

DETAILED PROJECT REPORT ON PADDY CLEANER (1.5 TPH) (GANJAM RICE MILL CLUSTER)



Bureau of Energy Efficiency

Prepared By



Reviewed By



PADDY CLEANERS FOR RICE MILL (1.5 TPH)

GANJAM RICE MILLS CLUSTER

BEE, 2010

Detailed Project Report on New Improved Design Paddy Cleaner

Rice Mill SME Cluster, Ganjam, Orissa (India)

New Delhi: Bureau of Energy Efficiency;

Detail Project Report No.: **Ganjam/Rice mills/PC/01**

For more information

Bureau of Energy Efficiency (BEE)
(Ministry of Power, Government of India)
4th Floor, Sewa Bhawan
R. K. Puram, New Delhi – 110066

Telephone +91-11-26179699

Fax+91-11-26178352

Websites: www.bee-india.nic.in

Email: jsood@beenet.in/ pktiware@beenet.in

Acknowledgement

We are sincerely thankful to the Bureau of Energy Efficiency, Ministry of Power, for giving us the opportunity to implement the BEE SME project in “Ganjam Rice Cluster, Ganjam”. We express our sincere gratitude to all concerned officials for their support and guidance during the conduct of this exercise.

Dr. Ajay Mathur, Director General, BEE

Smt. Abha Shukla, Secretary, BEE

Shri Jitendra Sood, Energy Economist, BEE

Shri Pawan Kumar Tiwari, Advisor (SME), BEE

Shri Rajeev Yadav, Project Economist, BEE

Zenith Energy Services Pvt. Ltd. (ZESPL) is also thankful to Shri Purna Chandra Sahu, President, Shri Santhosh Kumar Sahu, Secretary, Ganjam District Rice Mill Owners Association, Berhampur and to Shri Bibudatta Panigrahi, M/s Aanjeneya Modern Rice Mill for their valuable inputs, co-operation, support and identification of the units for energy use and technology audit studies and facilitating the implementation of BEE SME program in Ganjam Rice Cluster.

We take this opportunity to express our appreciation for the excellent support provided by Rice Unit Owners, Local Service Providers, and Equipment Suppliers for their active involvement and their valuable inputs in making the program successful and in completion of the Detailed Project Report (DPR).

ZESPL is also thankful to all the SME owners, plant in charges and all workers of the SME units for their support during the energy use and technology audit studies and in implementation of the project objectives.

Zenith Energy Services Private Ltd.

Hyderabad

Contents

List of Annexure	vii
List of Tables	vii
List of Figures	viii
List of Abbreviation	viii
Executive Summary	ix
About BEE'S SME program	xi
1 INTRODUCTION	1
1.1 Brief Introduction about cluster	1
1.1.1 Production process	1
1.2 Energy performance in existing situation	4
1.2.1 Electricity consumption of a typical unit in the cluster.....	4
1.2.2 Average production by a typical unit in the cluster	4
1.2.3 Specific Energy Consumption	4
1.3 Existing technology/equipment	4
1.3.1 Description of existing technology.....	4
1.3.2 Its role in the whole process	5
1.4 Establishing the baseline for the equipment to be changed	6
1.4.1 Design and operating parameters power consumption	6
1.4.2 Electricity consumption	6
1.4.2 Operating efficiency of the existing system	6
1.5 Barriers for adoption of new and energy efficient technology / equipment.....	7
1.5.1 Technological Barriers	7
1.5.2 Financial Barrier.....	7
1.5.3 Skilled manpower	7
1.5.4 Other barrier(s)	7
2. EQUIPMENT OPTION FOR ENERGY EFFICIENCY IMPROVEMENT	8

2.1	Detailed description of technology/equipment selected.....	8
2.1.1	Description of technology.....	8
2.1.2	Technology /Equipment specifications.....	8
2.1.3	Justification of the technology selected & Suitability	9
2.1.4	Superiority over existing technology/equipment	9
2.1.5	Availability of the proposed technology/equipment.....	9
2.1.6	Source of technology/equipment for the project.....	9
2.1.7	Service/technology providers	9
2.1.8	Terms of sales of the suppliers, etc.....	10
2.1.9	Process down time during implementation.....	10
2.2	Life cycle assessment and risks analysis	10
2.3	Suitable unit/plant size in terms of capacity/production	10
3.	ECONOMIC BENEFITS OF NEW ENERGY EFFICIENT TECHNOLOGY	11
3.1	Technical benefits.....	11
3.1.1	Fuel Saving.....	11
3.1.2	Electricity savings	11
3.1.2	Improvement in product quality	11
3.1.3	Increase in production.....	11
3.1.4	Reduction in raw material consumption	11
3.1.5	Reduction in other losses.....	11
3.2	Monetary benefits	11
3.3	Social benefits	11
3.3.1	Improvement in working environment in the plant	11
3.3.2	Improvement in skill set of workers	12
3.4	Environmental benefits	12
3.4.1	Reduction in effluent generation	12
3.4.2	Reduction in GHG emission such as CO ₂ , NO _x , etc.....	12

