VOLUME 4
ISSUE 2
June 2009

A platform for learning and action for small and micro enterprises

Editorial

The developing nations in South Asia and Africa share some common traits such as poor and rapidly growing populations; vast disparities in incomes and lifestyles; significant rural population-spread over extensive areas; high dependence on biomass fuels, especially among the rural populace; and very low, but exponentially growing, levels of per capita energy consumption. These are further characterized by (i) need for rapid economic growth and industrial expansion, (ii) fast rate of urbanization, (iii) substantial use of biomass forms of energy such as fuel-wood, farm and animal waste, and (iv) increasing substitution of traditional or non-commercial fuels by commercial energy.

These facts offer both challenges and opportunities for modern biomass technologies such as biomass gasification. The challenges are in terms of providing appropriate and convenient technological solutions and in organizing the biomass supply chain in a sustainable fashion. The latter challenge becomes even more daunting if we consider the very nature of availability of biomass, especially agri-residues, which are distributed widely and unevenly in geographical terms.

As different examples show (some of which are mentioned in this issue), researchers and other stakeholders are working successfully to tackle such challenges, thereby seizing the varied opportunities for promoting biomass-based technologies. These range from using biomass-gasification-based small power generation systems to supply electricity to cyclone-affected Myanmar, to addressing energy security concerns at the village level. A common thread across these endeavours is the fact that biomass-based technologies are becoming focal points of overall socio-economic development of the communities involved. This is an aspect that differentiates biomass-based solutions from other technological solutions. Nonetheless, it would be important to make biomass-gasifier based power generation systems 'grid-compatible' so that the extension of conventional grid would not make such systems redundant, but instead makes them more viable by absorbing the power generated by them.

However, in order to design such renewable energy technological solutions in a manner that is cost-effective as well as addresses the user needs, there is a felt need for trained professionals in the country. With the kind of up-scaling being envisaged for renewable energy in India, efforts must be made to ensure the availability of skilled human resources in all the critical aspects of renewable energy technologies. Realizing this, TERI University has launched its M Tech. programme in Renewable Energy Engineering and Management. As the name suggests, the focus is not only on engineering aspects but also on management aspects of renewable energy technologies and projects-crucial for accelerated deployment of renewable energy technologies.

Amit Kumar

Amit Kumar
Director, Energy Environment Technology Development, TERI

Contents

In this issue

Contents

The Energy and Resources Institute

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

Biomass gasifier-based electricity for cyclone-hit areas in Myanmar

Nargis, a tropical cyclone, hit the coast of Myanmar on 2 May 2008 and devastated large parts of the low-lying Irrawaddy delta. Buildings were damaged or flattened, trees uprooted, and power lines downed. In the rural areas, up to 95% of houses were destroyed.

India is helping Myanmar to recover from the cyclone's effects, through initiatives aimed at rebuilding and improving the social and economic lives of rural people. The Indian High Commission in Myanmar has identified provision of electricity as a top priority issue for restoration of normal life in the affected areas. To address this need, TERI proposes to set up 20 biomass-gasifier-based power plants of 10 kW_e each for supplying electricity to eight different townships in the cyclone affected areas in Myanmar. Support for the project will come from the MEA (Ministry of External Affairs).

In undertaking the proposed project, TERI will build upon the experience gained during its earlier successful demonstrations in Myanmar of biomass gasifier-based plants for both thermal and power applications. The proposed gasifier systems will be designed to run on a variety of woody biomass fuels. TERI will arrange for the systems from its licensee manufacturers in India and ensure they meet the required quality control norms. TERI will undertake installation and commissioning of all the 20 systems. Local Myanmar partners will be identified to provide manpower and other infrastructure support for erection and commissioning of the systems, and to identify system operators. TERI will impart training to the operators on system operation, and maintenance and trouble-shooting.

Biomass gasifiers to light up Myanmar homes

It is expected that electricity from the proposed gasifier-based power systems will transform the lives of the local communities through better lighting, reduced dependence on fossil fuels, and creation of entrepreneurial opportunities, and thereby help improve their socio-economic status.

