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A platform for learning and action for small and micro enterprises

Editorial

India is a biomass-rich country. The availability of agro-residues is estimated to be around 600–700 million tonnes, whereas currently used biomass energy amounts to about 110 million tonnes of oil equivalent, that too in a very inefficient manner. More than two decades ago, realizing the importance of biomass as a source of energy in a country like India, TERI started working on biomass energy technologies, especially biomass gasification. Considering the appropriateness of biomass as an energy source, the focus was on (a) village electrification and (b) thermal applications in small, micro, and rural enterprises. While biomass-based electrification is a natural option for villages, SMiEs (small and micro enterprises) were chosen because these occupy an important place in the country's economy. Moreover, most of the industries under this category use either commercial fuels like diesel and electricity or traditional biomass fuels like firewood. However, the present way of using biomass is generally inefficient, smoky, and with a low degree of control. On the other hand, industries currently using commercial fuels like diesel and electricity are finding it difficult to sustain their competitive edge because of high energy costs and are, hence, looking for alternate sources of energy.

Against this backdrop, taking a regional, cluster-based approach, TERI started propagation of biomass gasifiers for thermal applications in different SMiE sectors in the country. Recently, SMiE clusters in Rajasthan were included, particularly in the food-processing sector, including namkeen-making, sweet-making, and bakery. Simultaneously, the gasifier systems for bakery applications were also installed at Hubli and Dharwad regions of Karnataka. These biomass gasifier systems were marketed through TERI's licensed manufacturers and local service providers. For tiny and rural enterprises, TERI came out with an energy-efficient biomass cook stove.

On the rural electrification front, TERI focuses on small capacity (10–20 kWe) 100% producer-gas-engine-based power systems for rural areas. TERI systems are operational in the states of Orissa, Chhattisgarh, and Rajasthan. These gasifier systems provide electricity to village households for lighting purposes. Besides, electricity is also supplied for street lighting, schools, panchayat ghars, and shops on regular basis. These systems are also contributing to the socio-economic upliftment of villages with livelihood activities woven around them.

Realizing the importance of capacity building in promotion and long-term sustainability of a new product like the biomass gasifier, it has been TERI's continuous endeavour to strengthen the capacity of people at different levels, including the local communities, operators, manufacturers, as well as service-providers—an exercise that also engages other partners.

Amit Kumar
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Associate Director, Energy-Environment Technology Division, TERI

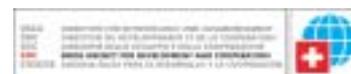
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The Energy and Resources Institute



Experience-sharing workshop at Thogur on VSBK



VSBK-Thogur

TERI initiated activities in the brick sector in South India in 2004, aimed at promoting the use of the energy-efficient VSBK (vertical shaft brick kiln). The institute partnered with STED (Science and Technology Entrepreneurship Development), Thanjavur, Tamil Nadu, which has similar interests in promoting rural

entrepreneurs. TERI worked with TJSB (Thanjai Jana Seva Bhavan) – an NGO (non-governmental organization) based in Thanjavur, which has established a large number of women SHGs (self-help groups) in the region and supported them in enhancing livelihood opportunities and improving employment generation.

Eleven women SHGs located at Thogur village in Thanjavur district had made significant progress. With their experience in various income-generation activities over the years, these SHGs were looking for opportunities that would help them establish larger rural-based businesses and thereby earn more money and improve the quality of their lives. With a booming market in the construction sector, and with a number of SHG members or their families having experience in brick moulding, they decided to set up a brick kiln unit.

With the guidance of STED–Thanjavur and TJSB, the groups decided to set up and operate a VSBK. TERI provided technical assistance in setting



Women preparing green bricks in soft mud moulding machine

up a two-shaft VSBK at Thogur. STED–Thanjavur did the required coordination between the SHGs, TJSB, and TERI. It was also instrumental in assisting the SHGs in procuring bank loans and obtaining grants from the state government. The SHGs have obtained financial assistance for their venture by way of term loan and working capital from the SBI (State Bank of India) and grants from the DRDA (District Rural Development Agency).

