DETAILED PROJECT REPORT
ON
ENERGY EFFICIENT MOTOR IN ROTARY FURNACE
(15 HP)
(BATALA, JALANDHAR, LUDHIANA FOUNDRY CLUSTER)

ENERGY IS LIFE
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Bureau of Energy Efficiency (BEE)

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ENERGY EFFICIENT MOTOR IN ROTARY FURNACE (15 HP)

BATALA, JALANDHAR, LUDHIANA FOUNDRY CLUSTER

BEE, 2011

Detailed Project Report on Energy Efficient Motor in Rotary Furnace (15 HP)

Foundry SME Cluster, Batala, Jalandhar , Ludhiana (Punjab) (India)

New Delhi: Bureau of Energy Efficiency

Detail Project Report No.: **BJL/CAP/EEM/02**

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CII – AVANTHA Centre for Competitiveness for SMEs
Confederation of Indian Industry
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List of Abbreviations

BEE	Bureau of Energy Efficiency
SME	Small and Medium Enterprises
DPR	Detailed Project Report
GHG	Green House Gases
DSCR	Debt Service Coverage Ratio
NPV	Net Present Value
IRR	Internal Rate of Return
ROI	Return on Investment
ROI	- Return on Investment
MoP	- Ministry of Power
MSME	- Micro Small and Medium Enterprises
MoMSME	- Ministry of Micro Small and Medium Enterprises
SIDBI	- Small Industrial Development Bank of India

EXECUTIVE SUMMARY

Confederation of Indian Industry is executing BEE-SME program in Batala, Jalandhar and Ludhiana Foundry Cluster, supported by Bureau of Energy Efficiency (BEE) with an overall objective of improving the energy efficiency in cluster units.

Batala, Jalandhar and Ludhiana Foundry cluster, is one of the largest Foundry clusters in India; accordingly this cluster was chosen for energy efficiency improvements by implementing energy efficient measures / technologies, so as to facilitate maximum replication in other Foundry clusters in India. The main energy forms used in the cluster units are grid electricity and fuel such as coal, furnace oil and Diesel oil.

Most of the Industrial installations in the country have large electrical loads which are severely inductive in nature, such as motors, large machines etc which results in a high power consumption. This means loss and wastage of energy by electricity boards as well as for Foundry units. Upto some extent this can be taken care by installation of Energy Efficient Motors in place of Old / Re-winded Motors in Rotary Furnace.

During energy audit it was observed that the maximum of motors are re-winded more than 5 times which leads to lower operating efficiency resulting higher power consumption. Present operating efficiency of old motor is in the range of 75 to 80%.

Project implementation i.e. installation of 15 HP energy efficient motor in rotary furnace will lead to reduction in power consumption by 6221kWh per year about 12.5% power saving vis- a-vis existing operation.

This DPR highlights the details of the study conducted for assessing the potential for installation of energy efficient motor, and its monetary benefit, availability of the technologies/design, local service providers, technical features & proposed equipment specifications, various barriers in implementation, environmental aspects, estimated GHG reductions, capital cost, financial analysis, sensitivity analysis for three different scenarios and schedule of Project Implementation.

This bankable DPR also found eligible for subsidy scheme of MoMSME for “Technology and Quality Upgradation Support to Micro, Small and Medium Enterprises” under “National Manufacturing and Competitiveness Programme”. The key indicators of the DPR including the Project cost, debt equity ratio, monetary benefit and other necessary parameters are given in table below:

S. No.	Particular	Unit	Value
1	Project cost	`(in lakh)	0.60
2	Power saving per year	kWh	5984
3	Monetary benefit	`(in lakh)	0.30
4	Debit equity ratio	Ratio	3 : 1
5	Simple payback period	Years	2.01
6	NPV	`(in lakh)	0.55
7	IRR	%age	34.58
8	ROI	%age	26.65
9	DSCR	Ratio	2.13
10	Process down time	hours	6 to 8
11	CO_2 emission reduction	Tonne/year	4.85

The projected profitability and cash flow statements indicate that the project implementation will be financially viable and technically feasible.

ABOUT BEE'S SME PROGRAM

Bureau of Energy Efficiency (BEE) is implementing a BEE-SME Programme to improve energy performance in 29 selected SMEs clusters. Batala, Jalandhar and Ludhiana Foundry Cluster is one of them. The BEE's SME Programme intends to enhance energy efficiency awareness by funding/subsidizing need based studies in SME clusters and giving energy conservation recommendations. For addressing the specific problems of these SMEs and enhancing energy efficiency in the clusters, BEE will be focusing on energy efficiency, energy conservation and technology up gradation through studies and pilot projects in these SMEs clusters.

Major Activities in the BEE - SME Program are furnished below:

Activity 1: Energy Use and Technology Audit

The energy use technology studies would provide information on technology status, best operating practices, gaps in skills and knowledge on energy conservation opportunities, energy saving potential and new energy efficient technologies, etc for each of the sub sector in SMEs.

Activity 2: Capacity Building of Stake Holders in Cluster on Energy Efficiency

In most of the cases SME entrepreneurs are dependent on the locally available technologies, service providers for various reasons. To address this issue BEE has also undertaken capacity building of local service providers and entrepreneurs/ managers of SMEs on energy efficiency improvement in their units as well as clusters. The local service providers will be trained in order to be able to provide the local services in setting of energy efficiency projects in the clusters.

Activity 3: Implementation of Energy Efficiency Measures

To implement the technology up gradation projects in clusters, BEE has proposed to prepare the technology based detailed project reports (DPRs) for a minimum of five technologies in three capacities for each technology.

Activity 4: Facilitation of Innovative Financing Mechanisms for Implementation of Energy Efficiency Projects

The objective of this activity is to facilitate the uptake of energy efficiency measures through innovative financing mechanisms without creating market distortion.

