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Report ID: COI/10/DPR

Detailed Project Report
On
Energy Efficient hydraulic moulding line and mixer plant

Ramprasad Tubes and Bars (P) Limited
Coimbatore (Tamil Nadu)

Prepared for

Bureau of Energy Efficiency
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Disclaimer

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The Energy and Resources Institute (TERI)
New Delhi

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List of abbreviations

BEE	Bureau of Energy Efficiency
CO_2	Carbon Dioxide
D/E	Debt /Equity
DISCOM	Distribution Company
DPR	Detailed Project Report
DSCR	Debt Service Coverage Ratio
EE	Energy Efficient
FIs	Financial Institutions
GEF	Global Environmental Facility
GHG	Green House Gas
HP	Horsepower
IDC	Interest Defer Credit
IGDPR	Investment Grade Detailed Project Report
IRR	Internal Rate of Return
Kg	Kilogram
kV	Kilo vault
kVA	kilovolt-ampere
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
SPP	Simple Payback Period
TANGENDCO	Tamil Nadu Generation and Distribution Company
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

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 Ramprasad Tubes and Bars (P) Ltd
Constitution	Private Limited
MSME Classification	Small
No. of years in operation	38
Address: Registered Office:	818/1, Samanaickenpalayam, No.4, Veerapandi (PO), Coimbatore-641019
Industry-sector	Ductile & Grey Iron Castings
Products manufactured	Casings of auto components, valve parts, machine tools industries
Name(s) of the promoters/ directors	Mr. J. Vidya Prakash

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 512.8 toe which is equivalent to 447 lakh rupees. The total CO_2 emission during this period is estimated to be 4,889 tonnes. Electricity was considered for CO_2 emission estimation.

The unit manufactures casting products of auto components. The total annual liquid metal production of the unit during 2017-18 is estimated to be 4,615 tonnes and good castings production is around 3,000 tonnes. The major source of energy is electricity, consume in the induction furnace, machine drives and lighting system.

Accepted/ recommended technology implementation

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

Technology	Annual energy saving Electricity (kWh)	Investment[1] (Rs lakh)	Monetary savings (Rs lakh/ year)	Simple payback period (Years)	Emission reduction (tonnes of CO_2)
Replacement of existing pneumatic based moulding line and old mixer plant machine with new EE hydraulic moulding line and mixer plant	459,154	138.36	62.3	2.2	377

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_2 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	138.36	138.36	138.36
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	21.75	15.97	17.60
4	NPV	Rs. In Lakh	41.93	19.75	26.0
5	DSCR	-	-	2.1	2.9

[1] Investment is including (i) Moulding Machine Rs 54.0 Lakh (ii) Oil purifier Rs 2.5 lakh (iii) moulding boxes Rs 10.5 (iv) sand controller Rs 12.5 lakh (v) sand cooler Rs 16.5 lakh, and (vi) applicable taxes & misc. Rs. 21.11 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 Ramprasad Tubes and Bars (P) Ltd	
2	Constitution	Small	
3	Date of incorporation / commencement of business	1985	
4	Name of the Contact Person	Mr. J. Vidya Prakash	
5	Mobile / Ph. No	+91-9787745251	
6	Email	ram_prasad@yahoo.com	
7	Address: Registered Office	818/1, Samanaickenpalayam, No.4, Veerapandi (PO), Coimbatore-641019	
8	Factory		
9	Industry / Sector	MSME/Manufacturing	Owned
10	Products Manufactured	Auto part castings, valve parts	Owned
11	No of hours of operation/shift	8	
12	No of shifts/ day	03	
13	No of days/year	360	
14	Installed Capacity	9000 MT per year (liquid metal)	
15	Whether the unit is exporting its products (Yes/ No)	Yes	
16	Quality Certification, if any	AD2000 Merkblatt W0 ISO 9001 : 2008	

2.0 Energy profile

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.

