

Electric forklift truck (material handling)



REPLACEMENT OF DIESEL-OPERATED FORKLIFT WITH ELECTRICAL FORKLIFT

- Present situation: Diesel-operated forklifts are commonly used
- Advantages of electrification: Less maintenance, no pollution
- Key barriers: Lack of information, higher capital investment

Implementation Support

- Support provided to MSMEs for implementation of electrification technologies.
- Electrification technologies implemented include diesel engines replaced with electrical motors, electric heater being used instead of FO-fired lead bath, and diesel forklift trucks being substituted with electric forklift trucks.



FO-fired bath replaced with electric induction heater at a wire-drawing unit in Ranchi



Diesel engine replaced with electric motor in a foundry in Howrah



Diesel forklift replaced with electric forklift in laminate industry in Hapur

Regional Awareness Workshops



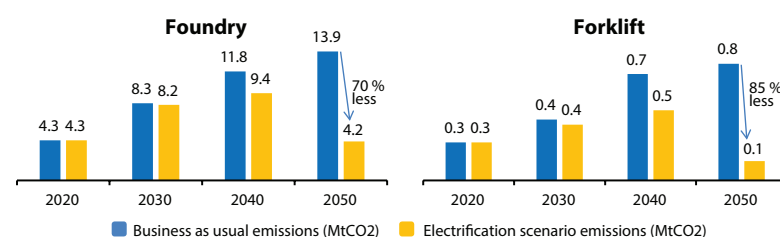
Delhi



Coimbatore

GHG Reduction Potential

- Nationwide, long-term emission reduction of key electrification options estimated



Electrification Options in Small-scale Industries



Backdrop

The industrial sector in India accounts for nearly 50% of the total commercial energy consumption and is a major consumer of fossil fuels. Industrial processes such as boilers, kilns, furnaces, dryers and so on widely use fossil fuels. Hence, there is a huge potential among energy-intensive industries to reduce their energy consumption and save energy costs by switching over to electricity-based options from their existing fossil fuel-based technologies. Efforts in this direction assume importance in the light of India's attempts to reduce its emission intensity to combat climate change.

About the project

The objective of the project was to identify small-scale industrial applications having high potential for decarbonization through direct electrification route. The project also estimated the potential impact of a select number of electrification options on nationwide long-term GHG reduction projections.

About Shakti Sustainable Energy Foundation (SSEF)

Shakti Sustainable Energy Foundation seeks to facilitate India's transition to a sustainable energy future by aiding the design and implementation of policies in the following areas: clean power, energy efficiency, sustainable urban transport, climate change mitigation, and clean energy finance.

About The Energy and Resources Institute (TERI)

A dynamic and flexible not-for-profit organization with a global vision and a local focus, TERI (The Energy and Resources Institute) is deeply committed to every aspect of sustainable development. From providing environment-friendly solutions to rural energy problems to tackling issues of global climate change across many continents and advancing solutions to growing urban transport and air pollution problems, TERI's activities range from formulating local- and national-level strategies to suggesting global solutions to critical energy and environmental issues. The Industrial Energy Efficiency Division of TERI works closely with both large industries and energy intensive Micro Small and Medium Enterprises (MSMEs) to improve their energy and environmental performance.

Small and Medium Enterprises: Energy Efficiency Knowledge Sharing (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 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 technology development specialists, R&D institutions, government bodies, training institutes, funding agencies and academia so as to facilitate this process.

For more information visit www.sameeeksha.org, or contact

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Project funded by



Project implemented by



THE ENERGY AND RESOURCES INSTITUTE

Knowledge partner



Electrification Options in Industries

Activities

Feasibility studies

Implementation support

GHG reduction potential

Focus Industrial Sectors/ Applications

- Foundry
 - » Melting
 - » Drive for fans
 - » Core drying
- Forging
 - » Billet heating
- Wire drawing and galvanizing
 - » Lead bath
- Magnesia carbide refractory brick
 - » Oven
- Clay brick
 - » Drive for fan
- Chemical and food processing
 - » Boiler
- Glass
 - » Muffle furnace
- Tea processing
 - » Withering
 - » Drying
- Brass lamps
 - » Melting
 - » Core baking
- Aluminium utensils
 - » Melting
 - » Annealing
- Aluminium extrusion
 - » Melting
 - » Reheating
- Cross-cutting
 - » Material handling (fork lift)

Electric oven
(magnesia
carbon
refractory brick)