1 INTRODUCTION

1.1 Brief Introduction about the Cluster

Indian foundry industry is very energy intensive. The energy input to the furnaces and the cost of energy play an important role in determining the cost of production of castings. Major energy consumption in medium and large scale foundry industry is the electrical energy for induction and Arc furnaces. Furnace oil is used in rotary furnaces. In Small foundry industry, coal is used for metal melting in Cupola furnaces. The energy costs contribute about 25 - 30% of the manufacturing cost in Indian foundry industry.

There are approximately 450 units, engaged in Foundry Cluster (automobile parts, agricultural implements, machine tools, diesel engine components, manhole covers, sewing machine stands, pump-sets, decorative gates and valves) production. The major locations wherein the units are spread are G.T. Road, Industrial area, Focal Point in Batala. In Jalandhar Dada Colony Industrial Area, Focal point, Focal Point Extn, Udyog Nagar, I.D.C, Kapurthala Road & Preet Nagar. In Ludhiana Focal Point Phase 5 to 8, Janta Nagar, Bhagwan Chowk Area & Industrial area – A/B. .

Availability of Electricity in Batala – across Dhir Road, GT Road is an issue; power is available from the grid for maximum 12/14 hours a day. There are some units in Jalandhar and Ludhiana having induction furnace in the range of 500 kg to 1 ton capacity whereas other units which are using local scrap as well as have high melting temperatures are having cupola and rotary furnace and has a capacity of minimum 5 ton per day.

The foundry produces a wide variety of castings such as manhole covers, pipe and pipe fittings, sanitary items, tube well body, metric weights, automobile components, railway parts, electric motor, fan body etc. 90% of the castings produced are from the SSI sector.

Energy Usage Pattern

Major energy sources being used in foundry cluster are electricity and fuels such as Coal, Furnace Oil, and Diesel. Electrical energy is being used in melting of iron in induction furnaces, operation of electrical utilities and thermal energy is being used in cupola furnaces operation.

Classification of Units

Broadly units are classified with respect to production capacity;

- Large Scale Units
- Medium Scale Units
- Small Scale Units

Production wise unit breakup

Foundry cluster at Batala, Jalandhar and Ludhiana can be broken into three categories viz. small, medium and large size unit. Table 1.1 shows that production wise breakup of Foundry cluster.

Table 1.1 production wise unit breakups

S. No.	Type of Unit	Production Capacity
1	Large scale unit	More than 1500 MT
2	Medium scale unit	250 to 1500 MT
3	Small scale unit	Less than 250 MT

Products Manufactured

Foundry SME cluster at Batala, Jalandhar and Ludhiana produces a wide variety of castings such as manhole covers, pipe and pipe fittings, sanitary items, tube well body, metric weights, automobile components, railway parts, electric motor, fan body etc.

A general process flow diagram of foundry cluster is shown in figure below:

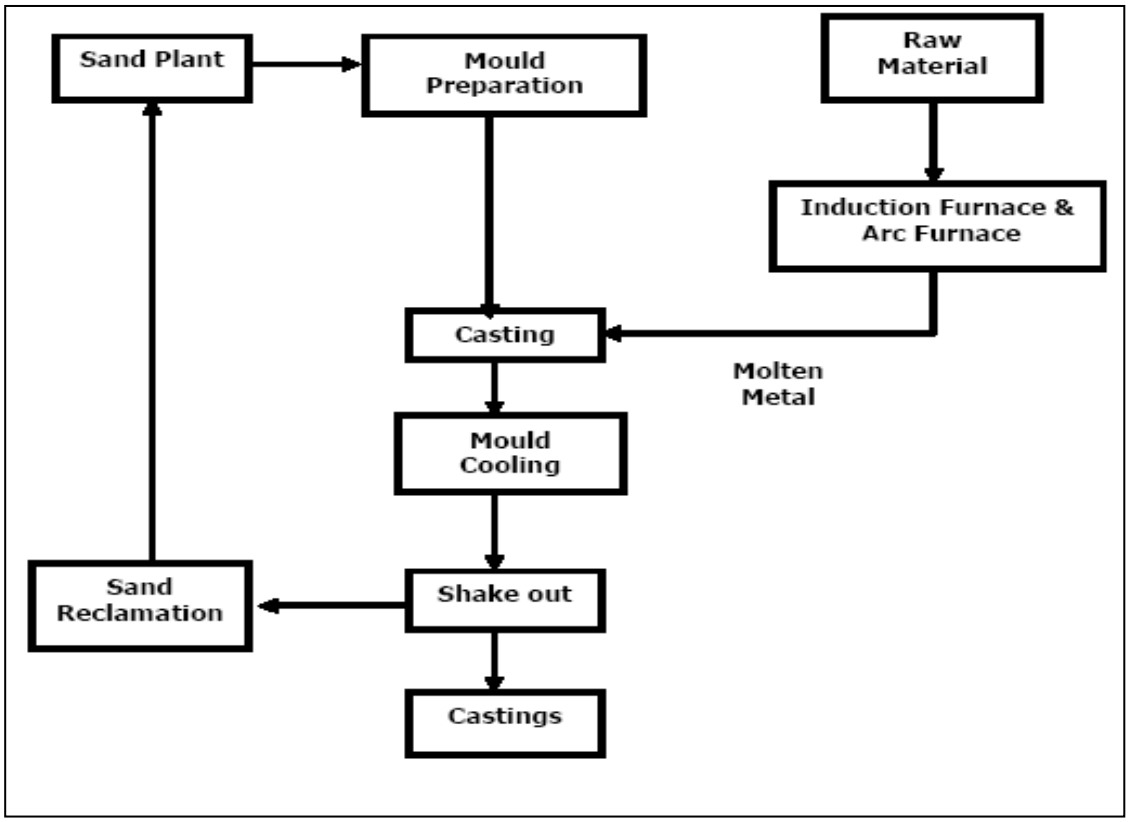


Figure 1.1: Process Flow diagram of a Foundry Cluster

The manufacturing process is described as below;

Melting Section:

The raw material is melted in melting furnace. The melting furnace can be an induction furnace or rotary or arc furnace or cupola furnace. Molten metal from the melting furnace is tapped in Ladles and then transferred to the holding furnaces. Typically the holding furnaces are induction furnaces. The holding furnace is used to maintain the required molten metal temperature and also acts as a buffer for storing molten metal for casting process. The molten metal is tapped from the holding furnace whenever it is required for casting process.

