DETAILED PROJECT REPORT
ON
COMMON SHAFT DRIVE SYSTEM (2.0 TPH)
(GANJAM RICE MILL CLUSTER)











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INDIVIDUAL MOTOR DRIVES FOR RICE MILL (2.0 TPH)

GANJAM RICE MILLS CLUSTER

BEE, 2010

Detailed Project Report on Individual Drive System (2.0 TPH)

Rice Mill SME Cluster, Ganjam, Orissa (India)

New Delhi: Bureau of Energy Efficiency;

Detail Project Report No.: **Ganjam/Ricemills/PC/01**

For more information

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Zenith Energy Services Private Ltd.

Hyderabad

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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
- 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
- TPH - Ton Per Hour

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%.

In about 50 % of the rice mills in the cluster, the rice mill equipments are driven by a single motor common drive system. In these common drive system, all the rice mill machinery like paddy cleaner, rubber sheller, whitener/cone, separator, rice grader and elevators are connected to a single common shaft and driven by a single electric motor. All the equipments are connected by number of long belt drives transmitting mechanical energy to the rice mill equipments. In this type of arrangement huge amount of transmission losses occurred.

Installation of proposed technology i.e. replacement of the common drive system with individual drive system consists of individual motors and drives system and is operated independently as and when required. This system reduces transmission losses considerably about 30% of the total power consumption of the common drive motor system.

The DPR highlights the details of the study conducted for assessing the potential for reducing electricity consumption by replacing the present common drives system with new individuals system 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)	1.80
2	Electricity saving	kWh/annum	17369
3	Monetary benefit	` (In lakh)	0.73
4	Debit equity ratio	Ratio	3:1
5	Simple payback period	Years	2.47
6	NPV	` (In lakh)	0.85
7	IRR	%age	23.36
8	ROI	%age	25.09
9	DSCR	Ratio	1.61
10	Process down time	Weeks	2
11	CO_2 reduction	Ton /year	17

The projected profitability and cash flow statements indicate that the project implementation 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 1.5 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

