ENERGY SAVING POTENTIAL IN INDIA’S INDUSTRIAL SECTOR

Toshizo Maeda,
Programme Director, Kansai Research Center
OVERVIEW OF INDIA'S POLICIES FOR ENERGY EFFICIENCY

India intends to reduce its emission intensity by 33~35% below 2005 levels by 2030
(Conference of Parties, Paris, 2015)


- Perform Achieve and Trade (PAT)
- Energy Efficiency Financing Platform (EEFP)
- Market Transformation for Energy Efficiency (MTEE)
- Framework for Energy Efficient Economic Development (FEEED)

The industrial sector has a share of 58% in the total energy consumption (TERI, 2018).
Perform Achieve and Trade (PAT)

- Scheme is targeted to promote energy savings across energy intensive industries
- Evaluation of PAT Cycle 1 - targeted 6.68 mtoe, achieved- 8.67 mtoe, 30% over achievement.

Primary reason for DCs to take energy saving measures was rising energy prices (Bhandari and Shrimali 2017).

<table>
<thead>
<tr>
<th>PAT Cycle</th>
<th>Target (mtoe)</th>
<th>DCs</th>
<th>Sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>I 2012-15</td>
<td>6.68</td>
<td>478</td>
<td>8</td>
</tr>
<tr>
<td>II 2016-19</td>
<td>8.86</td>
<td>621</td>
<td>11</td>
</tr>
<tr>
<td>III 2017-20</td>
<td>9.92</td>
<td>737</td>
<td>11</td>
</tr>
<tr>
<td>IV</td>
<td>Unavailable</td>
<td>737</td>
<td>13</td>
</tr>
</tbody>
</table>

Sectoral targets and achievement, PAT I (Source-BEE)
Schemes for MSMEs in India

- Financial Support to MSMEs in Zero Defect Zero Effect (ZED) Certification Scheme
- Credit Linked Capital Subsidy for Technology Upgradation

Lean Manufacturing Competitiveness Scheme (LMCS) for MSMEs

- LMCS started in 2009 across 100 Indian industrial Clusters for implementing Lean Techniques.
- MSMEs have been assisted in reducing their manufacturing costs by Lean Manufacturing Consultants

Image source: Pexel
INDIA-JAPAN BILATERAL COOPERATION

India-Japan Energy Dialogue, New Delhi, 1st May 2018

- Minister of State for Power and New & Renewable Energy, India, and Minister of Economy, Trade and Industry (METI), released a statement to strengthen the India-Japan partnership on energy cooperation for energy development of both countries.

ECCJ and BEE collaboration on Energy Conservation (EC)

- The Energy Conservation Centre, Japan (ECCJ) has been supporting Bureau of Energy Efficiency (BEE) to formulate the Indian version of the “EC Guideline”.
- Organising trainings in Japan for BEE's energy management experts and dispatching ECCJ experts for the meetings and round table discussions.
JICA - Small Industries Development Bank of India (SIDBI)

- JICA’s loan assistance through SIDBI supported over 4,800 MSMEs across industrial sectors including manufacturers of glass & ceramics, textiles, auto components, leather, pharma, plastics & polymers, electrical components, printing and brick kilns.

- The support has facilitated installation of energy efficient equipment by replacing the old and high energy consuming systems.

- Along with energy efficiency, the measures have served to improve the quality of the finished product, mitigate waste and enhance profitability as well as provided technical assistance.

- In the Phase III (2014), JICA has extended a line of credit worth JPY30 billion (about ₹1,800 crore) to SIDBI.
AIR POLLUTION IN INDIA AND APPLICABLE JAPANESE TECHNOLOGIES

- PM 2.5 was observed to be 12 times above the US government-recommended standards (The Guardian, 3 January 2019).
- Embassy of Japan in India launched “Blue Sky Initiatives” in 2018 to promote cooperation in controlling India’s air pollution by making full use of Japanese knowledge and technology.

ACHIEVEMENTS

- Horiba India conducted pilot study on real-time source apportionment of PM2.5 in Delhi-NCR
- Mitsubishi-Hitachi Power Systems India installed Flue-gas Desulfurization Systems at thermal power plant to reduce emissions of sulphur oxide (SOx) and soot dust
- Hitachi Zosen India contract award of three waste-to-energy projects in Andhra Pradesh
THE ENERGY AND RESOURCES INSTITUTE (TERI)

Advancing Energy Efficiency among MSMEs in India - TERI-Shakti Sustainable Energy Foundation (SAMEEKSHA 2018)

- Cluster profiling of 10 clusters such as ceramics, auto components, foundry, rubber, brick manufacturing, jaggery, compressor and flour mills.
- Developed a training curriculum and modules for shop floor technicians
- Organised Training of Trainers (ToT)

Sustainable Energy Leadership Programme (SELP)- TERI, UNIDO, TERI University (UNIDO,2014)

2 weeks awareness, knowledge dissemination, interaction programme for 20 government officials, policymakers, and experts from 20 countries in Africa, Asia and Europe.
IGES-TERI COLLABORATION: SATREPS (JICA/JST) 2010-2014

Investigated about 50 Indian MSMEs to assess the feasibility of low carbon technologies (LCTs) such as Electric Heat Pump and Gas Heat Pump and to enhance operating process for compressed air systems and induction furnace.

