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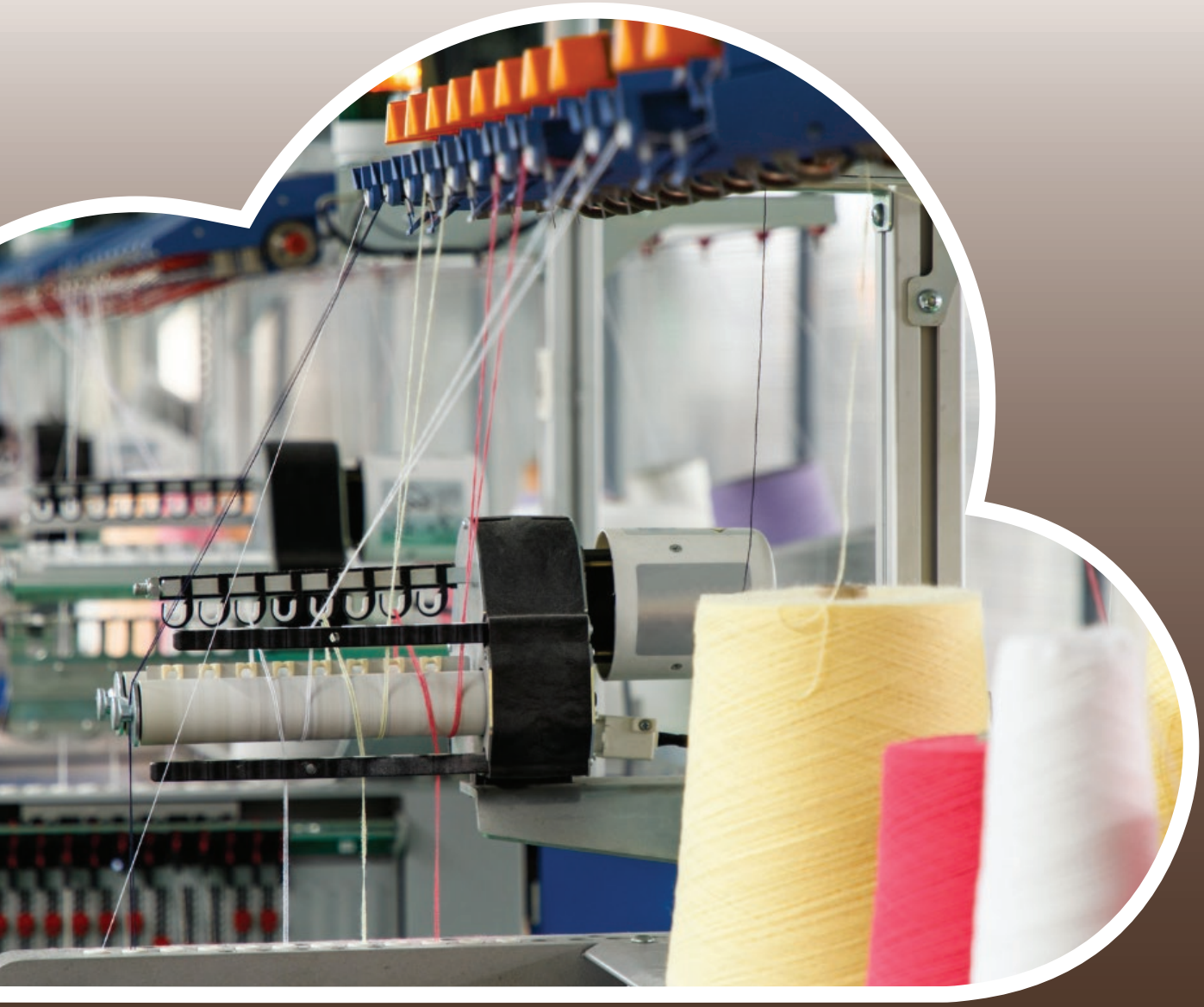


Scope for deep decarbonisation in MSME manufacturing sectors: Cluster report

Textiles, Tiruppur

Cluster Profile

The textile industry is one of India's largest manufacturing sectors. Tiruppur has a well-established and large textile cluster, generates revenue worth INR 60,000 crore yearly, and contributes to 1.06% of India's export. Tiruppur has 3,200 units, which perform dyeing, knitting, compacting, embroidery, bleaching, and finishing. The city employs 6 lakh direct workers and 2 lakh indirect workers. Women contribute to 60% of the workforce.

