DETAILED PROJECT REPORT
ON
VOLTAGE STABILIZER (50 KVA)
(GANJAM RICE MILL CLUSTER)











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VOLTAGE STABILIZERS FOR RICE MILL (50 KVA)

GANJAM RICE MILLS CLUSTER

BEE, 2010
Detailed Project Report on Voltage Stabilizer (50 KVA)
Rice Mill SME Cluster, Ganjam, Orissa (India)
New Delhi: Bureau of Energy Efficiency;
Detail Project Report No.: **Ganjam/Ricemills/PC/01**

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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.

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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

List of Table

List of Figures

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%.

Based on detailed energy audits conducted in various units of the cluster, the voltage supply is measured to be only 297 volts to 350 volts. About 30% of the units are facing acute low voltage problem due to overloading of electricity board distribution transformers. Due to low voltage, the current drawn by the motors is high due to low voltage and the windings are overheated and the frequent failure of the motors is evidenced. Further, due to low voltage the power consumption of the motors is high.

Voltage stabilizers are an effective solution to voltage fluctuation problems. They are designed to current a wide range of Input Fluctuations to maintain specified output voltage. Installation of proposed technology i.e. voltage stabilizer of 50 KVA capacity would lead to save about 7518 kWh of electricity per year.

The DPR highlights the details of the study conducted for assessing the potential for installation of voltage stabilizer in various unit of 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)	0.80
2	Electricity saving	kWh/annum	7518
3	Monetary benefit	` (In lakh)	0.32
4	Debit equity ratio	Ratio	3:1
5	Simple payback period	Years	2.50
6	NPV	` (In lakh)	0.34
7	IRR	%age	22.27
8	ROI	%age	24.93
9	DSCR	Ratio	1.58
10	Process down time	Days	2
11	CO_2 reduction	Ton /year	7

The projected profitability and cash flow statements indicate that the proposed 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

