DETAILED PROJECT REPORT
ON
ENERGY EFFICIENT MOTOR FOR AGITATOR – 7.5HP
(BHIMAVARAM ICE MAKING CLUSTER)










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Bureau of Energy Efficiency

Prepared By

APITCO LIMITED
Engineering Growth

Reviewed By

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ENERGY EFFICIENT MOTOR FOR AGITATOR -7.5 HP

BHIMAVARAM ICE MAKING CLUSTER

BEE, 2010
Detailed Project Report on Energy Efficient Motor for Agitator
Ice Plant SME Cluster, Bhimavaram, Andhra Pradesh (India)
New Delhi: Bureau of Energy Efficiency;
Detail Project Report No.:

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We take this opportunity to express our appreciation for the excellent support provided by Ice making 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).

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APITCO Limited

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

EXECUTIVE SUMMARY

APITCO Ltd. is executing BEE-SME program in Bhimavaram Ice Plants Cluster, supported by Bureau of Energy Efficiency (BEE) with an overall objective of improving the energy efficiency in cluster units.

Bhimavaram is renowned for the sea food business and is a big hub for fish and prawns culture. The prawns and fish are exported to various countries throughout the world. There are about 80 ice making units in the cluster. The major Energy forms used in the cluster are grid electricity and HSD oil. Electricity is used for driving the prime movers of compressors, pumps, agitators, drives and for lighting. HSD is used as fuel in DG sets for electricity generation in the event of failure of power supply.

The total energy cost in ice plant is between 48 to 54% of end product cost. Majority of the ice industries located in Bhimavaram are engaged in production of block ice which are required for storage and transportation of the sea food. The major cost component in ice production is energy cost followed by labor cost.

All Ice plants in Bhimavaram are working on indirect refrigeration system. These ice plants are requires the agitator to circulate brain solution continuously in evaporation tank for uniform heat transfer. The agitator is driven by electrical motor. These motors are operated continuously throughout the day till the plant shut down. If agitator motors are inefficient/re-winded, the motors consume more power compare to the efficient motors at same operating conditions and loading.

During the energy use and technology audit in ice plants in Bhimavaram, all agitator motors are having normal efficiency compare to energy efficient motors and many are re-winded. It is well known fact that re winded motors will have less efficiency and hence increasing power consumption. To reduce the power consumption by the agitator motor during the ice plant operation it is essential to implement energy efficient motor for agitator. By installing Energy Efficient Motor in agitator will result considerable energy savings and there by reduction in production cost.

Installation of energy efficient motor for agitator would lead to electricity saving upto 2477 kWh per year due to improved efficiency.

The DPR highlights the details of the study conducted for assessing the potential for reducing electricity consumption by installing new efficient motor for agitator 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 below:

Sr. No.	Particular	Unit	Value
1	Project cost	(` in Lakh)	0.18
2	Electricity Savings	kWh/annum	2477
3	Monetary benefit	(` in Lakh)	0.09
4	Simple payback period	Years	2
5	NPV	(` in Lakh)	0.11
6	IRR	%age	31.18
7	ROI	%age	31.81
8	Average DSCR	Ratio	1.66
9	CO_2 emission reduction	MT/year	2
10	Process down time	Days	1

The projected profitability and cash flow statements indicate that the project implementation i.e. installation of energy efficient motor on agitator 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. Bhimavaram Ice Making Units 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

Bhimavaram is a town in the West Godavari District in the state of Andhra Pradesh, India. It is located 395 kilometers east of state capita Hyderabad. Bhimavaram is renowned for the sea food business and is a big hub for fish and prawns culture. The prawns and fish are exported to various countries throughout the world. There are about 80 ice making units in the cluster. The major Energy forms used in the cluster are grid electricity and HSD oil. Electricity is used for driving the prime movers of compressors, pumps, agitators, drives and for lighting. HSD is used as fuel in DG sets for electricity generation in the event of failure of power supply.

The cost of energy as a percentage of end product cost (ice) cost varies anywhere between 48 to 54%. Majority of the industries located in Bhimavaram are engaged in for the next batch. The removed ice blocks are further cursed into smaller pieces production of ice blocks required for storage and transportation purpose of the sea food.

1.1.1 Production process

Raw water is pumped from local available water bodies such as pond / stream through raw water pump to overhead tank .

The production area of the plant has an Ice tank made of concrete. The ice tank contains the direct expansion coils, equally distributed throughout the tank and these coils are submerged in brine. The tank is provided with a suitable frame of hard wood for support the ice cans and a propeller or agitator for keeping the brine in motion: the brine in the tank acts as a medium of contact only, the ammonia evaporating in the ice coils extracts the heat from the brine, which again absorbs the heat for the water in the cans.

Raw water from overhead tank is filled into the ice cans. Water is chilled for 48 hours for complete ice block formation. The sp. gravity of brine is maintained at 1180 by adding salt of required quantity. Ice cans of fully formed ice blocks are removed from the chilling tank. The cans are emptied of the ice blocks and replaced into the chilling tank with water by ice crushers and loaded into plastic crates for transportation.

