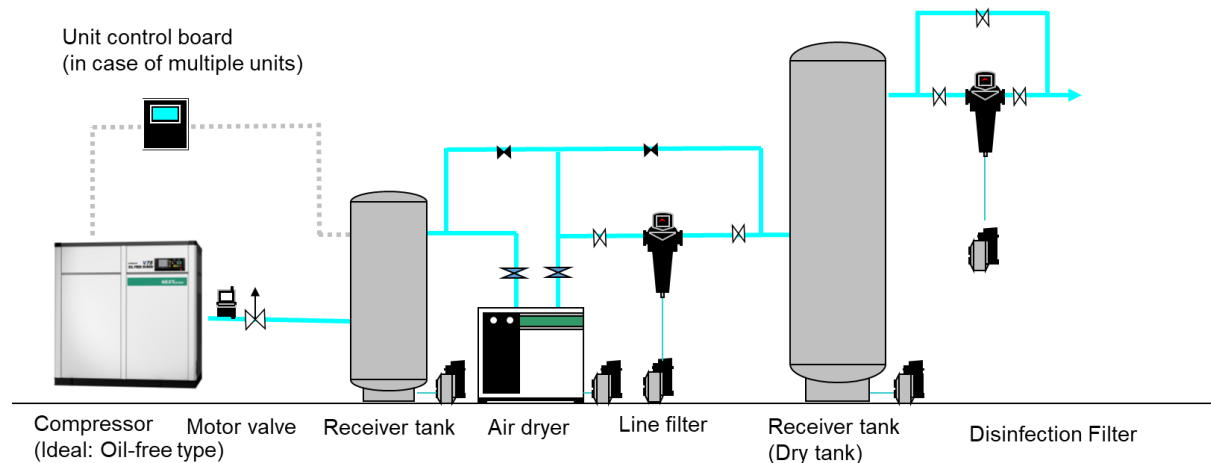


JITMAP Activities and Achievements

- Compressed Air System -



SAITO TSUKASA

Fellow, Institute for Global Environmental Strategies (IGES)

What is compressor?



at home

Compressors are used for air conditioners and refrigerators in home.



inside the factory



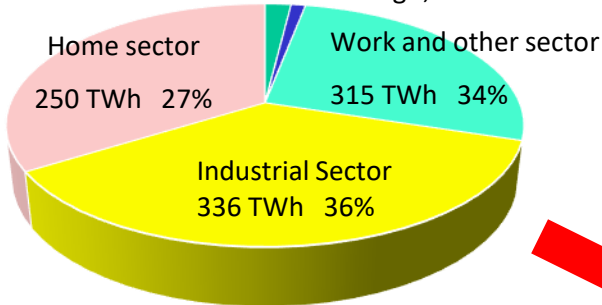
Air compressors are used in every factory.

These products use a high proportion of electrical energy.

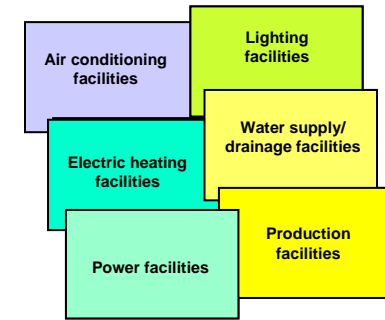
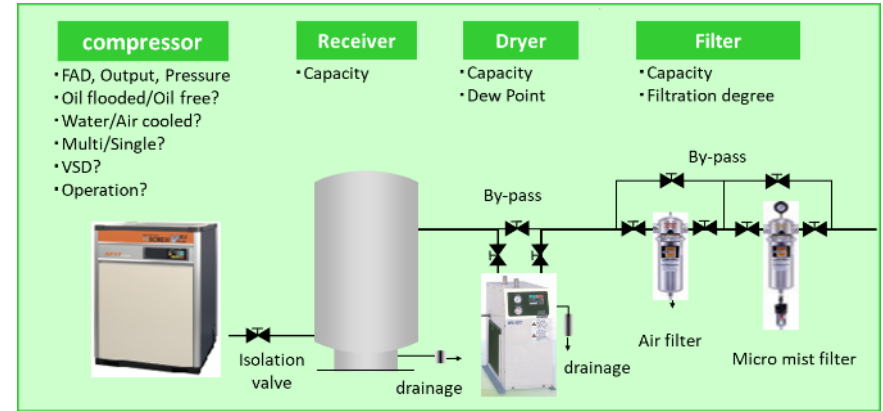
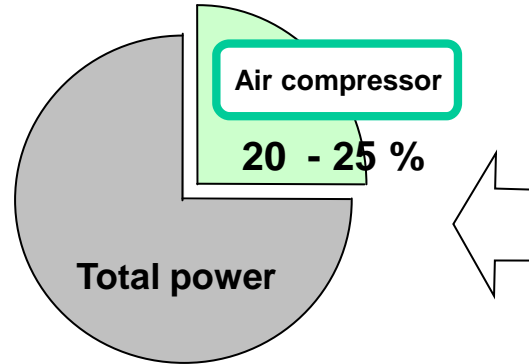
1 Energy consumption by sectors...Examples in Japan

