

Detailed Project Report On Energy Efficiency in Kiln

Kalyan Glazed Tiles

Morbi (Gujarat)

Prepared for

Bureau of Energy Efficiency

(13/GEF-UNIDO-BEE/LSP/14/4562)



©Bureau of Energy Efficiency, 2018

This DPR has been originally prepared by TERI as a part of 'Capacity Building of LSPs' activity under the GEF-UNIDO-BEE project 'Promoting Energy Efficiency and Renewable Energy in selected MSME clusters in India'.

Suggested Format for Citation

This document may be reproduced in whole or in part and in any form for educational and non-profit purposes without special permission, provided acknowledgement of the source is made. BEE and TERI would appreciate receiving a copy of any publication that uses this document as a source. A suggested format for citation may be as below:

GEF-UNIDO-BEE Project, Bureau of Energy Efficiency, 2018

“Capacity Building of Local Service Providers”

For more information

GEF-UNIDO-BEE PMU

Bureau of Energy Efficiency

4th Floor, Sewa Bhawan, Sector-1,

R.K. Puram, New Delhi-110066

Email: gubpmu@beenet.in

pmc@teri.res.in

Website: www.beeindia.gov.in

www.teriin.org

Disclaimer

This document is an output of an exercise undertaken by TERI under the GEF-UNIDO-BEE project's initiative for the benefit of MSME units and is primarily intended to assist the decision making by the management of the intended unit for the proposed technology. While every effort has been made to avoid any mistakes or omissions, GEF, UNIDO, BEE or TERI would not be in any way liable to any person or unit or other entity by reason of any mistake/omission in the document or any decision made upon relying on this document.

Acknowledgement

The Energy and Resources Institute (TERI) places on record its sincere thanks to Global Environment Facility (GEF), United Nations Industrial Development Organization (UNIDO) and Bureau of Energy Efficiency (BEE) for giving opportunity to partner in this prestigious assignment on Capacity Building of Local Service Providers (LSPs) under the GEF-UNIDO-BEE project 'Promoting energy efficiency and renewable energy in selected MSME clusters in India'.

TERI is particularly grateful to Mr Milind Deore, Director, Bureau of Energy Efficiency, Mr Sanjay Shrestha, Industrial Development Officer, Industrial Energy Efficiency Unit, Energy and Climate Branch, UNIDO, Mr Niranjana Rao Devela, National Technology Coordinator, UNIDO, Mr Vijay Mishra, Cluster Leader, Morbi Ceramic Cluster, UNIDO, Mr Mukesh Bhai Ughareja, M/s Kalyan Glazed Tiles and Morbi Ceramics Association for their support and guidance during the project.

Last but not least, the interactions and deliberations with numerous ceramic units, Industry Associations, technology providers and who were directly or indirectly involved throughout the study were exemplary and the whole exercise was thoroughly a rewarding experience for TERI.

The Energy and Resources Institute (TERI)
New Delhi

Table of contents

| | |
|---|-----------|
| Acknowledgement | 1 |
| List of tables | 1 |
| List of figures | 1 |
| List of abbreviations..... | 1 |
| Executive summary..... | i |
| 1.0 Details of the unit | 1 |
| 1.1 Particulars of unit..... | 1 |
| 2.0 Energy profile..... | 3 |
| 2.1 Process flow diagram..... | 3 |
| 2.2 Details of technology identified | 3 |
| 2.3 Energy used and brief description of their usage pattern | 3 |
| 2.4 Energy sources, availability & tariff details..... | 4 |
| 2.5 Analysis of electricity consumption..... | 4 |
| 2.6 Analysis of other energy forms/ fuels..... | 4 |
| 3.0 Proposed technology for energy efficiency..... | 7 |
| 3.1 Automation of kiln combustion system | 7 |
| 3.1.1 Background..... | 7 |
| 3.1.2 Observations and analysis | 7 |
| 3.1.3 Recommendation..... | 9 |
| 3.2 Cost benefit analysis | 9 |
| 3.3 Pre-training requirements | 9 |
| 3.4 Process down time for implementation..... | 10 |
| 3.5 Environmental benefits..... | 10 |
| 3.5.1 CO ₂ reduction..... | 10 |
| 3.5.2 Reduction in other pollution parameters (gas, liquid and solid) | 10 |
| 4.0 Project financials..... | 11 |
| 4.1 Cost of project and means of finance | 11 |
| 4.1.1 Particulars of machinery proposed for the project..... | 11 |
| 4.1.2 Means of finance..... | 11 |
| 4.2 Financial statement (project) | 11 |
| 4.2.1 Assumptions..... | 11 |
| 4.2.2 Payback | 12 |
| 4.2.3 NPV and IRR | 12 |
| 4.3 Marketing & selling arrangement..... | 13 |
| 4.4 Risk analysis and mitigation | 13 |
| 4.5 Sensitivity analysis..... | 14 |

| | | |
|--|---|-----------|
| 5.0 | Conclusions & recommendations | 15 |
| 5.1 | List of energy conservation measures | 15 |
| 5.2 | Summary of the project | 15 |
| 5.3 | Recommendations..... | 15 |
| 6.0 | Financing schemes for EE investments for MSME sector | 17 |
| Annexures..... | | 23 |
| Annexure 1: Copy of certificates from competent authorities | | 25 |
| Annexure 2: Budgetary offers / quotations | | 27 |
| | Quotation 1: Yantra Automation Pvt Ltd..... | 27 |
| Annexure 3: Instruments used | | 29 |

List of tables

| | |
|---|----|
| Table 1.1: Particulars of the unit..... | 1 |
| Table 2.2: Details of kiln | 3 |
| Table 2.3: Energy used and description of use..... | 3 |
| Table 2.4: Energy sources, availability and tariffs..... | 4 |
| Table 2.5: Electricity consumption profile..... | 4 |
| Table 2.6: Analysis of other energy/ fuel consumption..... | 4 |
| Table 3.1.1: Details of kiln..... | 7 |
| Table 3.1.2: Estimation of dry flue gas losses | 7 |
| Table 3.2: Cost benefit analysis for recommended energy savings measures..... | 9 |
| Table 4.1.1: Particulars of machinery proposed for the project..... | 11 |
| Table 4.1.2: Means of finance | 11 |
| Table 4.2.1: Assumptions made | 11 |
| Table 4.2.2: Payback..... | 12 |
| Table 4.2.3a: NPV and IRR (100% equity) | 12 |
| Table 4.2.3b: NPV and IRR (D/E- 70:30) | 13 |
| Table 4.2.3c: NPV and IRR (D/E- 50:50)..... | 13 |
| Table 4.3: Marketing & selling arrangements | 13 |
| Table 4.4: Risk analysis and mitigation | 13 |
| Table 4.5: Sensitivity analysis..... | 14 |
| Table 5.1: Summary of the energy conservation measures | 15 |
| Table 5.2: Summary of the project..... | 15 |
| Table 6.1: Major government schemes | 17 |
| Table 6.2: BEE's VCFEE and PRGFEE scheme..... | 18 |
| Table 6.3: IREDA's financing guidelines | 19 |
| Table 6.4: Major EE financing schemes/initiatives of SIDBI..... | 20 |
| Table 6.5: JBIC-SBI Green Line | 21 |
| Table 6.6: Canara bank scheme of EE SME loans..... | 22 |

List of figures

| | |
|--|---|
| Figure 2.1: Process flow chart | 3 |
| Figure 2.6: Percentage share of various fuel types in the unit | 5 |
| Figure 3.1.3: Combustion schematic diagram..... | 9 |