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

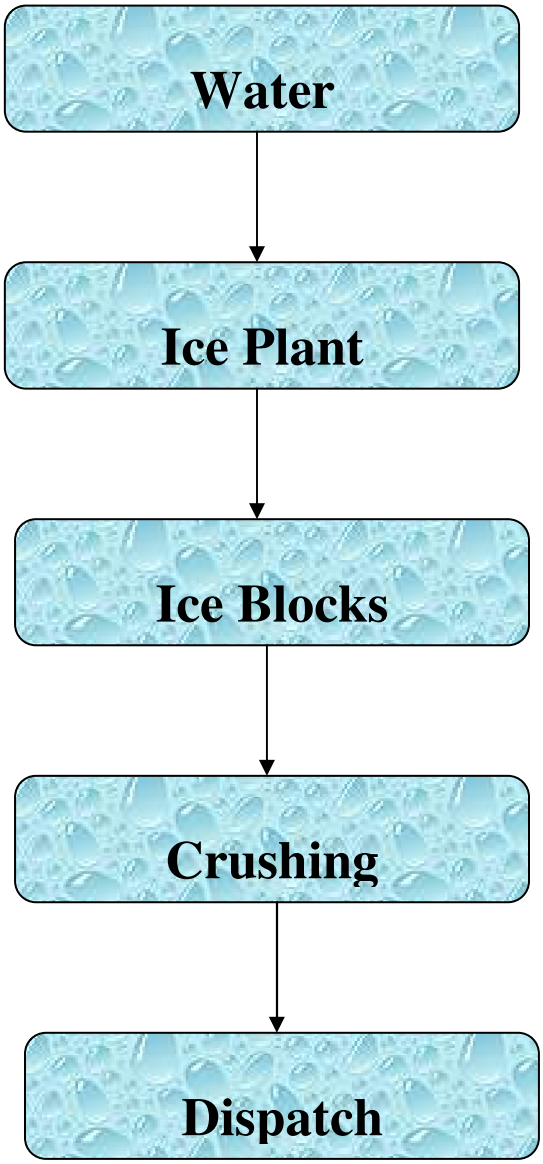


Figure 1.1: General process flowchart of a typical ice making unit

1.2 Energy performance in existing situation

1.2.1 Fuel and electricity consumption of a typical unit in the cluster

The main energy form used in a typical ice making unit in the cluster is electricity and HSD. Electricity is used for driving the prime movers of Compressors, pumps, agitators, ice crushers, lighting etc. The HSD is used as fuel in generators for electricity generation during power failures of grid electricity and is used in emergency situations only. The energy consumption of three typical ice making units in the cluster using low efficient agitator motor is furnished in Table 1.1 below:

Table 1.1: Energy consumption of typical units

S.No	Unit Name	Grid Electricity Consumption (kWh/annum)	HSD Consumption (Liters/annum)	Ice Production (tons/annum)
1	Krishna raja Ice Factory	493810	5776	4600
2	Surya Ice factory	465690	5447	4300

1.2.2 Average production by a typical unit in the cluster

The average production in a typical ice making unit is between 4200 to 4600 tons of ice blocks per annum.

1.2.3 Specific Energy Consumption

The major source of energy for ice making is electricity taken from grid and DG set .The specific electricity consumption per ton of ice production for typical units is furnished in Table 1.2 below:

Table 1.2: Specific energy consumption for typical units

Sr. No.	Unit Name	Units	Specific energy Consumption
1	Krishna raja Ice Factory	kWh/tons	116
2	Surya Ice factory	kWh/tons	115

1.3 Existing technology/equipment

1.3.1 Description of existing technology

All Ice plants in Bhimavaram are working on indirect refrigeration system. These ice plants are requires the agitator to circulate brain solution continuously in evaporation tank for uniform heat transfer. The agitator is driven by electrical motor. These motors are operated continuously throughout the day till the plant shut down. If agitator motors are inefficient/re-winded, the motor consume more power compare to the efficient motors at same operating conditions and loading.

During the energy use and technology audit in ice plants in Bhimavaram, all agitator motors are having normal efficiency compare to energy efficient motors and many are re-winded. It is well known fact that re winded motors will have less efficiency and hence increasing power consumption. Power costs will certainly continue to rise and further escalate motor operating expense. So the question of how repair affects motor efficiency

is an important one. Some claim a rewound motor is never as efficient as the original; others say a well-executed rewind can be better than the original design. These differences in perception suggest there may be several factors involved. Armed with the right information, understanding the factors that affect rewind performance does not need to be complicated. The ability of the repair shop to analyze and replace those parts which most influence losses, such as the stator core, the windings, and the rotor, will affect the outcome of a rewind.

To reduce the power consumption by the agitator motor during the ice plant operation it is essential to implement energy efficient motor for agitator. By installing Energy Efficient Motor in agitator will result considerable energy savings and there by reduction in production cost. . A detail of existing agitator motor is given in the Table 1.3 below:

Table 1.3 Existing Agitator motor specifications

S.No	Parameter	Details
1	Rated (HP)	7.5
2	Voltage (V)	415
3	Rated current (Amps)	10.80
4	Frequency (Hz)	50
5	Power Consumption (kW)	5.68
6	Efficiency (%age)	86.00

1.3.2 Its role in the whole process

The agitator motors are major energy consuming equipment after refrigeration compressor in ice making units. The motor is used drive the agitator to circulate the brain solution continuously in evaporator tank for uniform heat transfer. The motor is required to operate continuously for 24 hours in a day and for 350 days in a year.

1.4 Establishing the baseline for the equipment

1.4.1 Design and operating parameters

The present power consumption by agitator motor is 5.68 kW. These motor is operated for 24 hours in a day and 350 days per year.