30-40% energy saving due to reduction in fuel consumption of boiler and electricity consumption of chiller

35-45% energy saving due to switch from electricity to natural gas as source of energy

Achieved CO2 reduction across different sites

<table>
<thead>
<tr>
<th>Tech.</th>
<th>EHP</th>
<th>GHP</th>
<th>Compressed Air</th>
<th>Induction Furnace</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sites</td>
<td>Amul</td>
<td>Verka</td>
<td>Delta</td>
<td>Jagdish</td>
</tr>
<tr>
<td>emission reduction</td>
<td>33%</td>
<td>40%</td>
<td>47%</td>
<td>43%</td>
</tr>
</tbody>
</table>
Evaluation and verification of CO2 emissions reduction technologies
Supported by the Ministry of the Environment, Japan, FY2015-2018

Business to Business (B2B)

Japanese companies

Japanese Stakeholders
- Business Associations
- Supporting Agencies
- Government Agencies

Core Members
- IGES
- TERI

Dialogue Members
Selected stakeholders from Japan and India

Indian companies

Indian Stakeholders
- Business Associations
- Financing Agencies
- Government Agencies

Schematic diagram of JITMAP as a supporting mechanism to promote business matchmaking

JITMAP launched in 2016
IGES-TERI, with partners, have investigated 43 Indian companies

**Business Matchmaking**
- Conduct market assessment to identify potential matches between technology suppliers and end-users

**Feasibility studies and Technology Implementation**
- Facilitate business meetings (B2B)
- Facilitate/Arrange feasibility studies (FS)
- Implement pilot projects

**Training of Trainers**
- Dessimination events to enhance awareness (workshops, seminars, forums, etc.)

**Technical Support**
- In-house & On-site trainings

**Financial Support**
- Meeting with financing agencies (B2F matching)

**Policy Support**
- Meeting with policy makers (B2P matching)

Distribution of investigated companies
Capacity building of Compressed Air Systems

Training workshop for energy auditors, Pune, Maharashtra

Feasibility and walk through study

Interventions across different sectors

Outreach 2011-Present (37 Feasibility Studies)
Compressed Air measures implemented by Indian companies

- Installing a new receiver and a new air compressor
- Adjusting pressure setting
- Reducing air leakage by installing a foot switch
- Rearrange the pipe size and design
- Start using an efficient air gun
Case study: Promoting Energy Efficient compressors in Gujarat

<table>
<thead>
<tr>
<th>Training of Trainers</th>
<th>Technology Implementation</th>
<th>Awareness workshop</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGES-TERI-Maharashtra Energy Development Agency (MEDA) and Mahratta Chamber of Commerce, Industries and Agriculture (MCCIA) co-organized training program for energy auditors in Pune, Maharashtra</td>
<td>The trained energy auditors (from TERI) conducted energy auditing/feasibility study at ceramic plant in Thangadh, Gujarat, and recommended them energy efficient compressor</td>
<td>IGES-TERI-GEDA-GITCO-AIA co-organized a technology awareness workshop in Ankleshwar, Gujarat</td>
</tr>
<tr>
<td></td>
<td>The ceramic plant contacted Kobelco compressor and purchased/implemented the compressor as per the energy auditor’s recommendations</td>
<td>• Credits to their wide networks, more than 100 participants attended it</td>
</tr>
</tbody>
</table>
Promoting safe and energy efficient refrigeration systems

Need to for safe refrigeration systems in India

- February 2019, Maharashtra- Ammonia leak from the compressor at fish processing industry 5 ill and 2 hospitalised. (Times of India)
- February 2018, Punjab- 4 Killed and 11 ill after the ammonia cylinder explosion in a chemical factory. (Times of India)

Feasibility study for NH3/CO2 refrigeration at a seafood company in Andhra Pradesh

Mayekawa’s NH3/CO2 refrigeration NewTon

Energy-saving

Comparison of the electric power consumption before and after switching to NewTon

For cold storages

<table>
<thead>
<tr>
<th></th>
<th>NewTon R</th>
<th>NewTon G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>40,0</td>
<td>30,0</td>
</tr>
<tr>
<td>Feb</td>
<td>35,0</td>
<td>25,0</td>
</tr>
<tr>
<td>Mar</td>
<td>30,0</td>
<td>20,0</td>
</tr>
<tr>
<td>Apr</td>
<td>25,0</td>
<td>15,0</td>
</tr>
<tr>
<td>May</td>
<td>20,0</td>
<td>10,0</td>
</tr>
<tr>
<td>Jun</td>
<td>15,0</td>
<td>5,0</td>
</tr>
<tr>
<td>Jul</td>
<td>10,0</td>
<td>0</td>
</tr>
<tr>
<td>Aug</td>
<td>5,0</td>
<td>0</td>
</tr>
<tr>
<td>Sep</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Oct</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nov</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dec</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Average reduction of 27.8%

