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Detailed Project Report
On
EE Compressed Air Network

Amrut Ceramic
Thangadh (Gujarat)

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
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 Amrut Ceramic
Constitution	Partnership
MSME Classification	Small
No. of years in operation	8
Address: Registered Office:	Tarnetar Road, Thangadh Gujarat-363 530
Industry-sector	Ceramic
Products manufactured	Sanitary ware
Name(s) of the promoters/ directors	Mr Nitin B Shah Mrs. Savita Ben B Shah
Existing banking arrangements along with the details of facilities availed	HDFC Bank Limited

Brief highlights of the past financial position of the MSME unit

(Rs lakh)

S. No	Particulars	FY 2018 (Audited)
1	Total income	162.8
2	Net profit	5.32

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 plant is consuming about 161,682 kWh of electricity per year. The annual consumption of the NG is 269,216 SCM and HSD is 2,400 litres. The total energy consumption of the unit during last 12 months is estimated to be 249 toe which is equivalent to 85 lakh rupees. The total CO_2 emission during this period is

estimated to be 610 tonnes. Electricity, HSD and NG were considered for CO_2 emission estimation.

The unit manufactures the ceramic sanitary ware. The total annual production of the unit during 2017-18 is estimated to be 17,500 pcs per month.

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)
Replacing existing compressed air piping network with seamless piping	35,760	4.5	2.7	1.7	29.3

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	4.5	4.5	4.5
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	35.9	31.6	32.8
4	NPV	Rs. In Lakh	3.0	2.4	2.6
5	DSCR	-	-	2.1	0.9

[1] Investment including compressed air distribution network – Rs. 3.78 lakh (ii) taxes and miscellaneous – Rs. 0.68 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 Amrut Ceramic	
2	Constitution	Partnership	
3	MSME Registration No/UAN	Certificate enclosed	
4	PCB consent No.	PCB ID: NA	
5	Date of incorporation / commencement of business	2007	
6	Name of the Contact Person	Mr Nitin B Shah	
7	Mobile / Ph. No	+91-9825222883	
8	Email	-	
9	Address: Registered Office	Tarnetar Road, Thangadh, Gujarat - 363530	Owned
10	Factory	Tarnetar Road, Thangadh, Gujarat - 363530	Owned
11	Industry / Sector	MSME/Ceramic	
12	Products Manufactured	Sanitary ware	
13	No of hours of operation/shift	8	
14	No of shifts/ day	3	
15	No of days/year	300	
16	Installed Capacity	350 MT per month	
17	Whether the unit is exporting its products (Yes/ No)	Yes	
18	Quality Certification, if any	NA	

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.

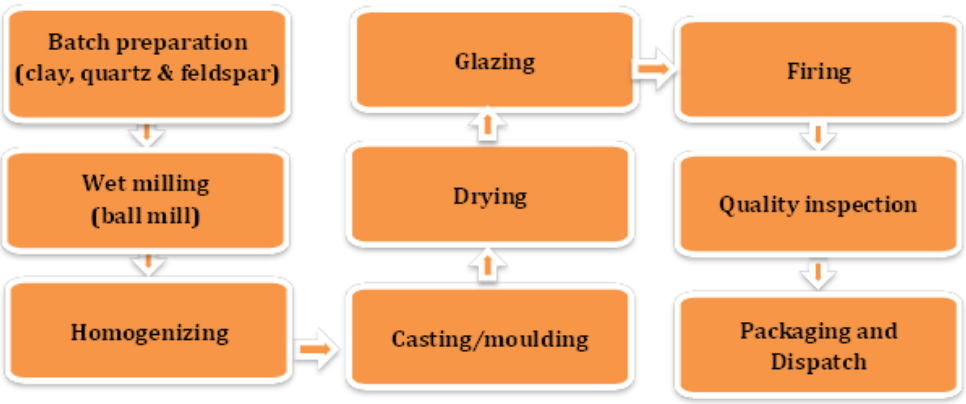

Figure 2.1: Process flow chart

2.2 Details of technology identified

The details of the compressed air system in the unit are given in table 2.2.

