Editorial

The SME sector in India is receiving more attention than ever! The sector is contributing significantly to income, output, employment and economic growth. According to the projections of Ministry of MSME, India has about 44 million MSMEs contributing 40% to GDP and 45% of India's overall industrial output. This contribution certainly will increase, especially in the light of 'Make in India' campaign and the ambitious targets set up by the government. India’s National Manufacturing Policy aims to accelerate India’s GDP growth by increasing the manufacturing's share in GDP to 25% (from existing 16%) in a decade. It also aims to generate another 100 million jobs in the manufacturing sector. Only the MSME sector can fuel this growth. However, this requires that the sector be made competitive by infusing new technologies, encouraging innovation and strengthening local institutions. This is a daunting task considering the expanse of the sector. Since most of the SMEs deploy obsolete technologies, use unskilled manpower and do not have access to easy financing, the task becomes all the more challenging.

TERI and SDC, having realized the role the MSME sector plays in the Indian economy, started intervention in key energy-intensive sub-sectors almost two decades back. Over this period, various initiatives for developing, demonstrating and promoting clean, energy efficient technological solutions have been undertaken. The initiatives have resulted in over 900 replications and cumulative energy savings of 230,000 tonnes of oil equivalent in key MSME sub-sectors.

TERI has now entered into a new phase of partnership with SDC to deepen its engagement in the MSME sector. Building upon the past achievements of the TERI-SDC partnership, the focus this time will essentially be on the foundry sector. In addition, the partnership will also have a major thrust on knowledge sharing. The SAMEEKSHA platform, which has been in existence for around five years will be strengthened and is expected to play a pivotal role in this direction. In this regard, as an example, TERI in collaboration with YES Bank Ltd recently developed a knowledge paper on ‘Enabling Finance for Scaling up Energy Efficiency in MSMEs’. The findings (drawn from the experiences of key stakeholders) and recommendations of the paper are briefed in this issue.

I wish the TERI team all the best in this new phase of the TERI-SDC partnership, which I hope will reach greater height in the coming years.

Leena Srivastava
Acting Director General, TERI
CLUSTER PROFILE
BHUBANESHWAR BRASS CLUSTER

Background
A traditional small-scale brass industry cluster is located near the ancient city of Bhubaneshwar, in Orissa. The brass units are spread across four villages, of which Bainchua is around 8 km from the old city while Balakati, Pratap Sasan and Rathijema are adjacent to one another and located about 22 km away. The units are very small and community-based, with manufacturing activities conducted by the artisans in the backyards of dwellings.

There are around 120 operational units in the cluster, with annual production levels ranging between 2–8 tonnes per unit. The main products comprise traditional brassware like thali (plates and trays), lota and ghara (pots), bela and kansa (cups), diya (lamps), ghanti (bells), etc. About half the units (65) make only thalis, while the others make a range of products. The units operate seasonally (typically, for 5–6 months a year), depending on the market demand and the availability of sufficient quantities of raw materials. The working of the brass units is influenced greatly by a group of middlemen, known as ‘Mahajans’, who control the supply and prices of raw materials as well as the prices and sale of finished products. This situation squeezes the profit margins of units, and leaves them with few options to improve profitability other than to reduce running costs. However, even in this they are constrained by the lack of financial resources and technical know-how.

Technology status and energy use
All the units follow traditional manufacturing processes that are largely manual, and that have been handed down over generations with little or no change. The main raw materials are copper, zinc, and brass scrap. These materials are mixed in the required proportion, placed in a crucible and melted in a melting furnace (chulla) at about 950° C. The molten metal is poured into moulds, called acchu, for casting into ingots/biscuits, or into the shapes of products like lota, ghara or diya. The cooled castings are reheated in a reheating furnace to about 800° C, and then beaten, scraped and polished to yield the finished products.

The melting process takes about 5–6 hours, and is carried out in batches, with two to four batches melted in a week. The melting furnace is a pit in the ground, about 40–70 cm wide and 15–60 cm deep. The reheating furnace is usually a built-up open furnace. The melting and reheating furnaces use charcoal and hard coke as fuels, and are invariably made by the artisans themselves, using traditional methods. The artisans use locally made tools like hammers of different sizes, pincers, stone and iron anvils, etc.