National Workshop on Village Energy Security Programme

TERI organized a National Workshop on the VESP (Village Energy Security Programme) on 9–10 June 2009 in New Delhi. As reported in an earlier issue, TERI has been involved as national consultant as well as one of the four regional consultants assisting the MNRE (Ministry of New and Renewable Energy) in implementation of the pilot phase of the VESP in India, under the World Bank supported project entitled 'Biomass for sustainable development' (see *CoSMiLE Update* **2**[3], September 2007). The VESP is a community based initiative that aims at providing energy security in remote villages/ hamlets through locally available renewable energy sources (preferably biomass) as well as technologies/ systems. The focus of the World Bank project has been on developing business models for small-scale biomass-based renewable applications that can meet energy needs related to productive uses, lighting, and cooking, and thereby bring about sustainable rural development and reduce GHG (greenhouse gas) emissions. The VESP has covered eight states, and around 67 test projects have either been implemented or are in various stages of implementation.

As a regional consultant, TERI has facilitated the implementation of 21 VESP test projects in Assam and West Bengal

National Workshop on VESP

through technical assistance and capacity building initiatives targeted at various stakeholders (communities, NGOs, state and district-level implementing agencies.). As the national consultant, TERI developed the prototype village energy plan, community operations manual and monitoring framework for the entire project, and is now assessing the performance of all the VESP test projects in order to consolidate the lessons and experiences.

The participants at the National Workshop included representatives from state nodal agencies, village energy committees of VESP test projects, NGOs, Panchayati Raj institutions, community and rural development agencies, forest departments, multilateral/bilateral organizations, and manufacturers of renewable energy systems. Among those who shared their experiences in the five technical sessions were experts from Ankur Scientific Energy Technologies Pvt Ltd, ARTI (Appropriate Rural Technology Institute), DESI Power, FOSET (Forum of Scientists, Engineers and Technologists), Maharashtra Renewable Energy Development Agency, MNRE, Ministry of Power, Orissa Renewable Energy Development Agency, READ Foundation, Sambandh, SDC, TERI University, UNDP-SGP, Usha Martin Ltd, the World Bank, and Winrock International India.

The National Workshop focused on

- The performance, experiences, and lessons of the VESP test phase and other rural energy initiatives in India, and sharing of best practices and success stories.
- exploring viable institutional and management models for strengthening and scaling up the dissemination of biomass energy technologies and rural energy services in India in a sustainable manner.

TERI University launches M Tech Programme in Renewable Energy Technology

In a major step towards building and strengthening capacities in renewable energy technologies, TERI University has joined hands with Suzlon Energy Ltd – the world's fifth largest manufacturer of wind turbines – to introduce a two-year MTech Programme in REEM (Renewable Energy Engineering and Management). The programme will equip engineers and physicists with knowledge and skill-sets in various renewable energy technologies, as well as in-depth understanding of the social and economic aspects of energy policy.

The REEM programme will be conducted by the CEE (Centre for Energy and Environment) of TERI University. CEE focuses on research in the broad field of clean technologies to achieve energy efficiency and reduce adverse environmental impacts. Trainees will learn to tackle design and development problems in renewable energy technologies for industrial applications, and also be encouraged to pursue academic research. The pedagogical tools for the MTech programme comprise lectures, tutorials, practicals, and industry/field visits. The areas covered include renewable energy for heat and power applications; green buildings; waste utilization; wind power; solar power; decentralized and distributed power generation; and biofuels.

PCRA project overcomes hurdles to promote DBC in Ahmedabad

In order to promote replication of the energy-efficient DBC (divided blast cupola) in Ahmedabad foundry cluster, TERI, with the support of the PCRA

Split solution

The project's choice of an 18-inch ID (internal diameter) DBC design is based on a simple but important fact: this is the size of the conventional cupolas used by foundry units in Ahmedabad. However, there is one major problem in operating a small, 18-inch ID cupola: it is difficult to maintain the refractory lining of the cupola. The usual practice in a foundry unit is that after each melt, when the cupola has cooled down, the operator enters it to repair corroded refractory bricks. The small internal cross-section of an 18-inch cupola makes it difficult for the operator to enter the cupola and undertake proper repairing. This considerably reduces the life of the cupola; often, the shell of the cupola has to be scrapped after 3–4 years.

To address this problem, TERI has modified the 18-inch DBC design so that the cupola is made up of three sections, which can be split by a simple mechanical arrangement to facilitate maintenance and repair. The modified design has been welcomed by the foundry owners and their cupola operators.

