

# Detailed Project Report (DPR) On Premium efficiency class IE3 motors

Gokul Ferrocast Private Limited  
Belgaum (Karnataka)

*Prepared for*

Bureau of Energy Efficiency  
(13/GEF-UNIDO-BEE/LSP/14/4562)



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This DPR has been originally prepared by TERI as a part of 'Capacity Building of LSPs' activity under the GEF-UNIDO-BEE project 'Promoting Energy Efficiency and Renewable Energy in selected MSME clusters in India'.

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The Energy and Resources Institute (TERI)  
New Delhi



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## List of abbreviations

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BEE	Bureau of Energy Efficiency
CO <sub>2</sub>	Carbon Dioxide
D/E	Debt /Equity
DPR	Detailed Project Report
DSCR	Debt Service Coverage Ratio
EE	Energy Efficient
FIs	Financial Institutions
GEF	Global Environmental Facility
GHG	Green House Gas
HESCOM	Hubli Electricity Supply Company Limited
IDC	Interest Defer Credit
IGDPR	Investment Grade Detailed Project Report
IRR	Internal Rate of Return
Kg	kilogram
kV	Kilo vault
kVA	kilovolt-ampere
Hz	Hertz
kW	Kilo Watt
kWh	Kilo Watt Hour
LDO	Light Diesel Oil
LSPs	Local Service Providers
MSME	Micro, Small and Medium Enterprises
MT	Metric Tonne
NPV	Net Present Value
O&M	Operation and Maintenance
RE	Renewable Energy
ROI	Return On Investment
Rs	Rupees
RPM	Revolutions per minute
SPP	Simple Payback Period
TERI	The Energy and Resources Institute
Toe	Tonnes of oil equivalent
UNIDO	United Nations Industrial Development Organization
USP	Unique Selling Proposition
WACC	Weighted Average Cost of Capital



## Executive summary

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The overall aim of the GEF-UNIDO-BEE project 'Promoting Energy Efficiency (EE) and Renewable Energy (RE) in selected MSME clusters in India' is to develop and promote a market environment for introducing energy efficiency and enhancing the use of renewable energy technologies in process applications in selected energy-intensive MSME clusters in India. This would help in improving the productivity and competitiveness of the MSME units, as well as in reducing the overall carbon emissions and improving the local environment.

Under the GEF-UNIDO-BEE Project, TERI has been entrusted to undertake Capacity building of Local Service Providers (LSPs) to BEE. The Scope of Work under the project

- Organizing 4 one-day training/ capacity building workshops for LSPs in each cluster.
- Development of 10 bankable DPRs for each cluster, based on mapping technology needs with capacities of local technology suppliers/service providers, and also replication potential and applications to banks in each cluster.

### Brief introduction of the MSME unit

Name of the unit	M/s Gokul Ferrocast Pvt Ltd.
Constitution	Private Limited
MSME Classification	Small
No. of years in operation	6
Address: Registered Office:	172/2, GP No. 509, Waghwade, Belgaum- 590 014, Karnataka
Industry-sector	Foundry
Products manufactured	Ductile and grey iron castings
Name(s) of the promoters/ directors	Mr. Nitin B. Landge

A detailed assessment study was undertaken in the identified area with the use of the sophisticated handheld instruments. Energy consumption pattern and production data were collected to estimate the specific energy consumption of the unit. The unit level baseline of the unit was also estimated using the historical data. The total energy consumption of the unit during last 12 months was 457 toe which is equivalent to 418 lakh rupees. The total CO<sub>2</sub> emission during this period is estimated to be 4,354 tonnes. Only electricity was considered for CO<sub>2</sub> emission estimation.

The unit manufactures the engine blocks & heads, housings for automotive sector. The total annual production of the unit during 2017-18 is estimated to be 7,200 tonnes of liquid metal. The major source of energy is electricity, consume in the furnace, motors and lighting.

### Accepted/ recommended technology implementation

The recommended technology considered after discussion with the plant personnel for implementation in the unit is given below.

Energy Conservation measure	Annual Investment <sup>1</sup>	Savings	Simple Payback	Emission reduction	
	energy savings Electricity (kWh)	(Rs Lakh)	(Rs. Lakh/ year)	(tonne CO <sub>2</sub> )	
Replacement of existing standard efficiency motors with Premium efficiency class IE3 motors for Sand plant mixers	16,410	2.93	1.29	2.3	13.5

## Other benefits

- The proposed project is not expected to bring in any change in process step or operating practices therefore no change expected in the product quality.
- Implementation of the selected technology in the unit may result in reduction in CO<sub>2</sub> emissions.

## Cost of project & means of finance

S. No.	Particulars	Unit	100% equity	D/E- 70:30	D/E- 50:50
1	Cost of Project	Rs in Lakh	2.93	3.04	3.01
2	D/E ratio	-	-	7:3	1:1
3	Project IRR	%	20.73	14.94	16.57
4	NPV	Rs in Lakh	0.81	0.34	0.48
5	DSCR	-	-	2.07	2.87

<sup>1</sup>Investment including the (i) hardware cost – Rs 2.69 lakh and (ii) fitting and fixture charges Rs 0.24 lakh

# 1.0 Details of the unit

---

## 1.1 Particulars of unit

**Table 1.1:** Particulars of the unit

1	Name of the unit	M/s Gokul Ferrocast Pvt Ltd.	
2	Constitution	Private Limited	
3	Date of incorporation / commencement of business	2012	
4	Name of the Contact Person	Mr. Nitin B. Landge	
5	Mobile / Ph. No	+91-9845568039	
6	Email	md@gokulferrocast.com	
7	Address: Registered Office	172/2, GP No. 509, Waghwade, Belgaum – 590 014, Karnataka	
8	Factory	172/2, GP No. 509, Waghwade, Belgaum – 590 014, Karnataka	
9	Industry / Sector	MSME/Manufacturing	Owned
10	Products Manufactured	Manufacturer of general engineering parts	Owned
11	No of hours of operation/shift	8	
12	No of shifts/ day	3	
13	No of days/year	300	
14	Installed Capacity	9,000 MT per year	
15	Whether the unit is exporting its products (Yes/ No)	Yes	
16	Quality Certification, if any	ISO 9001:2008	



## 2.0 Energy profile

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### 2.1 Process flow diagram

The major steps of process are mould sand preparation, charge preparation followed by melting, pouring, knockout and finishing. The steps are explained below.

#### 2.1.1 Sand preparation plant

The major equipment installed is sand siever, sand mixer and sand transport belts and elevators. Electricity is used to run all rotary machines in sand preparation plant. Fresh sand is mixed with adhesives in sand mixer then it is pressed in mould casing by pressing machine. In casing some amount of burnt sand is reused with fresh sand.

#### 2.1.2 Core preparation and moulding

For core preparation, fresh sand is used. Cores are baked in LDO fired ovens. After hardening of core it is mounted in mould. In mould preparation fresh and burnt sand is pressed by machines which operate on pneumatic in mould casing. Upper and lower half of mould is assembled together and then it gets ready to pouring.

