CoSMiLE UPDATE

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A platform for learning and action for small and micro enterprises

Editorial

Brick-making is an important economic activity in rural India. There are over 100 000 small and micro enterprises producing more than 140 billion bricks per year. The brick industry provides livelihood to an estimated 15 million people. There are several key issues – energy, environmental, and social – linked with brick production. Brick firing is a highly energy-intensive process; typically, 0.15–0.30 kg of coal is consumed in firing one brick. Therefore, substantial scope exists for conserving fuel in brick kilns. Also, brick kilns are a major source of local air pollution, and digging away of top soil results in degradation of land. The workers are generally very poor, and they work under appalling conditions. Absence of any form of security, low wages, no health-care facilities, unsanitary conditions, no education for children, unsafe and hard conditions for women—all these characterize the life of the worker and their families, that too in worksites far away from their native village and community.

With support of the SDC (Swiss Agency for Development and Cooperation) since 1995, TERI has been engaged in development and dissemination of technologies and practices to improve energy efficiency and tackle environmental problems in the Indian brick industry. During the initial period, TERI was mainly involved as a knowledge partner in demonstration of the VSBK (vertical shaft brick kiln) technology in different regions of the country. Other key players in this programme included Development Alternatives, Gram Vikas, Damle Clay Structurals Ltd, Comtrust Ltd and MITCON. TERI has also been actively associated with brick industry associations and various BTK (bull's trench kiln) entrepreneurs in promoting improved technological solutions that help in enhancing energy efficiency and reducing environmental impacts. It has also helped the INP (Int Nirmata Parishad), Varanasi, the local industry association, in establishing a testing laboratory for the brick kilns in the region. A significant signpost in the intervention has been the formulation of draft environmental norms for VSBKs for the CPCB (Central Pollution Control Board). TERI has also conducted performance evaluations of air pollution control systems and review of emission standards set for BTKs.

Broadly, TERI's intervention in the brick sector has attempted to give a new meaning to building and pooling of competencies, by integrating technological solutions to improve firing practices with social aspects of firemen/master-firemen communities. In other words, the intervention has aimed at techno-social integration. During the course of interaction with firemen in brick kilns across north India, TERI realized that the majority of firemen belong to the districts of Allahabad, Pratapgarh, Rae Bareli, and neighbouring districts in eastern Uttar Pradesh—a region that also has the highest density of brick kilns in the country. There are about 150 000 families of firemen in these three districts. They migrate long distances of up to 1000 km to work on BTKs. Hence, this region was chosen by TERI for extensive intervention in partnership with two regional NGOs – PEPUS and Lokmitra.

The main foci of intervention in eastern Uttar Pradesh were ownership of kilns by artisans; technical training, including BOP (best operating practices); building of firemen's community organizations like the BPVS (Bhatta Parivar Vikas Sangathan); and development and strengthening of women's leadership. The first VSBK of this region was built in Varanasi in the year 2001 with active involvement of the INP. Two more VSBKs were built in subsequent years under the ownership of firemen/master-firemen. Also, TERI facilitated commissioning of one VSBK at Thogur, Tamil Nadu, under the ownership of women SHGs (self-help groups).

In artisanal ownership, knowledge becomes capital. Several technical training sessions have broadened the knowledge of firemen, which they are using to their own advantage as well as for the betterment of the industry. The community organization, that is, the BPVS, has been a great source of empowerment for them. Since the men migrate for over six months each year, efforts to develop women's leadership have met with good response and results. TERI's intervention has so far covered about 20% of the firemen community in the region (the targeted community). All activities related to technical knowledge have been in direct relation with the community organization. The closeness of this relationship has introduced a context of social norms for technical knowledge and practice, particularly in the community context. Work now is focused on capacity building in interaction with other knowledge processes and institutions. The attempt is to infuse a knowledge perspective for a forward-looking approach.