Sand Plant:

Green sand preparation is done in the sand plant. Return sand from the molding section is also utilized again after the reclamation process. Sand Millers are used for green sand preparation. In the sand millers, green sand, additives and water are mixed in appropriate proportion. Then the prepared sand is stored in bunkers for making moulds.

Pattern Making:

Patterns are the exact facsimile of the final product produces. Generally these master patterns are made of aluminum or wood. Using the patterns the sand moulds are prepared.

Mould Preparation:

In small-scale industries still the moulds are handmade. Modern plants are utilizing pneumatic or hydraulically operated automatic molding machines for preparing the moulds. After the molding process if required the cores are placed at the appropriate position in the moulds. Then the moulds are kept ready for pouring the molten metal.

Casting:

The molten metal tapped from the holding furnace is poured into the moulds. The molten metal is allowed to cool in the moulds for the required period of time and the castings are produced. The moulds are then broken in the shake out for removing the sand and the used sand is sent back to the sand plant for reclamation and reuse. The castings produced are sent to fettling section for further operations such as shot blasting, heat treatment etc. depending upon the customer requirements.

1.2 Energy performance in existing situation

Major energy sources being used in foundry cluster are electricity and fuels such as Coal, Furnace Oil, and Diesel. Electrical energy is being used in melting of iron in induction

furnaces, operation of electrical utilities and thermal energy is being used in cupola furnaces and in rotary furnace operation.

1.2.1 Average Production

The Average Production of the Foundry Units is represented in figure 1.2 below during Year 2009-10 are as follows;

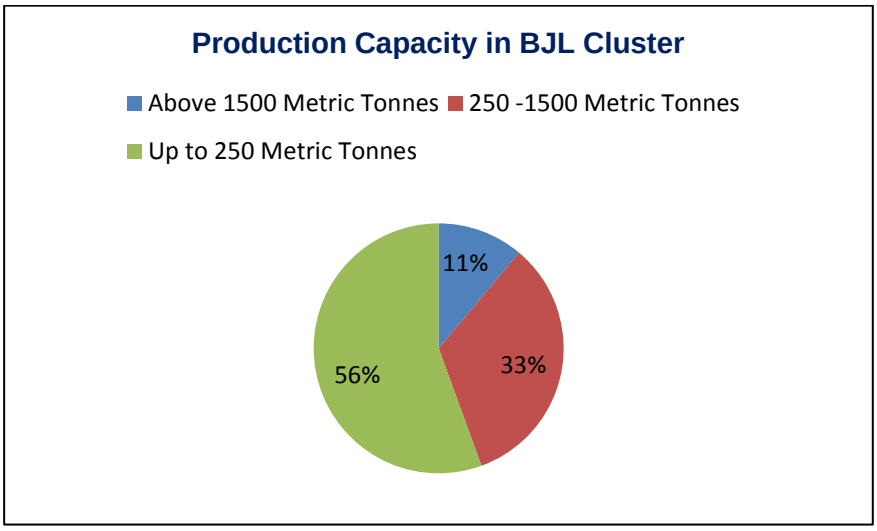


Figure 1.2: Production Capacity BJL Foundry cluster

1.2.2 Energy Consumption

Energy consumption (electrical) in a typical Foundry plant for different types of products is given in Table 1.2 below:

Table 1.2: Annual Energy Consumption

Electricity Consumption Pattern	Unit Consumed in kWh	Total Unit Consumption kWh
Blower Motor for Cupola	962100	26.92 Lakh
Rotary Motor for Rotary Furnace	330000	
Melting material in Induction Furnace	1400000	

Table 1.3: Annual Thermal Energy Consumption

Thermal Energy Consumption Pattern	Consumption per Year
Coal for Cupola	5000 Metric Tonnes
Furnace Oil for Rotary Furnace	17.8 Lakh Litter

1.2.3 Specific Energy Consumption

Specific energy consumption of Foundry units depends upon the production capacity & their corresponding power consumption. Specific energy consumption also depends on type of furnace. A brief summary of specific energy consumption depending upon type of furnace is shown in below table;

Table 1.4: Annual Thermal Energy Consumption

Sl. No	Types of Furnace	Types of Fuel	Specific Fuel Consumption / One kg Molten Material	In Terms of Rupees
1	Cupola	Coal	0.2 kg	` 3.00
2	Rotary Furnace	Furnace Oil	0.15 Lt	` 4.20
3	Induction Furnace	Electricity	0.72 kWh	` 3.60

*Assuming Coal rate ` 15.0 /kg
*Assuming F.O rate ` 28.0 /Lt.
*Assuming electricity rate ` 5.0/kWh

1.3 Proposed Technology/Equipment

1.3.1 Description about the existing technology

Foundry Industry had taken the electricity connection from the Punjab State Electricity Board. In rotary furnace, a rotary motor is used in a Rotary Furnace. During the period of energy auditing, it observed that the motor used in the rotary furnace was very old and rewinded number of times and it is common practice in all the SME. As it well known that rewinded motor are not so efficient than the original motor because it is not rewinded efficiently.

