

Boost Process Heating Efficiency

Use the Process Heating Assessment and Survey Tool (PHAST) to identify opportunities for saving energy.

PHAST Functions

Use the **Process Heating Assessment and Survey Tool (PHAST)** to survey all process heating equipment within a facility, select the equipment that uses the most energy, and identify ways to increase efficiency. Also use it to assess equipment performance under various operating conditions and “what-if” scenarios.

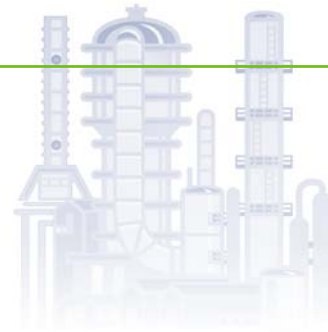
The software provides instructions on how to obtain the data for each step with commonly available instruments—without affecting production. It also supplies data on the thermal properties of commonly processed materials.

PHAST serves three specific purposes:

1. PHAST provides easy-to-use tools to **calculate the potential savings** that a plant can achieve by applying various energy-saving measures. Based on user-supplied equipment parameters, the tools, or “calculators,” compare the energy performance of individual pieces of equipment under various operating conditions.

2. PHAST surveys all equipment that uses fuel, steam, or electricity for heating. Based on facility-specific heat input and furnace operating data, the tool reports how much fuel, electricity, and steam each piece of equipment uses annually—plus the estimated annual energy costs. Energy-efficiency improvements can thus **focus on the pieces of equipment that use the most energy**.
3. PHAST constructs a detailed heat balance for selected pieces of process heating equipment. The process considers all areas of the equipment in which energy is used, lost, or wasted. Results of the heat balance **pinpoint areas of the equipment in which energy is wasted or used unproductively**.

PHAST produces a summary report on energy use in specific pieces of equipment and throughout the process heating system. The tool *suggests methods to save energy* in each area where energy is used or wasted and offers a list of additional resources. The report is valuable in identifying and prioritizing major opportunities for energy savings.



PHAST Calculators—

- **Energy Equivalency:** *Calculates heat requirements when the heat source is changed from fuel firing (Btu/hr) to electricity (kWh) or from electricity to fossil fuel firing.*
- **Efficiency Improvement:** *Calculates available heat for fuel-fired furnaces and expected energy savings when burner operating conditions are enhanced.*
- **Oxygen Enrichment:** *Calculates available heat for fuel-fired furnaces and expected energy savings when oxygen in combustion “air” is increased from the standard (21%) value.*

Download free tools from the U.S. Department of Energy to improve the energy efficiency of furnaces, heaters, melters, kilns, ovens, and other process heating equipment. Visit www.oit.doe.gov/bestpractices.

PHAST Gets Results

Process heating accounts for more direct energy use than any other process in U.S. manufacturing. The thermal efficiency of process heating equipment currently varies from 15% to 80%. At the lower efficiency levels, in particular, PHAST technology offers the potential for significant energy savings.

Steel Reheating Furnace Example

At one steel mill, PHAST identified significant potential savings in a steel reheating furnace. The furnace had a firing capacity of 135 million (MM) Btu per hour for the heating zone and 32MM Btu per hour for the soak zone. PHAST indicated that the furnace's fuel use could be reduced by approximately 30MM Btu per hour for the heating zone and 5MM Btu per hour for the soak zone. Another 2MM Btu per hour could be saved by reducing losses through openings. Total potential savings identified for the unit were 37MM Btu per hour, or 22% of all energy used by the furnace.

Suggested low-cost improvements included better control of the air-fuel ratio and installation of radiation shields (curtains that eliminate radiation heat loss).

Aluminum Extrusions Example

PHAST software was used to identify several strong opportunities to save energy and boost productivity at the Alcoa North American Extrusions facility in Plant City, Florida.

The PHAST assessment identified the pieces of process heating equipment that were the largest energy consumers, collectively consuming more than 80% of all process heating energy at the facility. PHAST analysis revealed that recovery of waste heat from flue gases in both melters offered one of the best opportunities for reducing energy use. Potential annual savings totaled over \$300,000 with a payback period of 6 to 24 months.

PHAST Results by Industry

Industry (No. of Assessments)	Average Energy Savings (Million Btu/year)	Average \$ Savings (Annual)
Aluminum (4)	236,300	\$945,000
Mining (4)	304,600	\$1,232,000
Petroleum (4)	286,700	\$1,112,500
Steel (1)	375,000	\$1,500,000

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.

*Office of Industrial Technologies
Energy Efficiency
and Renewable Energy
U.S. Department of Energy
Washington, D.C. 20585*



**U.S. Department of Energy
Energy Efficiency
and Renewable Energy**

June 2003