

SMALL AND MEDIUM ENTERPRISES: ENERGY EFFICIENCY KNOWLEDGE SHARING

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SAMEEEKSHA

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NEWSLETTER

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VISION

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.



A PLATFORM FOR PROMOTING ENERGY EFFICIENCY IN SMEs

IN THIS ISSUE...

This issue focuses on pump sets, which are widely used in the agricultural, industrial, commercial, municipal and domestic sectors. Pump sets together consume almost a fifth of India's total electricity production, and account for a major portion of energy consumed in the agriculture sector.

TERI with the support of Shakti Sustainable Energy Foundation undertook a study in 2011–12 on 'Promoting energy efficient pumps in industry in India: addressing the energy and climate change problem', in order to understand the issues and challenges that have to be addressed in promoting energy efficient pump sets. The salient points of the study are carried in this issue.

In order to obtain the perspective of pump set manufacturers, TERI has engaged in extensive interactions with pump set units and other cluster-level stakeholders in Rajkot, one of the largest pump set manufacturing clusters in India. The gist of these interactions is presented in this issue in the form a cluster profile.

This issue also carries a report on the inception workshop held in Rajkot to mark the launch of fresh activities in this cluster under the current TERI–SDC partnership, and summaries of capacity-building workshops conducted by TERI in Rajkot under an ongoing SIDBI-supported Cluster Level Intervention Program (CLIP).

SAMEEEKSHA Secretariat



STUDY TO PROMOTE ENERGY EFFICIENT PUMPS IN INDIA



TERI, with support from Shakti Sustainable Energy Foundation (SSEF), undertook a study on 'Promoting energy efficient pumps in industry in India: addressing the energy and climate change problem'. The study focused on agricultural pump sets which are commonly manufactured by SMEs in Gujarat (Ahmedabad and Rajkot) and Coimbatore clusters. It involved one-to-one interactions with pump manufacturers and consultants in these clusters in order to understand the potential for energy savings by introduction of energy efficient pump sets, and the improvements required in the regulatory framework. The gist of the study is set out in the following sections.

Backdrop

About 10% of the total electricity produced in the world goes into pumping. India is the fourth leading manufacturer of pump sets in the world, with well over 2000 manufacturers (as in 2012), comprising large-scale units—Indian and multinational—as well as a large number of SMEs. The industry employs about 120,000 people and produces about 4.5 million pumps annually for use in different sectors: agriculture, industry, commercial buildings, households, and public water works. India exports pumps to countries in Africa, the Middle East and South Asia. The organized segment of the Indian pump industry has an annual turnover of Rs 3500–4000 crores.

The number of electrified agricultural pumps, and consequently their energy consumption, has been increasing rapidly in recent years, matching the rapid depletion of groundwater levels. A study commissioned by BEE estimated that in 2004, there were around 14.2 million installed agricultural pumps and that this base was growing at compounded

annual growth rate (CAGR) of 6% (implying that the number of agricultural pumps in India crossed 20 million in 2012).

Pump sets consume a significant amount of electricity: some estimates put this figure as high as 21% of India's total electricity production. Pilot studies have shown that there is a huge potential (up to 40%) to save energy by replacing the inefficient pump sets with energy efficient models. According to a 'broad-brush' estimate by TERI based on 2009–10 data, the energy saving potential by adoption of energy efficient pumps in the agricultural sector alone is estimated to be 47,797 GWh, or around 8.4% of the total electricity sold in the country.

Pump manufacturing clusters

The major pump manufacturing clusters in India are located in Rajkot and Ahmedabad (Gujarat), and Coimbatore (Tamil Nadu).

The Coimbatore cluster produces almost 48% of all the pumps manufactured in India; submersible pumps account for the major share (65%), followed by pumps for domestic use. A number of units are suppliers to OEMs like Crompton, KSB, Grundfos, etc. Many of the submersible pumps manufactured in Coimbatore use gun metal impellers, which have better corrosion resistance properties.