A detail of existing compressor motor is given in the Table 1.4 below:

Table 1.4 Existing motor specifications

S.No	Details	Rotary motor
1	Model	IS 325
2	Rated HP	15
3	Rated Voltage	415
4	Frequency	50 Hz
5	Pole	4
6	RPM	1500

1.4 Establishing the Baseline for the Proposed Technology

Presently all the Foundry units in Batala, Jalandhar and Ludhiana are operating with very old and inefficient motors. The present power consumption of a motor is 11 kW. The motor is operated continuously for 15 hours in a day and for 300 days.

Table 1.5: Base line for proposed technology

S.No	Parameters	Details
1	Rated Capacity of motor	15 Hp
2	Existing power consumption	11 kW
3	Operating hours in a day	15 hrs
4	Annual Operating days	300
5	Present operating efficiency	80 %
6	Annual power consumption	49500 kWh

1.5 Barriers in adoption of propose technology

1.5.1 Technological Barrier

- Lack of awareness and information of the loss in terms of efficiency for re-winded and energy efficient motors
- Due to lack of technical knowledge and expertise, rewinded motor are used in the foundry units.
- In this cluster, like many others, there is lack of leadership to take up the energy efficiency projects in the plant.

1.5.2 Financial Barrier

Implementation of the proposed project activity requires an investment of ` 0.57Lakh, which is a significant investment for small industries and not commonly seen in the cluster for the implementation of energy efficiency projects. Also implementation of proposed technology requires regular maintenance and checkups which requires technically skilled and competent workman.

1.5.3 Skilled Manpower

In Foundry cluster at Batala, Jalandhar and Ludhiana, the availability of skilled manpower is one of the limitations; this issue gets further aggravated due to more number of foundry units as compared to the availability of skilled manpower.

2 PROPOSED TECHNOLOGY

2.1 Detailed Description of Technology

2.1.1 Description of Technology

Energy-efficient motors (EEM) are the ones in which, design improvements are incorporated specifically to increase operating efficiency over motors of standard design. Design improvements focus on reducing intrinsic motor losses. Improvements include the use of lower-loss silicon steel, a longer core (to increase active material), thicker wires (to reduce resistance), thinner laminations, smaller air gap between stator and rotor, copper instead of aluminum bars in the rotor, superior bearings and a smaller fan, etc.

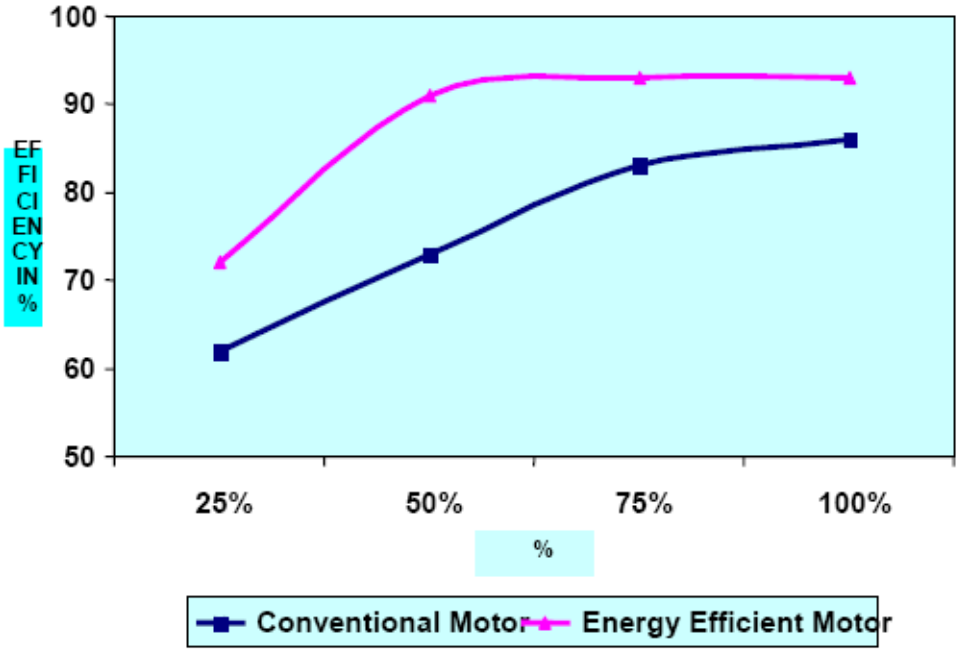
Energy-efficient motors now available in India operate with efficiencies that are typically 4 to 5 percentage points higher than standard motors. In keeping with the stipulations of the BIS, energy-efficient motors are designed to operate without loss in efficiency at loads between 75 % and 100 % of rated capacity. This may result in major benefits in varying load applications. The power factor is about the same or may be higher than for standard motors. Furthermore, energy-efficient motors have lower operating temperatures and noise levels, greater ability to accelerate higher-inertia loads, and are less affected by supply voltage fluctuations.

Advantages:-

- Less power consumption
- High efficiency
- Less losses
- Wide range with good efficiency
- Less starting torque

Standard vs High Efficiency Motors

Efficient motors have lower operating temperatures and noise levels, greater ability to accelerate higher-inertia loads, and are less affected by supply voltage fluctuations.



2.1.2 Technology Specification

For implementation of the proposed project, energy efficient motors must be replaced with energy efficient motors in the Foundry units. The rated voltage for the motors is 415 V, Frequency is 50 Hz, Insulation class F, 1500 RPM, 4 Pole, Flame Proof, rated output is 11kW and have efficiency 91 %. The IS code for energy efficient motors is 12615.

2.1.3 Suitability or Integration with Existing Process and Reasons for Selection

This is the simplest and widely accepted measure for energy cost reduction in all the industries. It does not affect the process but improves the process efficiency since these types of motors have high efficiency.

2.1.4 Availability of Technology

Now days when energy cost is high, it is poor practice to use re-winded motors. As far as technology is concerned Energy efficient motors are available in local/ national market. It is well proven technology which is adopted in many of the other similar and dissimilar units. Local vendors can arrange energy efficient motors at order. Local service providers are also available at Batala, Jalandhar and Ludhiana. More details of service provider are given in annexure 5.