1.4.2 Electricity consumption in existing system

The electricity consumption by agitator motor in two Ice making units in Bhimavaram cluster is given in Table 1.4 below:

Table 1.4 Electricity consumption by Agitator Motor

S. No	Name of the unit	Installed Motor Capacity (HP)	Actual Power consumption (kW)
1	Surya Ice factory	7.5	5.68

1.4.2 Operating efficiency of the existing motor

The detailed energy audit studies had been undertaken in various units in the Ice making Cluster, Bhimavaram to evaluate the agitator motor efficiencies. Efficiency of agitator motor in the name plate is found to be 86% and during the operation of the motor the efficiency is lower than the manufacturer's specification due to wind age losses, core losses, rewinded etc. Operating efficiency of existing motor is found to be 84%. Now a day's higher efficiency motors (eef1) are available whose efficiencies are more than the standard and existing motors.

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

1.5.1 Technological Barriers

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

- Dependence on local equipment suppliers and availability of the motors at lower cost.
- Lack of awareness of the energy efficient motors.

1.5.2 Financial Barrier

The replacement of motors requires high investment and repair and rewinding of the motor will cost very less. Hence, many of the owners don't show interest due to high initial investment and lack of financial strength to invest. Further, the lack of awareness of the losses and monetary benefit of energy efficient motors also one of the major factor for implementing the energy efficient motors.

Energy Efficiency Financing Schemes such as SIDBI's, if focused on the cluster, will play a catalytic role in implementation of identified energy conservation projects & technologies. The cluster has significant potential for implementing energy efficiency motors.

1.5.3 Skilled manpower

Not applicable

1.5.4 Other barrier(s)

Information on the energy efficient technologies not available among cluster unit owners, though the suppliers are available locally of energy efficient motors, the information was not disseminated among cluster units.

2. TECHNOLOGY/EQUIPMENT FOR ENERGY EFFICIENCY IMPROVEMENTS

2.1 Detailed description of technology/equipment selected

2.1.1 Description of equipment

The project activity is replacement of inefficient motors with new energy efficient motors in ice making units located in Bhimavaram. The new motor will have 88.6% of overall efficiency at full load conditions. The high efficiency motors having the following special features:

- These motors are available in TEFC construction for use in safe areas and also in flameproof enclosure for use in Hazardous areas.
- Low loss special grade of thinner laminations. This reduces the Iron loss even at partial loads.
- Thicker conductors and more copper contents reduce copper loss due to lower resistance.
- Longer core length, reduced and uniform air gap between stator and rotor to reduce stray losses.
- Special design of fan and fan cover to reduce windage losses

Considering the above facts and for reducing electricity consumption by the agitator motor it is suggested to install energy efficient motors in ice plants.

Advantage

- The benefits of using these motors in continuous duty applications like agitators in Ice making Industries.
- The efficiency curve of standard motor is dropping in nature i.e., there is a sharp fall in efficiency at partial loads. But the energy efficient motors have a flat efficiency curve and hence the fall in efficiency is marginal. In many applications the load factor of the motor will be range of 70% to 90% like agitators in Ice making Industries. Thus energy saving is significant even in part loads condition.

2.1.2 Technology /Equipment specifications

The detailed specification of suggested energy efficient motor for is furnished in table 2.1 below:

Table 2.1: Technical Specifications of Energy Efficient motor

S. No.	Parameter	Unit	Value
1	Rated Capacity	HP	7.5
2	Rated Current	Amps	10
3	No of pole	Nos.	2
4	Speed	RPM	2920
5	Efficiency	% age	88.60
6	Power Factor	--	0.86

2.1.3 Justification of the technology selected & Suitability

The agitator's motors are major energy consuming equipment after refrigeration compressors due to continuous operation required in Ice Making units. Based on detailed energy audits conducted for various motors installed in Bhimavaram Ice making units, major motors are age-old and many times re-winded. Due to the reason the efficiency of the motor will decrease and power consumption by agitator will increase at same load conditions.

But new energy efficient motors will have overall efficiency of 88.6% (at full load) compare to the existing motor efficiency of 84%. The following benefits are possible for selection of this technology

- Reduce electricity consumption during full and part load conditions
- It reduces the GHG emissions
- Lower payback period for Continuous Operation
- High power factor
- Flat efficiency curve for at all loads
- Higher Motor life

2.1.4 Superiority over existing technology/equipment

The energy efficient motors having following superior features over existing motors

- Improved and higher efficiency is available from and at 60% to 100% load
- The efficiency curve is almost flat during part load conditions which result higher energy savings

- The special design features also result in lower operating temperatures which enhance the life of motor and reduce the maintenance costs
- These motors have inherently low noise and vibration and help in conservation of environment
- These motors are with highest power factor due the special exclusive design.
- The higher power factor reduces cable loss
- Improving the system efficiency sometimes by even 2%, sometimes this allows even a lower cable size saving tremendously on capital costs.
- Saving is also made by reducing capacitors required to improve power factor

2.1.5 Availability of the proposed technology/equipment

The energy efficient motor suppliers are available in cities of Andhra Pradesh and 300-100 km from Bhimavaram Ice Making Cluster.

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

A detail of energy efficient motors suppliers has been furnished in Annexure 6.

2.1.8 Terms of sales

No specific terms and conditions

2.1.9 Process down time during implementation

The process down time for installation of energy efficient motor is considered one day which is required to dismantling/ replacing the existing motor and installation of new motor and providing electrical connections.