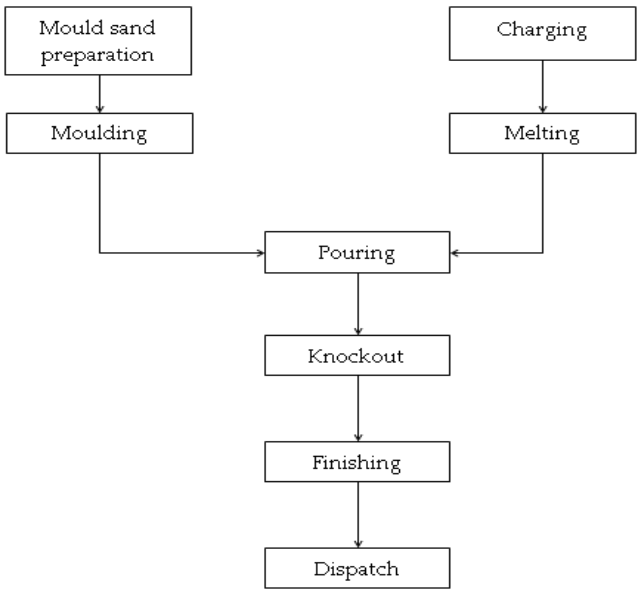

Figure 2.1.4: Process flow chart

2.2 Details of technology identified

The details of the moulding line and sand plant installed in the unit are given in table 2.2.

Table 2.2a: Details of moulding line and sand plant

Make	Unit	Local
Capacity	kg	500
Cycle time	min	2
Sand mixing	tonne/hr	8 to 10
Switching	-	Manual
Drives	-	No

Table 2.2b: Details of moulding line and sand plant

S.No	Moulding plant specs	No. of boxes per hr
1	Arpa 300	50 to 60
2	Arpa 300	50 to 60
3	Arpa 900	10 to 15

2.3 Energy used and brief description of their usage pattern

The unit uses grid power supplied by Tamil Nadu Generation and Distribution Company (TANGENDCO) under the tariff category HT-I(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	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

S No	Energy source	Availability	Tariff details
1	Electricity	Supplied by TANGEDCO	Tariff category: HT-I(A) @ 11 kV Demand charges: Rs 350/kVA Energy charges: Rs 6.35/kWh Time of day charges: 2200-0600: 5% rebate on energy charge 0600-0900: 20% additional energy charge 1800-2100: 20% additional energy charge PF penalty charges:

S No	Energy source	Availability	Tariff details
			Every 0.01 drop below 0.90, penalty 1% of energy charge Every 0.01 drop below 0.85, penalty 1.5% of energy charge Every 0.01 drop below 0.75, penalty 2% of energy charge Harmonics penalty: If beyond the permissible limits as specified by CEA regulations, 15% of energy charge

2.5 Analysis of electricity consumption

Table 2.5: Electricity consumption profile

Month	Electricity Consumption, kWh	Contract Demand, kVA	Actual Demand, kVA	Power Factor	Demand Charges, Rs.
Nov-17	3,87,980	2,080	1,872	0.91	6,55,200
Dec-17	6,17,522	2,080	1,872	0.91	6,55,200
Jan-18	5,74,702	2,080	1,872	0.92	6,55,200
Feb-18	5,44,118	2,080	1,872	0.91	6,55,200
Mar-18	3,60,107	2,080	1,872	0.91	6,55,200
Average	**4,96,886**	**2,080**	**1,872**	**0.91**	**6,55,200**
Annual	**59,62,630**	**-**	**-**	**-**	**78,62,400**

*The plant is procuring power from various sources including DISCOM, open access and wind mills through grid of TANGEDCO. The average cost of electricity has been estimated to be Rs. 7.5 per kWh in consultation with plant personal.

