

Energy Tips



Steam



Motors



Compressed Air

Blowdown Energy Recovery

Blowdown waste heat can be recovered with a heat exchanger, a flash tank, or flash tank in combination with a heat exchanger. Lowering the pressure in a flash tank allows a portion of the blowdown to be converted into low pressure steam. This low pressure steam is most typically used in deaerators. Drain water from the flash tank is then routed through a heat exchanger. Cooling the blowdown has the additional advantage of helping to comply with local codes limiting the discharge of high temperature liquids into the sewer system.

Recover Heat from Boiler Blowdown

Heat can be recovered from boiler blowdown by using a heat exchanger to preheat boiler makeup water. Any boiler with continuous blowdown exceeding 5% of the steam rate is a good candidate for the introduction of blowdown waste heat recovery. Larger energy savings occur with high-pressure boilers. The following table shows the potential for heat recovery from boiler blowdown.

Blowdown Rate, % Boiler Feedwater	Recoverable Heat from Boiler Blowdown				
	Heat Recovered, Million Btu per hour (MMBtu/hr)				
	Boiler Operating Pressure, psig				
	50	100	150	250	300
2	0.45	0.5	0.55	0.65	0.65
4	0.9	1.0	1.1	1.3	1.3
6	1.3	1.5	1.7	1.9	2.0
8	1.7	2.0	2.2	2.6	2.7
10	2.2	2.5	2.8	3.2	3.3
20	4.4	5.0	5.6	6.4	6.6

Based on a steam production rate of 100,000 pounds per hour, 60°F makeup water, and 90% heat recovery.

Example

In a plant where the fuel cost is \$3.00/MMBtu, a continuous blowdown rate of 3,200 pounds per hour (lbs/hr) is maintained to avoid the buildup of high concentrations of dissolved solids. What are the annual savings if a makeup water heat exchanger is installed that recovers 90% of the blowdown energy losses? The 82% efficient boiler produces 50,000 lbs/hr of 150-psig steam. It operates for 8000 hours per year. The blowdown ratio is:

$$\text{Blowdown Ratio} = \frac{3200}{3200 + 50,000} = 6.0\%$$

From the table, the heat recoverable corresponding to a 6% blowdown ratio with a 150-psig boiler operating pressure is 1.8 MMBtu/hr. Since the table is based on a steam production rate of 100,000 lbs/hour, the annual savings for this plant are:

$$\text{Annual Energy Savings} = \frac{1.67 \text{ MMBtu/hr} \times (50,000 \text{ lbs/hr} / 100,000 \text{ lbs/hr}) \times 8000 \text{ hrs/yr}}{0.82} = 8146 \text{ MMBtu}$$

$$\text{Annual Cost Savings} = 8146 \text{ MMBtu/year} \times \$3.00/\text{MMBtu} = \$24,438$$

Adapted from an Energy TIPS fact sheet that was originally published by the Industrial Energy Extension Service of Georgia Tech. For additional information on steam system efficiency measures, contact the OIT Clearinghouse at (800) 862-2086.



Suggested Actions

If there is a continuous blowdown system in place, consider installing a heat recovery system. If there is a non-continuous blowdown system, then consider the option of converting it to a continuous blowdown system coupled with heat recovery.



BestPractices is part of the Office of Industrial Technologies' (OIT's) Industries of the Future strategy, which helps the country's most energy-intensive industries improve their competitiveness. BestPractices brings together the best-available and emerging technologies and practices to help companies begin improving energy efficiency, environmental performance, and productivity right now.

BestPractices focuses on 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 motor, steam, compressed air, and process heating systems. In addition, the Industrial Assessment Centers provide comprehensive industrial energy evaluations to small and medium-size manufacturers.

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The Office of Industrial Technologies (OIT), through partnerships with industry, government, and non-governmental organizations, develops and delivers advanced energy efficiency, renewable energy, and pollution prevention technologies for industrial applications. OIT is part of the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy.

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- Steel

OIT and its BestPractices program offer a wide variety of resources to industrial partners that cover motor, steam, compressed air, and process heating systems. For example, BestPractices software can help you decide whether to replace or rewind motors (MotorMaster+), assess the efficiency of pumping systems (PSAT), or determine optimal insulation thickness for pipes and pressure vessels (3E Plus). Training is available to help you or your staff learn how to use these software programs and learn more about industrial systems. Workshops are held around the country on topics such as "Capturing the Value of Steam Efficiency," "Fundamentals and Advanced Management of Compressed Air Systems," and "Motor System Management." Available technical publications range from case studies and tip sheets to sourcebooks and market assessments. The *Energy Matters* newsletter, for example, provides timely articles and information on comprehensive energy systems for industry. You can access these resources and more by visiting the BestPractices Web site at www.oit.doe.gov/bestpractices or by contacting the OIT Clearinghouse at 800-862-2086 or via email at clearinghouse@ee.doe.gov.