DETAILED PROJECT REPORT
ON
ENERGY EFFICIENT MOTOR (30 HP)
(GANJAM RICE MILL CLUSTER)

Bureau of Energy Efficiency

Prepared By

Reviewed By

ENERGY EFFICIENT MOTOR (30 HP)

GANJAM RICE MILLS CLUSTER

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Detailed Project Report on Energy Efficient Motor (30 HP)
Rice Mill SME Cluster, Ganjam, Orissa (India)
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Zenith Energy Services Private Ltd.

Hyderabad

Contents

List of Table

List of Figure

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
- MoP - Ministry of Power
- MSME - Micro Small and Medium Enterprises
- 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

Zenith Energy Services Pvt. Ltd is executing BEE-SME program in Ganjam Rice Mills Cluster, supported by Bureau of Energy Efficiency (BEE) with an overall objective of improving the energy efficiency in cluster units.

Paddy is one of the major crops cultivated in the eastern states especially in the state of Orissa. The Rice comes out of milling of paddy. Hence rice milling is an important activity in the state. There are about 250 rice mills in Ganjam rice mills cluster covering Berhampur, Hinjilicut, Bhanjanagar and Ganjam areas. The major Energy forms used in the cluster is electricity. Electricity is used for driving the prime movers of elevators, Chaluni, separator, paddy cleaners, Rubber Sheller, and whiteners/cones, drives and for lighting. The cost of energy as a percentage of end product cost (Rice) cost varies anywhere between of 1% to 1.5%.

The main motor of the common shaft drive provides mechanical energy to the common shaft and to the other rice mill machinery like Chaluni (paddy cleaner), separator, paddy cleaners, rubber sheller, and whiteners/cones by long belts to the individual equipments to provide mechanical energy.

The motors installed for the main motor of common shaft drive system of the cluster units are of very old and are inefficient. The motors installed for the main motors of common shaft drive are re winded number of times due to frequent burning of the windings. It is well known fact that the re winded motors will have less efficiency and hence more power consumption and also increased operation and maintenance cost.

Installation of proposed technology i.e. new Energy Efficient motor (30 HP) would lead to save about 5273 kWh of electricity per year.

The DPR highlights the details of the study conducted for assessing the potential for reducing electricity consumption by replacing the present motor with new Energy Efficient motor in various units of the cluster, possible electricity 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:

S.No	Particular	Unit	Value
1	Project cost	` (In lakh)	0.56
2	Electricity saving	kWh/annum	5273
3	Monetary benefit	` (In lakh)	0.22
4	Debit equity ratio	Ratio	3:1
5	Simple payback period	Years	2.55
6	NPV	` (In lakh)	0.24
7	IRR	%age	22.22
8	ROI	%age	24.96
9	DSCR	Ratio	1.59
10	Process down time	Days	6
11	CO_2 reduction	Ton /year	4

The projected profitability and cash flow statements indicate that the project implementation of energy efficient motor by the present inefficient motor in the cluster units 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 29 selected SMEs clusters. Ganjam Rice Mills 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

Paddy is one of the major crops cultivated in the eastern states especially in the state of Orissa. The Rice comes out of milling of paddy. Hence rice milling is an important activity in the state. There are about 250 rice mills in Ganjam rice mills cluster covering Berhampur, Hinjilicut, Bhanjanagar, and Ganjam areas. The major Energy forms used in the cluster is grid electricity. Electricity is used for driving the prime movers of elevators, Chaluni, separator, paddy cleaners, Rubber Sheller, and whiteners/cones, drives and for lighting. The cost of energy as a percentage of end product cost (Rice) cost varies anywhere between 1% and 1.5%.

1.1.1 Production process

Pre-Cleaner/ Paddy Cleaner

Paddy cleaner is a most essential equipment in a rice mill and separates all the impurities like dust, straw, sand, clay and heavy particles of even and uneven sizes from paddy before the paddy is processed. The clean paddy sent to the rubber roll sheller to process further. The advantages with the paddy cleaner are it increases the life of rubber rollers and the percentage of oil in bran.

The function of the dust blower is to remove the dust from paddy through the pipeline connected to the paddy cleaner. This equipment is recommended for installation in conventional rice mills, also to get the same advantages as of modern rice mills. If this are not removed prior to shelling the efficiency of the rubber Sheller and the milling recovery is reduced.

The pre-cleaners separate three groups of materials:

- The first separation is done by scalping or removing the objects that are larger than the grain. Either a flat oscillating screen or a rotary drum screen that allows the grain to pass through but retains straw.
- The second separation retains the grains but allows broken grains, small stones and weed seeds to pass through. Aspirator is installed to remove the dust and light empty grains

Rubber Sheller

The objective of a hulling/de husking operation is to remove the husk from the paddy grain with a minimum of damage to the bran layer and, if possible, without breaking the brown rice grain. Since, the structure of the paddy grain makes it necessary to apply friction to the grain surface to remove the husk; it leads to breaking of some of the rice.

The paddy is fed into the center of the machine through a small hopper. A vertically adjustable cylindrical sleeve regulates the capacity and equal distribution of the paddy over the entire surface of the rotating disc, paddy is forced between the two discs (rubber sheller)and as a result of pressure and friction most of the paddy is de husked (hulled), where husk and brown rice are separated.