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

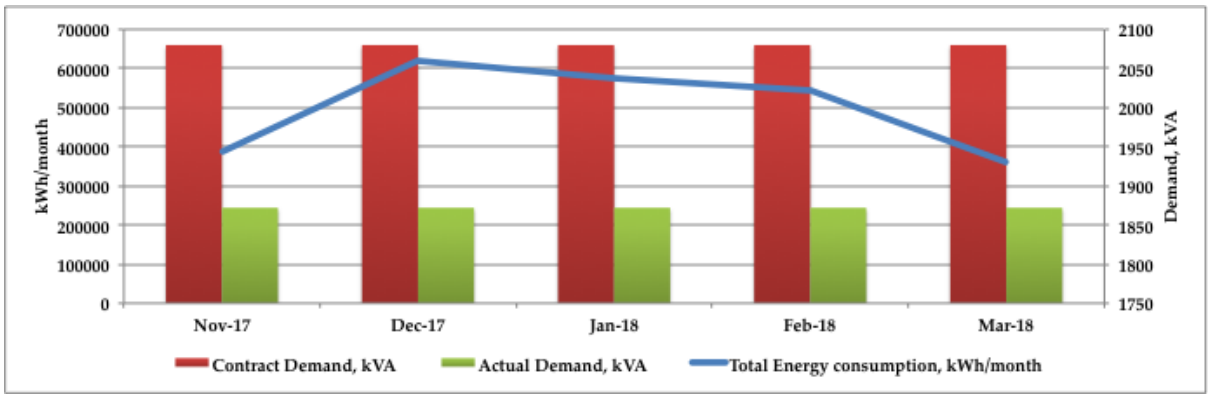

Figure 2.5: Demand pattern and energy consumption profile

The plant is consuming about 5,962,630 kWh of electricity per year. The total energy consumption of the unit during last 12 months is estimated to be 512.8 toe which is equivalent to 447 lakh rupees. The total CO_2 emission during this period is estimated to be 4,889 tonnes. Electricity was considered for CO_2 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 pneumatic based moulding line and old mixer plant machine with new EE hydraulic moulding line and mixer plant

3.1.1 Background

Ramprasad Tubes and Bars (P) Ltd is a foundry unit, which produces castings for automobile industries and has installed one induction furnace of total rated production capacity of 0.5T melting. Capacity of the sand plant is total 7 to 8 tonnes of sand per hour having one batch mixer and moulding line as specified in above section. The details of the moulding line and sand plant installed in the unit are given in table 3.1.1a and 3.1.1b.

Table 3.1.1a: Details of moulding line and sand plant

Make	**-**	**Local**
Capacity	kg	500
Cycle time	min	2
Sand mixing	tonne/hr	8 to 10
Switching	-	Manual
Drives	-	No

Table 3.1.1b: Details of moulding line and sand plant

Moulding plant specs	**No. of boxes per hr**
Arpa 300	50 to 60
Arpa 300	50 to 60
Arpa 900	10 to 15

3.1.2 Observations and analysis

Mixer installed in the plant are very old has high connected load due to which overall demand of the plant increases significantly, also sand both the mixers are manually operated. The specific power consumption of the sand plant is estimated to be 6.2kWh/tonne of sand processed considering total sand plant load based on the data measured/collected during the field visit in the unit. The measured trend of the active power and demand is shown in figure 3.1.2.