Energy use
The annual energy consumed by the Bhubaneshwar cluster is about 420 tonnes of oil equivalent (toe), almost entirely in the form of thermal energy in the melting and reheating furnaces (table 1). These furnaces are very low in energy efficiency (typically, below 5%). Electricity is primarily used for lighting, and in a few units, to operate polishing tools.

| Table 1. Annual energy consumption in Bhubaneshwar brass cluster |
|------------------|------------------|------------------|
| Energy source     | Annual consumption | Annual energy consumption (toe) |
| Electricity       | 15670 kWh         | 1.4              |
| Hard coke         | 310 tonnes        | 170.3            |
| Charcoal          | 359 tonnes        | 247.5            |
| Total             |                   | 419.2            |

* toe—tonnes of oil equivalent

A few brass products
Detailed energy audits were conducted on 29 units, from which the specific energy consumption (SEC) was found to vary between 0.46 toe/t and 2.08 toe/t, depending on the kind of product(s) being manufactured. The average SEC was 1.36 toe/t. About 14 of the units studied (50%) showed SEC values above this average value, indicating considerable potential for energy savings (figure 1).

The total energy saving potential in the Bhubaneshwar brass cluster is estimated at 241 toe, about 57% of the total annual energy consumed.

**Options for energy saving**

While identifying and implementing energy conservation measures (ECMs) for the Bhubaneshwar brass units, the following major challenges have to be taken into account:

- the tiny size of the units (in terms of capacity and turnover)
- their discontinuous (seasonal) operations
- their dependence on Mahajans for buying raw materials as well as selling their products, which restricts profits and leaves little or no surplus funds for investing in technology improvement

Considering these factors, investments in ECMs could become technically feasible and economically viable if three or four units collectively implemented each project. Some of the possible ECMs that could be considered for adoption by the units are listed in table 2.

**Table 2. Energy conservation measures for units in Bhubaneshwar brass cluster**

<table>
<thead>
<tr>
<th>No.</th>
<th>ECM</th>
<th>Replication potential (units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Redesign melting furnace with WHR system</td>
<td>19</td>
</tr>
<tr>
<td>2</td>
<td>Redesign melting furnace with rice husk gasification system</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>Redesign reheating furnace with WHR system</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>Redesign reheating furnace with rice husk gasification system</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>Energy efficient lighting</td>
<td>40</td>
</tr>
</tbody>
</table>

Compiled by TERI from (i) ‘Manual on energy conservation measures in brass cluster, Bhubaneshwar’ under the BEE-SME Program, 2011; (ii) ‘Benchmarking and mapping Indian MSMEs energy consumption’: a BEE–AfD–TERI study, 2012
TERI in collaboration with YES Bank Ltd recently published a knowledge paper titled ‘Enabling Finance for Scaling up Energy Efficiency in MSMEs’. The paper throws light on the MSME sector in India, barriers in energy efficiency (EE) financing, current government schemes and donor programs for promoting energy efficiency, and understanding the financing of EE technologies. The paper also outlines a way forward for the various stakeholders who play key roles in promoting EE finance, and provides recommendations to scale up financing for EE technologies based upon their stage of commercialization. The paper is available on the link: http://sameeeksha.org/pdf/publications/Enabling_Finance_for_Scaling_up_EE_in_SMEs.pdf

The paper was released by Mr Jayant Sinha, Minister of State for Finance, Government of India at the High Level Corporate Dialogue during TERI’s flagship Delhi Sustainable Development Summit (DSDS) held in February 2015, in the presence of other esteemed dignitaries like Mr Paul Polman, Chief Executive Officer, Unilever & Chairman, WBCSD; Dr Henrik O Madsen, Group President and Chief Executive Officer, DNV-GL; Dr R K Pachauri, Director General, TERI & President, TERI BCSD; Mr Rana Kapoor, Founder, Managing Director & Chief Executive Officer, YES Bank Limited & Patron Member, TERI BCSD; and Mr R Mukundan, Managing Director, Tata Chemicals Limited & Chairman, Executive Committee, TERI BCSD.

Key Findings

- The very nature of India’s MSME sector demands that energy efficient technologies (EETs) have to be developed through a process of Research, Development, Demonstration and Dissemination (RDD&D) and customized to suit local needs and conditions, which are often unique to the concerned MSME unit or to the cluster/region in which the unit is located. This is a primary reason why EETs are usually not available ‘off-the-shelf’, and also that they are more expensive than conventional technologies. Financing of EETs must therefore adapt itself to meet these ground realities.
- In addition, EET financing must also overcome special challenges posed by the low awareness and capacity levels among MSMEs, compounded by the lack of capacity among financiers in understanding and assessing EE projects.
- The paper underscores the critical point that an EET can be in one of three stages of maturity, and that different models of finance are required for the EET in each of these stages.
  - Pre-commercial. The EET is not available off-the-shelf; R&D is necessary (e.g. melting furnaces for iron, brass, aluminium; waste heat recovery systems)
  - Semi-commercial. The EET is relatively new; it has been demonstrated successfully in a few units but its replication has to be spurred by awareness generation efforts and more pilot projects (e.g. divided blast cupola, biomass gasifier systems)

