SMALL AND MEDIUM ENTERPRISES: ENERGY EFFICIENCY KNOWLEDGE SHARING

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SAMEEEKSHA NEWSLETTER

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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

teri The Energy and Resources Institute
Creating Innovative Solutions for a Sustainable Future

MSME
MICRO, SMALL & MEDIUM ENTERPRISES

A PLATFORM FOR PROMOTING ENERGY EFFICIENCY IN SMEs

IN THIS ISSUE...

This issue has as its theme the new opportunities that have opened up for scaling up the mutually beneficial technology cooperation in environmental technologies (ETs) between India and Japan under the initiative titled 'Japan India Technology Matchmaking Platform (JITMAP) that is being implemented by TERI and the Institute for Global Environmental Strategies (IGES), Japan.

At the bilateral level, steps have been initiated to create a new mechanism for technology cooperation between Japan and India—'Joint Crediting Mechanism' (JCM)—which will help both countries achieve their respective emissions-reduction targets through the carbon credits/carbon offsets that will accrue from the transfer and implementation of Japanese ETs in India. At the global level, significant progress has been made under the aegis of the UN Framework Convention on Climate Change (UNFCC) in creating an enabling framework for supporting and incentivizing the transfer of ETs from developed to less-developed countries.

The theme article explains how, with the formalization of support for technology transfer and the establishment of norms for trading carbon credits and carbon offsets under Article 6—in particular, Article 6.2, which covers technology transfers under bilateral/cooperative ventures between countries and entities—both Japan and India can take advantage of the avenues opened up for technology cooperation, including mobilization of finance, through JCM and under the UNFCCC ambit.

The subsequent articles outline two awareness and training initiatives conducted under JITMAP in Chennai in January 2024: (1) a training seminar on low-carbon Japanese technologies and best practices for compressed air system and steam management system; and (2) an awareness workshop/site visit on environment-friendly Japanese technologies for production of castings.

SAMEEEKSHA Secretariat

NEW OPPORTUNITIES FOR JAPAN–INDIA COOPERATION IN ENVIRONMENTAL TECHNOLOGIES THROUGH JITMAP

The consistent and rapid all-round growth of the Indian economy in recent years—with global rating agencies projecting GDP growth of 6.8% to 7.8% during 2024[1]—also brings with it the immense challenge of sustaining this growth on a low-emissions pathway, so that India can meet its commitment to become a net-zero economy by 2070 and thereby contribute to the global efforts to thwart climate change impacts. Overcoming this challenge requires the large-scale switchover from technologies and practices based on fossil fuels to highly efficient, low/zero emissions technologies, also known as environmental technologies (ET). This switchover to ETs must be undertaken not only in the materials, equipment and processes that are used in India's industrial sector but must extend to all the other sectors of the economy that are witnessing rapid expansion in pace with India's overall growth—airports, commercial buildings, housing, infrastructure, roads and railways, shipping, etc.

As reported in an earlier issue,[2] TERI and the Institute for Global Environmental Strategies (IGES), Japan have worked together since 2016 on developing and successfully implementing a business model for transfer of ETs from Japan to India, titled 'Japan India Technology Matchmaking Platform (JITMAP). The JITMAP work has essentially been undertaken in bilateral (Japan–India) mode, involving public and private entities in both countries and with the focus on enabling business-to-business (B2B) transactions between the technology suppliers in Japan and the industrial end-users in India.

JITMAP activities are structured to bridge the awareness and knowledge gaps that act as barriers to direct (B2B) transactions between the Japanese technology providers and Indian end-users. In many cases, the Japanese ET manufacturers/suppliers have limited knowledge regarding the (often-unique) needs and local conditions of the Indian end-users; and hence, they do not view Indian industries—except, perhaps, large-scale enterprises—as potential

customers for their ET products. On their part, the Indian end-users too—particularly MSMEs—are often unaware that Japanese companies can provide them with a range of high-efficiency ET options that could bring them significant benefits in terms of increased profits with attractive paybacks on investments, as well as reductions in emissions, improved productivity, better working conditions, and so on. They also often lack the technical capacity to absorb new/innovative technology, and face difficulties in accessing formal avenues of finance.