2.1.5 Source of Technology

The main source which has taken the initiative to create the awareness for implementation of this project by providing the benefit to the consumers in terms of rupees is the State Electricity Board. With use of energy efficient motors, State Electricity Distribution Board will be able to deliver more power to other industry.

2.1.6 Terms and Conditions after Sale

Warranty period of one year will be provided from the date of invoice against any manufacturing defects.

2.1.7 Process down Time during Implementation

Technology provider will bring the complete setup for the proposed project from their site and make all the arrangements for implementation at the client's site. Total process down would be 6 to 8 hours.

2.2 Life Cycle Assessment

Life of the proposed energy efficient motor will be around 10 to 15 years which depends on the operating conditions and maintenance at client's side.

2.3 Suitable Unit for Implementation of the Identified Technology

Proposed technology can be implemented in any units where presently old and rewinded motor are being used.

3 ECONOMIC BENEFITS FROM PROPOSED TECHNOLOGY

3.1 Technical Benefits

3.1.1 Electricity savings per year

Installation of Energy Efficient Motors in place of Old and re-winded motors will result in savings of electricity consumption in Foundry units. Total energy saving would be about 5984 kW per year.

3.1.2 Improvement in product quality

This project is not contributing to any improvement in product quality.

3.1.3 Increase in production

This project is not contributing for increasing in production in Foundry plant.

3.1.4 Reduction in raw material consumption

Raw material consumption will be the same after the implementation of the proposed project.

3.1.5 Reduction in other losses

This project does not contribute to any reduction in any loss.

3.2 Monetary Benefits per year

Total Monetary benefit after implementation of this technology would be about ` 0.30 lakh per year. Details of energy saving and monetary benefit calculation is furnished in Table 3.1 below:

Table 3.1: Energy cost saving

S. No.	Particular	Details
1	Existing power consumption	11 kWh
2	Proposed power consumption	9.67 kWh
3	Total power saving	1.33 kWh
4	Annual energy saving	5984 kW
5	Annual monetary benefits	` 0.30 lakh

3.3 Social Benefits

3.3.1 Improvement in Working Environment in the Plant

There is no significant impact of this project in the working environment in the plant.

3.3.2 Improvement in skill set of workers

Proposed technology will not improve skill set of worker it will only create awareness about energy efficient technology and its benefits.

3.4 Environmental Benefits

The major GHG reduction would be in Co_2 reduction. The technology will reduce grid electricity consumption and emission reductions are estimated at 4.85 tons of Co_2 per annum.

4 INSTALLATION OF THE PROPOSED TECHNOLOGY

4.1 Cost of Technology Implementation

4.1.1 Technology Cost

Cost of the equipment is about ` 0.52 lakh considering offer discount of 55% on the list price + ED+ VAT as provided by the suppliers. Quotation of supplier has been provided at Annexure 6.

4.1.2 Other Cost

Other costs required will be ` 0.08 Lakh which includes taxes. Details breakups are provided in the Table 4.1 below:

Table 4.1 Details of Proposed Technology Installation Cost

S. No.	Particular	Cost (` in lakh)
1	Cost of Motor @ 45 % Discount	51957
2	Excise	5649
3	Taxes	2597.85
4	Total	60203.85

4.2 Arrangements of Funds

4.2.1 Entrepreneur's Contribution

Entrepreneur will contribute 25% of the total project cost which is ` 0.15Lakh.

4.2.2 Loan Amount

Remaining 75% cost of the proposed project will be borrowed from bank which is ` 0.45 Lakh.

4.2.3 Terms & Conditions of Loan

The interest rate is considered at 10% which is normal rate of interest for energy efficiency projects. The loan tenure is 5 years excluding initial moratorium period is 6 months from the date of first disbursement of loan.

4.3 Financial Indicators

4.3.1 Cash Flow Analysis

Profitability and cash flow statements have been worked out for a period of 8 years. The

financials have been worked out on the basis of certain reasonable assumptions, which are outlined below.

- The Operation and Maintenance cost is estimated at 2 % of cost of total project with 2 % increase in every year as escalations.
- Interest on term loan is estimated at 10 %.
- Depreciation is provided as per the rates provided in the companies Act.

Based on the above assumptions, profitability and cash flow statements have been prepared and calculated in Annexure-3.

4.3.2 Simple Payback Period

The total project cost of the proposed technology is ` 0.60 Lakh and monetary savings due to reduction in electricity consumption is ` 0.30 Lakh hence, the simple payback period works out to be 2.01 years.

4.3.3 Net Present Value (NPV)

The Net present value of the investment at 10% works out to be ` 0.55 Lakh.

4.3.4 Internal Rate of Return (IRR)

The after tax Internal Rate of Return of the project works out to be 34.58%. Thus the project is financially viable.

4.3.5 Return on Investment (ROI)

The average return on investment of the project activity works out at 26.65%.

Table 4.2 Financial Indicators of Proposed Technology

S No	Particular	Unit	Value
1	Simple Payback	Years	2.01
2	NPV	` In Lakh	0.55
3	IRR	%age	34.58
4	ROI	%age	26.65

4.4 Sensitivity analysis in realistic, pessimistic and optimistic scenarios

A sensitivity analysis has been carried out to ascertain how the project financials would behave in different situations like when there is an increase in rupees savings or

decrease in rupees savings. For the purpose of sensitive analysis, two following scenarios have been considered.

- Optimistic scenario (Increase in energy savings by 5%)
- Pessimistic scenario (Decrease in energy savings by 5%)

In each scenario, other inputs are assumed as a constant. The financial indicators in each of the above situation are indicated along with standard indicators.