Approach

A participatory approach was followed to develop the paper. This involved conducting a detailed literature review of all government policies and donor programs for promoting energy efficiency in SMEs; analysing various financial schemes offered by the government, credit lines offered by bilateral agencies like JICA, KfW and AfD, and financial products offered by banks to accelerate adoption of EE technologies in SMEs; and conducting selected stakeholder consultations to obtain expert opinions that were fed into the paper. A survey of leading public and private sector banks was conducted to understand the challenges involved in MSME financing (mainly EE related projects) from a banker’s perspective. Consultations were also conducted with representatives of MSME units, government departments, donor organizations, industry associations and implementing agencies. Personal interviews were conducted with senior officials of SIDBI, SBI, FISME, EESL, SDC and BEE.
Commercial. The EET is available off-the-shelf (although the market is not saturated); concessional loans are needed to push these (e.g. IE3/IE4 electric motors, EE pumps, inverter air compressors, LED lighting)

- Public finance through government and bilateral/multilateral agencies has a crucial role in supporting R&D and innovation of new technological solutions for pre-commercial technologies, especially in the context of climate change.

Recommendations

- It is important to distinguish between an investment made for modernization or expansion, and an investment based on EE criteria. Typically, the former is marked by high capital cost and long payback period (e.g., a CNC machine) while the latter is marked by a relatively low capital cost but short payback period (e.g., an air compressor).
- It is imperative to consider payback period based purely on energy savings for analysing the viability of EE projects. The energy saved by the EET needs to be estimated by certified energy professionals or through clearly defined Measurement & Verification (M & V) techniques. The financing can then be made flexible to decide on the amount and terms of lending for such technologies.
- International credit lines for providing grants and low interest loans for energy efficiency typically consider the following criteria, based on energy savings alone:
  - Internal rate of return (IRR): around 10%
  - Payback period: 7–8 years
- Financing of EETs at different stages of commercialization could be modeled as follows:
  - Pre-commercial. Funds are needed for the entire RDD&D cycle. The funds could take the form of grants or venture capital, and come from government financing schemes and/or low-cost funds from multilateral/bilateral agencies.
  - Semi-commercial. Here, upfront costs are high, as are the perceived risks. Funds could take the form of capital subsidies and concessional interest rates for new technologies (making them more attractive for MSMEs compared to the existing low efficiency technologies). Grants will be required in many cases for developing and promoting local service delivery mechanisms as well as for capacity building measures.
  - Commercial. Funds could be routed through ESCOs and concessional lines of credit. Financiers should be provided with guidelines to assess EETs. In particular, IRR and payback period should be evaluated based on energy savings alone.
6TH ANNUAL ENERGY MANAGEMENT ACTION NETWORK (EMAK) WORKSHOP

TERI and the Institute of Energy Economics, Japan (IEEJ) organized the 6th Annual EMAK workshop on the theme ‘Promoting energy efficiency in SMEs, and waste heat recovery measures in India’ at Taj Palace Hotel, New Delhi on 25th February 2015. The event was attended by around 80 participants comprising entrepreneurs, SME industry associations, local service providers, energy consultants, representatives from BEE, MNRE, PCRA, SIDBI, MSME-DIs, Ministry of Steel, public and private sector banks, Japanese research organizations such as IEEJ and ECCJ, and Japanese companies like Kawasaki, Hitachi, Nippon Steel, etc. The workshop was moderated by Dr Patrick Crittenden, Director, Sustainable Business Pty Ltd, Australia.

Perspective

During the sessions, speakers from India, Japan and Australia made the following points to provide perspective for the discussions.

- Japan, like India, depends heavily on imported sources of energy. To meet this challenge following the oil crises of the 1970s, Japan established the Energy Conservation Law (ECL) in 1979 and has implemented energy conservation measures in every sector of its economy through a combination of regulations, taxes and incentives.
- India and other nations could draw valuable lessons and models for improving energy conservation from Japan’s experience, and through sharing information and experiences with one another. EMAK was established in 2009 to support this strategy.
- In the past decade, the Indian economy has grown by around 8% overall, while specific energy consumption has dropped by about 25%—indicating success in energy conservation measures, particularly among large industries like cement and fertilizer plants. However, it is still a challenge to promote energy efficiency (EE) in the SME sector, which is largely unorganized and hence difficult to influence through regulatory measures.
- The major barriers to improving EE in SMEs are in the realms of finance, technology, information and skills. These barriers can be addressed through well-structured programs undertaken by government in partnership with industry and other stakeholders.

Outcomes

Five aims were established for the workshop. The aims, and the outcomes of the discussions around them, are summarized below.

