Global Green Growth Institute (GGGI)

Energy Efficiency Services Limited

Azadi Ka Amrit Mahotsav

Federation of Indian Chambers of Commerce & Industry

Panipat

TEXTILE CLUSTER

CLUSTER PROFILE

Imprint

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ABBREVIATIONS

Abbreviation	Full Form
BDS	Business Development Services
BLDC	Brushless Direct Current
cfm	cubic feet per minute
DIC	District Industries Centre
DMC	District MSME Centre
EESL	Energy Efficiency Services Limited
ESCO	Energy Service Company
GGGI	Green Global Growth Institute
HCCI	Haryana Chamber of Commerce and Industries
HCMA	Haryana Carpet Manufacturers Association
HSIIDC	Haryana State Infrastructure & Industrial Development Corporation
HUM	Haryana Udyam Memorandum
kWh	kilowatt-hour
MSME	Micro, Small, and Medium Enterprises
MSME-DI	MSME – Development Institute
PLC	Programmable Logic Controller
PNG	Piped Natural Gas
SEET	Standard Energy Efficient Technologies
TFH	Thermic Fluid Heater
Toe	Tons of Oil Equivalent
VFD	Variable Frequency Drive

PANIPAT TEXTILE CLUSTER

4.1 Introduction

Panipat is a city of textiles and carpets, located on the NH.1 at about 90 K.M. from New Delhi towards Amritsar, a leading name in home textiles nationally & globally for bed linens, carpets, kitchen linens, bathmats, cushions and other textile articles. It is the biggest centre for quality blankets, carpets in India and biggest centre of "Shoddy Yarn" in the World.

During the partition in 1947, a large number of professional weavers migrated to India and set up their looms and got busy in their ancestral craft of weaving durries. Panipat is one of the largest markets of raw wool in northern India. Today the Panipat- Ambala durrie-rug belt, from cotton to woollen durries, is famous all over the country and has various outlets at home and abroad.

4.2 Cluster Overview

The Textile Cluster of Panipat is concentrated in and around Panipat City and its sub urban villages. The industry comprises of seven segments i.e. handloom, woollen carpets, shoddy yarn spinning, power-loom industry, Dyeing, wet processing and hosiery woollen yarn industry. The export from all these units is estimated at Rs. 11,700 crores.

Panipat is the also largest manufacturer of shoddy yarn in the world. Shoddy yarn is primarily used to weave blankets which are used in the Indian Military or during disaster relief operations in the country. The Samalkha division of Panipat is primarily consuming the shoddy yarn raw material to manufacture these blankets on both handlooms and plain powerlooms.

Some of the leading manufacturers and exporters of home furnishing in the cluster include Devgiri Exporters, Kapoor Industries, Gupta Textiles, Rivera Textiles, Golden Terry Towel Pvt. Ltd, Aggarsain Spinners Ltd, Anand International, Shivam Exports, Sachdeva Home Furnishing Pvt. Ltd, Vardhman Creations, and Om Overseas etc.

CLUSTER ASSOCIATIONS & SUPPORT INSTITUTIONS

Panipat Textile Cluster consist of many support institutions and agencies such as industry associations, government agencies, academic/R&D institutes, financial institutions, Business Development Services Providers etc. situated within and outside the cluster, which play a key role in developing the cluster. The key stakeholders of Textile Cluster, Panipat are:

Major Industrial Associations

a) Panipat Dyers Association: President, Mr. Bhim Rana

b) All India Woolen & Shoddy Mills Association: President, Mr. Pawan Garg

c) Panipat Industrial Association: President, Mr. Pritam Singh

d) Polar Manufacturers Association: President, Mr. Naveen Bansal

e) Haryana Chamber of Commerce & Industries: Chairman, Mr. RL Sharma

f) Haryana Carpet Manufacturers Association: General Secretary, Mr. Anil Mittal

Government Support Institutions

a) District MSME Centre (DMC)

DMC is another major government stakeholder for the cluster. The office of DMC comes under the Directorate of MSME and is headed by the General Manager who is assisted by functional managers and technical field officers. DMC promotes and routes subsidies to micro and small enterprises in the region. The Panipat DMC is actively supporting the units in the cluster to register them under central and state government portals like Udyam Registration, Haryana Udyam Memorandum (HUM) etc. The DMC would play a role in facilitation or implementation of any kind of policy, scheme or project in the powerloom cluster.

b) MSME-Development Institute, Karnal (MSME-DI Karnal)

MSME- DI, Karnal is a field office of the Development Commissioner (MSME), Ministry of MSME, New Delhi, which is an apex body for formulating, coordinating and monitoring the policies and programmes for promotion and development of MSMEs in the country. The MSME -DI provides a wide range of support services to the MSMEs including implementation of various schemes of central government.

c) Haryana State Infrastructure & Industrial Development Corporation (HSIIDC)

HSIIDC is a major agency in the state to promote the setting up and promotion of small, medium and large-scale industrial units. The corporation also acts as a state-level financial institution and provides long term loans for industrial projects. The important activities of the corporation are, development of industrial areas/ estates, support for entrepreneurs for securing registrations/ licences/ clearances from the statutory/other authorities, provisioning of term-loans etc. HSIIDC currently has 4 Industrial Estates in Panipat district with 2,210 plots

RAW MATERIAL & PRODUCT MANUFACTURED

The raw materials for home furnishing industries are sourced mainly from spinning mills and power loom industries. Procurement of raw material is one of the great concerns of the production processes adopted for home furnishing material to maintain the best quality standards of final product.

The cluster is producing all kinds of textile products made of both natural and man-made fibres. Most units manufacture home furnishing products like curtains, rugs, bedsheets, towels etc. made from cotton or mixture of cotton yarn with polyester or viscose. Some units also make fabrics like grey fabric, printed fabric etc. which is supplied to the readymade garments industry. Textiles industry has a vast array of fabrics and designs which can be weaved of different kind of powerlooms and this cluster manufactures most of these products as per requirement of the customer. The machines can be calibrated quite easily to make different products with varying designs, patterns and motifs. However, for different kinds of yarn, different looms have to be used, e.g., a cotton weaving loom cannot weave a woollen carpet or velvet fabric.