List of abbreviations

| | | |
|-----------------|---|--|
| BEE | : | Bureau of Energy Efficiency |
| CO ₂ | : | Carbon Dioxide |
| D/E | : | Debt /Equity |
| DPR | : | Detailed Project Report |
| DSCR | : | Debt Service Coverage Ratio |
| EE | : | Energy Efficient |
| GEF | : | Global Environmental Facility |
| GHG | : | Green House Gas |
| IDC | : | Investment without interest defer credit |
| IGDPR | : | Investment Grade Detailed Project Report |
| IRR | : | Internal Rate of Return |
| kW | : | Kilo Watt |
| kWh | : | Kilo Watt Hour |
| LSPs | : | Local Service Providers |
| MGO | : | Minimum Guaranteed Offtake |
| MSME | : | Micro, Small and Medium Enterprises |
| MT | : | Metric Tonne |
| NG | : | Natural Gas |
| NPV | : | Net Present Value |
| O&M | : | Operation and Maintenance |
| PCB | : | Pollution control board |
| PGVCL | : | Paschim Gujarat Vij Company Limited |
| RE | : | Renewable Energy |
| ROI | : | Return on Investment |
| SCM | : | Standard Cubic Meter |
| SME | : | Small and Medium Enterprises |
| SPP | : | Simple Payback Period |
| TERI | : | The Energy and Resources Institute |
| Toe | : | Tonnes of oil equivalent |
| UNIDO | : | United Nations Industrial Development Organization |
| WACC | : | Weighted Average Cost of Capital |

Executive summary

The overall aim of the GEF-UNIDO-BEE project 'Promoting Energy Efficiency (EE) and Renewable Energy (RE) in selected MSME clusters in India' is to develop and promote a market environment for introducing energy efficiency and enhancing the use of renewable energy technologies in process applications in selected energy-intensive MSME clusters in India. This would help in improving the productivity and competitiveness of the MSME units, as well as in reducing the overall carbon emissions and improving the local environment.

Under the GEF-UNIDO-BEE Project, TERI has been entrusted to undertake Capacity building of Local Service Providers (LSPs) to BEE. The Scope of Work under the project,

- Organizing 4 one-day training/ capacity building workshops for LSPs in each cluster.
- Development of 10 bankable DPRs for each cluster, based on mapping technology needs with capacities of local technology suppliers/service providers, and also replication potential and applications to banks in each cluster.

Brief introduction of the MSME unit

| | |
|--|--|
| Name of the unit | M/s Kalyan Glazed Tiles |
| Constitution | Partnership |
| MSME Classification | Medium |
| No. of years in operation | 24 |
| Address: Registered Office: | 8-A, National Highway, B/H Lalpar 132 K.V. Power House, Jambudia Savsar Plot Morbi - 363642, Gujarat |
| Industry-sector | Ceramic |
| Products manufactured | Digital wall tiles |
| Name(s) of the promoters/ directors | Mr. Mukesh Bhai Ughareja |
| Existing banking arrangements along with the details of facilities availed | NA |

A detailed assessment study was undertaken in the identified area with the use of the sophisticated handheld instruments. Energy consumption pattern and production data were collected to estimate the specific energy consumption of the unit. The unit level baseline of the unit was also estimated using the historical data. The plant is consuming about 32,03,611 kWh of electricity per year. The annual consumption of the NG is about 46,21,632 SCM. The total energy consumption of the unit during last 12 months is estimated to be 4,405 toe which is equivalent to 1,671 lakh rupees. The total CO₂ emission during this period is estimated to be 10,717 tonnes. Electricity and natural gas (NG) were considered for CO₂ emission estimation.

The unit manufactures the ceramic wall tiles and the total installed capacity of production of the unit during 2017-18 is estimated to be 15,000 MTS. The major source of energy is electricity and natural gas.

Accepted/ recommended technology implementation

The recommended technology considered after discussion with the plant personnel for implementation in the unit is given below.

| Technology | Annual energy saving | Investment ¹ | Monetary savings | Simple payback period | Emission reduction |
|--------------------------------------|----------------------|-------------------------|------------------|-----------------------|------------------------------|
| | NG (SCM) | (Rs lakh) | (Rs lakh/year) | (Years) | (tonnes of CO ₂) |
| Automation of kiln combustion system | 31,584 | 11.2 | 9.8 | 1.1 | 55.3 |

Other benefits

- The proposed project is not expected to bring in any change in process step or operating practices therefore no change expected in the product quality.
- Implementation of the selected technology in the unit may result in reduction in CO₂ emissions.

Cost of project & means of finance

| S. No. | Particulars | Unit | 100% equity | D/E- 70:30 | D/E- 50:50 |
|--------|-----------------|-------------|-------------|------------|------------|
| 1 | Cost of Project | Rs. In Lakh | 11.2 | 11.2 | 11.2 |
| 2 | D/E Ratio | - | - | 7:3 | 1:1 |
| 3 | Project IRR | % | 61.0 | 56.8 | 58.0 |
| 4 | NPV | Rs. In Lakh | 15.6 | 13.9 | 14.4 |
| 5 | DSCR | - | - | 2.1 | 0.9 |

¹ Investment including the (i) kiln combustion system automation – Rs. 9.0 lakh, and (ii) Taxes and other misc. cost – Rs. 2.2 lakh

1.0 Details of the unit

1.1 Particulars of unit

Table 1.1: Particulars of the unit

| | | | |
|----|---|--|-------|
| 1 | Name of the unit | M/s Kalyan Glazed Tiles | |
| 2 | Constitution | Partnership | |
| 3 | MSME Registration No/UAN | 24-009-12-03793 | |
| 4 | PCB consent No. | - | |
| 5 | Date of incorporation / commencement of business | 1994 | |
| 6 | Name of the Contact Person | Mr MukeshBhai Ughareja | |
| 7 | Mobile / Ph. No | +91- 9825213771 | |
| 8 | Email | - | |
| 9 | Address: Registered Office | 8-A, National Highway, B/H Lalpar 132 K.V. Power House, Jambudia Savsar Plot, Morbi - 363642, Gujarat | Owned |
| 10 | Factory | 8-A, National Highway, B/H Lalpar 132 K.V. Power House, Jambudia Savsar Plot, Morbi - 363642, Gujarat | Owned |
| 11 | Industry / Sector | MSME/Manufacturing | |
| 12 | Products Manufactured | Wall tiles | |
| 13 | No of hours of operation/shift | 12 | |
| 14 | No of shifts/ day | 2 | |
| 15 | No of days/year | 350 | |
| 16 | Installed Capacity | 15,000 MTS | |
| 17 | Whether the unit is exporting its products (Yes/ No) | No | |
| 18 | Quality Certification, if any | ISO 9001 : 2008 | |

2.0 Energy profile

2.1 Process flow diagram

Manufacturing of ceramic item uses wide range of raw material combination to produce different shape, size and colour. It requires both electrical and thermal energy at different stages of the process to operate the ball mill, casting/moulding, kilns, cutting & finishing machines and utilities such as motors, pumps air compressor etc. Ceramic manufacturing process primarily consists of mould preparation, body material preparation, shaping, drying and firing. Typical process flow chart is shown with figure 2.1.

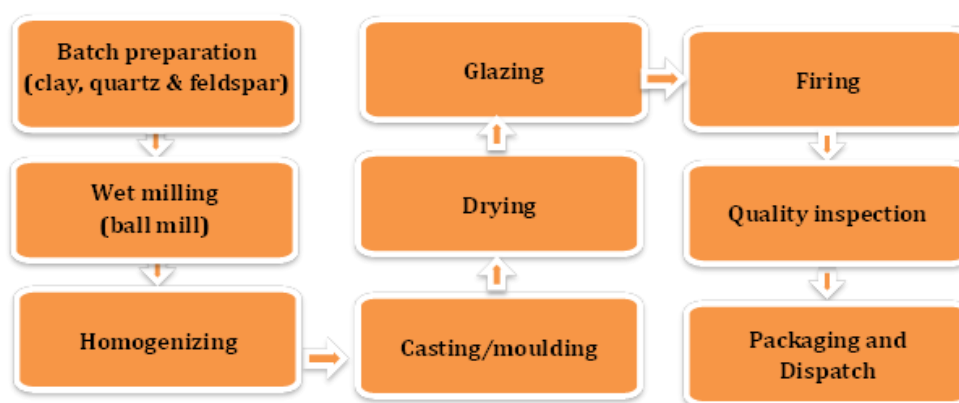


Figure 2.1: Process flow chart

2.2 Details of technology identified

The details of the kiln installed in the unit are given in table 2.2.