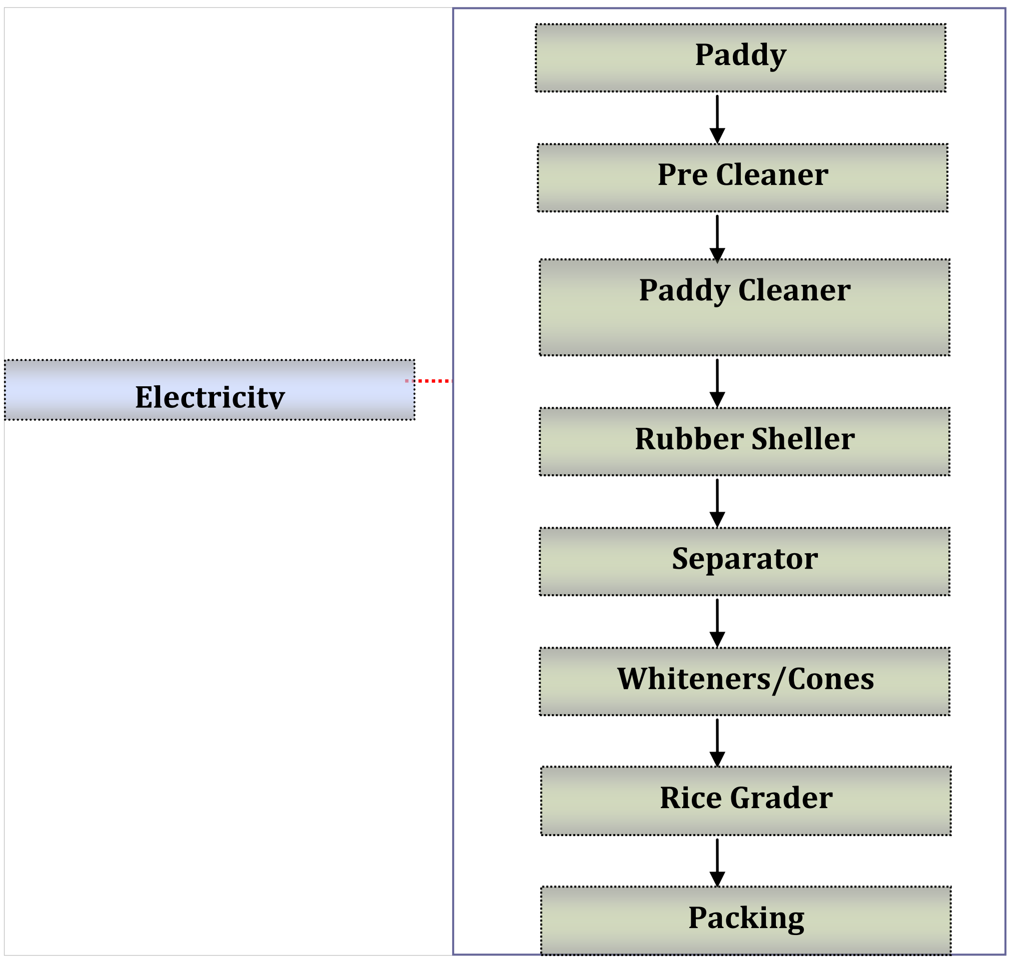

Figure 1.1: General Process Flowchart of a rice mill is furnished below.

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 design common drives system of 2.0 TPH capacity is furnished in Table 1.1 below:

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

S.No.	Details	Unit	Value
1	Electricity Consumption	MWh/annum	58
2	Production (Rice)	tonne/annum	6000

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 6000 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 processing for a typical unit of having 2.0 TPH capacity is furnished in Table 1.2 below:

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

S. No.	Type of energy	Units	Specific Energy Consumption
1	Electricity	kWh/ton	11.7

1.3 Existing technology/equipment

1.3.1 Description of existing technology

In about 50 % of the rice mills in the cluster, the rice mill equipments are driven by a single motor common drive system. In these common drive system, all the rice mill machinery like paddy cleaner, rubber sheller, whitener/cone, separator, rice grader and elevators are connected to a single common shaft and driven by a single electric motor. All the equipments are connected by number of long belt drives transmitting mechanical energy to the rice mill equipments. The present single drive system has the following disadvantages w.r.t power consumption

- High transmission losses due to longer belt drive systems.
- Low efficiency of the motor during under loading, when one or two equipments are operated
- Possibility of operation of motor for idle running for longer periods.
- More chances of production loss due to single motor drive system
- Low power factor due to partial load operation.
- Even for small equipment operation like elevator or paddy cleaner need to be operated higher capacity motor hence more losses.

The existing motor technical specifications of the main motor and operating parameters are furnished in Table 1.3 below:

Table 1.3 Existing Motor and drives specifications (M/s Balaji Traders Mill)

S.No	Details	Main motor
1	Rated HP	40
2	Voltage	400
3	Rated Amps	41.5
4	frequency	50 Hz
5	Rated (kW)	29.84
6	Transmission system type	Common shaft drive
7	RPM	1440

1.3.2 Its role in the whole process

The common shaft drive system is driven by a single motor. The common shaft is connected to all the rice mill machinery equipments like Chaluni, separator, paddy cleaners, Rubber Sheller, and whiteners/cones by long flat belt drives and the mechanical energy is transmitted from the main drive to the individual drive systems.

1.4 Establishing the baseline for the equipment to be changed

1.4.1 Design and operating parameters power consumption per year

The present power consumption of a common drive motor is 20.3 kW. The motor is operated for 8 to 10 hours in a day for 315 days. The average annual power consumption of the common drive motor is 58,571 kWh. The operating parameters of the existing system are furnished in Table 1.4 below:

Table 1.4 Operating parameters of the existing system (M/s Balaji Traders)

S.No	Details	Main motor
1	Measured Voltage	380
2	Measured Amps	31.2
3	Power factor	0.99
4	Frequency	50 Hz
5	Actual Power Consumption (kW)	20.3
6	Transmission system	v belt drive
7	RPM	1440
8	Paddy processing	2.0 TPH

1.4.2 Electricity consumption

The electricity consumption of three typical units having 2.0 TPH paddy processing capacity of the existing common drives system is furnished below in Table 1.5 below

Table 1.5 Power consumption of three typical units of common drives system

Name of the unit	Average production TPH	*Production capacity (Tons / annum)*	*Actual Power consumption (kWh/annum)*	*Specific energy consumption (kWh/ton)*
M/s Maa Kalua Rice Mill	2	6000	58,571	9.76
M/s Bajarangi Rice Mill	2	3960	28,571	7.2
M/s Loknath Rice Mill	2	3500	57,143	16.3

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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 losses of the common drive system. Based on the studies undertaken, the common drive system consumes 30% more power than individual drives system due to poor transmission, idle operation and part load operation etc.

