SAMEEEKSHA
SMALL AND MEDIUM ENTERPRISES: ENERGY EFFICIENCY KNOWLEDGE SHARING
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NEWSLETTER

A PLATFORM FOR PROMOTING ENERGY EFFICIENCY IN SMEs

In this issue...

Editorial

In an era where energy prices are rising and the availability of dependable sources of energy is becoming increasingly difficult, it is imperative for industries to make the best possible use of energy supplies they already draw on, i.e. to improve their energy efficiency. They can do this not only by renovating or replacing inefficient equipment and machinery—which usually entails capital expenditure—but also by implementing better energy management practices at little or no cost.

It is in this context that ISO 50001 Energy Management Standard holds relevance for MSMEs in India. ISO 50001 was launched by International Organization for Standardization in June 2011 after a two-year pilot study in two industrial units: one a large-scale plant owned by Dow Chemicals, and the other, a small-scale enterprise in Houston, Texas. Both units derived substantial energy savings (17.9% and 14.9% respectively) by implementing ISO 50001.

In essence, ISO 50001 follows a 'Plan–Do–Check–Act' process for continual improvement of the energy management system. It provides a framework of requirements enabling organizations to develop a policy for more efficient use of energy; fix targets and objectives to meet the policy; use data to better understand and make decisions concerning energy use and consumption; measure the results; review the effectiveness of the policy; and continually improve energy management. ISO 50001 can be implemented individually or integrated with other management system standards.

PCRA is spearheading efforts to promote the adoption of ISO 50001 in India. It has already supported some major refineries of Mumbai, Kochi, Bina and other large industries to adopt the standard. As a nodal agency for numerous energy efficiency programs in almost every sector of the economy, with a team of Certified Energy Auditors, PCRA is adequately equipped to provide consultancy to MSMEs as well for implementation of ISO 50001. Adoption of this energy management system by MSMEs would bring substantial energy savings, thereby improving productivity, profitability and environmental performance at relatively low cost. Certification as an ISO 50001 unit would also greatly improve the market standing of the MSME concerned. At the macro level, effective energy management through adoption of ISO 50001 would greatly strengthen the energy security of our nation.

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ENERGY IS LIFE
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सत्यमेव जयते
MSME

CLUSTER PROFILE

GUJARAT DAIRY CLUSTER

Background

The Indian dairy industry traditionally comprised unorganized milk producers who were scattered in rural areas and depended on middlemen to sell their produce. On the eve of Independence, the rural milk producers in the state of Gujarat were motivated to organize themselves as cooperatives and thereby obtain control over production, processing and marketing of milk and milk products. This cooperative dairy movement was later institutionalized under an ambitious and innovative nation-wide project called 'Operation Flood', thanks to which India has become the largest milk producer in the world. According to the National Dairy Development Board (NDDB), India produced 132.4 million tonnes of milk in 2012–13. There are currently over 15 million milk producers across the country, organized into 144,500 dairy cooperative societies. The milk is processed in 184 District Co-operative Unions and marketed by 22 State Marketing Federations.

Gujarat is now the fourth largest milk producing state (contributing to about 8% of total production) in the country; in 2012–13, the state produced 10.3 million tonnes of milk (*source*: NDDB). Almost all the districts in the state have milk processing units. Most of these units are identified as SMEs, and members of the Gujarat Cooperative Milk Marketing Federation (GCMMF), the sole agency for marketing the products manufactured by the different milk co-operative member societies in Gujarat under the brand name of 'Amul'. According to GCMMF, Gujarat has 17 District Cooperative Milk Producers' Unions and 17,025 village-level milk cooperative societies with 3.23 million members. The sales turnover in 2013–14 was 181,430 million rupees (USD 3.0 billion).

Chillling section

Technology status and energy use

The basic raw material in the dairy industry is milk (from cows and/or buffalo). As fresh milk is highly perishable, it needs to be chilled to about 4° C and retained at this temperature so that it does not get spoiled during storage and transport for further processing. There are two broad categories of milk processing units: (1) chilling centres; (2) dairies.

Chilling centres are located in remote villages to collect the fresh milk from various local cooperatives. The fresh milk is graded, weighed, chilled, sampled, loaded in tankers and dispatched to processing plants (dairies). Often, chilling centres may have bulk milk cooling tanks (BMCs), which are large storage tanks for chilling and holding the milk at a low temperature till such time as it can be transported to the dairies.