2.2 Life cycle assessment and risks analysis

The life of energy efficient motor is considered at 20 years. There is no risk involved as the motor are technology proven and are successfully in operation in all industries.

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

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

3. ECONOMIC BENEFITS OF NEW ENERGY EFFICIENT TECHNOLOGY

3.1 Technical benefits

3.1.1 Fuel savings per year

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

3.1.2 Electricity savings per year

The efficiency of the motor is more than the existing motor and hence it reduces electricity consumption. The power savings due to installation of new energy efficient motor is 2477 kWh per annum. Details of electricity saving calculation are given at Annexure 2.

3.1.3 Improvement in product quality

There is no significant impact on the product quality.

3.1.4 Increase in production

There is no significant effect on production capacity.

3.1.5 Reduction in raw material consumption

Raw material consumption is same as present.

3.1.6 Reduction in other losses

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

3.2 Monetary benefits

The monetary benefit due to installation of new energy efficient motor is ` 0.09 lakh per annum due to reduction in electricity consumption. Details of monetary saving calculation are furnished in Annexure 2.

3.3 Social benefits

3.3.1 Improvement in working environment in the plant

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

3.3.2 Improvement in skill set of workers

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

3.4 Environmental benefits

3.4.1 Reduction in effluent generation

No reduction in effluent generation.

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 2 tons of CO_2 per annum due to implementation of the project activity.

3.4.3 Reduction in other emissions like SOx

No significant impact on SOx emissions.

4. INSTALLATION OF NEW ENERGY EFFICIENT MOTOR

4.1 Cost of technology/equipment implementation

4.1.1 Cost of technology/equipments

The total cost for motor is ` 0.17 lakh, which includes motor cost and other charges and discounts as per the Quotation in Annexure 7.

4.1.2 Other costs

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

Table 4.1: Project detail cost

Sr. No.	*Particular*	*Unit*	*Value*
1	New Energy Efficient motor	` in lakh	0.17
2	Panel, Switch & Cabling, Elec. and Modifications etc.	` in lakh	0.01
3	Total Investment	` in lakh	0.18

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 ` 0.05 lakh.

4.2.2 Loan amount

The term loan is 75% of the total project, which is ` 0.14 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 3 years and the moratorium period is 3 months.

4.3 Financial indicators

4.3.1 Cash flow analysis

Considering the above discussed assumptions, the net cash accruals starting with ` 0.05 lakh in the first year operation and increases to ` 0.23 lakh at the end of sixth year.

4.3.2 Simple payback period

The total project cost of the proposed technology is ` 0.18 lakh and monetary savings due to reduction in electricity consumption is ` 0.09 lakh and the simple payback period works out to be 2 years.

4.3.3 Net Present Value (NPV)

The Net present value of the investment at 10.0% interest rate works out to be ` 0.11 lakh.

4.3.4 Internal rate of return (IRR)

The after tax Internal Rate of Return of the project works out to be 31.18%. 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 31.81%. The average DSCR is 1.66.

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	31.18	0.11	31.81	1.66
5% increase in power savings	33.80	0.13	32.10	1.75
5% decrease in power savings	28.54	0.10	31.48	1.58

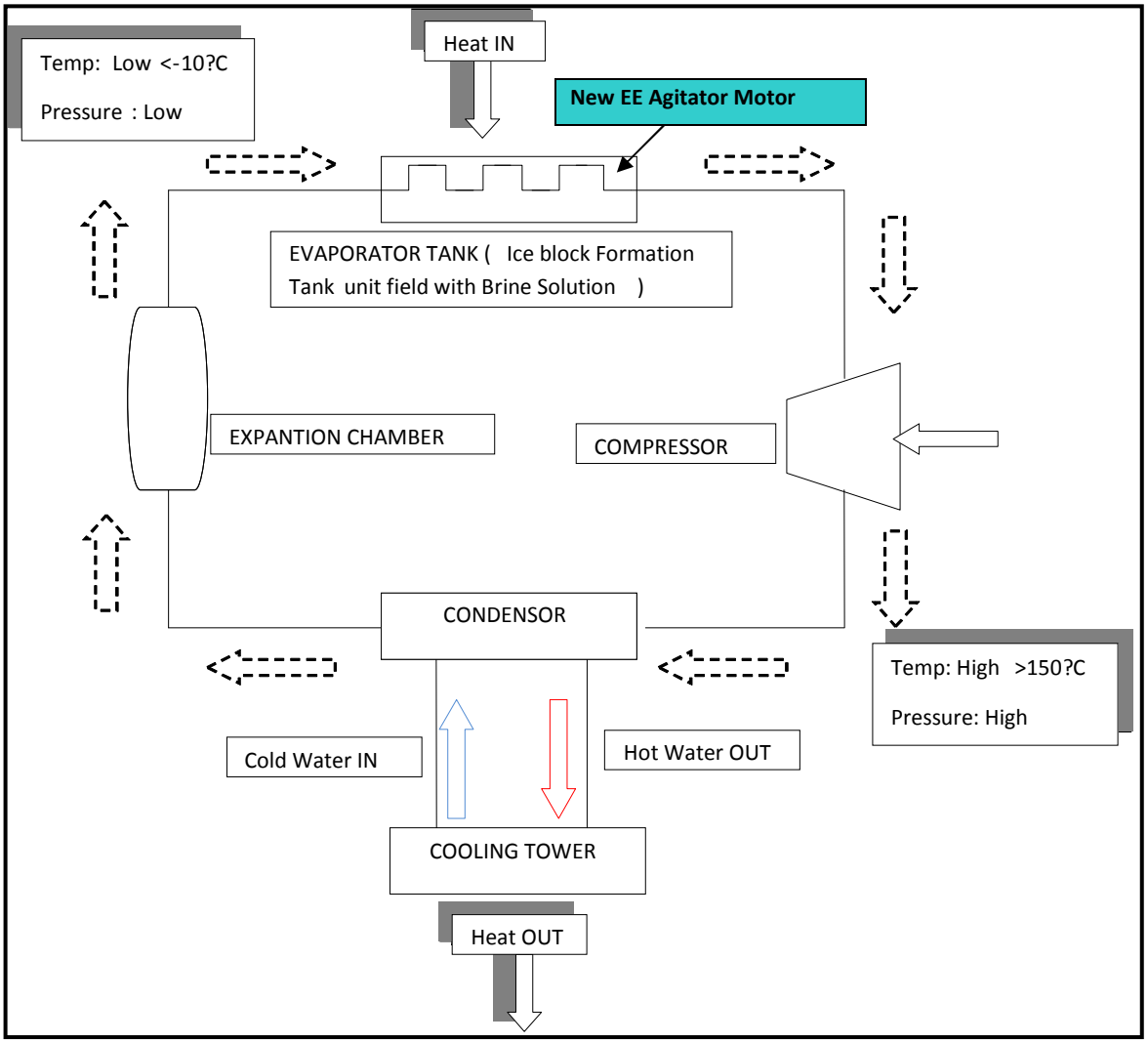
4.5 Procurement and implementation schedule

