

## Save Energy Now in Your Steam Systems

### Facts & Figures

- About one-third of the nation's total energy use is consumed in U.S. industrial facilities; nearly one-ninth is used by steam systems.
- Industry consumes more than 40% of the nation's total use of natural gas.
- Even plants with energy management programs can often save 10% to 15% more using best practices to increase their energy efficiency.
- System improvements can often reduce the energy costs of a typical industrial steam system by 10% to 15%.

### Benefits

- Energy efficiency improvements can reduce utility bills and improve your plant's bottom line.
- Many improvements require little or no extra investment, are easy to implement, and have payback times of less than a year.
- Strategies that increase energy efficiency often reduce operating and maintenance costs, minimize waste, and enhance production.
- Energy efficiency helps to reduce negative impacts on the environment and can enhance corporate community relations programs.

### Resources

For more information on steam system efficiency, to obtain DOE's suite of steam system assessment tools, and to learn more about DOE Qualified Specialists and training opportunities, visit the BestPractices Web site, [www.eere.energy.gov/industry/bestpractices/](http://www.eere.energy.gov/industry/bestpractices/).

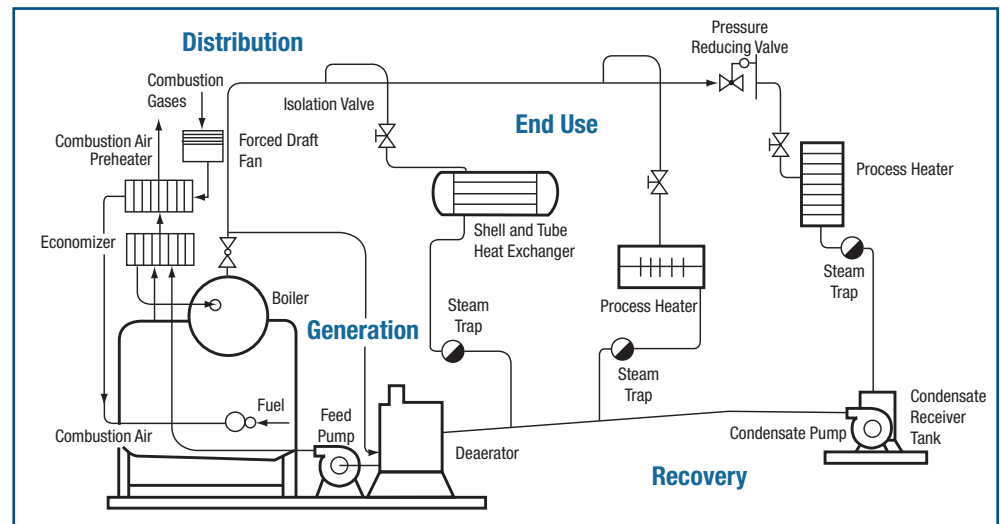
Steam systems account for about 30% of the total energy used in industrial applications for product output. These systems can be indispensable in delivering the energy needed for process heating, pressure control, mechanical drives, separation of components, and production of hot water for process reactions.

As energy costs continue to rise, industrial plants need effective ways to reduce the amount of energy consumed by their steam systems. To help meet this need, the U.S. Department of Energy's (DOE) Industrial Technologies Program (ITP) works with the nation's most energy-intensive plants to uncover opportunities for reducing energy use and costs while maintaining—or increasing—productivity.

Industrial steam systems can include generation, distribution, end use, and recovery components, as shown in the diagram. End-use equipment includes heat exchangers, turbines, fractionating towers, strippers, and chemical reaction vessels. Steam systems can also feature superheaters, combustion air preheaters, feedwater economizers, and blowdown heat exchangers to boost system efficiency.

### Potential for Savings

Making steam systems more efficient throughout industry could reduce annual plant energy costs by several billion dollars and environmental emissions by millions of metric tons. About 80% of the energy used in the pulp and paper



**Steam systems include generation, distribution, end use, and recovery components** (Source: DOE, *Improving Steam System Performance, A Sourcebook for Industry*, available online at [www.eere.energy.gov/industry/bestpractices/](http://www.eere.energy.gov/industry/bestpractices/).)



industry goes to generate steam, and steam systems consume about half of the energy used in the chemicals and petroleum refining industries. Typically, plants that assess their steam systems in these industries and others uncover potential steam system energy use and cost savings that range from 10% to 15% per year.

