DETAILED PROJECT REPORT
ON
ENERGY EFFICIENT MOTOR FOR KOLHU (40 HP)
(ALWAR OIL MILL CLUSTER)

ENERGY IS LIFE
BEE
CONSERVE IT

Bureau of Energy Efficiency (BEE)

Prepared By

CII
Confederation of Indian Industry

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ISTSL

ENERGY EFFICIENT MOTOR FOR KOLHU (40 HP)

ALWAR OIL MILL CLUSTER

BEE, 2010

Detailed Project Report on Energy Efficient Motor for Kolhu (40 HP)

Oil Mill SME Cluster, Alwar (Rajasthan) (India)
New Delhi: Bureau of Energy Efficiency;

Detail Project Report No.:

For more information

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CII – AVANTHA Centre for Competitiveness for SMEs
Confederation of Indian Industry
Chandigarh

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Lists of Abbreviations

BEE	- Bureau of Energy Efficiency
DPR	- Detailed Project Report
DSCR	- Debt Service Coverage Ratio
GHG	- Green House Gases
HP	- Horse Power
IRR	- Internal Rate of Return
MSME	- Micro Small and Medium Enterprises
MoP	- Ministry of Power
NPV	- Net Present Value
ROI	- Return on Investment
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 Alwar Oil Mill Cluster, supported by Bureau of Energy Efficiency (BEE) with an overall objective of improving the energy efficiency in cluster units.

Alwar Oil Mill cluster is one of the largest Oil Mill 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 Oil Mill clusters in India. The main energy forms used in the cluster units are grid electricity. In Oil Mill plant, electricity bill is almost 100% of total plant energy bill.

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 Oil Mill units. This can be taken care by Energy Efficient Motors in place of Old / Re-winded Motors.

In any oil mill, Kolhu and Expellers motors are the main energy consumers. During energy audit, it was observed that the maximum of such motors are very old and re-winded more than 5 times which leads to lower operating efficiency and higher power consumption. Operating Efficiency of old motors is in the range of 70 - 85%.

Installation of new energy efficient motor of 40 HP capacity for existing Kolhu having efficiency more than existing motor would lead to power saving upto 12571kW per year due to improve efficiency.

The DPR highlights the details of the study conducted for assessing the potential for reducing electricity consumption in Kolhu machine by installing new efficient motor in various units of the cluster, possible energy savings and its monetary benefit, availability of the technologies/design, local service providers, technical features and proposed equipment specifications, various barriers in implementation, environmental aspects, estimated GHG reductions, capital cost, financial analysis, 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:

Sr. No.	Particular	Unit	Value
1	Project cost	(` in Lakh)	1.07
2	Electricity Savings	kWh/annum	12571
3	Monetary benefit	(` in Lakh)	0.60
4	Simple payback period	Years	1.77
5	NPV	(` in Lakh)	1.11
6	IRR	%age	37.75
7	ROI	%age	26.52
8	Average DSCR	Ratio	2.20
9	CO_2 emission reduction	MT/year	10
10	Process down time	Days	1

The projected profitability and cash flow statements indicate that the project implementation i.e. installation of energy efficient motor will be financially viable and technically feasible solution for the cluster.

ABOUT BEE'S SME PROGRAM

Bureau of Energy Efficiency (BEE) is implementing a BEE-SME Programme to improve the energy performance in 25 selected SMEs clusters. Alwar Oil Mill Cluster is one of them. The BEE's SME Programme intends to enhance the 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 up of energy efficiency projects in the clusters

Activity 3: Implementation of energy efficiency measures

To implement the technology up-gradation project in the 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

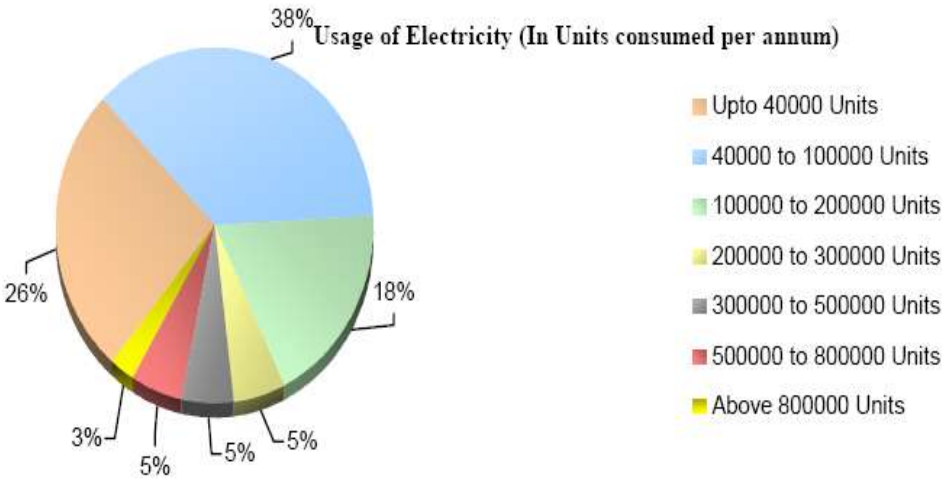
1.1 Brief Introduction about cluster

Alwar SME Cluster is one of the largest Oil Mill clusters in India, which is famous for manufacturing of Mustard Oil. The nearest airport is at Jaipur, which is 150 KM from Alwar by road.