The construction of VSBK–Thogur was completed during August 2005. The first firing of the kiln could be carried out only in May 2006 because heavy flooding of the area took place during the rainy season in December 2005. The floods caused considerable damage at the kiln site, washing away the storage shed and soil accumulated for green brick making. However, this did not dampen the enthusiasm of the SHGs, and they have already started repayment of their loan this year.

TERI has been providing technical and management support for kiln operation on a continuous basis. It also helped in setting up a green brick lifting system to carry bricks to the top of the loading platform, and a green brick moulding machine. These systems have helped in overcoming two major bottlenecks identified during operation of the kiln in the first year. TERI also imparted training to build the capacities of firemen/women in operation of the VSBK and the soft mud moulding machine.

Looking at the progress and efforts made by the women's SHGs, the DRDA further provided grants that helped in procuring a tractor. This is being used for lifting soil from nearby areas for green brick making, and for transporting fired bricks for sale.

The successful setting up and operation of the VSBK at Thogur by women SHGs makes it a model worthy of replication elsewhere in the country. The venture also marks an important milestone in efforts to promote the use of energy-efficient brick technology through participatory means. In order to share the



Experience-sharing workshop at Thogur

Thogur experience with different stakeholders in the brick industry, TERI organized an 'experience-sharing workshop' at the VSBK site in Thogur on 15–16 May 2007. The workshop was inaugurated by the project officer of the DRDA (Thanjavur). About 150 women SHG members participated in the programme.

Representatives of the groups spoke about the project, their efforts, and the support provided by various agencies. The initiative taken by the women SHGs was lauded by the participants, who included the Assistant General Manager of SBI (Thanjavur); Project Officer from STED (Thanjavur), Secretary/Director of TJSB, and a representative from Development Alternatives. CoSMiLE project partners, Lokmitra and PEPUS, along with the project resource persons, were also present.

Exploring Indo-French collaboration in bio-energy

In April 2007, the French Ministry of Agriculture and Fisheries sent a Mission to India to explore the possibility of setting up an 'Indo-French platform on bio-energies'. The idea of this collaborative platform originated at the Indo-French Forum held in Paris in October 2006. The Mission included representatives from the Ministry of Agriculture and Fisheries, the FDA (French Development Agency), and the French energy company AREVA.

The main purpose of the Mission was to identify a suitable Indian partner for long-term cooperation between France and India in the field of biomass-based energy. During the visit, the Mission held extensive discussions with TERI and also visited TERI's research facility at Gual Pahari. The Mission concluded that TERI, with its experience and expertise in the field of biomass energy, could be a major partner in establishing and supporting the proposed platform for cooperation. The visit has helped in identifying a number of possible collaborative ventures between France and India. These include:

- Establishment of testing facilities for biomass;
- Demonstration projects that combine bio-diesel production with electricity generation from biomass wastes;
- Research and development projects on biomass gasifier technology; and
- Collaboration on production of ethanol from starch/cellulosic material, and in studies of biofuel from plants such as jatropha and pongamia.

It is hoped that the visit of the French Mission will help give concrete shape to a platform that can enhance future collaboration between India and France in bio-energy.

Gas-fired muffle furnaces in Firozabad glass cluster: window of opportunity?

During its intervention in the Firozabad glass cluster, TERI successfully developed and demonstrated a clean, energy-efficient gas-fired muffle furnace for baking bangles in 2001. This furnace was meant to replace the traditional coal-fired muffle furnace (known as *pakai bhatti*), which causes very high levels of pollution, leading to poor workplace environment. The technology was widely accepted in the cluster and around 120 units came up till 2006. However, wider adoption of the gas-fired muffle furnace has been seriously hindered because of the following reasons.