A large number of units in Ahmedabad and Rajkot clusters are in the unorganized sector, engaged in assembling pumps from bought-out parts and selling them at prices that are about 30% lower than the branded products. While the branded manufacturers have their own pump designs and use their own patterns for cast sub-components, the non-branded units use common patterns produced in bulk by local foundries.

Existing policy environment

BEE launched a voluntary 'star labelling' scheme (BEE-SLS) for pumps in order to generate awareness



among consumers on the benefits of energy efficient pumps, and to provide pump manufacturers with an incentive to produce high efficiency (star-labelled) pumps. In essence, BEE-SLS assigns one or more stars to a pump based on how much more efficient it is than the efficiency norm set by the Bureau of Indian Standards (BIS). There is also a system to monitor and verify the performance of pumps.

BEE Star Labelling Scheme	
No. of stars	Overall energy efficiency above BIS norm
★	Up to 5% higher
★★	5–10% higher
★★★	10–15% higher
★★★★	15–20% higher
★★★★★	20–25% higher

Barriers to promoting energy efficient pumps

Power is either free or highly subsidized for farmers. This poses a major barrier to the adoption of energy efficient pump sets in the agriculture sector, as the farmer has little incentive to pay more to install an energy efficient pump set. A few schemes have been launched by central/state governments, under which old inefficient pumps are taken back from farmers and new energy efficient pumps are provided at subsidized rate. However, the effectiveness of these schemes has been limited due to problems like selection of pump manufacturers and models, and implementation issues. Also, as the selection of energy efficient pumps in many

government schemes is on the basis of L1 (lowest bid) for BEE five-star rated pump sets, it discourages participation by pump manufacturers having models with efficiencies higher than 'BEE five-star'.

The manufacture of energy efficient pump models is hindered by the lack of innovation among small-scale pump manufacturers. This is mainly due to inadequate technical expertise in-house, and the lack of support infrastructure at the cluster level. Often, sub-optimal designs coupled with poor materials of construction lead to high energy consumption and higher failure rates. Although the testing procedures as mandated by BIS have been relaxed over time, many small manufacturers still have not invested in proper testing equipment, thus compromising the reliability of the pumps produced by them.

Recommendations

Vast energy and cost savings can be realized by raising the efficiency and improving the quality of agricultural pumps produced in India. In order to stimulate demand for good quality energy efficient pump sets, a two-pronged approach is required:

- *Technical approach*— aiming at facilitating the manufacture of higher efficiency pump sets by the small pump manufacturers.
- *Policy and regulatory approach*—aiming at improving the standards and promoting efficient pumps through government schemes.

While the technical approach will ensure a steady supply of energy efficient and reliable pump sets through hand-holding small pump manufacturers to develop and manufacture energy efficient pump models, the policy and regulatory approach will eliminate the manufacture of inefficient pump sets and encourage power distribution companies (DISCOMS) to formulate public procurement schemes aimed at replacing the inefficient pumps with energy efficient pumps. ●●●

Compiled by TERI from 'Promoting energy efficient pumps in industry in India: addressing the energy and climate change problem': a TERI-Shakti Sustainable Energy Foundation (SSEF) stud, 2012

RAJKOT PUMP CLUSTER



Background

One of the largest MSME clusters in the country is located in Rajkot, Gujarat. As per industry estimates, there are an estimated 14,000 MSME units in the cluster. The major engineering-based industries in Rajkot are

of pump sets, foundry and forging, machine tools, auto components, building hardware, kitchenware, plastics and diesel engines.