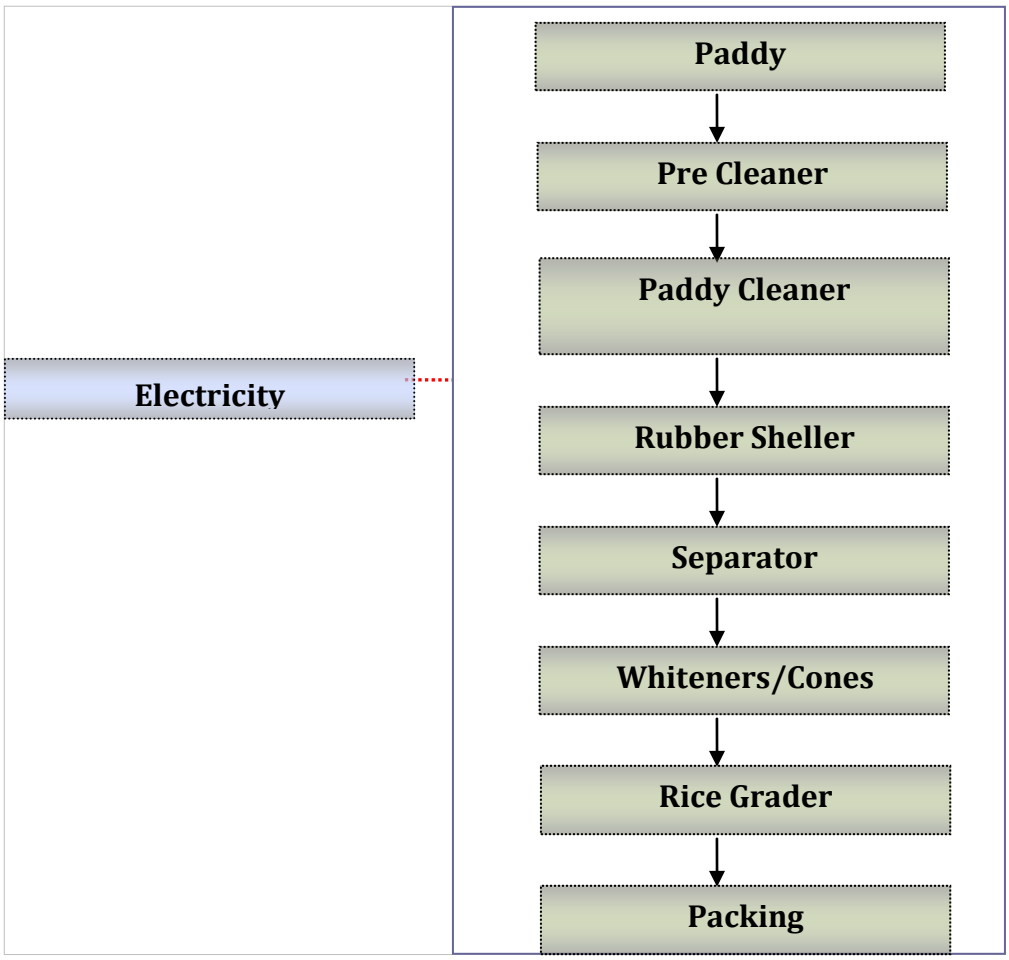


Figure 1.1: General Process Flowchart of a rice mill is furnished below.

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 is furnished in Table 1.1 below:

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

S.No.	Details	Unit	Value
1	Electricity Consumption	MWh/annum	75
2	Production (Rice)	tonne/annum	4100

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 4100 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 1.0 TPH capacity 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	18.29

1.3 Existing technology/equipment

1.3.1 Description of existing technology

The main energy source for the cluster rice mill units is electricity. The electricity is supplied the state electricity board through common distribution transformers. Based on detailed energy audits conducted in various units of the cluster, the voltage supply is measured to be only 297 volts to 350 volts. About 30% of the units are facing acute low

voltage problem due to overloading of electricity board distribution transformers. Due to low voltage, the current drawn by the motors is high due to low voltage and the windings are overheated and the frequent failure of the motors is evidenced. Further, due to low voltage the power consumption of the motors is high.

As the connected load of these rice mills is low, the power is supplied through common distribution transformers and the distribution transformers installed by electricity board is of lower capacity than the demand and hence the transformers are overloaded leading to low voltage supply.

1.4 Establishing the baseline for the equipment to be changed

1.4.1 Electricity consumption

The electricity consumption of typical units having 1/1.5 TPH paddy processing capacity where low voltage problem is furnished below in table 1.3 below:

Table 1.3: Electricity consumption in three different units

Name of the unit	*Production capacity (TPH)*	*No of (hours/ day)*	*No of (days /annum)*	*Average electricity consumption per month*	*Actual Power consumption (kWh/annum)*
M/s Jagateshwara Rice Mill	1.0	10	260	6250	75,000
M/s Radha Raman Rice Mill	1.5	8	270	3929	47,143

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 quality of power supply in cluster units. Based on the studies undertaken, the units are facing low voltage problem due to overloading of electricity board distribution transformer. The voltage supply in the cluster is poor and is varying anywhere between 270 to 350 volts against requirement of 415 Volts plus 10% variation. Due to low voltage, the current drawn by the motors is increased and hence I^2R losses increases (no load and load losses). Further, due to over draw of current, the motor windings gets heated up and frequent burning of the motors is common and hence drops in efficiency.

The production loss is also evident due to frequent failures of the motors and due to voltage supply, only partial equipments are operated leading to low loading of the motors hence drop in efficiency.

The above are the factors of lowering of the efficiency of the systems and hence more power consumption.

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 voltage stabilizer in the cluster are:

- The major technical barrier that prevented the implementation of the voltage stabilizers/transformers in the cluster is due Lack of technical knowledge and its losses and lack of technical manpower
- Lack of technical knowledge and its losses

1.5.2 Financial Barrier

- The installation of voltage stabilizers requires high initial investment. Hence, many of the owners don't show interest for implementation and operating the equipments even at low voltage.
- Lack of financial strength of the rice mill owners to invest for the technologies
- Further, the lack of awareness of the monetary losses due to the absence of voltage stabilizers 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 voltage stabilizer in the cluster*

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 installation of voltage stabilizers, and Stabilizer is the Automatic Voltage regulator. It regulates the output power. It produces the output 230 V ± 1% (Variable 5%) or 415 ± 1% (Variable 5%) or as per customer demand for the appliances.

Voltage stabilizers are an effective solution to voltage fluctuation problems. They are designed to current a wide range of input fluctuations to maintain specified output voltage. The output voltage waveform is completely distortion free and the regulation is unaffected by the load power factor.

Voltage stabilizer should have the high voltage protection, if the Input is going beyond the limit and output is going beyond the limit in worst cases. The stabilizer should sense Input and output condition and cutoff the output supply of the stabilizer. So In this way stabilizer protects the connected appliances.