There are approximately 60 Oil Mill units in this cluster which are engaged in manufacturing of mustard oil (kacchi Ghani and Pakki Ghani). There are more Oil Mill units coming up in Alwar.

Energy used for oil extraction is electricity. In Alwar and Sawaimadhopur region there is shortage of power and that leads to less production of oil. Because of the power shortage some of the very small scale units of cluster are planning to shut their plant.

- USAGE OF ELECTRICITY (IN UNITS CONSUMED PER ANNUM)



Electrical energy consumption in Alwar and Sawaimadhopur units lies in range of around 186 Lakhs kWh for processing of 1240000 Quintal of Mustard Seed. Oil units in Alwar & Sawaimadhopur regions are having Specific Energy Consumption in range of 10-15 kWh/Quintal of mustard seed processed.

Energy Usage Pattern

Average monthly electricity consumption in Oil Mill plants ranges from 0.5 lakh to 2 lakh kWh depending on the size of the plant.

Classification of Units

The Oil Mill units can be categorized into following three types based on capacity of production

- Large scale units
- Medium scale units
- Small scale units

Production Wise Unit Breakup

Alwar Oil Mill cluster can be broken into three categories viz. small, medium and large size unit. Table 1.1 shows that production wise breakup of Alwar cluster.

Table 1.1 production wise unit breakups

S. No.	Type of Unit	Production Capacity
1	Large scale unit	More than 120 MT
2	Medium scale unit	50 to 120MT
3	Small scale unit	Less than 50 MT

Products Manufactured

Different types of products manufactured in Alwar SME cluster are as shown in Table 1.2 below.

Table 1.2 Product Manufactured

S. No	Type of Product	% Share
1	Pakki Ghani	70
2	Kacchi Ghani	30

1.1.1 Production process

Mustard Oil Extraction

Raw material used for oil production is mustard seeds, which is purchased from Local Mandi of Alwar and Sawaimadhopur.

Seed cracker cracks the crop of mustard in fine pieces so that it can be further processed in Kolhu and Expeller. To get oil from raw mustard seed, it is first given to

Kolhu and the waste (oil cake) from the kolhu is given to Expeller which extracts more oil from the same oil cake. Remaining oil cake is given to solvent extraction plant or sold out in market. Filtered oil goes to oil filling plant where oil is filled in bottles as per requirement and finally packed in cartoon to send at required places across India.

Technology used for process involve expellers (Double pass & Single pass), Kolhus run by motors instead of any animal. Single motors run many kolhus, which are connected on same shaft by belts. After extracting oil from machines, it is sent for filtration to fine filter cloth

Detailed of process flow chart are finished in Figure 1.1 below:

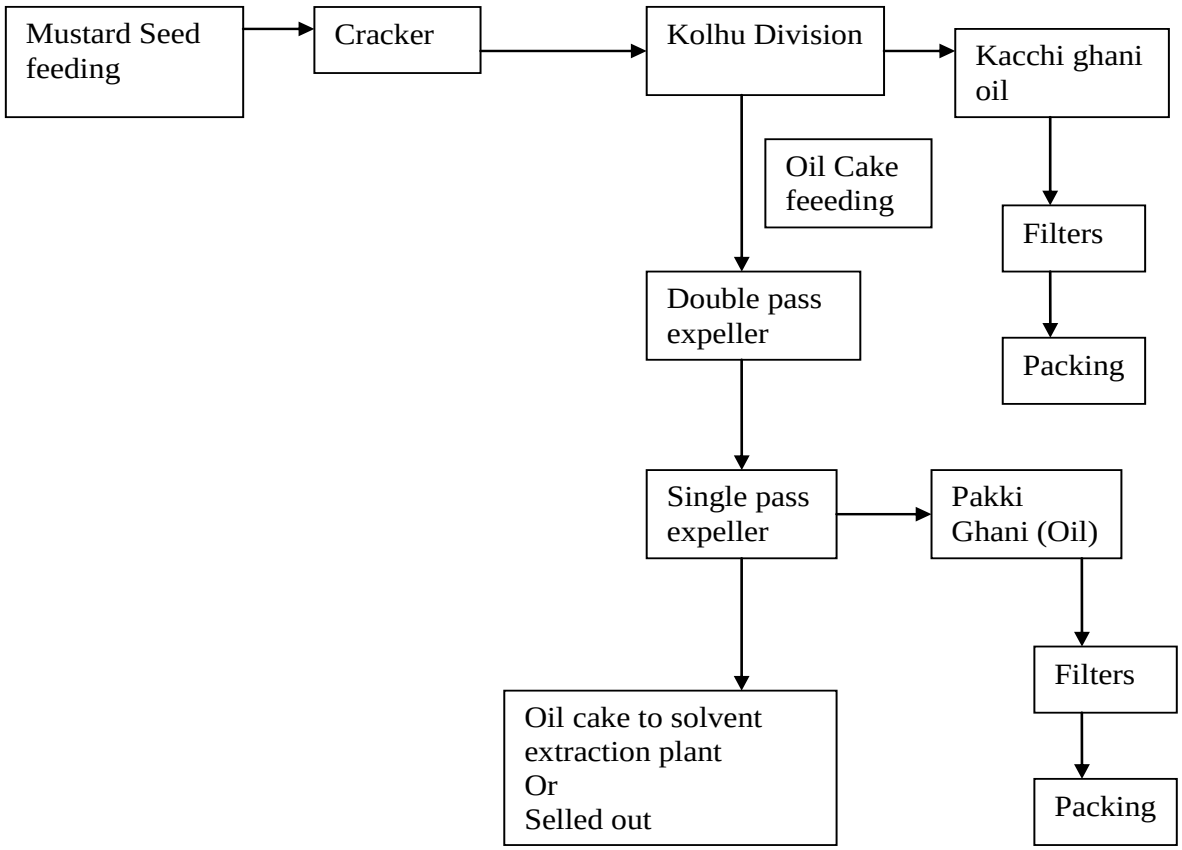


Figure 1.1: General process flowchart of a typical Oil mill

1.2 Energy performance in existing situation

Oil units in Alwar & Sawaimadhopur regions are having Specific Energy Consumption in range of 10-15 kWh/Quintal of mustard seed processed.

1.2.1 Average production by a typical unit

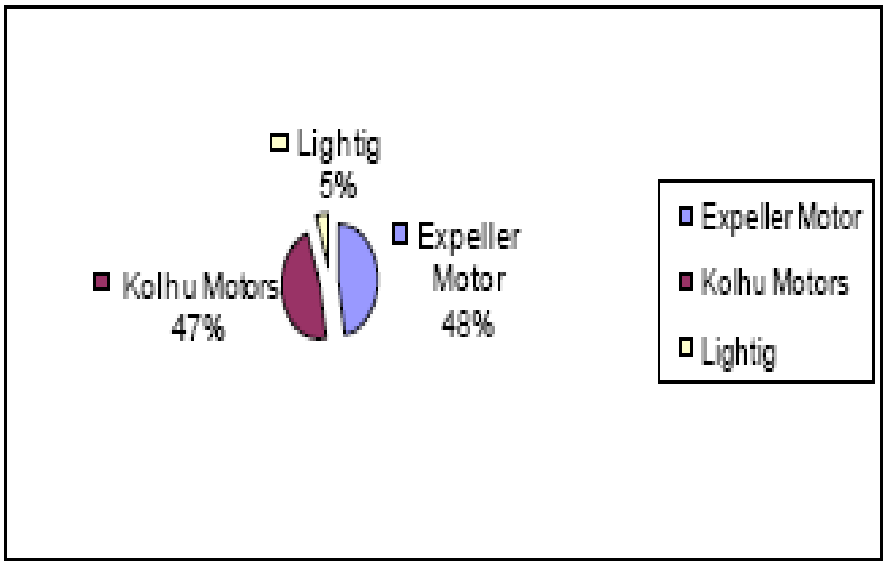
The average production in a typical Oil mill is between 122691 MT per annum.

1.2.2 Energy consumption

Energy consumption (electrical) in a typical Oil Mill plant for different types of products is given in Table 1.3 below:

Table 1.3 Energy consumption

S. No	Type of Fuel	Unit	Value	Contribution in equivalent energy terms (%)
1	Electricity	MWh/year	18.6	100



1.2.3 Specific Energy Consumption

Specific electrical energy consumption is 10 to 15 kWh for quintal of mustard seed processing in Oil Mill industry

1.3 Existing technology/equipment

1.3.1 Description of existing technology

Kolhu and Expellers are the main energy consumers in any oil mill. Induction motors in

the range of 40 – 60 hp are the prime movers for Expellers & Kolhus. It was observed that the maximum of motors are re-winded more than 5 times which leads to higher power consumption and lower operating efficiency. Also old en-efficient motors in the efficiency range of 70 - 85% are in use.

A detail of existing compressor motor is given in the Table 1.3 below:

Table 1.4 Existing motor specifications

S.No	Details	Kolhu motor
1	Rated HP	40
2	Rated Amps	52
3	Frequency	50 Hz
4	Power Consumption (kW)	30
5	RPM	1470

1.3.2 Its role in the whole process

Kolhu machine is used for getting oil from raw mustard seed.

1.4 Establishing the baseline for the equipment

1.4.1 Design and operating parameters

Presently all the Oil Mill plants at Alwar are operating with very old and inefficient motors. The present power consumption of a motor is 30 kW. The motor is operated continuously for 10 hours in a day and for 300 days in a year.

1.4.2 Operating efficiency of the existing motor

The detailed energy audit studies had been undertaken in various units of the cluster to evaluate the motor efficiencies. Based on the age and number of the times motor is re winded, the efficiency of the motor is found about 82%, against 93.20% efficiency of energy efficient motor available in the market.