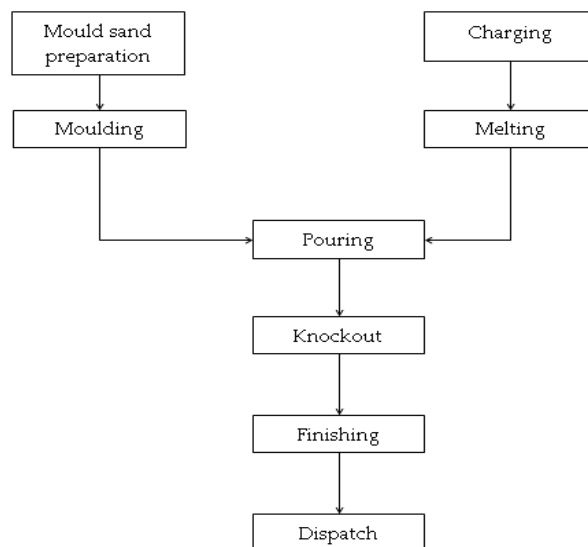
#### 2.1.3 Melting

Melting of charge is done with help of induction furnace. Induction furnace runs on medium frequency three phase electrical supply. Once melt attained required temperature and metallurgy, the liquid melt is poured into the earlier prepared sand moulds using ladles.

#### 2.1.4 Knockout and finishing

Mould is left to cool for certain time, then it follows to a vibrator with grated surface, it knocks-out the sand and the casting is send for finishing, which involves shot blasting and machining job.

The process flow diagram for major product and steel grade casting produced in the foundry is given in figure 2.1.4.



**Figure 2.1.4:** Process flow chart

## 2.2 Details of technology identified

The details of the existing technology installed in the unit are given in Table 2.2.

**Table 2.2:** Details of existing technology

Parameters/ Equipment ID	Value	Value
Equipment	Induction motor	Induction Motor
Rated capacity, kW	22	45
Make	Siemens	Siemens
Purpose/ Application	Blender	Mixer
Rated voltage, volt	415	415
Full load ampere, amp	40	80
Frequency, Hz	50	50
Mode of operation (batch/continuous)	Batch	Batch
Batch duration (Hours)	2 min	2 min
Nos of rewinding	NA	1

## 2.3 Energy used and brief description of their usage pattern

The unit uses grid power supplied by Hubli Electricity Supply Company Limited (HESCOM) under tariff category HT-2(a). Table 2.3 provides the details of energy uses.

**Table 2.3:** Energy used and description of use

S. No	Energy source	Description of use
1	Electricity	Induction furnace & Motive power for different drives in different process sections and utilities

## 2.4 Energy sources, availability & tariff details

Different energy sources, availability of listed energy types and their respective tariffs are given in table 2.4.

**Table 2.4:** Energy sources, availability and tariffs

Particular	HT-2(a)
Demand charges	Rs. 200 per kVA per month
Energy charges	Rs. 6.6 per kWh (For first One lakh units) Rs. 6.8 per kWh (for balance units)

If the consumer is availing power at voltage higher than 13.2 kV, he will be entitled to a rebate as indicated below:

- 33/66 kV: 2 Paise/unit of energy consumed
- 110 kV: 3 Paise/unit of energy consumed
- 220 kV: 5 Paise/unit of energy consumed



## 2.5 Analysis of electricity consumption

Table 2.5: Electricity consumption profile

Month & Year	Electricity consumption (kWh)	Contract Demand (kVA)	Power factor	Billed Demand (kVA)	Demand Charges, (Rs)	Total electricity bill (Rs)
Jan-18	4,46,475	1,400	0.925	1,306	2,61,200	35,19,684
Feb-18	4,38,525	1,400	0.927	1,274	2,54,800	34,57,902
Average	4,42,500	1,400	0.926	1,290	2,58,000	34,88,793
Total	53,10,000	-	-	-	-	4,18,65,516

Figure 2.5 presents contract demand, recorded maximum demand and the energy consumption of the unit.

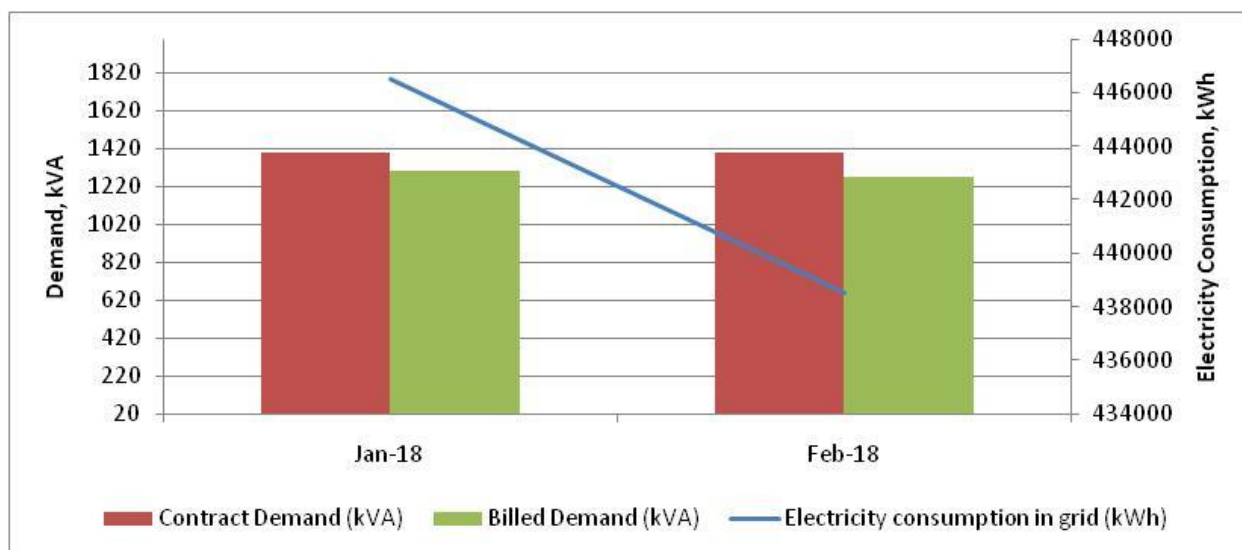


Figure 2.5: Demand pattern and energy consumption profile

The plant is consuming about 5,310,000 kWh of electricity per year. The total energy consumption of the unit during last 12 months is estimated to be 456 toe which is equivalent to 418.6 lakh rupees. The total CO<sub>2</sub> emission during this period is estimated to be 4,354 tonnes. Only electricity was considered for CO<sub>2</sub> emission estimation.



## 3.0 Proposed technology for energy efficiency

Based on the measurements, observations/ findings during detailed assessment study conducted in the unit, the following technology has been identified for energy efficiency improvement. The detail is given below.

