

Detailed Project Report On High Alumina Grinding Media

Sunrise Pottery Works
Thangadh (Gujarat)



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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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List of abbreviations

BEE	:	Bureau of Energy Efficiency
CO ₂	:	Carbon Dioxide
D/E	:	Debt /Equity
DPR	:	Detailed Project Report
DSCR	:	Debt Service Coverage Ratio
EE	:	Energy Efficient
GEF	:	Global Environmental Facility
GHG	:	Green House Gas
HSD	:	High Speed Diesel
IDC	:	Investment without interest defer credit
IGBT	:	Insulated-gate Bipolar Transistor
IGDPR	:	Investment Grade Detailed Project Report
IRR	:	Internal Rate of Return
kW	:	Kilo Watt
kWh	:	Kilo Watt Hour
LSPs	:	Local Service Providers
MSME	:	Micro, Small and Medium Enterprises
MT	:	Metric Tonne
NG	:	Natural Gas
NPV	:	Net Present Value
O&M	:	Operation and Maintenance
PCB	:	Pollution control board
RE	:	Renewable Energy
ROI	:	Return On Investment
SCM	:	Standard Cubic Meter
SME	:	Small and Medium Enterprises
SPP	:	Simple Payback Period
TERI	:	The Energy and Resources Institute
Toe	:	Tonnes of oil equivalent
UNIDO	:	United Nations Industrial Development Organization
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 Sunrise Pottery Works
Constitution	Partnership
MSME Classification	Small
No. of years in operation	52
Address: Registered Office:	Post Box No. 51, Amrapar, Thangadh - 363530, Gujarat,
Industry-sector	Sanitary ware (Ceramic)
Products manufactured	Ceramic Pedestal Wash Basins, Ceramic Wash Basins, Ceramic Water Closets, Ceramic Urinals, Ceramic Bidets, Ceramic Shower Trays, Squatting Pan etc.
Name(s) of the promoters/ directors	Mr. Kirti Bhai Maru Mr. Ashwin Bhai Maru
Existing banking arrangements along with the details of facilities availed	Bank of Baroda

Brief highlights of the past financial position of the MSME unit

		(Rs lakh)
		FY 2018
S. No	Particulars	(Audited)
1	Total income	633
2	Net profit	38

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 plant is consuming about 232,521 kWh of electricity per year. The annual consumption of the HSD is 1,500 litres and natural gas is 345,000 SCM. The total energy consumption of the unit during last 12 months is estimated to be 329 toe which is equivalent to 116.7 lakh rupees. The total CO₂

emission during this period is estimated to be 798 tonnes. Electricity, HSD and NG were considered for CO₂ emission estimation.

The unit manufactures the ceramic pedestal wash basins, ceramic wash basins, ceramic water closets, ceramic urinals, ceramic bidets, ceramic shower trays, and squatting pan etc. The total annual production of the unit during 2017-18 is estimated to be about 40,000 pieces. The major source of energy is natural gas, consume in the kiln and electricity consume in utilities and lighting.

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 ball mill grinding media with high alumina (68%) media	18,333	2.34	1.4	1.7	15

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 CO₂ 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	2.35	2.35	2.35
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	36.31	32.09	33.30
4	NPV	Rs. In Lakh	1.62	1.29	1.38
5	DSCR	-	-	2.1	0.92

¹ Investment includes grinding media cost of Rs. 1.07 lakh and lining & miscellaneous cost of Rs. 1.27 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 Sunrise Pottery works	
2	Constitution	Partnership	
3	DIC Number	24-008-12-00422	
4	PCB consent No.	PCB ID: 20450	
5	Date of incorporation / commencement of business	1974	
6	Name of the Contact Person	Mr. Ashwin Bhai Maru	
7	Mobile / Ph. No	91-9825215642	
8	Address: Registered Office	Post Box No. 51, Amraprapar, Thangadh - 363530, Gujarat,	Owned
9	Factory	Post Box No. 51, Amraprapar, Thangadh - 363530, Gujarat,	Owned
10	Industry / Sector	MSME/Manufacturing	
11	Products Manufactured	Manufacturer, exporter and supplier of designer wash basin, wash basin, ceramic wash basin, Indian toilet seats, urinal, antique wash basin, sanitary	
12	No of hours of operation/shift	12	
13	No of shifts/ day	02	
14	No of days/year	350	
15	Installed Capacity	500 MT per year	
16	Whether the unit is exporting its products (Yes/ No)	Yes	
17	Quality Certification, if any	ISO 9001 : 2015	

2.0 Energy profile

2.1 Process flow diagram

Manufacturing of ceramic item uses wide range of raw material combination to produce different shape, size and colour. It requires both electrical and thermal energy at different stages of the process to operate the ball mill, casting/moulding, kilns, cutting & finishing machines and utilities such as motors, pumps air compressor etc. Ceramic manufacturing process primarily consists of mould preparation, body material preparation, shaping, drying and firing. Typical process flow chart is shown with figure 2.1.