3.4.3	Reduction in other emissions like SOx.....	12
4.1	Cost of equipment implementation.....	13
4.1.1	Cost of equipments.....	13
4.1.2	Other costs.....	13
4.2	Arrangement of funds.....	13
4.2.1	Entrepreneur's contribution.....	13
4.2.2	Loan amount.....	13
4.2.3	Terms & conditions of loan.....	13
4.3	Financial indicators.....	13
4.3.1	Cash flow analysis.....	13
4.3.2	Simple payback period.....	14
4.3.3	Net Present Value (NPV).....	14
4.3.4	Internal rate of return (IRR).....	14
4.3.5	Return on investment (ROI).....	14
4.4	Sensitivity analysis.....	14
4.5	Procurement and implementation schedule.....	14

List of Annexures

Annexure 1: Process flow diagram	15
Annexure 2: Detailed Technology Assessment Report.....	16
Annexure 3: Detailed Financial Calculations & Analysis	17
Annexure 4: Details of procurement and Implementation plan.....	21
Annexure 5: Details of technology/equipment and service providers	22
Annexure 6: Quotations or Techno-Commercial Bids	23

List of Table

Table 1.1: Energy consumption of a typical unit (M/s Janatha Rice Mill).....	4
Table 1.2: Specific energy consumption for a typical unit (M/s Janatha Rice Mill)	4
Table 1.3 Existing Paddy cleaner Specifications	5
Table 1.4 operating parameters of the existing paddy cleaner.....	6
Table 1.5 Power consumption of three typical units of paddy cleaners	6
Table 2.1: Proposed Paddy Cleaner Specifications	8
Table 4.1: Project Cost.....	13
Table 4.2: Sensitivity analysis	14

List of Figure

Figure 1.1: General Process Flowchart of a Typical Rice Mill Unit	3
Figure 2.1: Paddy cleaner.....	8

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%.

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 new improved design paddy cleaner accurately separates Oversized and Undersized impurities and part of the Immature Grains from Paddy. The inbuilt Self-Clean system ensures optimum efficiency during the production cycle.

Installation of proposed technology i.e. New Improved Paddy Cleaner of 1.5 TPH capacity would lead to save about 6259 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 paddy cleaners with new improved design paddy cleaner 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)	0.75
2	Electricity saving	kWh/annum	6259
3	Monetary benefit	` (In lakh)	0.26
4	Debit equity ratio	Ratio	3:1
5	Simple payback period	Years	2.88
6	NPV	` (In lakh)	0.20
7	IRR	%age	17.62
8	ROI	%age	24.05
9	DSCR	Ratio	1.39
10	Process down time	Days	6
11	CO ₂ reduction	Ton /year	6

The projected profitability and cash flow statements indicate that the project implementation of improved design paddy cleaner by the present inefficient paddy cleaners 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