Dairies receive chilled milk from chilling centres and process it to make packaged milk for distribution, as well as to manufacture various products like butter, cheese, curd, ghee, paneer (cottage cheese), milk powders, ice cream, flavoured milk, sweets, etc. In all cases, the first and most important step is pasteurization of the milk to destroy the microbes that would otherwise spoil it. Pasteurization is carried out by heating the milk rapidly to around 80 °C, and holding it at that temperature for about 15 seconds.

Energy use

Milk processing in a dairy requires both heating and chilling. The major energy consuming equipment and machinery in a typical milk processing unit include:

- Ammonia vapour compression systems (for chilling)
- Boilers (for heating)
- Other auxiliaries like pumps and electric motors
- Dryers (milk powder units)

Pasteurization plant

The major energy sources in milk processing units include electricity, natural gas, furnace oil, light diesel oil, castor oil, de-oiled cake and biomass fuels like wood and saw dust. The total annual energy consumption of dairy industries in Gujarat is about 9344 tonnes of oil equivalent (Table 1) of which about 16% is consumed by chilling centres and 84% by dairies.

The specific energy consumption (SEC) depends on the final product being manufactured by the concerned dairy unit. The SEC for chilling centres is estimated at 0.003 toe/t, and that of dairy units at between 0.084–0.097 toe/t.

Table 1. Annual energy consumption in Gujarat dairy cluster

Energy source	*Unit*	*Annual consumption*			*toe*⋆
		Chilling centres	*Dairies*	*Total*	
Electricity	kWh	7838891	27607940	35446831	3048
FO	GJ	25182	113485	138667	3312
NG	GJ	–	108919	108919	2601
Wood	GJ	6234	6072	12306	294
LDO	GJ	344	2325	2669	64
HSD	GJ	1066	–	1066	25
				Total	9344

⋆ toe—tonnes of oil equivalent

Options for energy saving

Various energy audit studies in dairy units (undertaken as a part of the BEE-SME program) in the state of Gujarat indicated a number of energy conservation measures that could be considered by the units through technology upgradation and adoption of better operating practices (Table 2). The total annual energy saving potential through adoption of these measures is estimated at 920 toe (about 10% of the total annual energy consumed by the cluster). An investment of about 89 million rupees is required for implementation of energy conservation measures. The simple payback period on the investments ranges from 5 months to 9 years.

Table 2. Selected energy conservation measures for units in Gujarat dairy industries

No.	*Existing system*	*Proposed system*	*Replication potential (units)*	*Total annual energy saving potential*		*Total investment (Rs million)*
				Energy/fuel units	*toe*	
Best available technologies (BAT)						
1	Hot water generation	Solar energy based hot water generation system	12	95 tonnes FO	95	4
2	Refrigeration system	Waste heat recovery by providing de-superheater in ammonia vapour compression based system	14	1050782 kWh	90	6
3	Reciprocating compressors	Replacement of reciprocating compressors with screw compressors	5	91332 kWh	8	3
4	Ammonia compressor	Soft starter in ammonia compressor for part load operation	21	232344 kWh	20	1

Table 2. Contd...

No.	*Existing system*	*Proposed system*	*Replication potential (units)*	*Total annual energy saving potential*		*Total investment (Rs million)*
				Energy/fuel units	*toe*	
5	Condenser water circulation pumps	Providing glass flake coating in impellers and casing of condensate water circulation pumps	12	90461 kWh	8	1
6	Pneumatic pouch filling machine	Replacing conventional machine with PLC based mechanical pouch filling machine	6	63360 kWh	5	3
7	Refrigeration system	Replace ice bank tank (IBT) system with thermal storage system	22	569160 kWh	49	28
8	Cooling tower	Replace metallic blades with FRP blades in cooling towers	7	16200 kWh	1	–
9	Old and conventional motors	Replace with energy efficient motors	15	332899 kWh	29	4
Best operating practices (BOP)						
1	Boiler	Improve condensate recovery	4	25.4 tonnes FO	26	0.9
2	Steam and hot water lines	Insulation improvements in steam and hot water lines	22	187 tonnes FO	188	1
3	Compressor	Reducing operating pressure of compressed air system with proper size of compressed air pipelines	5	17510 kWh	2	0.4
4	Lighting	Use of energy efficient lighting system	22	62287 kWh	5	0.9
5	Chilled water pipeline	Insulation improvements in chilled water pipeline	22	263376 kWh	23	2
6	Chiller compressors	Use of cogged belts in place ofV-belts for reciprocating compressors	21		13	–

