SAMEEEKSHA

SMALL AND MEDIUM ENTERPRISES: ENERGY EFFICIENCY KNOWLEDGE SHARING

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NEWSLETTER

A PLATFORM FOR PROMOTING ENERGY EFFICIENCY IN SMEs

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Editorial

It is a matter of great satisfaction for the Swiss Agency for Development and Cooperation (SDC) now represented through the Climate Change and Development Division (CCDD) within the Embassy of Switzerland in India that its partnership with TERI in the Indian MSME sector has entered its 18th year. This long-term cooperation between the two partners has successfully enabled the development, demonstration and dissemination of energy efficient technologies in the small-scale foundry, glass and brick industries, thereby improving their environmental performance as well as competitiveness. The activities under the TERI–SDC partnership have been guided by the principles of participatory technology development, pooling of Indian and international competencies and knowledge sharing among different stakeholders.

Hence, in 2010 when an opportunity arose to support formation of SAMEEEKSHA a platform for facilitating knowledge sharing among different MSME stakeholders, SDC was happy to join hands with the Bureau of Energy Efficiency (BEE), the Ministry of MSME and TERI in this innovative collaboration forum.

For me, the event on "Fast tracking energy conservation in MSMEs" organized by SAMEEEKSHA jointly with REEEP in February 2011 on the eve of the annual Delhi Sustainable Development Summit hosted by TERI provided an opportunity for different MSME stakeholders to share their experiences and learning. The key messages that emerged reaffirmed the broad lessons from the TERI–SDC partnership; that the widespread and sustained adoption of energy efficiency technologies and practices in the MSME sector requires a supportive policy environment and the strengthening of local-level capacities to absorb, implement and innovate on the improved technologies and practices. The event also outlined the future opportunities and the interest of many other donors and stakeholder in promoting energy efficiency among the MSME clusters.

I hope in the coming years, many likeminded organizations – donor agencies, ministries and government departments, R&D institutions, academic institutes, technical consultancies, industry associations and others join and shape this platform for the ultimate benefit of the MSME clusters.

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ENERGY IS LIFE
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teri
The Energy and Resources Institute

Government of India
MSME
MICRO, SMALL & MEDIUM ENTERPRISES

CLUSTER PROFILE

SOLAPUR TEXTILE CLUSTER

Background

The Solapur textile industry cluster is renowned for producing cotton bed sheets *(chaddars)* and towels that command a huge market, both in India and abroad. There are about 600 units in the cluster with 12,000 looms producing about 162 million metres of fabric annually. The main raw material is cotton yarn, which is being procured from local manufacturers/ traders. The manufacturing units are located at MIDC, Gandhi Nagar, Bhavanin Peth, Bhadravathi Peth and New Paccha Peth. Of these, around 350 units are of 'integrated' type, with all the facilities for processing the raw material (cotton yarn) to the final product, while the remaining 250 units have only weaving facilities, i.e., power looms. Most of the units have been in operation for 20–30 years.

There are two main industry associations: Textile Development Foundation (TDF) and Power Looms Association (PLA). The Government of Maharashtra provides electricity at subsidized cost and extended tax exemptions to these textile units. The main positive features of Solapur textile cluster include availability of experienced design makers, raw materials and subsidized and reliable power.

Technology status and energy use

Manual processes are largely followed by textile manufacturing units in the Solapur cluster. These include operations such as preparation of designs, drawings, etc. Various machines used in the cluster include doubling machine, carding machine, warping machine, winding machine, circular knitting, calendaring and power loom. The textile units require steam, hot water and hot oil which are met through boilers, conventional ovens (*chulhas*) and thermic fluid heaters. Wood and groundnut husk briquettes are mainly used to meet the thermal energy requirements of the textile units. Energy costs account for 8–10% of the total production costs. The total estimated annual energy consumption in the entire Solapur cluster is over 16,600 tonnes of oil equivalent (toe).

Annual fuel consumption in Solapur cluster

Fuel/energy source	*Annual consumption*	*Energy share*
Wood/biomass	32,000 tonnes	60%
Electricity	7.4 million kWh	40%

Shuttle loom

Boiler in a textile unit

Options for energy saving

Solapur is one of the clusters covered under the BEE–SME program. This cluster offers significant potential for energy savings both in thermal and electrical areas. Some of the energy saving options that can be explored are given below.

