Energy Efficiency in Small-scale Glass Industries in Firozabad

A Supreme Court verdict bans use of coal/coke within the Taj Trapezium Zone (TTZ) – an area of 10,400 sq km around the Taj – to save the monument from pollution. Since Firozabad falls within the TTZ, glass units located in the city also need to stop using coal and switch over to natural gas. The TERI intervention aims to help the local industry shift to this cleaner fuel by helping it adopt energy-efficient and environment-friendly solutions.

Firozabad, also called the glass capital of India, is a small town in the state of Uttar Pradesh, situated 40 km from Agra. It accounts for roughly 70 per cent of the total glass production in the small-scale sector, and hence an important industry for energy efficiency measures.

The Tata Energy and Research Institute (TERI) recently carried out a preliminary diagnostic study (supported by the Swiss Agency for Development and Cooperation – (SDC) of the glass cluster to identify areas where technological intervention would make maximum impact in terms of reducing energy intensity. Table 1 shows the major furnace types used in Firozabad and a summary of their energy efficiency.

As can be seen from the table, energy efficiency of pot furnaces is lesser than of tank furnaces. Similarly, muffle furnaces in the cluster are also highly inefficient, which is evident from the high level of pollution emanating from chimneys.

TERI Intervention

The broad objective of the TERII intervention in Firozabad, supported by the SDC, is to develop a sustainable programme involving fuel substitution and furnace upgradation that would lead to savings in energy and reduction in pollution. A combination of applied research, technical support, capacity building and awareness generation of the target groups forms the approach.

The intervention in the cluster is currently limited to developing energy efficient and environmental-friendly technological solutions for both pot and muffle furnaces, these two segments being highly inefficient in terms of their energy use. They were also chosen because no off-the-shelf energy-efficient solutions for changeover to natural gas are available. Therefore, TERI first decided to set up full-scale demonstration plants to convince the small entrepreneurs about the benefits of technology intervention, and thus motivate the industry to adopt cleaner technological solutions.

With assistance from experts from the UK and inputs from local workers, an energy-efficient gas-fired pot furnace was set up at one of the operating pot-furnace units nominated by the local industry association, and was commissioned in February 2000. The average natural gas consumption has been optimized and lowered to about 1950 Sm^3/day, which translates into a saving of 57 per cent (in energy terms) as compared to coal operation. The furnace performance is constantly monitored so that any changes required for ease of operation and lower maintenance can be incorporated.

A demonstration gas-fired muffle furnace was also set up in a central location in the city. The energy consumption of this furnace is nearly 40 per cent less compared to the existing coal-based muffle furnaces operating in the cluster. Large-scale adoption of gas fired muffle furnaces will thus not only directly benefit in terms of reduced energy consumption and lower levels of pollution but also in terms of reducing health risks for workers and residents of the area.

Table 1: Types of furnaces and Their Energy Consumption

Furnace Type	Units Operating (approx)	Capacity Range (tpd)	Specific Energy Consumtion (Gcal/t of melt)
Tank furnace (coal)	15	15-25	3.6
Tank furnace (oil)	6	15-25	2.1
Open pot furnace (coal)	50	4.8-6.7	5.5
Closed pot furnace (coal)	30	2-4	9.5
Muffle furnace (baking units)	500	-	-

Future Activities

Future activities include assisting local industry in reducing energy consumption and improving environmental performance, both through adoption of improved designs and through incremental improvements in operating practices. The approach includes workshops and training programmes at the unit level and technical assistance to entrepreneurs willing to adopt energy-efficient designs. TERI also plans to intervene in other fields that have a bearing on the economic competitiveness and long-term sustainability of the industry. These interventions will also incorporate socio-economic dimensions so that benefits of improved energy and environmental performance get passed on to the workers and operators of these enterprises.

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Reference Book:
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