Separator

The output from the huller is a mixture of brown rice, husk, broken paddy etc. The huller aspirator removes the lighter material such as husk, bran and very small broken rice. The remainder passes onto the paddy separator where the unshelled paddy rice is separated from the brown rice. The amount of paddy present depends on the efficiency of the husker, and normally less than 10%. Paddy separators work by making use of the differences in specific gravity, buoyancy, and size between paddy and brown rice. Paddy rice has a lower specific gravity, higher buoyancy, and is physically bigger, longer and wider than brown rice

The compartment type of paddy separator uses the difference in specific gravity and the buoyancy to separate paddy and brown rice. When paddy and brown rice move over an inclined plane, they move at different speeds depending on their specific gravity, their shape and contact area, smoothness of inclined surface and the co-efficient of sliding friction. Brown grains are smaller, heavier, rounder, and smoother and will slide faster than paddy grains. The processing capacity of the compartment separator is dependent on the compartment area. For a 1.0 ton/hr capacity rice mill, a 45-compartment separator made up of 15 compartments on each of three decks is used.

Whitening and Polishing

In the process of whitening, the skin and bran layer of the brown rice are removed. During polishing of the whitened rice, the bran particles still sticking to the surface of the rice are removed and the surface of the rice is slightly polished to give it a glazed appearance. For further whitening if required as per the market demand or for export market, the polished rice is further processed in the silky machine for additional polishing.

Rice grader

After polishing, the white rice is separated into head rice and, large and small broken rice by a sifter. Head rice is normally classified as kernels, which are 75-80% or more of a whole kernel. The sifter is made up of a series of oscillating or cylindrical screens through which the rice passes. The output from the bottom screen is the very fine broken tips and is called the “brewers”.

Elevators

The elevator used at different stages of rice milling for transferring paddy, brown rice and white rice during the milling process

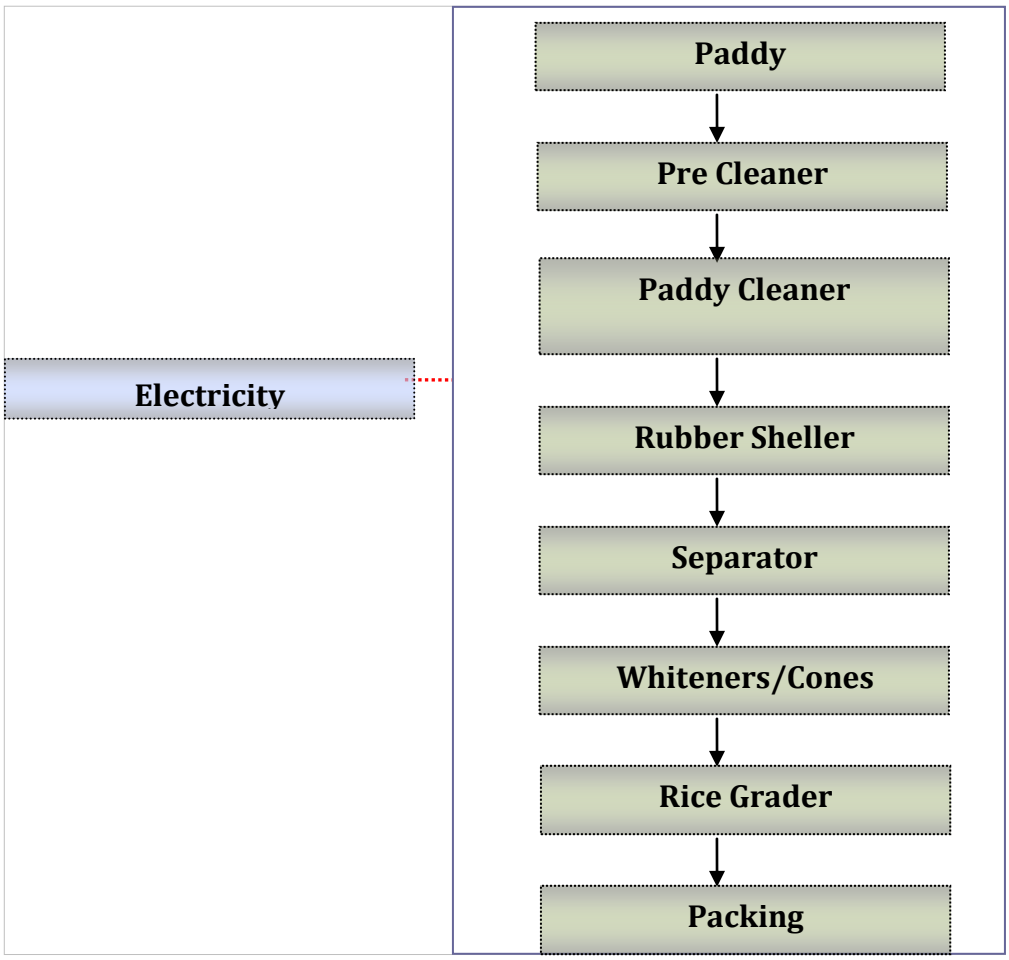


Figure 1.1: General Process Flowchart of a rice mill is furnished below.

1.2 Energy performance in existing situation

1.2.1 Electricity consumption of a typical unit in the cluster

The main source of energy for a typical rice milling unit in the cluster is electricity and is used for driving the prime movers of common drive shaft motor and in individual drive system like elevators, Chaluni, separator, paddy cleaners, Rubber Sheller, and whiteners/cones, drives and for lighting. The energy consumption of a typical rice production unit in the cluster having old and inefficient motor is furnished in Table 1.1 below:

Table 1.1: Energy consumption of a typical unit (M/s Ambica Rice Mill)

S.No.	Details	Unit	Value
1	Electricity Consumption	MWh/annum	45
2	Production (Rice)	tonne/annum	3000

1.2.2 Average production by a typical unit in the cluster

The average production in a year in a typical rice production unit is 3000 tonne per annum.