- Safety, financial, gas availability, and logistical considerations have prevented GAIL (India) Limited from supplying gas to *pakai bhatti* units at their existing locations in highly congested residential areas of Firozabad.
- *Pakai bhatti* owners find it difficult to relocate to sites where GAIL could provide gas supply.
- Coal is still available in Firozabad at affordable prices despite the fact that coal cannot be used by industries in the Taj Trapezium Zone as per the directions of the Supreme Court of India. This acts as a disincentive for switching over to gas.
- Gas prices have steeply increased over the years to a point where the *pakai bhatti* owners find it more profitable to burn coal/wood as fuel.

UNIDO (United Nations Industrial Development Organization) and the Office of the DCSSI (Development Commissioner – Small Scale Industries) have shown interest in this area and are willing to look at ways to find a permanent solution to this problem. In April 2007, TERI accompanied a team comprising officials from UNIDO, the DCSSI, and other officials from the MoSSI (Ministry of Small



Coal-fired *pakai bhatti*



Gas-fired muffle furnace

Scale Industries) to Firozabad. The team interacted with glass entrepreneurs, including muffle furnace representatives, and the CDGI (Centre for Development of Glass Industry) personnel. During discussions, it clearly emerged that almost 50% of the pot furnace owners have already switched over to the energy-efficient TERI design and the focus of any new DCSSI/UNIDO programme in Firozabad should be on *pakai bhattis* and other auxiliary furnaces.

Various options available for *pakai bhattis* were discussed during the interactions and the DCSSI expressed keen interest in supporting this segment. TERI affirmed its willingness to work with the DCSSI in assisting the owners of *pakai bhatti* units to adopt clean and efficient gas-fired muffle furnaces. In effect, this is a fresh window of opportunity to find a long-term solution to the problems of *pakai bhatti* owners.

Consultative meeting at Ahmedabad for dissemination of DBC technology in Gujarat

To promote dissemination of the energy-efficient DBC (divided blast cupola) technology in the Gujarat foundry industry, TERI organized a 'Consultative meeting on establishing a delivery system for DBC in Gujarat' in Ahmedabad on 11 May 2007. The programme was organized in collaboration with GITCO (Gujarat Industrial and Technical Consultancy

Organization Ltd), the IIF (Institute of Indian Foundrymen), and the AFC (Ahmedabad Foundry Cluster). About 15 entrepreneurs from the AFC benefited from the programme. Other participants included representatives from the IIF and GITCO. One of the major topics discussed during the programme was how the DBC technology could benefit more foundries in Gujarat, particularly in the Ahmedabad cluster.

Rice dryer for puffed rice units

Puffed rice is the staple food among many people in the northern districts of Karnataka. There are thousands of small puffed rice units operating in clusters located in Davangere, Dharwad, Hubli and other towns on the National Highway connecting Bangalore and Mumbai. TERI has been working with two partners – the BVBCET (BV Bhooraddi College of Engineering and Technology), Hubli, and the PGAMSS (Paripoorna Gramina Abhivruddi Mahila Seva Samsthe) – to bring about improvement in the lives of owners/workers in puffed rice units through clean, energy-efficient technology.

Puffed rice is made from unhusked rice in a series of steps. The paddy is soaked, parboiled, and dried. The rice grain is then dehusked, dried and roasted to yield puffed rice. The rice has to be dried immediately after parboiling to remove about 15% of the moisture content; or else it will not 'puff' satisfactorily when roasted. Traditionally, parboiled rice is sun-dried by spreading the grain on

Manufacturer's view—fuel supply as part of technology package?

I own an industrial fabrication unit in Bangalore named VEE (Vijay Engineering Enterprises). VEE has been licensed by TERI to fabricate thermal gasifiers. The first gasifier system was installed and commissioned under TERI's supervision at a silk fabric dyeing unit (Vivek Colour Factory in Bangalore) in March 2000. This system has so far logged over 30 000 hours of operation. Over the years, VEE has set up around 20 more gasifier-based dyeing systems.

