

Energy Tips

Tip Sheet #10 • Revised June 2001



Steam



Motors



Compressed Air

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.

Recoverable Heat from Boiler Blowdown					
Blowdown Rate, % Boiler Feedwater	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/hr, the annual savings for this plant are:

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

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

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.

Steam Tip Sheet information adapted from material provided by the Industrial Energy Extension Service of Georgia Tech and reviewed by the DOE BestPractices Steam Technical Subcommittee. 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.



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