- Out of 95 boilers in the cluster, economizers can be installed to preheat the boiler water using waste heat from flue gases in about 55 units. A fuel saving of about 7% is expected to save about 660 tonnes of wood at cluster level.
- Economizers can be installed in 10 textile units for generating hot water. This option would help in an energy saving of about 12%, equivalent to a reduction of 170 tonnes of wood per year in the cluster.
- Shift to energy efficient boilers would lead to improving the themal efficiency of boilers to a significant extent. About 20 units in the cluster can adopt energy efficient boilers, which would result in a wood saving of 800 tonnes per year.
- There are about 250 chulhas used for generating hot water for preparation of soap stock, which operate at a low thermal efficiency of 6–10%. These chulhas can be replaced with improved/ smokeless chulhas having better air circulation, damper for regulating air flow, optimized furnace area and improved grate design, and which maximize the utilization of heat in flue gases. Shifting to improved chulhas would help in realizing a wood saving of about 5000 tonnes per year.
- The hot water for dyeing process is required between 55–80°C based on the application. This can be met by renewable energy systems such as solar water heaters, thereby reducing the dependency on wood-fired boilers/ chulhas.
- Doubling machines are operated at constant load irrespective of the load on the machine. Variable frequency drives (VFDs) can be installed in about 500 doubling machines operating in the cluster. VFDs can also be installed in about 40 induced draft (ID) fans and 10 oil circulation pumps in the cluster. The total estimated electricity saving potential in the cluster is about 2.5 million kWh per year.
- Most units in Solapur use conventional power looms. Despite the availability of good quality cotton yarn for processing, these power looms produce fabrics that do not match international quality standards. Replacement of the existing conventional power looms by shuttle-less/ auto looms would help in increasing the productivity as well as enable the manufacture of better quality of fabric, thereby enhancing the market competitiveness of units.

Contributed by Zenith Energy, Hyderabad

ENERGY EFFICIENT POT FURNACE IN THE FIROZABAD GLASS INDUSTRY CLUSTER

Location: Firozabad, Uttar Pradesh
Partners and collaborators: SDC, TERI, Sorane SA, British Glass, and TECO
Duration: 1994–2011

Background

Almost the entire small-scale glass industry in India is located within a single cluster in Firozabad, about 40 km from Agra. Each day, MSME units in Firozabad produce around 2000 tonnes of glass products, including 50 million bangles, and provide direct employment to an estimated 150,000 people. Besides having a near-monopoly in the production of bangles, the Firozabad glass cluster also produces popular low-value glass products (bowls, tumblers, lamp shades, and so on). Glass for making bangles is melted mainly in open-pot furnaces. Till the mid-1990s, the 80-odd traditional pot furnaces in Firozabad were poor in design and coal-fired, resulting in very low levels of operating efficiency and high levels of CO_2 and particulate emissions.

Context

In 1994-95, the Swiss Agency for Development and Cooperation (SDC) partnered with The Energy and Resources Institute (TERI) in a project to evolve and promote a more energy-efficient pot furnace design—one that would save fuel (coal), and thereby reduce CO_2 emissions. However, the situation changed in December 1996, when the Supreme Court ordered 292 industries located in the Taj Trapezium zone—including the coal-fired pot furnace units in Firozabad—to switch over to natural gas (NG) to protect the Taj Mahal in Agra from environmental pollution. The Supreme Court also directed GAIL India Ltd to supply NG to industries in the region.

The coal-fired pot furnace units were plunged into a crisis following the Supreme Court's verdict, because there were no readily available designs for NG-fired pot furnaces at that point of time. Closure of these units would have disrupted the entire bangle-making industry, and threatened the livelihoods of thousands of workers.

Approach and results

Following the Supreme Court's verdict, the project set about developing an energy efficient NG-fired pot furnace as a long-term solution for the pot furnace entrepreneurs.

By pooling the competencies of Indian and international experts, and working in close consultation with entrepreneurs, furnace operators, masons, and other local stakeholders, TERI developed an energy efficient NG-fired pot furnace system—the 'recuperative furnace'. In 2001, TERI successfully demonstrated the recuperative furnace in a unit chosen by the local industry association.

Key features of TERI-designed pot furnace
Modular waste heat recovery system (recuperator)
Crown-mounted burner for better heat distribution
Improved structural design
Use of better quality refractories in crown and floor

The TERI-designed furnace yields energy savings of up to 50%, as compared to the traditional coal-fired pot furnace; and over 30%, when compared to the 'conventional' NG-fired pot furnace (which had been adopted by most pot furnace units by 2001, in the absence of alternatives). The payback period ranges from 6–24 months, depending on furnace capacity and NG price.