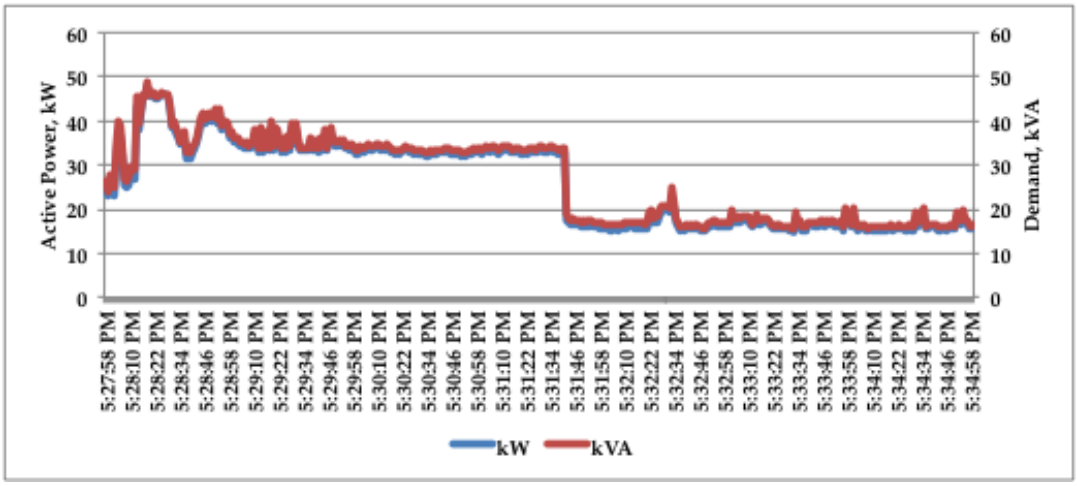

Figure 3.1.2: Trend of the active power and demand

The average sand quantity processed per hour is 7 to 8 tonnes depending on the production requirements. Unit presently has pneumatic based jolt squeeze line, which consumes very high amount of compressed air increasing load on the utilities. The specific energy consumption is higher than the consumption in similar categories of sand plant, which are hydraulic based. Therefore, it is recommended to replace the existing pneumatic moulding line with hydraulic moulding line and sand plant mixer with energy efficient IE3 motors and of a less electrical rating for the same capacity of output.

Table 3.1.2: Present connected load of sand plant

Load	HP	kW
Mixer motor	60	44.8
Blender motor	25	18.7
Bucket Elevator	7.5	5.6
Conveyor motors	15	11.2
	3	2.2
Vibrator motor	6	4.5
	1	0.7
Dust collector blower motor	30	22.4
Total	**148**	**110**

3.1.3 Recommendation

The unit may adopt the new sand plant with new moulding line to reduce the specific power consumption of sand plant area. New system will drastically reduce overall demand and will also reduce compressed air usage to minimal amount. The specific energy consumption of new sand plant would be 1.6 kWh per tonne of sand processed as specified by vendor.

Table 3.1b: Proposed connected load of new EE sand plant

Load	HP	kW
Moulding machine hydraulic	12.5	9.3
Hydraulic oil purifier	2	1.5
Air need	3	2.2
Mixer	60	44.8

Load	HP	kW
Sand cooling	15	11.2
Total	**92.5**	**69.0**

3.2 Cost benefit analysis

The estimated annual energy savings with new moulding line and sand plant is 459,154 kWh equivalents to a monetary saving of Rs 62.3 lakh. The investment requirement is Rs 138.36 lakh with a simple payback period of 2.2 years. The detailed calculations of the recommended energy conservation measures for IGDPR are provided in table 3.2.

Table 3.2: Cost benefit analysis for recommended energy savings measures

Parameters	Unit	Existing	Proposed
Connected load	HP	148	92.5
Hourly Sand processed	Tonnes/hr	8	8
Specific energy consumption for sand preparation	kWh/ tonne of sand	6.2	1.6
Daily energy consumption for sand plant	kWh/day	795	205
Energy saving in sand plant per day	kWh/day	-	591
Annual energy saving in sand plant	kWh/year	-	2,12,626
Metal saving due to new hydraulic moulding line	%	-	3
Metal saving	tonnes/year	-	180
Energy consumption in melting	kWh/tonne	-	700
Annual energy saving in melting	kWh/year	-	1,26,000
Air compressor connected load	kW	22	0
Energy consumption in air compressor	kWh/year	120,528	0
Energy saving in air compressor	kWh/year	-	1,20,528
Total energy saving	kWh/year	-	4,59,154
Monetary saving in Energy	Rs. In lakh/year	-	34.4
Demand due to sand plant	kVA	122	46
Demand saving	kVA/month	-	77
Demand cost saving	Rs. In lakh/year	-	3.2
Metal cost saving	Rs. In lakh/year	-	13.8
Labor cost savings	Rs. In lakh/year	-	10.8
Total monetary saving	Rs. In lakh/year	-	62.3
Investment required[2]	Rs. In lakh	-	138.3
Simple Payback Period	Years	-	2.2

3.3 Pre-training requirements

The training would be required on operation and maintenance of system parts.