(Petroleum Conservation Research Association), is undertaking the design, development and demonstration of an 18-inch DBC for adoption by four foundry units (see *CoSMiLE Update* **3**[2,3]). The project is being implemented in partnership with AFC (Ahmedabad Foundry Cluster, the local industries association) and GITCO (Gujarat Industrial and Technical Consultancy Organization Ltd).

As reported earlier, three foundry units had signed up in September 2008 for adoption of the 18-inch DBC. However, the post-Diwali period saw a severe slump in market demand for castings on the back of economic recession. This led all the three units to put on hold their plans for setting up DBCs. Undaunted by this setback, TERI engaged in active dialogue with AFC to identify alternate foundry units. After a series of interactions with AFC and individual unit owners, TERI has been able to obtain firm commitments from four other units. The units are (1) Bhadresh Foundries, Rakhial, (2) Paras Founders & Engineers, Rakhial, (3) Smith Technocast, Dudheshwar, and (4) Dynamic Autolooms (Foundry Division), Kathwada.

18-inch DBC for Ahmedabad foundries

The TERI team has inspected the proposed sites for the new DBCs and provided suggestions to the unit owners on the layout of their plants. The team has also identified two Ahmedabad-based firms to carry out fabrication of the proposed DBCs in accordance with the quality and specifications norms prescribed by TERI. All four foundry units have commenced civil works to locate the new DBCs. Fabrication of the cupolas is now under way. In order to create and strengthen local capacities in the new technology, the TERI team will train personnel from the fabrication units on the installation, trial run, and post-commissioning monitoring of the DBCs.

Security for migrant brick firemen: ID cards

The CoSMiLE intervention among the brick firemen community in eastern Uttar Pradesh has taken an interesting turn, with TERI and the NGO partners forging ties with an Udaipur-based NGO named Aajeevika Bureau, whose activities focus largely on migrant workers (see <*www.aajeevika.org*> for more information). As reported in earlier issues (for instance, see *CoSMiLE Update* **3**[4]), the NGO partners PEPUS and Lokmitra have been working to foster solidarity and cooperative action among the community of migrant firemen under the umbrella of *sangathan* (collective). One of the most significant initiatives was to provide the firemen with ID cards that they carry with them when they migrate to distant kilns—often, in other states. These ID cards are presently signed by the *sangathan* office, and provide a degree of security to the firemen both during travel and while at the kiln site.

On 23 December 2008, the CoSMiLE partners attended a workshop in Ahmedabad, organized by Aajeevika Bureau. The event showcased the activities of Aajeevika Bureau, facilitated exchange of ideas and experiences, and opened up the possibility of collaboration between the CoSMiLE partners and Aajeevika Bureau in their respective activities related to migrant workers. As a follow-up to the workshop, in February 2009 a team from Aajeevika Bureau visited the CoSMiLE project areas in Allahabad and Rae Bareilly districts in eastern Uttar Pradesh. The Aajeevika Bureau team interacted with field workers of both PEPUS and Lokmitra, as well as with members of the firemen *sanghatan*.

Between 5–8 April 2009 the CoSMiLE eastern Uttar Pradesh team, comprising members from TERI, PEPUS and Lokmitra, visited Aajeevika Bureau's head office in Udaipur as well as its Shramik Sahayta Kendras in Gogunda, Kumbhalgarh. Of special interest to the CoSMiLE team was the system that Aajeevika Bureau has put in place for issue of ID cards for migrant workers from Rajasthan. The Rajasthan Labour Department has authorized Aajeevika Bureau to maintain updated records and provide periodical feedback on migrant workers from the state, and to issue ID cards under its seal to the migrant workers. As a consequence, the ID cards issued by Aajeevika Bureau carry the stamp of government authority (sarpanch), and hence provide a greater degree of security to the migrant workers from Rajasthan than the ID cards issued by the *sanghatan* to migrant brick firemen from eastern Uttar Pradesh.

PEPUS and Lokmitra are now considering adopting the Aajeevika Bureau model for issue of ID cards, for the benefit of migrant brick firemen in eastern Uttar Pradesh. One idea being explored is that the firemen ID cards could carry the seal of the *Pradhan*'s office, in addition to the seal of the firemen *sanghatan*.