Table 4.3 Sensitivity Analysis in Different Scenarios

Scenario	IRR (%)	NPV(in Lakh)	ROI (%)	DSCR
Pessimistic	32.18	0.49	26.43	2.03
Base	34.58	0.55	26.84	2.13
Optimistic	36.95	0.61	26.73	2.24

4.5 Procurement and Implementation Schedule

Procurement and implementation schedule required for implementation of this technology is about 7 weeks and 2 days required as a process break down. Further detail breakups of procurement and implementation schedules are shown in Annexure 4.

ANNEXURES

Annexure -1: Energy audit data used for baseline establishment

S.No	Parameters	Details
1	Rated Capacity of motor	15 Hp
2	Existing power consumption	11 kW
3	Operating hours in a day	15 hrs
4	Annual Operating days	300
5	Present operating efficiency	80%
6	Annual power consumption	49500 kWh

Annexure -2: Detailed Technology Assessment Report

S. No.	Particular	Details
1	Efficiency of existing motor	80%
2	Power consumption in existing motor (kWh)	11
3	Efficiency of proposed motor	91.0%
4	Proposed power consumption (kWh)	9.67
5	Saving in power consumption (kWh)	1.33
6	Total operating hours	15
7	Total operating days	300
8	Annual saving in energy consumption (kW)	5984
9	Cost of electricity ` /kWh	5
10	Total monetary benefits (` in lakh)	0.30
11	Total cost of installation (` in lakh)	0.60
12	Simple payback period (years)	2.01

Annexure -3: Detailed Financial Calculations

Assumptions

Name of the Technology	***Energy Efficient Motor***		
Rated Capacity	***15 HP***		
Details	***Unit***	***Value***	***Basis***
Installed Capacity	HP	15	
No of working days	Days	300	
Total operating hours	Hrs	15	
Proposed Investment			
Equipment cost	` (in lakh)	0.52	
Taxes	` (in lakh)	0.08	
Other cost	` (in lakh)	0.00	
Total Investment	` (in lakh)	0.60	
Financing pattern			
Own Funds (Equity)	` (in lakh)	0.15	Feasibility Study
Loan Funds (Term Loan)	` (in lakh)	0.45	Feasibility Study
Loan Tenure	Years	5.00	Assumed
Moratorium Period	Months	6.00	Assumed
Repayment Period	Months	66	Assumed
Interest Rate	%age	10.00%	
Estimation of Costs			
O & M Costs	% on Plant & Equip	2.00	Feasibility Study
Annual Escalation	%age	5.00	Feasibility Study
Estimation of Revenue			
Power saving per annum	kWh/annum	5984	
Cost of electricity	` /kWh	5	
Total revenue per annum	` (in lakh)	0.30	
St. line Depn.	%age	5.28	Indian Companies Act
IT Depreciation	%age	80.00	Income Tax Rules
Income Tax	%age	33.99	Income Tax

Estimation of Interest on term loan ***`(in lakh)***

Years	***Opening Balance***	***Repayment***	***Closing Balance***	***Interest***
1	0.45	0.02	0.43	0.05
2	0.43	0.07	0.36	0.04
3	0.36	0.09	0.27	0.03
4	0.27	0.11	0.16	0.02
5	0.16	0.11	0.05	0.01
6	0.05	0.05	0.00	0.00
		0.45		

WDV Depreciation **` (in lakh)**

Particulars / years	*1*	*2*
Plant and Machinery		
Cost	0.60	0.12
Depreciation	0.48	0.10
WDV	0.12	0.02

Projected Profitability ***`(in lakh)***

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*Total*
Revenue through Savings									
Fuel savings	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	2.4
Total Revenue (A)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	2.4
Expenses									
O & M Expenses	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.10
Total Expenses (B)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.10
PBDIT (A)-(B)	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	2.29
Interest	0.05	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.16
PBDT	0.23	0.25	0.25	0.26	0.28	0.28	0.29	0.29	2.13
Depreciation	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.25
PBT	0.20	0.22	0.22	0.23	0.24	0.25	0.25	0.25	1.88
Income tax	0.00	0.05	0.09	0.09	0.09	0.10	0.10	0.10	0.61
Profit after tax (PAT)	0.20	0.16	0.14	0.14	0.15	0.16	0.16	0.16	1.27

Computation of Tax **` (in lakh)**

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Profit before tax	0.20	0.22	0.22	0.23	0.24	0.25	0.25	0.25
Add: Book depreciation	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Less: WDV depreciation	0.48	0.10	-	-	-	-	-	-
Taxable profit	(0.25)	0.15	0.25	0.26	0.28	0.28	0.29	0.29
Income Tax	-	0.05	0.09	0.09	0.09	0.10	0.10	0.10

Projected Balance Sheet

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Liabilities								
Share Capital (D)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Reserves & Surplus (E)	0.20	0.37	0.50	0.65	0.80	0.95	1.11	1.27
Term Loans (F)	0.43	0.36	0.27	0.16	0.05	0.00	0.00	0.00
TOTAL LIABILITIES (D)+(E)+(F)	0.78	0.88	0.92	0.95	0.99	1.10	1.26	1.42
Assets								
Gross Fixed Assets	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Less Accm. depreciation	0.03	0.06	0.10	0.13	0.16	0.19	0.22	0.25
Net Fixed Assets	0.57	0.54	0.51	0.47	0.44	0.41	0.38	0.35
Cash & Bank Balance	0.21	0.34	0.42	0.48	0.55	0.69	0.88	1.07

TOTAL ASSETS	0.78	0.88	0.92	0.95	0.99	1.10	1.26	1.42
Net Worth	0.35	0.52	0.65	0.80	0.95	1.10	1.26	1.42
Debt Equity Ratio	2.85	2.40	1.80	1.05	0.30	0.00	0.00	0.00