1.2.3 Specific Energy Consumption

The major source of energy for paddy processing is electricity and the specific electricity consumption per ton of paddy processing for a typical unit is furnished in Table 1.2 below:

Table 1.2: Specific energy consumption for a typical unit (M/s Ambica Rice Mill)

S. No.	Type of energy	Units	Specific Energy Consumption
1	Electricity	kWh/ton	15

1.3 Existing technology/equipment

1.3.1 Description of existing technology

The motors installed for the main motor of common shaft drive system of the cluster units are of very old and are inefficient. As per the detailed studies undertaken in various units of the cluster and based on the discussions with the supervisors and workers, the motors installed for the main motors of common shaft drive are re winded number of times due to frequent burning of the windings and is a common practice for SME owners in the cluster

of rewinding of the motors. It is well known fact that the re winded motors will have less efficiency and hence more power consumption and also increased operation and maintenance cost.

The existing motor specifications and operating parameters are furnished in Table 1.3 below:

Table 1.3 Existing motor specifications

S.No	Parameters	Details
1	Rated HP/kW	30/22
2	Year	1986
3	Rated Voltage	415
4	Rated Amps	40
5	frequency Hz	50
6	Measured Power Consumption (kW)	14.6
7	Transmission system	Belt Drives
8	RPM	1440

1.3.2 Its role in the whole process

The main motor of the common shaft drive provides mechanical energy to the common shaft and to the other rice mill machinery like Chaluni (paddy cleaner), separator, paddy cleaners, rubber sheller, and whiteners/cones by long belts to the individual equipments to provide mechanical energy. The motor is operated continuously for 10 hours in a day for 300 days in a year.

1.4 Establishing the baseline for the equipment to be changed

1.4.1 Design and operating parameters power consumption

The present power consumption of a motor is 14.6 kW. The motor is operated for 10 hours in a day and operated 300 days in a year and it varies from unit to unit.

1.4.2 Electricity consumption

The electricity consumption of the main motor connected to the common shaft drive system of three typical units having single motor and paddy processing capacity of 1 TPH is furnished in Table 1.4 below:

Table 1.4 Power consumption in three typical units

Name of the unit	*No of (hours/ day)*	*No of (days /annum)*	*Production capacity (Tons / annum)*	*Actual Power Consumption motor (kW)*	*Actual Power consumption (kWh/annum)*
M/s Ambica Rice Mill	10	300	3000	14.6	43800
M/s Bajarangi Rice Mill	8	330	2640	10.8	28512
M/s Durg Rice Mill	8	270	2160	7.35	15876

1.4.2 Operating efficiency of the existing system

The detailed energy audits studies had been undertaken in various units of the cluster to evaluate the motor efficiencies. Based on study, majority of motors are very old and rewinded number of times leading to low efficiency and hence more power consumption for same output whereas, the new energy efficient motors will have overall efficiency of 92.2% (at full load). Details of efficiency calculation are given at Annexure 1.

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 new energy efficient motor in the cluster are:

- Lack of awareness of the energy efficient motors
- Lack of knowledge on the disadvantages of the rewinded motors

1.5.2 Financial Barrier

The replacement of higher capacity motors requires high initial investment and the repair and rewinding of the motor will costs very less and LSP's are available locally. Hence, many of the owners don't show interest due to high initial investment and lack of financial strength to invest.

Further, the lack of awareness of the losses and monetary benefit of energy efficient motors also one of the major factor prevented the implementation of the energy efficient motors.

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

Not applicable

1.5.4 Other barrier(s)

Lack of Information on the energy efficient technologies is also one of the factors preventing implementation of the energy efficient motors among cluster unit owners

2. EQUIPMENT OPTION FOR ENERGY EFFICIENCY IMPROVEMENT

2.1 Detailed description of technology/equipment selected

2.1.1 Description of technology

The project activity is replacement of inefficient and old motors with new energy efficient motors. The new energy efficient motor will have overall efficiency of more than 92.2% at full load. The high efficiency of the energy efficient motor is due to the following special features:

- Low loss special grade of thinner laminations. This reduces the Iron loss even at partial loads.
- Thicker conductors and more copper contents reduce copper loss due to lower resistance.
- Longer core length, reduced and uniform air gap between stator and rotor to reduce stray losses.
- Special design of fan and fan cover to reduce windage losses

Considering the above facts and for reducing electricity consumption of the motors, it is suggested to install energy efficient motors.

Applications:

Best performance even at partial loads:

The benefits of using energy efficient motors are more in continuous duty applications for all industrial applications.

In many applications the load factor of the motor will range between 60% and 80%. The efficiency curve of standard motor is drooping 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 or negligible. Thus energy saving is significant even in part load operation of the motor.

2.1.2 Technology /Equipment specifications

The detail specifications of new energy efficient motor suggested is furnished in Table 2.1 below:

Table 2.1: Proposed Motor Specifications

S. No.	Parameter	Details
1	Rated Hp	30
2	Rated Amps	37.5
3	Speed	2945 rpm
4	Efficiency	92.2 %
5	Power Factor	0.89

2.1.3 Justification of the technology selected & its suitability

About 50% of the rice mill units in the cluster have common shaft drive system and is a very old technology. These types of mills have a single or two motors (some cases), where the main motor will drive the common shaft and from common shaft the mechanical energy is transmitted to other equipments through individual long belts connected to each equipment. Majority of motors are very old and rewinded number of times leading to low efficiency and hence more power consumption for same output whereas, the new energy efficient motors will have overall efficiency of 92.2% (at full load). The following are the reasons for selection of this technology

- Energy efficient motors will reduce electricity consumption
- High power factor
- Flat efficiency curve for at all loads
- Life of the motor is high

2.1.4 Superiority over existing technology/equipment

The following are the superior features of energy efficient motors;

- The efficiency curve is almost flat 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 by even 2 %, sometimes this allows even a lower cable size saving tremendously on capital costs.