Large plants that rely heavily on steam systems can realize significant savings. For example, following an evaluation conducted using DOE's Steam System Assessment Tool, the J.R. Simplot Company improved the steam system in its food processing plant in Caldwell, Idaho. Improvements included upgrading burners and controls, installing flue gas oxygen trim systems on boilers, and recovering more condensate to reduce the number of boilers needed to meet the steam load. These save the plant 52,000 MMBtu of natural gas and 526,000 kWh of electricity annually. In summer 2005, the plant's energy costs were lower by nearly \$300,000 per year.

Smaller plants can save, too. In 2001, six DOE Industrial Assessment Centers used the Steam System Scoping Tool (SSST), one of three ITP steam software decision tools, to evaluate systems at 18 small and mid-sized plants. They identified 89 system improvements with an average payback of just 7 months. At that time, estimated cumulative annual savings totaled nearly \$3 million.

## Start Saving Today

Some typical opportunities for increasing the efficiency of most industrial steam systems are shown in the table. Using ITP's resources—such as tip sheets, sourcebooks, case studies, and software assessment tools—you can begin assessing and improving your steam systems today.

Typical Ways to Increase Steam System Efficiency*	
<b>Generation</b>	<ul style="list-style-type: none"> <li>Minimize excess combustion air</li> <li>Clean boiler heat transfer surfaces</li> <li>Consider high-pressure boilers with backpressure turbine generators</li> <li>Improve water treatment to minimize boiler blowdown</li> <li>Add or restore boiler refractory</li> <li>Optimize the deaerator vent rate</li> </ul>
<b>Distribution</b>	<ul style="list-style-type: none"> <li>Repair steam leaks</li> <li>Minimize vented steam</li> <li>Ensure that piping, valves, fittings, and vessels are well insulated</li> <li>Implement a steam-trap maintenance program</li> <li>Isolate steam from unused lines</li> <li>Use backpressure turbines instead of pressure-reducing valves</li> </ul>
<b>Recovery</b>	<ul style="list-style-type: none"> <li>Optimize condensate recovery</li> <li>Use high-pressure condensate to make low-pressure steam</li> <li>Install heat recovery equipment such as feedwater and condensing economizers</li> <li>Recover energy from boiler blowdown</li> <li>Recover thermal energy from wastewater streams</li> </ul>

\*For more, look for ITP's steam tip sheets in the Resources section of the BestPractices home page: [www.eere.energy.gov/industry/bestpractices](http://www.eere.energy.gov/industry/bestpractices).

*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.*

BestPractices is part of the Industrial Technologies Program, and supports DOE's strategy to help the country's most energy-intensive industries improve their competitiveness. BestPractices brings together emerging technologies and energy-management best practices to help companies begin improving energy efficiency, environmental performance, and productivity right now.

BestPractices emphasizes plant systems, where significant efficiency improvements and savings can be achieved. Industry gains easy access to near-term and long-term solutions for improving the performance of process heating, steam, pumps, compressed air and other motor-driven systems. In addition, the Industrial Assessment Centers provide comprehensive industrial energy evaluations to small- and medium-size manufacturers.

## 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, Contact:

EERE Information Center  
 1-877-EERE-INF  
 (1-877-337-3463)  
[www.eere.energy.gov](http://www.eere.energy.gov)

Or visit these Web sites:

Industrial Technologies Program (ITP)  
[www.eere.energy.gov/industry](http://www.eere.energy.gov/industry)

ITP BestPractices  
[www.eere.energy.gov/industry/bestpractices](http://www.eere.energy.gov/industry/bestpractices)

Save Energy Now  
[www.eere.energy.gov/industry/saveenergynow](http://www.eere.energy.gov/industry/saveenergynow)

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