1. Learn about and share experiences on designing and implementing EE policies and programmes for SMEs
   - Thirteen presentations from highly respected Indian and international speakers were delivered.

2. Identify innovative ways of financing energy efficiency projects
   - A presentation and discussion was led by the TERI co-author of the recently published report *Enabling Finance for Scaling up Energy Efficiency in MSMEs*.
   - Participants shared their perspectives on the challenges and opportunities to improve access to finance for EE projects.

3. Better understand the technical opportunities to reuse waste heat in industrial organisations
   - Five presentations were made, covering waste heat recovery (WHR) options in India and the approach being adopted in Japan to establish a policy framework to support the uptake of WHR projects.
   - A number of follow-up meetings have been established: for example, between a cluster-level industry association and Hitachi Zosen India to explore a potential waste-to-energy project.

4. Initiate and develop networks within and across SMEs, the finance sector, industry associations and government policy-makers at both national and international levels
   - Participants from India, Japan and Australia contributed local, national and international perspectives on the topics of EE in SMEs and WHR opportunities and technologies.
   - Lessons learned about SME EE programmes around the world were shared through a presentation based on research for the forthcoming IEA publication titled ‘Policy Pathway on Energy Management Programmes for SMEs’.

5. Contribute towards domestic and international dialogue and capacity-building on EE measures.
   - The workshop was videographed and a workshop report is being prepared. These will be available on the International Energy Agency’s website to ensure that the workshop outcomes are widely shared with policy makers and practitioners.
WORKSHOP TO PROMOTE ENERGY EFFICIENT JAPANESE HEAT PUMP SYSTEMS

Japan is a pioneer in the development and commercialization of low carbon energy efficient technologies such as electric heat pump (EHP) and gas heat pump (GHP) for a range of heating and cooling applications in industry and other sectors. As reported earlier [see Sameeksha 4(2), June 2013 and 4(4), December 2013], a few heat pump (HP) systems have been set up and their benefits successfully demonstrated in different industrial applications in India under a program initiated by TERI and IGES. In order to share the program experiences and motivate other potential users to adopt HP technologies, TERI and ECCJ organized a workshop titled ‘Japanese experience on promoting heat pump systems for energy efficiency’ in New Delhi on 4th February 2015 in collaboration with BEE and Ministry of Economic Trade and Industry (METI), Japan. About 60 participants from government, industry, consultancy agencies and donor organizations attended the event.

TERI and IGES presented case studies on the commissioning of Japanese HP systems such as an EHP system in a dairy plant in Dharuhera; GHP systems in two investment casting units in Rajkot; and a geothermal-based HP system for space conditioning of a building in Arunachal Pradesh. Japanese manufacturers described, in detail and with examples, the various types of HP systems manufactured by their companies; their features and benefits; and their potential applications in commercial, industrial and household sectors for meeting both heating and cooling requirements. They underlined the flexibility offered by these HP systems, which can be geared to suit the different climatic profiles of different parts of the country. The main points that emerged from the discussions are summarized as follows:

- There is huge potential for energy savings in India through HP technologies for heating and cooling applications: in the industrial sector, which accounts for the highest share of commercial energy consumption in India (~44%), as well as in the growing residential and commercial building sectors which account for about 30% of total electricity consumption.

- The potential primary energy savings that can be brought about through HP systems is 1000 tonnes of oil equivalent (toe) in the Punjab and Gujarat dairy industries, and 0.78 million toe in the investment casting industries in India. HP systems can be applied in other industry segments such as textiles, pulp & paper, food processing, pharmaceuticals and beverages.

- A three-pronged approach is required to encourage the widespread adoption of HP systems in India:
  - Reduce prices. Both capital costs and payback periods are high for Japanese HP systems. The capital costs should be reduced by ‘frugal innovation’ paths; or else, users will seek and adopt cheaper options.
  - Showcase benefits and achievements. Information on the successfully installed HP systems must be consolidated and awareness spread on their benefits to generate interest among potential users. BEE is willing to support such interest-generating initiatives.
  - Develop business models. Effective business models such as energy services company (ESCO) model must be developed to make HP systems more attractive for users to adopt. More demonstration projects are required initially to generate data on benefits of HP systems and disseminate results to industry and building owners.
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

Mr Upinder Singh Dhingra
Secretary – SAMEEEKSHA
Industrial Energy Efficiency Division, TERI, Darbari Seth Block
IHC Complex, Lodhi Road, New Delhi – 110 003, India
Tel: +91 11 2468 2100, 2468 2111, Fax: +91 11 2468 2144, 2468 2145
Email: upinder.dhingra@teri.res.in
Website: http://sameeeksha.org