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Resource Person - CoSMiLE

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Book release: biomass gasifiers for heat applications

During the DSDS (Delhi Sustainable Development Summit) 2007, organized by TERI a book titled 'Towards Cleaner Technologies: a process story on biomass gasifiers for heat applications in small and micro enterprises' was released by H E Mamadou Lamine Loum, former Prime Minister of Senegal. The book recounts the activities and experiences of TERI since 1994, when it entered into a partnership with SDC to find solutions to the energy and environmental problems faced in select SMiE (small and micro enterprises) sub-sectors by means of improved technology and human and institutional development.

This book narrates, in a brief and simple way, the process by which TERI developed clean and energy-efficient biomass gasifier systems for heat applications— initially in silk reeling units and later in other SMiEs. In particular, it highlights the experiences of project staff and other stakeholders, and the challenges faced and overcome by them in the course of the work. The book will be useful as a guide for researchers, policy makers, NGOs, donor organizations, academic institutions, and others involved in SMiEs, particularly in developing countries.

[A copy of the book may be downloaded from http://www.cosmile.org. It may also be obtained from TERI Press at a subsidized price of Rs 300]

Brainstorming on upscaling of the divided blast cupola

On 6 February 2007, T E R I organized a brainstorming session at New Delhi, to evolve a strategy for upscaling of the DBC (divided blast cupola) among Indian foundries. The participants included K S Satyanarayana, S H Arjunwadkar, and H Sundara Murthy from IIF (Institute of Indian Foundrymen); Ajay Mathur from BEE (Bureau of Energy Efficiency); R R Bhatia (consultant) and Veena Joshi and Jean Bernard Dubois from SDC.

Brochure for market promotion of DBC

The participants agreed that the major emphasis should be to capitalize on the work done in the past with the objective of transferring the know-how to 'where it belongs'. The focus will be on developing local nodes and fabricators in order to strengthen the supply chain. They will be provided with marketing support, including suitable literature and other publicity material related to the DBC. The project will standardize design details of the DBC in order to reduce the cost and time for delivery. The participants suggested that various carbon financing mechanisms may be explored as possible financial vehicles for upscaling of the DBC.

Efforts will be made to highlight improvement in the quality of castings through the DBC route. In this connection, duplexing (a process wherein the cupola is used as the primary melting unit and the metal composition is adjusted subsequently in an induction furnace) provides a major cost advantage for foundries. NCTS (National Centre for Technical Services), a centre of IIF, Pune, is preparing a white paper on the duplexing process.

Regional business meets on biomass gasifiers

TERI organized two regional business meets for 'Promotion of biomass gasifiers for thermal and electrical applications' in Chandigarh on 16 March 2007 and in Dehradun on 21 March 2007. Organized in association with the state renewable energy development agencies of Haryana, Punjab, and Uttaranchal, these meets were also supported by the MNRE (Ministry of New and Renewable Energy).

Participants included representatives from small and micro enterprises; educational and religious institutions; HAREDA (Haryana Renewable Energy Development Agency); PEDA (Punjab Renewable Energy Development Agency); UREDA (Uttaranchal Renewable Energy Development Agency); forest, agriculture, rural development, and power departments; manufacturers of biomass gasifier systems, stoves, and briquetting systems; and briquette producers.

Demonstration of biomass gasifier and stove

The technical sessions focused on biomass gasification technology, TERI's initiatives on biomass gasifier, customized technology packages for thermal gasifiers and application of gasifiers for power generation applications. The MNRE elaborated on various financial incentives to promote the adoption of biomass gasifiers by industries and institutions. The salient feature of the meets was the demonstration of biomass gasifiers and biomass stoves.

Power to people – Kanheiput power gasifier

In December 2006, efforts to bring electricity to rural India crossed a small but significant milestone in the tiny village of Kanheiput in Orissa's Ganjam district, where a stand-alone power generating system based on biomass gasification logged 3000 hours of service.

