SMALL AND MEDIUM ENTERPRISES: ENERGY EFFICIENCY KNOWLEDGE SHARING

VOLUME 12 | ISSUE 1 | MARCH 2021

SAMEEEKSHA NEWSLETTER

www.sameeeksha.org

Inside...

Promoting Energy Efficiency in SMEs

SAMEEEKSHA

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.

Bureau of Energy Efficiency

SHAKTI SUSTAINABLE ENERGY FOUNDATION

The Energy and Resources Institute

A PLATFORM FOR PROMOTING ENERGY EFFICIENCY IN SMEs

IN THIS ISSUE...

This issue carries three articles centered on the common theme of scaling up the adoption of energy efficiency in the Indian MSME sector. The first article captures the gist of discussions during the 19th SAMEEEKSHA meeting held online on 23rd February 2021. The meeting focused on the challenges to be overcome and the strategies and actions required for implementation of the Energy Conservation (EC) guidelines for MSMEs, which have been prepared by BEE to enable the large-scale implementation of energy efficiency measures by MSMEs across the country. Implementation of the EC guidelines assumes particular relevance and urgency for MSMEs at a time when they are fighting to restore normal operations and improve competitiveness even as the Covid-19 pandemic continues to ravage economies across the world. The event provided representatives from industry associations with the opportunity to elaborate on the challenges faced by MSMEs in implementing the EC guidelines, as well as to suggest possible strategies and supportive measures that could help overcome these challenges in their respective sub-sectors.

The second article focuses on the energy mapping studies that are being conducted by TERI in the Thane chemical industry cluster, under the BEE program titled ''Energy and resource mapping of MSME clusters'. The studies include detailed energy audits that have been conducted on chemical units in the cluster to identify energy efficiency measures that can be implemented by the concerned units to bring significant savings in energy costs—in many cases, against low investments—and increase their profitability and competitiveness. The mapping studies in Thane and other chemical clusters will provide the foundation for drawing up a detailed road map for an energy efficiency intervention in the entire MSME chemical industry sub-sector in India, with a comprehensive implementation plan covering technological, financing, capacity building, and policy aspects. The third article profiles one of the chemical units studied, and summarizes the energy conservation measures (ECMs) recommended for implementation by the unit.

SAMEEEKSHA Secretariat

IMPLEMENTATION OF ENERGY CONSERVATION GUIDELINES: 19TH SAMEEEKSHA MEETING

The 19th meeting of SAMEEEKSHA was held (online) on 23rd February 2021. The discussions focused on implementation of the Energy Conservation (EC) guidelines for MSMEs, which have been prepared by BEE to enable the large-scale implementation of energy efficiency (EE) measures by MSMEs across the country. The EC guidelines cover the primary energy-consuming process equipment/systems used by MSMEs in 25 energy intensive sub-sectors, as well as a range of auxiliary systems and utilities such as air compressors, boilers, fans and blowers, etc. that are used by MSMEs in all sub-sectors (see SAMEEEKSHA, March 2020 for details).

Implementation of the EC guidelines assumes particular relevance and urgency for MSMEs at a time when they are fighting to restore normal operations and improve competitiveness even as the Covid-19 pandemic continues to ravage economies across the world, creating an environment that has been well described as 'volatile, uncertain, complex and ambiguous' (VUCA)[1].

The meeting was attended by senior officials from BEE, SSEF, MSME associations, and entrepreneurs representing different energy-intensive MSME sub-sectors across the country. Mr Girish Sethi, Senior Director, TERI, said that the primary aim of the meeting was to elicit views and ideas on how best to implement the EC guidelines, including the challenges to be overcome and the strategies and actions required. Dr Ajay Mathur, Director General, TERI, emphasized that implementation of the EC guidelines will not only bring benefits to MSMEs by way of improved profitability from lower energy costs, but also help reduce carbon emissions at local and national levels and enable India to achieve its national emission reduction targets. He underlined that EE is the key differentiator among MSMEs, and will be an increasingly important tool for MSMEs to improve their productivity and competitiveness.

