

**Making a
difference**

through

**cleaner
technologies**



**Gas-fired
Pakai Bhatti for
glass industry
cluster at
Firozabad**



teri

TERI is a premier research institute working in the fields of energy, environment, and sustainable development. One of the focal areas of TERI's research is developing comprehensive technology packages for the small and informal industry sector, aimed at better resource utilization and pollution reduction.

TERI has been active in the Firozabad glass industry cluster since 1995 and is attempting to help the industry switch over to energy-efficient and environment-friendly technologies based on natural gas. The efforts till now have focused on developing cleaner technologies for pot and muffle furnaces. The initiative in Firozabad is being carried out with the support of the SDC (Swiss Agency for Development and Cooperation).

TERI had carried out detailed studies on coal-fired muffle furnaces for evaluating their energy and environment performances. These studies revealed that the energy efficiency of these furnaces is very low. Moreover, coal-fired furnaces are a major source of pollution in Firozabad. Measurements of RSPM (respiratory suspended particulate matter) levels at different locations in the city indicate drastically higher levels of RSPM as compared to the norms.

Apart from the direct impact of pollution on the health of the workers in *pakai bhatties*, the higher pollution load from these coal-fired systems also affects the local population in Firozabad. This is due to the fact that most of the *pakai bhatti* units are located in congested areas amidst the residential zones.



First gas-based *pakai bhatti* at Saraswati Glass Works

TERI—SDC initiative in *pakai bhatti*

With active participation from the local industry at Firozabad, TERI has developed a muffle furnace operating on natural gas. The *pakai bhatti* model demonstrated by TERI seems to be well accepted by the local industry as about 25 *pakai bhatti* units with natural gas firing have already started operating in the city at various locations within one year of the demonstration. These gas-based *pakai bhatties* are similar to coal-fired units, both in terms of construction and operation. This design is now available to the muffle furnace owners who are interested in switching over to gas-based design.

The local industry and other stakeholders provided valuable support to the development and adoption of this gas-fired system. The *pakai bhatti* owners and operators provided help during the devel-



Pakai bhatti in operation at Saraswati Glass, R S Glass and Shivam Glass

opmental stage. Initial trials were conducted at the Electronic Glass Works, which volunteered for providing logistical support including space for setting up the pilot units. After successful trials, TERI sought the help of the DIC (District Industries Centre) to identify a central location in Firozabad, where the demonstration version of gas-fired *pakai bhatti* could be set up. Saraswati Glass Works, located in Sheetal Khan, an area with a high concentration of coal-fired *pakai bhattis*, came forward to join hands with TERI for further trials and commissioning. Gas-fired furnaces were set up by TERI at Saraswati Glass Works during July 2001. Fine-tuning of the demonstration furnaces was completed with the help of the operators/entrepreneurs who were operating these units.

The joint efforts of TERI and the local industry have proved to be quite successful. A number of *pakai bhatti* owners have expressed their interest to adopt this system. The success of this initiative and the enthusiasm of the muffle furnace owners can be gauged from the fact that in spite of piped natural gas not being available presently to the muffle furnace owners at their existing locations, nearly 25 *bhattis* have already come up at different locations in the city.

To disseminate the results of the gas-fired *pakai bhattis*, TERI and the SDC organized an 'Interaction Meet' at Sheetal Khan area in December 2001. Apart from muffle furnace owners and representatives of the various *pakai bhatti* associations, officials from the local DIC also participated. The DIC assured all administrative help in helping the *pakai bhatti* owners switch over to gas-based furnaces.



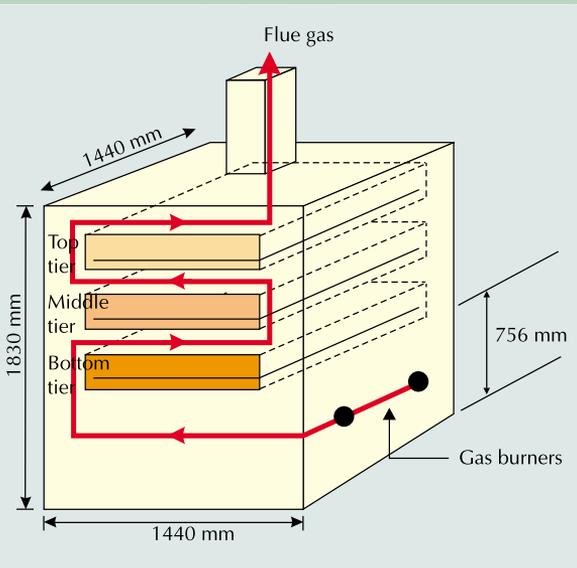
Interaction meet

Advantages of gas-based *pakai bhatti*

Gas-based *pakai bhattis* have the following advantages.

- Similar operational practices as for coal
- Higher productivity (average – 460 Toras a day, maximum – 550 Toras a day)
- Lower fuel cost on account of reduced energy consumption (Rs 2.30 to 2.80 per Tora for gas)

- Increased pot life (ordinary muffles – around 30 days; silicon carbide muffles – at least 2 years)
- Lower exposure level for workers
- Reduced health implications for the workers and their children and the residents of Firozabad



Investment and specification

The investment required for setting up a new *pakai bhatti* is between Rs 12 000 to Rs 30 000 depending upon the type of materials used for construction. The lower cost is for furnaces with ordinary clay muffles while the higher cost is for furnaces with two silicon carbide muffles and real-time gas flow measurement.

Support from TERI

With the objective of improving the energy and environment performance of the Firozabad glass industry cluster, TERI offers free technical assistance to the *pakai bhatti* owners for setting up gas-based *pakai bhattis*. TERI will provide assistance in (1) supervision during construction, (2) commissioning/ fine-tuning, and (3) monitoring gas consumption.

Interested muffle furnace owners can contact any of the following personnel

Mr Puneet Katyal
Industrial Energy Group
TERI
Habitat Place, Lodhi Road
New Delhi – 110003

Mr B C Sharma
Consultant-TERI
14/381-A
Arya Nagar
Firozabad – 283203

Fax +91 11 468 2144/468 2145
Tel. +91 11 468 2100/468 2111
Email puneetk@teri.res.in
Web www.teriin.org

Tel. +91 5612 43288