Kanheiput has a total population of 40, living in 11 small households. All the families fall under the BPL (below poverty line) category. Till 2004, Kanheiput—like 96 000 other Indian villages—did not have electricity at all. In general, it requires a lot of money to lay down infrastructure (transmission towers, substations, power lines, transformers, and so on) to provide power from the existing power grid to villages, particularly when the villages are small, scattered across large areas, and difficult to access. Clearly, there is a need to find ways by which these villages can obtain electricity from stand-alone generators based on renewable energy sources such as biomass, which is easily available in rural areas. Recognizing this need, and to build upon TERI's vast experience in the field of biomass gasification, in 2002 SDC sponsored a joint project between TERI and Gram Vikas, an Orissa-based NGO, called LIBERA (Livelihood Improvement through Biomass Energy in Rural Areas). In May 2004, the project developed and commissioned a 10-kW power gasifier system to provide electricity for Kanheiput. This system runs entirely on producer gas obtained by gasification of biomass; that is, it does not require any diesel at all to operate.

For TERI, the work at Kanheiput provided valuable lessons in setting up and running a power gasifier system. Being the first system to be taken to the field, the project decided to use charcoal (despite its higher costs as compared to wood) as it generates relatively clean gas (with less tar). It was also felt that this step would help in building user confidence during trials. A major challenge was to find a way by which air required for the gasifier could be supplied without using any external energy source. Initially, during the trial runs, the project used a 1-kW generator set based on LPG (liquefied petroleum gas) to run a blower supplying air to the gasifier. Within a few months, the project successfully developed and installed a pedal-operated blower for air supply. This manually operated blower has freed the villagers from dependence on fossil fuels like LPG, diesel, and kerosene, which are not only expensive but often difficult to procure in remotely located villages. Another challenge was to find a way to periodically remove ash deposits from the gasifier grate. Initially, the grate had to be shaken manually every half-hour or so to ensure smooth and continuous operation of the gasifier. In 2005, TERI designed a simple grate-shaking mechanism with a timer for automatic ash removal at periodic intervals. This device obviates the necessity for constant supervision by an operator. Later, an electronic governor was also successfully installed to take care of load fluctuations,

Illuminating lives in Kaneihput

The power gasifier in Kanheiput village

Maintenance frequency for components in power gasifier

Component	*Maintenance frequency*
Ash pit, cyclone, gravel bed filter*, foam filter**	7 days
Dust settling chamber	10 days
Paper filter, grate & duct	45 days
Spark plug and lube oil	500 hours

* partial replacement once in 120 days
** partial replacement once in 30 days

Performance summary of Kanheiput power gasifier system

Parameter	*Average value for 17 months*
Operation (hour/ day)	4.2
Usage per month (%)	97
Load (kW_e)	5.27
Power generated (kWh/month)	639
Fuel consumed (kg/month)	929
Specific fuel consumption (kg/kWh)	1.45
Fuel cost of production (Rs/kWh)	7.93

making the entire plant self-running with minimal operator intervention for the 7–8 hour batch fuel charged into the gasifier.

The Kanheiput power gasifier is essentially a technology demonstration under actual field conditions. Although the financial viability of the Kanheiput system is yet to be established, it has clearly shown that a 100% producer gas power gasifier can generate electricity for low-demand applications, and that it can be operated by the local community with some training. The average daily demand for electricity in the village is around 4–5 hours. However, the system can run for 7–8 hours continuously at full load on one full fuel charge. Thanks to the power gasifier, children in Kanheiput are now able to study by the light of electric lamps. Each household pays a sum of Rs 50 per month for electricity. On festive occasions, an additional Rs 200 is paid to run the system throughout the night.

The challenge is to find ways to make the power gasifier system affordable to poor communities. This is particularly relevant as the Government of India has identified 25 000 villages that require power supply of 5–25 kW daily, but are located in areas too remote for grid supply to be financially viable.