### 3.1 Replacement of existing standard efficiency motors with new IE3 standard motors for sand plant mixer

#### 3.1.1 Background

The Gokul Ferrocast Pvt. Ltd. manufactures general engineering parts and installed sand plant with 45kW mixer motor and 22 kW blender motor with rated capacity 500 kg of sand mixing. The operational parameters of the sand mixers including the electricity consumption and material charged were measured during the detailed assessment study and historic operating data for past one year is also collected.

#### 3.1.2 Observations and analysis

The power consumption of the sand motors mixer and blender is estimated based on the data measured/collected during the field visit in the unit. The unit is charging 450kg to 550kg in a batch as per demand. The average mixing per batch has been estimated to be 500kg per batch based on the data provided by the plant. The measured trend of the active power is shown in figure 3.1.2a.

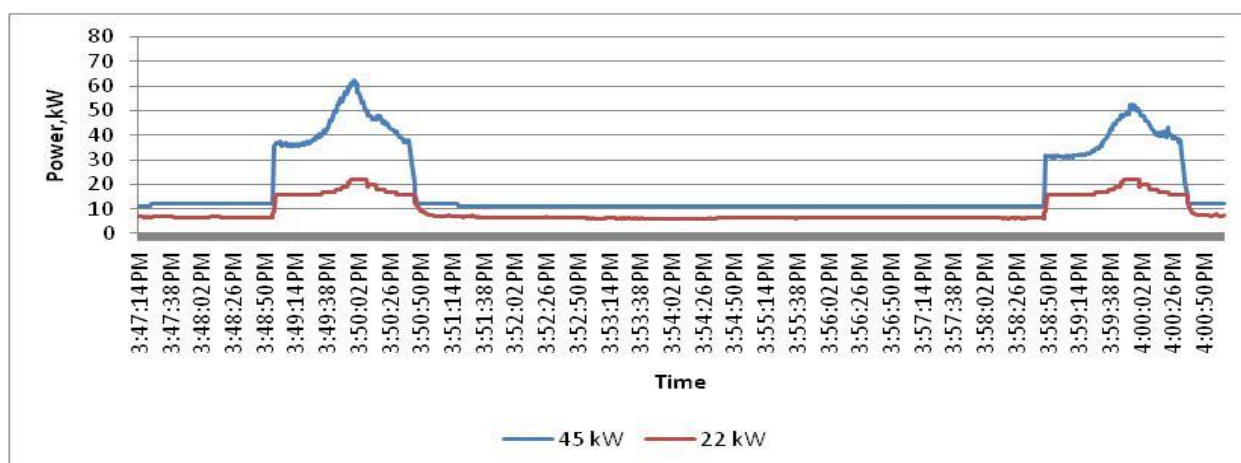


Figure 3.1.2: Trend of the active power consumption

The average production of the sand mixing section of the unit is estimated to be 500 kg per batch. The energy consumption is higher than the consumption in similar categories of motors due to low efficiencies of old and rewinded motors. Therefore, it is recommended to replace the existing standard efficiency motors with new IE3 standard premium efficiency motors.

#### 3.1.3 Recommendation

The unit may adopt the premium efficiency class IE3 motors of same rating to reduce the power consumption. The proposed Premium efficiency class IE3 motors specifications include 45 kW and 22 kW rating with same frame size as present motors. The rated

efficiency of new premium efficiency class IE3 motors would be above 93% as specified by vendor.

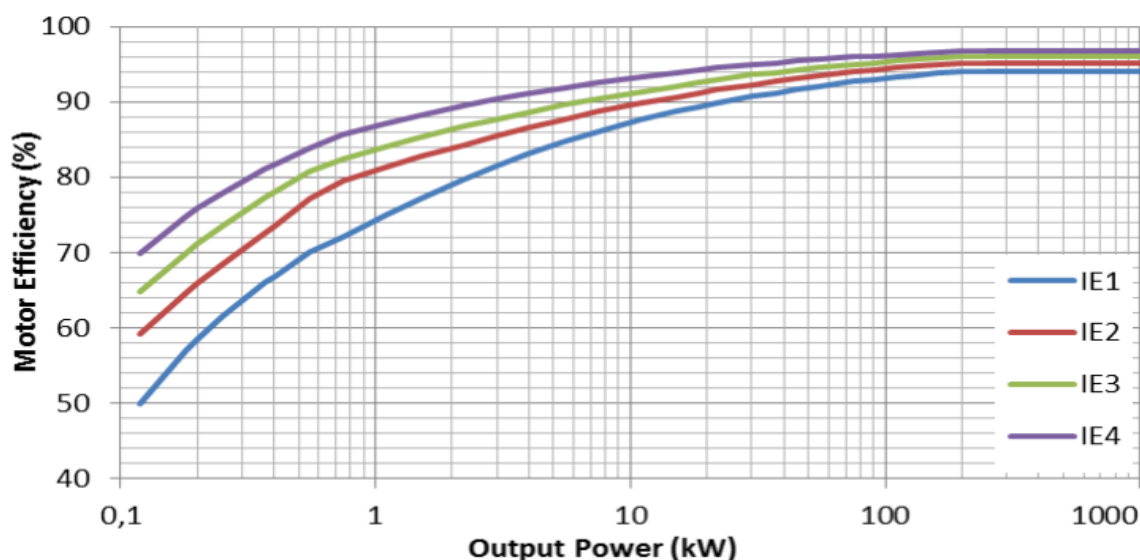


Figure 3.1.3: Efficiency levels as per IS12615 (4 pole, 50Hz)

## 3.2 Cost benefit analysis

The estimated annual energy savings by replacement of 22kW blender motor standard efficiency motor with IE3 standard premium efficiency motors is 4,689 kWh equivalent to a monetary saving of Rs 0.37 lakh. The investment requirement is Rs 0.67 lakh with a simple payback period of 1.8 years. The detailed calculation of the recommended energy conservation measure is provided in table 3.2a.

Table 3.2a: Cost benefit analysis for energy savings measure

Parameters	Unit	Existing	Proposed
Motor capacity	kW	22	22
Design RPM	rpm	1,440	1,440
Motor efficiency	%	89.9	93
Nos of Rewinding	No.s	-	-
Estimated operational efficiency	%	89.9	93
Input power – on load	kW	22.0	21.27
Input power – unload	kW	6.6	6.38
Loading	%	84	84
Operating time	hours/year	7,200	7,200
Energy consumption	kWh/year	1,40,660	1,35,971
Energy savings	kWh/year	-	4,689
Monetary savings	Rs/year	-	36,967
Investment towards motor	Rs.	-	63,488
Fitting and fixture	Rs.	-	3,391
Total investment <sup>2</sup>	Rs.	-	66,879
Payback period	years	-	1.8

<sup>2</sup> Quotation – 1 has been considered for estimation of investments

The estimated annual energy savings by replacement of existing mixer motors standard efficiency motor with IE3 standard premium efficiency motors is 11,721 kWh equivalents to a monetary saving of Rs 0.93 lakh. The investment requirement is Rs 2.26 lakh with a simple payback period of 2.4 years. The detailed calculation of the recommended energy conservation measure is provided in table 3.2b.