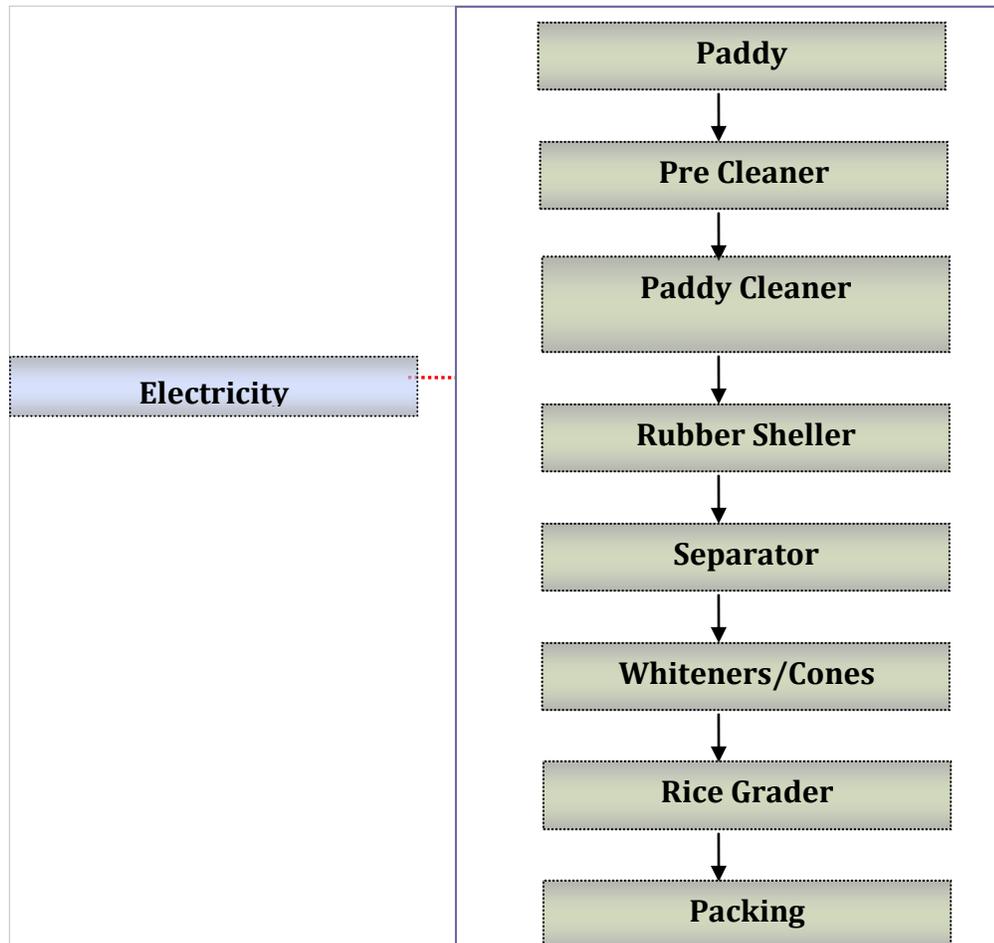


Figure 1.1: General Process Flowchart of a rice mill is furnished below.

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 paddy cleaner of 1.5 TPH paddy processing capacity is furnished in Table 1.1 below:

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

S.No.	Details	Unit	Value
1	Electricity Consumption	MWh/annum	67
2	Production (Rice)	tonne/annum	3600

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 3600 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 of 1.5 TPH is furnished in Table 1.2 below:

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

S. No.	Type of energy	Units	Specific Energy Consumption
1	Electricity	kWh/ton of production	18.61

1.3 Existing technology/equipment

1.3.1 Description of existing technology

More than 50% of the rice mills are old more than 15 years and these industries has installed old and local make equipments like paddy cleaners and separators. The present

equipment has the following disadvantages w.r.t power consumption, quality and productivity

- Inferior design and hence more power consumption w.r.t the technologies available in the market.
- Lower processing capacity for the same power consumption.
- Cleaning of the paddy from various foreign materials is poor and cleaning efficiency is also poor.

The existing paddy cleaner technical specifications and operating parameters are furnished in Table 1.3 below:

Table 1.3 Existing Paddy cleaner specifications

S.No	Parameters	Value
1	Rated HP	7.5
2	Year	-----
3	Processing capacity, TPH	1.5
4	Power consumption, kW	4.1
5	No. of hours of operation, hr	8

1.3.2 Its role in the whole process

Paddy cleaner separate all the impurities like dust, straw, sand and heavy particles of even uneven sizes from paddy. 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 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 (blower) is installed to remove the dust and light empty grains

The clean paddy is then 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.

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 paddy cleaner is 4.1 kW. The paddy cleaner is operated for 8 hours in a day for 300 days. The annual power consumption of the paddy cleaner is 9840 kWh. The operating parameters of the existing paddy cleaner machine are furnished in Table 1.4 below:

Table 1.4 operating parameters of the existing paddy cleaner

S.No	Details	Unit	Value
1	Measured Voltage	Volt	394
2	Measured Amps	Amp	6.00
3	frequency	Hz	50
4	Actual Power Consumption	kW	4.1
5	Paddy processing	TPH	1.5

1.4.2 Electricity consumption

The electricity consumption of three typical units having 1.5 TPH paddy processing capacity of the existing paddy cleaner is furnished below in Table 1.5 below:

Table 1.5 Power consumption of three typical units of paddy cleaners

S. No	Name of the unit	Production capacity (TPH)	Actual Power consumption per annum (kWh)
1	M/s Janatha rice mill	1.5	9840
2	M/s Laxmi nrusingnath Rice Mill	1.5	4521
3	M/s Maa laxmi Rice Mill	1.5	6218

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 efficiency of the existing paddy cleaner and compare w.r.t power consumption of the latest paddy cleaners available in the market. Based on the studies undertaken, the paddy cleaners installed in cluster units are consuming more power consumption than the new paddy cleaners 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 new improved design paddy cleaners in the cluster are:

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

1.5.2 Financial Barrier

The replacement of paddy cleaner with new improved design paddy cleaners requires high initial investment. 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 and further the energy cost w.r.t paddy cost is low or negligible.

Further, the lack of awareness of the losses of existing paddy cleaner and monetary benefit of the new improved design paddy cleaners 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 improved design paddy cleaner by replacing paddy cleaner.

1.5.3 Skilled manpower

Not applicable

1.5.4 Other barrier(s)

Information on the energy efficient technologies 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 old and inferior paddy cleaner with new improved design paddy cleaner.

The new modern Pre-Cleaning and Cleaning Sections with improved design paddy cleaner accurately separates Oversized and Undersized impurities and part of the Immature Grains from Paddy, The inbuilt Self-Clean system ensures optimum efficiency during the production cycle. Vibromotors make the operation noiseless and trouble-free.