Home furnishing and carpet manufacturing units are mainly exporting to both developing and developed countries, whereas spinning/yarn, processing/dyeing/printing units are processing the intermediate yarn/grey for final product manufacturers. A few manufacturers also have local market and supply chain system under various reputed brands in India. Units in the cluster are exporting to countries such as USA, Canada, Europe, Japan along with neighbouring countries like Nepal and Bangladesh

A few of the products manufactured by the cluster are presented in following figure

Sofa Cover

Polar Blanket

Mink Blanket

Carpet

Durries

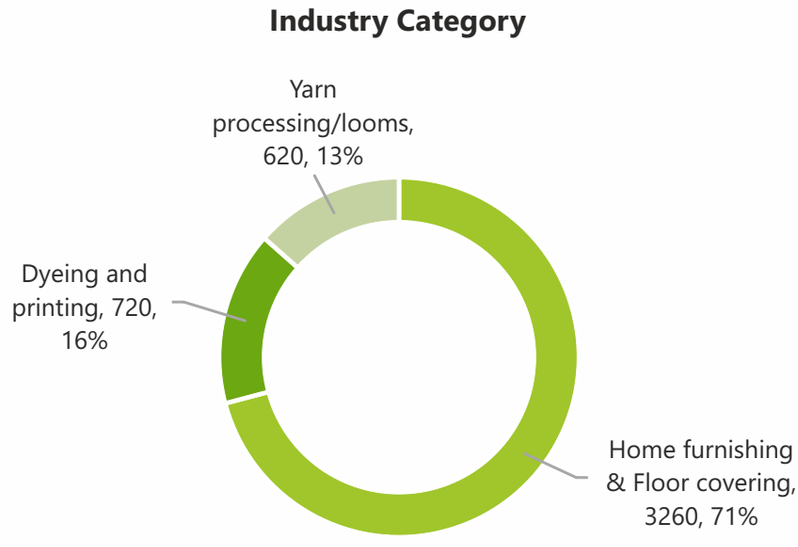
Towels

INDUSTRY CATEGORY

In Panipat Industrial cluster about 8500 organized & unorganized industries operating representing various sectors including textile. Out of these, there are about 4600 micro, small, and medium enterprises (MSMEs) in the Panipat textile cluster with more than 70% of the industries are involved in home furnishing. There are around 300 units where Standard Energy Efficient Technologies (SEET) could be deployed in the Panipat Textile Industry Cluster. The breakup of textile units operating in the cluster based on product manufactured is given in the following table.

Industry Category	Total
Home furnishing & Floor covering	3260
Dyeing and printing	720
Yarn processing/looms	620
Total	**4600**

Source: Field survey and interaction with units

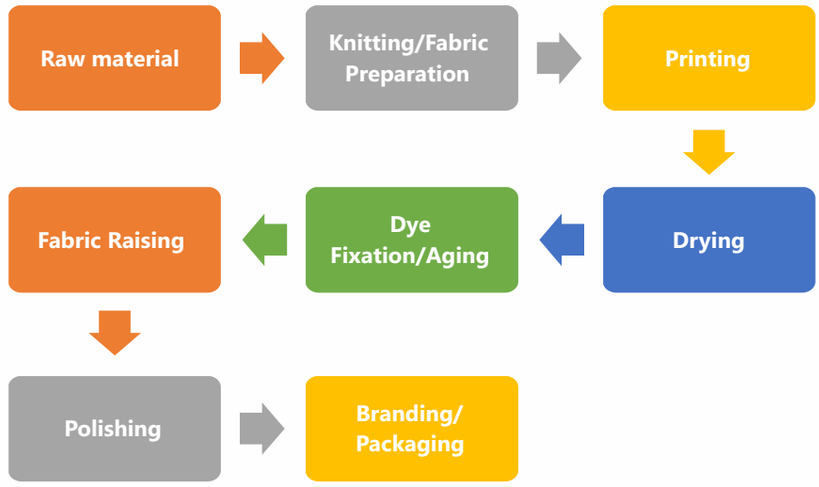


The annual export of the cluster is valued to be 11700 crore. Home furnishing, floor covering, carpet industries units require raw material, such as yarn and threads and services such as dying and printing, which is catered by local units. The major share of production in textile industries in Panipat is home furnishing product (71%), such as bed sheet, durree, and blanket (polar, cotton, and woollen). Most of the power looms and yarn-processing units are operating to cater to the raw material requirements of home furnishing industries and floor covering industries. There are some integrated units with power loom, yarn processing, dying, and printing facilities. While large industries and export house are selling their products with their brand names, some of the small units are manufacturing products for large brands etc.

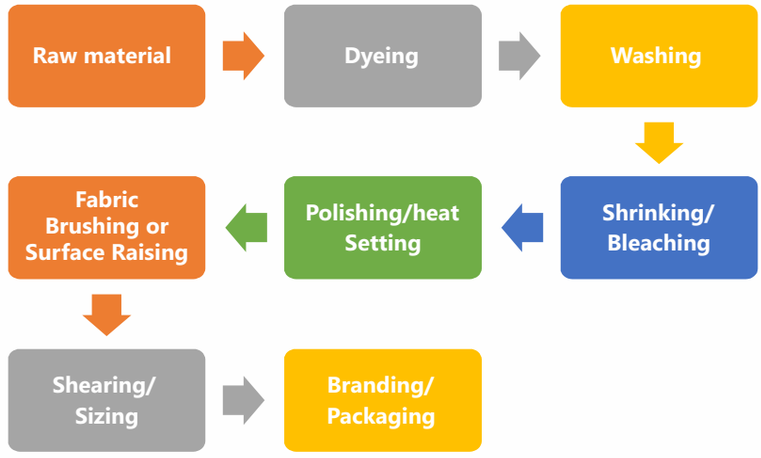
PRODUCTION PROCESS

The units in the cluster are engaged in various activities across the value chain of handloom and textile manufacturing processes.

The process flow diagram for polar blanket manufacturing is outlined as below



The Fabric Dyeing process flow diagram is outlined as below



Different process involved in preparation of polar blankets, weaving fabric for home furnishing material is described as below

a) Raw Material Preparation & Sourcing

Units procure cotton yarn, polyester blended yarn, viscose yarn, woollen yarn from the mills in Panipat itself. Very few weavers procure raw material from outside the region. Some units doing job-work with bigger units are supplied the yarn from the unit itself based on the requirement

b) Warping of Threads:

Warping plays an important role in the weaving process. The process involves transferring of thread from small packages onto beams of parallel lengths in preparation for weaving. The wrap beams are then loaded to weave machine for weaving

c) Weaving for Fabric Preparation:

Weaving is a process of interweaving two sets of yarn- the weft and the warp. The weaving is accomplished with a hand- or power-operated loom. Different weave patterns – Jacquard or Dobby can be produced by using different looms. The fabric could be plain, with simple geometric patterns or with design. Weaving is done on the plain looms by throw shuttle technique. In shuttle-less yarns rapiers, projectile bullets air or waterjets carry the weft yarn through the strands of the warp yarn.