2.1.2 Technology /Equipment specifications

The detailed specifications of voltage stabilizer of 50 kVA are furnished in Table 2.1 below:

Table 2.1: Proposed voltage stabilizer specifications

S. No.	*Parameter*	*Details*
1	Input	340 V to 480 V AC OR As per customer demand
2	Output	415 ± 1% (Variable 5%) OR As per customer demand
3	Capacity	Upto 100 KVA
4	Regulation	Better than ± 1%
5	Winding	Copper wound
6	Duty cycle	Continuous
7	Frequency	47 – 53 Hz
8	Waveform distortion	Nil
9	Power factor	Nil
10	Ambient	0 to 45° C Max

S. No.	Parameter	Details
11	Environment	Designed for indoor tropical use
12	Mounting	Free on wheel

Further detail technical specification is given at Annexure 7.

2.1.3 Justification of the technology selected & its suitability

As discussed in previous sections, about 30% of the units are facing low voltage problem due to overloading of electricity board distribution transformers. Due to low voltage, frequent failures, the frequent failure of motors is very common in the units, further the current drawn by the motors is high due to low voltage and power consumption also increases.

Voltage stabilizers are an effective solution to voltage fluctuation problems and will reduce motor failures and also optimize power consumption. They are designed to current a wide range of Input Fluctuations to maintain specified output voltage. The output voltage waveform is completely distortion free and the regulation is unaffected by the load power factor.

Based on facts, the installation of voltage supply for the cluster units is a viable option for reducing motors burnt and also reducing power consumption

2.1.4 Superiority over existing technology/equipment

The following are the superior features of voltage stabilizers.

- Power saving
- Improves life of the equipment'
- Reduces frequent burning of the motors
- Uses isolation shielding to suppress the harmonics to give quality power
- Reduces maintenance cost

2.1.5 Availability of the proposed technology/equipment

The voltage stabilizers suppliers are available at Bhubaneshwar, Vishakhapatnam and Vijaywada. The details of the suppliers are 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 5.

2.1.8 Terms of sales of the suppliers, etc.

The terms and conditions of the equipment supplier for supply of the voltage stabilizer are given at annexure 7.

2.1.9 Process down time during implementation

The process down time for installation of voltage stabilizer is considered at two days for installation of providing electrical connections to the panel and main feeder.

2.2 Life cycle assessment and risks analysis

The life of the voltage stabilizer is considered at 15 years. There is no risk involved in installation of voltage stabilizers.

2.3 Suitable unit/plant size the identified equipment

Based on total connected load and actual electrical load at full load operation, 50 KVA voltage stabilizers is selected for a unit having 1 to 1.5 TPH production capacities.

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

The installation of voltage stabilizer reduces the power consumption of the unit. The power savings due to installation of project activity is estimated at 7,518 kWh per annum. Detail of saving calculation is shown in Annexure 3.

3.1.2 Improvement in product quality

There will be no significant change in the product quality due to the installation of voltage stabilizer.

3.1.3 Increase in production

The installation of voltage stabilizer increases the production capacity due to reduction in frequent breakdowns of the machines due to voltage fluctuations and motor burnt and hence there may improvement in production.

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 voltage stabilizer is estimated at ` 0.32 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 voltage stabilizer will reduce frequent breakdowns and motor burnings 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 CO_2, NOx, etc

The major GHG emission reduction source is CO_2. The technology will reduce grid electricity consumption and emission reductions are estimated at 7 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 voltage stabilizer is estimated at ` 0.75 lakh (after discussion with technology vendor and considering the discount) as per the quotation provided in Annexure 7.

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	Voltage stabilizer	` in lakh	0.75
2	Cabling, Shaft , Modifications, Commissioning etc	` in lakh	0.05
3	Total Investment	` in lakh	0.80

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 ` 0.20 lakh.

4.2.2 Loan amount

The term loan is 75% of the total project cost, which is ` 0.60 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 ` 0.18 lakh in the first year operation and increases to ` 0.83 at the end of eighth year.

4.3.2 Simple payback period

The total project cost of the proposed technology is ` 0.80 lakh and monetary savings due to reduction in electricity consumption is ` 0.32 lakh and the simple payback period work out to be 2.50 years.

4.3.3 Net Present Value (NPV)

The Net present value of the investment at 10.0% interest rate works out to be ` 0.34 lakh.

4.3.4 Internal rate of return (IRR)

The after tax Internal Rate of Return of the project works out to be 22.27%. 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 24.93%.

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	22.27	0.34	24.93	1.58
5% increase in power savings	24.19	0.40	25.22	1.65
5% decrease in power savings	20.13	0.28	24.55	1.49

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 5.