Besides fabrication and installation of the systems, VEE also trains clients in their operation and maintenance. Most importantly, my unit also supplies sized dry wood as fuel for gasifier systems. The need for a regular and dependable supply of dry and sized woodchips was expressed by our very first client—Mr Rajagopal of Vivek Colour Factory—and thereafter echoed by others who bought our systems.

Initially, I purchased wood chips from sawmills. The wood chips were packed in gunny bags and sent directly to clients. However, it became difficult to obtain dry wood during the rainy season. As more and more units set up gasifier-based systems, the demand for sized dry wood chips increased substantially. This motivated me to set up a wood supply system in my own unit. We fabricated a table-top wood-cutting machine, stocked logs, and bought tarpaulins to protect the logs from rain. Today, VEE has three wood-cutting machines and every month we supply 50–55 tonnes of sized dry wood chips to our clients. The assurance of uninterrupted fuel supply throughout the year has certainly encouraged more units to adopt energy-efficient gasifier-based dyeing systems.

N Ravi Kumar
Vijay Engineering Enterprises



News clipping on parboiled rice drier

gunny bags on the ground in the vicinity of puffed rice units. However, this exposes the grain to dust and to animals. Also, sun-drying of grain is not possible for several days at a time during the three-month rainy season, interrupting the production of puffed rice.

In early 2006, TERI conducted an 'aspiration analysis' in the puffed rice clusters of Gollara Oni (Dharwad) and Padadayana Hakkalu (Hubli) to ascertain the needs of owners and workers. Based on their feedback, TERI and its partners, the BVBCET and PGAMSS, examined various options and decided to improve the drying process by designing a special oven for drying parboiled rice. A student project was framed around this idea, and a full-fledged working model was designed, constructed, and tested at the BVBCET campus. Puffed rice workers were given an opportunity to operate the system and suggest modifications for its improvement, which were duly incorporated.

Since then, TERI has organized a number of demonstrations of the improved rice-drying system in different puffed rice clusters to spread awareness among workers, owners, SHGs and bank officials.



Rice drier designed by students of BVBCET

Bankers have expressed interest in providing loans to puffed rice units for acquiring the new dryer.

The cost of an improved dryer system is about Rs 10 000. The dryer has the following features.

- It can process 15 kg of rice at a time.
- Drying time is about 20 minutes.
- About 0.26 kg of biomass fuel is required to dry one kg of parboiled rice.

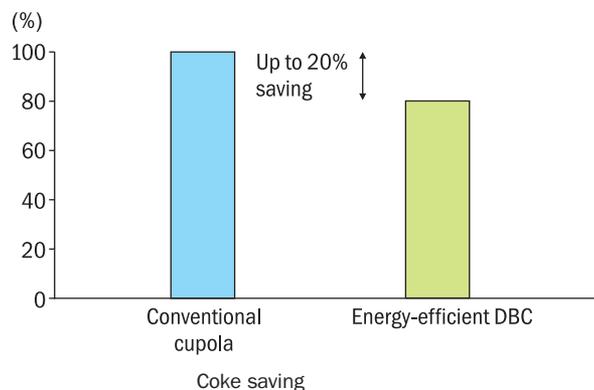
A dryer has now been installed at the puffed rice cluster in Jannath Nagar (Dharwad) for trials and assessment under actual field conditions. The response of unit owners and workers has been positive.

Techno-social programme in Howrah foundry cluster

TERI and its NGO partner at Howrah, the IMSE (Institute for Motivating Self-Employment), organized two sessions in the Howrah foundry cluster with a focus on techno-social issues. These sessions were aimed at enhancing the awareness levels among foundry workers on various technological and environmental issues. Each session was attended by about 25 foundry workers. The first session, held on 14 May 2007, discussed the possibilities of improving the working environment in coke-based foundries. The second session was held on 28 May 2007 and focused on two subjects—globalization, and technology gaps and the generally poor quality of finished castings produced in the Howrah foundry cluster.

