Sustainable Energy for SWITCH Garment (Webinar)

Steam system energy saving opportunity and best practices

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Global Support

A worldwide network supporting a globalised industry

62 Operating Companies in over 60 countries

Over 1500 direct engineers in the field

7 global manufacturing sites and multiple fabrication bases
Plant Steam Issues for Textiles & Garments

Steam is a vital utility for production efficiency and garment quality.

Steam is used:

- Irons
- Presses
- Washing Machines
- Tumble Dryers
- Dye heating
- Scouring and Bleaching
- Washing
- Drying

<table>
<thead>
<tr>
<th>Problem</th>
<th>Result</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam losses</td>
<td>High Fuel Costs</td>
<td>$$$</td>
</tr>
<tr>
<td>Wet steam at the irons on the garments</td>
<td>Rework of garment</td>
<td>$$$ &amp; lower productivity</td>
</tr>
<tr>
<td></td>
<td>Potential for moisture to remain in garment</td>
<td>$$$ &amp; low quality/rejects</td>
</tr>
<tr>
<td></td>
<td>at shipping</td>
<td></td>
</tr>
<tr>
<td>Poor pressure control at the iron</td>
<td>Increased ironing times</td>
<td>Lower productivity</td>
</tr>
<tr>
<td>Poor pressure / temperature at dryers and</td>
<td>Increased cycle times</td>
<td>$$$ for utilities and lower</td>
</tr>
<tr>
<td>washers</td>
<td></td>
<td>productivity</td>
</tr>
</tbody>
</table>
THE STEAM SYSTEM LOSSES

Typical Losses

- **Flue Losses**: 20%
- **Radiation Losses**: 3%
- **Distribution Losses**: 5%
- **Flash Losses**: 5%
- **Blowdown Losses**: 2%
- **Condensate Losses**: 10%
- **Heat Input**: 100%
- **Heat Output**: 75%
- **Heat To User**: 55%
THE STEAM SYSTEM LOSSES
THE STEAM SYSTEM LOSSES

Distribution Losses

Insulation of steam pipe is mandatory due to energy saving and safety issues

5m of uninsulated 2” pipe = ~ 12 tonnes per year (4kg/hr)

*Tonnes/year based on 12hr shift, 5 days per week, 48 weeks per year
Example of well insulated pipelines and steam valves against uninsulated Spirax Sarco Valves with Spirax Sarco Tailored Made Insulation Jackets

First for Steam Solutions
Benefits of Valve Insulation

Temperature Difference Before Installation Insulation Jacket and After Installation Insulation Jacket

BSA valve temperature before Installation Insulation Jacket: 148.8°C

BSA valve temperature after Installation Insulation Jacket: 51.4°C
THE STEAM SYSTEM LOSSES

Distribution Losses

Steam leaks - how much are they costing you?

• 25 mm valve stem 8 bar g
  3.5 kg/h = >10 tonnes per year*

• 2 mm hole, steam at 7 bar g
  9 kg/h = ~26 tonnes per year*

• Incorrect installed drainage points

• Incorrect pipe sizing

• Condition of steam
  (e.g. dryness fraction)

*Tonnes/year based on 12hr shift, 5 days per week, 48 weeks per year
# THE STEAM SYSTEM LOSSES

**Distribution Losses: Steam Traps**

<table>
<thead>
<tr>
<th>Failed Open Steam Trap</th>
<th>Failed Closed Steam Trap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste of energy/money</td>
<td>Waterlog</td>
</tr>
<tr>
<td>Increases production costs</td>
<td>Reduced plant output</td>
</tr>
<tr>
<td>Plumes of steam visible from vents</td>
<td>Spoilt product</td>
</tr>
<tr>
<td>Can cause problems in pipes</td>
<td>Under heating</td>
</tr>
<tr>
<td>Plant will still operate</td>
<td>Safety hazard – waterhammer</td>
</tr>
</tbody>
</table>

Failed open steam trap with a 4.3 mm orifice of TD42L ½”, operating at 7 barg will lose approximately 18.2 kg/h. Over 52 tonnes per annum.