Table 2.2: Details of existing compressed air system

Particulars	Unit	Compressor – 1
Make	-	IR
Type	-	Receiver
Model No.	-	-
Year of Installation	-	2007
Purpose	-	Process air
Capacity of receiver	M^3	1
Rated Capacity	M^3/Min	4.25

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
3	NG	Kiln

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	• 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/ kVArh

2.5 Analysis of electricity consumption

Table 2.5: Electricity consumption profile

Month & Year	Total electricity consumption (kWh)	Reactive Chargers (Rs for kVArh)	Sanctioned load/demand (kW)	Power factor	Recorded demand, (kW)	Demand charges (Rs)	Energy charges (Rs)	Monthly bill (Rs)
Jan-18	15,190	1,064	55	0.819	55	5,550	69,874	112,827
Feb-18	16,186	1,075	55	0.833	60	6,875	74,455	119,785
Mar-18	9,678	685	55	0.816	58	6,610	44,518	74,504
Apr-18	12,840	843	55	0.836	47	4,510	56,064	93,796
Average	**13,474**	**917**	**55**	**0.83**	**55**	**5,886**	**61,228**	**100,228**
Total	**161,682**		**-**	**-**	**-**	**70,635**	**734,733**	**1,202,736**

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

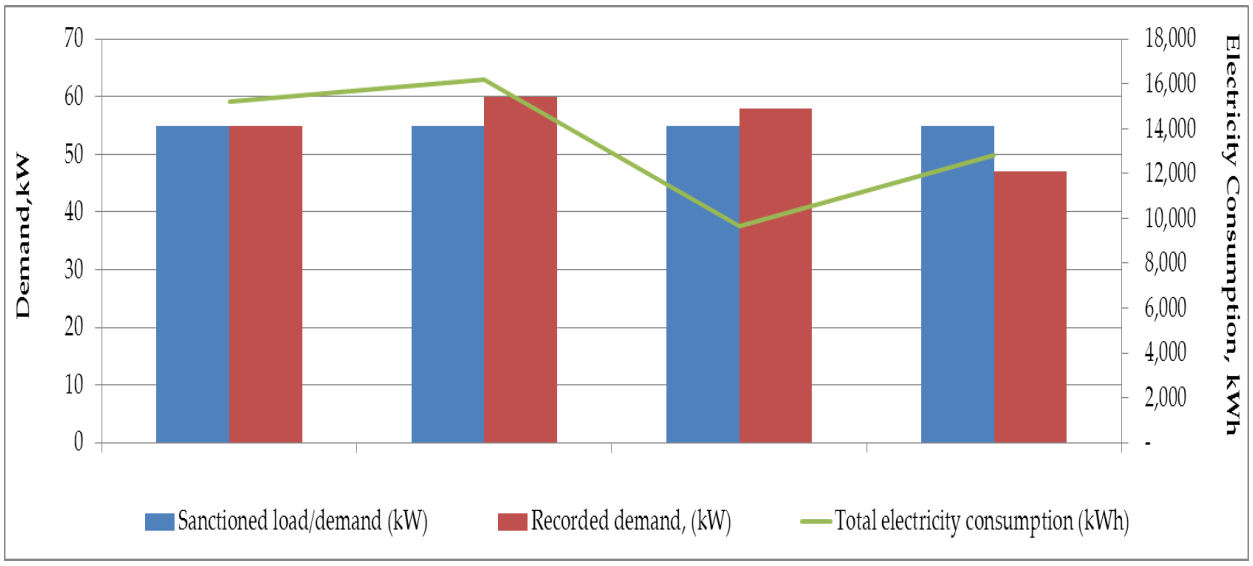

Figure 2.5: Demand pattern and energy consumption profile

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 (Liters)
Consumption unit/year	269,216	2,400
Calorific value per unit	8,650	9,202
Equivalent toe per year	232.9	2.2
Price (Rs per unit)	26.6	60.5
Total price per year	7,160,248	145,200