1.5 Barriers for adoption of new and energy efficient technology / equipment

1.5.1 Technological Barriers

The major technical barriers that prevented the implementation of the energy efficient motors in the cluster are:

- 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, re-winded motors are used in the Oil Mill plants.
- 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 ` 0.85 Lakh/motor. Each unit is having around 4 - 20 motors. This is a significant investment and not commonly seen in the cluster for the implementation of energy efficiency projects.

Energy Efficiency Financing Schemes such as SIDBI's, if focused on the cluster, will play a catalytic role in implementation of identified energy conservation projects & technologies.

The cluster has significant potential for implementing energy efficiency motors.

1.5.3 Skilled manpower

In Alwar Oil Mill cluster, the availability of skilled manpower is one of the limitations, this issue gets further aggravated due to more number of Oil Mill units as compared to the availability of skilled manpower. One local technical person available at Alwar takes care of about 2 to 3 Oil Mill units. For major equipments of Oil Mill units like Expeller or Kolhu for maintenance or the repair works of these equipments take care by the equipment suppliers itself.

1.5.4 Other barrier(s)

No other barriers

2. TECHNOLOGY/EQUIPMENT FOR ENERGY EFFICIENCY IMPROVEMENTS

2.1 Detailed description of technology/equipment selected

2.1.1 Description of equipment

Existing scenario of inefficient motors in plants of Alwar cluster is very poor. In almost all of the units, re-winded/old in-efficient motors are being used. In these cluster units various process working under different load condition so that it is not easier to maintain proper condition of motors.

These motors can be replaced with Energy Efficient Motors which leads to higher working efficiency of up to 5 - 10% for the same working condition. 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 3 to 4 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.

Advantage

Best performance even at partial loads:

In many applications the load factor of the motor will be range of 60% to 80%. The efficiency curve of standard motor is dropping in nature i.e., there is a sharp fall in efficiency at partial loads. But the energy efficient motors have a flat efficiency curve and hence the fall in efficiency is marginal. Thus energy saving is significant even in part loads.

2.1.2 Technology /Equipment specifications

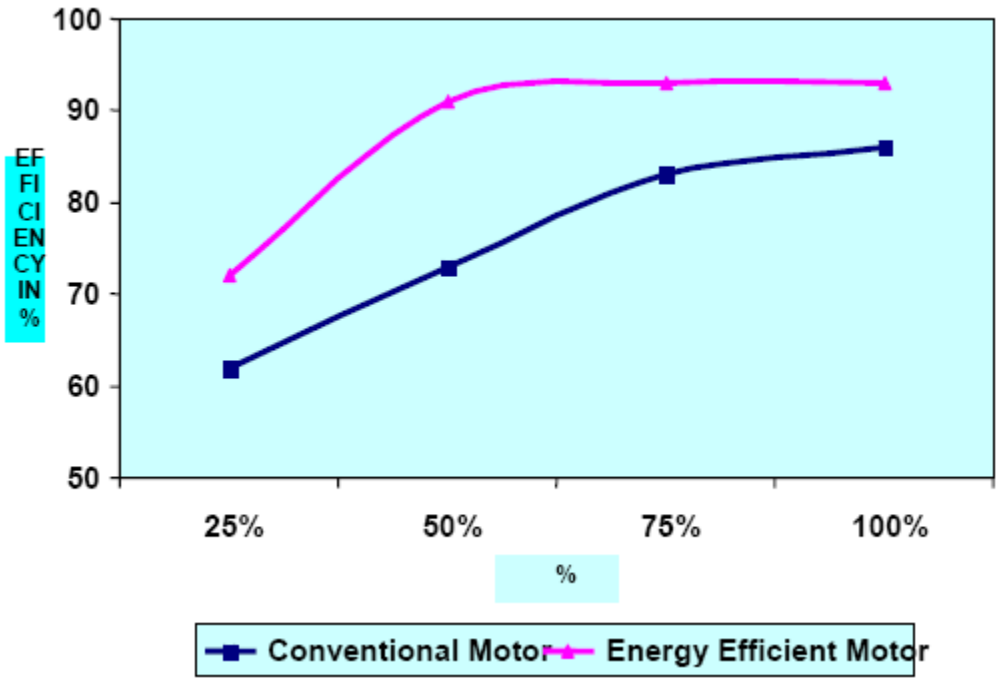
The detailed specification of the motor suggested is furnished in table 2.1 below:

Table 2.1: Energy Efficient motor Specifications

S. No.	Parameter	Unit	Value
1	Rated Capacity	HP	40
2	Rated Current	Amps	52
3	Speed	RPM	1470
4	Efficiency	% age	93.20
5	Power Factor	-	0.86

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.



2.1.3 Justification of the technology selected & Suitability

The kolhu motors are one of the major energy consuming equipment in Oil Mill cluster at Alwar. Based on the detailed energy audits conducted for various motors installed in cluster units, the motors are age old and rewinded number of time which leads to

reduction in efficiency and high power consumption. But the new energy efficient motors will have overall efficiency of 93.20% (at full load).