Annexure 1: Energy audit and base line establishment

M/s Jagates hwara Rice Mill

S.No.	Particulars	Unit	Value
1	Voltage measured Volts (V1)	Volt	310
2	Current measured Amps (I 1)	Amp	21.1
3	Resistance R	Ohm	14.69
4	Power loss kW (P1)	kW	6.54
5	New voltage (V2)	Volt	415
6	New current Amps (I 2)	Amp	15.76
6	Power loss kW (P2)	kW	3.65
7	Net power losses reduced per hr (P)	kWh	2.89

M/s Radha Raman Rice

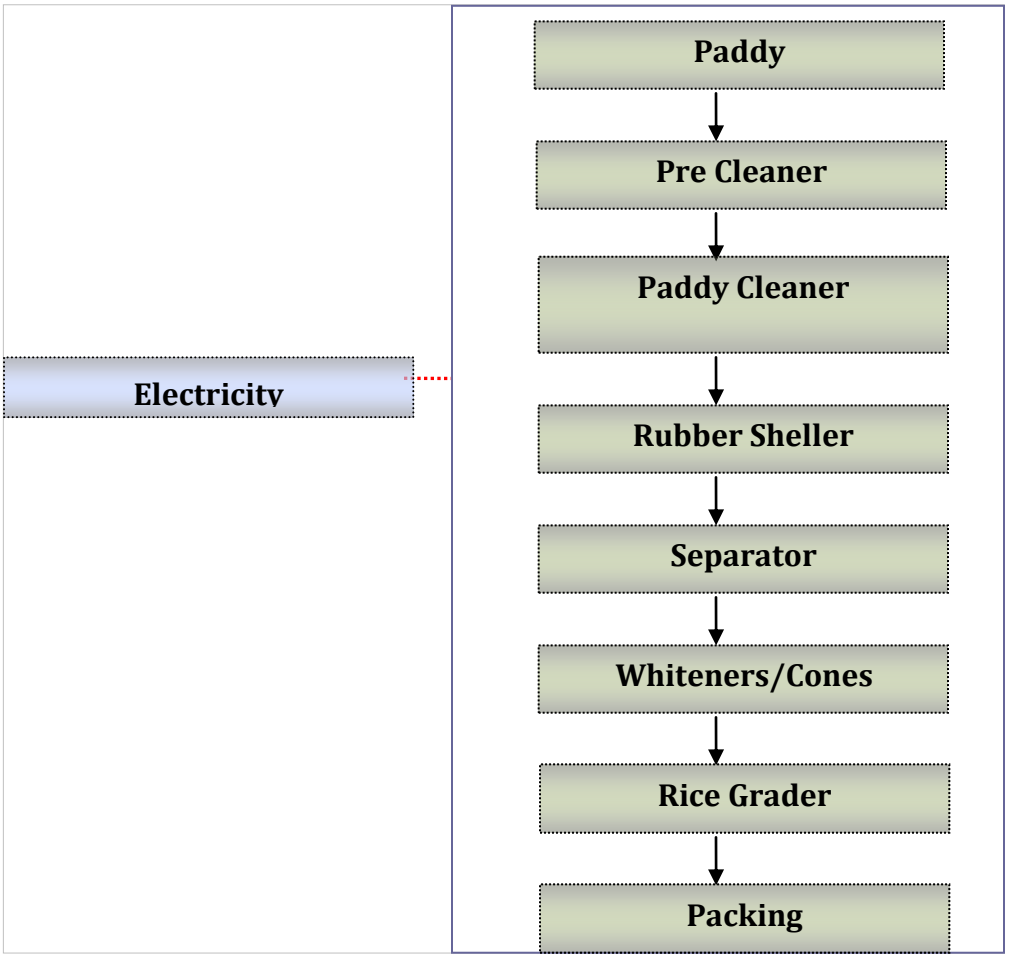
S.No.	Particulars	Unit	Value
1	Voltage measured Volts (V1)	Volt	305
2	Current measured Amps (I 1)	Amp	22
3	Resistance R	Ohm	13.86
4	power loss kW (P1)	kW	6.71
5	New voltage (V2)	Volt	415
6	New current Amps (I 2)	Amp	16.16
6	power loss kW (P2	kW	3.62
7	Net power losses reduced per hr (P)	kWh	3.09