Warping of Threads

Weaving for Fabric

d) Fabric Dyeing:

Dyeing is the process of imparting colours to fabric or yarn using a dye (pigments-based colour). In this process, dye is applied to the substrate in a uniform manner to obtain an even shade with a performance and fastness appropriate to its final use. The machinery used in the process is mainly tankie dyeing and cabinet dyeing machines; however, a few units use jet dyeing machines. Cabinet machines are designed to have liquor flow parallel to the yarn and they work with low liquor ratios to reduce thermal energy consumption and save water and chemicals.

In the dyeing process, water chamber of the machines is filled with measured quantity of water at required temperature and the fabric is loaded. The temperature of the liquid is raised by addition of steam (direct or indirect). When the temperature of water reaches desired level (90–130°C), necessary colours and chemicals are added. The water is completely drained off after the process is completed. A few plants are recycling the water for cleaning purpose. After dyeing, the fabric is unloaded from the machine and taken to the folding and rolling machines for improving the width of cloth, which gets shrunk during the washing and dyeing process

e) Printing:

Different types of printing methods used are:

- **Block Printing**

  Block Printing is the oldest method of printing that still exists, but the use is limited to the decoration of scarves and handkerchiefs. Colour is applied evenly to the wooden block with different designs & the pattern is stamped on the fabric.

- **Roller Printing**

  It is the most economical and fastest printing. This technique is used whenever long runs of fabric are to be printed with the same design. Engraved printing rollers used one for each colour, press against the fabric and the central cylinder. The printed fabric passes from the main cylinder and through a drying and steaming chamber to fix the colour

Block Printing

Roller Printing

- **Screen printing**

  It is like a photographic process. In this method, the design is applied by passing print paste through a silk or nylon screen on fabric. The screen of a single design is reused for a single colour. Screen printing may be a hand operation or an automatic machine process.

Rotary Printing

Flatbed Printing

Screen Printing

- **Heat Transfer Printing**

Papers with printing patterns are applied to the fabric and then passed together through a type of hot calendar, and the pattern is transferred from one to the other. This type of printing is especially very popular for polyester fabrics.

Papers with Printing Patterns

Hot Calendar

f) Colour Fixing, Drying, and Finishing

After printing, aging process will be performed to fix colour on fabric or yarn. Under this process, the material must be kept in a steam chamber and its duration depends on colour and fabric. Drying process is carried out in loop machine wherein temperature of 110–120°C for better colour setting is maintained.

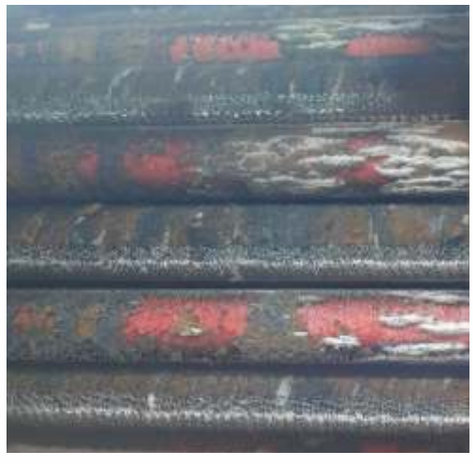
The printed fabric is then washed in a series of normal water and hot water in the presence of chemicals for colour setting. After completion of the washing process, the printed and washed fabric is subjected to heat setting process in stenter machines and sent for pressing and finishing. Heat setting is carried out on fabrics made of manmade fibres or blends of them with natural fibres to relax tensions in the textile fibres due to upstream fabric or yarn processing and to improve the dimensional stability of textiles. Heat setting is carried out continuously in stenters at temperatures 150– 220°C. The stenter chambers have heating coils wherein hot air generated from thermic fluid heater is circulated. A few more additional steps involved in home furnishing process include brushing, polishing, fabric raising, and embossing.

Stenter Machines

Aging Steam Chamber

g) Fabric Brushing or Surface Raising

In the finishing process, after the cloth is woven, it goes through processes such as washing, filling, raising, and trimming the nap. There are several ways to 'raise the nap', most of which involve wire brushes such as raising cards and involve special brushing machines to get the best finish. During raising, the fabric surface is treated with sharp teeth to lift the surface fibres, thereby imparting hairiness, softness, and warmth. Flannelette is a well-known example of this type of material. This process is primarily adopted in polar blanket manufacturing units as fabric brushing, or surface raising in blanket is an effective way to increase the ability of the fabric to retain heat or provide a thermal barrier.



Brushing Machines

MAJOR ENERGY CONSUMING EQUIPMENT'S, UTILITIES IN TEXTILE SECTOR

a) Boiler for Steam Generation:

Textile process industries require steam in process area machines like jet dyeing, aging steam chamber, hot water generator etc. Boilers with capacity in range of 2 to 8 tonne per hour (tph) generating steam in the range of 5 to 10 kg/cm^2 are mainly used by micro and small enterprises. Most of the boilers are three pass, solid fuel fired (wood, bagasse, upla) boilers. Few smaller units use single pass boiler, which exhibit higher heat losses and poor quality of steam. Some of the boilers have economizer to recover the heat from waste flue gases. Few units are also using thermic fluid to generate hot water as well as steam at 3.5–4.0 kg/cm^2 pressure to cater to the intermittent steam requirement of the process. There is no monitoring and control system provided for monitoring key operating parameters of boilers such as flue gas temperature, steam pressure at utilization end, and air to fuel ratio controllers.

b) Thermic Fluid Heaters

Textile units having combined facilities for dyeing, printing, and manufacturing of home furnishing product requires thermic fluid heaters to generate hot air indirectly for stenter, paint drying machine. The installed capacity of thermic fluid heater in the cluster is 5–25 lakh kcal per hour. These solid fuel-fired (wood, bagasse common fuel used) thermic fluid heaters are provided with constant speed thermic fluid circulation pump. Most of the thermic fluid heaters have manual fuel charging mechanism; however, some progressive units have also installed screw feeding mechanism.

c) Stenters

The stenter installed in home furnishing units consist of 6-8 chambers. Some large units in the cluster also have 12 chamber stenters. Most of the units (new and old installation) have stenters fitted with three-way valve (hot oil will bypass heat exchanger upon attaining set temperature) to maintain the temperature of stenter chambers. Conventional local-made blowers are installed with dual-speed motors (standard efficiency motors) and speed of fan is independent (having no closed loop control) of chamber temperature. The insulation level of the stenter chamber is poor.