Large market for small divided blast cupolas: participation in Indian Foundry Congress, Agra

Each year, the IIF (Institute of Indian Foundrymen) organizes a Congress to discuss issues of interest to the foundry industry. The 55th Indian Foundry Congress was held from 2–4 February 2007 at Agra, with 'Gateway to Global Markets' as its theme. The event highlighted global trends in the foundry industry, with a number of sessions devoted to foundry-related technologies.

Two presentations were made during the plenary session on 'Cash and credits of energy in foundries'. One was on 'Sharing of experiences on India's first gas-fired cokeless cupola at Agra' by Richard Taft, Cokeless Cupolas Ltd, UK. TERI made a presentation on 'Energy efficiency in foundries in the context of CDM (Clean Development Mechanism)'. TERI's presentation dealt with the relevance of carbon credits in the context of CDM and other carbon-trading mechanisms that are designed to promote energy efficiency and thereby reduce carbon emissions. The presentation described the benefits of using the TERI-designed DBC in terms of reduced carbon emissions (about 250 tonnes of CO_2 per year for a 250-tonne-per-month foundry) and monetary savings (equivalent to 60 tonnes of coke or Rs 860 000 per year @ Rs 14 400 per tonne of coke). Typically, the investments on a TERI-designed DBC are paid back within a year.

Seeds of innovation – the concept of waste heat recovery

In 2000, TERI developed and demonstrated an energy-efficient gas-based pot furnace in the Firozabad glass cluster. A key feature of the TERI-designed system is the use of a metallic device called recuperator, which recovers waste heat from flue gases and uses it to preheat combustion air to about 500–600°C. The recuperator helps in reducing gas consumption by 30–35%. About half of all the close pot furnace units (around 40 units) in Firozabad have adopted TERI's design. Interestingly enough, the concept of waste heat recovery seems to have caught on and spread much further and faster than TERI's design itself! This is evident from the number and variety of locally designed recuperators that are being developed and adopted by other pot furnace units. Among them, six units have installed 'plug-in' recuperators, and a few others have installed single/double pipe recuperators. These devices may not be as effective in heat recovery as TERI's recuperator, but they do help in reducing fuel consumption to some extent. Most important, they show that entrepreneurs are becoming increasingly confident in learning from improved technologies and adapting them to suit their individual needs.

Indeed, the concept of waste heat recovery is also being extended to other 'auxiliary' furnaces—furnaces used to convert glass melt to finished products. The sekai bhatti is one such furnace. It is used to re-heat globs of glass melt taken from the pot furnace after colours have been added to the globs. The majority of sekai bhatties are gas fired, with the gas burners placed at the bottom of the furnace. In general, these furnaces have low energy efficiencies. In 2005, TERI's local consultant in Firozabad, B C Sharma helped one of the local units in designing a simple heat recuperator for its sekai bhatti. This device consists of a circular mild steel pipe set into the crown of the sekai bhatti. Air passing through this pipe gets pre-heated by rising flue gases before it reaches the burners. It enables a

Plug-in type recuperator in a pot furnace unit

Local innovation in sekai bhatti

fuel saving of about 5%. Now, almost all the sekai bhatties in Firozabad have such a heat recovery system.

South–South cooperation: partnerships for development

Each year, TERI hosts the DSDS (Delhi Sustainable Development Summit)—a major international conference that focuses on issues related to energy, environment, and socio-economic development at the macro and micro levels. During DSDS 2007, a session was devoted to the topic 'Sustainable development: technologies for the poor'. Speakers at this session stressed that technologies meant to benefit the poor should satisfy three basic criteria, referred to as the '3As' – affordability, accessibility, and appropriateness. To make improved technologies affordable to the poor, it was suggested that markets should be created in which the poor would be actors or producers in the value chain. 'We must consider the poor as customers, not beneficiaries,' said Francois Binder, Country Director, SDC India. In order to ensure that improved technologies are appropriate for the local community, technology-specific development programmes should be framed in such a way that they suit local conditions and draw upon traditional knowledge and skills. The session also highlighted the need for developing countries to work together in addressing problems shared by them. 'South–South cooperation should be nurtured for solving problems specific to poor countries,' said Ms JoAnne Disano, Director, Division for Sustainable Development, Department of Economic and Social Affairs, United Nations.