2.1.5 Availability of the proposed technology/equipment

The energy efficient motor suppliers are available at Bhubaneshwar and Vishakapatnam.

2.1.6 Source of technology/equipment for the project

The source of the technology is indigenous and is locally available.

2.1.7 Service/technology providers

Detail of service providers for proposed motors is given in Annexure 7.

2.1.8 Terms of sales of the suppliers

The terms and conditions of the equipment supplier for supply of the Energy Efficient Motors are given in Annexure 6.

2.1.9 Process down time during implementation

The process down time for installation of energy efficient motor is considered at one week for dismantling the existing motor and installation of new motor and providing electrical connections to the motor.

2.2 Life cycle assessment and risks analysis

The life of the energy efficient motors is considered at 20 years. There is no risk involved as the motors are technology proven and are successfully in operation for more than a decade in the country.

2.3 Suitable unit/plant size for identified equipment

The motors are selected similar to the existing capacity of the motor and actual power drawn at full load based on energy audits carried out plus 20% margin to overcome sudden load and also as recommended by the rice mill equipment supplier.

3. ECONOMIC BENEFITS OF NEW ENERGY EFFICIENT TECHNOLOGY

3.1 Technical benefits

3.1.1 Fuel Saving

No fuel saving is envisaged due to implementation of proposed technology.

3.1.2 Electricity savings

The efficiency of the New Energy Efficient Motors will be more than the existing old and rewinded motors and hence reduces electricity consumption for same output. Total power savings due to installation of new energy efficient motor for a typical unit is estimated at 5273 kWh per annum. Details of electricity saving is given in Annexure 3.

3.1.2 Improvement in product quality

There is no significant impact on the product quality ***directly or indirectly.***

3.1.3 Increase in production

There is no significant impact on the production ***directly or indirectly.***

3.1.4 Reduction in raw material consumption

Raw material consumption is same even after project implementation.

3.1.5 Reduction in other losses

There is significant reduction of other loss ***directly or indirectly.***

3.2 Monetary benefits

The monetary benefit due to installation of new motor is estimated at ` 0.22 lakh per annum due to reduction in electricity consumption. Details of monetary saving are given in Annexure 3.

3.3 Social benefits

3.3.1 Improvement in working environment in the plant

As installation of new efficient motor may lessen the breakdowns and hence working environment may improve.

3.3.2 Improvement in skill set of workers

The technology selected for the implementation is new and energy efficient. The technology implemented will create awareness among the workforce and improves skills of the workers.

3.4 Environmental benefits

3.4.1 Reduction in effluent generation

Not applicable

3.4.2 Reduction in GHG emission such as CO2, NOx, etc

The major GHG emission reduction source is CO_2. The technology will reduce grid electricity consumption and emission reductions are estimated at 4 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 EQUIPMENT

4.1 Cost of equipment implementation

4.1.1 Cost of equipments

The total cost for implementation of New Energy Efficient Motor is estimated at ` 0.51 lakh as per the quotation provided in Annexure 8.

4.1.2 Other costs

Cost included in cabling modification and commissioning is ` 0.05 lakh. Detail of project cost is furnished in Table 4.1 below:

Table 4.1: Project Cost

S.No	Particular	Unit	Value
1	Motor	` in lakh	0.51
2	Panel, switch & cabling, Elec. modifications etc	` in lakh	0.05
3	Total Investment	` in lakh	0.56

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 ` 0.14 lakh.

4.2.2 Loan amount

The term loan is 75% of the total project cost, which is ` 0.42 lakh.

4.2.3 Terms & conditions of loan

The interest rate is considered at 10.0% which is prevailing interest rate of SIDBI 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 ` 0.12 lakh in the first year operation and increases to ` 0.59 lakh at the end of eighth year.

4.3.2 Simple payback period

The total project cost of the proposed technology is ` 0.56 lakh and monetary savings due to reduction in electricity consumption is ` 0.22 lakh and the simple payback period work out to be 2.55 years.

4.3.3 Net Present Value (NPV)

The Net present value of the investment at 10.0% interest rate works out to be ` 0.24 lakh.

4.3.4 Internal rate of return (IRR)

The after tax Internal Rate of Return of the project works out to be 22.22%. 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 24.96%.

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* `(In lakh)	*ROI* %	*DSCR*
Normal	22.22%	0.24	24.96	1.59
5% increase in power savings	24.24%	0.28	25.27	1.68
5% decrease in power savings	20.17%	0.20	24.61	1.51