Table 2.2: Details of kiln

| Parameters/ Equipment ID | Value |
|-------------------------------|-----------------|
| Equipment | Kiln |
| Type | MFS1/3000/170.1 |
| Make | Modena |
| Fuel type | NG |
| Maximum output | 11,500 kg/hr |
| Maximum operating temperature | 1,250 °C |

2.3 Energy used and brief description of their usage pattern

The unit uses grid power supplied by Paschim Gujarat Vij Company Limited under the tariff category of HTP-1. Table 2.3 provides the details of energy uses.

Table 2.3: Energy used and description of use

| S No | Energy source | Description of use |
|------|---------------|---|
| 1 | Electricity | Motive power for different drives in different process sections and utilities |

| S No | Energy source | Description of use |
|------|---------------|--------------------|
| 2 | NG | Kiln |

2.4 Energy sources, availability & tariff details

Different energy sources, availability of listed energy types and their respective tariffs are given in table 2.4.

Table 2.4: Energy sources, availability and tariffs

| Source | Remarks | Price |
|---------------------|------------------|--|
| Electricity (PGVCL) | HTP-1 | Demand charges: <ul style="list-style-type: none"> For first 500 kVA of billing demand: Rs. 150/- per kVA per month For next 500 kVA of billing demand: Rs. 260/- per kVA per month Energy charges: @ Rs. 4.20/kWh Power factor penalty: <ul style="list-style-type: none"> 1% of energy charges for every point drop in PF between 0.85 to 0.90 2% of energy charges for every point drop in PF below 0.85 Power factor rebate: <ul style="list-style-type: none"> 0.5% of energy charges for every point increase in PF over 0.95. |
| Natural gas | Gujarat Gas Ltd. | <ul style="list-style-type: none"> Minimum Guaranteed Offtake (MGO): Rs. 32.70/SCM Non - Minimum Guaranteed Offtake (Non-MGO): Rs. 35.97/SCM |

2.5 Analysis of electricity consumption

Table 2.5: Electricity consumption profile

| Month & Year | Electricity consumption (kWh) | Contract Demand (kVA) | Maximum Demand (kVA) | Minimum Billing Demand (kVA) | Demand Charges, Rs./month | Energy Charges, Rs./month | Power factor (PF) | Total electricity bill (Rs) |
|----------------|-------------------------------|-----------------------|----------------------|------------------------------|---------------------------|---------------------------|-------------------|-----------------------------|
| May-17 | 3,00,160 | 600 | 593 | 510 | 99,180 | 12,20,954 | 0.990 | 22,09,387 |
| Jun-17 | 2,91,224 | 600 | 528 | 510 | 82,280 | 11,84,392 | 0.996 | 21,23,125 |
| Jul-17 | 1,91,692 | 600 | 490 | 510 | 77,600 | 7,82,135 | 0.999 | 14,26,279 |
| Nov-17 | 2,75,544 | 600 | 551 | 510 | 88,260 | 11,21,413 | 0.991 | 19,94,932 |
| Dec-17 | 2,93,632 | 600 | 558 | 510 | 90,080 | 11,94,360 | 0.983 | 21,26,273 |
| Jan-18 | 1,63,940 | 600 | 544 | 510 | 86,440 | 6,67,954 | 0.985 | 12,30,781 |
| Feb-18 | 2,97,356 | 600 | 557 | 510 | 89,820 | 12,09,132 | 0.982 | 21,25,032 |
| Mar-18 | 2,79,336 | 600 | 531 | 510 | 83,060 | 11,36,461 | 0.983 | 19,94,531 |
| May-18 | 3,09,824 | 600 | 591 | 510 | 98,660 | 12,60,283 | 0.989 | 22,14,309 |
| Average | 2,66,968 | 600 | 549 | 510 | 88,376 | 10,86,343 | 0.989 | 19,38,294 |
| Total | 32,03,611 | - | - | - | - | - | - | 2,32,59,530 |

2.6 Analysis of other energy forms/ fuels

The analysis of the other fuels/forms of energy used in the unit is given in table 2.6.

Table 2.6: Analysis of other energy/ fuel consumption

| Parameters | NG |
|------------|----|
|------------|----|

| Parameters | NG |
|--------------------------|--------------|
| Consumption unit/year | 46,21,632 |
| Calorific value per unit | 8,935 |
| Equivalent toe per year | 4129.4 |
| Price (Rs per unit) | 31.1 |
| Total price per year | 14,39,09,590 |

The share of various energy forms used in the unit is given in figure 2.6.

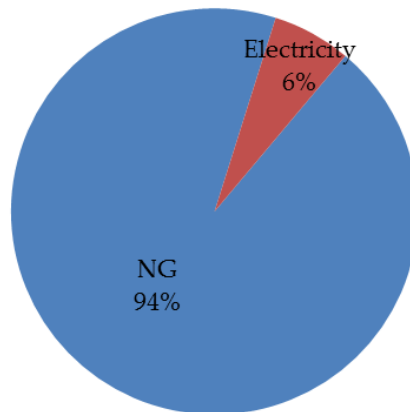


Figure 2.6: Percentage share of various fuel types in the unit

The plant is consuming about 32,03,611 kWh of electricity per year. The annual consumption of the NG is about 46,21,632 SCM. The total energy consumption of the unit during last 12 months is estimated to be 4405 toe which is equivalent to 1,671 lakh rupees. The total CO₂ emission during this period is estimated to be 10,717 tonnes. Electricity and NG were considered for CO₂ emission estimation.

3.0 Proposed technology for energy efficiency

Based on the measurements, observations/ findings during detailed assessment study conducted in the unit, the following technology has been identified for energy efficiency improvement. The detail is given below.

3.1 Automation of kiln combustion system

3.1.1 Background

To dry the glazed product in the tile unit, the roller type tunnel kiln is most commonly used in which the heat for the drying is mainly supplied by the combustion of natural gas and hot air recovered from the preheating zone of the kiln. The details of the kiln in the unit are given in table 3.1.1.

Table 3.1.1: Details of kiln

| Parameters/ Equipment ID | Value |
|-------------------------------|-----------------|
| Equipment | Kiln |
| Type | MFS1/3000/170.1 |
| Make | Modena |
| Fuel type | NG |
| Maximum output | 11,500 kg/hr |
| Maximum operating temperature | 1,250 °C |

Fuel fired kilns depend on a variety of means to control the burner air-to-fuel ratio. These systems vary considerably, but all of them require a suitable optimization of the flow and pressure. The operational parameters of the kiln including the temperature profiling in various zones, flue gas analysis, surface imaging and fuel and electricity consumption were measured during the detailed assessment study and analysis of the past one year data.

3.1.2 Observations and analysis

To analyse the combustion efficiency of the kiln, flue gas analysis conducted during the normal plant operation and observed that the oxygen level in the exhaust chimney duct is in the range of 15.6-16.8% (average of time series measurement is estimated to be 16.1%). The kiln is divided into the zones and each zone fuel supply is cut off after attending the set/desired temperature. The detailed analysis of the dry flue gas losses in the kiln is given in table 3.1.2.