Focus group discussion

To discuss the issue of South–South cooperation in greater depth, particularly in the context of helping the small and micro enterprise sector, CoSMiLE organized a focus group discussion on 24 January 2007as a DSDS special event. Among the participants were Philippe-Roger Scholtes (UNIDO), Carl G Svensson (Development Cooperation, Embassy of Sweden), Rajiv Gopal (International Finance Corporation), Herman Mulder & World Business Council for Sustainable Development), Juergen Bischoff (GTZ) and Dinesh Awasthi (Entrepreneurship Development Institute of India). Also present were representatives from Development Alternatives, Centre for Environment Education, Foundation for MSME Clusters, ABN-AMRO, UBS AG (Switzerland), INFRAS, Free University of Berlin, and the Namibian High Commission. The group discussion provided a platform for participants to share their experiences in working with the SMiE sector in different countries. Topics that were discussed included UNIDO's plan for South–South cooperation in India; projects under ITEC (Indian Technical and Economic Cooperation, Ministry of External Affairs, Government of India); work done by SDC and TERI in the brick and biomass sub-sectors in South-East Asia; ethanol production from bio-sources in Brazil; and Shell's intervention with cooking stoves.

The participants emphasized the importance of external support for the development of SMiEs. They also recognized that in order to be effective, South–South cooperation must work as a multi-lateral partnership in a "network of networks" mode. In particular, it is important to forge partnerships between research institutes, training centres, and NGOs in different countries, as well as to involve other stakeholders such as local banks and financial institutions. Overall, South–South cooperation must be built around three core elements — credibility, trust, and the willingness to share knowledge and experiences.

India and Vietnam – Possible South–South cooperation in brick-making

TERI has been associated with Entec AG (Vietnam) since 2003 for intervention in the Vietnamese brick industry. TERI provides support for technical

Extruder used in large brick kilns in Vietnam

improvements and performance evaluation of various types of brick kilns. It has also conducted training programmes and organized exposure visits for capacity building among various stakeholders. In Vietnam, three types of kilns are used for brick firing – tunnel kilns, clamps, and VSBKs. These kilns are generally coal fired.

There are similarities in terms of production capacities between brick kilns in India and Vietnam. However, Vietnam's brick industry has made certain innovations in technology that may be of benefit to the Indian brick sector. To explore this possibility in greater depth, an exposure visit to Vietnam was undertaken during January 2007 by a group of brick makers, technical experts, machinery suppliers, and a representative from TERI. The visit has opened up the possibility of cooperation in (i) adoption of cost-effective coal-fired tunnel kilns; and (ii) semi-mechanization of green brick production (perforated bricks and hollow blocks) both on large and small scale.

Peforated bricks from a tunnel kiln in Vietnam

Brick-making in Karnataka: workshop on best practices

TERI has been involved in introducing VSBK (vertical shaft brick kiln) technology in Karnataka, as well as in helping the local brick industry to improve the existing methods of drying and firing bricks. In order to share the knowledge and experience, TERI organized a joint workshop on 29 January 2007 with the DIC (District Industries Centre) and VIA (Vishveshwaraiah Industrial Association) of Kolar district. The workshop was attended by about 70 brick kiln entrepreneurs and inaugurated by the Deputy Commissioner, Kolar.

Participants discussed various aspects of brick-making, including selection, testing, blending, and mixing of raw materials and the shaping, drying, and firing of green bricks. They also shared know-how regarding the use of additives to improve the quality of green bricks, the drying process, and the use of 'internal fuels' (that is addition of fuel with clay that helps in the firing process). The workshop provided an overview of new technologies like tunnel kiln and the production of resource-efficient products such as hollow blocks and perforated bricks.