M/s Paddy Rice Mill

S.No.	Particulars	Unit	Value
1	Voltage measured Volts (V1)	Volt	270
2	Current measured Amps (I 1)	Amp	19.2
3	Resistance R	Ohm	14.06
4	power loss kW (P1)	kW	5.18
5	New voltage (V2)	Volt	415
6	New current Amps (I 2)	Amp	12.49
6	power loss kW (P2	kW	2.19
7	Net power losses reduced per hr (P)	kWh	2.99

Annexure 2: Process flow diagram

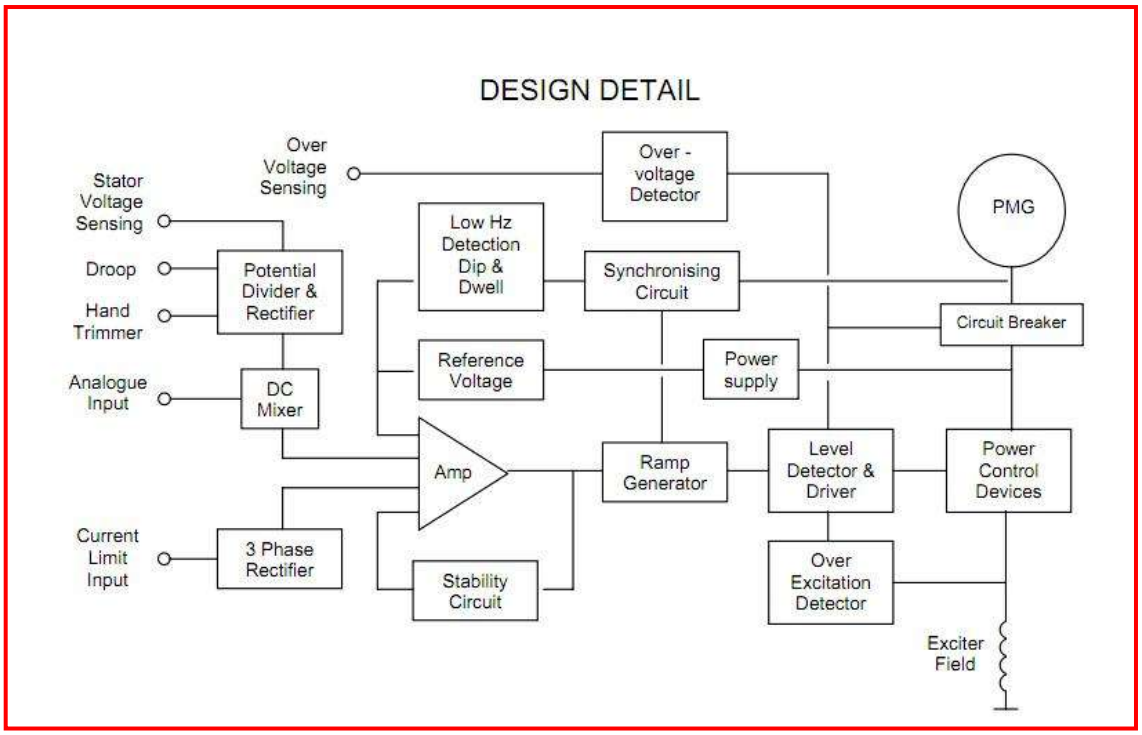
Process flow diagram is same even after implementation of proposed technology.



Annexure 3: Detail technical assessment report

S.No.	Particulars	Unit	Value
1	Voltage measured Volts (V1)	Volt	310
2	Current measured Amps (I 1)	Amp	21.1
3	Resistance R	Ohm	14.69
4	Power loss kW (P1)	kW	6.54
5	New Improved voltage (V2)	Volt	415
6	New current Amps (I 2)	Amp	15.76
7	Power loss kW (P2)	kW	3.65
8	Net power losses reduced per hr	kWh	2.89
9	Total operating hours	Hr	10
10	Total operating days	days	260
11	Total power saving	kWh	7518
12	Cost of electricity	` /kWh	4.2
13	Monetary savings per annum	`(In lakh)	0.32
14	Investment required	`(In lakh)	0.8
15	Payback period	Years	2.50

Annexure 4: Technical drawing



Annexure 5: Detailed Financial Calculations & Analysis

Assumption

Name of the Technology	**VOLTAGE STABLIZER**		
Rated Capacity	**50 KVA**		
Details	***Unit***	***Value***	***Basis***
Installed Capacity	kVA	50	
No of working days	Days	260	
No of operating hours	hrs	10	
Proposed Investment			
Equipment cost	` (in lakh)	0.75	
Cabling, Civil works and Modification	` (in lakh)	0.05	
Total Investment	` (in lakh)	0.80	
Financing pattern			
Own Funds (Equity)	` (in lakh)	0.20	
Loan Funds (Term Loan)	` (in lakh)	0.60	
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	7518	
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