**Table 3.2b:** Cost benefit analysis for energy savings measure

Parameters	Unit	Existing	Proposed
Motor rating	kW	45	45
Motor efficiency	%	91.4	93.7
Nos of Rewinding	No.s	1	-
Efficiency reduction due to rewinding	%	1.5	-
Estimated operational efficiency	%	89.9	93.7
Input power – on load	kW	45.5	43.7
Input power - unload	kW	12.0	11.5
Loading	%	84	84
Operating time	hours/year	7,200	7,200
Energy consumption	kWh/year	2,89,008	2,77,287
Energy savings	kWh/year	-	11,721
Monetary savings	Rs/year	-	92,409
Investment towards motor	Rs.	-	204,923
Fitting and fixture	Rs.	-	21,210
Total investment <sup>3</sup>	Rs.	-	2,26,133
Payback period	years	-	2.4

### 3.3 Pre-training requirements

The training would be required on regular maintenance practices for new motors.

### 3.4 Process down time for implementation

The estimated process down time required for implementation of recommended measure is estimated to be 1 day.

### 3.5 Environmental benefits

#### 3.5.1 CO<sub>2</sub> reduction<sup>4</sup>

Implementation of the selected energy conservation measures in the unit may result in reduction in CO<sub>2</sub> emissions due to reduction in overall energy consumption. The estimated reduction in GHG emission by implementation of the recommended energy conservation measures is 13.5 tonnes of CO<sub>2</sub> per year.

<sup>3</sup> Quotation – 1 has been considered for estimation of investments

<sup>4</sup> Source for emission factor for fuels: 2006 IPCC Guidelines for National Greenhouse Gas Inventories & for electricity; CO<sub>2</sub> Baseline Database for the Indian Power Sector, user guide version 12.0, May 2017 (CEA)

### 3.5.2 Reduction in other pollution parameters (gas, liquid and solid)

There is not significant impact on the reduction in other pollution parameters including gas, liquid and solid.

## 4.0 Project financials

### 4.1 Cost of project and means of finance

#### 4.1.1 Particulars of machinery proposed for the project

The particulars of machinery proposed for the project is given in table 4.1.1.

**Table 4.1.1:** Particulars of machinery proposed for the project

S. No	Name of machinery (Model/ specification)	Name of manufacturer, contact person	Advantage	Disadvantage
1	IE3 standard premium efficiency motor	Crompton Greaves (Online supplier- easysparepart.com)	Online supplier	-
2	IE3 standard premium efficiency motor	Aakash Powertech Pvt. Ltd, Marathon Teramax	Reputed supplier	-
3	IE3 standard premium efficiency motor	Shaildeep Enterprise, ABB motors	Reputed supplier	-

#### 4.1.2 Means of finance

The means of finance for the project is shown in table 4.1.2.

**Table 4.1.2:** Means of finance

S. No.	Details	100% equity	D/E - 70:30	D/E - 50:50
1	Additional (Share) Capital	2.93	0.88	1.47
2	Internal Accruals	-	-	-
3	Interest free unsecured loans	-	-	-
4	Term loan proposed (Banks/FIs)	-	2.05	1.47
5	Others	-	-	-
	<b>Total</b>	<b>2.93</b>	<b>2.93</b>	<b>2.93</b>

## 4.2 Financial statement (project)

### 4.2.1 Assumptions

The assumptions made are provided in table 4.2.1.

**Table 4.2.1:** Assumptions made

Details	Unit	100% equity	D/E - 70:30	D/E - 50:50
<b>General about unit</b>				
No of working days	Days		300	
No of shifts per day	Shifts		3	
Annual operating hours	hours/year		7,200	
Installed production capacity	tonnes/year		9,000	
Production in last financial years	tonnes/year		7,200	
Capacity utilization factor	%		80%	
<b>Proposed investment (Project)</b>				
Total cost of the project	Rs. (in Lakh)	2.9	2.9	2.9
Investment without interest defer credit	Rs. (in Lakh)	2.9	2.9	2.9

Details	Unit	100% equity	D/E - 70:30	D/E - 50:50
<b>(IDC)</b>				
Implementation time	Months	6.0	6.0	6.0
Interest during the implementation phase	Rs. in lakhs	-	0.11	0.08
<b>Financing pattern</b>				
Total investment	Rs. in lakhs	2.9	3.04	3.01
Own funds	Rs. in lakhs	2.9	1.0	1.5
Loan funds (term loan)	Rs. in lakhs	-	2.05	1.47
Loan tenure	Years	-	3.0	3.0
Moratorium period (No EMI (interest and principal amount))	Months	-	6.0	6.0
Total repayment period	Months	-	36	36
Interest rate	%	-	10.5%	10.5%
<b>Estimation of costs</b>				
Operation & maintenance costs	%		5.0	
Annual escalation rate of O&M	%		5.0	
<b>Estimation of revenue</b>				
Reduction in energy cost	Rs. (in lakh)/ year		1.29	
Total saving	(Rs Lakh/year)		1.29	
Straight line depreciation	%		16.21	
IT depreciation	%		80.0	
Income tax	%		33.99	
Period of cash flow analysis	Years		5.0	

## 4.2.2 Payback

The simple payback period on the investments made are shown in table 4.2.2.

**Table 4.2.2:** Payback

Details	100% equity	D/E- 70:30	D/E- 50:50
Total project cost (Rs. In lakh)	2.93	3.04	3.01
Cash flow as annual saving (Rs. In lakh/year)	1.29	1.29	1.29
O&M Expenses for first year (Rs. In lakh/year)	0.15	0.15	0.15
Net Cash flow (Rs. In lakh/year)	1.14	1.14	1.14
SPP (months)	30.75	32.03	31.66
Considered (month)	30.70	32.00	31.70

## 4.2.3 NPV and IRR

The NPV and IRR calculations are shown in table 4.2.3.