Considering the above facts and reducing electricity consumption, it is suggested to install improved design paddy cleaner.



Figure 2.1: Paddy cleaner

2.1.2 Technology /Equipment specifications

The detailed specifications of the paddy cleaner of Milltech make suggested is furnished in Table 2.1 below:

Table 2.1: Proposed Paddy Cleaner Specifications

S. No.	Parameter	Details
1	Type	CLAS – 20S
2	Capacity	1.5 TPH
3	Power required	1.1 kW
4	Voltage	415 V/50 Hz

S. No.	Parameter	Details
5	Aspiration required	22 cum/min
6	Overall dimensions (mts)	2.6x1.8x1.39
7	Motor capacity	2 HP
8	RPM	1500

2.1.3 Justification of the technology selected & Suitability

About 50% of the rice mill units in the cluster have paddy cleaners which are very old technology. Majority of these paddy cleaners are very old and inferior design and consuming more power for same output. Whereas, the new improved paddy cleaner consumes less power and paddy processing capacity is more than the old paddy cleaner.

2.1.4 Superiority over existing technology/equipment

The following are the superior features of new improved design paddy cleaner developed by Milltech;

- Removes Immature grains along with other Impurities
- Inbuilt cleaning system to avoid clogging of screens
- Different screens can be mounted to suit the applications
- Screens can be interchanged easily
- No relatively moving parts
- Maintenance free

2.1.5 Availability of the proposed technology/equipment

The paddy cleaner suppliers are available at Hyderabad and at Berhampur. The detail of the suppliers is provided in Annexure 6.

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 the paddy cleaners 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 of new improved design paddy cleaner is considered at one week for dismantling the existing system and installation of new machine, 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 paddy cleaner is considered at 15 years. There is no risk involved as the paddy cleaners are successfully in operation in since 3 decades in the rice mills.

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

The paddy processing capacity of the present paddy cleaner is 1.5 TPH and the capacity of the new paddy cleaner is upto 2.0 TPH hence, capacity can be adjusted as per the requirement.

3. ECONOMIC BENEFITS OF NEW ENERGY EFFICIENT TECHNOLOGY

3.1 Technical benefits

3.1.1 Fuel Saving

No fuel saving is envisaged in proposed technology.

3.1.2 Electricity savings

The New Improved Design Paddy Cleaner will consume less power than the existing paddy cleaner and hence reduces electricity consumption. The power savings due to installation of project activity is estimated at 6259 kWh per annum. Details of electricity saving is given in Annexure 2.

3.1.2 Improvement in product quality

The product quality will improve to certain extent due to better cleaning of the paddy and removes unwanted materials accurately.

3.1.3 Increase in production

The new paddy cleaner has more production capacity than the existing paddy cleaner and hence there may be increase in the production for the same duration of 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 new improved design paddy cleaner is estimated at ` 0.26 lakh per annum due to reduction in electricity consumption. Details of monetary saving are given in Annexure 2.

3.3 Social benefits

3.3.1 Improvement in working environment in the plant

As installation of improved design paddy cleaner will reduce the noise levels and dust 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, NO_x, etc

The major GHG emission reduction source is CO₂. The technology will reduce grid electricity consumption and emission reductions are estimated at 6 tons of CO₂ per annum due to implementation of the project activity.

3.4.3 Reduction in other emissions like SO_x

No significant impact on SO_x 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 Improved Paddy Cleaner is estimated at ` 0.70 lakh (considering discount of ` 10,000) as per the quotation provided in Annexure 6.

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	Paddy Cleaner	` in lakh	0.70
2	Cabling, Shaft , Modifications, Commissioning etc	` in lakh	0.05
3	Total Investment	` in lakh	0.75

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 ` 0.19 lakh.

4.2.2 Loan amount

The term loan is 75% of the total project cost, which is ` 0.56 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 ` 0.14 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 ₹ 0.75 lakh and monetary savings due to reduction in electricity consumption is ₹ 0.26 lakh and the simple payback period works out to be 2.88 years.

4.3.3 Net Present Value (NPV)

The Net present value of the investment at 10.0% interest rate works out to be ₹ 0.20 lakh.

4.3.4 Internal rate of return (IRR)

The after tax Internal Rate of Return of the project works out to be 17.62%. 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 24.05%.

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.