Dr Anshu Bhardwaj, CEO, SSEF, cited the significant EE improvements that have been achieved among large-scale enterprises (Designated Consumers) under the 'Perform Achieve and Trade' (PAT) scheme, and said it is appropriate that similar EE improvements should be brought about among MSMEs through implementation of the EC guidelines. In this regard MSMEs will require support in areas such as bridging the gaps in knowledge and awareness levels; identifying the most suitable EE technologies; strengthening technical capacities; and accessing finance. SAMEEEKSHA can play a supportive role in this context, as a repository of knowledge and a forum for sharing best practices and disseminating information.

Mr R K Rai, Secretary, BEE, spoke on a joint study by Confederation of Indian Industry (CII) and World Resources Institute (WRI) in the Naroda (Gujarat) and Belgaum (Karnataka) MSME clusters, to assess the potential for promoting EE through demand aggregation via common utility centres. The study In Naroda indicates that out of 900 industrial units, approximately 120 units can meet their demands for process steam through a common boiler facility.

Mr Abhay Bakre, Director General, BEE, mentioned the efforts by BEE to expand the scope of the PAT scheme beyond an audit and efficiency-based mechanism. In addition to EE solutions, he emphasized the need to explore opportunities for shifting from fossil fuels to electricity-based technologies—as this would help reduce energy (oil and gas) imports and also create new opportunities for promoting 'green' electricity from renewable energy (RE) sources.

Dr Sachin Kumar, Secretary, SAMEEEKSHA and Senior Fellow, TERI, outlined the various activities undertaken under the SAMEEKSHA platform, and provided an overview of the SAMEEKSHA website and its features such as the MSME energy map, technology showcase and resources centre. Mr P. Shyam Sundar, Joint Director, BEE, outlined various initiatives by BEE to promote EE among MSMEs. He also mentioned new initiatives such as the 'E3' scheme to promote EE in the brick sector, and the 2nd phase of the GEF-World Bank-SIDBI collaborative program to promote EE and RE in 23 MSME clusters across five sectors (brass, ceramics, dairy, foundry, and hand tools).

Mr Suvra Majumdar, Technical Expert, UNDP, spoke on projects supported by UNDP for promoting EE and RE among MSMEs in Jharkhand and Manipur. The Jharkhand project covered 120 units across six sub-sectors, where the potential energy saving by the implementation of EE measures and rooftop solar systems was estimated at approximately 4000 MWh per year. Hand-holding helped in implementation of the EE/RE measures; however, MSMEs still face difficulties in accessing low-cost finance. UNDP is also working closely with industry stakeholders on R&D projects related to battery storage and rooftop solar systems.

Mr Milind Deore, Director, BEE, outlined the

1 For instance, https://www.europeanbusinessreview.com/using-the-triaxial-model-of-values-to-build-resilience-in-a-covid-19-vuca-world/

project titled 'Energy and resource mapping of MSME clusters' covering nearly 100 MSME clusters in nine energy intensive sub-sectors (see SAMEEEKSHA, December 2020 issue for details). The project will lead to the formulation of a national strategy document for launching comprehensive energy and resource efficiency interventions throughout each sub-sector, with implementation plans covering technological, financing and capacity building aspects as well as policy recommendations. Thus, the project dovetails perfectly with the EC guidelines prepared by BEE, and provides the framework to promote, improve and sustain EE throughout the Indian MSME sector.

Representatives from industry associations explained the challenges faced by MSMEs in implementing the EC guidelines, and suggested possible strategies and supportive measures that could help overcome these challenges. Among the speakers were Mr A Pari, Managing Director, C R P Industries; Mr Anirbandip Dasgupta, Indian Refractory Makers Association (IRMA); Mr Bipin Thapliyal, Indian Agro & Recycled Paper Mills Association (IARPMA); and Mr R.K. Chauhan, Federation of Safety Glass (FOSG). Some of the important points and suggestions related to their respective sub-sectors are listed below.

Salient points

Aluminium

- The scope for EE improvement is significant in the aluminium melting process, as the actual energy requirement for melting is about twice the theoretical value, with a correspondingly higher consumption of fuel.
- India could learn from the technologies and the best practices followed by aluminium industries in other countries, and adopt these with suitable adaptations as required. In this regard, there is need to invest in R&D and work with all stakeholders to reduce the high technology costs.