Location: Tiruppur

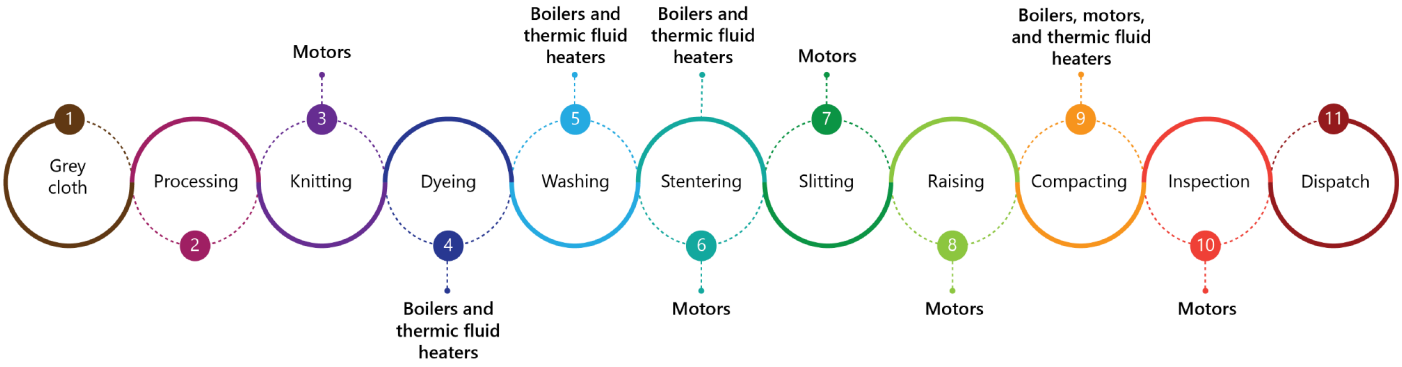
Sector: Textiles

MSME sample size: 9 (a mix of micro, small, and medium)

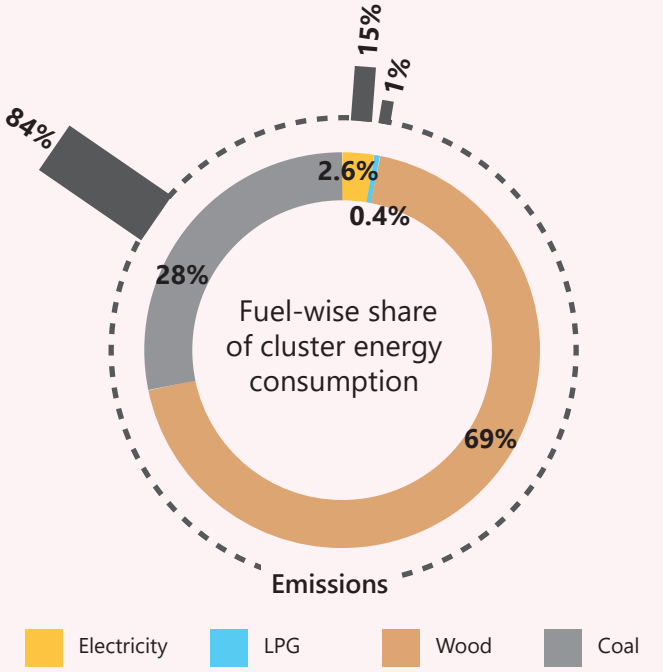
Products: Vests, T-shirts, and summer and spring knitwear