Pumps are widely used in the agricultural, municipal, domestic and industrial sectors. Rajkot is one of the largest producers of submersible pumps for the agricultural and domestic sectors, as well as centrifugal pumps for domestic and industrial usage. The growth of pump industry in Rajkot is a relatively recent phenomenon: in 1994, there were only 10 pump manufacturing units in Rajkot. However, in the years that followed, the number of pump set units increased rapidly, matching the growth in demand for submersible pump sets in the agricultural sector due to depletion of groundwater levels all across the country and lack of surface water irrigation facilities. By 2010 there were about 350 pump manufacturers in Rajkot, and this number has grown to about 1000 in 2015! Due to the relatively lower manufacturing costs in Rajkot, some pump manufacturers even from Coimbatore are sourcing components from this cluster.

Rajkot Engineering Association (REA) is the apex industry association in the cluster, with a membership of over 1000 engineering units. Most of the larger pump manufacturers are members of REA.

BIS and BEE certification

The major policy frameworks for pumps are the Bureau of Indian Standards (BIS) label for quality, and BEE star labelling scheme (BEE-SLS) for

energy efficiency. The BEE label is based on BIS certification, but is presently applicable to a limited number of pump models. Each small-scale pump manufacturer makes a large number of pump models (200 or more in many cases). However, due to financial implications (e.g., testing and marking fees charged by BIS and BEE) and other complexities (periodic renewal, changes in group certification etc), only about a third of the manufacturers obtain BIS certification for their products—and that too for a limited number of models (5–20 models).

Technology status and energy use

Common pump models

Four main categories of submersible pump sets are produced in Rajkot: V3 (i.e. for 3-inch bore well) V4 (for 4-inch bore well), V6 (for 6-inch bore well) and V8 (for 8-inch bore well). The power rating of the electrical motor in commonly produced pumps



Pump manufacture in progress



ranges from a few horsepower (HP) up to 10 HP. The most common models produced are V6 8 stage (7.5 HP) and V6 10 stage (10 HP) radial flow pumps. The former models are capable of delivering 350–400 litres of water per minute from a depth of 96 m; the latter, from a depth of 120 m. For arid regions where the water table is very low, large diameter models like V8 and even V10 (for 10-inch bore well) are produced, with power ratings that can go as high as 100–200 HP.

The motors of submersible pumps can be either water-filled or oil-filled. Oil-filled motors are capable of operating at low voltages. Almost 80% of the submersible pumps produced in Rajkot are of water-filled type.

Quality of pumps

Some leading pump manufacturers produce pumps that have efficiencies even higher than the 'five star BEE label' and could theoretically qualify for 'seven or eight star' BEE label!

About 350 pump manufacturers have at least a few BIS-certified pump sets in their product range. About an equal number of units are capable of

reaching BIS quality standards with some technical support. The remaining 300–400 units in the cluster are very small and in the unorganized sector; they manufacture very low cost, low quality pump-sets.

The pump manufacturers in Rajkot produce pump sets of two different levels of quality—colloquially referred to as 'premium' (or BIS equivalent) and 'commercial' (below BIS quality). According to industry estimates, roughly 50% of the pumps manufactured in the cluster are of commercial quality. There is a market for commercial quality pumps as they are about 30% cheaper than the premium quality models. Also, there is a market for premium quality pumps as they are equivalent in quality to BIS-labelled ones, yet cheaper (due to lower testing and marking fees).

Often, the pump and motor designs are developed by trial and error. The motors are often not designed to withstand voltage fluctuations, which are quite common in India. Small manufactures lack the capacity to invest in testing equipment. Few manufacturers have proper testing facilities for the electric motors. Inadequate design and overloading of the motor often leads to high rates of burnout.

Establishment of a common pump testing facility

SIDBI, under a multi-donor supported project, engaged TERI to support SME foundry and pump set units in Rajkot to improve access to finance and business development services (BDS) during 2009–2011. At that time, the pump manufacturers in Rajkot were facing difficulties obtaining BIS certification: the Rajkot cluster had only one BIS-approved lab, which was overburdened with applications by pump units for testing their products, leading to delays.