The project is expected to be completed in 1 week from the date of release of purchase order. The detailed schedule of project implementation is furnished in Annexure 5.

ANNEXURE

Annexure 1: Process Flow Diagram

Process flow diagram will remain the same after implementation of proposed energy efficient motor.



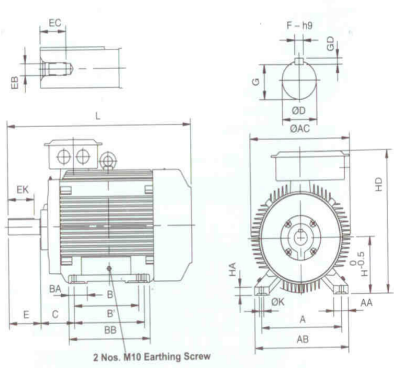
Annexure 2: Detailed technology assessment report – EE Agitator Motor

S.No	Particulars	Unit	Value
1	Present rated capacity of motor	HP	7.5
2	Present rated capacity of motor	kW	5.5
3	Efficiency of existing motor	% age	84
4	Input Power at full load	kW	6.66
5	Actual power consumption measured	kW	5.68
6	% Loading of motor	%age	85.28
7	Rated capacity of new Energy Efficient Motor	kW	5.5
8	Efficiency of energy efficient motor	% age	88.6
9	Input Power to New Motor at full loading	kW	6.31
10	Power Consumption at same loading	kW	5.39
11	Power savings	kW	0.29
12	Operating hours	Hrs	24
13	Operating days	Days	350
14	Power savings per annum	kWh	2477
15	Monetary savings per annum (@ ` 3.75 per kWh)	` in lakh	0.09
16	Investment required for new energy efficient motor	` in lakh	0.18
17	Payback period	Years	2

Annexure 3: Detailed drawing for civil work required for EE Motor

HX+ 160...280 (Foot Mounted)

Mounting Designation B3, B6, B7, B8, V5, V6



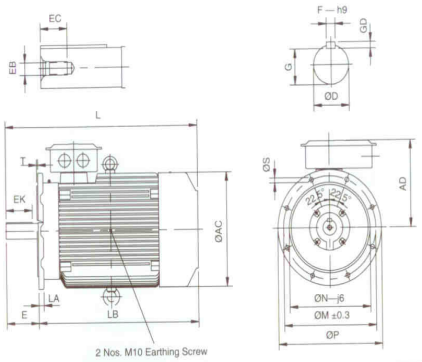
Type	A	AA	AB	AC	B	B'	BA	BB	C	D –Tol.	E	EB	EC
HX+160ML	254	60	310	305	210	254	65	310	108	42–k6	110	M16	36
HX+180ML	279	58	324	348	241	279	58	324	121	48–k6			
HX+200ML	318	70	378	381	267	305	81	354	133	55–m6			
HX+225SM 2P	356	65	416	442	286	311	83	360	149	60–m6		M20	42
HX+225SM 4-8P													
HX+250M 2P	406	80	473	495	349	-	93	406	168	65–m6	140		
HX+250M 4-8P													
HX+280SM 2P	457	85	530	556	368	419	105	486	190	75–m6			
HX+280SM 4-8P													

Type	EK	F	G	GD	H	HA	HD	K	L	Bearing	
										DS	NDS
HX+160ML	90	12	37	8	160	22	407	15	671	6309ZZ C3	6308ZZ C3
HX+180ML		14	42.5	9	180	26	446	15	706	6310ZZ C3	6309ZZ C3
HX+200ML		16	49	10	200	30	484	19	731	6312ZZ C3	6311ZZ C3
HX+225SM 2P		16	49	10	225	32	562	19	833	6313 C3	6312 C3
HX+225SM 4-8P	115										
HX+250M 2P		18	53	11	250	40	612	24	910	6315 C3	6313 C3
HX+250M 4-8P			58								
HX+280SM 2P		20	67.5	12	280		728		1040	6316 C3	6315 C3
HX+280SM 4-8P											