Refractory

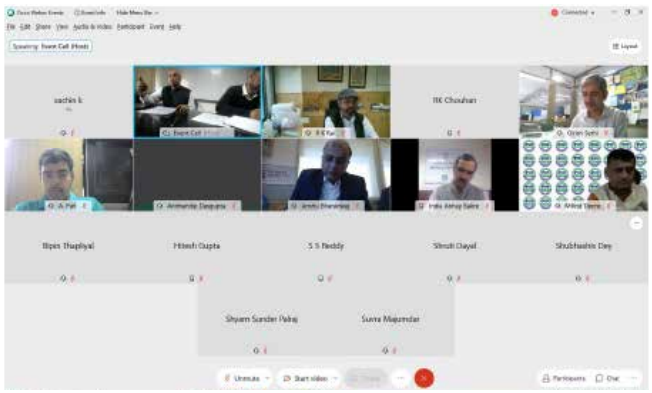
- There is significant scope for reducing electricity consumption in the heavy machinery used for refractory manufacture, as well as to improve energy efficiency and/or switch to alternate fuels in other processes.
- A virtual meeting could be organized to connect representatives from the refractory clusters all over India; capture the common problems and needs of the industry as well as the unique challenges faced by clusters in different locations; and enable discussions to identify alternate fuels and EE options.

Pulp & Paper

- There are 13 pulp & paper industry clusters with about 200 MSME mills located in Hyderabad, Patiala, Meerut, Kashipur and other places. These units are not very cost-competitive; they continue to operate on low-efficiency process and utility technologies, primarily due to low awareness on EE options and lack of EE technology suppliers. They also confront issues related to waste-water treatment and air pollution.
- There is need to explore technology solutions based on RE such as wind and solar, and to provide units with support for energy auditing and for upgrading technology (i.e., utility technology such as boilers, as well as process technology such as systems controls).

Glass

- The float glass processing industry presents significant scope for energy saving, particularly in the tempering process, with electricity costs accounting for about 60% of total production cost.
- There is need to explore solutions based on solar energy, which could reduce overall production costs in an estimated 300 small-scale float glass processing units across India.



ENERGY MAPPING OF MSME CLUSTERS: THANE CHEMICAL CLUSTER

The chemical industry is one of the two MSME sub-sectors in which TERI is conducting an energy mapping exercise under the project 'Energy and resource mapping of MSME clusters' launched by BEE (the other sub-sector being glass & ceramic industry). The mapping studies are being carried out in five prominent MSME chemical clusters: Ahmedabad (Gujarat), Ernakulam (Kerala), Jamshedpur (West Bengal), Karnal (Haryana),and Thane (Maharashtra). The project team has held discussions with key stakeholders in these clusters including entrepreneurs, representatives of industry associations, as well as relevant government bodies. Also, detailed energy audits (DEAs) are being conducted in representative chemical units in each cluster, in order to identify and highlight the benefits of energy efficiency opportunities that offer significant savings in energy consumption and costs as well as reductions in carbon emissions, with attractive payback periods on investments.

Indian chemical industry

The chemical industry is among the most important industrial sub-sectors in India, providing the basic building blocks as well as a range of process materials for many other industries including agrochemicals, paper, paints, pharmaceuticals, soap and detergents, textiles, etc. It is ranked 4th in Asia and 6th in the world in terms of market size, with output valued at Rs 695,513 crores in 2018–19 and exports (excluding pharmaceuticals and fertiliser products) contributing nearly 15% of India's total exports as of September 2020.

[Source: Annual Report, 2020–21. Ministry of Chemicals & Fertilisers, Department of Chemicals and Petrochemicals, Government of India. Available at http://chemicals.nic.in/document-report/annual-report]

This article presents a brief profile of the Thane chemicals cluster, and also outlines the potential energy efficiency (EE) improvement opportunities for chemical units (in MSME category) based on the knowledge gathered during the course of the ongoing project activities and on TERI's experiences in identifying and implementing EE measures in other chemical industry clusters—notably, in Ankleshwar (Gujarat).

Cluster profile

Thane is among the most industrialized districts of Maharashtra. According to the official estimates[1], in 2012–13 there were over 15,000 MSMEs in Thane, providing direct employment to over 220,000 people. The MSMEs represent a range of industrial sub-sectors such as chemicals and chemical products, electrical machinery, engineering, food processing, furniture, garments, leather, metal-based, mineral-based, pharmaceuticals, plastic, rubber, and textiles. The largest industry association is Thane Small Scale Industries Association (TSSIA), which has 2500 members representing different industrial sub-sectors.