` (in lakh)

Years	***Opening Balance***	***Repayment***	***Closing Balance***	***Interest***
1	0.60	0.03	0.57	0.07
2	0.57	0.06	0.51	0.05
3	0.51	0.09	0.43	0.05
4	0.43	0.12	0.31	0.04
5	0.31	0.24	0.07	0.02
6	0.07	0.06	0.01	0.00
		0.60		

WDV Depreciation **` (in lakh)**

Particulars / years	*1*	*2*
Plant and Machinery		
Cost	0.80	0.16
Depreciation	0.64	0.13
WDV	0.16	0.03

Projected Profitability **` (in lakh)**

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Fuel savings	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Total Revenue (A)	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Expenses								
O & M Expenses	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.05
Total Expenses (B)	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.05
PBDIT (A)-(B)	0.28	0.28	0.28	0.28	0.28	0.27	0.27	0.27
Interest	0.07	0.05	0.05	0.04	0.02	0.00	-	-
PBDT	0.21	0.23	0.23	0.24	0.26	0.27	0.27	0.27
Depreciation	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
PBT	0.17	0.18	0.19	0.20	0.21	0.23	0.23	0.23
Income tax	-	0.03	0.08	0.08	0.09	0.09	0.09	0.09
Profit after tax (PAT)	0.17	0.15	0.11	0.12	0.13	0.14	0.14	0.14

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

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Profit before tax	0.17	0.18	0.19	0.20	0.21	0.23	0.23	0.23
Add: Book depreciation	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Less: WDV depreciation	0.64	0.13	-	-	-	-	-	-
Taxable profit	(0.43)	0.10	0.23	0.24	0.26	0.27	0.27	0.27
Income Tax	-	0.03	0.08	0.08	0.09	0.09	0.09	0.09

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

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Liabilities								
Share Capital (D)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Reserves & Surplus (E)	0.17	0.32	0.43	0.55	0.68	0.81	0.95	1.09
Term Loans (F)	0.57	0.51	0.43	0.31	0.07	0.01	0.01	0.01
Total Liabilities (D)+(E)+(F)	0.94	1.03	1.06	1.06	0.94	1.02	1.16	1.30

Assets	1	2	3	4	5	6	7	8
Gross Fixed Assets	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Less Accm. Depreciation	0.04	0.08	0.13	0.17	0.21	0.25	0.30	0.34
Net Fixed Assets	0.76	0.72	0.67	0.63	0.59	0.55	0.50	0.46
Cash & Bank Balance	0.18	0.32	0.38	0.42	0.35	0.47	0.65	0.83
TOTAL ASSETS	0.94	1.03	1.06	1.06	0.94	1.02	1.16	1.29
Net Worth	0.37	0.52	0.63	0.75	0.88	1.01	1.15	1.29
Debt Equity Ratio	2.85	2.55	2.13	1.53	0.33	0.03	0.03	0.03

Projected Cash Flow

` (in lakh)

Particulars / Years	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Sources									
Share Capital	0.20	-	-	-	-	-	-	-	-
Term Loan	0.60								
Profit After tax		0.17	0.15	0.11	0.12	0.13	0.14	0.14	0.14
Depreciation		0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Total Sources	0.80	0.21	0.19	0.15	0.16	0.17	0.18	0.18	0.18
Application									
Capital Expenditure	0.80								
Repayment Of Loan	-	0.03	0.06	0.09	0.12	0.24	0.06	-	-
Total Application	0.80	0.03	0.06	0.09	0.12	0.24	0.06	-	-
Net Surplus	-	0.18	0.13	0.07	0.04	(0.07)	0.12	0.18	0.18
Add: Opening Balance	-	-	0.18	0.32	0.38	0.42	0.35	0.47	0.65
Closing Balance	-	0.18	0.32	0.39	0.43	0.36	0.48	0.66	0.83

IRR

` (in lakh)

Particulars / months	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Profit after Tax		0.17	0.15	0.11	0.12	0.13	0.14	0.14	0.14
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	0.05	0.04	0.02	0.00	-	-
Cash outflow	(0.80)	-	-	-	-	-	-	-	-
Net Cash flow	(0.80)	0.28	0.25	0.20	0.20	0.19	0.18	0.18	0.18
IRR	22.27%								
NPV	0.34								