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

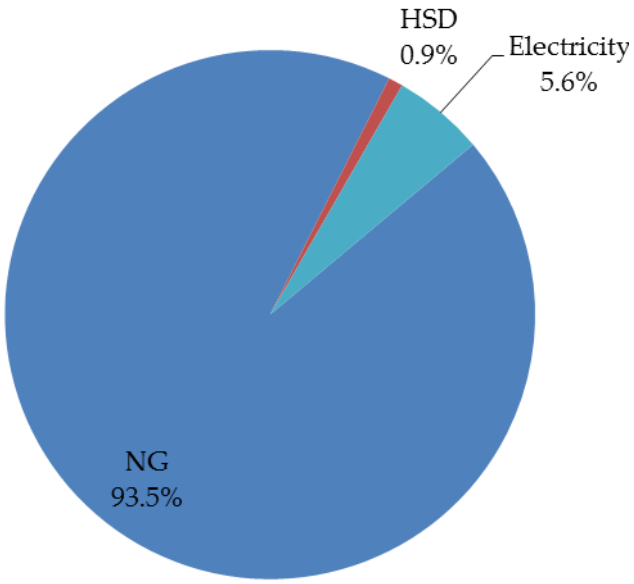

Figure 2.6: Percentage share of various fuel types in the unit

The plant is consuming about 161,682 kWh of electricity per year. The annual consumption of the NG is 269,216 SCM and HSD is 2,400 litres. The total energy consumption of the unit during last 12 months is estimated to be 249 toe which is equivalent to 85 lakh rupees. The total CO_2 emission during this period is estimated to be 610 tonnes. Electricity, HSD and natural gas were 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 Replacing existing compressed air piping network with seamless pimping network

3.1.1 Background

To cater to the compressed air need of the molding as well as glazing section, the plant has installed rotary screw compressor with variable speed drive. The capacity of the air compressor is 2.12 cubic meter per minute with installed motor of 15kW. The compressed air distribution network is parted into two areas (i) gazing section – flexible pipes (ii) molding section – the main header is MS pipe and distribution to battery system is flexible piping.

3.1.2 Observations and analysis

During the assessment study, leakage & pressure drop survey study of the compressed air distribution network conducted and it was found that there was enormous amount of compressed air leakages through different junction points, instruments regulator valve and supply valves in distribution network. Overall leakage of compressed air is estimated to be 54%. The all leakage points were highlighted to the plant team during the survey.

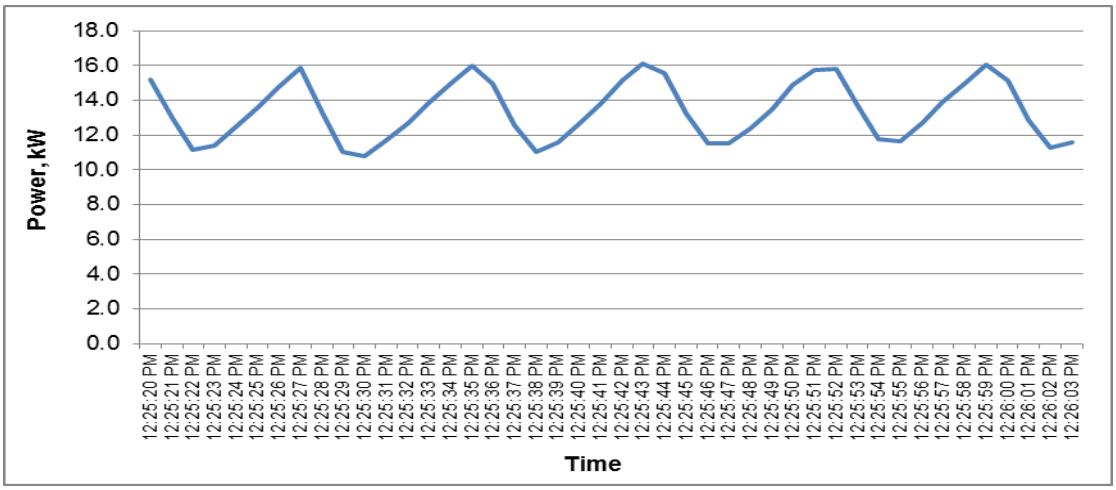

Figure 3.1.2: Power consumption trend of air compressor

3.1.3 Recommendation

Leaks are significant source of energy wastage in a compressed air system. Compressed air leaks can also contribute to problems with system operations, including:

- Fluctuating system pressure, which can cause air tool and other air-operated equipment to function less efficiently, which possibly affects the production.
- Excess compressor capacity, resulting in necessary increase in cost.
- Decreased service life and increased maintenance of supply equipment (including the compressor package) due to unnecessary cycling and increased run time.