In order to support and sustain replications of the TERI-design furnace, the project has strengthened cluster-level technology delivery systems through

ongoing awareness generation and capacity-building programmes. As a result of these efforts, about 70 (till March 2011)of the 80-odd operating open pot furnace units in the cluster have switched over to the TERI-design furnace, thereby yielding an annual energy saving of over 60,000 tonnes of oil equivalent.TERI is presently working with BEE under the BEE-SME programme, and considering energy conservation options for other types of furnaces.

Key lessons

The Firozabad experience provides a number of important lessons, which may be relevant for other initiatives aimed at promoting energy efficient technology in the Indian MSME sector.

- *Work with an 'ice-breaker'.* The project initially faced difficulties in establishing linkages with industry associations, entrepreneurs, and other stakeholders in the cluster. The problem was solved by identifying and working with an 'ice-breaker'—a well-known and widely respected entrepreneur.
- *Adopt a participatory approach*. The success of the project depended vitally on involving the local stakeholders—workers, entrepreneurs, and others—in developing the new/improved technology. Not only did this approach ensure that the technology was adapted to local conditions and requirements; but it also gave the local people a sense of ownership over the technology, and the enthusiasm and confidence to use it beyond the project's term.
- *First benchmark technology, then explore cost-cutting*. The energy efficient technology was developed in stages. The first priority was to maximize energy efficiency during demonstration, and benchmark various parameters of performance. Quality and reliability of equipment and materials were therefore critical factors in setting up the demonstration plant; while cost factors were relatively less important at this stage. After successful demonstration of the technology and benchmarking of its performance parameters, cost-cutting measures were explored step by step, and in a participatory manner, to make the technology more affordable.

Energy efficient gas fired pot furnace

- *Technology must be flexible to adapt to cluster realities*. In certain aspects, tradition and custom wielded far more influence over an entrepreneur than even the proven benefits of the improved technology. It was, therefore, important for the project to be able to modify the technology to suit these local traditions and customs.
- *Build cluster capacities to spread and sustain the technology*. Demonstration of the improved technology was not enough.The industry stakeholders had to be imparted the information and skills required to use and innovate on the technology beyond the project's term. This meant training workers and entrepreneurs in best operating practices; strengthening the capabilities of fabricators, technicians, and masons to support the new technology; identifying and training local consultants to provide advisory and trouble-shooting services; and so on.
- *Sustained project engagement with the cluster is a must*. SDC has a principle of long-term engagement in its funding programmes, which allows the formulation of flexible participatory schemes that can operate for extended durations. Working with SDC enabled TERI to stay engaged with the Firozabad cluster for over a decade. This continuous involvement has paid off, with approximately 80% of the operating open-pot furnace units having adopted the TERI-designed furnace so far.

Contributed by TERI

IMPROVING THE ENERGY EFFICIENCY OF ELECTRIC MOTORS

Location: Hyderabad
Partners and collaborators: UNDP, BEE, ICPCI, NFTDC
Duration: July 2008–June 2011

India's energy consumption has been keeping pace with rapid economic growth. From 1980 to 2003, the actual per capita electricity consumption in the country has more than doubled, that is, from 140 kilowatt (kWh) to 500 kWh, and is expected to grow to about 800 kWh by 2012. However, supply is far behind demand. Already, India faces chronic electricity shortages—a shortfall of 10% on average, going up to 20% in peak hours.

One way to address the issue of energy shortage is through increasing the end-use efficiency of electrical appliances. Electric motors, which are widely used in the agricultural and industrial sectors—including the MSME sector—account for a substantial 35% of the total electricity consumption in India. While energy efficient motors are available in the market, feedback from manufacturers indicates that they account for only about 2% of the total sales—primarily because of their high initial cost. Hence, there is a need to develop technology that can reduce the initial cost of energy efficient motors. A cost-effective option is to use '*die-cast copper rotors*' instead of the die-cast aluminium rotors in electric motors; this will also reduce the size of the motors without lowering their output. The International Copper Association (ICA) has developed the technology for manufacture of die-cast copper motor rotor, called 'CMR technology'. The need is to transfer, develop, and adapt CMR technology to suit the requirements of Indian motor manufacturers.

Project objective and activities

The United Nations Development Programme (UNDP) is supporting a project titled '*Achieving reduction in GHG emissions through advanced energy efficient technology in electric motors*' along with Global Environment Facility (GEF) and Bureau of Energy Efficiency (BEE). The objective of the project is to transfer, develop, and adapt CMR technology for use by Indian motor manufacturers. This will help in reducing the processing costs and also increase the energy efficiency of the motors by up to 5% through lower operating temperatures, increased insulation life, and better reliability. The project is being implemented by the International Copper Promotion Council of India (ICPCI), a member of ICA, in association with the Non-Ferrous Materials Technology Development Centre (NFTDC), Hyderabad.