Booklet on intervention among brick firemen community

TERI has brought out a booklet on the intervention among the brick firemen community in eastern Uttar Pradesh, undertaken in partnership with NGO partners PEPUS, Lokmitra, and Vidya Ashram. Titled 'Working with the Brick Firemen Community: a techno-social initiative in eastern Uttar Pradesh', the booklet describes how

TERI and its partners have attempted to bring about positive socio-economic change through empowerment of the firemen and their families—both at the kilns and in the villages—by recognizing and integrating the traditional skills and knowledge of the community with scientific and technical knowledge. The booklet may be downloaded at <http://www.cosmile.org/doc/upbook.pdf>.

VSBK-Cuddalore: encouraging performance

In 2008, TERI provided technical support for design, installation and commissioning of a two-shaft VSBK at Nesanour (Nellikuppam, Cuddalore, Tamil Nadu) for a private entrepreneur, who was a new entrant to the brick industry. The entrepreneur obtained a bank term loan of Rs 28 lakh for installation of the unit, in addition to a working capital loan of Rs 7 lakh for accessories related to kiln operation. The VSBK was commissioned during July 2008, and has since been performing well. The special features of the kiln are described below.

Moulding and shifting/loading of green bricks

Green bricks are moulded manually as well as by using a soft mud moulding machine. At present, the machine produces 600 bricks per hour. Around 12 people—including 8 women—are employed in

VSBK Cuddalore

Comparison of performance: VSBK and Clamp

Parameter	*VSBK*	*Clamp*
Production capacity (bricks per month)	200 000 to 250 000	250 000
Yield (%)	95%	70%
Specific energy consumption (MJ/kg brick)	0.94	1.77
Production cost (Rs per brick)	Rs 1.90*	Rs 1.90
Selling price (Rs per brick)	Rs 2.70	Rs 2.20

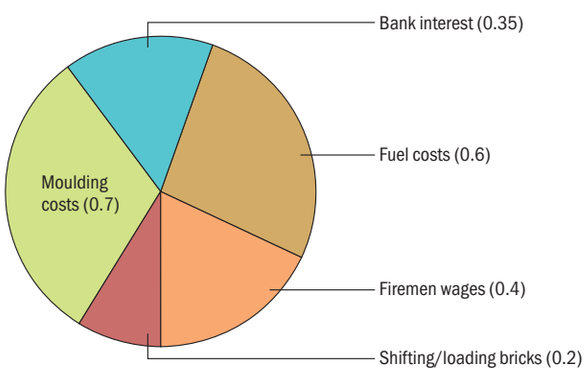
*excluding bank interest

Brick workers

machine moulding. The weight of a machine-moulded brick is about 3.3 kg, and of a hand-moulded brick, 3.7 kg. Dried green bricks are stored in a shed of 220 ft × 42 ft × 15 ft with an approximate storing capacity of 10 to 12 lakh bricks. The unit has a 3-phase power supply and uses an electrical lifting system for shifting of dried bricks to the loading platform for firing. The loading platform has a storage capacity of about 30,000 bricks.

Firing

Initially, the unit used the conventional stacking pattern for bricks. However, this resulted in higher breakage. The unit has, therefore, switched over to the alternate 'chullah' arrangement of bricks, which has reduced the breakage level to less than 5 per cent. The unit also had to reduce the output (unloadings) from 16 batches to 12 batches so as to provide better firing and to ensure the quality. Each batch of bricks contains 296 machine-moulded bricks or 276 manually moulded bricks. At present, only one shaft is being operated due to shortage of green bricks available at site. The entrepreneur plans to procure green bricks from other locations. Six firemen from Bihar are employed for firing, while other workers are sourced locally.



Details of production cost of a fired brick (total cost Rs 2.25)

The VSBK uses Indonesian coal having a GCV (gross calorific value) of about 5800 kcal per kg. The average coal consumption in the unit is 135 gram per brick, which is equivalent to the specific energy consumption of 0.94 MJ per kg fired brick.