3.4 Process down time for implementation

The estimated process down time required for implementation of recommended measure is estimated to be 15 days after commissioning and testing of the new sand plant and moulding line.

[2] Quotation-1 is considered for calculation of investment

3.5 Environmental benefits

3.5.1 CO_2 reduction[3]

Implementation of the selected energy conservation measures in the unit may result in reduction in CO_2 emissions due to reduction in overall energy consumption. The estimated reduction in GHG emission by implementation of the recommended energy conservation measures is 377 tonne of CO_2 per year.

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.

[3] Source for emission factor: 2006 IPCC Guidelines for National Greenhouse Gas Inventories & electricity: CO_2 Baseline Database for the Indian Power Sector, user guide version 12.0, May 2017 (CEA)

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	Basis of selection of supplier
1	0.5T/batch Sand plant batch mixer with conveyor belt sand system along with hydraulic moulding line	Rhino Machines Pvt. Ltd, Mr. Manish Kothari, Phone-9227124977, Email: rhino.mk@gmail.com	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	138.36	41.51	69.18
2	Internal Accruals	-	-	-
3	Interest free unsecured loans	-	-	-
4	Term loan proposed (Banks/FIs)	-	96.85	69.18
5	Others	-	-	-
	Total	**138.36**	**138.36**	**138.36**

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- 7:3	D/E- 1:1
General about unit				
No of working days	Days		360	
No of shifts per day	Shifts		3	
Annual operating hours	hours/year		8,640	
Installed production capacity	tonnes/year		9,000	
Production in last financial years	tonnes/year		4,615	
Capacity utilization factor	%		51	
Total cost of the project	Rs. (in Lakh)	138.3	138.3	138.3
Investment without interest defer credit (IDC)	Rs. (in Lakh)	138.3	138.3	138.3
Implementation time	months	6.0	6.0	6.0
Interest during the implementation phase	Rs. in lakhs	-	5.08	3.63
Total investment	Rs. in lakhs	138.3	143.4	142

Details	Unit	100% equity	D/E- 7:3	D/E- 1:1
Financing pattern				
Own funds	Rs. in lakhs	138.3	46.6	72.8
Loan funds (term loan)	Rs. in lakhs	-	96.85	69.18
Loan tenure	Years	-	5.0	5.0
Moratorium period (No EMI (interest and principal amount))	Months	-	3.0	3.0
Total repayment period	Months	-	60.0	60.0
Interest rate	%	-	10.5	10.5
Estimation of costs				
Operation & maintenance costs	%		5.0	
Annual escalation rate of O&M	%		5.0	
Estimation of revenue				
Reduction in energy cost	Rs lakh/year		62.3	
Total saving	Rs lakh/year		62.3	
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)	138.36	143.44	141.99
Cash flow as annual saving (Rs. In lakh/year)	62.30	62.30	62.30
O&M Expenses for first year (Rs. In lakh/year)	6.92	7.17	7.10
Net Cash flow (Rs. In lakh/year)	55.39	55.13	55.20
SPP (months)	29.98	31.22	30.86
Considered (month)	**30.00**	**31.20**	**30.90**

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	-	32.96	40.22	15.17	13.71	13.21
Depreciation	-	22.43	22.43	22.43	22.43	22.43
Cash outflow	138.36	-	-	-	-	-
Net cash flow	-138.36	55.39	62.65	37.60	36.14	35.64
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	-138.36	50.70	52.49	28.83	25.37	22.90
Net present value	**41.93**					
Simple IRR considering regular cash flow	**21.75**					