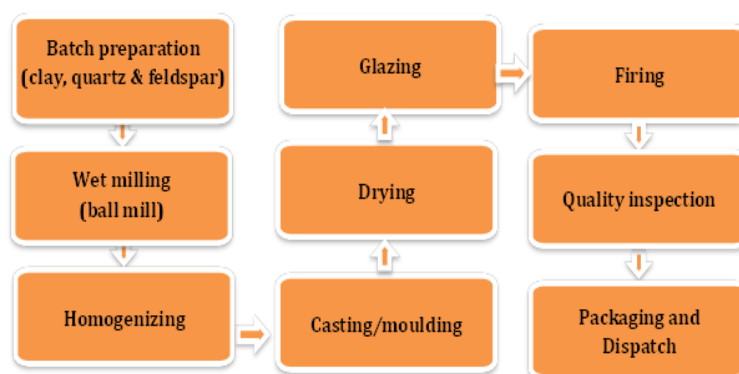


Figure 2.1 Process flow chart

2.2 Details of technology identified

The details of the ball mill installed in the unit are given in table 2.2.

Table 2.2 Details of ball mill

Parameters/ Equipment ID	Value
Equipment	Ball mill
Rated capacity (tonnes)	6
Size of the mill	8 X 10
Type of grinding media	Natural Pebbles
Density of grinding media (kg/m ³)	2.4
Motor rating, kW	30
Water addition (kl per batch)	2.4
Mode of operation (batch/continuous)	Batch
Batch duration (Hours)	5

2.3 Energy used and brief description of their usage pattern

The unit uses grid power supplied by Paschim Gujarat Vij Company Ltd under the tariff category LTMD. 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	NG	Kiln

S No	Energy source	Description of use
3	HSD	For diesel generator (backup power during power cuts)

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	LTMD
Demand charges	<ul style="list-style-type: none"> For first 40 kW of billing demand Rs. 98/kW/month Next 20 kW of billing demand Rs. 130/kW/month Above 60 kW of billing demand Rs. 195/kW/month
Energy charges	Rs. 4.60/ kWh
Reactive energy charges	Rs. 0.10/ kVAh

2.5 Analysis of electricity consumption

Table 2.5: Electricity consumption profile

Month & Year	Total electricity consumption (kWh)	Sanctioned load/demand (kW)	Power factor	Recorded demand, kVA	Demand charges (Rs)	Energy charges (Rs)	Monthly bill (Rs)
Oct-17	20,083	75	0.96	63	8,345	82,708	122,565
Nov-17	17,513	75	0.96	82	10,730	114,724	169,285
Dec-17	18,430	75	0.95	80	10,100	117,259	179,945
Jan-18	21,481	75	0.94	86	11,696	110,492	167,106
Total	232,521	-	-	-	122,613	1,275,549	1,916,703