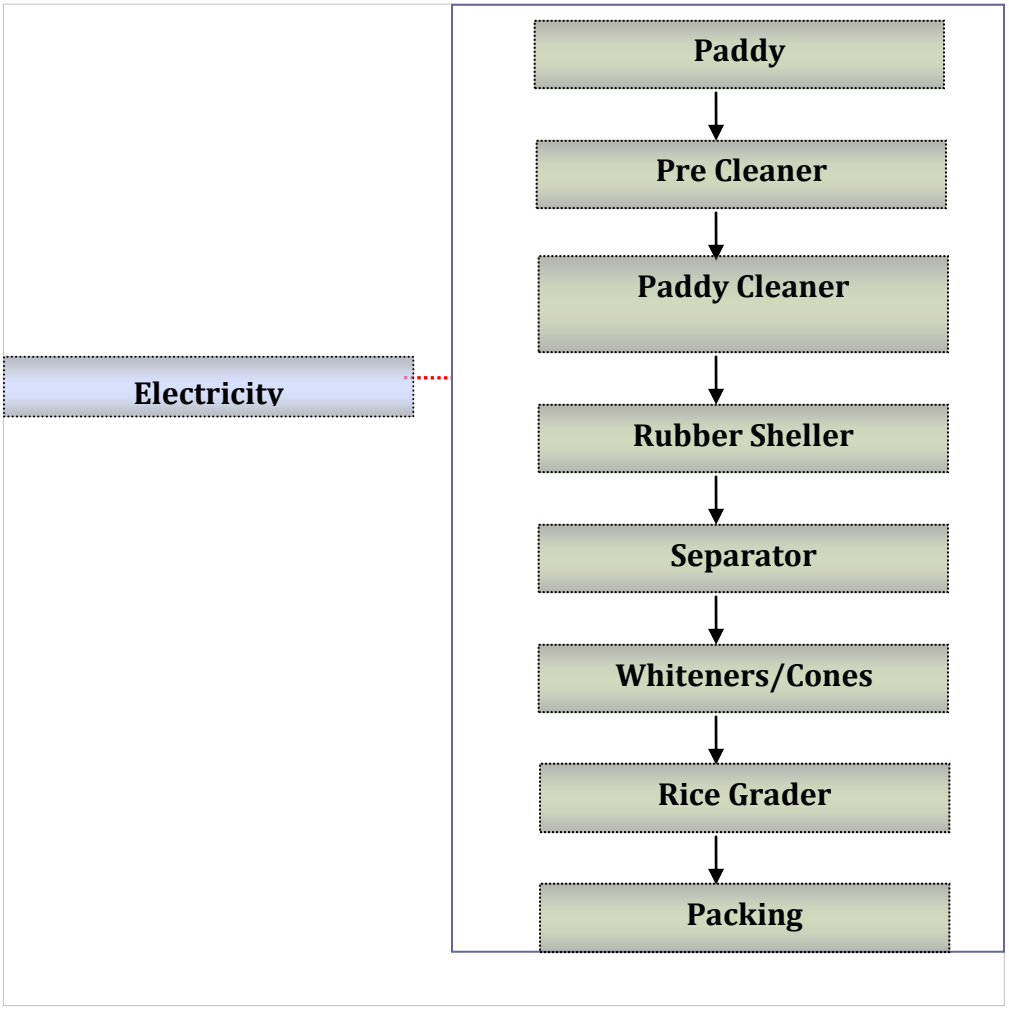
4.5 Procurement and implementation schedule

The project is expected to be completed in 4 weeks from the date of release of purchase order. The detailed schedule of project implementation is furnished in Annexure 6.

Annexure 1: Energy audit and base line establishment

Name of industry	No of year old motor	Initial efficiency of the motor (%age)	No of times rewinded	Efficiency derated in each rewinding	Efficiency derated for total no of rewinding	Present efficiency of the motor (%age)
M/s Ambica Rice Mill	25 years	91.1	10	1%	10%	81.10
M/s Bajarangi Rice Mill	20 years	91.1	8	1%	8%	83.80
M/s Durg Rice Mill	12 years	91.1	7	1%	7%	84.70

