flue Gas Losses/Heating System Efficiency
Heat Storage

Water - Cooling Losses
Wall Losses
Opening Losses

Load/Charge Material
Fixtures, Trays, Baskets etc. Losses
Atmosphere Losses

Select Type Solid Liquid Gas

	Current	Modified
Type of Material	Gasoline stock	Gasoline stock
Charge (Liquid)-Feed Rate (lb/hr)	55000	55000
Initial Temp. (Degree F)	325	325
Discharge Temp. (Degree F)	750	750
Charge Liquid Vaporized (% of Charge)	100	100
Charge Reacted (%)	0	0
Heat of Reaction (Btu/lb)	100 Endothermic	100 Endothermic
Additional Heat Required (Btu/hr)	0	0
Heat Required (Btu/hr)	22,341,000	22,341,000

Comments

← Previous Next →

Current Net Heat Required (Btu/hr) **24,075,899** Furnace Summary Enter/Edit Current Data

Modified Net Heat Required (Btu/hr) **23,696,425** Report Close

Furnace Data
[X]

File Help

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Plant Name Test Petroleum plant - US **Furnace Name** Cat Cracker

Other Losses	Flue Gas Losses/Heating System Efficiency	Heat Storage
Water - Cooling Losses	Wall Losses	Opening Losses
Load/Charge Material	Fixtures, Trays, Baskets etc. Losses	Atmosphere Losses

Select Type Solid Liquid Gas

	Current	Modified
Type of Material	<input type="button" value="New"/> Gasoline stock	Gasoline stock
Charge (Liquid)-Feed Rate (lb/hr)	55000	55000
Initial Temp. (Degree F)	325	550
Discharge Temp. (Degree F)	750	750
Charge Liquid Vaporized (% of Charge)	100	100
Charge Reacted (%)	0	0
Heat of Reaction (Btu/lb)	100 Endothermic	100 Endothermic
Additional Heat Required (Btu/hr)	0	0
Heat Required (Btu/hr)	22,341,000	14,668,500

← Previous
Next →

Current Net Heat Required (Btu/hr)	24,075,899		Furnace Summary		Enter/Edit Current Data
Modified Net Heat Required (Btu/hr)	16,023,925				Report
					Close

Plant Energy Profiler (PEP) Tool

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

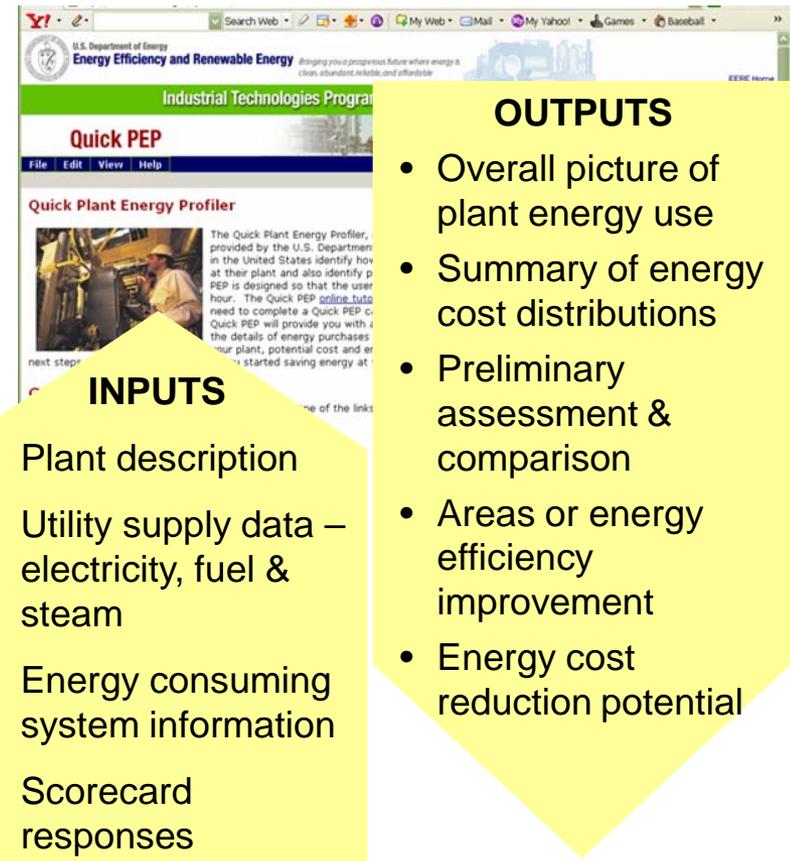
- Where is my energy going?
- What is my potential for improvement?
- What resources are available to help me?

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)



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



Base Lining and Carbon Foot Printing

ITP's online QuickPEP tool provides base lining, 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.

QuickPEP 2.0 has 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

QuickPEP 2.0 also has 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



ITP Energy Management Tool Suite

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