Compiled by TERI from (i) 'Manual on energy conservation measures in Gujarat dairy (SME) cluster, Ahmedabad' under the BEE-SME Program, 2011; (ii) 'Benchmarking and mapping Indian MSMEs energy consumption': a BEE–AfD–TERI study, 2012

Forging Units Adopt Energy Efficient Compressed Air Systems

A CASE STUDY FROM PUNE, MAHARASHTRA

Partners : GEF–World Bank, SIDBI, BEE, AIFI, TERI
Duration : November 2013 to present

About the cluster

One of the largest forging clusters in India is located in Pune. As reported earlier, TERI studied a number of MSME units in this cluster under the GEF–World Bank project titled 'Financing energy efficiency at MSMEs' being co-implemented by SIDBI and BEE, and identified specific energy conservation measures (ECMs) that could be adopted by the units. A number of units have since implemented some of the recommended ECMs [please see *Sameeeksha Newsletters*: 4(4), December 2013; 5(2), June 2014]. This case study summarizes how five MSME units in the Pune cluster have benefited by implementing the ECMs recommended for their compressed air systems.

About the intervention in the units

The five units described below have each replaced their existing low-efficiency air compressors with energy efficient air compressor systems. The units are:

1. Venus Die Castings and Components (P) Ltd
2. Aum Prasad Castings (P) Ltd
3. Ranvik Auto Components (P) Ltd
4. Kumars Autotech (P) Ltd
5. Sachin Forge

In each case, at the unit's request, TERI helped in estimating energy savings potential and measures to tap the potential savings. TERI also assisted in identifying vendors for procuring the necessary machinery/ equipment, facilitated interactions between the units and the vendors, finalized technology specifications, and provided technical support as and when required by the units during commissioning of the new compressed air system systems.

Investments, energy savings and other benefits

Table 1 summarizes the new energy efficient air compression systems installed in the five units, and their benefits in terms of energy and cost savings. The simple payback period on the investments ranges from 1.7 years to about 4 years. Figure 1 illustrates the extent of energy savings brought about by the adopted ECMs.

Table 1. Summary of ECMs implemented, energy savings and monetary benefits

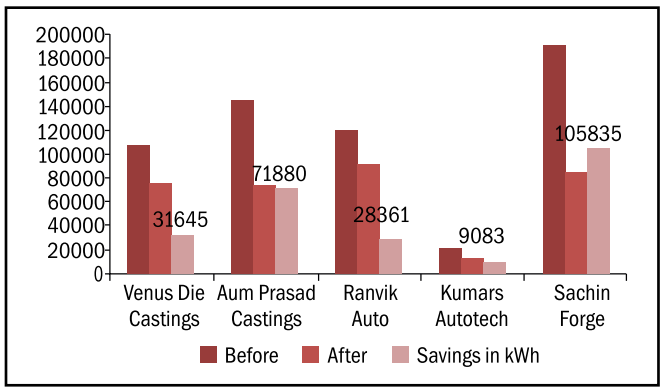
No.	*Unit*	*ECM*	*Annual energy savings (kWh)*	*Investment (Rs. Lakh)*	*Annual savings (Rs. Lakh)*	*Simple payback (years)*
1	Venus Die Castings	Replacement of GA-15 air compressor with new inverter type (VFD) screw air compressor	31,645	6.0	2.3	2.6
2	Aum Prasad Castings	Replacement of all existing reciprocating air compressors with new inverter type (VFD) screw air compressors	71,879	10.9	6.0	1.8
3	Ranvik Auto	Replacement of CPC-50 screw air compressor with new inverter type air compressor	28,361	8.2	2.5	3.3
4	Kumars Autotech	Replacement of all existing reciprocating air compressors with new screw air compressor	9,083	3.6	0.9	3.9
5	Sachin Forge	Replacement of existing reciprocating air compressor with new screw air compressor	105,835	13.5	8.1	1.7
	Total		246,803	42.2	19.8	

BEFORE Replacement of reciprocating air compressor with inverter type screw air compressor AFTER

Key lessons

TERI's experience while working with these five units—during the detailed energy audits as well as during implementation of the ECMs—underlines the importance of generating awareness as to how and why an ECM will bring benefits, not only among entrepreneurs and other management-level personnel, but also among operators and other factory floor personnel. This awareness alone will convince the entrepreneur/management to adopt the ECM and sustain it in the long term. Equally important, it is only with this awareness that operators and other factory floor personnel will learn and adopt proper operating practices so that the ECM yields the maximum benefits.