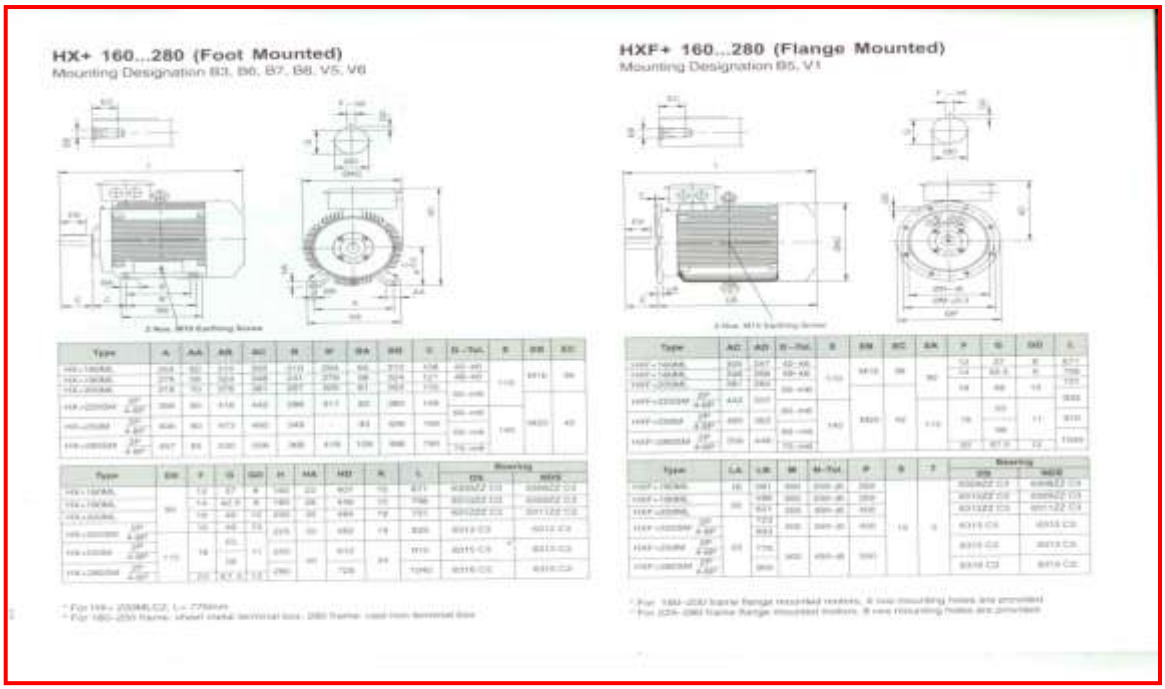
Annexure 2: Process flow diagram



Annexure 3: Detailed Technology Assessment Report

S.No.	Particulars	Unit	Value
1	Rated capacity of existing motor	HP	30
2	Efficiency of existing motor	%age	81.1
3	present power consumption	kWh	14.6
4	Efficiency of proposed motor	%age	92.2
5	Power consumption in new energy efficient motor	kWh	12.84
6	Electricity saving	kWh	1.76
7	Total operating hours	hrs	10
8	Total operating days	Days/year	300
9	Electricity saving per year	kWh	5273
10	Cost of electricity	` /kWh	4.2
11	Monetary savings per annum	`(In lakh)	0.22
12	Investment required for new EE motor	`(In lakh)	0.56
13	Payback period	Years	2.55

Annexure 4: Detailed engineering drawing



Annexure 5: Detailed Financial Calculations & Analysis

Assumption

Name of the Technology	**ENERGY EFFICIENT MOTOR**		
Rated Capacity	**30 HP**		
Details	***Unit***	***Value***	***Basis***
Installed Capacity	HP	30	
No of working days	Days	300	
No of operating	Hrs	10	
Proposed Investment			
Equipment cost	` (in lakh)	0.51	
Cabling, Civil works and Modification	` (in lakh)	0.05	
Total Investment	` (in lakh)	0.56	
Financing pattern			
Own Funds (Equity)	` (in lakh)	0.14	
Loan Funds (Term Loan)	` (in lakh)	0.42	
Loan Tenure	Years	5	Assumed
Moratorium Period	Months	6	Assumed
Repayment Period	Months	66	Assumed
Interest Rate	%age	10.00%	SIDBI Lending rate
Estimation of Costs			
O & M Costs	% on Plant & Equip	4.00	Feasibility Study
Annual Escalation	%age	5.00	Feasibility Study
Estimation of Revenue			
Electricity saving	kWh/year	5273	
Cost	`/kWh	4.2	
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	0.42	0.03	0.39	0.05
2	0.39	0.06	0.33	0.04
3	0.33	0.08	0.25	0.03
4	0.25	0.09	0.16	0.02
5	0.16	0.10	0.06	0.01
6	0.06	0.06	0.00	0.00
		0.42		

WDV Depreciation **` (in lakh)**

Particulars / years	1	2
Plant and Machinery		
Cost	0.56	0.11
Depreciation	0.45	0.09
WDV	0.11	0.02

Projected Profitability **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8
Fuel savings	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Total Revenue (A)	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Expenses								
O & M Expenses	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03
Total Expenses (B)	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03
PBDIT (A)-(B)	0.20	0.20	0.20	0.20	0.19	0.19	0.19	0.19
Interest	0.05	0.04	0.03	0.02	0.01	0.00	-	-
PBDT	0.15	0.16	0.17	0.17	0.18	0.19	0.19	0.19
Depreciation	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
PBT	0.12	0.13	0.14	0.14	0.15	0.16	0.16	0.16
Income tax	-	0.02	0.06	0.06	0.06	0.06	0.07	0.06
Profit after tax (PAT)	0.12	0.11	0.08	0.09	0.09	0.10	0.10	0.10

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

Particulars / Years	1	2	3	4	5	6	7	8
Profit before tax	0.12	0.13	0.14	0.14	0.15	0.16	0.16	0.16
Add: Book depreciation	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Less: WDV depreciation	0.45	0.09	-	-	-	-	-	-
Taxable profit	(0.30)	0.07	0.17	0.17	0.18	0.19	0.19	0.19
Income Tax	-	0.02	0.06	0.06	0.06	0.06	0.07	0.06

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

Particulars / Years	1	2	3	4	5	6	7	8
Liabilities								
Share Capital (D)	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Reserves & Surplus (E)	0.12	0.23	0.31	0.39	0.48	0.58	0.68	0.77
Term Loans (F)	0.39	0.33	0.25	0.16	0.06	0.00	0.00	0.00
Total Liabilities (D)+(E)+(F)	0.65	0.70	0.70	0.69	0.68	0.72	0.82	0.91

Assets	1	2	3	4	5	6	7	8
Gross Fixed Assets	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Less Accm. Depreciation	0.03	0.06	0.09	0.12	0.15	0.18	0.21	0.24
Net Fixed Assets	0.53	0.50	0.47	0.44	0.41	0.38	0.35	0.32
Cash & Bank Balance	0.12	0.20	0.23	0.25	0.27	0.34	0.47	0.59
TOTAL ASSETS	0.65	0.70	0.70	0.69	0.68	0.72	0.82	0.91
Net Worth	0.26	0.37	0.45	0.53	0.62	0.72	0.82	0.91
Debt Equity Ratio	2.79	2.36	1.79	1.14	0.43	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	0.14	-	-	-	-	-	-	-	-
Term Loan	0.42								
Profit After tax		0.12	0.11	0.08	0.09	0.09	0.10	0.10	0.10
Depreciation		0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Total Sources	0.56	0.15	0.14	0.11	0.11	0.12	0.13	0.13	0.13
Application									
Capital Expenditure	0.56								
Repayment Of Loan	-	0.03	0.06	0.08	0.09	0.10	0.06	-	-
Total Application	0.56	0.03	0.06	0.08	0.09	0.10	0.06	-	-
Net Surplus	-	0.12	0.08	0.03	0.02	0.02	0.07	0.13	0.13
Add: Opening Balance	-	-	0.12	0.20	0.23	0.25	0.27	0.34	0.47
Closing Balance	-	0.12	0.20	0.23	0.25	0.27	0.34	0.47	0.59