Electric energy emissions in Japan
(by fuel combustion)

Transportation sector 18 TWh 2% Agri, Fisheries 10 TWh 1%



FY2019 Total Approx. 929 TWh



- ✓ Energy consumed for the industrial sector (factories): **About 36%** of the total energy consumption and **about a quarter of that amount** by air compressors in Japan.
- ✓ Since energy consumption by air compressors can be relatively reduced easily, there is a **strong need for energy conservation through inverter control and multiple unit control (volume control).**
- ✓ The effects of these activities can **reduce CO2 emissions and help protect the environment in India**, where the industrial structure is relatively similar.

BEE's Energy Conservation Guidelines for MSME & FS (Walk through)

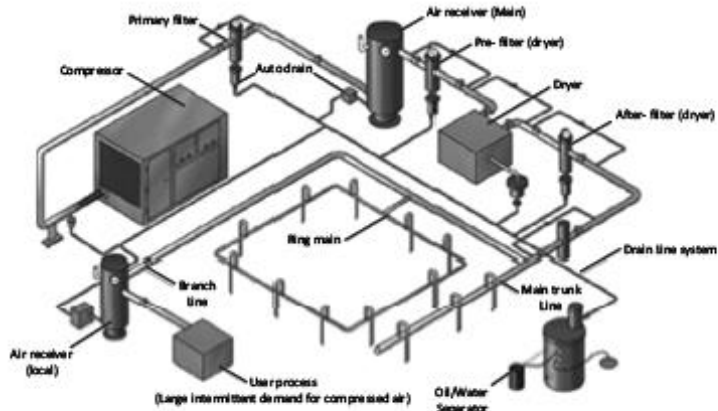
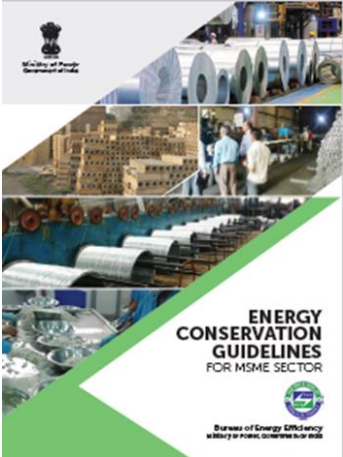