Table 4.2.3b: NPV and IRR (D/E- 7:3)

Particulars / years	0	1	2	3	4	5
			Rs. in lakhs			
Profit after tax	-	26.96	36.96	9.73	9.54	10.49
Depreciation	-	23.25	23.25	23.25	23.25	23.25
Cash outflow	143.44	-	-	-	-	-
Net cash flow	-143.44	50.21	60.22	32.98	32.79	33.74
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	-143.44	45.61	49.68	24.72	22.32	20.86
Net present value	**19.75**					
Simple IRR considering regular cash flow	**15.97**					

Table 4.2.3c: NPV and IRR (D/E- 1:1)

Particulars / years	0	1	2	3	4	5
			Rs. in lakhs			
Profit after tax	-	28.67	37.90	11.28	10.73	11.27
Depreciation	-	23.02	23.02	23.02	23.02	23.02
Cash outflow	141.99	-	-	-	-	-
Net cash flow	-141.99	51.69	60.91	34.30	33.75	34.28
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	-141.99	47.05	50.47	25.87	23.17	21.42
Net present value	**26.00**					
Simple IRR considering regular cash flow	**17.60**					

4.3 Marketing & selling arrangement

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

Table 4.3: Marketing & selling arrangements

Items	Remarks
Main Markets (locations)	Pan India
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 situations are given in table 4.5.

Table 4.5: Sensitivity analysis

S. No.	Scenario	D/E ratio	Payback period (months)	NPV (Rs lakh)	IRR (%)	DSCR	ROI (%)
1	10% increase in estimated savings	100% equity	26.90	57.98	26.24	-	16.47
		70:30	28.10	35.47	20.44	2.3	24.93
		50:50	27.70	42.06	22.14	3.18	21.39
2	10% reduction in estimated savings	100% equity	33.80	25.87	17.12	-	12.50
		70:30	35.30	4.01	11.31	1.93	18.96
		50:50	35.10	9.05	12.50	2.65	15.82
3	10% rise in interest rates	70:30	31.30	15.18	15.37	2.07	21.84
		50:50	31.00	22.63	17.16	2.86	18.68
4	10% reduction in interest rates	70:30	31.10	24.42	16.56	2.16	22.70
		50:50	30.80	29.41	18.02	2.99	19.20

5.0 Conclusions & recommendations

The IGDPR prepared for the replacement of existing pneumatic based moulding line with new EE hydraulic moulding line and sand mixer 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

Technology	Annual energy saving Electricity (kWh)	Investment (Rs lakh)	Monetary savings (Rs lakh/ year)	Simple payback period (Years)	Emission reduction (tonnes of CO_2)
Replacement of existing pneumatic based moulding line and old mixer plant machine with new EE hydraulic moulding line and mixer plant	4,59,154	138.36	62.30	2.2	377

The measure has an estimated investment of 138.3 lakh rupees and can yield a savings of 62.3 lakh rupees per year. The total annual reduction in emission by implementation of recommended measure is estimated to be 377 tonnes of CO_2. 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. in Lakh	138.6	138.36	138.36
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	21.75	15.97	17.60
4	NPV	Rs. in Lakh	41.93	19.75	26.0
5	DSCR	-	-	2.1	2.9

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 measures 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	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.
Credit Linked Capital Subsidy Scheme (CLCSS) (2000-ongoing)	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
Credit Guarantee Fund Scheme for Micro and small Enterprises (in partnership with SIDBI) (2000-ongoing)	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.
Technology and Quality Up gradation Support to MSMEs (TEQUP) (2010-ongoing)	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.
Technology Upgradation Fund Scheme (TUFS) (1999-ongoing)	Interest subsidy and /or capital subsidy for Textile and Jute Industry only. 1. To facilitate Technology Up gradation of Small Scale (SSE) units in the textile and jute industries. Key features being: • Promoter's margin -15%; • Subsidy – 15% available on investment in TUF compatible machinery subject to ceiling of Rs 45 lakh; • Loan amount – 70% of the cost of the machinery by way of Term Loan