Inauguration of knowledge hub in eastern Uttar Pradesh

A 'knowledge hub' on the brick sector was inaugurated at Lalgopalganj (Allahabad) on 29 May 2007 by PEPUS, TERI's partner in the CoSMiLE project. The inaugural function was attended by office bearers and members of the BPVSS (Bhatta Parivar Vikas Seva Sangathan). The knowledge hub will integrate traditional knowledge and skills of the firemen community with scientific and technical knowledge. It is envisaged as an 'epicentre of knowledge', as described by Mr Sunil Sahasrabudhey, the resource person who was present on the occasion. The hub will enable stakeholders to share their learning and experiences.



Two more DBCs commissioned in Rajkot: five to come!

In April 2007, TERI successfully commissioned two new DBCs of 21-inch internal diameter at Rajkot—one in Sardar Castings (on 8 April) and the other at Vishal Foundry (on 19 April). The commissioning of the DBCs went off smoothly. Both units had a charge coke consumption of close to 9.7% in their conventional cupolas. The newly commissioned DBCs achieved a charge coke consumption of 7.14%–8.4% (coke-to-charge ratio of 1:14 to 1:12), indicating substantial coke saving of 15%–20%. These two foundries are part of a group of seven foundries in Rajkot, which have jointly taken up adoption of the TERI-designed DBCs at their units. With the commissioning of these two DBCs jointly with the entrepreneurs, and sharing of best operating practices in DBCs, sufficient capacities have been created within the Rajkot cluster to commission the remaining five DBCs.

Another group of three foundries (with a total of four DBCs) have joined together for adoption of the TERI-designed DBC of 24-inch internal diameter in the same cluster. Designs have been finalized and fabrication work is in progress in all the units. Commissioning of these DBCs is expected to be completed during the later part of this year.



DBC commissioning at Sardar Castings (Rajkot)

Anchor team training to promote modern biomass technologies

TERI conducted a five-day training programme at Bangalore during 21–25 May 2007 titled 'Anchor Team Training Programme' to promote modern biomass energy technologies. The programme was co-sponsored by the MGIRED (Mahathma Gandhi Institute of Rural Energy and Development) and aimed to strengthen capacities of the potential service providers, as well as prospective trainers in biomass energy technologies. The participants included entrepreneurs, NGOs, engineering colleges (where energy is a subject at postgraduate level), and government organizations.

The programme had two unique aspects:

(1) project-based learning to equip the anchors to identify potential enterprises and develop business plans for feasible interventions; and (2) business meets/interactions between manufacturers (one from Bangalore and the other from Mumbai), TERI, and the potential anchors to carry forward the business plans. Classroom sessions and site demonstrations enabled participants to appreciate field realities in the interventions. Some of the decisions that emerged during the training are summarized below.

- The BV Bhoomaraddi College of Engineering and Technology will conduct a *mela* (fair) to promote modern biomass technologies among potential users in Hubli/ Dharwad.
- Malnad College of Engineering, Hassan, will conduct sectoral studies to identify the potential in Malnad area for end uses such as arecanut and cashew processing.
- Suma Khadi Gramodyog will conduct sectoral studies and awareness programmes at Kolar covering mango-pulp processing and other units that use diesel and/or biomass as fuel.
- The MGIRED will set up a demonstration thermal gasifier to popularize the technology during its training sessions.
- The MS Ramiah Institute of Technology, Bangalore, will set up a biomass laboratory.
- The NIRD (National Institute of Rural Development), Hyderabad, will provide space for demonstration of TERI-designed gasifier systems and other devices.