25-35% energy saving potential

Meeting with Andhra Pradesh State Energy Conservation Mission (APSECM)
Case study: Promoting Energy Saving Belts in Ankleshwar, Gujarat

Feasibility Studies

- IGES-TERI coordinated with Gujarat Energy Development Agency (GEDA), Gujarat Industrial and Technical Consultancy Organisation Ltd (GITCO) and Ankleshwar Industries Association (AIA) to arrange business meetings with “top” decision makers of potential end-users for Bando Chemical Industries, Ltd.

- “Top” decision makers approved to conduct feasibility studies and decided to implement Bando’s energy efficient transmission belts on a trial basis.

Awareness workshop

- IGES-TERI-GEDA-GITCO-AIA co-organized a technology awareness workshop in Ankleshwar,
  - More than 100 participants attended it
  - Substantial opportunities for replication
Promoting steam management system

Common Findings from walk through investigations

- Pipe size optimisation
- Distribution line layout
- Condensate Heat Recovery
- Steam Trap Failure
- Pressure optimisation at different locations within the company
- Appropriate trap selection

Diagnostic Tool: TrapMan
Precession in trap assessment
Database creation
Trap performance assessment

SSOP
4.6% Energy saving in oil refineries and Petrochemical Plants
12% saving in general industrial plants
(Source - TLV)

Reduce CO₂ Emissions

Improve Safety, Reliability

Increase Profitability

Steam System Optimisation Programme
Project implementation structure of Deep Dive EE Intervention in India’s SMEs

**DRAFT: To be applied for SATREPS in 2019**

**India side**
- **MoP**
- **MoEFCC**
- **TERI**
- **IGES**
- **BEE**
- **MoMSME**
- **GEDA**
- **GITCO**
- **MEDA**
- **MCCIA**
- **SMEs**
- **SMEs**

**Japan side**
- **MOEJ**
- **JICA**
- **JST**
- **METI**
- **ECCJ**
- **JASE-World**
- **JCCII**

**Project team**
- **Private companies**

**Environmental Cooperation Agreement**
- Development of Energy Conservation (EC) Guidelines for Industries and Energy Management (EM) Manuals and their application at model factories

**Energy Dialogue**

**Project implementation support and M&E**

**Support for activities in Gujarat State**
- Support for training energy auditors and energy managers
- Support for selecting LCT service providers

**Technology transfer**
- Provision of LCTs and services; conducting feasibility studies; implementing demonstration projects

**MoP**: Ministry of Power  
**BEE**: Bureau of Energy Efficiency  
**MoEFCC**: Ministry of Environment, Forest and Climate Change  
**MoMSME**: Ministry of Micro, Small & Medium Enterprises  
**SIDBI**: Small Industries Development Bank of India  

**GEDA**: Gujarat Energy Development Agency  
**GITCO**: Gujarat Industrial and Technical Consultancy Organization Ltd.  
**MEDA**: Maharashtra Energy Development Agency  
**MCCIA**: Maharashtra Chamber of Commerce, Industries and Agriculture  
**TERI**: The Energy and Resources Institute  
**IGES**: Institute for Global Environmental Strategies  

**JICA**: Japan International Cooperation Agency  
**JST**: Japan Science and Technology Agency  
**MOEJ**: Ministry of the Environment, Japan  
**Hyogo Pref. Gov.**: Hyogo Prefectural Government  
**METI**: Ministry of Economy, Trade and Industries  
**ECCI**: Energy Conservation Center, Japan  
**JASE-World**: Japanese Business Alliance for Smart Energy Worldwide  
**JCCII**: Japan Chamber of Commerce and Industry in India
Thematic Track: February 11, 2019

Promoting Cleaner Technologies in SMEs

- “Lean Manufacturing Scheme has been successful in improving energy efficiency of targeted SME clusters.” --- Mr. Sudir Garg, Joint Secretary, Ministry of MSME

- “Improving SMEs’ knowledge on energy efficient technologies and provision of various financing schemes are crucial.” --- Mr. Abhay Bakre, Director General, Bureau of Energy Efficiency

- “SMEs need a readymade template of technically and financially feasible options.” --- Dr. Ajay Mathur, DG, TERI

- “Under the LM Scheme, local consultants assigned to SME clusters created ‘local heroes’ demonstrating energy savings.” --- Mr. Prashant Girbane, DG, MCCIA
Japan has held consultations for the JCM with developing countries since 2011 and has established the JCM with Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Viet Nam, Lao PDR, Indonesia, Costa Rica, Palau, Cambodia, Mexico, Saudi Arabia, Chile, Myanmar, Thailand and the Philippines.

Source: Recent Development of The Joint Crediting Mechanism (JCM), July 2018, Government of Japan