The following benefits are possible for selection of this technology

- Energy efficient motors will reduce electricity consumption
- It reduces the GHG emissions
- Lower payback period for Continuous Operation
- High power factor
- Flat efficiency curve
- Higher Motor life

2.1.4 Superiority over existing technology/equipment

The following are the superior features of energy efficient motors over existing motors

- The efficiency curve is almost flat between 60 to 100 % load, resulting in higher energy savings as in most of the cases the motor is not always fully loaded
- The special design features also result in lower operating temperatures which enhance the life of motor and reduce the maintenance costs.
- These motors have inherently low noise and vibration and help in conservation of environment.
- These motors are with highest power factor in the industry due the special exclusive design.
- The higher power factor reduces the currents in the cables supplying power to motor and this reduces cable loss,
- Improving the system efficiency, sometimes this allows even a lower cable size saving tremendously on capital costs.
- Saving is also made by reducing capacitors required to improve power factor

2.1.5 Availability of the proposed technology/equipment

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 Alwar. More details of service provider are given in annexure 5.

2.1.6 Source of technology/equipment for the project

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.

2.1.7 Service/technology providers

A detail of energy efficient motors suppliers has been furnished in Annexure 5.

2.1.8 Terms of sales

No any specific terms and conditions for sale of Energy efficient motor.

2.1.9 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. However, one day would be required for process down time.

2.2 Life cycle assessment and risks analysis

The life of the energy efficient motor is considered at 10-15 years. There is no risk involved as the motor are technology proven and are successfully in operation in other industries of the country.

2.3 Suitable unit/plant size in terms of capacity/production

For estimation of the saving potential on implementation of this project, here the Oil Mill plant engaged in producing mustard oil, having old and re-winded motors can be considered.

3. ECONOMIC BENEFITS OF NEW ENERGY EFFICIENT TECHNOLOGY

3.1 Technical benefits

3.1.1 Fuel savings per year

No fuel saving is possible due to implementation of proposed system.

3.1.2 Electricity savings per year

The efficiency of the new energy efficiency motor is more than the existing motor which will lead to reduction in electricity consumption. The power savings due to installation of new energy efficient motor would be 10815 kW per annum. Details of electricity saving calculation are given at Annexure 2.

3.1.3 Improvement in product quality

There is no significant impact on the product quality.

3.1.4 Increase in production

There is no significant effect on production capacity.

3.1.5 Reduction in raw material consumption

Raw material is consumption will be same.

3.1.6 Reduction in other losses

Due to improved power factor of new energy efficient motor, the distribution losses may also reduce.

3.2 Monetary benefits

The monetary benefit due to installation of new energy efficient motor is ` 0.52 lakh per annum due to reduction in electricity consumption. Details of monetary saving calculation are furnished in Annexure 2.

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

The technology selected for the implementation is new and energy efficient motor will create the awareness among the workforce on energy efficiency.

3.4 Environmental benefits

3.4.1 Reduction in effluent generation

None

3.4.2 Reduction in GHG emission such as CO_2, NOx, etc

The major GHG emission reduction source is CO_2. The technology will reduce grid electricity consumption and emission reductions are estimated at 8 tons of CO_2 per annum due to implementation of the project activity.

3.4.3 Reduction in other emissions like SOx

No significant impact on SOx emissions.

4. INSTALLATION OF NEW ENERGY EFFICIENT MOTOR

4.1 Cost of technology/equipment implementation

4.1.1 Cost of technology/equipments

The total cost for motor is estimated at ` 0.77 lakh, which includes motor cost and other charges and discounts as per the Quotation in Annexure 7.

4.1.2 Other costs

Other charges include taxes and cabling and panel modification. Project cost details are furnished in Table 4.1 below:

Table 4.1: Project detail cost

Sr. No.	*Particular*	*Unit*	*Value*
1	New Energy Efficient motor	` in lakh	0.77
2	Applicable taxes	` in lakh	0.031
3	Panel, Switch & Cabling, Elec. and Modifications etc.	` in lakh	0.05
4	Total Investment	` in lakh	0.85

4.2 Arrangement of funds

4.2.1 Entrepreneur's contribution

The entrepreneur's contribution is 25% of total project cost, which works out at ` 0.21 lakh.

4.2.2 Loan amount

The term loan is 75% of the total project, which is ` 0.64 lakh.

4.2.3 Terms & conditions of loan

The interest rate is considered at 10.0% which is normal interest rate for energy efficiency related projects. The loan tenure is 5 years and the moratorium period is 6 months.

4.3 Financial indicators

4.3.1 Cash flow analysis

Considering the above discussed assumptions, the net cash accruals starting with ` 0.38lakh in the first year operation and increases to ` 1.86 at the end of eighth year.

4.3.2 Simple payback period

The total project cost of the proposed technology is ` 0.85 lakh and monetary savings due to reduction in electricity consumption is ` 0.52 lakh and the simple payback period works out to be 1.63 years.

4.3.3 Net Present Value (NPV)

The Net present value of the investment at 10.0% interest rate works out to be ` 1.03 lakh.

4.3.4 Internal rate of return (IRR)

The after tax Internal Rate of Return of the project works out to be 42.19%.

4.3.5 Return on investment (ROI)

The average return on investment of the project activity works out at 26.96%. The average DSCR is 2.41.