Few units are also using pipeline natural gas (PNG) fired stenters for drying & polishing the fabrics.

d) Air Compressor

Compressed air is used for pneumatic operation in process machinery, such as stenter, polishing, cleaning, and packing. Home furnishing units use reciprocating as well as screw type air compressors. The connected load of an air compressor size ranges from 5 hp to 60 hp. The pressure requirement for the majority of applications is below 5.5 kg per cm2 (bar). Capacity of most of the compressors is more than the requirement, which is leading to unload power losses. Air quality control (e.g., auto drain valve) system and improvement system (e.g., dryer) are also not used by most of the units

e) Power looms Machine

A power loom units will essentially have one or more power loom of any kind, a warping machine and a winding machine. Most units in the cluster uses the plain power loom which is a mechanized version of the traditional handloom. However, these plain power looms weave a less sophisticated fabric which is seeing diminishing demand in the market. Therefore, various units have upgraded from plain power looms to highspeed loom which are more efficient and manufacture with higher quality of weaves and finesse.

ENERGY SCENARIO IN THE CLUSTER

The primary source of energy for boilers & TFH is biomass consisting of wood chips, bagasse. Earlier industries were using pek coke as fuel which is banned due to pollution issues. Few units are also using PNG for hot air generation in stenter, dryers. Additionally, electrical is secondary source of energy for operating electrical utilities such as pumps, motors, compressors etc.

The cluster has an estimated overall energy consumption of 396288 tonne of oil equivalent (toe) per annum leading to carbon emissions of 12.82 Lakh tonnes of CO_2.

Production category	Electrical energy, Million kWh/year	Thermal energy, toe/year	Total energy, (toe/year)	Total CO2 emissions, (t CO2/year)
Home furnishing & Floor covering	93	230736	238728	783732
Dyeing and printing	20	154607	156341	484721
Yarn processing/looms	14		1219	13605
Total	127	385343	396288	1282057

The home furnishing & floor covering units consumes about 60% of the total energy consumption of the cluster, which is mainly due to use of the thermal energy in dyeing, aging, washing, and printing as well as electrical heating system in polishing section.

The thermal energy accounts for about 90-95% of total energy consumption in the cluster for biomass (bagasse, wood chips, upla), diesel, PNG consumption. Higher thermal energy consumption may be attributed to factors such as large heating requirement during the dyeing, printing, aging, and drying process. The share of the grid electricity and backup power generation is less than 5-10%.

Prices of Major Energy Sources is Provided Below Table

Source	Price
Electricity HT Industry (above 50 kW)	Demand Charges: 165 per kVA Energy Charges: @11 kV- 6.55 per kVAh @33 kV-6.55 per kVAh @66/132 kV-6.45 per kVAh
Electricity LT Industry (above 50 kW)	Demand Charges: 185 per kW Energy Charges: @up to 10 kW-6.35 per kVAh @10-20 kW-6.65 per kVAh @20-50 kW-6.40 per kVAh
Wood chips/ Bagasse	6000-13,000 per tonne (seasonal variation with respect to moisture content)
PNG	Rs. 50 to 55/ SCM
HSD	Rs. 90 per litre (price subjected to market fluctuations)

Source: Field survey and interaction with units

STANDARD ENERGY EFFICIENT TECHNOLOGIES (SEET) ADOPTION POTENTIAL

There is great potential exist in Panipat Textile cluster for adoption Standard Energy Efficient Technologies (SEET) through innovative financing mechanism which will Improve Industrial Productivity, Reduce Electricity & Fuel Bills, Control Emission of Pollutants, Access to Technologies at Discounted Price, reducing Operating & Maintenance Cost. The SEET already demonstrated by EESL in other MSME clusters, which are applicable for Panipat textile cluster are as below:

a) Programmable Logic Controller (PLC) based automation & control system for Jet Dyeing Machine

Existing practice:

In MSME textile processing units, the jet dyeing machine is mostly operated manually. It is used for dyeing the cloth by forcibly contacting the jet flow of dyestuff chemical. It is done in such way that the cloth gets dyed evenly with a relatively less quantity of chemical without applying much tension on the cloth in order to keep the quality of the cloth intact. Other than that, the steam is used to raise the temperature of the dyeing solution through the heat exchanger this process under goes both heating and cooling cycle. In the present system, this operation is done manually where in the batch time depends on the skill of the person. More over the amount of water and chemical required for completing the process also depend of the individual operator's skill set.

Proposed Technology:

- The package of PLC based automation & control system for Jet Dyeing Machine offers flexibility to operate & the automation system will optimize and reduce the batch time of the existing Jet Dying Machine process. In enhances the overall production capacity. It automatically selects the heating and cooling cycle as per the process requirement and it also optimize the temperature as per the system requirement.
- This PLC based automation system optimizes the chemical, energy and time requirement of the batch:
    - Less man power needed.
    - Less time required for completing the batch.
    - Less energy requirement for batch completion.
    - Amount of water and chemical required is less.
    - Reduction in steam consumption

Success Story: Demonstration in MSME Clusters

Location of MSME Cluster	:	**Surat**
Type of Cluster	:	Textile
Name of the MSME Unit	:	Annapurna Industries Pvt. Ltd
Total water requirement	:	320 kL
Total water requirement for heating cycle	:	128 kL
Total water saving	:	14,400 kL/y
Annual Coal saving	:	345 t/y
Annual Cost Savings	:	₹ 17,40,000
Investment	:	₹ 18,00,000
Simple Payback	:	12 month

Benefits Incurred from the Project

- Water intake during each cycle is optimized
- Batch time is optimized and reduced.
- Steam for raising the temperature for extra water is saved, thereby reducing the fuel consumption.

b) Installation of Automation and Control System in Boiler

Existing practice:

Textile processing units are equipped with boilers in the range of 6 TPH to 12 TPH which are typically fired using solid fuel i.e. biomass (Bagasse, Wood Chips). Most of these boilers are equipped with waste heat recovery system. Although, there are VFDs installed in the FD / ID Fans, the air flow control is manually done in most of the units.