For instance, during the energy audit, the TERI team logged the electrical parameters of the existing air compressors, which revealed their loading–unloading patterns. In each case, these results were shared with the entrepreneur while explaining the proposed ECM (adoption of energy efficient screw type or inverter type air compressor), and helped him take a swift decision to adopt the ECM. Indeed, so impressed was one entrepreneur that, after the air compressors were replaced, he insisted on another electrical logging being conducted on the new system. This was duly done—revealing, to the entrepreneur's satisfaction, that the earlier loading–unloading pattern had changed to a continuous pattern with lower energy consumption.



At the factory floor level, the TERI team made the plant personnel aware of how they could achieve considerable energy savings just by improving their operating practices—for instance, optimizing the setting of generation air pressure, and using air guns with smaller diameter for scale-removing operations near the hammer (earlier, the operators were using pipes of larger diameter, which often had leakages). Through such measures, the operators have learned to reduce compressed air usage and leakages.

Contact details for further information

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Compiled by TERI based upon the ongoing activities being undertaken by TERI under the WB–GEF–SIDBI project 'Financing Energy Efficiency at MSMEs'

WORKSHOP ON PROMOTING APPLICATION OF JAPANESE LOW CARBON TECHNOLOGIES IN INDIA

An awareness workshop was organized by TERI and IGES on 18th November 2014 to discuss and share experiences on promoting the application of Japanese low carbon technologies (LCTs) in India. The participants included representatives from BEE, MNRE, PCRA, Japanese LCT manufacturers (Mayekawa Mfg Co. Ltd and Yanmar India Pvt. Ltd), technical experts and energy consultants. The participants shared experiences on various initiatives to promote LCTs in India, including the JICA/JST-supported ALCTS project implemented by IGES and TERI. The following important points emerged from the discussions.

Policy level

- An important avenue for taking the LCT initiative forward is the Climate Technology Centre and Network (CTCN)—the operational arm of the UNFCCC Technology Mechanism. TERI is one of the 11 Centres of Excellence that support CTCN. In order to request for and avail of assistance through CTCN, the Indian government must put in place a National Designated Entity (NDE)—as only NDEs are eligible to liaise with CTCN.
- Models for promoting LCTs must factor in issues related to technology development costs, financing mechanisms, IPR, and handholding.
- Agencies like IGES could develop a repository of Japanese LCTs with potential for application in India.

- A sector-wise approach could be adopted to promote LCTs.

Collaborators and users

- Users are deterred from adopting LCTs due to their high capital costs and IPR-related issues. These issues must be addressed to spur adoption of LCTs.
- The price of natural gas (NG) is a key factor in determining the cost-effectiveness of NG-based LCTs; hence, the potential to apply LCTs in different regions in India (where different NG prices prevail) should be explored.
- Post-demonstration training of unit level workers and energy professionals is essential for better impact.
- Replication of LCTs should be propagated through linkages of Government of Japan with ongoing programs of UNIDO/GEF/World Bank, avenues such as the Joint Credit Mechanism (JCM) and CTCN, and government schemes for promoting clean, energy efficient technologies.

Manufacturers

For successful implementation of LCTs, the following are essential:

- feasibility and detailed studies to select suitable sites, identify savings potential and customize the technology solution(s)
- adaptation of LCT to local conditions: for example, power cuts are rare in Japan but common in India; quality standards of materials are different; and so on
- handholding
- Users do *not* consider carbon savings to be an issue of fundamental importance—but they appreciate the financial benefits offered by LCTs! Hence, a sector-wise awareness generation approach should be undertaken to encourage users to adopt LCTs.

Pune workshop

An awareness workshop on 'Energy Efficient Japanese Technologies and Best Practices in Compressed Air System' was organized in Pune on 11th October 2014 by TERI and IGES in collaboration with Maharashtra Energy Development Agency (MEDA). The event was attended by around 45 representatives from government, industry, consultancy agencies and donor organizations. A presentation was made on improving operational efficiency of air compression systems, which typically consume between 20–40% of the total energy in many industries. TERI outlined the proposed bilateral 'Joint Crediting Mechanism (JCM)', between India and Japan, which can provide a good opportunity for financing the adoption of new energy efficient Japanese technologies in India.

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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