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

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Variable Expenses								
Oper. & Maintenance Exp (75%)	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Sub Total*(G)*	0.02	0.03	0.03	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	0.05	0.04	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)	0.12	0.10	0.10	0.09	0.07	0.05	0.05	0.05
Sales (J)	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Contribution (K)	0.29	0.29	0.29	0.29	0.29	0.28	0.28	0.28
Break Even Point (L= G/I)	41.07%	36.11%	34.19%	30.74%	24.97%	19.10%	18.67%	18.97%
Cash Break Even {(I)-(H)}	26.59%	21.57%	19.59%	16.08%	10.23%	4.29%	3.78%	3.99%
Break Even Sales (J)*(L)	0.13	0.11	0.11	0.10	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	0.17	0.18	0.19	0.20	0.21	0.23	0.23	0.23	1.65
Net Worth	0.37	0.52	0.63	0.75	0.88	1.02	1.16	1.29	6.63
									24.93%

Debt Service Coverage Ratio

` (in lakh)

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***Total***
Cash Inflow									
Profit after Tax	0.17	0.15	0.11	0.12	0.13	0.14	0.14	0.14	0.82
Depreciation	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.25
Interest on Term Loan	0.07	0.05	0.05	0.04	0.02	0.00	0.00	0.00	0.23
Total (M)	0.28	0.25	0.20	0.20	0.19	0.18	0.18	0.18	1.30

DEBT

Interest on Term Loan	0.07	0.05	0.05	0.04	0.02	0.00	0.00	0.00	0.23
Repayment of Term Loan	0.03	0.06	0.09	0.12	0.24	0.06	0.00	0.00	0.60
Total (N)	0.10	0.11	0.13	0.16	0.26	0.06	0.00	0.00	0.83
	2.85	2.17	1.52	1.25	0.73	2.94	0.00	0.00	1.58
Average DSCR (M/N)	1.58								

Annexure 6: Details of procurement and Implementation plan

Project Implementation Schedule

S. No	Activity	Weeks			
		1	2	3	4
1	Placement of Orders for voltage stabilizer				
2	Supply of voltage stabilizer				
3	Installation of the voltage stabilizerr and cabling				
4	Trial runs				

Process down time

The process down time for installation of voltage stabilizer is considered at two days for installation of providing electrical connections to the panel and main feeder.

Annexure 7: Details of technology/equipment and service providers

Equipment details	*Source of technology*	*Service/technology providers*
Voltage Stabilizer	Indigenous	**Servomax** Mr.T Srinivas Servomax India Limited 208, Meridian Plaza, Beside Lal Bunglow, Ameerpet, Hyderabad 500 016 Phone Nos : 040 444436666, 44436600 Email:tsrinivas@servomax.net www.servomax.net
Voltage Stabilizer	Indigenous	**UNIVERSAL ELECTRONICS**, No.14, MOSQUE STREET, ESWARAN NAGAR, ANNA SALAI, PAMMAL, CHENNAI - 600 075

Annexure 8: Quotations or Techno-Commercial Bids

SERVOMAX

Servomax India Limited

- Distribution Transformers LT / HT - Up to 3Mva
- Industrial Voltage Stabilizers - L.T & H.T UPTO 5000Kva.
- Panel Boards - A.P.F.C and all types
- Isolation Transformers - up to 5000Kva
- K-1 Transformers
- K-20 Transformers - up to 2000kVA
- Surge Protection equipments
- Energy Saving Equipments and Solutions.
- Turnkey electrical solution - H.T & L.T.

All the above are backed by responsive customer support system, State of the art technology developed by R&D team and ISO quality system. This reflects our providing total solutions that enable our client to get the benefits of innovation, high savings, Quality power

Product Recommended :

50, 75 & 100 KVA Servo controlled Voltage Stabilizer - Air cooled		
Model	:	PS 50K, 75K & 100K 3P

Features of Servo Stabilizer

Protections :

- Low Voltage Protection
- High Voltage Protection
- Over load Protection
- Short Circuit Protection
- Single Phase preventer

High Reliability

Use solid state control circuits, No relays, No warm up time, Synchronous motor drive, Professional grade ICs and components are used

Trouble Free Operation

- Every unit is 'soak tested' for 48 hours
- Quick response time 10 Milli Sec (Half a Cycle)
- All transformers are copper-wound on CR laminations and double vacuum impregnated for high efficiency