Projected Cash Flow: ***`(in lakh)***

Particulars / Years	***0***	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
Sources									
Share Capital	0.15	-	-	-	-	-	-	-	-
Term Loan	0.45								
Profit After tax		0.20	0.16	0.14	0.14	0.15	0.16	0.16	0.16
Depreciation		0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Total Sources	0.60	0.23	0.20	0.17	0.17	0.18	0.19	0.19	0.19
Application									
Capital Expenditure	0.60								
Repayment Of Loan	-	0.02	0.07	0.09	0.11	0.11	0.05	0.00	0.00
Total Application	0.60	0.02	0.07	0.09	0.11	0.11	0.05	0.00	0.00
Net Surplus	-	0.21	0.13	0.08	0.06	0.07	0.14	0.19	0.19
Add: Opening Balance	-	-	0.21	0.34	0.42	0.48	0.55	0.69	0.88
Closing Balance	-	0.21	0.34	0.42	0.48	0.55	0.69	0.88	1.07

IRR ***` (in lakh)***

Particulars / months	***0***	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
Profit after Tax		0.20	0.16	0.14	0.14	0.15	0.16	0.16	0.16
Depreciation		0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Interest on Term Loan		0.05	0.04	0.03	0.02	0.01	0.00	-	-
Cash outflow	(0.60)	-	-	-	-	-	-	-	-
Net Cash flow	(0.60)	0.29	0.24	0.20	0.20	0.19	0.19	0.19	0.19
IRR	34.58%								

NPV	0.55

Break Even Point

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
Variable Expenses								
Oper. & Maintenance Exp (75%)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Sub Total*(G)*	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fixed Expenses								
Oper. & Maintenance Exp (25%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on Term Loan	0.05	0.04	0.03	0.02	0.01	0.00	0.00	0.00
Depreciation *(H)*	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Sub Total (I)	0.09	0.07	0.07	0.06	0.05	0.04	0.04	0.04
Sales (J)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Contribution (K)	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
Break Even Point (L= G/I)	30.04%	25.75%	23.10%	19.66%	15.80%	12.60%	12.17%	12.20%

Cash Break Even {(I)-(H)}	19.08%	14.79%	12.13%	8.68%	4.82%	1.61%	1.17%	1.20%
Break Even Sales (J)*(L)	0.09	0.08	0.07	0.06	0.05	0.04	0.04	0.04

Return on Investment **` (in lakh)**

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***Total***
Net Profit Before Taxes	0.20	0.22	0.22	0.23	0.24	0.25	0.25	0.25	1.88
Net Worth	0.35	0.52	0.65	0.80	0.95	1.10	1.26	1.42	7.05
									26.65**%**

Debt Service Coverage Ratio ***`(in lakh)***

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***Total***
Cash Inflow									
Profit after Tax	0.20	0.16	0.14	0.14	0.15	0.16	0.16	0.16	0.95
Depreciation	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.19
Interest on Term Loan	0.05	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.16
Total (M)	0.29	0.24	0.20	0.20	0.19	0.19	0.19	0.19	1.30

DEBT

Interest on Term Loan	0.05	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.16
Repayment of Term Loan	0.02	0.07	0.09	0.11	0.11	0.05	0.00	0.00	0.45
Total (N)	0.07	0.11	0.12	0.13	0.12	0.05	0.00	0.00	0.61
	3.83	2.19	1.64	1.46	1.56	4.07	0.00	0.00	2.13
Average DSCR (M/N)	2.13								

Annexure:-4 Procurement and implementation schedule

Procurement and Implementation Schedule

S. No.	Activities	Weeks						
		1	2	3	4	5	6	7
1	Identification of Old and inefficient motors							
2	Planning and order placement							
3	Procurement							
4	Commissioning							

Annexure -5: Details of technology service providers

Energy Conservation measure	Source of product	Details of Local vendor / service provider
1. Energy Efficient Motors	Bharat Bijlee Ltd	Mr. Rakesh Verma Sr. Manager – Marketing rakesh.verma@bharatbijlee.com 09871861872
2. Energy Efficient Motors	ABB Ltd	Mr. Neeraj Verma ABB Ltd Power Product SCO-13-14-15 Sector-34A Chandigarh Phone: 0172-4321845 Telefax: 0172-2601618 Mobile: 09878613484 email: neeraj.verma@in.abb.com
3.Energy Efficient Motors	Kirloskar Brothers Ltd	Mr. Kamlesh Gupta Station Road Alwar Tel.: +91 (144) 2700226 Mob. : +91 9414019126/ 09414019126
4.Energy Efficient Motor	Havells, Epcos	Mr. Sachin Hope Circus ,Alwar -301001 Tel. : +91 (144) 2337886 (o) (R) 0144-2330971

Annexure–6: Quotations/Techno-commercial bids for new technology/equipment

Bharat Bijlee

CE eff1

FLAME PROOF MOTORS (Standard Motors)

For foot mounted (B3 construction), 415V ±10%, 50Hz ±5%,combined variation ±10%, 3 phase supply, Insulation Class F,Degree of Protection IP55,Ambient Temperature 45°C,Conforms to IS:325, IS:2148, Gas Group IIA,IIB.

3000 rpm 2 Pole					
Kw	Hp	Frame	Type	LP33	Excise
0.37	0.50	80	MJ080243	20380	997
0.55	0.75	80	MJ080283	22690	1110
0.75	1.00	80	MJ080213	23310	1140
1.10	1.50	80	MJ080233	26050	1274
1.50	2.00	90 L	MJ09L243	29120	1425
2.20	3.00	100L	MJ10L213	45000	2202
3.70	5.00	112M	MJ11M233	52820	2584
5.50	7.50	132 M	MJ13M253	65440	3202
7.50	10.00	132 M	MJ13M293	72360	3540
9.30	12.50	160M	MJ16M233	130300	6375
11.00	15.00	160 M	MJ16M253	134210	6566
15.00	20.00	160 M	MJ16M263	153250	7498
18.50	25.00	160 L	MJ16L293	176070	8614
22.00	30.00	180 L	MJ18L233	207460	10150
30.00	40.00	200 L	MJ20L2A3	280670	13732
37.00	50.00	200 L	MJ20L253	363170	17768
45.00	60.00	225 M	MJ22M253	459380	22475
55.00	75.00	280S	MJ28S213	717820	35119
75.00	100.00	280M	MJ28M233	750010	36694
90.00	120.00	280 M	MJ28M253	831280	40670
110.00	150.00	315S	MJ31S233	868100	42472
125.00	170.00	315M	MJ31M2A3	1018790	49844
132.00	180.00	315M	MJ31M233	1029370	50362
150.00	200.00	315L	MJ31L2A3	1131040	55336
160.00	215.00	315L	MJ31L253	1166970	57094
180.00	240.00	315L	MJ31L283	1399060	68449
* 200.00	270.00	315L	MJ31L273	1747190	85481