The project focused on strengthening the availability of local BIS pump certification services through the establishment of a Common Facility Centre (CFC), which will be of immense benefit to the Rajkot pump manufacturers. TERI requested a suitable agency (GITCO) to prepare a DPR for the proposed CFC; a Special Purpose Vehicle (SPV) named 'Rajkot Engineering, Testing and Research Centre' was formed with the partnership of local industry, state and central government; and land for the CFC was provided by REA. The CFC project, with a total cost of about Rs 7.2 crores, was approved in March 2014. Over Rs 74 lakhs was contributed by 62 local industries; Rs 3.82 crores by the central government towards testing equipment; and Rs 2.45 crores by the state government towards the building. The civil construction of the CFC is almost complete; ordering of the testing equipment will commence soon.





View of a pump manufacturing unit



Testing of pumps

Promotion of BEE labelled pumps

Star rating of pump sets under BEE-SLS is presently voluntary. However star rating is beneficial to the manufacturer in terms of branding and marketing of the product to the consumer. Obtaining a BEE Star Label also enables a pump manufacturer to compete for government and other tenders, which specify a minimum energy efficiency standard.

In the year 2009, when TERI was engaged by SIDBI to implement the BDS project, not a single pump manufacture in Rajkot had a BEE star-labeled pump. The local manufacturers could not perceive the need for testing and declaring the energy efficiency of their pump sets. In order to create and sustain awareness on the benefits of BEE star labeling, TERI identified a local BDS provider, and arranged for his training at BEE, New Delhi on all aspects of BEE-SLS—technical verification of the efficiency factor, testing of the pump set in an independent laboratory recognized by BIS, obtaining an ISI mark, and so on. The development of the BDS provider in Rajkot has contributed substantially to the steady growth of BEE labelled pump sets produced in Rajkot cluster.

Options for energy saving

Interactions with the local industry reveal that there is a large scope to revisit the present BIS specifications for pump sets, as well as the methods of implementation of BIS and BEE-SLS. A comprehensive upgradation of the BIS specifications, as well as implementation of BIS and BEE-SLS, has the potential to incentivize the manufacture of energy efficient pump sets in India. This will in turn yield substantial energy savings in agriculture and all other sectors where pump sets are widely used.

There is also a great potential to improve the design of the pumps and motors manufactured in the cluster, and make them more energy efficient and reliable (i.e., reduce failure rates during operation). A few broad areas in which to improve energy efficiency options are:

- Optimize design of the motor: e.g., stamping length; quality of stamping; quality of the copper wire in motor windings; etc.
- Optimize the manufacturing process (e.g. fabricated SS impeller) and material of construction (MOC) of different pump parts (e.g., impeller, shaft, bearing bush, quality of thrust bearings and motor component stampings, cooling medium, etc.), which are not specified in the BIS standards. ●●●

Prepared by TERI based on past studies and recent interactions with industry stakeholders in Rajkot



FRESH IMPETUS TO IMPROVING ENERGY EFFICIENCY IN RAJKOT CLUSTER

The ongoing TERI–SDC partnership has been engaged with the Rajkot engineering cluster for over 10 years. The new phase of the TERI–SDC partnership, titled ‘Scaling-up Energy efficiency in Small Enterprises’ (ESEE), has a focus on improving the energy efficiency of small-scale foundry units in Rajkot cluster. ESEE is synergetic with SIDBI’s ‘Cluster Level Intervention Programme’ (CLIP), which focuses on addressing gaps in knowledge and skill development in selected MSME clusters, and is being implemented by TERI in Rajkot. Summarized below are a few events organized by TERI in Rajkot under these initiatives, in association with Rajkot Engineering Association (REA) and Institute of Indian Foundrymen (IIF), Rajkot Chapter.