4.4 Sensitivity analysis in realistic, pessimistic and optimistic scenarios

A sensitivity analysis has been worked out to ascertain how the project financials would behave in different situations like there is an increase in power savings or decrease. For the purpose of sensitive analysis, two scenarios are considered are.

- Increase in power savings by 5%
- Decrease in power savings by 5%

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

Table 4.2: Sensitivity analysis

Particulars	*IRR*	*NPV*	*ROI*	*DSCR*
Normal	42.19%	1.03	26.96%	2.41
5% increase in power savings	45.06%	1.13	27.14%	2.54
5% decrease in power savings	39.30%	0.93	26.76%	2.29

4.5 Procurement and implementation schedule

The project is expected to be completed in 7 weeks from the date of release of purchase order. The detailed schedule of project implementation is furnished in Annexure 5.

ANNEXURE

Annexure 1: Energy audit data used for baseline establishment

S. No.	Particular	Unit	Value
1	Kolhu motor capacity	hp	40
2	Actual power consumption	kW	30
3	Number of passes	Nos	Single / double
4	Total length	Inches	33-66
5	Oil extraction (first pass)	%	20
6	Oil extraction (first pass)	%	2.5
7	Oil extraction (first pass)	%	1.5
8	Oil extraction (first pass)	%	1
9	Feed- mustard seed	Kg/hr	1600
10	Oil cake formation	Kg/hr	1250
11	Oil percent in cake	%	7.5

Annexure 2: Detailed technology assessment report – EE Motor

S.No	Particulars	Unit	Value
1	Present rated HP	HP	40
2	Power consumption in base case scenario	kW	30
3	Efficiency of existing motor	% age	82
4	Efficiency of energy efficient motor	% age	92.80
5	Proposed power consumption	kWh	26.39
6	Power savings	kW	3.61
7	Total operating hours	hrs	10
8	Total operating days	days	300
9	Power savings per annum	kWh	10815
10	Monetary savings per annum (@ `.4.80 per kWh)	` in lakh	0.52
11	Investment required for new energy efficient motor	` in lakh	0.85
12	Payback period	Years	1.63

Annexure 3: Detailed financial calculations & analysis

Assumptions

Name of the Technology	***Energy Efficient Electric Motor***		
Rated Capacity	***40 HP***		
Details	***Unit***	***Value***	***Basis***
Installed Capacity	HP	40	
No of working days	Days	300	
No of operating hours	Hrs	10	
Proposed Investment			
Plant & Machinery	` (in lakh)	0.77	
Applicable taxes	` (in lakh)	0.03	
Panel, Switch & Cabling etc.	` (in lakh)	0.05	
Total Investment	` (in lakh)	0.85	
Financing pattern			
Own Funds (Equity)	` (in lakh)	0.21	Feasibility Study
Loan Funds (Term Loan)	` (in lakh)	0.64	Feasibility Study
Loan Tenure	Years	5.00	Assumed
Moratorium Period	Months	6.00	Assumed
Repayment Period	Months	66.00	Assumed
Interest Rate	%age	10.00%	SIDBI Lending rate
Estimation of Costs			
O & M Costs	% on Plant & Equip	5.00	Feasibility Study
Annual Escalation	%age	5.00	Feasibility Study
Estimation of Revenue			
Electricity Saving	kWh/Year	10815	
Cost of electricity	`/kWh	4.8	
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	0.64	0.02	0.61	0.07
2	0.61	0.10	0.51	0.06
3	0.51	0.12	0.39	0.05
4	0.39	0.12	0.27	0.03
5	0.27	0.14	0.13	0.02
6	0.13	0.14	-0.01	0.00
		0.64		

WDV Depreciation **` (in lakh)**

Particulars / years	***1***	***2***
Plant and Machinery		
Cost	0.85	0.17
Depreciation	0.68	0.14
WDV	0.17	0.03

Projected Profitability **` (in lakh)**

Particulars / Years	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Fuel savings	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Total Revenue (A)	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Expenses								
O & M Expenses	0.04	0.04	0.05	0.05	0.05	0.05	0.06	0.06
Total Expenses (B)	0.04	0.04	0.05	0.05	0.05	0.05	0.06	0.06
PBDIT (A)-(B)	0.48	0.47	0.47	0.47	0.47	0.46	0.46	0.46
Interest	0.07	0.06	0.05	0.03	0.02	0.00	0.00	0.00
PBDT	0.40	0.42	0.43	0.44	0.45	0.46	0.46	0.46
Depreciation	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
PBT	0.36	0.37	0.38	0.39	0.40	0.42	0.42	0.41
Income tax	0.00	0.10	0.14	0.15	0.15	0.16	0.16	0.16
Profit after tax (PAT)	0.36	0.28	0.24	0.24	0.25	0.26	0.26	0.26

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

Particulars / Years	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Profit before tax	0.36	0.37	0.38	0.39	0.40	0.42	0.42	0.41
Add: Book depreciation	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Less: WDV depreciation	0.68	0.14	-	-	-	-	-	-
Taxable profit	(0.28)	0.28	0.43	0.44	0.45	0.46	0.46	0.46
Income Tax	-	0.10	0.14	0.15	0.15	0.16	0.16	0.16