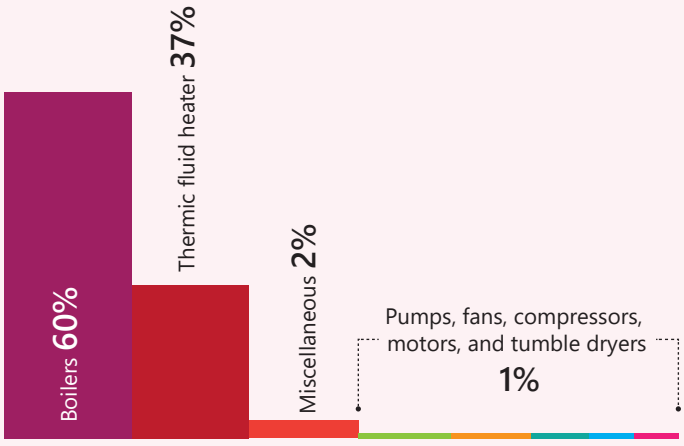
MSME classification	Turnover (in INR crore)	Investment (in INR crore)
Micro	0–5	0–1
Small	5–50	1–10
Medium	50–250	10–50

Unit process diagram



Energy Consumption Profile

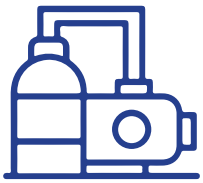




Equipment-wise share of cluster energy consumption

Note: Miscellaneous equipment consists of lighting, fans, additional process equipment, and so on

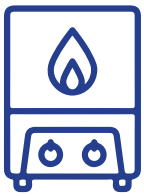
Energy- and Emission-Intensive Equipment



Boilers

Boilers are the primary source of steam generation, an important prerequisite in manufacturing processes such as dyeing. Most boilers in Tiruppur are solid fuel–fired, using coal and biofuels such as tamarind wood.

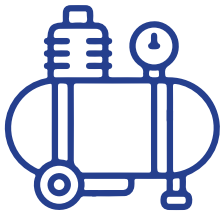
Furnace fuel	Efficiency
Coal	25%—52%
Biofuels (tamarind wood)	14%—78%



Thermic fluid heaters

Like boilers, thermic fluid heaters meet the needs of several process heating requirements in manufacturing units but without the use of steam. Thermic fluid heaters are used for drying, printing, and stentering. The fuel used in thermic fluid heaters is coal and wood.

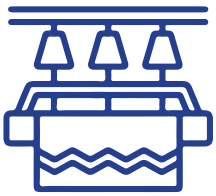
Thermic fluid heater fuel	Efficiency
Coal	45%
Wood	50%—70%



Compressor

Air compressors are another energy-intensive component in textile units. Compressed air is a reliable means of running a variety of pneumatic actuators, ejection processes, and other tools in machining. Ideally, 0.16–0.18 kW is required for every cubic feet per minute (CFM) of compressed air, given the pressure requirements of the sector.