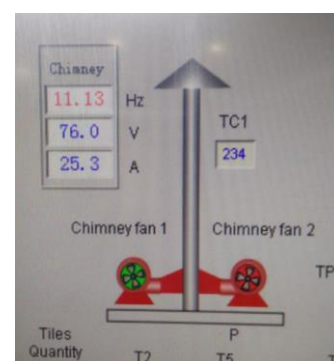


Table 3.1.2: Estimation of dry flue gas losses

| Operating Parameters | Unit | Value |
|------------------------------|----------|-------|
| Fuel | | NG |
| Fuel CV | kCal/kg | 8,935 |
| Average gas consumption | SCM/Hour | 188 |
| Operating parameters | | |
| O ₂ % in flue gas | % | 16.1 |
| Flue Gas Temperature | °C | 234 |

| Operating Parameters | Unit | Value |
|--|---------------|--------|
| CO ₂ % in flue gas | % | 2.6 |
| Ambient air Conditions | | |
| DBT | °C | 38.7 |
| RH | % | 58.3 |
| WBT | °C | 29.3 |
| Specific Humidity | kg/kg of air | 0.026 |
| Fuel Analysis | | |
| Carbon | % | 74.7 |
| Hydrogen | % | 25.0 |
| Sulphur | % | - |
| Oxygen | % | - |
| Nitrogen | % | 0.8 |
| Moisture | % | - |
| Ash | % | - |
| Total | % | 100.5 |
| Combustion air analysis | | |
| Theo. Air required | kg/kg of fuel | 17.37 |
| % Excess air | % | 328.57 |
| Total air supplied | kg/kg of fuel | 74.42 |
| Excess air quantity | kg/kg of fuel | 57.06 |
| Flue Gas Constituents | | |
| H ₂ O formation due to H ₂ in fuel | kg | 2.25 |
| H ₂ O from moisture in fuel | Kg | - |
| H ₂ O from moisture in air | kg | 1.92 |
| N ₂ in air supplied | kg | 57.16 |
| O ₂ in excess air | kg | 13.24 |
| Total flue gas generated | kg | 74.56 |
| Total DFG generated | kg | 70.39 |
| Energy saving analysis | | |
| Dry flue gas losses | kCal/SCM | 3,162 |
| Percentage heat loss in waste gases | % | 35 |

As fuel supply is cut off in the respective zone but combustion is continued supplied in the respective zone which further increasing the oxygen level in exhaust gases. Excess air supply for combustion of fuel always increases fuel combustion. To enhance cooling rate additional cool air is supplied and also to remove part of this air before entering into the firing zone, multiple hot air removal port system has been incorporated in the cooling zone. Thus, a substantial amount of energy could be saved by preventing excess air in kilns, through improved controls of the combustion process, recovering and recycling heat generated by firing, as well as through improved designs of kilns and other equipment/machinery.



3.1.3 Recommendation

The combustion schematic shown in figure 3.1.3 is an arrangement that shows a proportional control system. It is designed, in its most basic form, to provide constant ratio control, i.e., a set ratio of air-to-gas regardless of firing rate. And it only works due to the flow law that we defined above. This combustion system consists of the following bits of hardware:

- Combustion air fan: Fan delivers combustion air to the burner system at a reasonably constant pressure.
- Motor operated air control valve: Valves modulates the flow of air to the burner.
- Gas proportioning regulator/ratio regulator: This device is the “heart” of the system. Developed decades ago, it is still an accurate and economical means of controlling the proportion of gas to air.
- Limiting orifice: This device introduces a pressure drop in a flow line to allow for balancing or adjusting flow rate. In laymen’s terms, it is a needle valve.

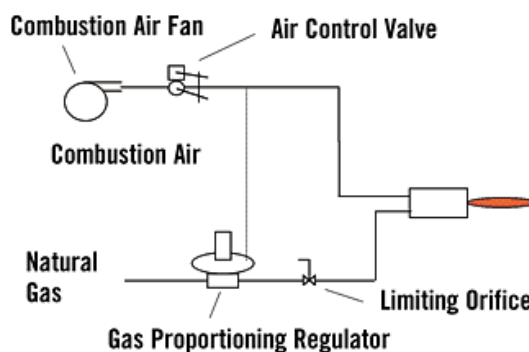


Figure 3.1.3: Combustion schematic diagram

3.2 Cost benefit analysis

The estimated annual energy saving by Automation of kiln combustion system is 31,584 SCM which is equivalent to about Rs. 9.8 lakhs. The investment requirement is Rs 11.2 lakh with a simple payback period of 1.7 years. The detailed calculations of the recommended energy conservation measures for DPR are provided in table 3.2.

Table 3.2: Cost benefit analysis for recommended energy savings measures

| Parameters | Unit | Existing | Proposed |
|---|----------|----------|-----------|
| Dry flue gas losses | kCal/SCM | 3,162 | 2964.9 |
| Percentage heat loss in waste gases | % | 35 | 33 |
| Reduction in heat loss in waste gases | % | - | 2.0 |
| Reduction in fuel consumption by optimization of combustion | SCM/Hour | - | 3.76 |
| Annual reduction in gas consumption | SCM/Year | - | 31,584 |
| Annual monetary benefits (@ Rs 31 per SCM) | Rs/year | - | 9,79,104 |
| Investment towards PLC/Servo Motor Based Automation | Rs | - | 8,97,860 |
| Other fabrication & Misc. charges @ 25 % | Rs | - | 2,24,465 |
| Total investment ² | Rs | - | 11,22,325 |
| Simple payback period | Years | - | 1.1 |

3.3 Pre-training requirements

The training would be required on preventive maintenance of combustion system of the kiln.

² Quotation - 1 has been considered for estimation of investments

3.4 Process down time for implementation

The estimated process down time required for implementation of recommended measure is estimated to be 5 days after commissioning and testing.

3.5 Environmental benefits

3.5.1 CO₂ reduction³

Implementation of the selected energy conservation measures in the unit may result in reduction in CO₂ emissions due to reduction in overall energy consumption. The estimated reduction in GHG emission by implementation of the recommended energy conservation measures is 55.3 tonne of CO₂ per year.

3.5.2 Reduction in other pollution parameters (gas, liquid and solid)

There is not significant impact on the reduction in other pollution parameters including gas, liquid and solid.

³ Source for emission factor: 2006 IPCC Guidelines for National Greenhouse Gas Inventories & electricity: CO₂ Baseline Database for the Indian Power Sector, user guide version 12.0, May 2017 (CEA)

4.0 Project financials

4.1 Cost of project and means of finance

4.1.1 Particulars of machinery proposed for the project

The particulars of machinery proposed for the project is given in table 4.1.1.

Table 4.1.1: Particulars of machinery proposed for the project

| S. No | Name of machinery (Model/ specification) | Name of manufacturer, contact person | Advantage | Disadvantage |
|-------|---|---|--------------------------------|-------------------------|
| 1 | PLC/Servo Motor Based Automation system | Yantra automation Pvt Ltd 101,102,103, Plot No 84, survey no.40 Ambedkar Road, Sangamwadi Pune-411001 | Reputed service provider | Not based in cluster |

4.1.2 Means of finance

The means of finance for the project is shown in table 4.1.2.

Table 4.1.2: Means of finance

| S. No. | Details | 100% equity | D/E- 70:30 | D/E- 50:50 |
|--------------|--------------------------------|-------------|-------------|-------------|
| 1 | Additional (Share) Capital | 11.2 | 3.4 | 5.6 |
| 2 | Internal Accruals | - | - | - |
| 3 | Interest free unsecured loans | - | - | - |
| 4 | Term loan proposed (Banks/FIs) | - | 7.9 | 5.6 |
| 5 | Others | - | - | - |
| Total | | 11.2 | 11.2 | 11.2 |

4.2 Financial statement (project)

4.2.1 Assumptions

The assumptions made are provided in table 4.2.1.