Figure 5.1 Air compressor network

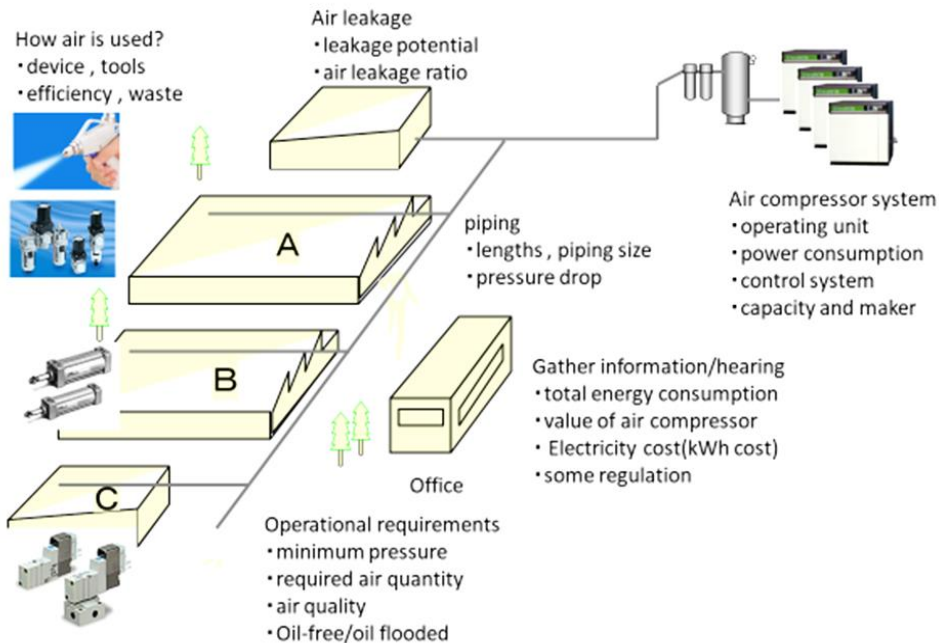


Energy Conservation Guidelines for MSME Sector

Checking with FS (Feasibility study ~ Walk through)

First step;

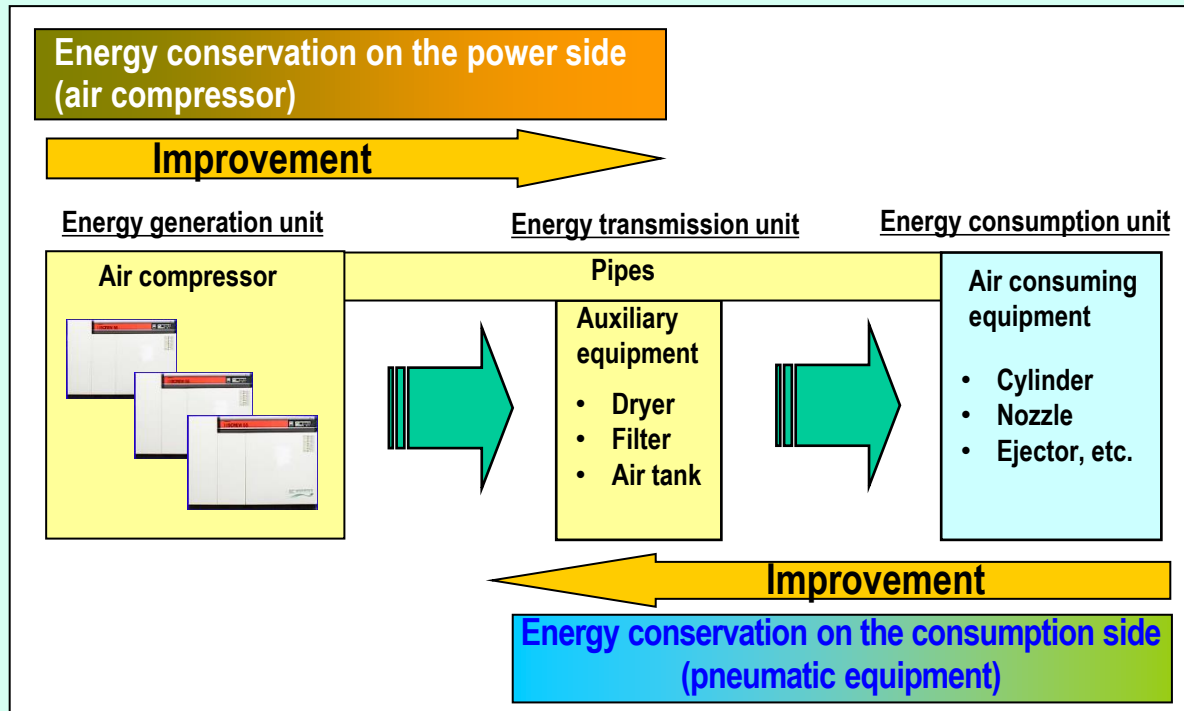
- * understand the current situation.
- * Walk-through to check not only the compressor room but also the factory situation.