The Thane industrial units may be grouped under six broad zones based on their major product categories, as shown in table 1.

Table 1. Thane industrial zones by major product categories

S. no	Zone	Major product categories
1	Ambarnath-Badlapur	Pharmaceutical
2	Dombivli	Chemical, pharmaceutical
3	Mira Road	Chemical, dyes, paints
4	Murbad	Metal
5	Thane-Belapur	Chemical, pharmaceutical
6	Thane – Wagle estate	Metal, pharmaceuticals

With its proximity to Mumbai and Pune, Thane offers excellent connectivity to markets across India as well as abroad by road, rail, air and sea. There are as many as 16 industrial training institutes (ITIs) in the Thane region, where factory workers are able to acquire and upgrade their technical skills as required.

There are hundreds of MSME chemical units in Thane, manufacturing products that find a wide range of applications—from laboratory reagents and other chemicals for educational and R&D institutions, to raw materials and processing chemicals for other industries like detergents, metals and metallurgical, paints and

[1] Brief Industrial Profile of Thane District. 2012–13. MSME Development Institute, Mumbai.

varnishes, paper and paper products, pharmaceuticals, plastic, rubber, textiles, and so on. Some units execute job works for large-scale industries (LSIs) in the vicinity: the LSI supplies the raw materials (feedstock), which is processed by the MSME unit using specialized equipment into the finished products that are tested for quality and then sent back to the LSI.

The chemical units typically have skilled workers to operate the process equipment as well as unskilled workers for tasks such as cleaning and packing. Generally, each unit has a small laboratory facility to test and ensure that products as well as process materials meet the required quality parameters. If and when required, the units send samples for testing to the National Chemical Laboratory in Pune. Almost all the chemical units have either in-house effluent treatment plants (ETPs) or share a common ETP, where waste water is recovered for reuse and water pollution is avoided.

Energy sources

The major energy sources for chemical units in the Thane cluster are electricity; piped natural gas (PNG), particularly in Thane–Belapur area; furnace oil (FO), and light diesel oil (LDO). Some units use briquettes in their boilers.

Dependable electricity supply is available in the cluster at competitive rates: currently, the tariff is about Rs 7/kWh for an LT connection and Rs 9–10/kWh for an HT connection. Recently, the electricity utility Maharashtra State Electricity Distribution Co. Ltd ('Mahavitaran') has switched from kWh-based to kVAh-based metering and billing of industrial consumers in Thane. In essence, this new metering/billing system provides consumers with an incentive to use electricity efficiently— by maintaining power factor (PF) close to unity—and is more effective than the earlier metering/billing system which was a combination of penalty and incentive. The utility too benefits from improved PF among consumers, as it avoids overloading of the distribution system and provides a better voltage profile; reduces line and transformer losses; and improves the overall system stability and power quality.

Energy conservation opportunities

The major energy consuming equipment and processes used in chemical manufacturing units include the following:

- Reaction vessels (heated by electricity, thermic fluids, or direct combustion of fuels such as PNG)
- Boilers/thermic fluid heaters (based on electricity, LDO or biomass)
- Distillation columns, condensers, vacuum systems
- Filtration units and centrifuges
- Evaporators and dryers
- Cooling towers with fans
- Process refrigeration and air-conditioning systems
- Electric motors
- Compressed air (CA) systems
- Pumps
- Lighting systems

The EE opportunities for the chemical units can be classified under three broad levels according to the energy savings they offer: (1) good housekeeping measures including best operating practices (BOP); (2) retrofits and revamps; (3) new equipment or process designs. Good housekeeping measures alone can save up to 3–5% of energy costs at low or zero investment. As MSMEs typically operate with small margins, even this level of saving in operating costs will greatly increase profits. A few examples of EE options in each level are shown in table 2.