JITMAP identifies and addresses these knowledge barriers on both sides in the broad and overlapping domains of awareness generation, technical assistance,

1 See (1) https://economictimes.indiatimes.com/news/economy/indicators/moodys-ups-indias-2024-gdp-forecast-from-6-1-to-6-8/articleshow/108194154.cms?from=mdr; (2) https://economictimes.indiatimes.com/news/economy/indicators/fitch-revises-india-fy24-fy25-gdp-forecast-upwards-expects-economy-to-continue-strong-expansion/articleshow/108483578.cms?from=mdr

2 See SAMEEEKSHA 13(1), March 2022,

and creation of a supportive policy & regulatory environment for technology transfer. The primary JITMAP activities comprise seminars and workshops, feasibility studies, training-of-trainers programs, and stakeholder meetings covering a number of ETs for various industrial sectors and applications. By December 2023, JITMAP had conducted 54 feasibility studies, 17 seminars/workshops, 6 training-of-trainer programs, and 7 stakeholder meetings in different locations in India covering a range of industrial processes and systems including compressed air systems, electric heat pump (EHP) refrigeration systems, steam management systems, energy saving transmission belts, continuous emission monitoring systems (CEMS), and others.

Through its sustained engagements with industry and other stakeholders, and in particular, its follow-up activities on feasibility studies, JITMAP has helped overcome barriers in both countries in the domains of awareness generation, technology identification and adaptation, and capacity building, thus enabling the successful transfer of advanced ETs from Japanese firms to Indian end-users to the benefit of both sides. The subsequent articles in this issue outline two awareness and training initiatives conducted in Chennai in January 2024: (1) an awareness workshop/site visit on environment-friendly Japanese technologies for production of castings; and (2) a training seminar on low-carbon Japanese technologies and best practices for compressed air system and steam management system. Also during January–March 2024, post-feasibility study visits were undertaken to four industrial plants in Pune— two forging units, a foundry, and a pharmaceutical unit— to assess the potential benefits of implementing energy efficient Japanese compressed air systems and operating practices.

Article 6

The 'Paris Agreement' that resulted from the Climate Change Summit held in Paris in 2015 (COP21) established 'Article 6' to enable countries to collaborate in achieving their respective Nationally Determined Contributions (NDCs) by trading mitigation outcomes, i.e., by trading in carbon credits and carbon offsets that result from the implementation of ETs, including technologies transferred from one country to the other. The framework and mechanisms for Article 6 transactions in international carbon markets have been given clear shape through the subsequent COPs, particularly COP26 (Glasgow, 2021) and COP27 (Sharm El-Sheikh , 2022).

Looking ahead

The coming years present new opportunities for scaling up the mutually beneficial technology cooperation in ETs between India and Japan under JITMAP, with two key avenues formally opened up to incentivize the transition from fossil fuels to low/zero emission options.

At the bilateral level, steps have been initiated to create a new mechanism for technology cooperation between Japan and India—'Joint Crediting Mechanism'—for which an aide memoire was signed in March 2023 between Ministry of the Environment, Japan (MOEJ) and Ministry of Environment, Forest and Climate Change, India (MOEFCC). The 'Joint Crediting Mechanism' will help both countries achieve their respective emissions-reduction targets through the carbon credits/carbon offsets that will accrue from the transfer and implementation of Japanese ETs in India.

At the global level, significant progress has been made under the aegis of the UN Framework Convention on Climate Change (UNFCC) in creating an enabling framework for supporting and incentivizing the transfer of ETs from developed to less-developed countries, including the mobilization of funds for technology transfers, as well as setting out the principles and

guidelines for the creation of standardized international carbon markets. With the formalization of support for technology transfer and the establishment of norms for trading carbon credits and carbon offsets under Article 6—in particular, Article 6.2, which covers technology transfers under bilateral/cooperative ventures between countries and entities—both Japan and India can take advantage of the avenues opened up for technology cooperation, including mobilization of finance, through JCM and under the UNFCCC ambit. Both countries, including their industries and businesses, can derive benefits in terms of energy and cost savings as well as emissions reductions through scaling up and widening the transfer and adoption of Japanese ETs by Indian end-users under suitable business models designed via JITMAP.

The increased participation of Japanese technology suppliers as well as Indian end-users in this process can be expected with the forthcoming establishment of the Indian carbon market. In this regard, in November 2023, the Bureau of Energy Efficiency (BEE), as the National Designated Authority for administering the carbon market in India, laid out the ground rules for the operability of the Indian carbon market with respect to the compliance sector, including the regulatory compliances necessary for sorting out how emission allowances (i.e., carbon credits) will be issued and traded to pave the way for the market's official launch.[3]

3 https://shaktifoundation.in/carbon-market-in-india-creating-a-more-sustainable-future/

GoI has also finalized the following technologies to be considered for trading of carbon credits under bilateral/cooperative approaches under Article 6.2.[4]

GHG mitigation activities

- Renewable energy with storage (only stored component)
- Solar thermal power
- Off- shore wind
- Green hydrogen
- Compressed bio-gas
- Emerging mobility solutions like fuel cells
- High end technology for energy efficiency
- Sustainable aviation fuel
- Best available technologies for process improvement in hard-to-abate sectors
- Tidal energy, ocean thermal energy, ocean salt gradient energy, ocean wave energy and ocean current energy
- High Voltage Direct Current transmission in conjunction with renewal energy projects