Studies suggest that most of the units fail to maintain the correct amount of air in the combustion chamber, required for optimum combustion. This leads to incomplete combustion with a significant percentage of the heat loss through dry flue gas loss. The excess air flow can be determined by the free oxygen percentage in the flue gas which automatically leads to higher excess air percentage. Also, the draft pressure is not monitored and controlled to the desire level. The blow-down control in the boiler is also manual which leads to a lower boiler efficiency.

Proposed Technology:

Automation and Control system in boiler helps to monitor and analyze various boiler parameters, improve the efficiency of boiler through effective monitoring and control of air-fuel ratio; controlling furnace draft; maintain optimum fuel feed based on steam pressure in boiler and automatic blow-down. Automation and Control system in boiler will:

- Optimize boiler combustion efficiency through effective monitoring and control of Forced Draft (FD), Induced Draft (ID) and Fuel Feeder.
- Monitoring and synchronizing fuel feeder control with respect to instantaneous steam pressure.
- Excess Air monitoring and control based on the fuel feeding rate with the help of feedback from the stack oxygen sensor.
- Furnace draft pressure monitoring and controlling the furnace at slightly negative draft pressure.
- Automatic boiler blow-down based on TDS level monitoring

The proposed technology of automation and control system in boiler not only helps to monitor and analyse various boiler parameters but also can improve the efficiency of boiler through effective monitoring and control of air-fuel ratio; controlling furnace draft; maintain optimum fuel feed based on steam pressure in boiler and automatic blow-down.

Success Story: Demonstration in MSME Clusters

Location of MSME Cluster	**:**	**Surat**
Type of Cluster	:	Textile
Boiler efficiency (Baseline)	:	62.25
Boiler efficiency (Post Implementation)	:	66.39
Annual Fuel saving	:	248 tonne/year
Annual Cost Savings	:	16 Rs in lakh/year
Investment		: ₹ 12 lakh
Simple Payback	:	0.73 year

Benefits Incurred from the Project

- 2-5 % reduction in specific fuel consumption
- 5-7% Reduction in energy consumption
- 2-5% Improvement in boiler indirect efficiency
- Improvement in boiler blow-down loss
- Improvement in boiler draft pressure

c) Installation of 100% Flash Steam and Condensate Recovery System

Existing practice:

Steam at a working pressure of 3-4 kg/cm2 is used in textile processing units in jet dying machines for indirect heating of water. A significant amount of steam is lost during the heating operation of the jet dyeing process, as the portion of the latent heat is transferred to the equipment line resulting in condensate formation. Also, a significant amount of steam is transformed to condensate during the cooling cycle of the jet dyeing process. In addition to these, heat available in exit water generated during the process is wasted during the water recycling process.

Also in typical units, no traps or thermodynamics (TD) traps are used in these pressurized steam machines. TD traps for such applications are not suitable to remove condensate properly. In this process, a significant amount of water and energy is lost into the atmosphere.

Proposed Technology

Installation of condensate recovery system in the jet dyeing machines to reuse the water and sensible heat contained in the discharged condensate. The system includes a positive displacement condensate pump which can recover (suck) hot condensate and flash steam from the steam pipeline and feed the same into the boiler feed water tank. The pump may also be equipped with an in-built receiver for condensate which eliminates the need for a separate storage tank. The installation of the system will allow 80-100% recovery of condensate formed during the jet dyeing. The technology can be suitably modified for mechanical or sensor based control.

Success Story: Demonstration in MSME Clusters

Location of MSME Cluster	**:**	**Surat**
Type of Cluster	:	Textile
Name of the MSME Unit	:	Pashupati Prints Pvt. Ltd
Coal consumption in boiler (Baseline)	:	18 tonne/ day
Coal consumption in boiler (Post Implementation)	:	17.5 tonne/ day
Annual Coal Saving	:	178 Tonne/year
Annual water Saving	:	8,151 kL/year
Annual Monetary Saving	:	Rs. 10,80,000
Investment	:	Rs 6,50,000
Simple Payback	:	0.6 years

Benefits Incurred from the Project

- Reduction in specific energy consumption by 2-3%
- Boiler Efficiency improvement 2-5 %
- Maintenance cost reduction 20-30%
- Reduction in breakdown 20-30%

d) Installation of Low-Grade Waste Heat Recovery System

Existing practice:

The dyeing process requires water to be heated at a temperature of 85°C to 130°C. This temperature variation depends on the type of fabric being processed. The average temperature of water needed for dyeing process in Varanasi cluster is 95°C.

Once the process is completed, this hot water is flushed out of the dyeing machine and is sent to effluent treatment plant for treatment. At the effluent treatment plant, this water is collected and is retained for 6 – 8 hours before it is treated. This retention time is for allowing the water to cool down to a temperature of 45°C - 50°C.

In the existing system, the input water to the dyeing machine is at ambient temperature. This would mean that the temperature of water would vary from 20°C to 35°C. In different stages of dyeing process, the temperature of hot water required varies between 60°C to 130°C.

Proposed Technology:

Installation of localized/ decentralized **heat exchangers** at each machine/ process area to recover the heat from hot water/condensate for heating up the water for next batch/ cycle or boiler feed water. This new system can raise the temperature of input water from 30°C at present to up to 55°C, thus, reducing the heating requirement of the system and corresponding fuel consumption.

Success Story: Demonstration in MSME Clusters

Location of MSME Cluster	**:**	**Varanasi**
Type of Cluster	:	Textile
Amount of fuel required to generate required steam (Baseline)	:	304.68 Kg/ day
Amount of fuel required to generate required steam (Post Implementation)	:	183.86 Kg/ day
Annual fuel Saving	:	36,246 Kg/year
Annual Monetary Saving	:	Rs. 1,81,230
Investment	:	Rs 5,00,000
Simple Payback	:	34 Months

Benefits Incurred from the Project

- Reduction in production time
- Reduction in fuel consumption
- Reduction in retention time at effluent treatment plant

e) Replacement of Reciprocating Compressor by Screw Compressor with VFD & Permanent Magnet Motor

Existing practice:

In the textile manufacturing process, there is a continuous demand of compressed air in order to cater various pneumatic operations throughout the manufacturing process. In the exiting manufacturing process the compressed air system is distributed in nature and most of the compressed air demand is catered by multiple reciprocating air compressor installed at various location of the plant. In most of the cases separate reciprocating air compressors are installed for individual processes. Generally, these single stage reciprocating compressors work with higher noise and have a relatively high cost of compression. The operational efficiency varies from 22 to 35 kW/100 cfm, based on the age of the equipment.