> Good housekeeping measures alone can save up to 3–5% of energy costs at low or zero investment. As MSMEs typically operate with small margins, even this level of saving in operating costs will greatly increase profits

Table 2. Energy savings from different levels of EE technology implementations

Level	Description	Key features	Examples
1	Good housekeeping and best operating practices (BOP)	• Low energy savings (3–5% of total energy consumption) • Low or no cost • Can be implemented quickly or immediately (by changing operation practice)	• Reduce leaks in air and steam systems • Monitor and control process parameters like temperature, pressure • Optimize the voltage level by adjusting the transformer tap setting • Fine tuning of boiler operating parameters

2	Retrofits and revamps	• Moderate energy savings (6–10% of total energy consumption) • Medium to high cost • Medium implementation time (1–2 years)	• Retrofit under-loaded motors, compressors with variable speed drives (VSDs) • Retrofit boilers/steam systems with waste heat recovery (WHR) systems • Replace existing aluminium casting cooling tower fans with FRP fans
3	New equipment or process designs	• High energy savings (8–12% of total energy consumption) • High cost • Long implementation time (2–3 years)	• Install EE (IBR) boiler in place of low efficiency boiler • Replace low efficiency pumps with EE pumps

Among the EE options so far identified by the project, pumping systems appear to offer the most significant scope for energy savings among the chemical units in Thane; especially because pumping systems typically account for 40–50% of total plant energy consumption.

Taking stock, looking ahead

The project experience in Thane cluster reveals that the chemical unit entrepreneurs are very keen to adopt the identified EE opportunities which offer significant savings in energy costs—in many cases, against low investments—and will thereby increase their profitability and competitiveness. This is seen as especially important at a time when the second wave of the Covid-19 pandemic is raging across the country, with Maharashtra state being particularly badly affected.

One entrepreneur was so inspired by his discussions with the project team during the energy audit that he went ahead and implemented the identified EE measures without even waiting for the final DEA report!

The biggest barrier faced by entrepreneurs in adopting EE measures is their general lack of awareness regarding the various EE technology options that are available in the market. The awareness gap is often compounded by their inability to determine which EE option is best suited to meet their specific requirements and conditions. The entrepreneurs usually depend for advice on the technology vendors; on their part, the vendors understandably tend to push only their own limited range of technology products.

Weathering the Covid-19 storm

The Thane chemicals cluster was severely impacted by the onset of the Covid-19 pandemic in 2020 and the ensuing phases of lockdown that devastated supply chains and markets. Almost all the chemical units had to shut down during the initial lockdown phases in 2020. However, most of the units were able to resume production—in some cases, at full capacity—within a few months. This was primarily enabled by two factors: (1) local authorities were very supportive of the entrepreneurs, and permitted them to restart operations against assurances that the prescribed Covid-related safety precautions would be taken at plant-floor levels; (2) the majority of skilled workers did not leave Thane during the lockdown but stayed on in their settlements in nearby areas, and hence resumed work as soon as the units reopened. The local industrialists are confident that they will be able to weather and overcome the current wave of the pandemic as well.

The mapping studies in Thane and other chemical clusters will provide the basis for drawing up a detailed road map for an EE intervention in the entire MSME chemical industry sub-sector in India, with a comprehensive implementation plan covering technological, financing, capacity building, and policy aspects (please see SAMEEEKSHA 11(4), December 2020 for further details on the project).

“One entrepreneur was so inspired by his discussions with the project team during the energy audit that he went ahead and implemented the identified EE measures without even waiting for the final DEA report!”

ENERGY CONSERVATION MEASURES IDENTIFIED FOR A THANE CHEMICAL UNIT

Unit 'X' is one of the 10 MSME units in the Thane chemical industry cluster where TERI conducted detailed energy audits during 2020 under the project titled 'Energy and resource mapping of MSME clusters' launched by BEE. This article summarizes the main energy conservation measures (ECMs) that have been identified for implementation by the unit.

Unit profile

Unit X has been in operation for 25 years. It is engaged in the production of over 20 different kinds of chemicals by the process of fractional distillation of solvent mixtures. Unit X essentially operates as an ancillary unit of a large-scale industry (LSI) that supplies the solvent mixtures for processing. In 2019–20, unit X produced about 3.6 million litres of finished products.

Process

The primary raw materials, i.e., solvent mixtures, are received by unit X from the LSI in drums and tankers. The solvent mixtures are transferred by a pneumatic pumping system to one or more reactor vessels, depending on the characteristic and volume of each batch. The reactor vessels are heated by low-pressure steam, and equipped with overhead condensers to separate the various component-solvents. The separated products are tested for quality and sent back to the LSI in drums.