3 Which units of the air system have the potential to save energy?

Visualizing the energy distribution of an air compressor.

- ① **Energy generation unit (air compressor):** Installing an inverter compressor and unit control are highly effective. If pressure fluctuation is controlled by the size of the air tank, the energy-saving effect is big.
- ② **Energy transmission unit (piping system):** Piping size is directly related to pressure loss. A well-balanced air system minimizes pressure loss.
- ③ **Energy consumption unit:** Air volume, supply pressure and efficiency of consuming equipment need to be considered.



Pneumatic equipment



Air control valve



Air cylinder



Vacuum equipment

4 JITMAP activities on Compressed Air

- **8 on-site missions from FY 2016 to 2019** and a Follow-up survey for previous activities by TERI in FY 2020.
- **FS** was conducted **mainly for MSME** as well as for several large companies upon their requests.



Feasibility Studies (FS): a total of 25 companies
Trainings for energy auditors & managers: 5 times
(220 participants)
Awareness Workshops: 5 times (360 participants)
Multi-Stakeholder Meetings: 2 times

- Lessons learned through these on-the ground activities: **Japanese technological products are still not well known and trusted in the industrial sector.**
- **Our ultimate goal: To match machine and equipment (hard-technology) with the appropriate operational practices (soft-technology)**
Our challenge: To make it a reality.
- In order to achieve this, we **need to continue our activities and act in a way that will benefit both India and Japan.**

5 Results obtained from JITMAP activities

1. Realization of CO2 emission reduction in Indian companies:

1-1. Contributed to raising their awareness that the efficient use of compressed air saves energy.

→ **Appropriate measures were taken by understanding about where there is waste and what kind of effects can be obtained.**

1-2. Establishment of various appropriate operational practices of technology (**soft-technology**) :

→ **CO2 emissions and energy consumption were significantly reduced.**

1-3. Increased recognition of effectiveness of technologies such as inverters (**hard-technologies**)

→ **Many cases have been reported in which air compressors have actually been introduced and effective.**

2. Results of the activities:

2-1. **Certain evaluation of activities** such as FS, workshops, trainings, etc. **by Indian government and companies.**

2-2. **Raising environmental consideration and awareness (co-benefits).**

- Reduction of NOx and Sox in proportion to reduction of electricity consumption.

- Reduction of air and soil pollution and pollutants in wastewater.

- ◆ Environmental impact of drainage in oil

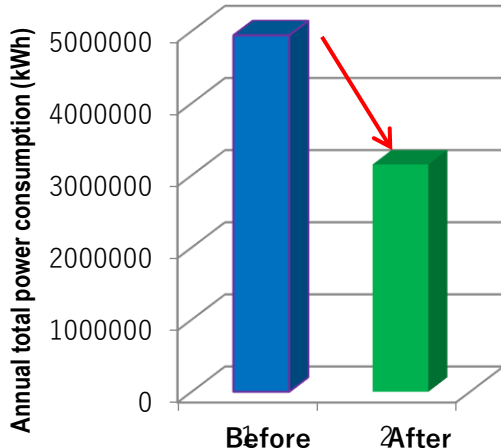
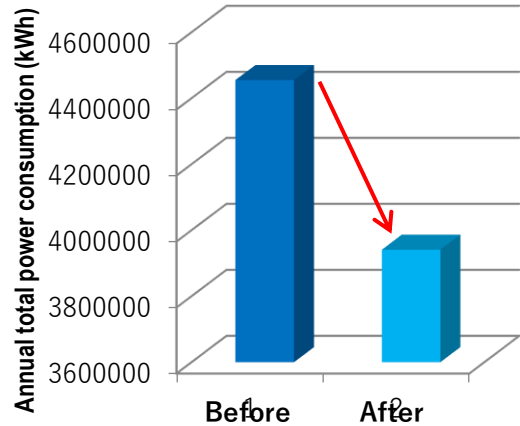
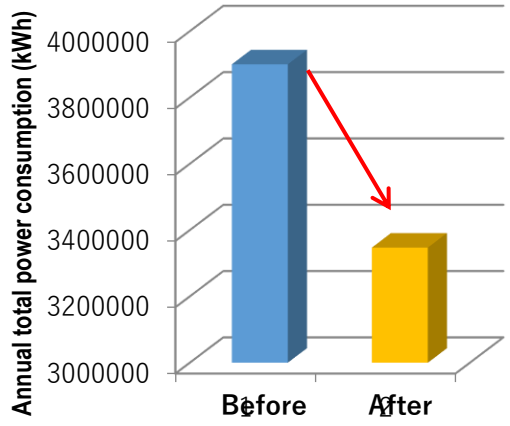
- Reduction of waste: extended maintenance intervals, reduction of maintenance parts, regular maintenance.