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

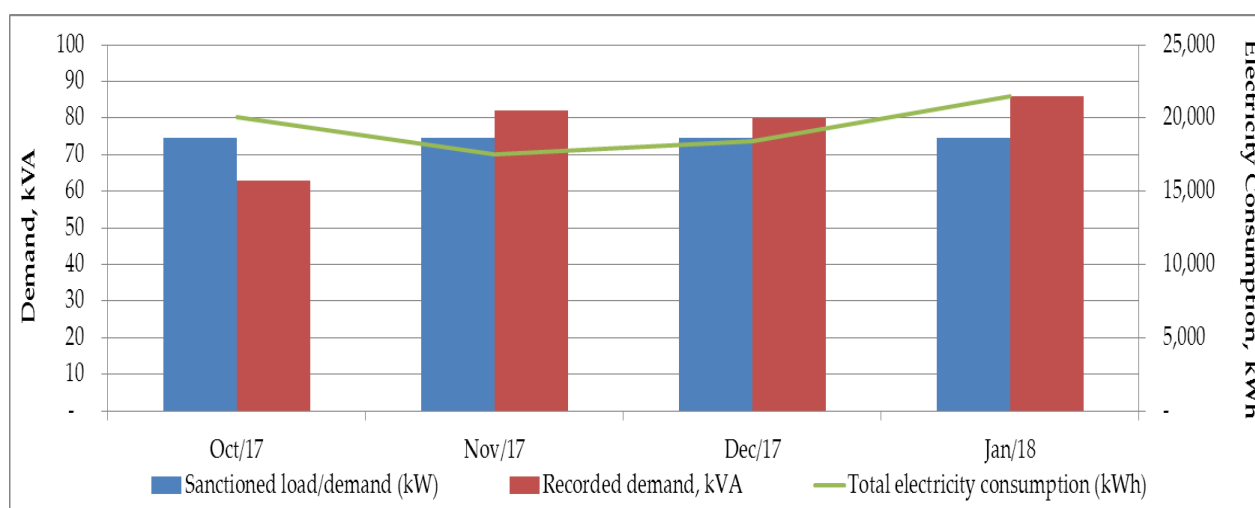


Figure 2.5: Demand pattern and energy consumption profile

2.6 Analysis of other energy forms/ fuels

The analysis of the other fuels/forms of energy used in the unit is given in table 2.6.

Table 2.6: Analysis of other energy/ fuel consumption

Parameters	NG (SCM)	HSD (Litre)
Consumption unit/year	3,45,000	1,500
Calorific value per unit	8,935	9,202
Equivalent toe per year	308.3	1.4
Price (Rs per unit)	28.0	60.0
Total price per year	96,60,000	90,000

The share of various energy forms used in the unit is given in figure 2.6.

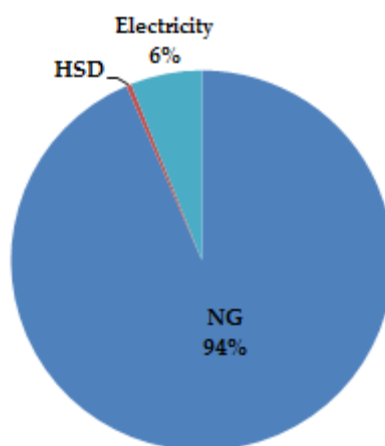


Figure 2.6: Percentage share of various fuel types in the unit

The plant is consuming about 232,521 kWh of electricity per year. The annual consumption of the HSD is 1,500 litres and natural gas is 345,000 SCM. The total energy consumption of the unit during last 12 months is estimated to be 329 toe which is equivalent to 116.7 lakh rupees. The total CO₂ emission during this period is estimated to be 798 tonnes. Electricity, HSD and NG were considered for CO₂ 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 ball mill grinding media with high alumina (68%) media

3.1.1 Background

The Sunrise Pottery works is manufacturing sanitary ware such as designer ceramic wash basin, Indian as well as western toilet seats, urinal etc. To prepare the raw material for body casting, wet grinding technology has been used in which two ball mills of capacity of 6 tonnes each is installed in the plant. The operational parameters including the electricity consumption and material loaded were measured during the detailed assessment study.

3.1.2 Observations and analysis

The grinding media used in the ball mills are natural pebble of different sizes (figure 3.1.2a). The density of the natural pebble is 2.4 kg/m^3 . The drawback of natural pebble is uneven shape and size. Due to uneven shape and size, the grinding time to achieve the desired residue is estimated to be 5-6 hours per batch. The specific power consumption of the grinding is estimated to be 16.85 kWh per tonne based on the total electricity consumption measured during the assessment study.



Figure 3.1.2a: Natural pebbles (existing grinding media)

The material addition practices also discussed and found that approximate 6.6 tonne per year grinding media addition is required in the case of natural pebble, which is increasing the operational cost also.

3.1.3 Recommendation

It is recommended to replace the existing natural grinding media with high alumina (68%) balls of desired sizes. The density of high alumina balls (68%) is about 3.2 kg/m^3 and shape is even in all sizes. As compared with natural pebble grinding media, the alumina grinding ball has better performance in wear resistance, uniform size, high density and high mechanical strength. The high density and ultra-hardness of the alumina grinding ball enable the increase of ball mill loading. The alumina grinding ball is compact and uniform in shape, the collide probability increased and grinding efficient increased. The alumina grinding ball can assure



Figure 3.1.2b: High alumina balls

less contamination to the raw material and keep them chemical composition stabilized. The specific power consumption of the ball mill with high alumina grinding media is estimated to be 12.5 kWh per tonne based on the discussion with suppliers. The grinding media consumption rate for the high alumina balls (68%) will be about 2.9 tonne per year per ball mill which will further reduce the operational cost.