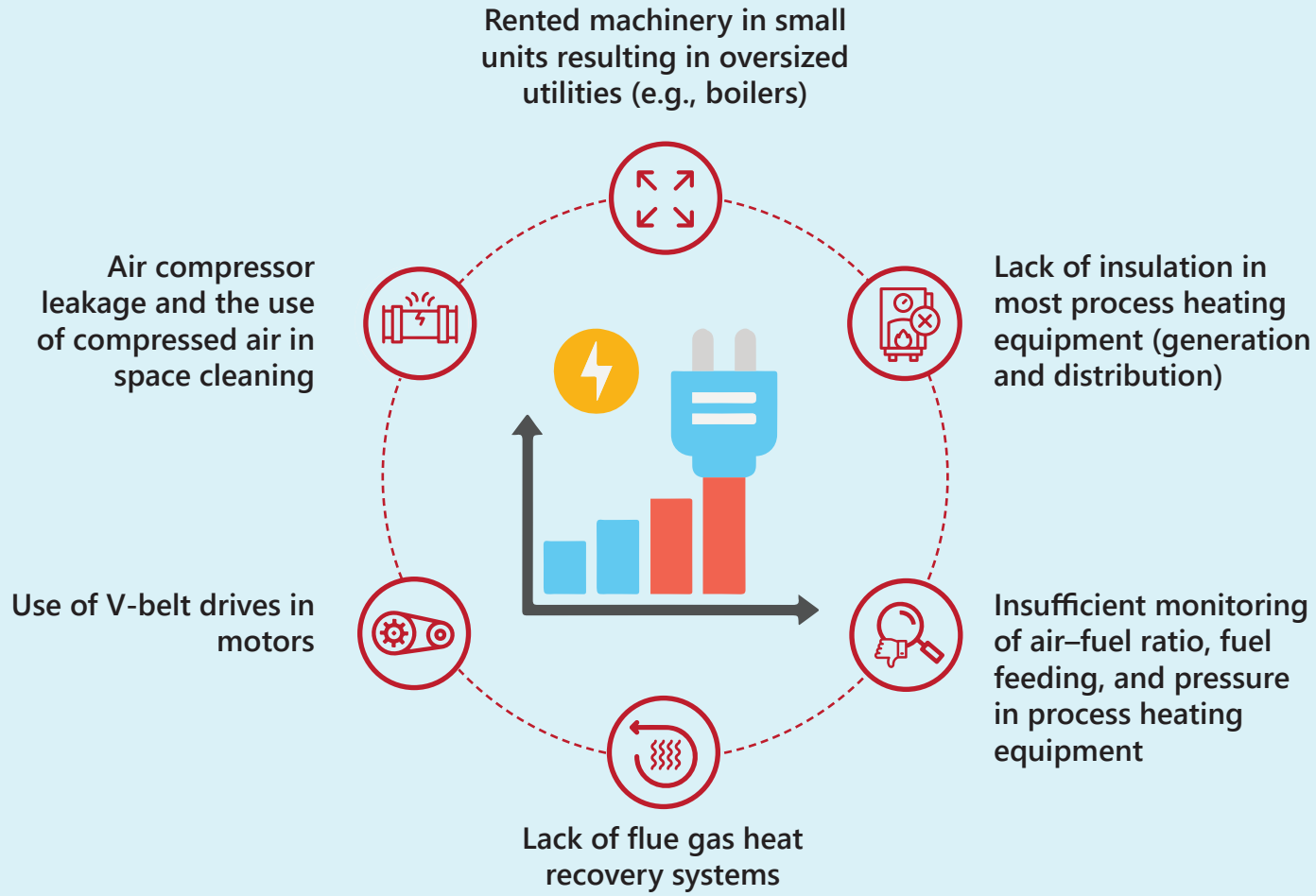
Equipment	Recorded SEC in kW/CFM
Air compressor	0.145—1.95



Process equipment

Various equipment within textile units used for processes such as knitting, dyeing, compacting, stentering, finishing, and drying requires electricity to run their motors and pumps.

Reasons for High Specific Energy Consumption (SEC)