1500 rpm 4 Pole					
Kw	Hp	Frame	Type	LP33	Excise
0.37	0.50	80	MJ080413	20230	990
0.55	0.75	80	MJ080433	22050	1079
0.75	1.00	80	MJ080453	22900	1120
1.10	1.50	90 L	MJ09L423	26040	1274
1.50	2.00	100L	MJ10L453	33960	1661
2.20	3.00	112M	MJ11M433	38570	1887
3.70	5.00	132M	MJ13M433	54520	2667
5.50	7.50	132 M	MJ13M473	62550	3060
7.50	10.00	160M	MJ16M4A3	99480	4867
9.30	12.50	160 M	MJ16M4C3	109290	5347
11.00	15.00	160 M	MJ16M4K3	115460	5649
15.00	20.00	180L	MJ18L433	152340	7453
18.50	25.00	180 L	MJ18L473	161640	7908
22.00	30.00	200L	MJ20L433	224550	10986
30.00	40.00	200 L	MJ20L453	256450	12547
37.00	50.00	225M	MJ22M433	332890	16287
45.00	60.00	250M	MJ25M4A3	465310	22765
55.00	75.00	250 M	MJ25M413	517000	25294
75.00	100.00	280 S	MJ28S413	664300	32501
90.00	120.00	280 M	MJ28M433	684810	33504
110.00	150.00	315S	MJ31S413	769320	37639
125.00	170.00	315M	MJ31M4A3	885360	43316
132.00	180.00	315M	MJ31M433	922210	45119
150.00	200.00	315L	MJ31L4A3	958800	46909
160.00	215.00	315L	MJ31L453	968600	47389
180.00	240.00	315L	MJ31L463	1159390	56723
* 200.00	270.00	315L	MJ31L473	1395660	68283

*Rating suitable for 40c

Eff1 will be punched on name plate as per IS 12615: 2004 for

2 Pole- 0.37kW to 160Kw 4 Pole- 0.37kW to 160Kw

Authorised by : A M Naik

Bharat Bijlee

FLAME PROOF MOTORS (Standard Motors)

CE eff2

For foot mounted (B3 construction), 415V ±10%, 50Hz ±5%,combined variation ±10%, 3 phase supply, Insulation Class F,Degree of Protection IP55,Ambient Temperature 45° C,Conforms to IS:325, IS:2148, Gas Group IIA,IIB.

3000 rpm 2 Pole					
Kw	Hp	Frame	Type	LP33	Excise
0.37	0.50	80	MD0802A3	18940	927
0.55	0.75	80	MD0802B3	21190	1037
0.75	1.00	80	MD080213	21840	1069
1.10	1.50	80	MD080233	24080	1178
1.50	2.00	90 L	MD09L233	27320	1337
2.20	3.00	90 L	MD09L253	34100	1668
3.70	5.00	100 L	MD10L213	43290	2118
5.50	7.50	132 M	MD13M233	61140	2991
7.50	10.00	132 M	MD13M253	67610	3308
9.30	12.50	132 M	MD13M293	96080	4701
11.00	15.00	160 M	MD16M213	118440	5795
15.00	20.00	160 M	MD16M253	143520	7022
18.50	25.00	160 L	MD16L273	162900	7970
22.00	30.00	180 L	MD18L213	192760	9431
30.00	40.00	200 L	MD20L233	259780	12710
37.00	50.00	200 L	MD20L253	336520	16464
45.00	60.00	225 M	MD22M233	425080	20797
55.00	75.00	250 M	MD25M213	521320	25506
75.00	100.00	280 S	MD28S213	697800	34140
90.00	120.00	280 M	MD28M233	722870	35366

1500 rpm 4 Pole					
Kw	Hp	Frame	Type	LP33	Excise
0.37	0.50	80	MD0804A3	18600	910
0.55	0.75	80	MD080413	20530	1004
0.75	1.00	80	MD080433	21370	1046
1.10	1.50	90 L	MD09L433	24380	1193
1.50	2.00	90 L	MD09L453	26520	1297
2.20	3.00	100 L	MD10L433	33690	1648
3.70	5.00	112 M	MD11M433	42260	2068
5.50	7.50	132 M	MD13M433	58300	2852
7.50	10.00	132 M	MD13M473	66320	3245
9.30	12.50	160 M	MD16M4A3	101540	4968
11.00	15.00	160 M	MD16M4C3	107510	5260
15.00	20.00	160 L	MD16L4K3	130700	6394
18.50	25.00	180 L	MD18L433	147700	7226
22.00	30.00	180 L	MD18L473	175450	8584
30.00	40.00	200 L	MD20L433	236410	11566
37.00	50.00	225 S	MD225413	307170	15028
45.00	60.00	225 M	MD22M433	386450	18907
55.00	75.00	250 M	MD25M413	474150	23198
75.00	100.00	280 S	MD28S413	609470	29818
90.00	120.00	280 M	MD28M433	621210	30393

Authorised by : A M Naik

On the list price offer discount of 55 % + ED + Vat for retail customer. For enquiries of motors more than 5 prices are negotiable.

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