6 Results obtained from JITMAP activities (Continued)

3. Building reliability:

- **Many cases where Indian companies have understood our improvement proposals and implemented them, resulting in reducing CO2 emissions and energy consumption.**
- Several companies presented these success stories elsewhere or came to us to report on them, which can be examples of recognition and trust in our activities.

7 Examples of follow-up results in energy conservation (FY2019)

A: Forging Factory (MSME) Compressor ratio; 35%	B: Textile Company (PAD DC) Compressor ratio ; 15%	C: Textile Company (MSME) Compressor ratio ; 25%																		
<ul style="list-style-type: none"> Stopping unnecessary units --- review OF operational control. Stopping buried pipes. Measures against air leakage. Maintenance of air equipment. 	<ul style="list-style-type: none"> Optimization of operation . . . Centrifugal as base + Variable Screw Indoor ventilation measures. Measures against air leakage. From Grove Valve to Needle Valve. 	<ul style="list-style-type: none"> Pressure optimization . . . Reducing fluctuations. Introduction of receiver tank at the end Introduction of high performance drain traps Measures against air leakage. 																		
<p>Energy reduction effects 1,790,245kWh/y 36.2% CO2 reduction effects 1,665t/y</p>  <table border="1"> <caption>Energy Conservation Data - Forging Factory</caption> <thead> <tr> <th>Category</th> <th>Before (kWh)</th> <th>After (kWh)</th> </tr> </thead> <tbody> <tr> <td>Annual total power consumption</td> <td>~5,000,000</td> <td>~3,200,000</td> </tr> </tbody> </table>	Category	Before (kWh)	After (kWh)	Annual total power consumption	~5,000,000	~3,200,000	<p>Energy reduction effects 514,107kWh/y 11.5% CO2 reduction effects 478t/y</p>  <table border="1"> <caption>Energy Conservation Data - Textile Company (PAD DC)</caption> <thead> <tr> <th>Category</th> <th>Before (kWh)</th> <th>After (kWh)</th> </tr> </thead> <tbody> <tr> <td>Annual total power consumption</td> <td>~4,500,000</td> <td>~4,000,000</td> </tr> </tbody> </table>	Category	Before (kWh)	After (kWh)	Annual total power consumption	~4,500,000	~4,000,000	<p>Energy reduction effects 552,750kWh/y 14.2% CO2 reduction effects 514t/y</p>  <table border="1"> <caption>Energy Conservation Data - Textile Company (MSME)</caption> <thead> <tr> <th>Category</th> <th>Before (kWh)</th> <th>After (kWh)</th> </tr> </thead> <tbody> <tr> <td>Annual total power consumption</td> <td>~3,900,000</td> <td>~3,350,000</td> </tr> </tbody> </table>	Category	Before (kWh)	After (kWh)	Annual total power consumption	~3,900,000	~3,350,000
Category	Before (kWh)	After (kWh)																		
Annual total power consumption	~5,000,000	~3,200,000																		
Category	Before (kWh)	After (kWh)																		
Annual total power consumption	~4,500,000	~4,000,000																		
Category	Before (kWh)	After (kWh)																		
Annual total power consumption	~3,900,000	~3,350,000																		

