The Lneti Experience on Energy Management in Woollen Subsector of the Textile Industry

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The textile sector in Portugal represents about 30% of the gross value of production in the manufacturing industry and also accounts for 15% of the energy consumption. The woollen subsector of the textile industry is third in importance, with about 10 per cent of total production, 12 per cent of the number of employees and 14 per cent of energy consumption; the Covilha woollen industry represents about 40 per cent of the national total for this subsector.

For a long time the textile industry has been devoted to obtaining the highest possible standards of quality. While this objective still remains essential, the continuous increase in the price of fuels has made it necessary that a greater attention should be paid to energy consumption and ways of achieving savings.

This improvement in energy conservation must not only be carried out in effort to reduce the cost of production to maintain competitiveness of this industry in relation to its major competitors but must also be achieved to enhance the efforts to reduce the Portugal's dependence on imported energy which represents 80% of the total energy consumed in the country.

With the purpose of knowing the consumption of heat in the Covilha woollen industry and of quantifying the efficiency of steam production and use, and of the condensate return and waste heat recovery systems, of the sector a study was carried out in the dyeing and finishing sections of sixteen companies in this sector. The analysis of the technologies involved in the production process, although they directly affect the consumption of energy by unit of product, has been the subject of another study. In these studies the University of Beira Interior has been working jointly with the LNETI group.

The study demonstrated that the specific energy consumption primarily depended on (i) the technologies in the production process, and on (ii) the efficiency and operation of the steam generating and distribution systems, and of the way and extent to which heat is recovered.

In the dyeing operation the energy usage was found to be particularly dependent on various factors among which the most important are (i) the dyeing system (automation, reproducibility, time-temperature cycle, dyes, chemicals, etc), (ii) the prior preparation of material to be dyed, and (iii) the load equipment factor (liquor rate, utilization rate). These factors are highly interdependent and its improper consideration leads to an increase in energy consumption, particularly through corrections that become required to obtain the desired quality. It can be concluded from the study that the overall potential saving is about 21 per cent which, however, does not included saving to be expected from replacement of obsolete process plant or modifications of low efficiency processes.

The breakdown of the potential energy savings are as follows:

<table>
<thead>
<tr>
<th>Percentage of overall consumption</th>
<th>Improved control and/or operations of boilers and thermal oil generators</th>
<th>Condenser steam mains and pipes</th>
<th>Improved recovery of condensate</th>
<th>Improved operation of dryers</th>
<th>Improved control of steaters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8.6</td>
<td>1.8</td>
<td>4.0</td>
<td>2.1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

In the above-named Department, a project has been initiated jointly with the University of Beira Interior to study experimentally the drying of the re-els of the textile fibre, which was identified as one of the processes for further improvement for on energy saving.

The study aims at carrying out experimental work for drying one or clusters of re-els of various geometry under different conditions of flow of heat to determine the evolution of temperature within the reel. In order to monitor the evolution of the temperature, thermocouples were situated on and inside the re-els and they are connected to a data logger for the acquisition of data to be stored on an microcomputer.

The analyses of the data will enable the extent of the influence of the process parameters to be quantified during drying.

A further initiative has also been undertaken in the above-named Department to develop a software for a computer-based energy management system particularly to deal with boilers, insulation of pipes etc. with the view of controlling the consumption of energy by unit of product on a real-time basis.

The first object of developing the computer-based energy management system is to provide Portuguese industrial energy users with a resource that can monitor their energy use and thus target problem areas. An envisaged future function is the provision of expert recommendations by such a system.