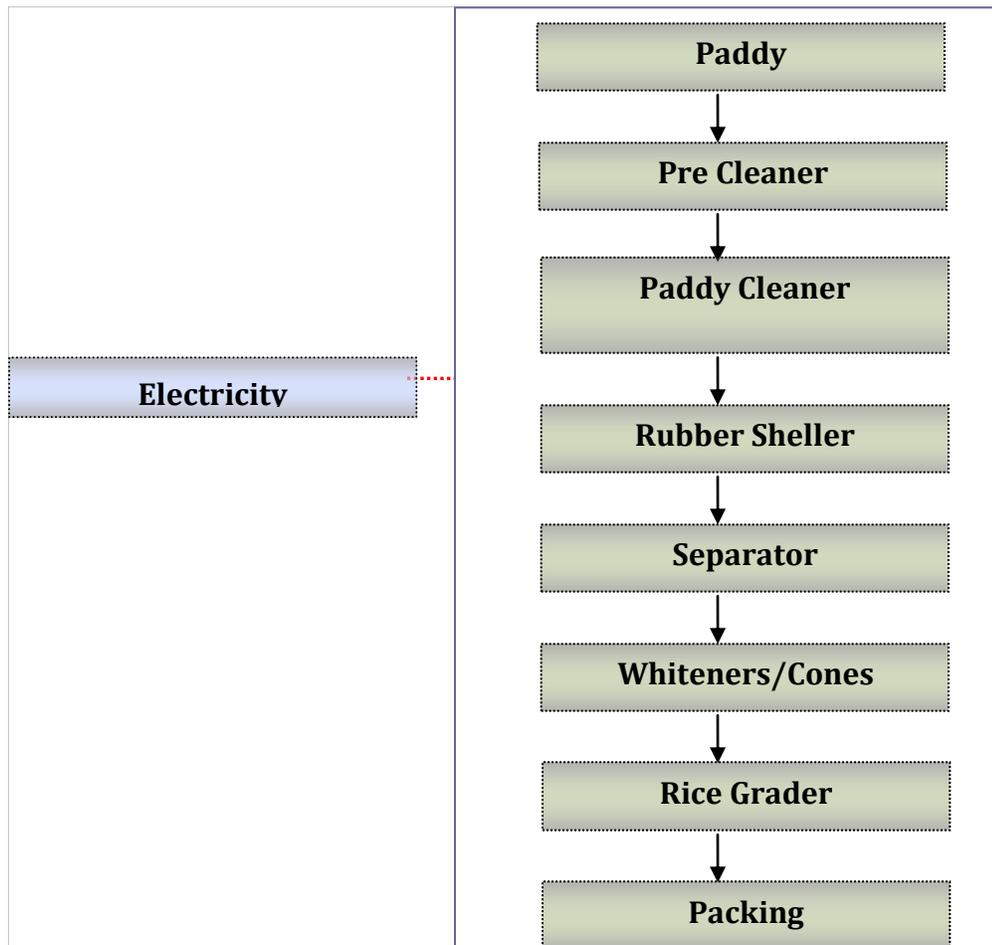
Table 4.2: Sensitivity analysis

<i>Particulars</i>	<i>IRR</i> %	<i>NPV</i> ₹ in lakh	<i>ROI</i> %	<i>DSCR</i>
Normal	17.62	0.20	24.05	1.39
5% increase in power savings	19.48	0.25	24.43	1.46
5% decrease in power savings	15.73	0.15	23.62	1.32

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: Process flow diagram



Annexure 2: Detailed Technology Assessment Report

S.No.	Particulars	Unit	Value
1	Present rated capacity	HP	7.5
2	Actual power consumption	kW	4.1
3	Rated capacity of proposed equipment	HP	2
4	Electricity consumption in new system	kWh	1.49
5	Electricity saving	kWh	2.61
6	Total operating hours	hrs	8
7	Total operating days	days	300
8	Power savings per annum	kWh	6259
9	Cost of electricity	`/kWh	4.2
10	Monetary savings per annum	`(In lakh)	0.26
11	Investment required for new paddy cleaner	`(In lakh)	0.75
12	Payback period	years	2.88

Annexure 3: Detailed Financial Calculations & Analysis**Assumption**

Name of the Technology	PADDY CLEANER		
Rated Capacity	1.5 TPH		
Details	Unit	Value	Basis
Installed Capacity	TPH	1.5	
No of working days	Days	300	
No of operating hours	hrs	8	
Proposed Investment			
Equipment cost	₹ (in lakh)	0.70	
Cabling, Civil works and Modification	₹ (in lakh)	0.05	
Total Investment	₹ (in lakh)	0.75	
Financing pattern			
Own Funds (Equity)	₹ (in lakh)	0.19	
Loan Funds (Term Loan)	₹ (in lakh)	0.56	
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			
Power saving	kWh/year	6259	
Cost	₹/kWh	4.2	
St. line Depn.	%age	5.28	Indian Companies Act
IT Depreciation i.e. WDV	%age	80.00	Income Tax Rules
Income Tax rate	%age	33.99	Income Tax

Estimation of Interest on Term Loan

Years	Opening Balance	Repayment	Closing Balance	Interest
1	0.56	0.03	0.53	0.07
2	0.53	0.06	0.47	0.05
3	0.47	0.08	0.39	0.04
4	0.39	0.12	0.27	0.03
5	0.27	0.20	0.07	0.02
6	0.07	0.07	0.00	0.00
		0.56		

WDV Depreciation

` (in lakh)