Latest Update of Activities: FS at Polymer Industries

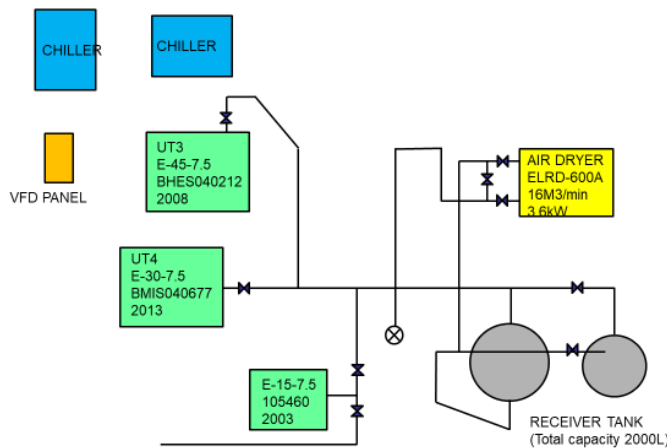
- Was invited by Indian Polymer industries supplying products to major Japanese industries.
- Operating two plants in India for 24H/Day and 365 days, and very positively working on energy efficiency and environmental improvement with obtaining ISO14001 certificate.
- Using three compressors for driving injection molding machine.
- Electricity consumption of injection molding machines accounts for more than half of the total electric energy usage in the company, and the one of the air compressors is 5.4%.

[Recommendations based on FS]

- 1) Energy Efficiency aspect
 - Improving piping system
 - Re-constructing air
 - Detecting and reducing air leakage
- 2) Environment Protection aspect
 - Drain treatment
 - Installing oil-free compressors
- 3) For Further Improvement
 - Energy and operation monitoring



UTILITY ROOM(AIR COMPRESSOR ROOM)



8 Transitioning to Business to Business (B to B) from the research stage

The following solutions are suggested to be continuously discussed and implemented under cooperation between the governments of India and Japan for further facilitating the transition to business-to-business.

	Solutions	Contents
1	Gradual reduction of import tariffs	Act on Special Measures Concerning Imports of High Efficiency Products, etc.
2	Introduction of the Energy Conservation Law	evaluation system on business classification, establishment of annual energy reduction.
3	Top-runner system	Dissemination of high-efficiency products, IE3
4	Environmental Protection Law	Water pollution prevention, air quality laws (clean air), waste reduction
5	Indian version of subsidy system	Diagnosis and proposal forms, incentives
6	International exhibitions	Improvement of technology and exchange
7	Strengthening interactions	Ministries, local governments, and organizations (forging industry, textile industry, etc.)

9 Specific activities that are recommended to be conducted in B to B

- What Japanese companies are recommended to do when doing business with Indian companies -

	Activities	Contents
1	Recognition of Japanese products	First, it is important to let people know about them.
2	Communication and mutual understanding	Building a sense of trust with the people of India.
3	Introduction of high-efficiency methods and systems	Soft technology; energy efficiency diagnostic methods, optimized control.
4	Promotion of high-efficiency products	Inverters (VSD, VFD), etc.
5	Introduction of concept of LCC (Life Cycle Costing)	Concept of cost merit
6	Long life product development	Proper maintenance and parts supply, Re-Use, etc.
7	Short-term or long-term monitoring	Status Monitoring
8	Monitoring through the application of IoT technology	Energy conservation and preventive diagnosis through mutual communication
9	Continuous education	Strengthening workshops and trainings.
10	Meetings to exchange opinions	Energy auditors, customers, etc.



Continuous activities · · · Improvement of diagnostic techniques in India through OJT and dissemination activities



Thank You for your attention!