Projected Balance Sheet **` (in lakh)**

Particulars / Years	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Liabilities								
Share Capital (D)	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Reserves & Surplus (E)	0.36	0.63	0.87	1.11	1.36	1.62	1.88	2.14
Term Loans (F)	0.61	0.51	0.39	0.27	0.13	-0.01	-0.01	-0.01
Total Liabilities (D)+(E)+(F)	1.18	1.36	1.48	1.60	1.71	1.83	2.09	2.35
Assets	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Gross Fixed Assets	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Less Accm. Depreciation	0.04	0.09	0.13	0.18	0.22	0.27	0.31	0.36
Net Fixed Assets	0.81	0.76	0.72	0.67	0.63	0.58	0.54	0.49
Cash & Bank Balance	0.38	0.60	0.76	0.93	1.08	1.25	1.55	1.86
TOTAL ASSETS	1.18	1.36	1.48	1.60	1.71	1.83	2.09	2.35
Net Worth	0.57	0.85	1.08	1.33	1.58	1.83	2.09	2.35
Debt Equity Ratio	2.89	2.42	1.85	1.29	0.63	-0.03	-0.03	-0.03

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

Particulars / Years	0	1	2	3	4	5	6	7	8
Sources									
Share Capital	0.21	-	-	-	-	-	-	-	-
Term Loan	0.64								
Profit After tax		0.36	0.28	0.24	0.24	0.25	0.26	0.26	0.26
Depreciation		0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Total Sources	0.85	0.40	0.32	0.28	0.29	0.29	0.30	0.31	0.30
Application									
Capital Expenditure	0.85								
Repayment Of Loan	-	0.02	0.10	0.12	0.12	0.14	0.14	0.00	0.00
Total Application	0.85	0.02	0.10	0.12	0.12	0.14	0.14	0.00	0.00
Net Surplus	-	0.38	0.22	0.16	0.17	0.15	0.16	0.31	0.30
Add: Opening Balance	-	-	0.38	0.60	0.76	0.93	1.08	1.25	1.55
Closing Balance	-	0.38	0.60	0.76	0.93	1.08	1.25	1.55	1.86

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

Particulars / months	0	1	2	3	4	5	6	7	8
Profit after Tax		0.36	0.28	0.24	0.24	0.25	0.26	0.26	0.26
Depreciation		0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Interest on Term Loan		0.07	0.06	0.05	0.03	0.02	0.00	-	-
Cash outflow	(0.85)	-	-	-	-	-	-	-	-
Net Cash flow	(0.85)	0.48	0.38	0.33	0.32	0.32	0.31	0.31	0.30
IRR	42.19%								
NPV	1.03								

Break Even Point **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8
Variable Expenses								
Oper. & Maintenance Exp (75%)	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04
Sub Total(G)	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04
Fixed Expenses								
Oper. & Maintenance Exp (25%)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Interest on Term Loan	0.07	0.06	0.05	0.03	0.02	0.00	0.00	0.00
Depreciation (H)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Sub Total (I)	0.13	0.11	0.10	0.09	0.08	0.06	0.06	0.06
Sales (J)	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Contribution (K)	0.49	0.49	0.48	0.48	0.48	0.48	0.48	0.47
Break Even Point (L= G/I)	26.63%	23.40%	21.20%	18.91%	16.61%	13.10%	12.42%	12.63%
Cash Break Even {(I)-(H)}	17.41%	14.15%	11.92%	9.60%	7.26%	3.71%	2.99%	3.16%
Break Even Sales (J)*(L)	0.14	0.12	0.11	0.10	0.09	0.07	0.06	0.07

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

Particulars / Years	1	2	3	4	5	6	7	8	Total
Net Profit Before Taxes	0.36	0.37	0.38	0.39	0.40	0.42	0.42	0.41	3.15
Net Worth	0.57	0.85	1.08	1.33	1.58	1.83	2.09	2.35	11.68
									26.96%

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

Particulars / Years	1	2	3	4	5	6	7	8	Total
Cash Inflow									
Profit after Tax	0.36	0.28	0.24	0.24	0.25	0.26	0.26	0.26	1.62
Depreciation	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.27
Interest on Term Loan	0.07	0.06	0.05	0.03	0.02	0.00	0.00	0.00	0.24
Total (M)	0.48	0.38	0.33	0.32	0.32	0.31	0.31	0.30	2.13

DEBT

Interest on Term Loan	0.07	0.06	0.05	0.03	0.02	0.00	0.00	0.00	0.24
Repayment of Term Loan	0.02	0.10	0.12	0.12	0.14	0.14	0.00	0.00	0.64
Total (N)	0.10	0.16	0.17	0.15	0.16	0.14	0.00	0.00	0.88
	4.85	2.41	1.97	2.09	1.95	2.14	0.00	0.00	2.41
Average DSCR (M/N)	2.41								

Annexure 4: Details of procurement and implementation plan

Project Implementation schedule

S. No	Activity	Weeks						
		1				2	3	4
1	Placement of Orders for Equipment							
2	Supply of motor							
3	Installation of the motor							
4	Trial runs							

The process down time is considered for only one day.