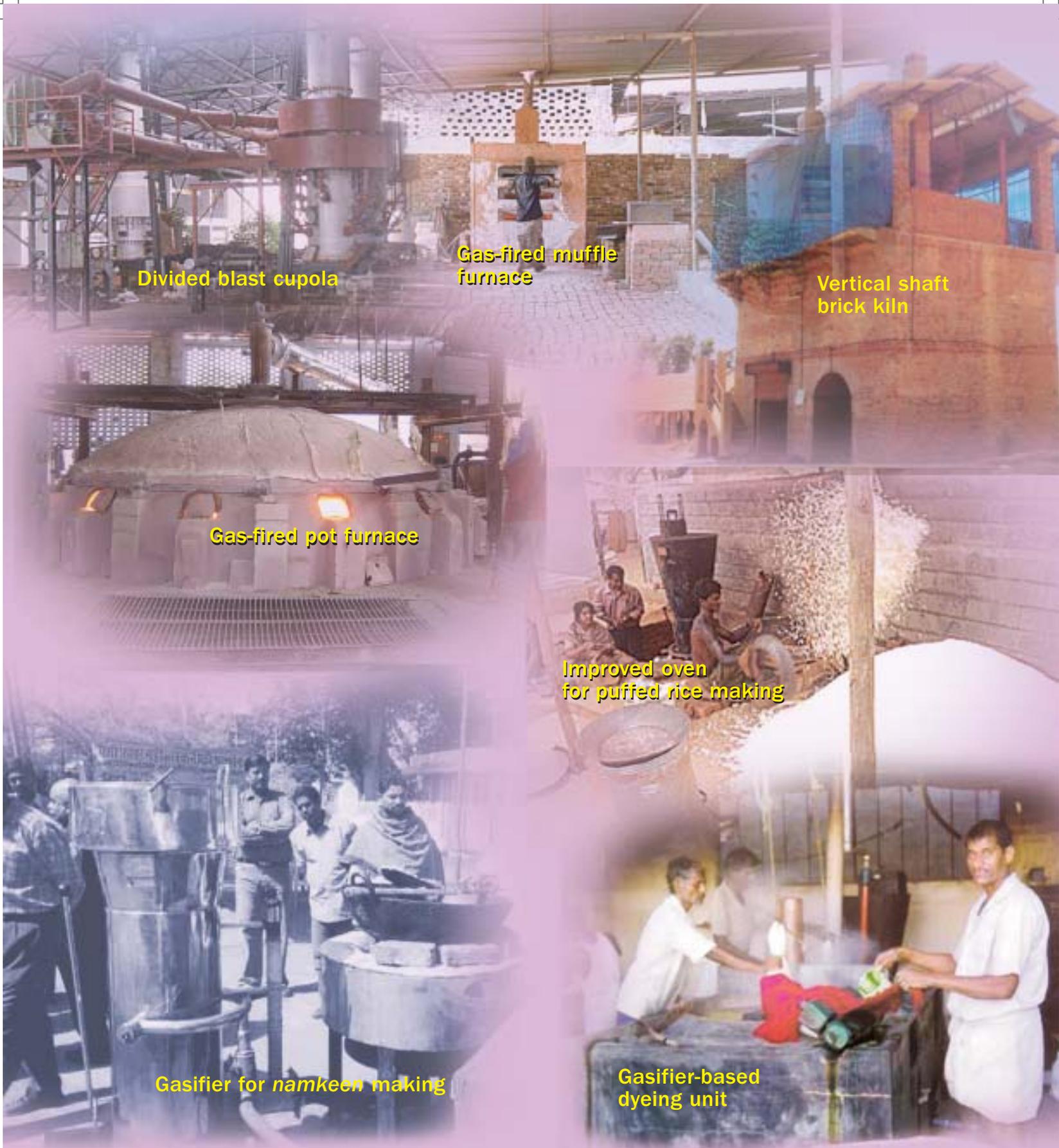
TERRAVIEW capsules—making waves

TERI has prepared 10 film capsules focusing on energy-efficient technologies and cleaner environment in the SMiE sector. Eight capsules have already been aired on Doordarshan News Channel under the series titled TERRAVIEW, in both Hindi and English. The capsules cover the SDC-TERI interventions in the foundry, glass, brick, and biomass gasifier sectors, as well as interventions by other agencies in the ceramics sector.