* For HX+ 200MLC2, L= 770mm
* For 160–250 frame: sheet metal terminal box, 280 frame: cast iron terminal box

HXF+ 160...280 (Flange Mounted)

Mounting Designation B5, V1



Type	AC	AD	D –Tol.	E	EB	EC	EK	F	G	GD	L
HXF+160ML	305	247	42–k6	110	M16	36	90	12	37	8	671
HXF+180ML	348	266	48–k6					14	42.5	9	706
HXF+200ML	381	284	55–m6					16	49	10	731
HXF+225SM 2P	442	337									833
HXF+225SM 4-8P			60–m6		M20	42					
HXF+250M 2P	495	362		140			115	18	53	11	910
HXF+250M 4-8P			65–m6						58		
HXF+280SM 2P	556	448						20	67.5	12	1040
HXF+280SM 4-8P			75–m6								

Type	LA	LB	M	N–Tol.	P	S	T	Bearing	
								DS	NDS
HXF+160ML	16	561	300	250–j6	350	19	5	6309ZZ C3	6308ZZ C3
HXF+180ML	20	596	300	250–j6	350			6310ZZ C3	6309ZZ C3
HXF+200ML		621	350	300–j6	400			6312ZZ C3	6311ZZ C3
HXF+225SM 2P	22	723	400	350–j6	450			6313 C3	6312 C3
HXF+225SM 4-8P		693							
HXF+250M 2P		770	500	450–j6	550			6315 C3	6313 C3
HXF+250M 4-8P									
HXF+280SM 2P		900						6316 C3	6315 C3
HXF+280SM 4-8P									

* For 160–200 frame flange mounted motors, 4 nos mounting holes are provided
* For 225–280 frame flange mounted motors, 8 nos mounting holes are provided

Annexure 4: Detailed financial calculations & analysis

Assumptions

Name of the Technology	New Energy Efficient Motor		
Rated Capacity	***7.5 HP***		
Details	Unit	Values	Basis
Installed capacity	HP	7.5	
No of working days	Days	350	
No of Operating Hours	Hrs.	24	
Proposed Investment			
New Energy Efficient Motor	` in lakh	0.17	
Cabling, Civil and Modifications	lumpsum	0.01	
Total Investment	` in lakh	0.18	
Financing pattern			
Own Funds (Internal Accruals)	` in lakh	0.05	Feasibility Study
Loan Funds (Term Loan)	` in lakh	0.14	Feasibility Study
Loan Tenure	Years	3	Assumed
Moratorium Period	Months	3	Assumed
Repayment Period	Months	39	Assumed
Interest Rate	%	10	SIDBI Lending Rate
Estimation of Costs			
O & M Costs	% on Plant & Equip	2	Feasibility Study
Annual Escalation	%	5	Feasibility Study
Estimation of Revenue			
power savings	kWh/annum	2477	Detailed calculations enclosed
power cost	`/kWh	3.75	
St. line Depn.	%	5.28	Indian Companies Act
IT Depreciation	%	80.00	Income Tax Rules
Income Tax	%	33.99	Income Tax

Estimation of Interest on Term Loan **` (in lakh)**

Years	*Opening Balance*	*Repayment*	*Closing Balance*	*Interest*
1	0.14	0.02	0.11	0.02
2	0.11	0.05	0.06	0.01
3	0.06	0.05	0.01	0.00
4	0.01	0.02	0.00	0.00
		0.14		

WDV Depreciation **` (in lakh)**

Particulars / years	*1*	*2*
Plant and Machinery		
Cost	0.18	0.04
Depreciation	0.15	0.03
WDV	0.04	0.01

Projected Profitability **` (in lakh)**

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***
Fuel savings	0.09	0.09	0.09	0.09	0.09	0.09
Total Revenue (A)	0.09	0.09	0.09	0.09	0.09	0.09
Expenses						
O & M Expenses	0.004	0.004	0.004	0.004	0.004	0.005
Total Expenses (B)	0.004	0.004	0.004	0.004	0.004	0.005
PBDIT (A)-(B)	0.09	0.09	0.09	0.09	0.09	0.09
Interest	0.02	0.01	0.00	0.00	0.00	0.00
PBDT	0.07	0.08	0.08	0.09	0.09	0.09
Depreciation	0.01	0.01	0.01	0.01	0.01	0.01
PBT	0.06	0.07	0.07	0.08	0.08	0.08
Income tax	0.00	0.02	0.03	0.03	0.03	0.03
Profit after tax (PAT)	0.06	0.05	0.05	0.05	0.05	0.05

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

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***
Profit before tax	0.06	0.07	0.07	0.08	0.08	0.08
Add: Book depreciation	0.01	0.01	0.01	0.01	0.01	0.01
Less: WDV depreciation	0.15	0.03	-	-	-	-
Taxable profit	(0.07)	0.05	0.08	0.09	0.09	0.09
Income Tax	-	0.02	0.03	0.03	0.03	0.03