By installing seam less pipes with suitable application specific nozzles, taking the necessary maintenance practices and periodic inspection of distribution network, it would be possible to reduce the air leakages significantly. Although leaks can occur in any part of the system, the most common problem areas are: couplings, hoses, tubes, pipe joints, valves, thread sealants, and point of use devices. Leakage rates are a function of the supply pressure in an uncontrolled system and increase with higher system pressures. Leakage rates are also proportional to the square of the orifice diameter.

Table 3.1.3: Leakage rates for different supply pressure

Leakage rates [a] (cfm) for different supply pressure and approximately equivalent orifice sizes						
Pressure (psig)	Orifice Diameter (inches)					
	1/64	1/32	1/16	1/8	1/4	3/8
70	0.3	1.2	4.8	19.2	76.7	173
80	0.3	1.3	5.4	21.4	85.7	193
90	0.4	1.5	5.9	23.8	94.8	213
100	0.4	1.6	6.5	26.0	104	234
125	0.5	2.0	7.9	31.6	126	284

*For well-rounded orifices, multiply the values by 0.97, and for sharp-edged orifices, multiply the values by 0.61.

Leakages was observed in different sections of the plant during the study and cumulative air losses due to leakages is estimated to be 1.58 cubic meter per min, which resulted in additional power consumption of 13.24 kW.

3.2 Cost benefit analysis

The estimated saving in annual operation cost by replacement of existing air compressor pipe lining is Rs. 2.7 lakhs. The investment[2] requirement is Rs 4.5 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.

[2] Quotation – 1 has been considered for estimation of investments

Table 3.2: Cost benefit analysis for recommended energy savings measures

Particulars	Unit	Values
Total installed capacity	m^3/min	2.12
Actual air delivery	m^3/min	2.93
Actual demand of the compressed air	m^3/min	1.35
Compressed air leakage	m^3/min	1.58
Percentage loss in leakage	%	54
Specific Power Consumption	kW/m^3/min	8.8
Annual reduction of power consumption by avoiding leakage	kWh/annum	35,760
Annual monetary benefit	Rs in lakh	2.66
Capital cost for installation of seamless pipe	Rs in lakh	4.5
Simple payback period	Rs	1.7

3.3 Pre-training requirements

Not required

3.4 Process down time for implementation

The estimated process down time required for implementation of recommended measure is estimated to be 3-5 days.

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 29.3 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	Advantage	Disadvantage
1	Pneumatic Piping system • 90Mm X 5.8 mtr Alu. Pipe • 90mm Connector • 90mm Equal Elbow • 90mm Equal Tee • 90mm X 3" Adaptor • 3" Ball Valve • 90mm Pipe Clip • 20mm X 4mtr Alu. Pipe • 20mm X 1/2" Adaptor • 20 MM ELBOW • 20mm Pipe Clip • 1/2" Ball Valve • 90mm X " Saddle • 3" Flange	Avadhesh Agencies 13, Vijay Plot, Gondal Road, Opp Dharti Honda Show Room Rajkot - 360 002 Email: bmbarai@hotmail.com Cell : 98240 41849	• Excellent air quality meeting ISO 8573 class 1 • No rusting assurance • Experience in the sector	-
2	Pneumatic Piping system for compressed air system	Global Airtech Systems 219, Akshar Arcade, Opp. Mamnagar Fire Station, Nr. Vijay Char Rasta, Navrangpura, Ahmedabad - 380 017	• Good business practices • Transparent in dealing • 24x7 customer assistance • After sale services • Customer centric approach • On time delivery	