Alternate materials

- Green ammonia

Removal activities

- Carbon capture, utilization and storage

4 https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1900216

TRAINING SEMINAR ON LOW-CARBON JAPANESE TECHNOLOGIES AND BEST PRACTICES FOR COMPRESSED AIR SYSTEM AND STEAM MANAGEMENT SYSTEM

Under the JITMAP initiative, IGES and TERI, together with Tamil Nadu Energy Development Agency (TEDA), organized a training seminar on 'Japanese low carbon technologies and best practices: Compressed Air System & Steam Management' in Chennai on 23rd January 2024 with support from the Ministry of the Environment, Government of Japan MoEJ. The objectives of the seminar were: (1) to strengthen the capacities of energy auditors/managers and industry personnel on low carbon technologies (LCTs) and practices in compressed air and steam management systems; and (2) generate awareness regarding the JITMAP initiative. The training seminar was attended by about 55 participants from diverse backgrounds in industry and energy efficiency.

Inaugural session

Initiating the program, Ms Mihoko Nagai, First Secretary, Embassy of Japan in India, and Mr Girish Sethi, Senior Director-Energy Program, TERI, welcomed the participants and briefed them on the objectives of the training seminar. They went on to outline the advantages and benefits offered by LCTs in terms of energy savings and reduced energy costs and emissions at plant level. The adoption of LCTs also enables companies/industrial units to improve their business profiles through better environmental, social and governance (ESG) performance—a key yardstick used in national and global markets for assessment

of business responsibility and sustainability—and to help India achieve its target of becoming a net-zero emissions economy by 2070.

Mr Prosanto Pal, Senior Fellow & Associate Director, TERI, and Mr Toshinori Hamaguchi, Program Manager, IGES, Japan outlined the efforts by IGES and TERI under JITMAP to promote Japanese LCTs in India through activities such as seminars and workshops, feasibility studies, awareness and training programs, and stakeholder meetings covering a number of LCTs for various industrial sectors and applications. They also presented a few case studies to highlight the benefits brought by adoption of the LCTs.

Technical sessions

Session 1: Compressed air system

Mr Tsukasa Saito, Compressed Air System Expert and IGES Fellow, made a detailed presentation on 'Optimization of compressed air system – Japanese experience'. His presentation highlighted the improved operating practices that can be applied in compressed air systems to achieve significant energy efficiency improvements and reduced CO_2 emissions. For example:

- Lowering of compressed air generation pressure by 0.1 MPa can reduce emissions by almost 8%.

- Proper pipe sizing and piping layout can reduce pressure loss in piping and bring down emissions by about 5%.
- Arresting compressed air leakages could reduce emissions by up to 20%.
- Using inverter system (VFD/ VSD) could reduce emissions by about 20%.
- In case of booster compressors, controlled consumption and usage of compressed air has a potential to reduce emissions by about 30%.

He underlined the importance of regular measurement and monitoring of power consumption and performance of the compressed air system, and the procedures to be followed. Some of the measures for improving the efficiency of compressed air system include:

- Adopting ideal system configuration (layout) of air compressors.
- Installing oil-free compressors.
- Installing inverter-based (VSD/VFD-driven) air compressors.
- Ensuring that pipelines do not have multiple bends, multiple partitions (such as check valves and other valves), small bores and large lengths.
- Selecting proper 'material of construction' (MOC) for pipelines and sizing according to the application.
- Installing air flow meters on major headers to monitor the air consumption in different sections/ machines of the plant.
- Using booster air compressors for localized high pressure requirements
- Regular air leakage detection and pressure drop monitoring.

Session 2: steam system

Mr Daiki Tanaka, Consulting Engineer, CES Division, Consulting & Engineering Department, TLV Co, LTD. made a presentation on 'Steam management system – Japanese experience'. He explained that steam carries significant quantities of latent heat energy, and transfers most of this latent energy rapidly upon condensation; hence, steam is used widely in industry for fast and even heating applications. As some of the latent heat remains in the condensate, there is scope for improving energy efficiency and reducing water consumption in steam systems through the recovery and reuse of heat and water from the condensate. He outlined the different designs of condensate heat recovery systems, and elaborated on the key principles for efficient operation of steam systems:

- Supply dry, saturated steam to improve heat transfer and avoid the problems caused by the presence of any condensate droplets in the steam.
- Ensure stable steam pressure and remove all air from the steam. This helps stabilize the steam temperature and enables even heating, leading to better product quality.
- Deliver steam at high pressure but use the steam at low pressure. This increases the latent heat content and reduces steam consumption. It also allows tighter control of temperature of the heated material/object.
- Most importantly, ensure rapid and continuous removal of condensate discharge through the use of appropriately designed steam traps. The right choice of steam trap greatly determines the overall energy efficiency of the steam system as well as productivity and product quality.