View of Enabling Technology Centre

In order to facilitate the technology transfer and developmental process, an 'Enabling Technology Centre' (ETC) is being set up at the premises of NFTDC. The activities of the centre will cover the following.

- Develop and demonstrate the efficacy of a low-cost vertical die-casting CMR technology
- Facilitate transfer of the CMR technology to potential manufacturers
- Provide ongoing capacity building services for motor manufacturers in the MSME sector
- Pilot production of copper rotors

Trials have already been conducted by the ETC to establish the viability of CMR technology for producing energy efficient motors.

Contributed by UNDP-GEF, India

LEAN MANUFACTURING COMPETITIVENESS SCHEME

IMPROVING THE COMPETITIVENESS OF THE MSME SECTOR

The 'Lean Manufacturing Competitiveness Scheme' is one of 10 schemes launched by the Ministry of MSME under its National Manufacturing Competitiveness Programme. The objective of the Scheme is to increase the competitiveness of MSMEs through the adoption of various lean manufacturing (LM) techniques that will reduce wastes; increase productivity; introduce innovative practices; establish good management systems; and create a culture of continuous improvement.

During the pilot phase, the government will select 100 MSME 'mini-clusters', each comprising about 10 units, from different parts of the country that show potential for improving productivity and competitiveness. Consultants will be deployed in the selected mini-clusters to identify and suggest specific LM techniques. As MSME units often find it difficult to engage consultants on their own, the government will contribute up to 80% of the costs in each mini-cluster, while the remaining charges will be borne by the beneficiary MSME units. At the end of the pilot phase, an impact assessment study will be carried out for these 100 mini-clusters, and the outcome of the study report will form the basis for upscaling the Scheme in future.

The Scheme is open to all MSMEs across the country. It is being implemented through a three tier structure.

1. Interested units form a mini-cluster and incorporate a Special Purpose Vehicle (SPV) for engaging an LM consultant to implement specific LM techniques.
2 The LM consultants as well as SPVs report regularly to a National Monitoring and Implementing Unit (NMIU), which facilitates implementation and monitoring of the Scheme. The National Productivity Council (NPC) is functioning as NMIU during the pilot phase of the Scheme.
3. NMIU reports to the Screening and Steering Committee (SSC), which provides overall direction to the Scheme. The SSC is headed by the Development Commissioner, MSME (DC-MSME), and includes representatives of concerned government departments, industry associations, technical institutions, professional bodies, and other stakeholders.

WHAT IS LEAN MANUFACTURING?

MSME units usually do not have either the capacity or the time to develop and adopt practices and techniques that would help enhance their productivity and competitiveness. 'Lean manufacturing' (LM) describes a set of techniques that help improve production efficiency and reduce costs. The main LM techniques are listed below.

- *5S System*
- *Visual Control*
- *Standard Operating Procedures (SOPs)*
- *Just in Time (JIT)*
- *Kanban*
- *Cellular Layout*
- *Value Stream Mapping*
- *Poka Yoke*
- *Single-Minute Exchange of Dies (SMED)*
- *Total Productive Maintenance (TPM)*
- *Kaizen Blitz*

ABOUT SAMEEEKSHA

SAMEEEKSHA is a collaborative platform aimed at pooling the knowledge and synergizing the efforts of various organizations and institutions—Indian and international, public and private—that are working towards the common goal of facilitating the development of the small and medium enterprise (SME) sector in India, through the promotion and adoption of clean, energy-efficient technologies and practices.

SAMEEEKSHA provides a unique forum where industry may interface with funding agencies, research and development (R&D) institutions, technology development specialists, government bodies, training institutes, and academia to facilitate this process.

ABOUT TERI

A dynamic and flexible not-for-profit organization with a global vision and a local focus, TERI is deeply committed to every aspect of sustainable development. From providing environment friendly solutions to rural energy problems to tackling issues of global climate change across many continents and advancing solutions to growing urban transport and air pollution problems, TERI's activities range from formulating local and national level strategies to suggesting global solutions to critical energy and environmental issues.

With staff of over 900 employees drawn from diverse disciplines, the institute's work is supported by ministries and departments of the government, various bilateral and multilateral organizations, and corporations of repute.

VISION OF SAMEEEKSHA

SAMEEEKSHA envisages a robust and competitive SME sector built on strong foundations of knowledge and capabilities in the development, application and promotion of energy-efficient and environment-friendly technologies.

FOR MORE DETAILS, PLEASE CONTACT

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