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	4.46	1.34	2.23
2	Internal Accruals	-	-	-
3	Interest free unsecured loans	-	-	-
4	Term loan proposed (Banks/FIs)	-	3.12	2.23
5	Others	-	-	-
	Total	**4.46**	**4.46**	**4.46**

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		2	
Annual operating hours	Hrs/year		7200	
Installed production capacity	pieces/year		25,000	
Production in last financial years	pieces/year		17,500	
Capacity utilization factor	%		70	
Proposed investment (Project)				
Total cost of the project	Rs. (in Lakh)	4.5	4.5	4.5
Investment without interest defer credit (IDC)	Rs. (in Lakh)	4.5	4.5	4.5
Implementation time	Months	3.0	3.0	3.0
Interest during the implementation phase	Rs. in lakhs	-	0.02	0.01
Total investment	Rs. in lakhs	4.5	4.5	4.5
Financing pattern				
Own funds	Rs. in lakhs	4.5	1.36	2.2
Loan funds (term loan)	Rs. in lakhs	-	3.12	2.2
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		2.7	
Total saving	Rs Lakh/year		2.7	
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)	4.5	4.5	4.5
Cash flow as annual saving (Rs. In lakh/year)	2.66	2.66	2.66
O&M Expenses for first year (Rs. In lakh/year)	0.22	0.22	0.22
Net Cash flow (Rs. In lakh/year)	2.43	2.43	2.43

Details	100% equity	D/E- 70:30	D/E- 50:50
SPP (months)	21.99	22.09	22.06
Considered (month)	22.00	22.10	22.10

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	-	1.71	1.50	0.92	0.87	0.85
Depreciation	-	0.72	0.72	0.72	0.72	0.72
Cash outflow	4.5	-	-	-	-	-
Net cash flow	-4.5	2.43	2.23	1.64	1.59	1.58
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	-4.46	2.23	1.87	1.26	1.12	1.01
Net present value	**3.02**					
Simple IRR considering regular cash flow	**35.87%**					

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	-	1.55	1.38	0.77	0.76	0.80
Depreciation	-	0.73	0.73	0.73	0.73	0.73
Cash outflow	4.48	-	-	-	-	-
Net cash flow	-4.48	2.27	2.10	1.50	1.49	1.52
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	-4.48	2.07	1.73	1.12	1.01	0.94
Net present value	**2.39**					
Simple IRR considering regular cash flow	**31.64%**					

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	-	1.59	1.41	0.81	0.79	0.81
Depreciation	-	0.73	0.73	0.73	0.73	0.73
Cash outflow	4.47	-	-	-	-	-
Net cash flow	-4.47	2.32	2.14	1.54	1.52	1.54
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	-4.47	2.11	1.77	1.16	1.04	0.96
Net present value	**2.57**					
Simple IRR considering regular cash flow	**32.85%**					

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	-
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 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	19.80	3.71	41.41	-	21.73
		70:30	19.90	3.06	37.23	2.12	32.32
		50:50	19.90	3.25	38.42	0.92	28.13
2	10% reduction in estimated savings	100% equity	24.70	2.34	30.21	-	18.00
		70:30	24.80	1.72	25.91	2.12	28.23
		50:50	24.80	1.90	27.14	0.92	23.95
3	10% rise in interest rates	70:30	22.10	2.23	31.19	2.12	30.36
		50:50	22.10	2.45	32.53	0.92	26.12
4	10% reduction in	70:30	22.10	2.56	32.08	2.12	30.65

S. No.	Scenario	D/E ratio	Payback period (months)	NPV (Rs lakh)	IRR (%)	DSCR	ROI (%)
	interest rates	50:50	22.10	2.70	33.17	0.91	26.34

5.0 Conclusions & recommendations

The DPR prepared for the replacement of compressed air piping network with seamless aluminium piping network 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)
Replacing existing compressed air piping network with seamless piping	35,760	4.50	2.66	1.70	29.30

The measure has an estimated investment of 4.5 lakh rupees and can yield a savings of 2.7 lakh rupees per year. The total annual reduction in emission by implementation of recommended measure is estimated to be 29.3 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	4.5	4.5	4.5
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	35.9	31.6	32.8
4	NPV	Rs. In Lakh	3.0	2.4	2.6
5	DSCR	-	-	2.1	0.9