Particulars / years	1	2
Plant and Machinery		
Cost	0.75	0.15
Depreciation	0.60	0.12
WDV	0.15	0.03

Projected Profitability

` (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Fuel savings	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Total Revenue (A)	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Expenses								
O & M Expenses	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04
Total Expenses (B)	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04
PBDIT (A)-(B)	0.23	0.23	0.23	0.23	0.23	0.22	0.22	0.22
Interest	0.07	0.05	0.04	0.03	0.02	0.00	-	-
PBDT	0.17	0.18	0.19	0.19	0.21	0.22	0.22	0.22
Depreciation	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
PBT	0.13	0.14	0.15	0.15	0.17	0.18	0.18	0.18
Income tax	-	0.02	0.06	0.07	0.07	0.08	0.08	0.08
Profit after tax (PAT)	0.13	0.12	0.08	0.09	0.10	0.11	0.11	0.11

Computation of Tax

` (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Profit before tax	0.13	0.14	0.15	0.15	0.17	0.18	0.18	0.18
Add: Book depreciation	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Less: WDV depreciation	0.60	0.12	-	-	-	-	-	-
Taxable profit	(0.43)	0.06	0.19	0.19	0.21	0.22	0.22	0.22
Income Tax	-	0.02	0.06	0.07	0.07	0.08	0.08	0.08

Projected Balance Sheet

` (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Liabilities								
Share Capital (D)	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Reserves & Surplus (E)	0.13	0.25	0.33	0.42	0.52	0.62	0.73	0.84
Term Loans (F)	0.53	0.47	0.39	0.27	0.07	0.00	0.00	0.00
Total Liabilities (D)+(E)+(F)	0.85	0.91	0.91	0.88	0.78	0.81	0.92	1.03

Assets	1	2	3	4	5	6	7	8
Gross Fixed Assets	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Less Accm. Depreciation	0.04	0.08	0.12	0.16	0.20	0.24	0.28	0.32
Net Fixed Assets	0.71	0.67	0.63	0.59	0.55	0.51	0.47	0.43
Cash & Bank Balance	0.14	0.24	0.28	0.29	0.23	0.30	0.45	0.59
TOTAL ASSETS	0.85	0.91	0.91	0.88	0.78	0.81	0.92	1.03
Net Worth	0.32	0.44	0.52	0.61	0.70	0.81	0.92	1.03
Debt Equity Ratio	2.84	2.52	2.09	1.45	0.39	0.01	0.01	0.01

Projected Cash Flow

										` (in lakh)
Particulars / Years	0	1	2	3	4	5	6	7	8	
Sources										
Share Capital	0.19	-	-	-	-	-	-	-	-	
Term Loan	0.56									
Profit After tax		0.13	0.12	0.08	0.09	0.10	0.11	0.11	0.11	
Depreciation		0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
Total Sources	0.75	0.17	0.16	0.12	0.13	0.14	0.15	0.15	0.15	
Application										
Capital Expenditure	0.75									
Repayment Of Loan	-	0.03	0.06	0.08	0.12	0.20	0.07	-	-	
Total Application	0.75	0.03	0.06	0.08	0.12	0.20	0.07	-	-	
Net Surplus	-	0.14	0.10	0.04	0.01	(0.06)	0.08	0.15	0.15	
Add: Opening Balance	-	-	0.14	0.24	0.28	0.29	0.23	0.30	0.45	
Closing Balance	-	0.14	0.24	0.28	0.29	0.23	0.30	0.45	0.59	

IRR

										` (in lakh)
Particulars / months	0	1	2	3	4	5	6	7	8	
Profit after Tax		0.13	0.12	0.08	0.09	0.10	0.11	0.11	0.11	
Depreciation		0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
Interest on Term Loan		0.07	0.05	0.04	0.03	0.02	0.00	-	-	
Cash outflow	(0.75)	-	-	-	-	-	-	-	-	
Net Cash flow	(0.75)	0.23	0.21	0.17	0.16	0.16	0.15	0.15	0.15	
IRR	17.62%									

NPV	0.20
------------	-------------

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	0.03	0.03	0.03	0.03	0.03		
Sub Total(G)	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03		
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	0.05	0.04	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)	0.11	0.10	0.09	0.08	0.07	0.05	0.05	0.05		
Sales (J)	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26		
Contribution (K)	0.24	0.24	0.24	0.24	0.24	0.23	0.23	0.23		
Break Even Point (L= G/I)	46.71%	40.96%	38.70%	34.65%	28.96%	22.02%	21.33%	21.69%		
Cash Break Even {(I)-(H)}	30.24%	24.41%	22.07%	17.93%	12.15%	5.11%	4.32%	4.56%		
Break Even Sales (J)*(L)	0.12	0.11	0.10	0.09	0.08	0.06	0.06	0.06		

Return on Investment

` (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8	Total
Net Profit Before Taxes	0.13	0.14	0.15	0.15	0.17	0.18	0.18	0.18	1.28
Net Worth	0.32	0.44	0.52	0.61	0.70	0.81	0.92	1.03	5.34
									24.05%