Telecast date	Capsule title	Topic
25 March 2007	Towards an efficient tomorrow	Biomass gasifiers for large-scale cooking
1 April 2007	Igniting change	Divided blast cupola for foundries
8 April 2007	Changing convention	Top firing gas-based pot furnace for glass melting in Firozabad glass cluster
15 April 2007	Rubber industry: a turning point	Biomass gasifiers for rubber processing units
6 May 2007	Energizing tomorrow	Biomass gasifiers for silk industry
13 May 2007	Green energy	Energy from waste: converting agro-wastes into briquettes for fuelling biomass gasifiers
3 June 2007	A smokeless pyre	Gasifier-based crematoria
17 June 2007	Unfinished journey	Gas-fired muffle furnace for bangle-baking in Firozabad glass cluster

Events calendar

- 1 Knowledge dialogue among firemen community, social activists, farmers, and students on brick making; Ghuisarnath (Lalganj), 26 June 2007.
- 2 Exposure visit for puffed rice owners and workers from clusters in Shimoga and Guttal to BVBCET premises; Hubli, 6 July 2007.
- 3 Meeting with Additional Secretary and Development Commissioner, MSME (Ministry of Micro, Small and Medium Enterprises) on muffle furnaces; New Delhi, 6 July 2007.
The meeting will focus on various options available for coal-fired muffle furnace owners of Firozabad to switch over to cleaner, gas-based systems.
- 4 Sensitization programme for puffed rice makers of Ranebennur cluster; Ranebennur, 6 July 2007.
The objective of the programme is to provide information on various technology options available to puffed rice makers.
- 5 Meeting with officials of the District Industries Centre, Pollution Control Board, and Puffed Rice Association to promote improved devices for puffed rice making; Hassan, 20 July 2007.
- 6 Awareness meeting among firemen and officials from the Ministry of Labour; Harchandpur, July 2007.
The meeting will familiarize brick industry firemen with various government schemes meant to benefit the less privileged sections of society.
- 7 Social training programme for brick industry firemen and master firemen; Lalgopalganj, July and September 2007.
- 8 Technical training programme for brick industry firemen and master firemen; Lalgopalganj, 9–10 August 2007.
- 9 Two-day meet on alternative technologies, jointly organized by the M S Ramaiah Institute of Technology (Bangalore) and TERI; MS Ramiah Institute of Technology, Bangalore, 17–18 August 2007.
The emphasis of the meet is to familiarize faculty of engineering colleges in Karnataka with modern biomass technologies.
- 10 Awareness meet on modern biomass technologies; Mysore, 30 August 2007.
The one-day meet is aimed at creating awareness among potential biomass users and entrepreneurs for promoting modern biomass technologies.
- 11 Demonstration of gasifier-based ovens for mango-pulp making—jointly organized by Suma Khadi Gramodyog Sangha (Kolar) and TERI; Kolar, 24 September 2007.



Divided blast cupola

Gas-fired muffle furnace

Vertical shaft brick kiln

Gas-fired pot furnace

Improved oven for puffed rice making

Gasifier for namkeen making

Gasifier-based dyeing unit

For more details, please contact

Girish Sethi
 Project Coordinator - CoSMiLE
 Energy-Environment Technology Division
 TERI
 Darbari Seth Block, IHC Complex
 Lodhi Road, New Delhi - 110 003 / India



Tel. 2468 2100 or 4150 4900
Fax 2468 2144 or 2468 2145
E-mail cosmile@teri.res.in
Web <<http://www.cosmile.org>>