*Tonnes/year based on 12hr shift, 5 days per week, 48 weeks per year

**First for Steam Solutions**
Steam Trap Selection

The need for steam traps:
- Condensate removal
- Air removal
- CO2 removal
- Thermal efficiency

If water is in the system:
- Waterhammer
- Reduced heat transfer
- Slows down heating process
- Safety hazard

Correctly Selected Steam Traps can prevent:
- Poor quality steam
- Wrong trap for the job
- Traps wrongly fitted
- Traps wrongly sized
- Dirt, waterhammer, freezing
- Air
- Excessive back pressure

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<table>
<thead>
<tr>
<th>Application</th>
<th>Ball float-thermostatic</th>
<th>Ball float FT-C</th>
<th>Thermodynamic</th>
<th>Balanced pressure</th>
<th>Bimetallic</th>
<th>Liquid expansion</th>
<th>Inverted bucket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garment press</td>
<td>B</td>
<td>B</td>
<td>A$^6$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ironers and calendars</td>
<td>B</td>
<td>A</td>
<td>B$^1$</td>
<td>B$^1$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tumble dryers</td>
<td>A</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry cleaning machines</td>
<td>A</td>
<td></td>
<td>B$^1$</td>
<td></td>
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</tbody>
</table>

A - Best choice, B - Acceptable alternative, $^1$(parallel air vent) $^5$ (‘near-to-steam’ capsule), $^6$ (anti-air-binding disc).
Steam Utilization
3 Typical Problems with Irons

Uncontrolled pressure
Steam lacking at the point of use
Lots of water wetting/staining garment

ALL CAUSED BY
STEAM LEAKAGE
Irons

- Typical solution to avoid Steam Losses and Production Deficiency:
  1. Install pressure reducing valve to maintain downstream pressure relatively constant
  2. Quite enough pressure to Ironers at around 2-2.5 bar
  3. Install separator in steam mains Ironers to improve steam dryness
Iron Installation Scheme

- Isolation Valve
- Steam Line
- Steam Trap
- Check Valve
- Condensate Line

- Ironer

Spirax Sarco

EXPERTISE | SOLUTIONS | SUSTAINABILITY

Sustainable Growth
Condensate Recovery

If...

• A long distance from the boiler house
• The condensate needs to be raised a long height
• Poor pressure or very wet steam at the end of the iron line

... you may need to consider a dedicated receiver and pump

(Mechanical Condensate Pump Packaged Unit)

First for Steam Solutions
Condensate Recovery
The Feedwater Tank

- For every 6°C rise in temp. equates to 1% reduction in fuel. (condensate return)
- Reduces oxygen content
- Reduces chemicals
- Increases boiler operation
Examples of Energy Saving Projects

- **Insulation**
- **Flash steam**
- **Vent**
- **Condenser**

**Implementation:**
- **Easy**
- **Complex**

*First for Steam Solutions*
Results

Ideal System

Fuel Input 100%

Boiler

Flue Losses 15%
Radiation Losses 2%

Heat Output 82%

Distribution

Distribution Losses 4%
Flash Losses 0%

Heat To User 77%

Blowdown Losses <1%

Condensate Losses <1%
SUMMARY

KEEPING IN THE HEAT
- Good design and installation
- Insulate efficiently
- Consider heat recovery

KEEPING IN THE STEAM
- Cure leaks
- Monitor steam trap operation

KEEPING IN THE WATER
- Return condensate for re-use
- Review contaminated condensate arrangements
Useful Tool

- Steam Tools for pipe sizing and steam tables
Resources

- [https://www.spiraxsarco.com/learn-about-steam](https://www.spiraxsarco.com/learn-about-steam)

Learn about steam | Spirax Sarco
Find out about the principles of steam engineering and heat transfer, including a comprehensive guide to engineering best practice covering all ...

- Introduction to Steam Distribution
- Steam Mains and Drainage
- The steam and condensate loop
- Introduction - Why Steam Traps?
- Steam and the organisation
- Introduction to the boiler house

- [Spirax-Sarco Engineering plc | LinkedIn](https://www.spiraxsarco.com/learn-about-steam)
- [Home | Spirax Sarco Engineering plc](https://www.spiraxsarco.com/learn-about-steam)
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