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

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***
Share Capital (D)	0.05	0.05	0.05	0.05	0.05	0.05
Reserves & Surplus (E)	0.06	0.12	0.16	0.21	0.26	0.31
Term Loans (F)	0.11	0.06	0.01	0.00	0.00	0.00
Total Liabilities (D)+(E)+(F)	0.22	0.23	0.22	0.26	0.30	0.35
Assets	**1**	**2**	**3**	**4**	**5**	**6**
Gross Fixed Assets	0.18	0.18	0.18	0.18	0.18	0.18
Less Accm. Depreciation	0.01	0.02	0.03	0.04	0.05	0.06
Net Fixed Assets	0.17	0.16	0.15	0.14	0.13	0.12
Cash & Bank Balance	0.05	0.06	0.07	0.11	0.17	0.23
TOTAL ASSETS	0.22	0.23	0.22	0.26	0.30	0.35
Net Worth	0.11	0.16	0.21	0.26	0.31	0.36
Debt Equity Ratio	2.47	1.42	0.28	-0.04	-0.04	-0.04

Projected Cash Flow

` (in lakh)

Particulars / Years	***0***	***1***	***2***	***3***	***4***	***5***	***6***
Sources							
Share Capital	0.05	-	-	-	-	-	-
Term Loan	0.14						
Profit After tax		0.06	0.05	0.05	0.05	0.05	0.05
Depreciation		0.01	0.01	0.01	0.01	0.01	0.01
Total Sources	0.18	0.07	0.06	0.06	0.06	0.06	0.06

Application							
Capital Expenditure	0.18						
Repayment Of Loan	-	0.02	0.05	0.05	0.02	0.00	0.00
Total Application	0.18	0.02	0.05	0.05	0.02	0.00	0.00
Net Surplus	-	0.05	0.01	0.00	0.04	0.06	0.06
Add: Opening Balance	-	-	0.05	0.06	0.07	0.11	0.17
Closing Balance	-	0.05	0.06	0.07	0.11	0.17	0.23

IRR **` (in lakh)**

Particulars / months	***0***	***1***	***2***	***3***	***4***	***5***	***6***
Profit after Tax		0.06	0.05	0.05	0.05	0.05	0.05
Depreciation		0.01	0.01	0.01	0.01	0.01	0.01
Interest on Term Loan		0.02	0.01	0.00	0.00	-	-
Cash outflow	(0.18)	-	-	-	-	-	-
Net Cash flow	(0.18)	0.09	0.07	0.06	0.06	0.06	0.06
IRR	31.18%						
NPV	0.11						

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

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***
Variable Expenses						
Oper. & Maintenance Exp (75%)	0.003	0.003	0.003	0.003	0.003	0.003
Sub Total*(G)*	0.003	0.003	0.003	0.003	0.003	0.003
Fixed Expenses						
Oper. & Maintenance Exp (25%)	0.001	0.001	0.001	0.001	0.001	0.001
Interest on Term Loan	0.016	0.009	0.004	0.000	0.000	0.000
Depreciation *(H)*	0.010	0.010	0.010	0.010	0.010	0.010
Sub Total (I)	0.026	0.020	0.015	0.011	0.011	0.011
Sales (J)	0.093	0.093	0.093	0.093	0.093	0.093
Contribution (K)	0.090	0.090	0.090	0.090	0.090	0.089
Break Even Point (L= G/I)	28.93%	21.90%	16.59%	12.15%	12.01%	12.09%
Cash Break Even {(I)-(H)}	18.24%	11.19%	5.86%	1.40%	1.24%	1.30%
Break Even Sales (J)*(L)	0.027	0.020	0.015	0.011	0.011	0.011

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

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***	***Total***
Net Profit Before Taxes	0.06	0.07	0.07	0.08	0.08	0.08	0.45
Net Worth	0.11	0.16	0.21	0.26	0.31	0.36	1.40
							31.81%

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

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***	***Total***
Cash Inflow							
Profit after Tax	0.06	0.05	0.05	0.05	0.05	0.05	0.21
Depreciation	0.01	0.01	0.01	0.01	0.01	0.01	0.04
Interest on Term Loan	0.02	0.01	0.00	0.00	0.00	0.00	0.03
Total (M)	0.09	0.07	0.06	0.06	0.06	0.06	0.28

DEBT

Interest on Term Loan	0.02	0.01	0.00	0.00	0.00	0.00	0.03
Repayment of Term Loan	0.02	0.05	0.05	0.02	0.00	0.00	0.14
Total (N)	0.04	0.06	0.06	0.02	0.00	0.00	0.17
	2.26	1.26	1.07	3.85	0.00	0.00	1.66
Average DSCR (M/N)	1.66						