Corporate Office : #206, Meridian Plaza, Beside Lal Banglow, Ameerpet , Hyderabad **Page 3**

SERVOMAX

Servomax India Limited

- Excellent regulation as high as +/- 0.5%
- Zero wave-form distortion
- Plug-in type fiberglass PCBs with gold-plated fingers for better contacts to ensure excellent reliability and minimum down-time
- Unaffected by load power factor
- No Load losses are very low
- Very wide input operating ranges
- Reset - Manual / Auto reset with time delay
- Control Switch - Phase control- Individual phase control is provided
- Provision of cabling : Input / Output cable termination with provision for fixing cable glands
- Servo Motor Drive : Rugged AC step synchronous motor
- Enclosure - IP 32
- Mounting - floor mounted / Free on wheel

Technical Specifications:

Input Voltage	:	300-460 V 3 Ph AC
Out Put Voltage	:	415 V 3Ph AC
Line Frequency	:	47-53Hz.
Output Voltage Regulation	:	+/- 1%
Type	:	Unbalanced supply and Load conditions
Efficiency	:	≥98%
Speed of Correction	:	60 V per sec. (Air cooled)
Wave form distortion	:	Nil
Effect of Load power factor	:	Nil
Ambient Temperature	:	0-40°C
Duty Cycle	:	Continuous
Mode of System	:	Fully Automatic / Manual
Indications on	:	Input on
		Input Low
		Input High

SERVOMAX

Servomax India Limited

		Output On
		Output Cutoff
Controls on each Phase	:	Auto/Manual Selector Switch
		Increase/Decrease Selector Switch
		Volts adj. Potentiometer.
Metering	:	Voltmeter to read Input and Output
		Voltages with selector switch.
		Ammeter to read the Output Current in each ph with selector Switch(from 15 KVA 3 Ph onwards)
Panel Control	:	Input / Output Select Switch
		Auto / Manual select switch
		Increase / Decrease switch to control the output
		voltage in manual mode
		Volts adjust to set required output in auto mode
System Construction	:	As per IS : 9815 -1994

Price Schedule/Scope of supply

S.No	Product Descriptions	Basin Price in Rs	Quantity in No's	Total basic Price in Rs
01	50 KVA 3 Ph SCVS	84, 000/-	01 No's	84,000.00
01	75 KVA 3 Ph SCVS	1,22,000/-	01 No's	1,22,000.00
01	100 KVA 3 Ph SCVS	1,49,000/-	01 No's	1,49,000.00

SERVOMAX

Servomax India Limited

Note: Purchase order raised on below address

Servomax India Limited

Plot no : 16 , 17 & 18 , Ida ,Phase – II ,

Cherlapally , Hyderabad-51

Commercial Terms

PRICES QUOTED IS	:	EX-WORKS BASIS.
PACKING & FORWARDING	:	**NIL.**
DUTIES	:	**EXTRA AS APPLICABLE** TO YOUR ACCOUNT CURRENT RATE OF EXCISE DUTY IS @ **10.3% EXTRA**; EDGP SHALL BE ROVIDED.
TAXES	:	EXTRA AS APPLICABLE TO YOUR ACCOUNT CURRENT RATE OF VAT @ **14.5%** WILL BE CHARGED EXTRA OR **2% AGAINST** FORM "C". IF ANY OTHER TAXES LIKE ENTRY TAX, OCTROI, ETC., SHALL BE EXTRA AT ACTUAL TO YOUR ACCOUNT.
DELIVERY PERIOD	:	**3-4 WEEKS** FROM THE DATE OF RECEIPT OF YOUR CLEAR TECHNO-COMMERCIALY PURCHASE ORDER.
WARRANTY PERIOD	:	**1 YEAR** FROM THE DATE OF INVOICE AGAINST ANY MANUFACTURING DEFECTS ONLY.
VALIDITY	:	**30 DAYS.**
PAYMENT	:	**50% ADVANCE** ALONG WITH PURCHASE ORDER AND BALANCE PAYMENTS AGAINST **PROFORMA INVOICE**
UNLOADING	:	SHALL BE IN **YOUR SCOPE.**
Transportation	:	Extra If Delivery is out of Hyderabad.

Yours Sincerely
For Servomax India Limited

T. Srinivas
Marketing Dept
98489 10144
E mail : tsrinivas@servomax.net; Servomax_srinivas@rediffmail.com.

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,
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Institutional Area, Janakpuri, New Delhi-110058
Tel: +91-11-28525534, Fax: +91-11-28525535
Website: www.techsmall.com