Annexure 6: Details of technology/equipment and service providers

Equipment details	*Source of technology*	*Service/technology providers*
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

Annexure 7: Quotation or techno-commercial bid

Bharat Bijlee

CE

eff

TEFC Energy Efficient Motors

For foot mounted (B3 construction) Induction Motors suitable for 415V ±10%, 50Hz ±5%,combined variation ±10%, 3 phase supply. Insulation Class F,Degree of Protection IP55,Ambient Temperature 50°C,Conforms to IS:325

3000 rpm 2 Pole					
Kw	Hp	Frame	Type	LP33	Excise
0.37	0.50	71	MH0712A3	**9890**	484
0.55	0.75	71	MH071233	**10930**	535
0.75	1.00	80	MH080213	**11320**	554
1.10	1.50	80	MH080233	**12370**	605
1.50	2.00	90S	MH09S243	**14330**	701
2.20	3.00	90L	MH09L273	**18340**	897
3.70	5.00	100L	MH10L233	**22520**	1102
5.50	7.50	132S	MH13S253	**36940**	1807
7.50	10.00	132S	MH13S293	**38110**	1865
9.30	12.50	160M	MH16M233	**65490**	3204
11.00	15.00	160M	MH16M253	**66570**	3257
15.00	20.00	160M	MH16M263	**77980**	3815
18.50	25.00	160L	MH16L293	**101130**	4948
22.00	30.00	180M	MH18M233	**107830**	5276
30.00	40.00	200L	MH20L2A3	**160200**	7838
37.00	50.00	200L	MH20L253	**195490**	9564
45.00	60.00	225M	MH22M253	**251560**	12308
55.00	75.00	250M	MH25M233	**340770**	16672
75.00	100.00	280S	MH28S233	**420770**	20586
90.00	120.00	280M	MH28M253	**487780**	23865
110.00	150.00	315S	MH31S233	**614830**	30081
125.00	170.00	315M	MH31M2A3	**721700**	35309
132.00	180.00	315M	MH31M233	**756280**	37001
150.00	200.00	315L	MH31L2A3	**799550**	39118
160.00	215.00	315L	MH31L253	**828460**	40532
180.00	240.00	315L	MH31L2B3	**871770**	42651
* 200.00	270.00	315L	MH31L273	**971450**	47528
* 250.00	335.00	355L	MH35L213	**1077730**	52728
* 315.00	425.00	355L	MH35L233	**1174110**	57443

1500 rpm 4 Pole					
Kw	Hp	Frame	Type	LP33	Excise
0.37	0.50	71	MH071433	**10450**	511
0.55	0.75	80	MH080433	**11640**	569
0.75	1.00	80	MH080453	**11730**	574
1.10	1.50	90S	MH09S423	**13390**	655
1.50	2.00	90L	MH09L473	**14630**	716
2.20	3.00	100L	MH10L473	**19360**	947
3.70	5.00	112M	MH11M473	**24760**	1211
5.50	7.50	132S	MH13S473	**34130**	1670
7.50	10.00	132M	MH13M443	**39840**	1949
9.30	12.50	160M	MH16M4C3	**62130**	3040
11.00	15.00	160M	MH16M4K3	**63750**	3119
15.00	20.00	160L	MH16L4T3	**79250**	3877
18.50	25.00	180M	MH18M473	**102170**	4999
22.00	30.00	180L	MH18L483	**113900**	5573
30.00	40.00	200L	MH20L453	**153670**	7518
37.00	50.00	225S	MH22S433	**197410**	9658
45.00	60.00	225M	MH22M453	**228770**	11193
55.00	75.00	250M	MH25M433	**316400**	15480
75.00	100.00	280S	MH28S413	**383840**	18779
90.00	120.00	280M	MH28M433	**445340**	21788
110.00	150.00	315S	MH31S413	**539180**	26379
125.00	170.00	315M	MH31M4A3	**616820**	30178
132.00	180.00	315M	MH31M433	**632520**	30946
150.00	200.00	315L	MH31L4A3	**683620**	33446
160.00	215.00	315L	MH31L453	**742690**	36336
180.00	240.00	315L	MH31L463	**791660**	38732
200.00	270.00	315L	MH31L473	**903630**	44210
250.00	335.00	355L	MH35L413	**995980**	48728
315.00	422.00	355L	MH35L433	**1140030**	55776
355.00	480.00	355L	MH35L453	**1467630**	71804
400.00	540.00	400M	MH40M413	**2013580**	98514
450.00	600.00	400M	MH40M433	**2078320**	101682
500.00	670.00	400M	MH40M453	**2158470**	105603
560.00	750.00	400L	MH40L473	**2273260**	111219
630.00	850.00	400L	MH40L493	**2340780**	114523

* These ratings are sutiable for Ambient Temperature 45 C

rating upto 1000kW/4p,800 kW/6P & 630kW/8P can be offered in Frame 450. For price refer to marketing office.

eff1 increased Safety EX'e', Non Sparking Ex 'nA' can be offered upto Frame 355. For price & frame size refer to marketing office.

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

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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