IRR

` (in lakh)

Particulars / months	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Profit after Tax		0.12	0.11	0.08	0.09	0.09	0.10	0.10	0.10
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	(0.56)	-	-	-	-	-	-	-	-
Net Cash flow	(0.56)	0.20	0.17	0.14	0.14	0.13	0.13	0.13	0.13
IRR	22.22%								
NPV	0.24								

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

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Variable Expenses								
Oper. & Maintenance Exp (75%)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Sub Total*(G)*	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
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	0.05	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)	0.08	0.07	0.07	0.06	0.05	0.04	0.04	0.04
Sales (J)	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Contribution (K)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Break Even Point (L= G/I)	40.89%	35.18%	32.41%	28.56%	24.13%	19.24%	18.63%	18.93%
Cash Break Even {(I)-(H)}	26.44%	20.68%	17.84%	13.93%	9.42%	4.45%	3.77%	3.98%
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	0.12	0.13	0.14	0.14	0.15	0.16	0.16	0.16	1.17
Net Worth	0.26	0.37	0.45	0.53	0.62	0.72	0.82	0.91	4.69
									24.96%

Debt Service Coverage Ratio

` (in lakh)

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***Total***
Cash Inflow									
Profit after Tax	0.12	0.11	0.08	0.09	0.09	0.10	0.10	0.10	0.58
Depreciation	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.18
Interest on Term Loan	0.05	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.15
Total (M)	0.20	0.17	0.14	0.14	0.13	0.13	0.13	0.13	0.91

DEBT

Interest on Term Loan	0.05	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.15
Repayment of Term Loan	0.03	0.06	0.08	0.09	0.10	0.06	0.00	0.00	0.42
Total (N)	0.08	0.10	0.11	0.11	0.11	0.06	0.00	0.00	0.57
	2.54	1.80	1.27	1.22	1.18	2.07	0.00	0.00	1.59
Average DSCR (M/N)	1.59								

Annexure 6: Details of procurement and Implementation plan

Project Implementation Schedule

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

Process Down Time

S. No	Activity	Weeks			
		1	2	3	4
1	Dismantling of the existing motor				
2	Electricity connections				
3	Installation of the motor				
4	Trial runs				

The process down time is considered for one week.

Annexure 7: Details of technology/equipment and service providers

Equipment details	*Source of technology*	*Service/technology providers*
Energy Efficient motors	Indigenous	Deraz Engineers, Hyderabad # 6-3-1177/90, BS Maktha, Begumpet, Hyderabad - 500 016. Andhra Pradesh. India. Ph : +91-40-2340 2442, 2340 6843, 2340 4732 Telefax: +91-40-23412165 Cell: +91-9948353601 Email: deraz@deraz.in
Energy Efficient motors	Indigenous	Crompton Greaves Ltd Ashok Nagar, BhubaneshwarIndia
Energy Efficient motors	Indigenous	SLR Enterprises, D. No. 3464, 3rd Floor, " Dundoo Vihar", R.P. Road, Secunderabad-500003

Annexure 8: Quotations or Techno-Commercial Bids

Our Ref No – 2K1101252/KKB/RB, Dated –03-02-2011

DERAZ ENGINEERS
Excellence in every endeavour
www.derazengineers.com

Authorized Dealer

M/s. Zenith Energy.
10-5-6/B, My home plaza
Masabtank, Hyderabad
Ph: 040-23376630/23376631, Fax: 23322517
E-mail: krishna@zenithenergy.com

Kind Attn – Mr. Krishna - 9440234294

Dear Sir,

Sub –Quotation for SIEMENS make Motors.
Ref – Your mail Enquiry , Dt:02.02.2011

With reference to the above, we are pleased to submit our offer as given below

TERMS & CONDITIONS:

1. **PRICES** – F.O.R. OUR WORKS.
2. **DUTIES** – E.D@10.30% Extra.
3. **TAXES** - VAT@14.5% **extra or CST@2% extra against form C**
4. **DELIVERY** –Within 12 weeks after receipt of the same
5. **PAYMENT** – 25%Advance balance against Performa invoice prior to dispatch
   Documents through bank. In case of delayed payment OD Interest@18%p.a will be charged
6. **VALIDITY** - 15 days.
7. **DISCOUNT** - @50% on quoted price

We now request you to kindly place your valuable order on us.
Thanking you and assuring you of our best services at all times.

Yours faithfully,
For DERAZ ENGINEERS

03/02/11

(K.A.ABDUL RAZAKH)
CHIEF EXECUTIVE OFFICER

Note: For Further clarification Please contact to Mr.Kishore Babu (Manager-sales)
Cell: 9948353615

HO: Hyderabad 6-3-1177/90, 'Deraz House', BS Maktha, Begumpet 500 016
Ph: 23402442, 23406843, 23404732. Fax: 040 - 23412165. Cell: 9948353601 e-mail: deraz@deraz.in, sales@deraz.in
BO: Vijayawada F-2, Navrang Apartments, Khanna Nagar 520 010. Telefax: 0866 - 2488330. Cell: 9948353611 e-mail: vja@deraz.in
BO: Visakhapatnam Flat No. 308, Sreemithra Heights, Opp: Bus Depot, Gopalapatnam 530 027. Cell: 9948353610 e-mail: vizag@deraz.in
BO: Tirupathi 19-7-97b, Gopalraju Colony, RC Road 517 501. Telefax: 0877 - 2246378. Cell: 9948353614 e-mail: tpt@deraz.in