Proposed Technology:

Based on the detailed analysis of the existing compressed air system, it is proposed to replace the low performing reciprocating compressor with VFD enabled permanent motor based screw air compressor.

The package of **Screw Compressor with VFD & Permanent Magnet Motor** offers flexibility to operate air compressor to meet varying air requirement without compromising on performance and Energy Efficiency. Each component of this technology has added advantages over conventional reciprocating or Screw compressor with standard motor.

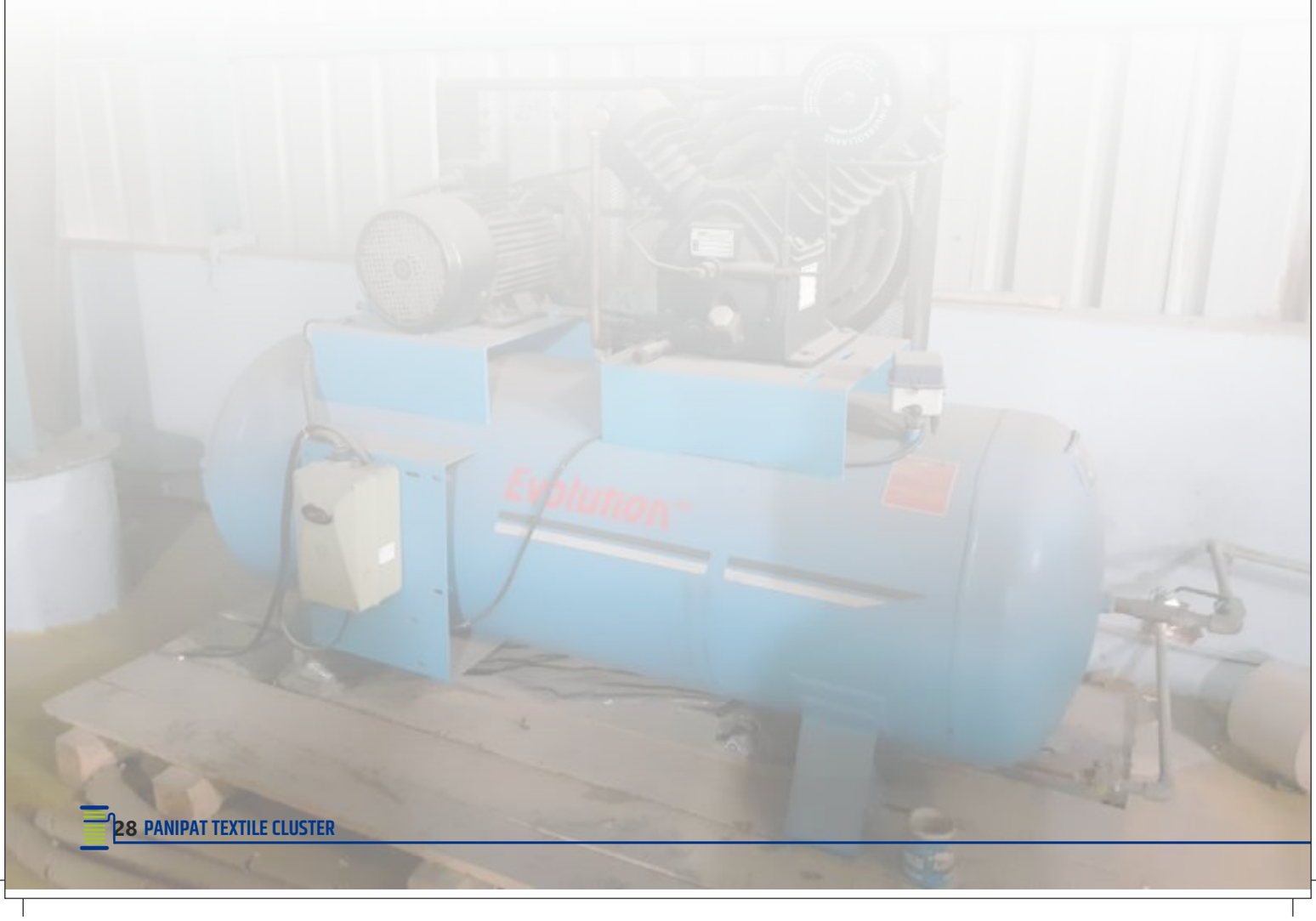
- **Permanent Magnet Motors** offer increased efficiency compared to standard motors. The rotor is made up of a permanent magnet.
  - Motor is directly connected to the screw arrangement of the compressor which nullifies the transmission loss of a belt- driven system (3% to 5%). Such a direct drive system enhances the overall efficiency of the system.
  - Permanent Magnet Motor is maintenance free.
  - VFD provides soft starting, enabling controlled acceleration and deceleration.
  - VFD keeps desired line pressure constant, adjusting automatically according to system air consumption by varying motor speed.
  - Through VFD, compressor operating range reduces from 1-2 kg/cm2 to 0.2- 0.4 kg/cm2.
  - VFD with highly efficient rotary screw compressor can cater to fluctuating compressed air requirement efficiently.

Success Story: Demonstration in MSME Clusters

Location of MSME Cluster	:	**Bhestan, Gujarat**
Type of Cluster	:	Textile
Name of the MSME Unit	:	Narayan processor
Baseline Specific Energy Consumption	:	0.27 kWh/cfm
Resulted Specific Energy Consumption	:	0.17 kWh/cfm
Annual Energy Saved	:	1,87,651 kWh
Annual Money Saved	:	Rs. 14,20,000
Total Project Cost	:	Rs. 16,00,000
Simple Pay-back Period	:	13 Months
Life of New Technology	:	15 Years

Benefits Incurred from the Project

- Reduction in specific power consumption by 40%
- Replacement of multiple compressors with one compressor
- Reduction in maintenance cost and break-down time by 50%
- Noise free operation



f) Replacement of IE1 or sub IE1 level motors with IE3 motors

Existing practice:

In India, about 40% of the total electricity consumption is contributed by the industrial sector. Electric motor-systems use 28% of total national electricity which is reasonably high. India has banned IE1 motors since October 2017.