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 individual drives system in the cluster are:

- Lack of awareness of the technologies in the area
- Lack of technical knowledge and its losses about the existing system

1.5.2 Financial Barrier

The replacement of common drive system with individual drive system requires high initial investment for the motors and drives. Hence, many of the owners don't show interest for implementation. Further, the production capacities of these mills are low and operated for one shift only for six months.

Further, the lack of awareness of the losses of common drive system and monetary benefit of the new individual drive system is also one of the major factors for implementing the technology.

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 the individual drive systems by replacing common drive system.

1.5.3 Skilled manpower

Not applicable

1.5.4 Other barrier(s)

Information on the energy efficient technologies is not available 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 the common drive system with individual drive system. The individual drive system consists of individual motors and drives system and is operated independently as and when required. The motors are connected to the rice mill machinery like elevators, paddy cleaner; rubber sheller, whiteners/cones, separator, grader etc and the capacity of the motors are connected based on the requirement. This system reduces transmission losses considerably about 30% of the total power consumption of the common drive motor system. Apart from reduction in high transmission losses, the power consumption is also reduced due to avoidance of part load operation and idle operation of the equipments. In common drive system, even for operation of a small equipment like elevator, which requires 1 HP in normal scenario, in common drive system, the 50 HP motor is required to be operated and hence more power consumption

2.1.2 Technology /Equipment specifications

The detailed specifications of the motors suggested are furnished in table 2.1 below:

Table 2.1: Proposed Motors Specifications

S. No.	Parameter	Motor
1	Elevators 7 no's	1 HP for 2 elevators
2	Chaluni 2 no's	1 HP each
3	Rubber Sheller	10 HP
4	Cones 2 no's	10 HP each
5	Separator	2 HP

All motors are of TEFC motors and 4 pole motors of reputed company make and necessary shafts, V belts and starters/panel and cabling

2.1.3 Justification of the technology selected & its suitability

As discussed above, the common drive system has high transmission losses due to long belt drives leading to high power consumption. . In these common drive system, all the rice mill machinery like paddy cleaner, rubber sheller, whitener/cone, separator, rice grader and elevators are connected to a single common shaft driven by a single electric motor. All the equipments are connected by a long belt drives transmitting mechanical energy to the rice mill equipments. The present single drive system has the following disadvantages w.r.t power consumption:

- High transmission losses due to longer belt drive systems.
- Low efficiency of the motor during under loading, when one or two equipments are operated
- Possibility of operation of motor for idle running for longer periods.
- More chances of production loss due to single motor drive system
- Low power factor due to partial load operation.
- Even for small equipment operation like elevator or paddy cleaner need to be operated higher capacity motor hence more losses.

Based on above facts, the common drive system can be replaced with individual motor drive system is a viable option and reducing power consumption. The capacity of the motors selected as per the requirement and suitability.

2.1.4 Superiority over existing technology/equipment

The following are the superior features of individual drive system

- The new system will reduce power consumption considerably by over 30%
- Improved power factor of the electrical system
- The equipments are operated can be operated as required with reduced power consumption
- Improved production as the production down time is reduced due to avoidance of slippages.
- Reduces GHG emissions

2.1.5 Availability of the proposed technology/equipment

The individual drive system and motor suppliers are available at Bhubaneswar and Visakhapatnam which are nearer towns to the cluster. The details of the suppliers are provided in Annexure 5.

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

Details of service providers had been furnished in Annexure 6.

2.1.8 Terms of sales of the suppliers, etc.

The terms and conditions of the equipment supplier for supply of motors and individual drive systems are furnished below:

Terms & Conditions:

- 40% advance and 40% after delivery of the materials and 20% after completion of the Work
- 12 months guarantee from the date of delivery of the materials

2.1.9 Process down time during implementation

The process down time for installation individual drive system is considered at two weeks for dismantling the existing system and installation of new motors and drives, providing electrical connections to the motor, cable laying, panels and starters installation etc.

2.2 Life cycle assessment and risks analysis

The life of the individual drive system is considered at 20 years. There is no risk involved as the individual drive systems are successfully in operation in since 3 decades in the rice mills.