**Table 4.2.3a:** NPV and IRR (100% equity)

Particulars/ years	0	1	2	3	4	5
		(Rs. in lakhs)				
Profit after tax	-	0.67	0.84	0.30	0.27	0.26
Depreciation	-	0.47	0.47	0.47	0.47	0.47
Cash outflow	2.93	-	-	-	-	-



Particulars / years	0	1	2	3	4	5
Net cash flow	-2.93	1.14	1.32	0.78	0.75	0.74
Discount rate % @ WACC	9.30	9.30	9.30	9.30	9.30	9.30
Discount factor	1.00	0.92	0.84	0.77	0.70	0.64
Present value	-2.93	1.05	1.10	0.60	0.52	0.47
<b>Net present value</b>	<b>0.81</b>					
<b>Simple IRR considering regular cash flow</b>	<b>20.73%</b>					

Table 4.2.3b: NPV and IRR (D/E- 70:30)

Particulars / years	0	1	2	3	4	5
(Rs. in lakhs)						
Profit after tax	-	0.54	0.77	0.19	0.18	0.20
Depreciation	-	0.49	0.49	0.49	0.49	0.49
Cash outflow	3.04	-	-	-	-	-
Net cash flow	-3.04	1.03	1.27	0.68	0.68	0.70
Discount rate % @ WACC	10.10	10.10	10.10	10.10	10.10	10.10
Discount factor	1.00	0.91	0.83	0.75	0.68	0.62
Present value	-3.04	0.94	1.04	0.51	0.46	0.43
<b>Net present value</b>	<b>0.34</b>					
<b>Simple IRR considering regular cash flow</b>	<b>14.94%</b>					

Table 4.2.3c: NPV and IRR (D/E- 50:50)

Particulars / years	0	1	2	3	4	5
(Rs. in lakhs)						
Profit after tax	-	0.58	0.79	0.22	0.21	0.22
Depreciation	-	0.49	0.49	0.49	0.49	0.49
Cash outflow	3.01	-	-	-	-	-
Net cash flow	-3.01	1.07	1.28	0.71	0.70	0.71
Discount rate % @ WACC	9.90	9.90	9.90	9.90	9.90	9.90
Discount factor	1.00	0.91	0.83	0.75	0.69	0.63
Present value	-3.01	0.97	1.06	0.53	0.48	0.44
<b>Net present value</b>	<b>0.48</b>					
<b>Simple IRR considering regular cash flow</b>	<b>16.57%</b>					

### 4.3 Marketing & selling arrangement

The marketing and selling arrangements of the unit are given in table 4.3.

Table 4.3: Marketing &amp; selling arrangements

Items	Remarks
Main Markets (locations)	Pune, Chennai etc.
Locational advantages	-
Indicate competitors	Other Foundry units
Any USP or specific market strength	-
Whether product has multiple applications	NA
Distribution channels (e.g. direct sales, retail network, distribution network)	Direct sales
Marketing team details, if any.	NA

## 4.4 Risk analysis and mitigation

The risk analysis and mitigation for the proposed options are given in table 4.4.

**Table 4.4:** Risk analysis and mitigation

Type of risk	Description	Mitigation
Technology	The equipment/technology provided by the supplier may not be of high quality, which may result in underperformance.	The equipment/technology should be procured from standard/reputed vendors only.
Market /Product	Demand of the product manufactured by the unit may change resulting in lower capacity utilization.	Regular vigilance/tab on the market scenario by the SME will help in better understanding of new substitute product. The unit may modify the product line based on the emerging market trend.
Policy/Regulatory	Changes in government regulation/policy related to pollution and taxes & duties can affect the viability of the unit.	Local industrial association may play a role in discussing these issues with the relevant governmental bodies on a regular basis, so that any concerns of the unit are brought to their notice.

## 4.5 Sensitivity analysis

A sensitivity analysis has been carried out to ascertain how the project financials would behave in different scenarios are given in table 4.5.

**Table 4.5:** Sensitivity analysis

S. No.	Scenario	D/E ratio	SPP (months)	NPV (Rs lakh)	IRR (%)	DSCR	ROI (%)
1	10% increase in estimated savings	100% equity	27.60	1.15	25.18	-	16.05
		70:30	28.70	0.67	19.39	2.25	24.35
		50:50	28.40	0.81	21.02	3.12	20.82
2	10% reduction in estimated savings	100% equity	34.70	0.48	16.13	-	12.03
		70:30	36.20	0.02	10.32	1.89	18.16
		50:50	35.70	0.15	11.96	2.61	15.39
3	10% rise in interest rates	70:30	32.20	0.25	14.35	2.03	21.15
		50:50	31.80	0.41	16.14	2.81	18.08
4	10% reduction in interest rates	70:30	31.90	0.44	15.54	2.11	22.04
		50:50	31.60	0.55	17.00	2.93	18.61

## 5.0 Conclusions & recommendations

The IGDP prepared for the replacement of existing standard efficiency sand plant mixer motors with premium efficiency class motor based on the performance assessment study conducted at unit and the acceptance of the unit management. The brief of selected energy conservation measure is given below.

### 5.1 List of energy conservation measures

The brief summary of the energy conservation measures are given in table 5.1.

**Table 5.1:** Summary of the energy conservation measures

Energy Conservation measure	Annual energy savings	Investment	Savings	Simple Payback	Emission reduction (tonne CO <sub>2</sub> )
	Electricity (kWh)	(Rs Lakh)	(Rs. Lakh/year)	(Year)	
Replacement of existing standard efficiency motors with Premium efficiency class IE3 motors for Sand plant mixers	16,410	2.93	1.29	2.3	13.5

The measure has an estimated investment of 2.93 lakh rupees and can yield a savings of 1.29 lakh rupees per year. The total annual reduction in emission by implementation of recommended measure is estimated to be 13.5 tonnes of CO<sub>2</sub>. The financial indicators provided above in the table shows the project is financially viable and technically feasible.

### 5.2 Summary of the project

The summary of the project is given in table 5.2.

**Table 5.2:** Summary of the project

S. No.	Particulars	Unit	100% equity	D/E- 70:30	D/E- 50:50
1	Cost of Project	Rs Lakh	2.93	3.04	3.01
2	D/E ratio	-	-	7:3	1:1
3	Project IRR	%	20.73	14.94	16.57
4	NPV	Rs Lakh	0.81	0.34	0.48
5	DSCR	-	-	2.07	2.87

### 5.3 Recommendations

The financial indicators provided above show the project is financially viable and technically feasible. It is recommended that the implementation of the identified the energy conservation measure may be undertaken by the unit.



## 6.0 Financing schemes for EE investments for MSME sector

Government of India has many schemes to provide concessional finance for EE technologies among MSMEs. Some major government schemes are summarised in table 6.1.