Table 4.2.1: Assumptions made

| Details | Unit | 100% equity | D/E- 70:30 | D/E- 50:50 |
|---|---------------|-------------|------------|------------|
| General about unit | | | | |
| No of working days | Days | | 350 | |
| No of shifts per day | Shifts | | 2 | |
| Annual operating hours | hrs/year | | 8400 | |
| Installed production capacity | tonnes/year | | - | |
| Production in last financial years | tonnes/year | | - | |
| Capacity utilization factor | % | | - | |
| Proposed investment (Project) | | | | |
| Total cost of the project | Rs. (in Lakh) | 11.2 | 11.2 | 11.2 |
| Investment without interest defer credit (IDC) | Rs. (in Lakh) | 11.2 | 11.2 | 11.2 |
| Implementation time | Months | 3.0 | 3.0 | 3.0 |

| Details | Unit | 100% equity | D/E- 70:30 | D/E- 50:50 |
|--|---------------|-------------|------------|------------|
| Interest during the implementation phase | Rs. in lakhs | - | 0.05 | 0.03 |
| Total investment | Rs. in lakhs | 11.2 | 11.3 | 11.3 |
| Financing pattern | | | | |
| Own funds | Rs. in lakhs | 11.2 | 3.4 | 5.6 |
| Loan funds (term loan) | Rs. in lakhs | - | 7.9 | 5.6 |
| Loan tenure | Years | - | 5.0 | 5.0 |
| Moratorium period (No EMI (interest and principal amount)) | Months | - | 3.0 | 3.0 |
| Total repayment period | Months | - | 60.0 | 60.0 |
| Interest rate | % | - | 10.5 | 10.5 |
| Estimation of costs | | | | |
| Operation & maintenance costs | % | | 5.0 | |
| Annual escalation rate of O&M | % | | 5.0 | |
| Estimation of revenue | | | | |
| Reduction in energy cost | Rs. lakh/year | | 9.8 | |
| Total saving | Rs. lakh/year | | 9.8 | |
| Straight line depreciation | % | | 16.21 | |
| IT depreciation | % | | 80.0 | |
| Income tax | % | | 33.99 | |
| Period of cash flow analysis | Years | | 5.0 | |

4.2.2 Payback

The simple payback period on the investments made are shown in table 4.2.2.

Table 4.2.2: Payback

| Details | 100% equity | D/E- 70:30 | D/E- 50:50 |
|--|-------------|------------|------------|
| Total project cost (Rs. In lakh) | 11.2 | 11.3 | 11.3 |
| Cash flow as annual saving (Rs. In lakh/year) | 9.8 | 9.8 | 9.8 |
| O&M Expenses for first year (Rs. In lakh/year) | 0.6 | 0.6 | 0.6 |
| Net Cash flow (Rs. In lakh/year) | 9.2 | 9.2 | 9.2 |
| SPP (months) | 14.6 | 14.7 | 14.6 |
| Considered (month) | 14.6 | 14.7 | 14.6 |

4.2.3 NPV and IRR

Table 4.2.3a: NPV and IRR (100% equity)

| Particulars/ years | 0 | 1 | 2 | 3 | 4 | 5 |
|---|--------|---------------|----------------|------|------|------|
| | | | | | | |
| | | | (Rs. in lakhs) | | | |
| Profit after tax | - | 7.41 | 4.78 | 4.36 | 4.24 | 4.20 |
| Depreciation | - | 1.82 | 1.82 | 1.82 | 1.82 | 1.82 |
| Cash outflow | 11.22 | - | - | - | - | - |
| Net cash flow | -11.22 | 9.23 | 6.60 | 6.18 | 6.06 | 6.02 |
| Discount rate % @ WACC | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 |
| Discount factor | 1.00 | 0.92 | 0.84 | 0.77 | 0.70 | 0.64 |
| Present value | -11.22 | 8.45 | 5.53 | 4.74 | 4.25 | 3.87 |
| Net present value | | 15.61 | | | | |
| Simple IRR considering regular cash flow | | 60.95% | | | | |

Table 4.2.3b: NPV and IRR (D/E- 70:30)

| Particulars / years | 0 | 1 | 2 | 3 | 4 | 5 |
|---|----------------|-------|-------|-------|-------|-------|
| | (Rs. in lakhs) | | | | | |
| Profit after tax | - | 7.00 | 4.46 | 3.98 | 3.97 | 4.05 |
| Depreciation | - | 1.83 | 1.83 | 1.83 | 1.83 | 1.83 |
| Cash outflow | 11.27 | - | - | - | - | - |
| Net cash flow | -11.27 | 8.83 | 6.29 | 5.81 | 5.80 | 5.88 |
| Discount rate % @ WACC | 10.10 | 10.10 | 10.10 | 10.10 | 10.10 | 10.10 |
| Discount factor | 1.00 | 0.91 | 0.83 | 0.75 | 0.68 | 0.62 |
| Present value | -11.27 | 8.02 | 5.19 | 4.35 | 3.94 | 3.63 |
| Net present value | 13.86 | | | | | |
| Simple IRR considering regular cash flow | 56.83% | | | | | |

Table 4.2.3c: NPV and IRR (D/E- 50:50)

| Particulars / years | 0 | 1 | 2 | 3 | 4 | 5 |
|---|----------------|------|------|------|------|------|
| | (Rs. in lakhs) | | | | | |
| Profit after tax | - | 7.12 | 4.55 | 4.09 | 4.05 | 4.09 |
| Depreciation | - | 1.82 | 1.82 | 1.82 | 1.82 | 1.82 |
| Cash outflow | 11.26 | - | - | - | - | - |
| Net cash flow | -11.26 | 8.94 | 6.38 | 5.92 | 5.87 | 5.92 |
| Discount rate % @ WACC | 9.90 | 9.90 | 9.90 | 9.90 | 9.90 | 9.90 |
| Discount factor | 1.00 | 0.91 | 0.83 | 0.75 | 0.69 | 0.63 |
| Present value | -11.26 | 8.14 | 5.28 | 4.46 | 4.03 | 3.70 |
| Net present value | 14.35 | | | | | |
| Simple IRR considering regular cash flow | 58.01% | | | | | |

4.3 Marketing & selling arrangement

The marketing and selling arrangements of the unit are given in table 4.3.

Table 4.3: Marketing & selling arrangements

| Items | Remarks |
|---|--------------|
| Main Markets (locations) | Pan India |
| Locational advantages | - |
| Any USP or specific market strength | - |
| Whether product has multiple applications | NA |
| Distribution channels (e.g. direct sales, retail network, distribution network) | Direct sales |
| Marketing team details, if any. | NA |

4.4 Risk analysis and mitigation

The risk analysis and mitigation for the proposed options are given in table 4.4.

Table 4.4: Risk analysis and mitigation

| Type of risk | Description | Mitigation |
|--------------|---|---|
| Technology | The equipment/technology provided by the supplier may not | The equipment/technology should be procured from standard/reputed vendors |

| Type of risk | Description | Mitigation |
|-------------------|---|---|
| | be of high quality, which may result in underperformance. | only. |
| Market /Product | Demand of the product manufactured by the unit may change resulting in lower capacity utilization. | Regular vigilance/tab on the market scenario by the SME will help in better understanding of new substitute product. The unit may modify the product line based on the emerging market trend. |
| Policy/Regulatory | Changes in government regulation/policy related to pollution and taxes & duties can affect the viability of the unit. | Local industrial association may play a role in discussing these issues with the relevant governmental bodies on a regular basis, so that any concerns of the unit are brought to their notice. |

4.5 Sensitivity analysis

A sensitivity analysis for various scenarios which may affect the return on investment is given in table 4.5.

Table 4.5: Sensitivity analysis

| S. No. | Scenario | D/E ratio | Payback period (months) | NPV (Rs lakh) | IRR (%) | DSCR | ROI (%) |
|--------|------------------------------------|-------------|-------------------------|---------------|---------|------|---------|
| 1 | 10% increase in estimated savings | 100% equity | 14.5 | 15.7 | 6.1 | - | 26.7 |
| | | 70:30:00 | 14.6 | 15.5 | 6.1 | 0.1 | 27.2 |
| | | 50:50:00 | 14.5 | 15.6 | 6.1 | 0.0 | 27.1 |
| 2 | 10% reduction in estimated savings | 100% equity | 14.5 | 15.7 | 6.1 | - | 26.7 |
| | | 70:30:00 | 14.6 | 15.5 | 6.1 | 0.1 | 27.2 |
| | | 50:50:00 | 14.5 | 15.6 | 6.1 | 0.0 | 28.1 |
| 3 | 10% rise in interest rates | 70:30:00 | 14.6 | 15.5 | 6.1 | 0.1 | 27.2 |
| | | 50:50:00 | 14.5 | 15.5 | 6.1 | 0.0 | 27.1 |
| 4 | 10% reduction in interest rates | 70:30:00 | 14.6 | 15.6 | 6.1 | 0.1 | 27.2 |
| | | 50:50:00 | 14.5 | 15.6 | 6.1 | 0.0 | 27.1 |

5.0 Conclusions & recommendations

The DPR prepared for the automation of kiln combustion system based on the performance assessment study conducted at unit and the acceptance of the unit management. The brief of selected energy conservation measure is given below.