Debt Service Coverage Ratio

` (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8	Total
Cash Inflow									
Profit after Tax	0.13	0.12	0.08	0.09	0.10	0.11	0.11	0.11	0.62
Depreciation	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.24
Interest on Term Loan	0.07	0.05	0.04	0.03	0.02	0.00	0.00	0.00	0.22
Total (M)	0.23	0.21	0.17	0.16	0.16	0.15	0.15	0.15	1.08

DEBT

Interest on Term Loan	0.07	0.05	0.04	0.03	0.02	0.00	0.00	0.00	0.22
Repayment of Term Loan	0.03	0.06	0.08	0.12	0.20	0.07	0.00	0.00	0.56
Total (N)	0.10	0.11	0.12	0.15	0.22	0.07	0.00	0.00	0.78
	2.45	1.91	1.34	1.05	0.71	2.06	0.00	0.00	1.39
Average DSCR (M/N)	1.39								

Annexure 4: Details of procurement and Implementation plan

Project Implementation Schedule

S. No	Activity	Weeks			
		1	2	3	4
1	Placement of Orders for new paddy cleaner				
2	Supply of paddy cleaner				
3	Installation of the paddy cleaner and cabling				
4	Trial runs				

Process down time

S. No	Activity	Weeks			
		1	2	3	4
1	Dismantling of the existing paddy cleaner				
2	Supply of new paddy cleaner				
3	Installation of the paddy cleaner and connections				
4	Trial runs				

The process down time is considered for one week.

Annexure 5: Details of technology/equipment and service providers

Equipment details	Source of technology	Service/technology providers
Paddy Cleaners	Indigenous	Baba Auto Mechanical works Plot no c-12/b, IDA, Uppal, Hyderabad
Paddy Cleaners	Indigenous	Sree Srinivasa Enterprises 5-5-76/F-8, 1 st Floor, Srinivasa Commercial Complex, Ranigunj, Secunderabad

Annexure 6: Quotations or Techno-Commercial Bids

TIN NO. 28165210932

(O) 040-66494488
Cell : 93966 24488**Sree Srinivasa Enterprises**

5-5-76/F-8, 1st Floor, Srinivasa Commercial Complex, Ranigunj, Secunderabad.

Ref. : SE/

Date :

Dt / 16-11-2010

QUOTATIONTo,
M/s. VENKATARAMANA RICE MILL
C H E V E L L A
Dist : RANGA REDDY

S.no.	MACHINE DESCRIPTION	QUANTITY	RATE	PRICE
1	Paddy Cleaning Service with Aspirator with 2 Motor	ONE	90,000-00	90,000-00
2	Paddy Cleaner with De-Stoner with 3 Motor	ONE	1,10,000-00	1,10,000-00
3	Husk Separator with 3 HP Motor	ONE	65,000-00	65,000-00
4	Paddy Separator with 2 HP motor	ONE	1,25,000-00	1,25,000-00
5	Multi Grader (Brokens) 1 HP Motor	ONE	1,25,000-00	1,25,000-00
6	Double Elevator's - with 1 HP Motor	4 Nos.	85,000-00	85,000-00
				8,55,000-00
		4%Vat Tax		34,200-00
	Loding & Transportation Charges Extra	TOTAL		8,89,200-00

(Rs : Eight Lakhs Eighty Nine Thousands Two Handred only)

Thanking You

for SREE SRINIVASA ENTERPRISES

Prop. 
(K>SRINIVAS)**DEALERS : RICE MILL MACHINERY AND SPARE PARTS**

Baba Auto Mechanical Works

Plot no: c-12/b, IDA, Uppal, Hyderabad-500 039

30 years of Excellence in customer satisfaction

TIN: 28790212598

DATE: Wednesday, November 24, 2010

NAME : ZENITH ENERGY SERVICES PVT LTD

VILLAGE : HYDERABAD

DISTRICT :

STATE : ANDHRA PRADESH

PHONE : 9502688948

We thank you for enquiry and have pleasure on Quoting as follows. We trust the same meets with you approval and look forward to receive your valued order.