Energy Efficiency (EE) Recommendations

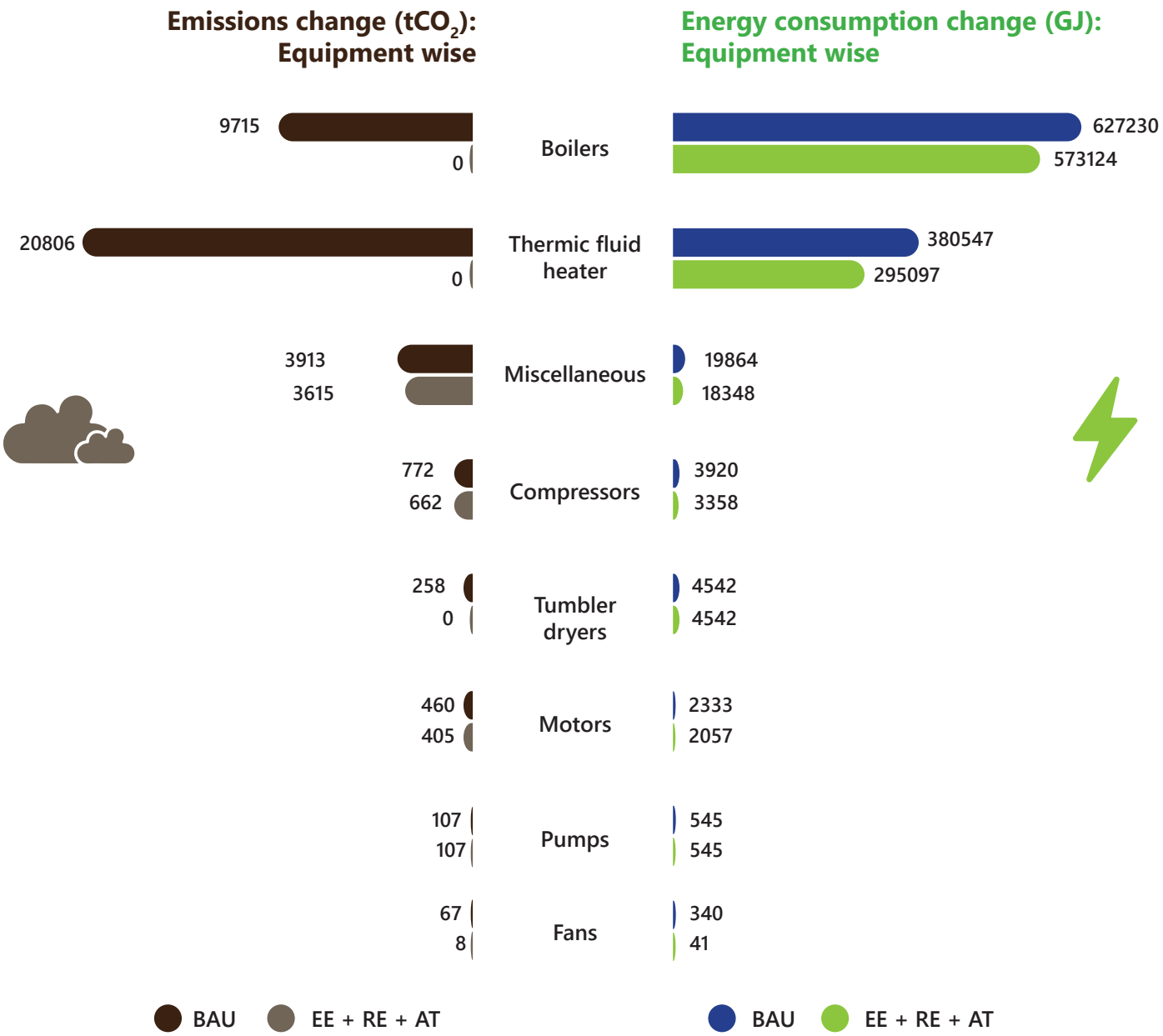
- Optimising air–fuel ratio in boilers and thermic fluid heaters **(short term)**
- Arresting compressed air leakages **(short term)**
- Insulation of boiler surfaces, steam pipes, and condensate recovery pipes **(short term)**
- Reducing compressor inlet air temperature **(short term)**
- Increasing air temperature in the preheater **(medium term)**
- Replacing V-belt drives in motors with synchronous belt drives **(medium term)**
- Installing VFD to avoid power consumption during compressor unloading **(medium term)**
- Installation of energy-efficient screw compressors **(medium term)**

Decarbonisation measure	Short term: <1 year	Medium term: 1-2 years	Long term: >2 years

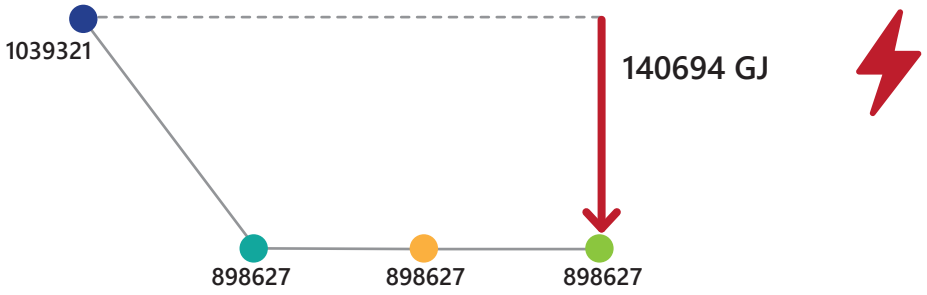
Techno-economic Analysis

A techno-economic analysis is carried out for a sample size of 9 units where energy, emission, and energy cost are modelled across four scenarios. The analysis shows the difference in each scenario and the impact of decarbonisation measures at various levels. The scenarios are as follows:

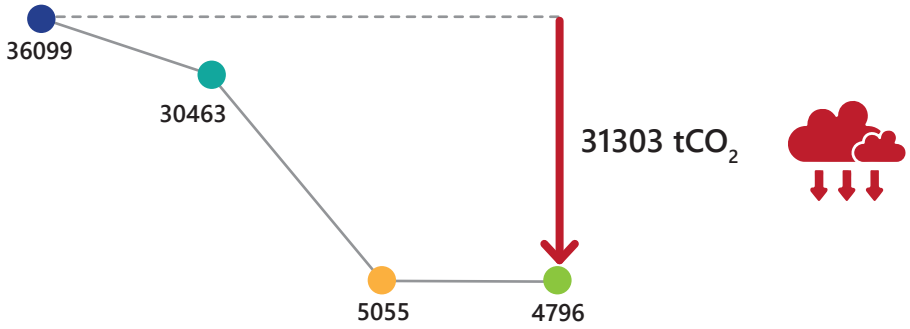
- **Business as Usual (BAU):** Without any interventions
- **Energy Efficiency (EE):** EE measures on existing equipment
- **Energy Efficiency with Renewables (EE + RE):** EE measures and renewables for electricity generation
- **Advanced Technologies (EE + RE + AT):** EE + RE measures and advanced decarbonisation technologies (clean fuels, process electrification)



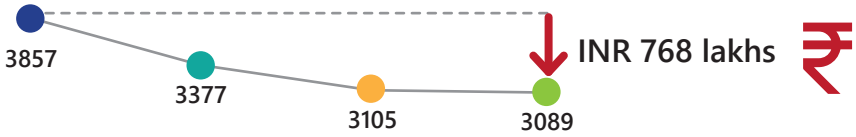
Scenario-wise reduction in cluster energy consumption (GJ)



Scenario-wise reduction in cluster GHG emissions (tCO_2)



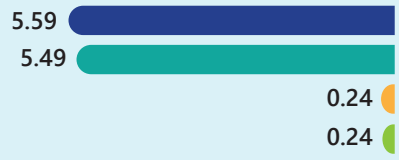
Scenario-wise reduction in energy cost within cluster (INR in lakhs)



BAU EE EE + RE EE + RE + AT

For a typical unit in the cluster, the change in energy and emission intensity of production is given:

Scenario-wise reduction in emission intensity (tCO_2/tonne)



Scenario-wise reduction in Specific energy consumption (GJ/tonne)