SIEMENS MAKE, 415V, IP 55, CLASS F INSULATION, 50Hz SQUIRREL CAGE INDUCTION MOTOR - EFF2									
SL NO	KW	HP	RPM	FRAME SIZE	MLFB	Mounting	QTY IN NOS	UNIT PRICE IN RS	TOTAL PRICE IN RS
1	22	30	1440	180L	1LA0 186-4YA80	Foot	1	91740	91740
2	30	40	1440	200L	1LA0 207-4YA80	Foot	1	123805	123805
3	37	50	1440	225S	1LA0 221-4YA80	Foot	1	158895	158895
GRAND TOTAL									123805

SIEMENS MAKE, 415V, IP 55, CLASS F INSULATION, 50Hz SQUIRREL CAGE INDUCTION MOTOR - EFF1									
SL NO	KW	HP	RPM	FRAME SIZE	MLFB	Mounting	QTY IN NOS	UNIT PRICE IN RS	TOTAL PRICE IN RS
1	22	30	1440	180L	1SE0 186-4YL80	Foot	1	100850	100850
2	30	40	1440	200L	1SE0 207-4YL80	Foot	1	136160	136160
3	37	50	1440	225S	1SE0 221-4YK80	Foot	1	176550	176550
GRAND TOTAL									136160

QUOTATION

Ph : (O) 66568120
Telefax : 66338262
Mobile : 9849006201

SLR ENTERPRISES

AUTHORISED DEALER FOR :
FINOLEX CABLES LTD, ROTOMOTIVE - MOTORS & WORM GEAR BOXES

D. No. 3464, (4-3-1 to 6) 3rd Floor, "Dundoo Vihar", R.P. Road, Secunderabad - 500 003.

Qtn. No. : 358 Date 24/12/10.

Ref. No. :

S.No.	DESCRIPTION	Qty.	Unit Price	Amount Rs.	Ps.
a)	SIEMENS Make 1500 RPM FOOT MOUNTING EFF1				
1)	5 HP 1SE0 113-4YB80		19935=/-		
2.	7½ HP 1SE0 130-4YB80		23470=/-		
3.	10 HP 1SE0 133-4YB80		31995=/-		
4	12.5 HP 1SE0 163-4YB80		51480=/-		
5	15 HP 1SE0 163-4YB80		52900=/-		
6	20 HP 1SE0 166-4YB80		65750=/-		
7	25 HP 1SE0 183-4YB80		86830=/-		
8	30 HP 1SE0 186-4YL80		91660=/-		
9	40 HP 1SE0 207-4YL80		123750=/-		
10	50 HP 1SE0 221 4YK80		160500=/-		
	Discount : 45% extra @ 10.3%				

TIN : 28630156311
APGST No. SEC/10/1/2734/96-97 Valid from : 1-4-1996
CST No. : SEC/10/1/2352/2000-2001 w.e.f. : 1-8-2000

Terms & Conditions :

1) Prices : Vat @ 4%. extra for SC no 1703 & 1457. opting for others.
2) Delivery : Ex-Stock
3) F.O.R. : Sec'bad
4) Payment : 25% advance balance against delivery
5) Validity : One week

for SLR ENTERPRISES

QUOTATION

SLR ENTERPRISES

Ph : (O) 66568120
Telefax : 66338262
Mobile : 9849006201

AUTHORISED DEALER FOR :
FINOLEX CABLES LTD, ROTOMOTIVE - MOTORS & WORM GEAR BOXES
D. No. 3464, (4-3-1 to 6) 3rd Floor, "Dundoo Vihar", R.P. Road, Secunderabad - 500 003.

Qtn. No. : 359 Date : 24/12/10.

Ref. No. :

S.No.	DESCRIPTION	Qty.	Unit Price	Amount Rs.	Ps.
	a) SIEMENS MAKE 1500 RPM FOOT MOUNTING MOTOR EFFI				
1	60 HP 1SE0 223 – 4YL80		198,400/-		
2.	75 HP 1SE0 254 – 4YA80		252500/-		
3	100 HP 1SE0 281 – 4YA80		323,150/-		
4	120 HP 1SE0 284 – 4YB80		374910/-		
5	150 HP 1SE0 311 – 4YB80		453900/-		
	LESS DISCOUNT : 45%				
	EXCISE DUTY : extra @	10.3%			

TIN : 28630156311
APGST No. SEC/10/1/2734/96-97 Valid from : 1-4-1996
CST No. : SEC/10/1/2352/2000-2001 w.e.f. : 1-8-2000

Terms & Conditions :
1) Prices : VAT @ 14.5% extra
2) Delivery : Ex Stock
3) F.O.R. : Secunderabad
4) Payment : 25% advance balance against delivery.
5) Validity : One week.

for SLR ENTERPRISES

Bureau of Energy Efficiency (BEE)
(Ministry of Power, Government of India)
4th Floor, Sewa Bhawan, R. K. Puram, New Delhi – 110066
Ph.: +91 – 11 – 26179699 (5 Lines), Fax: +91 – 11 – 26178352
Websites: www.bee-india.nic.in, www.energymanagertraining.com

Zenith Energy Services Pvt. Ltd
10-5-6/B, My Home Plaza, Masab
Tank HYDERABAD, AP 500 028
Phone: 040 23376630, 31,
Fax No.040 23322517
Website: www.zenithenergy.com

India SME Technology Services Ltd
DFC Building, Plot No.37-38,
D-Block, Pankha Road,
Institutional Area, Janakpuri, New Delhi-110058
Tel: +91-11-28525534, Fax: +91-11-28525535
Website: www.techsmall.com