Name of the scheme	Brief Description and key benefits
	• Interest rate: Reimbursement of 5% on the interest charged by the lending agency on a project of technology upgradation in conformity with the Scheme • Cover under Credit Guarantee Fund Scheme for Micro and Small Enterprises (CGMSE) available 2. To enable technology upgradation in micro and small power looms to improve their productivity, quality of products and/ or environmental conditions • 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.
Tax incentives	• Accelerated depreciation is provided to the customers / users of the energy saving or renewable energy devises under the direct tax laws. • Under indirect taxes, specific concessional rates of duty are only available to CFLs and not to all energy efficient products • 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.

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)	• This fund is to provide equity capital for energy efficiency projects in Government buildings and Municipalities in the first phase. • A single investment by the fund shall not exceed Rs 2 crore • 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
Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE)	• 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. • Guarantees a maximum 50% of the loan (only principal). In case of default, the fund will: o Cover the first loss subject to maximum of 10% of the total guaranteed amount o Cover the remaining default (outstanding principal) amount on

Venture Capital for Energy Efficiency (VCFEE)	• This fund is to provide equity capital for energy efficiency projects in Government buildings and Municipalities in the first phase. • A single investment by the fund shall not exceed Rs 2 crore • 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
	partial basis upto the maximum guaranteed amount • PFI shall take guarantee from the PRGFEE before disbursement of loan to the borrower. • The Guarantee will not exceed Rs 300 lakh per project or 50% of loan amount, whichever is less. • Maximum tenure of the guarantee will be 5 years from the date of issue of the guarantee

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	• Rs. 50 lakh
Type of projects considered for term loans	• Replacement / retrofit of selected equipment with energy efficient equipment • Modification of entire manufacturing processing • Recovery of waste heat for power generation
Incentive available	• Rebate in central excise duty • Rebate in interest rate on term loan • Rebate in prompt payment of loan instalment
Interest rate	• 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 • 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. • Rebate of 0.5% in interest rates are available for projects set up in North Eastern States, Sikkim, J&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.
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	Support for technical /advisory services such as: • Detailed Energy Audit • Support for implementation • Measurement & Verification Financing terms: • Terms loans upto 90% • Interest rate upto 3% below normal lending rate.
TIFAC-SIDBI Revolving Fund for Technology Innovation (Srijan Scheme)	To support SMEs for up-scaling and commercialization of innovative technology based project at flexible terms and interest rate. Preference accorded to sustainable technologies / products. Soft term loan with an interest of not more than 5%.
Partial Risk Sharing Facility for Energy Efficiency (PRSF) Project (supported by World Bank)	Sectors covered: • Large industries (excluding thermal power plants) • SMEs • Municipalities (including street lighting) • Buildings Coverage: • The minimum loan amount Rs 10 lakh and maximum loan amount of Rs 15 crore per project. • The extent of guarantee is 75% of the loan amount
JICA-SIDBI Financing Scheme	• 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.

	• Project uses an Energy Saving Equipment List approach • Equipment/machinery with energy saving potential less than 10% is not eligible. • Interest rate: As per credit rating and 1% below the normal lending rate • 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
KfW-SIDBI Financing Scheme	Coverage a) SMEs for energy efficiency projects b) SMEs and clusters for cleaner production and emission reduction measures, waste management and Common Effluent Treatment Plant (CETP) facilities Interest rate As per credit rating and 1% below the normal lending rate Eligible criteria 3 t CO_2 emission reduction per year per lakh invested List of eligible equipment/technology and potential suppliers developed for guidance

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

Key Features

- Amount : USD 90 million
- Repayment Schedule: First repayment on May 30, 2017 and final repayment date May 30, 2025 (equal instalment)