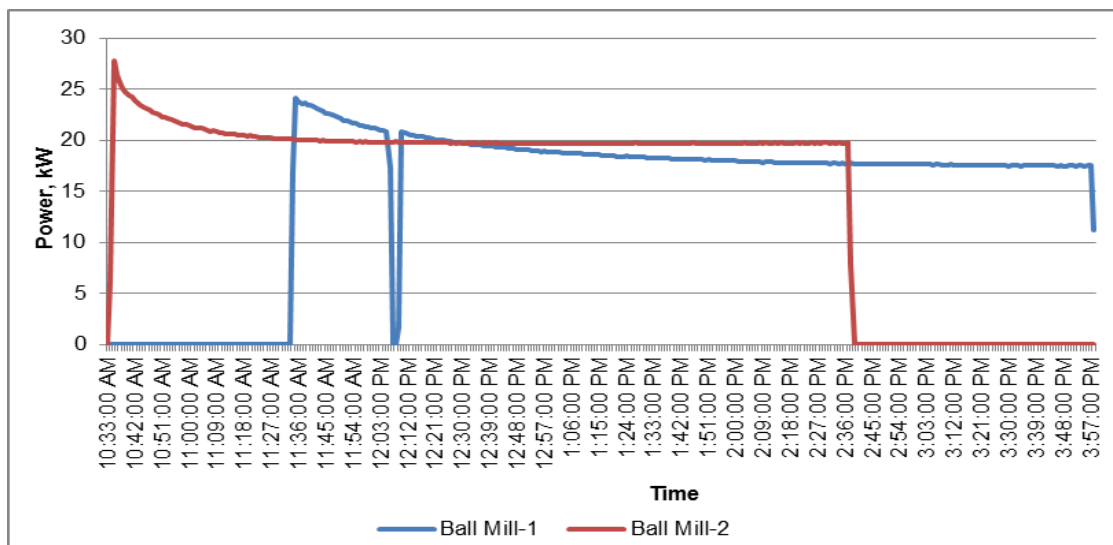


Figure: 3.1.2c: Power consumption trend of ball mills

3.2 Cost benefit analysis

The estimated saving in annual operation cost by replacement of existing grinding media is Rs. 1.4 lakhs for three operating ball mills. The investment requirement is Rs 2.3 lakh with a simple payback period of 1.7 years. The detailed calculations of the recommended energy conservation measures for DPR are provided in table 3.2.

Table 3.2: Cost benefit analysis for recommended energy savings measures

Parameters	Unit	Natural (river stone)	Alumina (68%)
Weight of grinding media	tonne	6	6
Density	kg/m ³	2.4	3.2
Body preparation material	tonne	6	6
Water addition	kL	2.4	2.4
Average running hours	hours/bat ch	5	4
Batches per day	No.s	2	2
Number of operating days	days/year	350	350
Average power input	kW	20.2	18.7
Average unit consumption	kWh/batc h	101.2	75.0
Cost of electricity	Rs./kWh	8.33	8.3
Operating cost of electricity	Rs/year	5,89,666	4,36,988
Annual addition of grinding media	tonne	6.6	2.9
Cost of grinding media	Rs./tonne	10,000	27,000
Cost of addition of grinding	Rs./year	66,000	77,760

Parameters	Unit	Natural (river stone)	Alumina (68%)
media			
Total operating cost	Rs/Year	6,55,666	5,14,748
Annual monetary benefits	Rs/Year	-	1,40,918
Investment ²	Rs.	-	2,34,667
Simple payback period	Years	-	1.7

3.3 Pre-training requirements

NA

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 CO₂ reduction³

Implementation of the selected energy conservation measures in the unit may result in reduction in CO₂ emissions due to reduction in overall energy consumption. The estimated reduction in GHG emission by implementation of the recommended energy conservation measures is 15 tonne of CO₂ 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.