2.3 Suitable unit/plant size the identified equipment

The motors and drive systems, cables and starters are selected based on the requirement of the existing machinery like paddy cleaner, rubber sheller, elevators, cones etc 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 proposed technology

3.1.2 Electricity savings

Installation of individual motor for each machine would reduce the transmission loss up to 30%. Apart from reduction in high transmission losses, the power consumption is also reduced due to avoidance of part load operation and idle operation of the equipments. The power savings due to installation of project activity is estimated at 17369 kWh per annum. Details of electricity saving is given in Annexure 3.

3.1.2 Improvement in product quality

The product quality will improve to certain extent

3.1.3 Increase in production

The new individual drive system will reduce the frequent breakdowns due to long belts; hence there may be increase in the production for the same duration operation of the rice mill.

3.1.4 Reduction in raw material consumption

Not Applicable

3.1.5 Reduction in other losses

Not applicable.

3.2 Monetary benefits

The monetary benefit due to installation of individual drive system is estimated at ` 0.73 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 individual drive system will remove long belts and long shafts, the working environment will improve due to more safety of the workers, as in earlier case, there limited space in the mill for the movement 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 17 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 of Individual Drive Systems is estimated at ` 1.00 lakh as per the quotation provided in Annexure 7.

4.1.2 Other costs

Cost included in Panel, SFU, cabling and commissioning is ` 0.50 lakh. Detail of project cost is furnished in Table 4.1 below:

Table 4.1: Project cost

S.No	Particular	Unit	Value
1	Individual motors	` in lakh	1.00
2	Cabling, Shaft , Modifications, Commissioning etc	` in lakh	0.50
3	Other charges including contingency	` in lakh	0.30
3	Total Investment	` in lakh	1.80

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 ` 0.45 lakh.

4.2.2 Loan amount

The term loan is 75% of the total project cost, which is ` 1.35 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 ` 0.44 lakh in the first year operation and increases to ` 1.97 at the end of eighth year.

4.3.2 Simple payback period

The total project cost of the proposed technology is ` 1.80 lakh and monetary savings due to reduction in electricity consumption is ` 0.73 lakh and the simple payback period work out to be 2.47 years.

4.3.3 Net Present Value (NPV)

The Net present value of the investment at 10.0% interest rate works out to be ` 0.85 lakh.

4.3.4 Internal rate of return (IRR)

The after tax Internal Rate of Return of the project works out to be 23.36%. 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 25.09%.

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	23.36%	0.85	25.09	1.61
5% increase in power savings	25.42%	0.99	25.39	1.69
5% decrease in power savings	21.27%	0.71	24.75	1.52

4.5 Procurement and implementation schedule

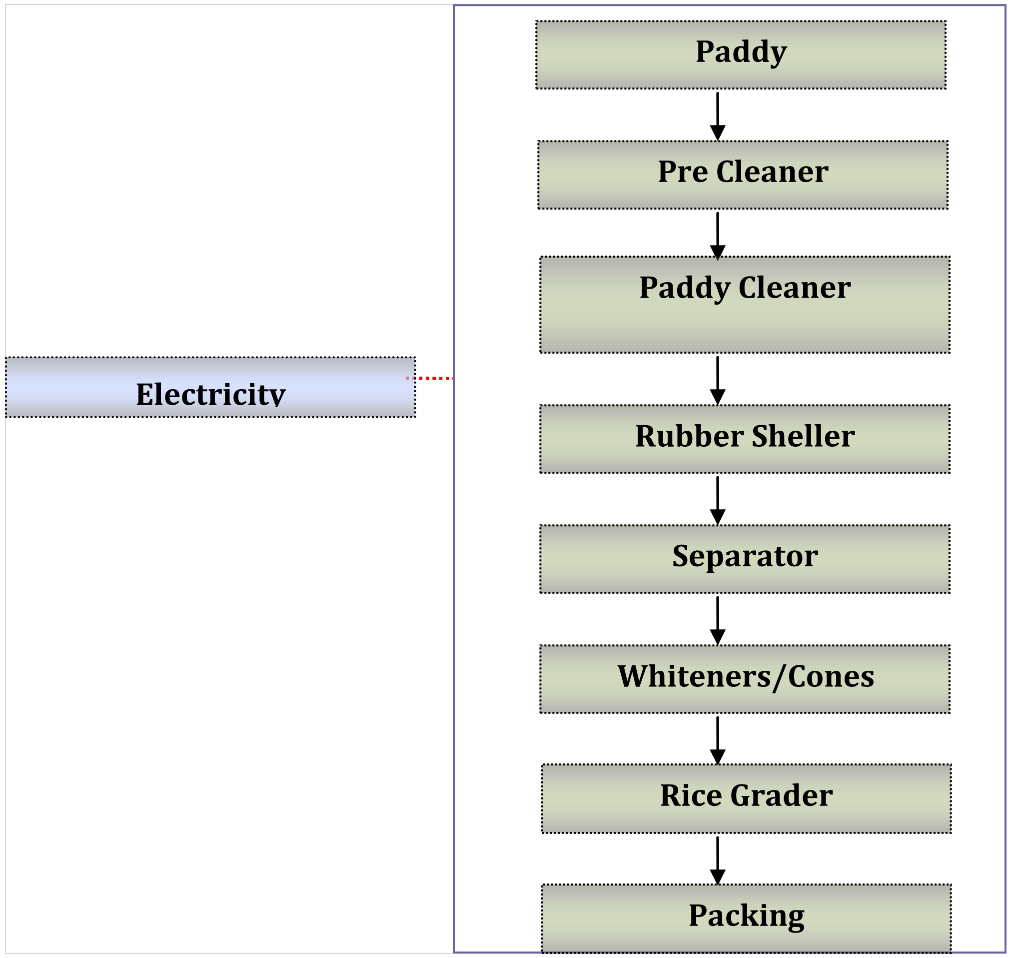
The project is expected to be completed in 4 weeks from the date of release of purchase order. The detailed schedule of project implementation is furnished in Annexure 4.