Equipment

The unit has 10 reactor vessels of different capacities ranging from 200–5000 litres. Other major equipment include cooling towers that supply cold water to the condensers; water demineralization (DM) plant; nitrogen plant; water jet pneumatic pump system; and utilities including transformer, air compressors, electric motors, and lighting system. The unit has a DG set for providing back-up power during scheduled power staggering hours (power failures are rare in Thane).

Energy usage

The annual energy consumption is about 350.3 tonnes of oil equivalent (toe), of which thermal energy accounts for about 88% (308.2 toe) and electricity the remaining 12% (42.1 toe) as depicted in figure 1. Steam is the main source of thermal energy, accounting for about 302.5 toe annually. The steam is imported from a neighboring plant. High speed diesel (HSD) used by the DG set accounts for 5.7 toe of total thermal energy consumed. The total annual CO_2 emissions are about 418 tonnes.

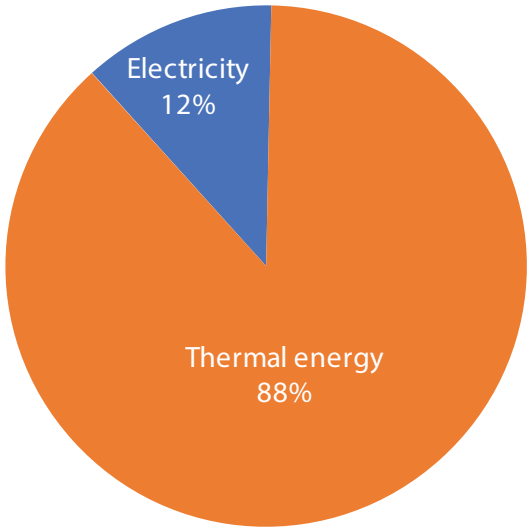


Figure 1. Annual energy consumption profile of unit X

Energy conservation measures

The detailed energy audit helped identify six key ECMs that will bring significant benefits upon implementation as shown in figure 2 and table 1.

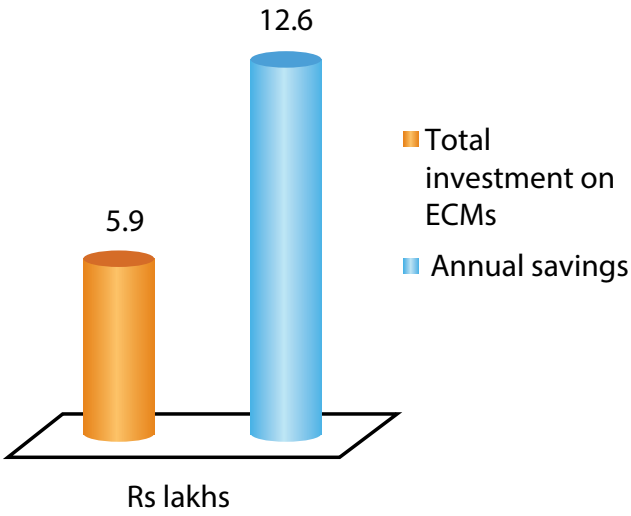


Figure 2. Monetary benefits from implementation of all ECMs

Table 1. ECMs identified for implementation by unit X

No.	ECM	Electricity saving (kVAh/year)	Investment (Rs lakhs)	Monetary saving (Rs lakhs/year)	Simple payback (years)	Emissions reduction (t-CO_2/year)
1	Adjust transformer tap setting to optimize voltage level	3846	Nil	0.4	Immediate	3.2
2	Optimize pressure setting of screw air compressor	7488	Nil	0.7	Immediate	6.1
3.	Replace inefficient cooling water circulation pumps with EE pumps	82368	2.5	8.2	0.3	67.5
4.	Install temperature sensor to optimize cooling tower fan operation	20280	0.5	2.0	0.2	16.6
5	Replace inefficient cooling tower fan motors with EE motors	1962	0.4	0.2	1.8	1.6
6	Replace the inefficient aluminum casting fans in cooling tower with EE fibre reinforced plastic (FRP) fans	11232	2.5	1.1	2.2	9.2
	Overall	**127176**	**5.9**	**12.6**	**0.5**	**104.2**

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.

For more details, please contact

Mr Sachin Kumar
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: sachink@teri.res.in
Website: http://sameeeksha.org