² Quotation – 1 has been considered for estimation of investments

³ Source for emission factor: 2006 IPCC Guidelines for National Greenhouse Gas Inventories & electricity: CO₂ 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	Advantage	Disadvantage
1	Al ₂ O ₃ percentage 68% SiO ₂ + Fe ₂ O ₃ + CaO + others = 32% Water Absorption: = 0.02% Bulk Density (g/cm ³) = 3.00 Self-Wear Rate (24h) = 0.03%	Olive Merchandise Vaibhav Plaza, GF-19 Lakhdirpur Road Morbi - 363642 Gujarat, India Mr. Kashyap Koringa (08048582415)	-	-
2	Al ₂ O ₃ percentage 68% SiO ₂ + Fe ₂ O ₃ + CaO + others = 32% Water Absorption: = 0.02% Bulk Density (g/cm ³) = 3.00 Self-Wear Rate (24h) = 0.03%	Face Impex Private Limited No. 58/88, Shakti Chamber, 8A, National Highway Old Morbi Morbi - 363641 Gujarat, India Mr. Nitin Bopaliya (09714009174)	-	-
3	Al ₂ O ₃ percentage 68% SiO ₂ + Fe ₂ O ₃ + CaO + others = 32% Water Absorption: = 0.02% Bulk Density (g/cm ³) = 3.00 Self-Wear Rate (24h) = 0.03%	Supercon Engineers Air Systems No. 293/4, Govindpuri, Kalkaji Govindpuri New Delhi - 110019 Delhi, India Mr. Harish Chauhan (08048077658)	-	-

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	2.35	0.70	1.17
2	Internal Accruals	-	-	-
3	Interest free unsecured loans	-	-	-
4	Term loan proposed (Banks/FIs)	-	1.64	1.17
5	Others	-	-	-
	Total	2.35	2.35	2.35

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
General about unit				
No of working days	Days		300	
No of shifts per day	Shifts		3	
Annual operating hours	Hrs/year		7,200	
Installed production capacity	tonnes/year		500	
Production in last financial years	tonnes/year		360	
Capacity utilization factor	%		72	
Proposed investment (Project)				
Total cost of the project	Rs. (in Lakh)	2.4	2.4	2.4
Investment without interest defer credit (IDC)	Rs. (in Lakh)	2.4	2.4	2.4
Implementation time	Months	3.0	3.0	3.0
Interest during the implementation phase	Rs. in lakhs	-	0.01	0.01
Total investment	Rs. in lakhs	2.3	2.4	2.4
Financing pattern				
Own funds	Rs. in lakhs	2.4	0.7	1.2
Loan funds (term loan)	Rs. in lakhs	-	1.6	1.2
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		1.4	
Total saving	Rs. lakh/year		1.4	
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)	2.35	2.36	2.35
Cash flow as annual saving (Rs. In lakh/year)	1.41	1.41	1.41
O&M Expenses for first year (Rs. In lakh/year)	0.12	0.12	0.12
Net Cash flow (Rs. In lakh/year)	1.29	1.29	1.29
SPP (months)	21.80	21.90	21.87
Considered (month)	21.80	21.90	21.90

4.2.3 NPV and IRR

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

Particulars / years	0	1	2	3	4	5
	(Rs. in lakhs)					
Profit after tax	-	0.91	0.80	0.49	0.47	0.46
Depreciation	-	0.38	0.38	0.38	0.38	0.38
Cash outflow	2.35	-	-	-	-	-
Net cash flow	-2.35	1.29	1.18	0.87	0.85	0.84
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	-2.35	1.18	0.98	0.67	0.59	0.54
Net present value	1.62					
Simple IRR considering regular cash flow	36.31%					

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	-	0.83	0.73	0.41	0.41	0.43
Depreciation	-	0.38	0.38	0.38	0.38	0.38
Cash outflow	2.36	-	-	-	-	-
Net cash flow	-2.36	1.21	1.11	0.79	0.79	0.81
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	-2.36	1.10	0.92	0.59	0.54	0.50
Net present value	1.29					
Simple IRR considering regular cash flow	32.09%					

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	-	0.85	0.75	0.43	0.43	0.43
Depreciation	-	0.38	0.38	0.38	0.38	0.38
Cash outflow	2.35	-	-	-	-	-
Net cash flow	-2.35	1.23	1.13	0.82	0.81	0.82
Discount rate % @ WACC	9.90	9.90	9.90	9.90	9.90	9.90

Particulars / years	0	1	2	3	4	5
Discount factor	1.00	0.91	0.83	0.75	0.69	0.63
Present value	-2.35	1.12	0.94	0.62	0.55	0.51
Net present value	1.38					
Simple IRR considering regular cash flow	33.30%					