Historically, the motors sold (and used by end-users) in India have lower energy efficiencies (IE-1 or less) than the efficient products technologically available and manufactured. Based on estimation, 90- 95% of the current installed stock of motors is at IE1 & sub-IE1 levels. The issue of multiple rewinding in the service life of motor(s) further reduces the efficiency drastically. This results in more energy consumption, hence affects the competitiveness of any business entity.

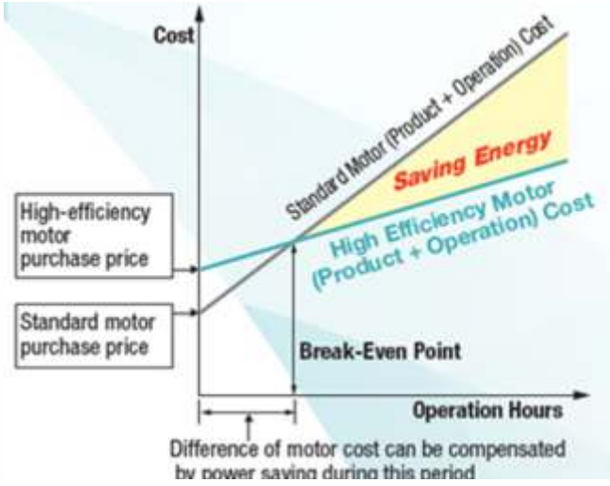
Proposed Technology:

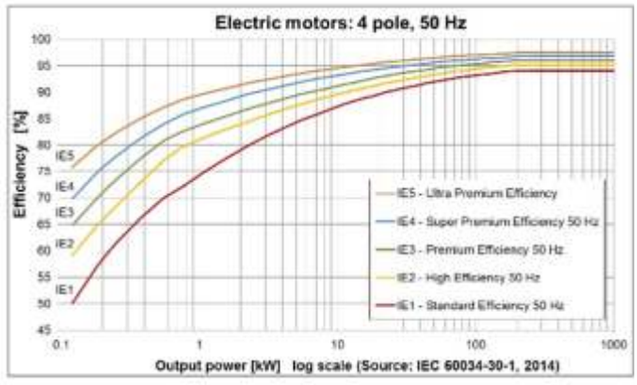
Replacing the existing IE1 or sub-IE1 level motors with IE3 motors can save energy as well as operating cost, which is more than its purchase cost. IE3 motors offers

- Higher Efficiency and hence Lower Power Consumption
- Constructed with superior material
- Longer Insulation and Bearing Lives
- Lower Waste Heat Output
- Less Vibration

Success Story: Demonstration in MSME Clusters

Year of demonstration	**:**	**2018**
Location of MSME	:	Banswara, Rajasthan
Type of Cluster	:	Textile
Name of the MSME Unit	:	Banswara Syntex Limited
Annual Energy Saved	:	2,44,094 kWh
Annual Money Saved	:	Rs. 14,64,563
Total Project Cost (125 nos. IE3 Motors)	:	Rs. 35,88,000
Simple Pay-back Period	:	2.4 Years
Life of New Technology	:	15 Years
Warranty of the New Technology	:	3 years





Benefits Incurred from the Project

- IE3 motor provide 2-3% higher efficiency compare to IE2 motor, which even higher compare to IE1 motor
- Suitable for continuous process industries , where high energy saving is essential.
- Short Payback Period, Enhanced motor life, Less maintenance
- Rating-wise energy saving percentage for replacing Standard motors with IE3 motors

3.7KW - 9.89%

5.5KW - 7.35%

7.5KW - 3.29%

11KW – 2.13%

15KW - 2.18%

g) Replacement of Regular Fans with BLDC Fans

The fan is a device that delivers the amount of cool air at low pressure. There are many different types of fans and various applications. The fans used in the modern age are the electric fans mostly comprised of a motor connected to blades. The motor blades that move at a fast speed to create a fast flow of air causing the air to cool. In warm places, it is common to see fans to get rid of the discomfort of heat and sweat

Existing practice:

Industries are using ceiling fans with an ordinary induction motor which consumes about 75-80 W power. Such fans are used in the industry for several decades.

Proposed Technology:

It is proposed to replace regular fans with BLDC fans. The term BLDC stands for Brushless Direct Current Motors. It essentially comprises a synchronous motor clubbed with a DC electric source. The windings in the BLDC motor are supported by the housing. This feature allows the motor to cool by conduction. So, no external airflow is required for internal cooling, thus protecting the motor from dirt and foreign substances. Some of the prime benefits of BLDC motor fans can be listed as

- BLDC contains Permanent Magnets while Electromagnet is used in Induction Motors, with Direct Current input
- Super Energy efficient ceiling (BLDC) fan providing 50% savings over regular ceiling fan, consumes about 25-30W power
- Remote integrated ceiling fan with service value > 6.0 (m3/min/watt)
- Fan with wide operating voltage (90 – 300V)
- Capacitive regulator operated BLDC fan
- Lower noise, lower static pressure due lower RPM, and higher airflow(15% more) compared to any other fans
- Runs upto 3X longer on inverter

Success Story: Demonstration in Ceramic unit

Year of demonstration	**:**	**2019**
Location of MSME	:	Thangadh
Type of Cluster	:	Ceramic
Name of the MSME Unit	:	Sunrise Pottery Works
Annual Energy Saved (108 ceramic units and 17600 fans)		: 48.2 Lakh kWh
Annual Money Saved	:	Rs. 335 Lakh
Total Project Cost (17600 nos.)	:	Rs. 382 Lakh
Simple Pay-back Period	:	2.4 Years
Life of New Technology	:	15 Years
Warranty of the New Technology	:	3 years

Super Efficient Fan Design

Regular Fan

Super Efficient Fan

STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS (SWOT) ANALYSIS

A SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of the MSME textile manufacturing units in the cluster has been carried out keeping in mind the energy/environment compliance, marketing, business environment and, skills, inputs, innovation of the units. The SWOT analysis is provided in below table