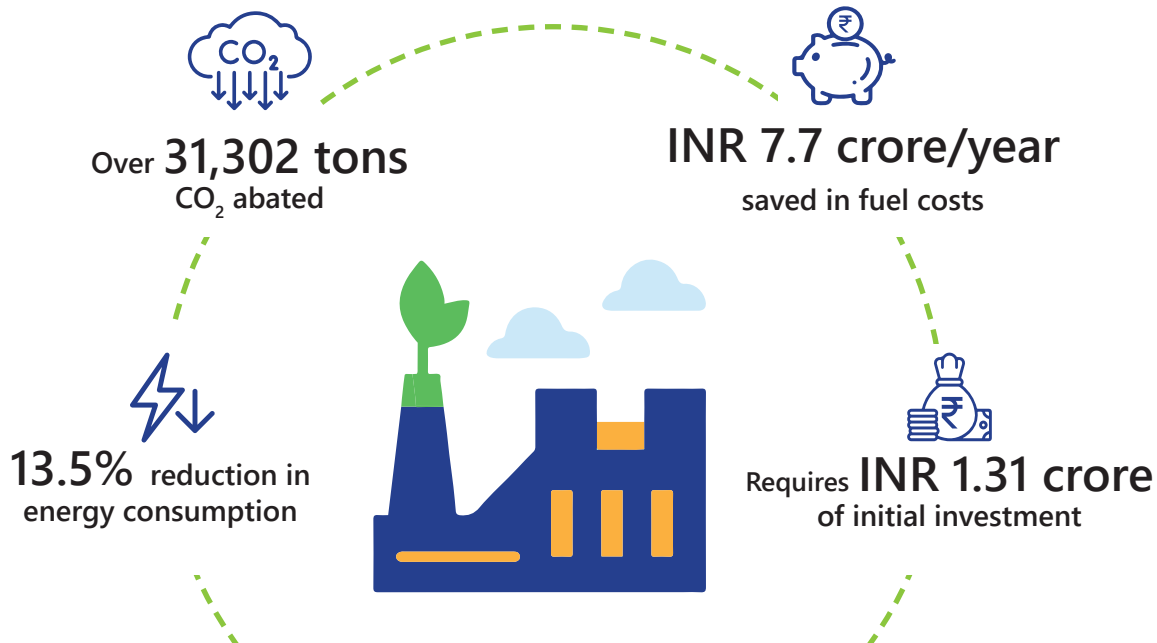
BAU EE EE + RE EE + RE + AT

Advanced technology measures considered for cluster and impact

Equipment	Decarbonisation measure	Energy reduction	Emissions reduction	Investment cost	Payback period
All electric equipment	Installing rooftop solar	-	High	High	<5 years
All electric equipment	Using open access green energy from the grid	-	High	Low	Immediate
DG set	Biodiesel blending (20%) in DG set	-	Medium	Low	Immediate
DG set	Use of 100% biodiesel generator	-	High	Medium	<3 years
DG set	Conversion of DG set to battery	Medium	None	High	Not feasible
Thermic fluid heater	Petcoke thermic fluid heater to electricity	Low	None	High	Not feasible
Thermic fluid heater	Petcoke thermic fluid heater to biomass briquettes	None	High	Low	0.2 to 4 years*
Boiler	Coal boiler to electric	Low	None	High	Not feasible
Boiler	Coal boiler to biogas	Low	High	High	Not feasible
Boiler	Coal boiler to green hydrogen	Low	High	High	Not feasible
Boiler	Petcoke boiler to biomass briquettes	None	High	Low	0.2 to 4 years*
Tumbler dryer	LPG to biogas	None	High	Low	Immediate

**Depending on petcoke prices*

Potential impact of decarbonisation measures

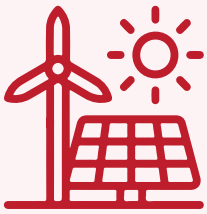


Way Ahead

Energy efficiency

Limited scope for energy efficiency measures (12.5% emissions and energy reduction). However, changes in the form of insulation and equipment replacement (motors and compressors) are helpful:

- Utilising the Amended Technology Upgradation Scheme for the textile sector
- Setting local benchmarks for energy consumption
- State government support through the upcoming RAMP scheme



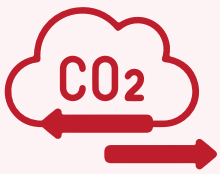
Potential for using RE in units and increasing usage

- Rooftop solar installation and use of RE-specific financing schemes (e.g., MNRE)
- Utilising RE open access and aggregating demand from multiple MSME units
- Reducing networking charges for RTPV
- Allowing RTPV installation above the sanctioned load in the gross metering regime
- DISCOMs to provide power evacuation infrastructure

Demand aggregation

Given similar processes and proximity of units, the possibility to utilise the MSME Cluster Development Programme and the Integrated Processing Development Scheme funds for common:

- Centralised steam distribution and compressed air systems
- Centralised RE systems



MSMEs carbon trading

Use of the upcoming carbon market as a potential source to reduce the payback period of decarbonisation measures:

- Regulations and framework on market design
- Sensitisation and awareness-building in the MSME community

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