ESEE inception workshop

An inception workshop was held on 10th April 2015 in Rajkot to mark the launch of fresh activities in the cluster under ESEE. Some key points from the discussions:

- TERI will provide energy audit and implementation support free of cost to a large number of foundry units in the cluster. SDC will consider giving appreciation certificates to the foundry units that successfully implement the measures recommended in the energy audits.
- Investments in new efficient technologies may involve some risk; therefore, market leaders are needed who are willing to take risks so that other units in the cluster can follow.
- A project office has been established in REA so that the units can regularly interact with project personnel and tap their expertise as and when needed.



Events under CLIP

Awareness program on lean manufacturing

An awareness workshop on lean manufacturing was

organized on 29th May 2015. Some key points from the interactions:

- MSMEs need to develop in four main areas, i.e., skill development, energy efficiency, testing facilities and knowledge of latest technologies.
- Lean manufacturing (LM) reduces the cost of production by waste elimination, and thus actually helps in inventory control.
- Automobile manuring industries have been included under the lean cluster program.
- An expert on LM, Mr. Jayen Kotecha of Perfext consulting group, provided information and guidance to the participants on LM fundamentals, the lean cluster approach, and implementation methodology for lean clusters.



Awareness program on energy efficiency and pollution control

This program, held on 5th June 2015, enhanced awareness and understanding on: (i) energy audit and energy saving case studies; (ii) pollution control systems for foundries; and (iii) SIDBI’s 4E (End to End Energy Efficiency) program and Gujarat Energy Development Agency (GEDA) schemes for energy efficiency improvement in SMEs. An expert from India SME Technology Services Limited (ISTSL) provided information on financial schemes for SMEs, and on ISTSL’s ‘4E Solutions’ product.





9TH COORDINATION COMMITTEE MEETING OF SAMEEEKSHA

The 9th Coordination Committee Meeting of SAMEEEKSHA was held on 7th April 2015. The meeting was chaired by Mr Daniel Ziegerer, Director of Cooperation, SDC. The other participants included representatives from BEE, Ministry of MSME, UNIDO, GIZ, SBI, PCRA, GIZ-IGEN, financial institutions, implementing agencies, and technical consultancy organizations.

The following presentations were made (available on website):

- An update on the activities of SAMEEEKSHA platform—Mr Upinder Singh Dhingra, TERI
- Activities under the BEE-SME Program—Mr Sameer Pandia, BEE
- UNIDO initiatives in promoting EE in MSMEs—Mr Sudhir Singh, UNIDO
- GIZ Responsible Enterprise Financing Programme in the SME sector —Ms Devyani Hari, GIZ
- Promoting energy efficient agricultural pump sets—Mr Prosanto Pal, TERI

Salient points from the presentations and discussions are summarized below.

- In order to make the SAMEEEKSHA website more user-friendly as well as more effective, its hosted content will be made accessible by means of graphical interfacing.
- SAMEEEKSHA could consider collating the results from various interventions undertaken towards

promoting EE in MSMEs, in order to estimate the energy/GHG emissions savings at national level. The results could be displayed in the form of a 'dashboard' on the website.

- After a delayed start, the GEF–UNIDO–BEE project on promoting energy efficiency and renewable energy in five selected MSME clusters is under way..
- Under the 'Responsible Enterprise Finance' project, GIZ has prepared a draft document on 'Financial Sector Guidelines for Responsible Banking'; it is under discussion with Indian Banks' Association (IBA).
- There is huge potential to save energy by improving the quality and energy efficiency of pump sets through appropriate interventions both at the policy and technology levels. SDC is willing to interact with other partners who might wish to participate in, or contribute to this initiative.
- About 56 projects with a total subsidy outlay of Rs 4.21 crores have been cleared under the MoMSME's TEQUP scheme. Besides SIDBI, five public sector banks have been added as implementing agencies.
- The National Institute for Entrepreneurship and Small Business Development (NIESBUD) is conducting an evaluation of the TEQUP scheme; SAMEEEKSHA members are invited to make suggestions on how the scheme could be improved.
- MoMSME has formulated a 'Venture Capital Fund Scheme' with a corpus of Rs 5000 crores, which will soon be operationalized.



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.

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