Annexure 1: Energy audit and baseline establishment

Name of the unit	Machine Name	Rated Capacity kW	Voltage Volt	Current Amp	Power factor	Active Power kW	Loading %
M/s Maa Kalua Rice Mill	Main Motor	29.84	380	31.2	0.99	20.3	68.1

S. No	Equipment	Capacity of motor (hp)	No of motors	Rated (kW) For each motor	Actual (kW) for each motor	No of (hours)	No of (days)	kWh per annum
1	Elevators	1	3	0.75	0.24	12	315	2721.6
2	Chaluni	1	2	0.75	0.24	12	315	1814.4
3	Rubber Sheller	7.5	1	5.63	2.4	12	315	9072
4	Cones	10	2	7.50	3.3	12	315	24948
5	Separator	2	1	1.50	0.7	12	315	2646
6	Suggested consumption kWh /annum (1+2+3+4+5)							41202
7	Present consumption kWh/ annum							58571
8	Net saving kWh/annum							17369

Annexure 2: Process flow diagram



Annexure 3: Detailed Technology Assessment Report

S.No.	Particulars	Unit	Value
1	Power consumption in common drives system	kWh	58,571
2	Power consumption in individual drives system	kWh	41202
3	Reduction in power consumption	kWh	17369
4	Cost of electricity	` /kWh	4.20
5	Monetary benefit	`(In lakh)	0.73
6	Investment required	`(In lakh)	1.80
7	Simple payback period	Years	2.47

Annexure 4: Detailed Financial Calculations & Analysis

Assumption

Name of the Technology	Individual Drive System		
Rated Capacity	**2 TPH**		
Details	**Unit**	**Value**	**Basis**
Installed Capacity	TPH	2	
No of working days	Days	315	Feasibility Study
Operating hour	Hrs	12	
Proposed Investment			
Equipment cost	` (in lakh)	1.00	
Cabling, Civil works and Modification	` (in lakh)	0.50	
Contingency	` (in lakh)	0.30	
Total Investment	` (in lakh)	1.80	
Financing pattern			
Own Funds (Equity)	` (in lakh)	0.45	
Loan Funds (Term Loan)	` (in lakh)	1.35	
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/annum	17369	
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	1.35	0.06	1.29	0.16
2	1.29	0.12	1.17	0.12
3	1.17	0.24	0.93	0.11
4	0.93	0.32	0.61	0.08
5	0.61	0.36	0.25	0.05
6	0.25	0.25	0.00	0.01
		1.35		

WDV Depreciation **` (in lakh)**

Particulars / years	1	2
Plant and Machinery		
Cost	1.80	0.36
Depreciation	1.44	0.29
WDV	0.36	0.07