**Table 6.1:** Major government schemes

Name of the scheme	Brief Description and key benefits
ZED assessment and certification	<p>Assessment process, fee and subsidy are as follows:            Online (e-Platform) self-assessment: Nil fee            Desk Top assessment : Rs 10,000 per SME            Complete assessment : Rs 80,000 ZED rating per SME; Rs 40,000 for additional ZED defence rating; Rs 40,000 for re-rating            The rating costs will include cost of Rs 10,000/- as certification cost by QCI.            Subsidy for Micro, Small and Medium Enterprises are 80%, 60% and 50% respectively.</p>
Credit Linked Capital Subsidy Scheme (CLCSS) (2000-ongoing)	<p>15% capital subsidy of cost of eligible plant and machinery / equipment for adoption of proven technologies for approved products / sub-sectors for MSE units subject to ceiling of INR 15 lakhs</p>
Credit Guarantee Fund Scheme for Micro and small Enterprises (in partnership with SIDBI) (2000-ongoing)	<p>This scheme was launched by MoMSME and SIDBI to alleviate the problem of collateral security and enable micro and small scale units to easily adopt new technologies. Under the scheme, collateral free loans up to Rs 1 crore can be provided to micro and small scale units. Additionally, in the event of a failure of the SME unit which availed collateral free credit facilities to discharge its liabilities to the lender, the Guarantee Trust would guarantee the loss incurred by the lender up to 75 / 80/ 85 per cent of the credit facility.</p>
Technology and Quality Up gradation Support to MSMEs (TEQUP) (2010-ongoing)	<p>The benefits available to SMEs under TEQUP include –technical assistance for energy audits, preparation of DPRs and significant capital subsidy on technologies yielding an energy savings of over 15%. The scheme offers a subsidy of 25% of the project cost, subject to a maximum of Rs. 10 lakhs. TEQUP, a scheme under NMCP, focuses on the two important issues in enhancing competitiveness of the SME sector, through EE and Product Quality Certification.</p>
Technology Upgradation Fund Scheme (TUFS) (1999-ongoing)	<p>Interest subsidy and /or capital subsidy for Textile and Jute Industry only.</p> <ol style="list-style-type: none"> <li>To facilitate Technology Up gradation of Small Scale (SSE) units in the textile and jute industries. Key features being:           <ul style="list-style-type: none"> <li>Promoter’s margin -15%;</li> <li>Subsidy - 15% available on investment in TUF compatible machinery subject to ceiling of Rs 45 lakh;</li> <li>Loan amount - 70% of the cost of the machinery by way of Term Loan</li> </ul> </li> </ol>

Name of the scheme	Brief Description and key benefits
	<ul style="list-style-type: none"> <li>• Interest rate: Reimbursement of 5% on the interest charged by the lending agency on a project of technology upgradation in conformity with the Scheme</li> <li>• Cover under Credit Guarantee Fund Scheme for Micro and Small Enterprises (CGMSE) available</li> </ul> <p>2. To enable technology upgradation in micro and small power looms to improve their productivity, quality of products and/ or environmental conditions</p> <ul style="list-style-type: none"> <li>• 20% margin subsidy on investment in TUF compatible specified machinery subject to a ceiling of Rs 60 lakhs or Rs 1crore (whichever is applicable) on subsidy amount to each unit – released directly to the machinery manufacturer.</li> </ul>
Tax incentives	<ul style="list-style-type: none"> <li>• Accelerated depreciation is provided to the customers / users of the energy saving or renewable energy devises under the direct tax laws.</li> <li>• Under indirect taxes, specific concessional rates of duty are only available to CFLs and not to all energy efficient products</li> <li>• A further waiver of import tariffs and taxes for EE technology imports are dealt on a case to case basis, meaning higher costs for those imported technologies that are not available in the domestic markets at present.</li> </ul>

Two financing schemes have been created by Bureau of Energy Efficiency (BEE) under The National Mission for Enhanced Energy Efficiency (NMEEE) for financing of energy efficiency projects - Venture Capital for Energy Efficiency (VCFEE) and Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE). These funds seek to provide appropriate fiscal instruments to supplement the efforts of the government for creation of energy efficiency market. Highlights of these two schemes are provided in the table 6.2.

**Table 6.2:** BEE’s VCFEE and PRGFEE scheme

Venture Capital for Energy Efficiency (VCFEE)	<ul style="list-style-type: none"> <li>• This fund is to provide equity capital for energy efficiency projects in Government buildings and Municipalities in the first phase.</li> <li>• A single investment by the fund shall not exceed Rs 2 crore</li> <li>• Fund shall provide last mile equity support to specific energy efficiency projects, limited to a maximum of 15% of total equity required, through Special Purpose Vehicle (SPV) or Rs 2 crore, whichever is less</li> </ul>
Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE)	<ul style="list-style-type: none"> <li>• A PRGF is a risk sharing mechanism lowering the risk to the lender by substituting part of the risk of the borrower by granting guarantees ensuring repayment of part of the loan upon a default event.</li> <li>• Guarantees a maximum 50% of the loan (only principal). In case of default, the fund will: <ul style="list-style-type: none"> <li>○ Cover the first loss subject to maximum of 10% of the total guaranteed amount</li> <li>○ Cover the remaining default (outstanding principal) amount on</li> </ul> </li> </ul>

Venture Capital for Energy Efficiency (VCFEE)	<ul style="list-style-type: none"> <li>This fund is to provide equity capital for energy efficiency projects in Government buildings and Municipalities in the first phase.</li> <li>A single investment by the fund shall not exceed Rs 2 crore</li> <li>Fund shall provide last mile equity support to specific energy efficiency projects, limited to a maximum of 15% of total equity required, through Special Purpose Vehicle (SPV) or Rs 2 crore, whichever is less</li> </ul>
	<p style="text-align: center;">partial basis upto the maximum guaranteed amount</p> <ul style="list-style-type: none"> <li>PFI shall take guarantee from the PRGFEE before disbursement of loan to the borrower.</li> <li>The Guarantee will not exceed Rs 300 lakh per project or 50% of loan amount, whichever is less.</li> <li>Maximum tenure of the guarantee will be 5 years from the date of issue of the guarantee</li> </ul>

Indian Renewable Energy Development Agency (IREDA), a non-banking financial institution established by the government also extends financial assistance for setting up projects relating to new and renewable sources of energy and energy efficiency/conservation. The detailed financing guidelines for energy efficiency projects are provided in table 6.3.

**Table 6.3:** IREDA's financing guidelines

Eligible companies who can apply	Private Sector Companies/ firms, Central Public Sector Undertaking (CPSU), State Utilities/ Discoms/ Transcos/ Gencos/ Corporations, Joint Sector Companies which are not loss making.
Minimum loan amount	<ul style="list-style-type: none"> <li>Rs. 50 lakh</li> </ul>
Type of projects considered for term loans	<ul style="list-style-type: none"> <li>Replacement / retrofit of selected equipment with energy efficient equipment</li> <li>Modification of entire manufacturing processing</li> <li>Recovery of waste heat for power generation</li> </ul>
Incentive available	<ul style="list-style-type: none"> <li>Rebate in central excise duty</li> <li>Rebate in interest rate on term loan</li> <li>Rebate in prompt payment of loan instalment</li> </ul>
Interest rate	<ul style="list-style-type: none"> <li>10.60% to 11.90% depending upon the grading of the applicant with prompt payment rebate of 15 bps if payment is made on / before due dates</li> <li>Interest rates are floating and would be reset on commissioning of the project or two years from the date of first disbursement. Thereafter, the rates will be reset after every two years.</li> <li>Rebate of 0.5% in interest rates are available for projects set up in North Eastern States, Sikkim, J&amp;K, Islands, Estuaries. Rebates of 0.5% in interest rates are also available for projects being set up by SC/ST, Women, Ex Servicemen and Handicapped categories involving project cost of upto Rs. 75.00 lakh.</li> </ul>
Loan	Upto 70% of the total project cost. Promoter's contribution should be Minimum 30% of the total project cost
Maximum debt	3:1

equity ratio	The project cash flow should have a minimum average Debt Service Coverage Ratio of 1.3
Maximum repayment period	12 years with moratorium of maximum 12 months
Procurement procedures	The borrower is required to follow the established market practices for procurement and shall demonstrate that the quality goods and services are being purchased at reasonable and competitive prices. Wherever the loan is sanctioned against international lines of credit such as the World Bank, Asian Development Bank, kfW, etc., the relevant procedures will have to be followed and requisite documents will have to be submitted by the borrower

Small Industries Development Bank of India (SIDBI) has several schemes and focused lines of credit for providing financial assistance for energy efficiency and cleaner production projects for SMEs. Highlights of some of the major financial assistance schemes/projects managed by SIDBI are given in table 6.4.