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/UAE
Locational advantages	-
Any USP or specific market strength	-
Whether product has multiple applications	NA
Distribution channels (e.g. direct sales, retail network, distribution network)	Direct sales/ Through market
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 for various scenarios which may affect the return on investment is 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	19.70	1.98	41.89	-	21.88
		70:30	19.70	1.64	37.71	2.12	32.47
		50:50	19.70	1.74	38.90	0.92	28.28
2	10% reduction in estimated savings	100% equity	24.50	1.26	30.62	-	18.15
		70:30	24.60	0.93	26.32	2.12	28.41
		50:50	24.50	1.02	27.55	0.92	24.13
3	10% rise in interest rates	70:30	21.90	1.20	31.64	2.12	30.52
		50:50	21.90	1.32	32.98	0.92	26.29
4	10% reduction in interest rates	70:30	21.90	1.38	32.53	2.12	30.80
		50:50	21.90	1.45	33.61	0.91	26.50

5.0 Conclusions & recommendations

The DPR prepared for the replacement of existing grinding media by high alumina grinding media based on the performance assessment study conducted at unit and the acceptance of the unit management. The brief of selected energy conservation measures is given below.

5.1 List of energy conservation measures

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

Table 5.1: summary of the energy conservation measures

Technology	Annual energy saving	Investment (Rs lakh)	Monetary savings	Simple payback period (Years)	Emission reduction (tonnes of CO ₂)
	Electricity (kWh)		(Rs lakh/year)		
Replacement of existing ball mill grinding media with high alumina (68%) media	18,333	2.3	1.4	1.7	15.0

These measures have an estimated investment of 2.3 lakh rupees and can yield a savings of 1.4 lakh rupees per year. The total annual reduction in emission by implementation of recommended measures is estimated to be 15 tonnes of CO₂. 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	2.35	2.35	2.35
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	36.31	32.09	33.30
4	NPV	Rs. In Lakh	1.62	1.29	1.38
5	DSCR	-	-	2.1	0.92

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	<p>Assessment process, fee and subsidy are as follows:</p> <p>Online (e-Platform) self-assessment: Nil fee</p> <p>Desk Top assessment : Rs 10,000 per SME</p> <p>Complete assessment : Rs 80,000 ZED rating per SME; Rs 40,000 for additional ZED defence rating; Rs 40,000 for re-rating</p> <p>The rating costs will include cost of Rs 10,000/- as certification cost by QCI.</p> <p>Subsidy for Micro, Small and Medium Enterprises are 80%, 60% and 50% respectively.</p>
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)	<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"> 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"> 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
	<ul style="list-style-type: none"> • 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 <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"> • 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	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> ○ Cover the first loss subject to maximum of 10% of the total guaranteed amount ○ Cover the remaining default (outstanding principal) amount on

Venture Capital for Energy Efficiency (VCFEE)	<ul style="list-style-type: none"> • 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
	<p>partial basis upto the maximum guaranteed amount</p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Rs. 50 lakh
Type of projects considered for term loans	<ul style="list-style-type: none"> • Replacement / retrofit of selected equipment with energy efficient equipment • Modification of entire manufacturing processing • Recovery of waste heat for power generation
Incentive available	<ul style="list-style-type: none"> • Rebate in central excise duty • Rebate in interest rate on term loan • Rebate in prompt payment of loan instalment
Interest rate	<ul style="list-style-type: none"> • 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	<p>Support for technical /advisory services such as:</p> <ul style="list-style-type: none"> • Detailed Energy Audit • Support for implementation • Measurement & Verification <p>Financing terms:</p> <ul style="list-style-type: none"> • Terms loans upto 90% • Interest rate upto 3% below normal lending rate.
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"> • Large industries (excluding thermal power plants) • SMEs • Municipalities (including street lighting) • Buildings <p>Coverage:</p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.