5.1 List of energy conservation measures

The brief summary of the energy conservation measures are given in table 5.1.

Table 5.1: Summary of the energy conservation measures

| Technology | Annual energy saving | Investment (Rs lakh) | Monetary savings | Simple payback period (Years) | Emission reduction (tonnes of CO ₂) |
|--------------------------------------|----------------------|----------------------|------------------|-------------------------------|---|
| | NG (SCM) | | (Rs lakh/year) | | |
| Automation of kiln combustion system | 31,584 | 11.2 | 9.8 | 1.1 | 55.3 |

The measure has an estimated investment of 11.2 lakh rupees and can yield a savings of 9.8 lakh rupees per year. The total annual reduction in emission by implementation of recommended measure is estimated to be 55.3 tonnes of CO₂. The financial indicators provided above in the table shows the project is financially viable and technically feasible.

5.2 Summary of the project

The summary of the project is given in table 5.2.

Table 5.2: Summary of the project

| S. No. | Particulars | Unit | 100% equity | D/E- 70:30 | D/E- 50:50 |
|--------|-----------------|-------------|-------------|------------|------------|
| 1 | Cost of Project | Rs. In Lakh | 11.2 | 11.2 | 11.2 |
| 2 | D/E Ratio | - | - | 70:3 | 1:1 |
| 3 | Project IRR | % | 61.0 | 56.8 | 58.0 |
| 4 | NPV | Rs. In Lakh | 15.6 | 13.9 | 14.4 |
| 5 | DSCR | - | - | 2.1 | 0.9 |

5.3 Recommendations

The financial indicators provided above show the project is financially viable and technically feasible. It is recommended that the implementation of the identified the energy conservation measures may be undertaken by the unit.

6.0 Financing schemes for EE investments for MSME sector

Government of India has many schemes to provide concessional finance for EE technologies among MSMEs. Some major government schemes are summarised in table 6.1.

Table 6.1: Major government schemes

| Name of the scheme | Brief Description and key benefits |
|---|--|
| ZED assessment and certification | <p>Assessment process, fee and subsidy are as follows: Online (e-Platform) self-assessment: Nil fee Desk Top assessment : Rs 10,000 per SME Complete assessment : Rs 80,000 ZED rating per SME; Rs 40,000 for additional ZED defence rating; Rs 40,000 for re-rating The rating costs will include cost of Rs 10,000/- as certification cost by QCI. Subsidy for Micro, Small and Medium Enterprises are 80%, 60% and 50% respectively.</p> |
| Credit Linked Capital Subsidy Scheme (CLCSS) (2000-ongoing) | <p>15% capital subsidy of cost of eligible plant and machinery / equipment for adoption of proven technologies for approved products / sub-sectors for MSE units subject to ceiling of INR 15 lakhs</p> |
| Credit Guarantee Fund Scheme for Micro and small Enterprises (in partnership with SIDBI) (2000-ongoing) | <p>This scheme was launched by MoMSME and SIDBI to alleviate the problem of collateral security and enable micro and small scale units to easily adopt new technologies. Under the scheme, collateral free loans up to Rs 1 crore can be provided to micro and small scale units. Additionally, in the event of a failure of the SME unit which availed collateral free credit facilities to discharge its liabilities to the lender, the Guarantee Trust would guarantee the loss incurred by the lender up to 75 / 80/ 85 per cent of the credit facility.</p> |
| Technology and Quality Up gradation Support to MSMEs (TEQUP) (2010-ongoing) | <p>The benefits available to SMEs under TEQUP include –technical assistance for energy audits, preparation of DPRs and significant capital subsidy on technologies yielding an energy savings of over 15%. The scheme offers a subsidy of 25% of the project cost, subject to a maximum of Rs. 10 lakhs. TEQUP, a scheme under NMCP, focuses on the two important issues in enhancing competitiveness of the SME sector, through EE and Product Quality Certification.</p> |
| Technology Upgradation Fund Scheme (TUFS) (1999-ongoing) | <p>Interest subsidy and /or capital subsidy for Textile and Jute Industry only.</p> <ol style="list-style-type: none"> To facilitate Technology Up gradation of Small Scale (SSE) units in the textile and jute industries. Key features being: <ul style="list-style-type: none"> Promoter's margin -15%; Subsidy - 15% available on investment in TUF compatible machinery subject to ceiling of Rs 45 lakh; Loan amount - 70% of the cost of the machinery by way of Term Loan |

| Name of the scheme | Brief Description and key benefits |
|--------------------|---|
| | <ul style="list-style-type: none"> • Interest rate: Reimbursement of 5% on the interest charged by the lending agency on a project of technology upgradation in conformity with the Scheme • Cover under Credit Guarantee Fund Scheme for Micro and Small Enterprises (CGMSE) available <p>2. To enable technology upgradation in micro and small power looms to improve their productivity, quality of products and/ or environmental conditions</p> <ul style="list-style-type: none"> • 20% margin subsidy on investment in TUF compatible specified machinery subject to a ceiling of Rs 60 lakhs or Rs 1crore (whichever is applicable) on subsidy amount to each unit - released directly to the machinery manufacturer. |
| Tax incentives | <ul style="list-style-type: none"> • Accelerated depreciation is provided to the customers / users of the energy saving or renewable energy devises under the direct tax laws. • Under indirect taxes, specific concessional rates of duty are only available to CFLs and not to all energy efficient products • A further waiver of import tariffs and taxes for EE technology imports are dealt on a case to case basis, meaning higher costs for those imported technologies that are not available in the domestic markets at present. |

Two financing schemes have been created by Bureau of Energy Efficiency (BEE) under The National Mission for Enhanced Energy Efficiency (NMEEE) for financing of energy efficiency projects - Venture Capital for Energy Efficiency (VCFEE) and Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE). These funds seek to provide appropriate fiscal instruments to supplement the efforts of the government for creation of energy efficiency market. Highlights of these two schemes are provided in the table 6.2.

Table 6.2: BEE’s VCFEE and PRGFEE scheme

| | |
|--|--|
| Venture Capital for Energy Efficiency (VCFEE) | <ul style="list-style-type: none"> • This fund is to provide equity capital for energy efficiency projects in Government buildings and Municipalities in the first phase. • A single investment by the fund shall not exceed Rs 2 crore • Fund shall provide last mile equity support to specific energy efficiency projects, limited to a maximum of 15% of total equity required, through Special Purpose Vehicle (SPV) or Rs 2 crore, whichever is less |
| Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) | <ul style="list-style-type: none"> • A PRGF is a risk sharing mechanism lowering the risk to the lender by substituting part of the risk of the borrower by granting guarantees ensuring repayment of part of the loan upon a default event. • Guarantees a maximum 50% of the loan (only principal). In case of default, the fund will: <ul style="list-style-type: none"> ○ Cover the first loss subject to maximum of 10% of the total guaranteed amount ○ Cover the remaining default (outstanding principal) amount on |

| | |
|---|---|
| Venture Capital for Energy Efficiency (VCFEE) | <ul style="list-style-type: none"> This fund is to provide equity capital for energy efficiency projects in Government buildings and Municipalities in the first phase. A single investment by the fund shall not exceed Rs 2 crore Fund shall provide last mile equity support to specific energy efficiency projects, limited to a maximum of 15% of total equity required, through Special Purpose Vehicle (SPV) or Rs 2 crore, whichever is less |
| | <p style="text-align: center;">partial basis upto the maximum guaranteed amount</p> <ul style="list-style-type: none"> PFI shall take guarantee from the PRGFEE before disbursement of loan to the borrower. The Guarantee will not exceed Rs 300 lakh per project or 50% of loan amount, whichever is less. Maximum tenure of the guarantee will be 5 years from the date of issue of the guarantee |

Indian Renewable Energy Development Agency (IREDA), a non-banking financial institution established by the government also extends financial assistance for setting up projects relating to new and renewable sources of energy and energy efficiency/conservation. The detailed financing guidelines for energy efficiency projects are provided in table 6.3.