Electric boiler
(chemical and
food processing)



Electric heater
to heat air (tea
withering)



Insights from Selected Studies

Electric
induction
melting
(foundry)



Electric
induction
heating
(forging)



Electric motor
coupled blower
(foundry and
clay brick)



Electric
induction
heating
(wire drawing)



REPLACEMENT OF CUPOLA WITH ELECTRIC INDUCTION FURNACE

- Present situation: Coke-based cupola melting furnace is widely used by small-scale foundries
- Advantages of electrification: Easier control, better metal chemistry, lower pollution
- Key barriers: High investment requirement, high electricity price, cost involved in upgrading the power connection infrastructure

Electric melting
furnace (brass)



REPLACEMENT OF FURNACE OIL (FO)-FIRED FORGING FURNACE WITH ELECTRIC INDUCTION BILLET HEATER

- Present situation: Most small-scale forging units use FO-fired batch- type furnace
- Advantages of electrification: Lower energy cost, reduced maintenance, negligible scale loss
- Key barriers: High investment requirement, low awareness

Electric
melting furnace
(aluminium
utensil)



REPLACEMENT OF DIESEL ENGINE COUPLED FAN WITH ELECTRICAL MOTOR

- Present situation: Diesel engine coupled fans are used by unregistered MSMEs (zig-zag brick kilns, food processing, and some foundries)
- Advantages of electrification: Attractive payback period, low maintenance
- Key barriers: Lack of grid connectivity, remote location of brick kilns, unregistered units, lack of interest to get electric connection

Electric
annealing furnace
(aluminium
utensil)



REPLACEMENT OF FURNACE OIL (FO)-FIRED LEAD BATH WITH ELECTRICAL HEATING

- Present situation: Use of FO-fired molten lead bath is commonly used by small-scale wire-drawing units for stress relieving
- Advantages of electrification: Lower energy cost, ease of operation, lower pollution
- Key barriers: High investment requirement, low awareness

Electric induction
furnace
(Aluminium
extrusion)



REPLACEMENT OF HIGH SPEED DIESEL (HSD)-FIRED OVEN WITH ELECTRIC OVEN

- Present situation: HSD fired ovens used for firing green bricks
- Advantages of electrification: Lower energy cost, less pollution
- Key barriers: High investment requirement, non-availability of customized technological solution, low awareness

REPLACEMENT OF LIGHT DIESEL OIL (LDO)-FIRED BOILER WITH ELECTRIC BOILER

- Present situation: LDO-fired boilers commonly used by pharmaceutical, food, and other industries
- Advantages of electrification: High efficiency, attractive payback period
- Key barriers: Limited technology availability, high investment, low awareness

REPLACEMENT OF COAL FIRED HOT AIR GENERATOR (HAG) WITH ELECTRIC HEATER

- Present situation: Coal-fired HAGs provide hot air for removing moisture from fresh tea leaves
- Advantages of electrification: Reduced operating cost and GHG emissions
- Key barriers: Technology not yet demonstrated in India, low awareness

REPLACEMENT OF USED AUTOMOTIVE OIL FIRED MELTING FURNACE WITH ELECTRIC FURNACE

- Present situation: Obsolete design of melting furnace burning used motor oil prevalent at present for manufacture of brass lamps
- Advantages of electrification: Improved work environment, less pollution
- Key barriers: High investment requirement, high cost of electricity, additional infrastructural cost

REPLACEMENT OF FURNACE OIL (FO)-FIRED MELTING FURNACES WITH ELECTRIC FURNACE

- Present situation: All aluminium utensil units use inefficient FO-fired melting furnaces
- Advantages of electrification: Lower pollution, space saving, ease of operation
- Key barriers: High initial investment, high cost of electricity, cost of upgrading the power connection infrastructure

REPLACEMENT OF LPG FIRED ANNEALING FURNACE WITH ELECTRIC ANNEALING FURNACE

- Present situation: Many aluminium utensil units use LPG fired circle annealing furnaces
- Advantages of electrification: Better material quality, less rejections
- Key barriers: High initial investment, high cost of electricity, additional infrastructural cost

REPLACEMENT OF FURNACE OIL (FO)-FIRED REVERBERATORY MELTING FURNACE WITH ELECTRIC INDUCTION FURNACE

- Present situation: Liquid or gaseous fossil fuel-fired melting furnaces are used
- Advantages of electrification: Lower melting losses, better operational control, no pollution
- Key barriers: High initial investment, high electricity price