	<ul style="list-style-type: none"> • 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	<p>Coverage</p> <ul style="list-style-type: none"> 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 <p>Interest rate</p> <p>As per credit rating and 1% below the normal lending rate</p> <p>Eligible criteria</p> <p>3 t CO₂ 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><u>Key Features</u></p> <ul style="list-style-type: none"> • Amount : USD 90 million • Repayment Schedule: First repayment on May 30, 2017 and final repayment date May 30, 2025 (equal instalment) <p><u>Eligibility Criteria</u></p> <ul style="list-style-type: none"> • 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”
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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

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)

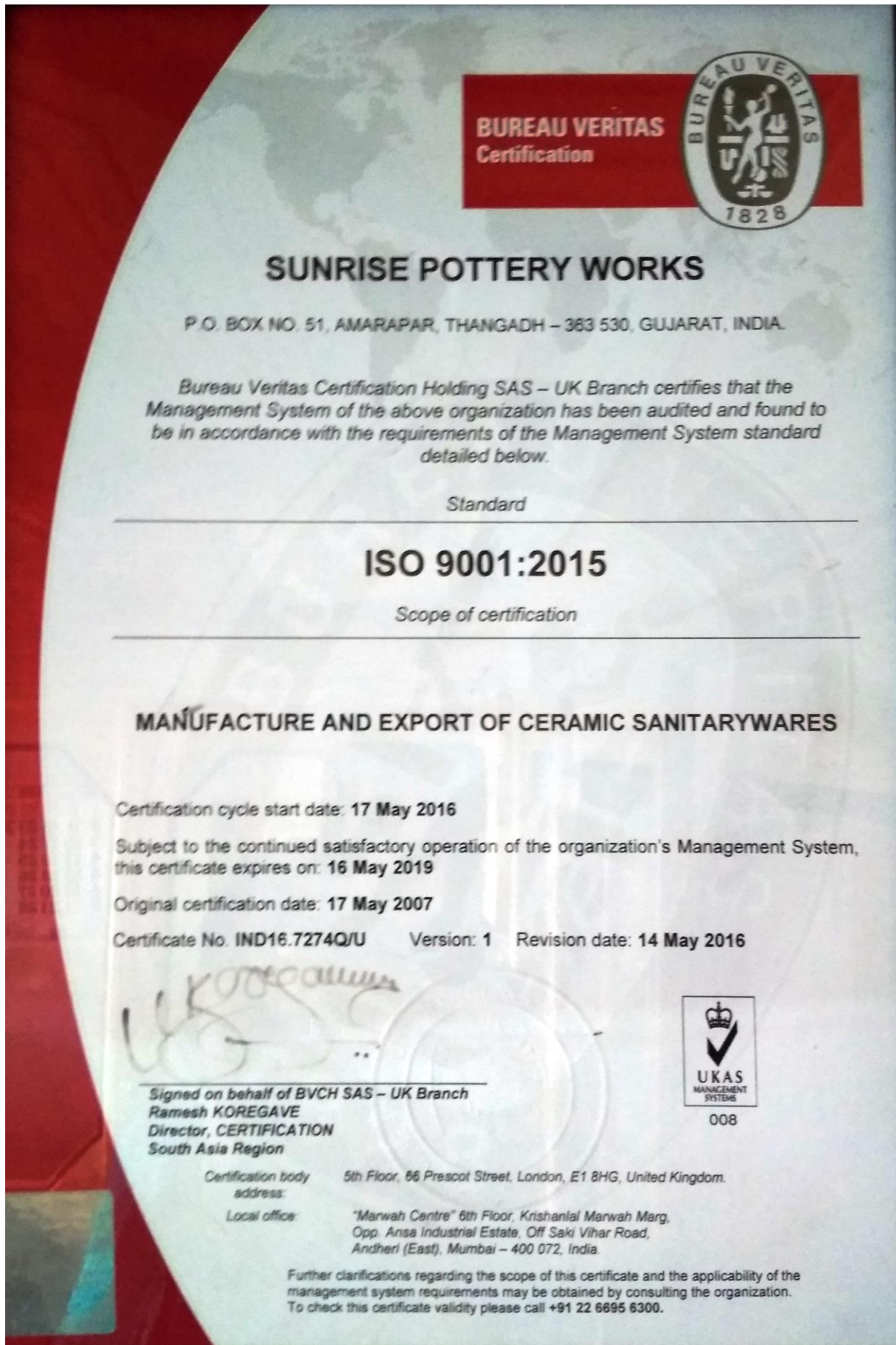
Among the private sector banks in India, Yes Bank is also active in financing of renewable energy and energy efficiency projects. The bank has an MOU with SIDBI for providing funding for EE through PRSF.