**Table 6.4:** Major EE financing schemes/initiatives of SIDBI

End to End Energy Efficiency (4E) Program	<p>Support for technical /advisory services such as:</p> <ul style="list-style-type: none"> <li>• Detailed Energy Audit</li> <li>• Support for implementation</li> <li>• Measurement &amp; Verification</li> </ul> <p>Financing terms:</p> <ul style="list-style-type: none"> <li>• Terms loans upto 90%</li> <li>• Interest rate upto 3% below normal lending rate.</li> </ul>
TIFAC-SIDBI Revolving Fund for Technology Innovation (Srijan Scheme)	<p>To support SMEs for up-scaling and commercialization of innovative technology based project at flexible terms and interest rate.</p> <p>Preference accorded to sustainable technologies / products. Soft term loan with an interest of not more than 5%.</p>
Partial Risk Sharing Facility for Energy Efficiency (PRSF) Project (supported by World Bank)	<p>Sectors covered:</p> <ul style="list-style-type: none"> <li>• Large industries (excluding thermal power plants)</li> <li>• SMEs</li> <li>• Municipalities (including street lighting)</li> <li>• Buildings</li> </ul> <p>Coverage:</p> <ul style="list-style-type: none"> <li>• The minimum loan amount Rs 10 lakh and maximum loan amount of Rs 15 crore per project.</li> <li>• The extent of guarantee is 75% of the loan amount</li> </ul>
JICA-SIDBI Financing Scheme	<ul style="list-style-type: none"> <li>• The loan is used to provide SMEs with funds necessary to invest in energy-saving equipment (and some medical equipment) in the form of two-step loans through SIDBI or three-step loans through intermediary financial institutions.</li> </ul>



	<ul style="list-style-type: none"> <li>• Project uses an Energy Saving Equipment List approach</li> <li>• Equipment/machinery with energy saving potential less than 10% is not eligible.</li> <li>• Interest rate: As per credit rating and 1% below the normal lending rate</li> <li>• Separate technical assistance component which is used for wetting of loan applications, holding seminars to raise awareness of energy saving among SMEs and to improve the ability of financial institutions to screen loan applications for energy-saving efforts</li> </ul>
KfW-SIDBI Financing Scheme	<p>Coverage</p> <ul style="list-style-type: none"> <li>a) SMEs for energy efficiency projects</li> <li>b) SMEs and clusters for cleaner production and emission reduction measures, waste management and Common Effluent Treatment Plant (CETP) facilities</li> </ul> <p>Interest rate</p> <p>As per credit rating and 1% below the normal lending rate</p> <p>Eligible criteria</p> <p>3 t CO<sub>2</sub> emission reduction per year per lakh invested</p> <p>List of eligible equipment/technology and potential suppliers developed for guidance</p>

State Bank of India (SBI) has been provided a green line of credit by Japan Bank for International Cooperation (JBIC) for financing of energy efficiency investments. Highlights of the line of credit are given in table 6.5.

**Table 6.5: JBIC-SBI Green Line**

<p><b><u>Key Features</u></b></p> <ul style="list-style-type: none"> <li>• Amount : USD 90 million</li> <li>• Repayment Schedule: First repayment on May 30, 2017 and final repayment date May 30, 2025 (equal instalment)</li> <li>•</li> </ul> <p><b><u>Eligibility Criteria</u></b></p> <ul style="list-style-type: none"> <li>• Projects contributing to preservation of global environment, i.e. significant reduction of GHG emissions</li> <li>• Acceptance of JBIC-MRV (“J-MRV”) by the project proponent in terms of the numerical effect of the environment preservation. To ensure effective GHG reduction emissions in Green financed projects, JBIC reviews such effects through simple and practical Measurement Reporting Verification (MRV) process both in (a) prior estimation and (b) ex-post monitoring.</li> <li>• Procurement in line with the “Guidelines for Procurement under Untied Loans by Japan Bank for International Cooperation”</li> </ul>
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Canara bank has a dedicated scheme for financing EE investment among SME sector as mentioned in table 6.6.

**Table 6.6:** Canara bank scheme of EE SME loans

<b>Purpose</b>	<b>For acquiring/adopting energy conservation/savings equipment/measures by SMEs</b>
<b>Eligibility</b>	Units under Small and Medium Enterprises Cost of energy for the unit should constitute not less than 20% of the total cost of production Unit should possess energy audit report issued by an approved energy Consultant/Auditor. Borrowal a/cs-ASCC code S1 or S2 during previous review. Current account holders having dealings exclusively with us satisfactorily for a period of last one year
<b>Maximum loan</b>	Maximum Rs 100 lakhs in the form of term loan
<b>Security</b>	Prime: Assets created out of loan Collateral: Upto Rs.5 lakhs – NIL Above Rs.5 lakhs, as determined by the bank
<b>Repayment</b>	Maximum 5-7 years including moratorium of 6 months
<b>Guarantee cover</b>	Cover available under CGMSE of CGTMSE available for eligible loans
<b>Margin</b>	10% of the project cost
<b>Rate of interest</b>	1% less than the applicable rate
<b>Upfront fee</b>	1% of the loan
<b>Insurance cover</b>	Assets acquired and charged as security to Bank to be insured
<b>Special offer, if any</b>	<b>Grants :</b> Bank provides 25% of the cost of Energy Audit / Consultancy charges with a maximum of Rs 25000/- to the first 100 units on a first come first served basis which is in addition to the grant of Rs 25000/- being provided by IREDA(First 100 units)

Among the private sector banks in India, Yes Bank is also active in financing of renewable energy and energy efficiency projects. The bank has an MOU with SIDBI for providing funding for EE through PRSF.

Most commercial banks charge interest rate between from 11% to 13% from MSMEs depending upon general criteria such as credit ratings, references, past lending record, balance sheet for last 3 years and so on. Interest rebate is offered for a few customers whose collateral value is around 125% of the loan amount. Further 0.5% concession in interest rate was offered to women entrepreneurs.