He outlined the main functions of the different types of steam traps and their operating principles, the features, structure, functions and cautions of mechanical (free float) and disc-type steam traps, and presented a few case studies on industrial plants to illustrate the efficient management of steam systems.

Practical demonstrations

Thereafter, the participants moved to Dr Ambedkar Institute of Productivity—the training wing of the National Productivity Council (NPC) located in Ambattur, Chennai—where they witnessed practical demonstrations of compressed air systems and steam systems. Also present during this session were Mr Hans Raj Verma, I.A.S, CMD, TEDA; and Mr D Sreenivasulu, Director, National Productivity Council. The demonstrations and the discussions that followed provided the participants with knowledge and insights on the advantages of VFD-driven air compressors over fixed-speed air compressors, unit control, role of receiver tank, etc.; and on various kinds of steam systems including the different types of steam traps (e.g., float, ball, thermodynamic traps), and their respective advantages and disadvantages.

CREATING AWARENESS ON ENVIRONMENT-FRIENDLY JAPANESE TECHNOLOGIES FOR PRODUCTION OF CASTINGS

Under the JITMAP initiative, TERI and IGES organized a seminar-cum plant visit on 24th January, 2024 in Chennai titled 'Japanese technologies and practices: environment-friendly casting production' in cooperation with The Institute of Indian Foundrymen (IIF), Chennai Chapter. The seminar aimed at creating awareness and strengthening knowledge among foundry managers and engineers on high quality and value-added environment-friendly casting production. About 20 participants attended the event, including representatives from IIF, foundry owners and managers, academic institutions and technology consultants.

Welcoming the participants, Mr R Palanimurugan, Hon. Secretary, IIF, Southern Region, appreciated the efforts made by TERI and IGES to promote awareness among foundry-based industries on improving energy efficiency, and noted that this seminar was the first program in this direction carried out in the Chennai foundry cluster. He assured support to TERI and IGES for promoting and scaling up energy efficient technologies across the cluster, and underlined the need to identify 'low hanging fruit' (i.e., easily adopted and affordable technologies and practices) that would improve productivity and energy efficiency, and to train shop-floor operators on deploying these technologies and practices effectively.

Dr Satoshi Kojima, Programme Director, IGES, underlined the need and potential to promote low carbon technology transfers from Japan to India in the context of the imperative to curb CO_2 emissions. He highlighted key features of the JITMAP initiative and its roll-out over the years, particularly its focus on the MSME sector, and reiterated the keenness of IGES and TERI to collaborate with IIF in undertaking initiatives in this direction in the Chennai foundry cluster.

Mr Prosanto Pal, Senior Fellow & Associate Director, TERI, elaborated on the various activities undertaken through JITMAP such as seminars and workshops, feasibility studies, awareness generation and technical training programs, and meetings with stakeholders at various levels. He also presented a few case studies to highlight the benefits brought by the adoption of low carbon technologies and practices for various industrial sectors and applications.

Mr Shinji Kasuya, Director, Sinto Bharat Manufacturing Pvt. Ltd, made a detailed presentation on 'Eco-Friendly Casting Production' from the perspective of energy saving, recycling, and improving the working environment. He described how automation of moulding process leads to several advantages, such as reduction in sand wastage, lower labour costs, less scrap generation, and so on. He highlighted the following technologies and practices that could reduce CO_2 emissions and improve the environment in the foundry industry.

- Aeration sand filling—an innovative, advanced technology for better quality mould production. Aeration sand filling also allows the production of high-quality moulds using less energy, compared to existing sand moulding systems.
- Servo cylinders—an innovative drive method that not only saves energy but also solves the problems faced with hydraulic and pneumatic driving in conventional moulding lines.
- Hybrid hydraulic systems— which reduce energy consumption during standby.

- Smart foundry practices—the number of defects can be reduced by real-time monitoring of operating conditions and defects and optimizing various parameters of casting production.
- Sand reclamation systems— reducing the environmental impact of sand disposal, and also contributing to lower running costs.
- Improvements in plant environment—improving the environment in and around the plant by combining various suction hoods and collection systems depending on the characteristics of the dust generating areas.

Following the discussions, the participants were taken on a tour of the Sinto Bharat Manufacturing plant located in Kanchipuram. At the end of the program, IIF proposed a vote of thanks for IGES, Sinto and TERI and reiterated their interest to organize similar capacity building events in Southern 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.

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