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

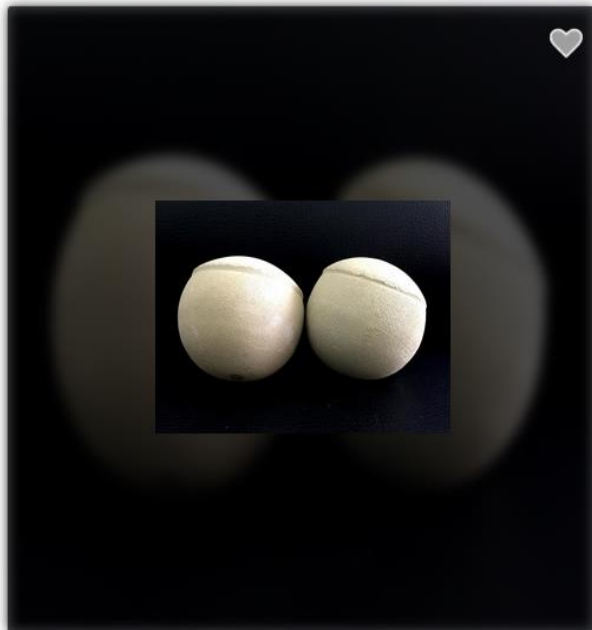
Annexure 1: Copy of certificates from the competent authorities





Annexure 2: Budgetary offers / quotations

Quotation - 1: Olive Merchandise



Medium Alumina Grinding Ball

Color: White

Rs 25/Kilogram



Olive Merchandise

Lakhdirpur Road, Morbi, Gujarat

Send to my mobile

Call this Supplier

08048582415

Nature of Business: Importer

Delivery Location: Deals In India As Well As Global

Contact Supplier

Have a question?

Get Latest Price

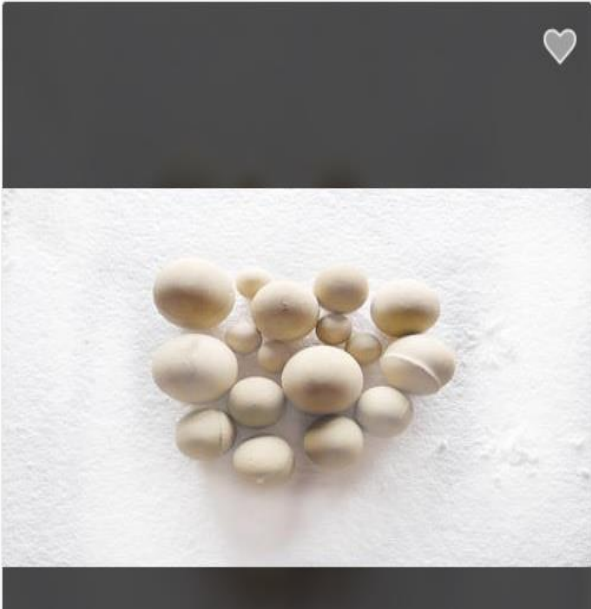
Request a quote

Product details:

Color White

Minimum Order Quantity 5000 Kilogram

Quotation - 2: Face Impex Pvt. Ltd.



Alumina Ceramic Balls

Physical State: solid
Grade Standard: Reagent Grade, Technical Grade
Rs 25/Kilogram

Face Impex Private Limited
Old Morbi, Morbi, Gujarat
Send to my mobile
Call this Supplier
09714009174

Response Rate: 71%
Nature of Business: Importer
Delivery Location: Deals In India As Well As Global

Contact Supplier
Have a question?

Get Latest Price
Request a quote

Quotation - 3: Supercon Engineers Air Systems



Alumina Ceramic Balls

Material: Alumina Ceramic
Moh's Hardness: More than 9
Rs 55/Kilogram



Supercon Engineers Air Systems

Govindpuri, New Delhi, Delhi

Send to my mobile

[Call this Supplier](#)
08048077658

Response Rate: 97%
Nature of Business: Manufacturer
Delivery Location: All Over India

[Contact Supplier](#)
Have a question?

[Get Latest Price](#)
Request a quote

Product details:

Material	Alumina Ceramic
Moh's Hardness	More than 9

Annexure 3: Instruments used

Instruments	Model/ Make	Application	Accuracy
Power analysers	Fluke: 435, Fluke: 43B,	Electrical Parameters Harmonics analysis, power logging	$\pm 0.5\%$
Thermal imager	875-2/Testo	Surface Temperature & Image	$\pm 2\%$
Infrared thermometer	Testo: 845	Surface Temperature	$\pm 0.75\%$ of mv