Projected Profitability ` (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Fuel savings	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Total Revenue (A)	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Expenses								
O & M Expenses	0.07	0.08	0.08	0.08	0.09	0.09	0.10	0.10
Total Expenses (B)	0.07	0.08	0.08	0.08	0.09	0.09	0.10	0.10
PBDIT (A)-(B)	0.66	0.65	0.65	0.65	0.64	0.64	0.63	0.63
Interest	0.16	0.12	0.11	0.08	0.05	0.01	-	-
PBDT	0.50	0.53	0.54	0.57	0.59	0.63	0.63	0.63
Depreciation	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PBT	0.41	0.44	0.45	0.47	0.50	0.54	0.54	0.53
Income tax	-	0.08	0.18	0.19	0.20	0.21	0.22	0.21
Profit after tax (PAT)	0.41	0.35	0.26	0.28	0.30	0.32	0.32	0.32

Computation of Tax ` (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Profit before tax	0.41	0.44	0.45	0.47	0.50	0.54	0.54	0.53
Add: Book depreciation	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Less: WDV depreciation	1.44	0.29	-	-	-	-	-	-
Taxable profit	(0.94)	0.24	0.54	0.57	0.59	0.63	0.63	0.63
Income Tax	-	0.08	0.18	0.19	0.20	0.21	0.22	0.21

Projected Balance Sheet ` (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Liabilities								
Share Capital (D)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Reserves & Surplus (E)	0.41	0.76	1.02	1.30	1.60	1.92	2.24	2.56
Term Loans (F)	1.29	1.17	0.93	0.61	0.25	0.00	0.00	0.00
Total Liabilities (D)+(E)+(F)	2.15	2.38	2.40	2.36	2.30	2.37	2.69	3.01

Assets	1	2	3	4	5	6	7	8
Gross Fixed Assets	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Less Accm. Depreciation	0.10	0.19	0.29	0.38	0.48	0.57	0.67	0.76
Net Fixed Assets	1.70	1.61	1.51	1.42	1.32	1.23	1.13	1.04
Cash & Bank Balance	0.44	0.77	0.89	0.94	0.97	1.14	1.56	1.97
TOTAL ASSETS	2.15	2.38	2.40	2.36	2.30	2.37	2.69	3.01
Net Worth	0.86	1.21	1.47	1.75	2.05	2.37	2.69	3.01
Debt Equity Ratio	2.87	2.60	2.07	1.36	0.56	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	0.45	-	-	-	-	-	-	-	-
Term Loan	1.35								
Profit After tax		0.41	0.35	0.26	0.28	0.30	0.32	0.32	0.32
Depreciation		0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Total Sources	1.80	0.50	0.45	0.36	0.37	0.39	0.42	0.42	0.41
Application									
Capital Expenditure	1.80								
Repayment Of Loan	-	0.06	0.12	0.24	0.32	0.36	0.25	-	-
Total Application	1.80	0.06	0.12	0.24	0.32	0.36	0.25	-	-
Net Surplus	-	0.44	0.33	0.12	0.05	0.03	0.17	0.42	0.41
Add: Opening Balance	-	-	0.44	0.77	0.89	0.94	0.97	1.14	1.56
Closing Balance	-	0.44	0.77	0.89	0.94	0.97	1.14	1.56	1.97

IRR

` (in lakh)

Particulars / months	0	1	2	3	4	5	6	7	8
Profit after Tax		0.34	0.30	0.22	0.24	0.26	0.28	0.27	0.27
Depreciation		0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Interest on Term Loan		0.14	0.11	0.09	0.07	0.04	-	-	-
Cash outflow	(1.65)	-	-	-	-	-	-	-	-
Net Cash flow	(1.65)	0.57	0.50	0.40	0.39	0.38	0.36	0.36	0.36
IRR	23.36%								

NPV	0.85

Break Even Point

` (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Variable Expenses								
Oper. & Maintenance Exp	0.05	0.06	0.06	0.06	0.07	0.07	0.07	0.08
Sub Total*(G)*	0.05	0.06	0.06	0.06	0.07	0.07	0.07	0.08
Fixed Expenses								
Oper. & Maintenance Exp	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03
Interest on Term Loan	0.16	0.12	0.11	0.08	0.05	0.01	0.00	0.00
Depreciation *(H)*	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Sub Total (I)	0.27	0.24	0.22	0.20	0.16	0.13	0.12	0.12
Sales (J)	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Contribution (K)	0.68	0.67	0.67	0.67	0.66	0.66	0.66	0.65
Break Even Point (L= G/I)	39.93%	35.30%	32.98%	29.53%	24.80%	19.01%	18.13%	18.42%
Cash Break Even {(I)-(H)}	25.86%	21.17%	18.79%	15.28%	10.48%	4.62%	3.67%	3.88%
Break Even Sales (J)*(L)	0.29	0.26	0.24	0.22	0.18	0.14	0.13	0.13