Annexure 5: Details of procurement and implementation plan

Project Implementation schedule

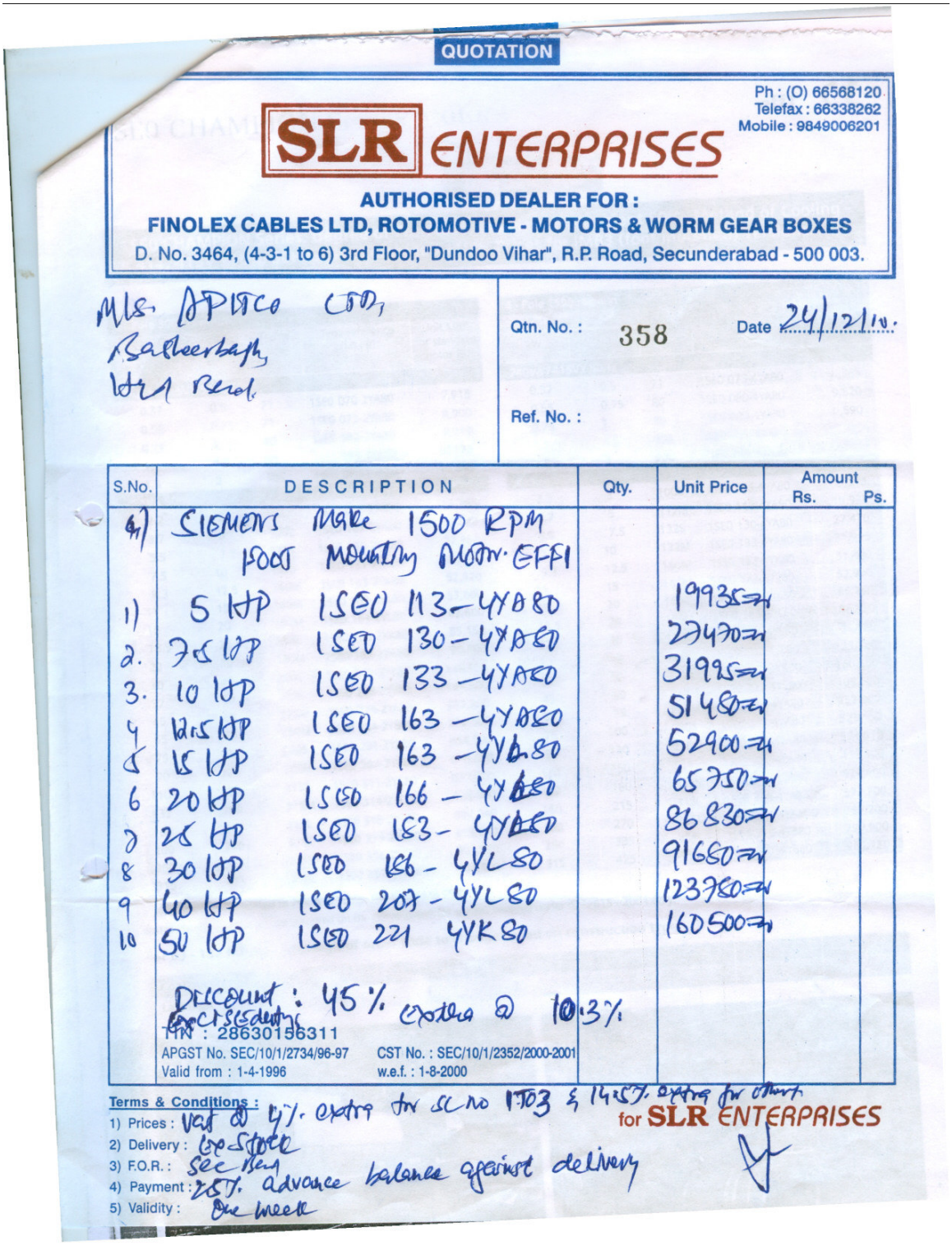
S. No	Activity	Days			
		2	4	6	8
1	Placement of Orders for Equipment				
2	Supply of energy efficient motor				
3	Erection and Commissioning				
4	Trial runs				

The process down time is considered for only one day.

Annexure 6: Details of technology/equipment and service providers

Equipment details	Source of technology	Service/technology providers
Energy Efficient Motors	SIEMENS	SLR Enterprises D.No:3464, (4-3-1 to 6) 3rd Floor, "Dundoo Vihar" R.P.Road Secunderabad-500 003 Ph No:040-66588120 Fax:040-66338262 Mobile:9849006201

Annexure 7: Quotation or techno-commercial bid



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.

M/s. APIIC Co Ltd, Balkeerbagh, Hyd Road

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

Ref. No. :

S.No.	DESCRIPTION	Qty.	Unit Price	Amount Rs.	Ps.
	SIEMENS Make 1500 RPM FOOT Mounting Motor EFFI				
1)	5 HP 1SE0 113-4YA80		19935=/-		
2.	7.5 HP 1SE0 130-4YA80		23470=/-		
3.	10 HP 1SE0 133-4YA80		31995=/-		
4	12.5 HP 1SE0 163-4YA80		51480=/-		
5	15 HP 1SE0 163-4YB80		52900=/-		
6	20 HP 1SE0 166-4YB80		65750=/-		
7	25 HP 1SE0 183-4YB80		86830=/-		
8	30 HP 1SE0 186-4YL80		91680=/-		
9	40 HP 1SE0 207-4YL80		123780=/-		
10	50 HP 1SE0 221 4YK80		160500=/-		
	Discount : 45% extra @ 10.3%				

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

Terms & Conditions :
1) Prices : Vat @ 4% extra for SC No 1703 & 1457 extra for others
2) Delivery : Ex-Stock
3) F.O.R. : Secunderabad
4) Payment : 25% advance balance against delivery
5) Validity : One week

for SLR ENTERPRISES

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

APITCO Limited
8th floor, Parisrama Bhavan
Basheerbagh, Hyderabad -500004
Phones: +91- 040-23237333, 23237981,
Fax: +91-40-23298945
E-mail: hyd1_apitco@bsnl.in
Website: www.apitco.org

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