# Annexures



# Annexure 1: Budgetary offers / quotations

## Quotation 1: Easy Spare Parts

38% CROMPTON GREAVES MOTOR 30HP(1500/1440RPM) IE3 (FOOT MOUNTED)

**Free Shipping**  
This product qualifies for free air shipping.

Brand: CROMPTON GREAVES Views: 24  
Product Code:  
Price Per Piece/Box: Per Piece  
Availability: In Stock

Shipping To

Check

0 Product(s) Sold

~~Rs. 102,400~~ Rs. 63,488

- 1 + **ADD TO CART**

**BUY NOW**

38% CROMPTON GREAVES MOTOR 60HP(1000/960RPM) IE3 (FOOT MOUNTED)

**Free Shipping**  
This product qualifies for free air shipping.

Brand: CROMPTON GREAVES Views: 20  
Product Code:  
Price Per Piece/Box: Per Piece  
Availability: In Stock

Shipping To

Check

0 Product(s) Sold

~~Rs. 330,520~~ Rs. 204,923

- 1 + **ADD TO CART**

**BUY NOW**

## Quotation 2: Aakash Powertech Pvt. Ltd

2 -Pole 3000 RPM			4 - Pole 1500 RPM			6 - Pole 1000 RPM		
Frame	KW	Price	Frame	KW	Price	Frame	KW	Price
						90S	0.75	10865
80	0.55	8345	80	0.55	8860	90L	1.1	11915
80	0.75	8625	80	0.75	8990	100L	1.5	15295
80	1.1	9415	90S	1.1	10210	112M	2.2	18280
90S	1.5	10785	90L	1.5	11175	132S	3	26695
90L	2.2	13855	100L	2.2	14815	132S	3.7	27800
100L	3	16280	100L	3	15665	132M	5.5	28905
112M	3.7	17205	112M	3.7	18910	160M	7.5	51645
132S	5.5	28085	132S	5.5	26170	160L	11	64325
132S	7.5	29070	132M	7.5	30360	180L	15	79424
160M	11	50805	160M	11	48640	200L	18.5	103421
160M	15	59520	160L	15	60460	200L	22	112404
160L	18.5	76495	180M	18.5	83764	225M	30	175201
180M	22	80233	180L	22	84759	250M	37	251627
200L	30	119187	200L	30	115995	280S	45	301279
200L	37	145473	225S	37	148411	280M	55	342527
225M	45	187217	225M	45	175343	315S	75	411181
250M	55	269439	250M	55	249660	315M	90	516112
280S	75	335037	280S	75	305406	315L	110	575130
280M	90	388056	280M	90	354318	315L	132	673170
315S	110	489174	315S	110	428948	355M	160	698307
315M	132	600113	315M	132	505020	355M	200	798371
315L	160	658749	315L	160	591005	355L	250	860444
315L	200	770942	315L	200	717345			
355M	250	858038	355M	250	790590			
355L	315	934224	355L	315	907155			
355L	355	1121065	355L	355	1125978			
355L	375	1233167	355L	375	1238553			

## Quotation 3: Shaildeep Enterprise



# Shaildeep Enterprise

Plot No.1, Survey No.235, Nr.Galaxy Agrico, B/H, Hotel Pitrukrupa, Veraval (Shapar) Dist.Rajkot-360024,  
Ph.:02827-252479, Cell: - 07201977277, 7201877277 E-mail: shaildeepent@gmail.com

To, M/S. VIVEK SHARMA	Our Reference: SD/QTN/040/17-18
Kind Attention:Mr. Vivek Sharma	Date: 28-03-2018
Contact: 09850366248	Rev.:
Email ID: vivek_honest@yahoo.co.in	Enquiry Reference: E-mail
	Enquiry date:27-03-2018

Dear Sir,

This is with reference to your enquiry of electric motors; we are pleased to submit our offer offer as below

### 1. GENERAL TECHNICAL SPECIFICATIONS

- ABB make totally Enclosed Fan Cooled (TEFC) Squirrel Cage, Induction Motors, Continuously rated (S1) suitable for operation on 415 Volt  $\pm 10\%$  3 phase, 50 Hz  $\pm 5\%$ , A.C. supply with Class F insulation for 50° C ambient temperature, IP55 and as per IS\_325 and IS12615:2011.
- IE3 motors. Standard test certificate is available with every motor. Motor Datasheet and GA Drawing attached.
- Offered Motors are suitable for Direct On Line starting. In case application calls for VFD. It is recommended to use VFD Duty Motors. Extra charges @ 5% on quoted prices for VFD Duty Motors.
- Offered Motors are suitable for Direct Coupling. In case your application calls for V belt and Pulley, It is recommended to use Roller bearing at NDE side. Roller bearing Charges Extra for 160 TO 200 Frame INR 1500 225 to 250 Frames is INR 3000 per Motor.

### 1. PRICE SCHEDULE

ABB MAKE IE3 TEFC MOTOR SUITABLE DIRECT COUPLING									
Sr. No.	Qty	KW/HP	RPM	Mount	Type Of Starting	Frame Size	Unit Price	Total Amount	Delivery
1	1	45/60	1000	B3-FOOT	DOL	E3HX280SMA6	191638	191638/-	6-8 WEEK
2	1	22/30	1475	B3-FOOT	DOL	M2BAX180MLB4 IE3	56678	56677/-	6-8 WEEK





# Shaildeep Enterprise

Plot No.1, Survey No.235, Nr.Galaxy Agrico, B/H, Hotel Pitrukrupa, Veraval (Shapar) Dist.Rajkot-360024,  
Ph.:02827-252479, Cell: - 07201977277, 7201877277 E-mail: shaildeepent@gmail.com

C. Terms and Conditions:

Testing Charge	:	Motors will be supplied with Routine Test Certificate. However any witness testing required. Same will be charged extra as per Manufacturers price list
Taxes / Surcharge	:	GST extra as applicable. Present Rate of GST will be 18%
Validity	:	15 Days from the date of our offer
Payment	:	100% Invoice prior to dispatch within 2 day
P&F / Insurance	:	NIL
Price	:	Ex Rajkot. Freight To pay
Warranty	:	Limited to a period of 12 months from the date of installation or 18 months from the date of dispatch, ex-works whichever is earlier.
Delivery	:	As mentioned in above price schedule

1. Our GST Details are as below

Company Name	:	Shaildeep Enterprise
GSTIN	:	24ACTFS1580L1ZJ

1. Bank Detail :

Bank Name	:	Central Bank Of India
Branch	:	Main Branch Rajkot
A/C No.	:	3468387369
A/C Type	:	CC
NEFT CODE	:	CBIN0280571

We hope it will be in line with your requirement, incase if you have any query please feel free to contact us.

Thanking you once again and assuring you of our best services at all times.

Truly Yours,

For, Shaildeep Enterprise

Dipen Devani

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## Annexure 2: Instruments used

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Instruments	Model/ Make	Application	Accuracy
Power analysers	Fluke: 435, Krykard ALM 10,	Electrical Parameters Harmonics analysis, power logging	$\pm 0.5\%$
Thermal imager	875-2/Testo	Surface Temperature & Image	$\pm 2\%$