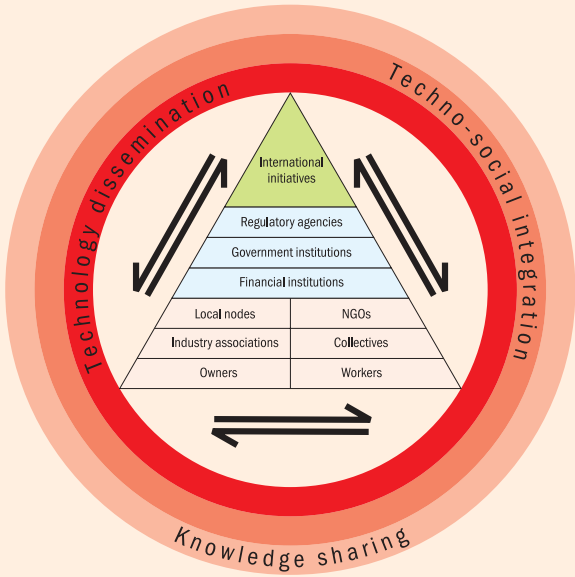
The Kolar brick-makers expressed their need for a testing laboratory for testing raw material and fuel. In response, the local SISI (Small Industries Service Institute) offered to make its own facilities available for tests. It was also decided that TERI would facilitate an exposure visit for the entrepreneurs to brick-making sites in bigger clusters in order to broaden their understanding of various technologies available in brick-making.

Workshop on best practices in brick making

About CoSMiLE

The goal of CoSMiLE (Competence Network for Small and Micro Learning Enterprises) is to improve the economic, environmental, and social conditions of entrepreneurs and workers of small and micro enterprises.

CoSMiLE focuses on adopting resource-efficient technologies and knowledge sharing to enhance the competitiveness of the targeted small and micro enterprises. It aims to facilitate the holistic development of enterprises through techno-social integration. Furthermore, it aims to ensure that the developed technologies benefit the workforce by providing improved working conditions and a better quality of life.



The CoSMiLE Framework

CoSMiLE is a dynamic and informal grouping of actors consisting of owners and workers of small and micro enterprises; service providers like masons, contractors, fabricators, and local experts; and stakeholder institutions like industry associations, government departments, NGOs (non-governmental organizations), financing institutions, and academic and research institutions. The common factor binding the network's members is learning orientation. It is an open network, which welcomes forward-looking enterprises and experts desirous of learning and sharing knowledge.

Events calender

1 Commissioning of DBCs, Rajkot foundry cluster, 16–20 April 2007

2 Visit of French delegation to explore collaboration in the field of biomass energy; TERI, New Delhi, 17 April 2007
The delegation comprises representatives from French industry and donor organizations and is facilitated by the Embassy of France.

3 Sensitization programme for puffed-rice makers of Ranebennur cluster; Ranebennur, 30 April 2007.
The objective is to provide information on various technology options available to puffed-rice makers.

4 Technical orientation programme on DBCs and best operating practices for furnace operators; Popular Casting, Howrah, April/May 2007

5 Training of SHGs of Hubli and Dharwad puffed-rice clusters on income-generating activities; Dharwad, 5 May 2007

6 Exposure visit for puffed-rice owners and workers from clusters in Shimoga and Guttal to BVB College of Engineering and Technology, Hubli, 10 May 2007

7 Experience-sharing workshop on VSBK; Thogur, Tamil Nadu, 15–16 May 2007
The workshop will provide a platform for women's self-help groups to share their experience and learning while working with VSBK.

8 Technical training programme for firemen/ master firemen/ entrepreneurs at BTK sites near Patna, Bihar; May/June 2007
The programme will provide an overview on production of perforated bricks, hollow blocks, and other decorative items.

9 Interaction meet with open pot furnace entrepreneurs; Firozabad, June 2007
The meet will focus on QAQC (quality assurance and quality control) in various aspects of construction and fabrication of recuperators.

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