Insulate Steam Distribution and Condensate Return Lines

Uninsulated steam distribution and condensate return lines are a constant source of wasted energy. The table shows typical heat loss from uninsulated steam distribution lines. Insulation can typically reduce energy losses by 90% and help ensure proper steam pressure at plant equipment. Any surface over 120°F should be insulated, including boiler surfaces, steam and condensate return piping, and fittings.

Insulation frequently becomes damaged or is removed and never replaced during steam system repair. Damaged or wet insulation should be repaired or immediately replaced to avoid compromising the insulating value. Eliminate sources of moisture prior to insulation replacement. Causes of wet insulation include leaking valves, external pipe leaks, tube leaks, or leaks from adjacent equipment. After steam lines are insulated, changes in heat flows can influence other parts of the steam system.

### Heat Loss per 100 feet of Uninsulated Steam Line

<table>
<thead>
<tr>
<th>Distribution Line Diameter (inches)</th>
<th>Heat Loss per 100 feet of Uninsulated Steam Line (MMBtu/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15</td>
</tr>
<tr>
<td>1</td>
<td>140</td>
</tr>
<tr>
<td>2</td>
<td>235</td>
</tr>
<tr>
<td>4</td>
<td>415</td>
</tr>
<tr>
<td>8</td>
<td>740</td>
</tr>
<tr>
<td>12</td>
<td>1,055</td>
</tr>
</tbody>
</table>

Based on horizontal steel pipe, 75°F ambient air, no wind velocity, and 8,760 operating hr/yr.

### Example

In a plant where the value of steam is $4.50/MMBtu, a survey of the steam system identified 1,120 feet of bare 1-inch diameter steam line, and 175 feet of bare 2-inch line both operating at 150 psig. An additional 250 feet of bare 4-inch diameter line operating at 15 psig was found. From the table, the quantity of heat lost per year is:

- 1-inch line: 1,120 feet x 285 MMBtu/yr per 100 ft = 3,192 MMBtu/yr
- 2-inch line: 175 feet x 480 MMBtu/yr per 100 ft = 840 MMBtu/yr
- 4-inch line: 250 feet x 415 MMBtu/yr per 100 ft = 1,037 MMBtu/yr

Total Heat Loss = 5,069 MMBtu/yr

The annual operating cost savings from installing 90% efficient insulation is:

0.90 x $4.50/MMBtu x 5,069 MMBtu/yr = $20,530

### Suggested Actions

Conduct a survey of your steam distribution and condensate return piping, install insulation, and start to save.
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