Table 6.3: IREDA's financing guidelines

| | |
|--|---|
| Eligible companies who can apply | Private Sector Companies/ firms, Central Public Sector Undertaking (CPSU), State Utilities/ Discoms/ Transcos/ Gencos/ Corporations, Joint Sector Companies which are not loss making. |
| Minimum loan amount | <ul style="list-style-type: none"> Rs. 50 lakh |
| Type of projects considered for term loans | <ul style="list-style-type: none"> Replacement / retrofit of selected equipment with energy efficient equipment Modification of entire manufacturing processing Recovery of waste heat for power generation |
| Incentive available | <ul style="list-style-type: none"> Rebate in central excise duty Rebate in interest rate on term loan Rebate in prompt payment of loan instalment |
| Interest rate | <ul style="list-style-type: none"> 10.60% to 11.90% depending upon the grading of the applicant with prompt payment rebate of 15 bps if payment is made on / before due dates Interest rates are floating and would be reset on commissioning of the project or two years from the date of first disbursement. Thereafter, the rates will be reset after every two years. Rebate of 0.5% in interest rates are available for projects set up in North Eastern States, Sikkim, J&K, Islands, Estuaries. Rebates of 0.5% in interest rates are also available for projects being set up by SC/ST, Women, Ex Servicemen and Handicapped categories involving project cost of upto Rs. 75.00 lakh. |
| Loan | Upto 70% of the total project cost. Promoter's contribution should be Minimum 30% of the total project cost |
| Maximum debt | 3:1 |

| | |
|--------------------------|---|
| equity ratio | The project cash flow should have a minimum average Debt Service Coverage Ratio of 1.3 |
| Maximum repayment period | 12 years with moratorium of maximum 12 months |
| Procurement procedures | The borrower is required to follow the established market practices for procurement and shall demonstrate that the quality goods and services are being purchased at reasonable and competitive prices. Wherever the loan is sanctioned against international lines of credit such as the World Bank, Asian Development Bank, kfW, etc., the relevant procedures will have to be followed and requisite documents will have to be submitted by the borrower |

Small Industries Development Bank of India (SIDBI) has several schemes and focused lines of credit for providing financial assistance for energy efficiency and cleaner production projects for SMEs. Highlights of some of the major financial assistance schemes/projects managed by SIDBI are given in table 6.4.

Table 6.4: Major EE financing schemes/initiatives of SIDBI

| | |
|--|---|
| End to End Energy Efficiency (4E) Program | <p>Support for technical /advisory services such as:</p> <ul style="list-style-type: none"> • Detailed Energy Audit • Support for implementation • Measurement & Verification <p>Financing terms:</p> <ul style="list-style-type: none"> • Terms loans upto 90% • Interest rate upto 3% below normal lending rate. |
| TIFAC-SIDBI Revolving Fund for Technology Innovation (Srijan Scheme) | <p>To support SMEs for up-scaling and commercialization of innovative technology based project at flexible terms and interest rate.</p> <p>Preference accorded to sustainable technologies / products. Soft term loan with an interest of not more than 5%.</p> |
| Partial Risk Sharing Facility for Energy Efficiency (PRSF) Project (supported by World Bank) | <p>Sectors covered:</p> <ul style="list-style-type: none"> • Large industries (excluding thermal power plants) • SMEs • Municipalities (including street lighting) • Buildings <p>Coverage:</p> <ul style="list-style-type: none"> • The minimum loan amount Rs 10 lakh and maximum loan amount of Rs 15 crore per project. • The extent of guarantee is 75% of the loan amount |
| JICA-SIDBI Financing Scheme | <ul style="list-style-type: none"> • The loan is used to provide SMEs with funds necessary to invest in energy-saving equipment (and some medical equipment) in the form of two-step loans through SIDBI or three-step loans through intermediary financial institutions. |

| | |
|----------------------------|--|
| | <ul style="list-style-type: none"> • Project uses an Energy Saving Equipment List approach • Equipment/machinery with energy saving potential less than 10% is not eligible. • Interest rate: As per credit rating and 1% below the normal lending rate • Separate technical assistance component which is used for wetting of loan applications, holding seminars to raise awareness of energy saving among SMEs and to improve the ability of financial institutions to screen loan applications for energy-saving efforts |
| KfW-SIDBI Financing Scheme | <p>Coverage</p> <ul style="list-style-type: none"> a) SMEs for energy efficiency projects b) SMEs and clusters for cleaner production and emission reduction measures, waste management and Common Effluent Treatment Plant (CETP) facilities <p>Interest rate</p> <p>As per credit rating and 1% below the normal lending rate</p> <p>Eligible criteria</p> <p>3 t CO₂ emission reduction per year per lakh invested</p> <p>List of eligible equipment/technology and potential suppliers developed for guidance</p> |

State Bank of India (SBI) has been provided a green line of credit by Japan Bank for International Cooperation (JBIC) for financing of energy efficiency investments. Highlights of the line of credit are given in table 6.5.

Table 6.5: JBIC-SBI Green Line

| |
|--|
| <p><u>Key Features</u></p> <ul style="list-style-type: none"> • Amount : USD 90 million • Repayment Schedule: First repayment on May 30, 2017 and final repayment date May 30, 2025 (equal instalment) <p><u>Eligibility Criteria</u></p> <ul style="list-style-type: none"> • Projects contributing to preservation of global environment, i.e. significant reduction of GHG emissions • Acceptance of JBIC-MRV (“J-MRV”) by the project proponent in terms of the numerical effect of the environment preservation. To ensure effective GHG reduction emissions in Green financed projects, JBIC reviews such effects through simple and practical Measurement Reporting Verification (MRV) process both in (a) prior estimation and (b) ex-post monitoring. • Procurement in line with the “Guidelines for Procurement under Untied Loans by Japan Bank for International Cooperation” |
|--|

Canara bank has a dedicated scheme for financing EE investment among SME sector as mentioned in table 6.6.

Table 6.6: Canara bank scheme of EE SME loans

| Purpose | For acquiring/adopting energy conservation/savings equipment/measures by SMEs |
|-----------------------|---|
| Eligibility | Units under Small and Medium Enterprises Cost of energy for the unit should constitute not less than 20% of the total cost of production Unit should possess energy audit report issued by an approved energy Consultant/Auditor. Borrowal a/cs-ASCC code S1 or S2 during previous review. Current account holders having dealings exclusively with us satisfactorily for a period of last one year |
| Maximum loan | Maximum Rs 100 lakhs in the form of term loan |
| Security | Prime: Assets created out of loan Collateral: Upto Rs.5 lakhs – NIL Above Rs.5 lakhs, as determined by the bank |
| Repayment | Maximum 5-7 years including moratorium of 6 months |
| Guarantee cover | Cover available under CGMSE of CGTMSE available for eligible loans |
| Margin | 10% of the project cost |
| Rate of interest | 1% less than the applicable rate |
| Upfront fee | 1% of the loan |
| Insurance cover | Assets acquired and charged as security to Bank to be insured |
| Special offer, if any | Grants : Bank provides 25% of the cost of Energy Audit / Consultancy charges with a maximum of Rs 25000/- to the first 100 units on a first come first served basis which is in addition to the grant of Rs 25000/- being provided by IREDA(First 100 units) |

Among the private sector banks in India, Yes Bank is also active in financing of renewable energy and energy efficiency projects. The bank has an MOU with SIDBI for providing funding for EE through PRSF.

