ABB Swirl flowmeters
Metering heat from steam

Metering heat from steam in split-range operation with the FS4000 Swirl flowmeter

The challenge
A number of companies, in particular those based in industrial parks, have centralized or outsourced their power supply and obtain their heat energy in the form of steam.

The steam is generated centrally in a power plant on or near to the site. It is then distributed to subscribers via insulated pipelines.
So that consumption can be billed accurately, energy quantities (steam quantities) must be recorded by taking a variety of individual measurements. In order to ensure reliable metering of the quantities consumed, which fluctuate significantly, 2 flow measurements with different nominal diameters are often required, since even when consumption is low (during summer operation, for example), energy flows have to be recorded and billed accurately.

The solution
Swirl flowmeters, which benefit from high measuring range dynamics thanks to their design, can be used in many cases instead of installing two metering systems with different nominal diameters. This approach reduces installation and equipment costs. Installing two metering systems would require two sets of equipment to meter not only steam quantity but also temperature and pressure, and two measurement computers would also be required.
Compared with differential pressure metering procedures, the accuracy achieved with Swirl flowmeters is constant across the entire range. Higher inaccuracies when metering at low range are rare.

The installation of two devices with graded nominal diameters is recommended for measuring points where fluctuations in consumption are so great that the measurement dynamics of one device are no longer sufficient. Switchover from summer to winter operation can be done manually or automatically.
The valves are controlled by a small PLC which evaluates the operating flow of the Swirl flowmeters. ABB is a one-stop shop for all components required for balancing heat quantities (temperature and pressure meters and measurement computers, for example).
Swirl flowmeter with flow-dependent automatic switching

<table>
<thead>
<tr>
<th>List of example devices for individual measurements</th>
<th>List of example devices for split-range measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 FS4000-ST4, 4&quot; (DN 100) Swirl flowmeter</td>
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</tr>
<tr>
<td>Range, e. g.,</td>
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</tr>
<tr>
<td>— 160 … 4,800 kg/h (350 … 10,600 lb/h) saturated steam</td>
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<tr>
<td>at 160 °C (320 °F)</td>
<td>at 160 °C (320 °F)</td>
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<tr>
<td>— or 220 … 9,600 kg/h (480 … 21,000 lb/h) saturated steam</td>
<td>— or 220 … 9,600 kg/h (480 … 21,000 lb/h) saturated steam</td>
</tr>
<tr>
<td>at 190 °C (375 °F)</td>
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</tr>
<tr>
<td>1 SensyTemp TSP121 temperature sensor</td>
<td>1 FS4000-ST4, 1 1/2&quot; (DN 40) Swirl flowmeter</td>
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<tr>
<td>1 261GS pressure transmitter</td>
<td>Range, e. g.,</td>
</tr>
<tr>
<td>1 SensyCal FCU400-S steam computer</td>
<td>— 28 … 650 kg/h (60 … 1,400 lb/h) saturated steam at 160 °C (320 °F)</td>
</tr>
<tr>
<td>with standard program for heat output / flow correction</td>
<td>— or 40 … 1,275 kg/h (90 … 2,800 lb/h) saturated steam at 190 °C (375 °F)</td>
</tr>
<tr>
<td>2 SensyTemp TSP121 temperature sensor</td>
<td>2 SensyCal FCU400-S steam computer</td>
</tr>
<tr>
<td>2 261GS pressure transmitter</td>
<td>with standard program for heat output / flow correction</td>
</tr>
<tr>
<td>2 SensyCal FCU400-S steam computer</td>
<td>Recommended switching points from 1 1/2&quot; to 4&quot; (DN 40 to DN 100):</td>
</tr>
<tr>
<td>with standard program for heat output / flow correction</td>
<td>480 kg/h at 160 °C (1,000 lb/h at 320 °F) or 660 kg/h at 190 °C</td>
</tr>
<tr>
<td>Recommended switching points from 1 1/2&quot; to 4&quot; (DN 40 to DN 100):</td>
<td>(1,500 lb/h at 375 °F)</td>
</tr>
<tr>
<td>Pressure loss approx. 100 mbar (1.5 psi)</td>
<td>Note</td>
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</tbody>
</table>

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