Financial performance

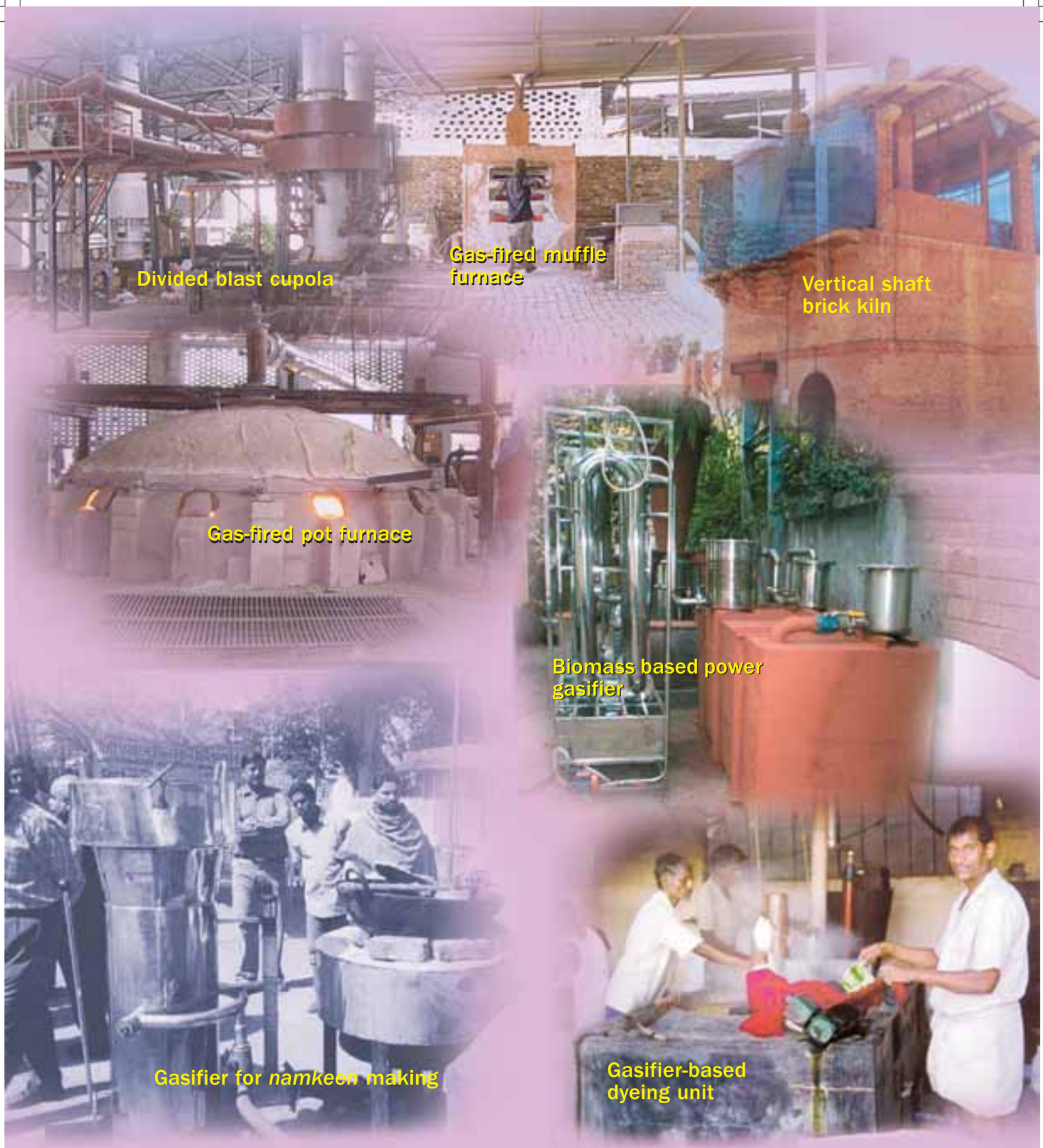
The present yield from VSBK-Cuddalore is about 95%. The total production cost per brick is Rs 2.25 (Rs 1.90 basic operational costs + Rs 0.35 towards interest on the bank loan). The chart below shows the break-up of the production cost of one brick.

Clamps are predominant in the region. The quality of VSBK bricks is much better than that of the local clamps, and even superior to the chamber kilns (BTKs). The table compares the VSBK performance with a local clamp.

A number of areas require attention and improvements in order to promote the VSBK as an alternative to clamps in Tamil Nadu. These include the following.

- Increase in the VSBK's production level
- Use of internal fuel so as to further reduce the fuel consumption
- Use of alternate local fuels such as wood
- Better machinery for making green bricks to suit small brick-makers.

The entrepreneur can also be approached for more details regarding his experience with the VSBK, at <starbriks@yahoo.com>



For more details, please contact

Girish Sethi
Project Coordinator – CoSMiLE
Industrial Energy Efficiency 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>