Most commercial banks charge interest rate between from 11% to 13% from MSMEs depending upon general criteria such as credit ratings, references, past lending record, balance sheet for last 3 years and so on. Interest rebate is offered for a few customers whose collateral value is around 125% of the loan amount. Further 0.5% concession in interest rate was offered to women entrepreneurs

Annexures

Annexure 1: Copy of certificates from competent authorities

DISTRICT INDUSTRIES CENTER, RAJKOT
(Government of Gujarat)
M.S. BUILDING, 1ST FLOOR, BLOCK NO. 12, RACE COURSE ROAD, RAJKOT,
Ph. 02812476376, Fax No. 02812476293 (E-Mail : gm-dic-raj@gujarat.gov.in)

No. DIC/RAJ/EM/Part-2/ **3559 14/9/09** Form No. **942**

**ENTREPRENEURS' MEMORANDUM FOR SETTING UP MICRO, SMALL OR MEDIUM ENTERPRISE
ACKNOWLEDGEMENT FOR PART - II**

M/s. KALYAN GLAZED TILES HAS FILED MEMORANDUM FOR A MANUFACTURING ENTERPRISE AT THE ADDRESS S-A N.H At Village - JAMBUDIYA, At Taluka - MORVI, At District - RAJKOT, PIN - 363642 FOR THE ITEM/ITEMS INDICATED BELOW AND THE ACTIVITY HAS COMMENCED FROM THE DATE - 27/05/1996 AS STATED IN FORM NO. 942 AND ALLOCATED ENTREPRENEURS' MEMORANDUM NO AS BELOW:

MAIN ITEMS MANUFACTURED
MANUFACTURE OF CERAMIC BUILDING MATERIAL, OTHER THAN BRICKS, FLOORING BLOCKS, ROOFING TILES, WALL TI

DETAILS OF THE ITEMS MANUFACTURED

| Sr.No. | Items Manufactured | CAPACITY PER ANNUM | |
|--------|----------------------|--------------------|------|
| | | QTY | UNIT |
| 1 | CERAMIC GLAZED TILES | 15000 | MTS |

NOTE: THE ISSUE OF THIS ACKNOWLEDGEMENT DOES NOT BESTOW ANY LEGAL RIGHT. THE ENTERPRISE HAS TO SEEK REQUISITE CLEARANCE/LICENCE/PERMIT REQUIRED UNDER STATUTORY OBLIGATION SHIPRA/LLI UNDER THE LAWS OF CENTRAL GOVERNMENT/STATE GOVERNMENT/ADMINISTRATOR/COURT ORDERS.

DATE OF CHANGE OF CATAGORY FROM MICRO/S SMALL TO SMALL/MEDIUM OR VICE VERSA

DATE OF ISSUE 05/09/2009

NATURE OF ACTIVITY (MANUFACTURING-1, SERVICES-2) 1

CATEGORY OF ENTERPRISE (MICRO-1, SMALL-2, MEDIUM-3) 2

ENTREPRENEURS MEMORANDUM NUMBER (PART - II) 24 - 009 - 12 - 03793

(First two digit = State, Next three digit = District code, sixth digit = Nature of Activity, seventh digit = category of enterprise and last five digit are for Entrepreneurs' Memorandum)

DATE 05/09/2009
PLACE RAJKOT OFFICE SEAL

To,
M/s. KALYAN GLAZED TILES
MANSUKHBHAI K. PATEL
S-A N.H
JAMBUDIYA, MORVI, RAJKOT

[Signature]
GENERAL MANAGER
DISTRICT INDUSTRIES CENTER,
PAJKOT.

Annexure 2: Budgetary offers / quotations

Quotation 1: Yantra Automation Pvt Ltd



Date: - 24 MAR 2018
Ref: YAPL/MOR/MAR 18/AB/3541

YANTRA AUTOMATION PVT LTD
101,102,103, Plot No 84, survey no.40,
Ambedkar Road, Sangamwadi, Near
RTO OFFICE, PUNE-411001 INDIA
Phone: 020-26053200

To,
The Energy & Resources Institute, (TERI)

Kind Attention: Mr. Vivek Sharma,
Email: vivek.sharma@teri.res.in
Mobile: 09850366248

Sub: Quotation for RA Hardware.

Dear Sir,

Please find enclosed herewith our offer for RA make Hardware

We are the largest authorized distributor and channel partner of Rockwell Automation (Allen Bradley) products in India. Rockwell is one of the largest manufacturers of Automation products in the world.

We have forwarded you our prices and now look forward to receive your valuable purchase order. Please feel free to call us in case you need any further technical/Commercial clarifications/Information.

Please note that this quotation is valid for 30 Days from the date shown above. All typographical and clerical errors are subject to correction. I hope these prices meet with your approval and look forward to hearing from you. Please do not hesitate to contact in case of any assistance.

Assuring you our best attention

Yours Sincerely

Atul Jain
Sr. Sales Engineer
Yantra Automation Pvt. Ltd.
9689949782



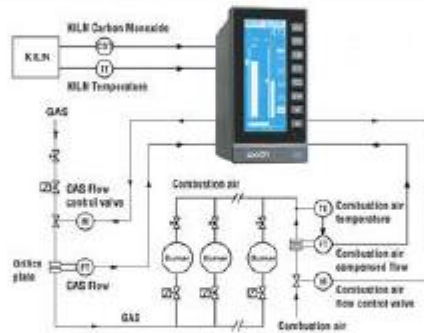


YANTRA AUTOMATION PVT LTD
 101,102,103, Plot No 84, survey no.40,
 Ambedkar Road, Sangamwadi, Near
 RTO OFFICE, PUNE-411001 INDIA
 Phone: 020-26053200

Date: - 24 MAR 2018
 Ref: YAPL/MOR/MAR 18/AB/3541

Bill of Material:

| Product | Description | Qty | Unit Price |
|--------------------|--|-----|------------|
| 20F1ANC170ANONNNNN | PowerFlex 753 AC Drive, with Embedded I/O, Air Cooled, AC Input with Precharge, no DC Terminals, Open Type, 170 Amps, 400 VAC, 3 phase, Filtered, CM Jumper Removed, None, Blank (No HIM) 35 adjustable temperature sensors (thermopairs), that control 10 servo motors and 22 electrovalves | 1 | 337,380 |
| 20-750-2262C-2R | PF750-24V I/O Module-2AI,2AO,6DI,2RO (RealTek RTL8019AS device) | 10 | 5,580 |
| 20-HIM-A6 | Burner Servomotor SQN91.140B2793 | 10 | 12,500 |



Terms and Conditions:

| | |
|--------------------|---|
| Price Basis: | Ex works Pirangut godown. |
| Duties & Taxes: | GST At actual. |
| Delivery : | 6 to 8 weeks from receipt of your Techno-commercial clear P.O |
| Payment : | 30% Advance & balance against Proforma Invoice. |
| Warranty: | 12 months from the date of Yantra invoice. |
| Validity: | 30 Days from the date of offer. |
| Transit Insurance: | In your scope. |
| P & F : | 2% Extra |
| Freight : | Extra at actual |
| Note: | MOQ will be applicable if any. |



Annexure 3: Instruments used

| Instruments | Model/ Make | Application | Accuracy |
|----------------------------------|------------------------------|--|-------------------------------------|
| Power analysers | Fluke: 435, Fluke: 43B, | Electrical Parameters Harmonics analysis, power logging | ± 0.5% |
| Flue gas analyser | Testo: 330-2LL | Flue gas O ₂ , CO, CO ₂ & Temperature | ±0.1vol%, 1ppm, 1ppm, 0.1°C |
| Thermal imager | 875-2/Testo | Surface Temperature & Image | ± 2% |
| Digital Temperature indicator | Comark: N1001, Testo: 925 | Temperature | ± 1% |
| Anemometer | Testo: 425, Airflow: TA45 | Air Velocity | ±(0.03 m/s +5% of mv) |
| Differential pressure meter | Testo: 512 | Air pressure | 0.5% full-scale value / ±1 digit |
| Temperature data logger | 175-T3/Testo | Temperature | ± 0.5% |