QUOTATION/ PERFORMA INVOICE..AP-214-2010

S.No.	DESCRIPTION	QTY.	UNIT RATE	AMOUNT
	<i>Sri Laxmi</i> paddy milling machinery 2ton capacity per hour on paddy			Indian Rupees
1.	PADDY CLEANER	ONE	80000=00	80000=00
2.	PADDY PRE CLEANER	ONE	54000=00	54000=00
3.	PNEUMATIC RUBBERSHELLER	ONE	150000=00	150000=00
4.	HUSK ASPIRATOR	ONE	45000=00	45000=00
5.	PADDY SEPARATOR- 5STRAY	ONE	115000=00	115000=00
6.	RICE WHITENER	ONE	145000=00	145000=00
7.	GLAZE MASTER	ONE	105000=00	105000=00
8.	AIR LOCK SYSTEM		125000=00	125000=00
9.	PLAIN SIFTER 100x5	ONE	115000=00	115000=00
10.	6" DOUBLE ELEVATOR	4NOS	54000=00	216000=00
11.	6" SINGLE ELEVATOR	ONE	30000=00	30000=00
	TOTAL			1170000=00
	VAT@	4%		46800=00
	TOTAL			1216800=00

NOTE: THE ABOVE MENTIONED MACHINERY ARE WITHOUT ELECTRICAL MOTORS, AIR COMPRESSOR & PANNEL BOARD

NOTE: ERECTION CHARGES RS 45000/- EXTRA WILL BE CHARGED, TRANSPORT AND TRANSIT INSURANCE EXTRA

NOTE: HANDLING CHARGES OF 3500/- EXTRA.

Customer's signature

For Baba Auto Mechanical Works

Authorized signature

Manufacturers of *Sri Laxmi* Brand Modern Rice mill machinery
 FIND US: www.srilaxmiengineers.com, www.babaauto.com, Email: babaautomechanicalworks@gmail.com
 Contact us: +91-40-27207363 (Off phone & Fax), +91-9440050172, +91-9246150172 (mobile)
 OUR BANKERS: BANK OF INDIA, AZAMABAD BRANCH, CC A/C NO: 862630100033001
 STATE BANK OF INDIA, RAMANTHAPUR BRANCH, CURRENT A/C NO: 30281208834

Baba Auto Mechanical Works

Plot no: c-12/b, IDA, Uppal, Hyderabad-500 039

REQUIRED MOTORS:-

PADDY CLEANER	2HP,960 RPM
PADDY PRE CLEANER	2HP ,1440 RPM
PNEUMATIC RUBBER SHELLER	10 HP, 1440 RPM
HUSK ASPERATOR	3 HP 1440 RPM
PADDY SEPARATOR	2 HP, 960 RPM
RICE WHITENER	25 HP, 960RPM (FLANGE)
GLAZE MASTER	20HP, 960RPM
AIR LOCK SYSTEM	10HP, 2800, 1 HP ROTARY VALVE, 2HP, 1440RPM (ELECTRICAL MOTORS ARE SUPPLIED FOR AIR LOCK SYSTEM)
100x5 PLAIN SIFTER	1.5HP, 1440RPM,1 HP 2800 RPM (ELECTRIC MOTORS FOR PLAIN SIFTER ARE SUPPLIED)
6"DOUBLE ELEVATORS	4nos x1HP, 1440 RPM
6" SINGLE ELEVATOR	1HP, 1440 RPM
AIR COMPRESSOR(10 KG PRESSURE)	2HP 1440 RPM

Note: 2 HP BLOWERS SUPPLIED WITH THE MACHINERY APART FROM THE ABOVE LIST

GENERAL TERMS AND CONDITIONS

THE PRICE	The confirmation of price is exclusive of electrical, packing, forwarding, Transit insurance, transportation, erection & trial run etc.
TAXES & DUTIES	TIN / CST Excise and other Govt. Levies Extra as applicable at the time of Delivery
FIRM ORDER	(a) The price confirmation is valid for the Firm order only (b) 40 % of the value as advance is treated as firm order; payment should be made in the form of demand draft of cheque only (c) in case, if the customer fails to pay 40% within in two weeks from the date of order the price confirmed is not valid and the rates will be applicable as the time at the time of delivery
DELIVERY (X' GODOWN)	Delivery will be effective within 2 to 3 weeks from the date of receipt of full payment (a) For inter state transaction, 'C' Forms should be arranged (b) Customer should arrange their TIN / CST Registration certificate for effective delivery (c) Company is not responsible for the delay in delivery schedule effect by natural calamities strikes lock - outs, shortage of raw materials and power - cuts etc.
TERMS & PAYMENT	Balance payment should be arranged before the delivery of the machinery.
RISK IN TRANSIT	Company is not responsible for the loss or damage of goods of their documents in transit.
CANCELLATION NOTE	Orders once placed will not be cancelled, ALL THE LEGAL MATTERS ARE SUBJECT TO HYDERAABAD JURISDICTION ONLY

I / We accept all the above terms & conditions

Customer's signature

For Baba Auto Mechanical Works

Authorized signature

Manufacturers of *Sri Laxmi* Brand Modern Rice mill machinery
 FIND US: www.srilaxmiengineers.com, www.babaauto.com, Email:babaautomechanicalworks@gmail.com
 Contact us: +91-40-27207365(Off phone & Fax), +91-9440050172, +91-9246150172(mobile)
 OUR BANKERS: BANK OF INDIA, AZAMABAD BRANCH, CC A/C NO: 862630100033001
 STATE BANK OF INDIA, RAMANTHAPUR BRANCH, CURRENT A/C NO: 30281208834



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