Return on Investment

` (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8	Total
Net Profit Before Taxes	0.41	0.44	0.45	0.47	0.50	0.54	0.54	0.53	3.87
Net Worth	0.86	1.21	1.47	1.75	2.05	2.37	2.69	3.01	15.41
									25.09%

Debt Service Coverage Ratio

` (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8	Total
Cash Inflow									
Profit after Tax	0.41	0.35	0.26	0.28	0.30	0.32	0.32	0.32	1.92
Depreciation	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.57
Interest on Term Loan	0.16	0.12	0.11	0.08	0.05	0.01	0.00	0.00	0.52
Total (M)	0.66	0.57	0.47	0.45	0.44	0.42	0.42	0.41	3.01

DEBT

Interest on Term Loan	0.16	0.12	0.11	0.08	0.05	0.01	0.00	0.00	0.52
Repayment of Term Loan	0.06	0.12	0.24	0.32	0.36	0.25	0.00	0.00	1.35
Total (N)	0.22	0.24	0.35	0.40	0.41	0.26	0.00	0.00	1.87
	0.16	0.12	0.11	0.08	0.05	0.01	0.00	0.00	0.52
Average DSCR (M/N)	1.61								

Annexure 5: Details of procurement and Implementation plan

Project Implementation Schedule

S. No	Activity	Weeks			
		1	2	3/	5/6
1	Placement of Orders for motors and panels				
2	Supply of motors and panels				
3	Installation of the motors and panels and cabling				
4	Trial runs				

Process Down Time

S. No	Activity	Weeks			
		1	2	3/4	5/6
1	Dismantling of the existing common drive system				
2	Supply of motors and panels				
3	Installation of the motors and panels and cabling				
4	Trial runs				

The process down time is considered for one week.

Annexure 6: Details of technology/equipment and service providers

Equipment details	*Source of technology*	*Service/technology providers*
Individuals Drives	Indigenous	**R.K Associates** Padhuanpada, Proof Road, Balasore, Orissa-756001,India. Mobile/CellPhone: +(91)-9438286089/9337749353
Individuals Drives	Indigenous	**Suri Engineering Works** 4/4, IDA, Nacharam, Hyderabad, Andhra Pradesh, India. Contact number:040-27150282/27177726 Contact person: K.Rameshwar Reddy
Individuals Drives	Indigenous	**Rice-tec Machinery** 57/p, phase-1, IDA, Jeedimetla, Hyderabad, Andhra Pradesh, India. Contactnumber:040-23195938, 9440624435/9246373477 Contact person: Bhanu Prakash
Individuals Drives	Indigenous	**Baba Auto Mechanical Works** c-12/b, IDA, Hyderabad, Andhra Pradesh, India. Contact number:040-27207565/9985455770 Contact person: Ravi Shankar

Annexure 7: Quotations or Techno-Commercial Bids

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.
4)	SIEMENS Make 1500 RPM FOOT MOUNTING MOTOR EFF1				
1)	5 HP 1SE0 113-4YA80		19935=00		
2.	7.5 HP 1SE0 130-4YA80		27470=00		
3.	10 HP 1SE0 133-4YA80		31995=00		
4	12.5 HP 1SE0 163-4YA80		51480=00		
5	15 HP 1SE0 163-4YA80		52900=00		
6	20 HP 1SE0 166-4YA80		65750=00		
7	25 HP 1SE0 183-4YA80		86830=00		
8	30 HP 1SE0 186-4YL80		91680=00		
9	40 HP 1SE0 207-4YL80		123780=00		
10	50 HP 1SE0 221 4YK80		160500=00		
	Discount : 45 % extra @ 10.3% Excise duty				

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 : 4% extra for SC No 1 TO 3 & 14.5% extra for others
1) Prices : Vat @
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 EFF1				
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 - 4YA80		374910/-		
5	150 HP 1SE0 311 - 4YA80		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. : Sec'bad
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