Eligibility Criteria

- Projects contributing to preservation of global environment, i.e. significant reduction of GHG emissions
- 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.
- Procurement in line with the "Guidelines for Procurement under Untied Loans by Japan Bank for International Cooperation"

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

Purpose	**For acquiring/adopting energy conservation/savings equipment/ measures by SMEs**
Eligibility	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
Maximum loan	Maximum Rs 100 lakhs in the form of term loan
Security	Prime: Assets created out of loan Collateral: Upto Rs.5 lakhs – NIL Above Rs.5 lakhs, as determined by the bank
Repayment	Maximum 5-7 years including moratorium of 6 months
Guarantee cover	Cover available under CGMSE of CGTMSE available for eligible loans
Margin	10% of the project cost
Rate of interest	1% less than the applicable rate
Upfront fee	1% of the loan
Insurance cover	Assets acquired and charged as security to Bank to be insured
Special offer, if any	**Grants :** 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 : Rhino Machines Pvt. Ltd.

Ramprasad Tubes

For replacing 2 Nos ARPA 300, we shall offer one machine FM1 600 x 600 x 150/150 mm @ 60 m/hr rated

II	**MOULDING LINE WITH FM12-M-MP**				
1	Moulding Machines - FM12-M-MP Box Size : 750 x 650 x 250/250 mm Rated Moulding Capacity : 60 moulds/hr Its complete with One Set of Bolster & Stripper Assembly, Hydraulic Cylinders, Guides, Machine Frame, Hydraulic Piping. Completely assembled on one frame, Safety Guards & Machine Covers, Electrical PLC Fabricated Heavy Duty Body, HMI, Operator Station. Power - 12.5 HP	1	No.	69,00,000	69,00,000
2	Online hydraulic oil purifier. (optional for better performance) Drive : 2HP	1	No	2,50,000	2,50,000
3	Cast mould box 750 x 650 x 250/250 mm	50	Pairs	33,000	16,50,000

In order to make the project complete – we have to check whether they have existing or require new facilities such as:

- Hoist & tackle for handling boxes
- Pallet cars for movement of boxes & the track / trolley system
- Sand feeding arrangement for the machine with weighing hopper
- Sand properties – whether they are able to get 1400 to 1500 gcs from their existing sand system
- Sand Control – whether they are able to control & manage the sand consistency for getting best results.

Hope the above details will help in preparing the DPR for them.

In the Multiflex Machine we are not using compressed air for any operation. The air is used for cleaning – blow off, pattern spray, weigh hopper cylinder operation, which needs maybe about 3 HP energy for air.

Sent: Tuesday, April 24, 2018 10:35 AM
To: Manish Kothari <manish@rhinomachine.com>
Subject: Re: Specs sheet of Sand plant 1) Eltex and 2) Ramprasad_Coimbatore

[Quoted text hidden]

Manish Kothari <manish@rhinomachine.com> Tue, Apr 24, 2018 at 7:20 PM
To: Nil Shedge <nil.shedge@gmail.com>

Mixer Value – common for both

RTM 500 – 500 kg batch mixer : Rs 33,25,000 including VFD Panel & Batch Hopper with load cells (Installed Power : 60 HP – consumed power 1.6 kWh/MT of output sand)

Add on:

RTC 103.6 – Sand Controller – Rs 12,50,000

Sand Cooling (Evaporative) with Fluidising blower (VFD Controlled) & Bag Filter – Rs 16,50,000 (Installed power: 15 HP – consumed power not checked as on date)

Total Rs 62,00,000 in case of all equipment purchased together – total power 75 HP

With Best Regards.

Manish Kothari
Managing Director | Director

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Annexure 2: Instruments used

Instruments	Model/ Make	Application	Accuracy
Power analysers	Krykard: ALM32, Krykard: ALM10,	Electrical Parameters Harmonics analysis, power logging	± 0.5%