Area	Strengths	Weaknesses	Opportunities	Threats
Energy/ Environment	• Adoption of renewable fuels like bagasse, wood chips, biomass reducing GHG emission reduction • Increased focus on environment due to requirement from buyers	• Lack of knowledge of energy efficiency resulting in higher energy consumption • High energy cost structure because of lack of efficient processes	• Regular checks on maintaining quality and safety standards • Potential to reduce energy costs by energy auditing	• Increase in power tariff • Increased focus on environment standards • Dyeing and washing require environment compliances, and if units diversify into these services then these compliances and • certifications would have to be met.
Market	• Cluster located within the Panipat Industrial area, which is well connected with all major national and international industrial hubs. • Cluster located in the proximity of NCR which is a major supply hub. • Strong natural business ecosystem in the region with presence of a large number of buying houses. • Steady local and international demand for cluster products.	• Units are unable to price their products competitively due to high cost of digital printing on cotton. The mark-up is to the tune of 50% on an average. • Presence of other large players to whom bulk orders are made. MSME units have a well-established clientele. This makes market penetration, a challenge. • Loss of orders occasionally due to inordinate delay in processing of orders.	• Rising income levels and increasing urbanisation driving the growth of domestic market • Potential to price products competitively with acquisition of technology, in order to compete effectively with countries such as Vietnam, Bangladesh & China • Potential for assistance under upcoming State Textile Policy	• Intense competition from global markets. • Competition from other major players like Walmart.

Area	Strengths	Weaknesses	Opportunities	Threats
Skill/ Manpower	• Skills acquired on-the-job • Presence of technical institutes such as Apparel Training & Design Centre at Gurugram.	• High labour costs • Lack of interaction between SMEs and technical institutes for providing technical training • No mechanism to mobilize regional youth for training in the sector	• Customized training programs on required skills (operations, soft skills etc.) Engage technical institutes for skill development programs • Increased cost of labour in China provides opportunity for Indian • industry	• Youth interested to work in other lucrative sectors • Big companies such as • Walmart
Inputs	• Availability of raw materials from local dealers • Buyers sometimes specify dealers from whom they want materials	• No web portal displaying prices and sources of raw materials • Challenge in getting quality dyed fabrics at affordable prices with some of the units doing traditional dyeing in- • house.	• Potential to develop a portal displaying information (price, suppliers) of raw materials	• Cost of power in India is, on average, higher than key competing countries like China, Bangladesh, Vietnam
Innovation	• Ability to manufacture home furnishing products as per the manufacturers specifications • Some units create their own designs and sell these	• Lack of a standardised ERP solution for home furnishing industry • Low investment in development of designs • Lack of process automation • Lack of adoption of lean • manufacturing clusters such as Six Sigma, Kaizen	• Development of a standard IT based ERP solution • Structured processes for information sharing among SMEs in the cluster	• Could lose business to other more price competitive manufacturers from countries such as Sri Lanka, Bangladesh, China if units do not innovate
Business Environment	• Panipat well known as a leading industrial hub of • India for handloom • Steady growth in domestic demand • Cluster well known as a textile hub across North India • Conducive policy and regulatory initiatives • Active State Govt. and schemes for development of the sector • Proactive industries associations in Panipat	• Lack of knowledge of regulatory frameworks • and government schemes among micro level home furnishing units • High cost of industrial land in the cluster • Lack of common infrastructure/CFC facilities • No long-term vision of industrialists	• Establish CFC with latest technologies for digital • Printing Create better awareness of government schemes and regulations	• Change in policies and regulatory environment • Increase in land rates Environmental policies result in shutting down of dying houses (traditional dyeing methods) which is impacting home furnishing industries

REFERENCES

Energy Efficiency Services Limited; Promoting Market Transformation for Energy Efficiency in Micro, Small & Medium Enterprises(MSME): https://msme.eeslindia.org/CaseStudies.aspx

MSME-Development Institute (Ministry of MSME, Govt. of India,): Brief Industrial Profile of Panipat District: http://dcmsme.gov.in/old/dips/har_panipat.pdf

The Energy and Resources Institute Panipat Textile Cluster Profile Report: http://www.sameeeksha.org/pdf/clusterprofile/PanipatTextileCluster.pdf

Diagnostic Study Report on Powerloom Cluster, Panipat https://sidbi.in/files/publications/37.%20SIDBI_Powerloom%20Cluster%20-%20Panipat.pdf

Market Report on Panipat : City Of Handlooms & International Home Textiles Hub https://textilevaluechain.in/in-depth-analysis/textile-market-report/panipat-city-of-handlooms-international-home-textiles-hub/

Project Report (DPR) for setting up of Design and Development Centre - as a common facility centre (CFC) at Handloom and Textile cluster; https://cdnbbsr.s3waas.gov.in/s3f48c04ffab49ff0e5d1176244fdfb65c/uploads/2021/05/2021052614.pdf

About GGGI

The Global Growth Institute (GGGI) organization, headquartered in Seoul, Republic of Korea. dedicated to supporting and promoting strong, inclusive and sustainable economic growth in developing countries and emerging economies.

GGGI's mission is to support the transition of its member and partner countries toward a model of green growth by developing and implementing strategies that simultaneously achieve poverty reduction, social inclusion, environmental sustainability and economic growth. By pursuing this mission, GGGI aims to achieve its vision of a resilient world of strong, inclusive and sustainable green growth.

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Founded in 2009, Energy Efficiency Services Limited (EESL) is a super Energy Service Company (S-ESCO), which enables consumers, industries and government to effectively manage their energy needs through energy efficient technologies. EESL, a JV of PSUs under the Ministry of Power, Government of India is implementing the world's largest energy efficiency portfolio across sectors like lighting, buildings, industry electric mobility, smart metering agriculture, etc. at an enormous scale. EESL's energy efficiency solutions have saved India over 47 billon Kwh energy annually while reducing 36.5 million tons of carbon emission.

About FICCI

Established in 1927, FICCI is the largest and oldest apex business organisation in India. A non-government, not-for-profit organisation, FICCI is the voice of India's business and industry. FICCI is deeply committed to every aspects of Sustainable Development, Global Climate Change, Energy Efficiency and strategies to suggest global solutions to critical energy & environmental issues.It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to over 2,50,000 companies. The Resource Conservation Management (RCM) Division of FICCI works closely with both large industries and energy intensive Micro, Small & Medium Enterprises (MSMEs) to improve their Energy & Environmental Performance.

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