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: Copy of certificates from the competent authorities

ગુજરાત સરકાર
GOVERNMENT OF GUJARAT

ઉદ્યોગ આયુક્તશ્રીનો
INDUSTRIES COMMISSIONERATE

જિલ્લા ઉદ્યોગ કેન્દ્ર :...
DISTRICT INDUSTRIES CENTRE

કાયમી નોંધણી પ્રમાણપત્ર
PERMANENT REGISTRATION CERTIFICATE

~~લઘુ/આનુષાંગિક ઉદ્યોગ/લઘુ સેવા સંસ્થાન/અતિ લઘુ~~ એકમ તરીકે
AS A
SMALL SCALE/~~ANCILLARY UNDERTAKING/SMALL SERVICE ESTABLISHMENT/TINY~~ UNIT.

આથી પ્રમાણિત કરવામાં આવે છે કે મેસર્સ...
This is to certify that M/s.

~~માલીકી / ભાગીદારી / પ્રા.લી. / સહકારી મંડળી / અન્ય~~.....છે.
~~Proprietory/~~Partnership/~~Pvt. Ltd./Cooperative Society/Others.~~

(કચેરીનું સરનામું)
(Office address)

નીચે જણાવેલ નંબર અને તારીખથી લઘુ ઉદ્યોગ / ~~આનુષાંગિક ઉદ્યોગ / લઘુ સેવા સંસ્થા / અતિ~~ લઘુ એકમ તરીકે કાયમી નોંધાયેલ છે.
PERMANENTLY REGISTERED AS SMALL SCALE/~~ANCILLARY UNDERTAKING, SMALL SERVICE ESTABLISHMENT/TINY~~ UNIT UNDER THE NUMBER & DATE GIVEN HEREUNDER :—

નંબર Number	તારીખ Date
0 2 1 2 0 2 1 4 9	3 0 0 3 0 3 6

કૅનું કારખાનાનું સ્થળ...
For the Factory located at

(પૂરું સરનામું)
(Full address)

નીચે જણાવેલ ઉત્પાદિત વસ્તુઓ/પ્રક્રિયા માટે નોંધવામાં આવેલ છે.
for the manufacture/processing of the following items :—

વસ્તુ :-
Items.

1.
2.
3.
4.

Annexure 2: Budgetary offers / quotations

Quotation – 1 : Avadhesh Agencies

Avadhesh Agencies

13, Vijay Plot, Gondal Road, Opp Dharti Honda Show Room RAJKOT - 360 002 Email: bmbarai@hotmail.com Cell : 98240 41849

TERI — **QUOTATION**

195

DATE- 19.5.2018

Sno	D E S C R I P T I O N	HSN CODE	Qty.	Rate	DISC	Total
1	50Mm X 5.8 mtr Alu. Pipe	7609	20	7500	5%	142500
2	50mm Connector	7609	8	4504.5	5%	34234
3	50mm Equal Elbow	7609	8	6389.5	5%	48560
4	50mm Equal Tee	7609	5	9379.5	5%	44553
6	3" Ball Valve	84812000	3	6756.75	5%	19257
7	50mm Pipe Clip	39174000	80	149.5	5%	11362
8	20mm X 4mtr Alu. Pipe	7609	13	334.75	5%	4134
13	20mm X 1/2" Adaptor	7609	26	422.5	5%	10436
14	20 MM ELBOW	7609	26	458.25	5%	11319
15	20mm Pipe Clip	39174000	40	74.75	5%	2841
17	1/2" Ball Valve	84812000	13	279.5	5%	3452
20	50mm X " Saddle	7609	13	1946.75	5%	24042
35	3" Flange		4	5590	5%	21242
		Total Material Value after Discount				**377931**
		Transportation				**Extra**
		Installation Charges @ Rs.225.00 per meter plus GST 18%				**EXTRA**
		GST 18%				68028
		Total Project cost including taxes				**4,45,958.74**

TERMS & CONDITIONS:

1. **Payment Terms:-For material -25% advance with PO and balance against proforma.**
   Payment Terms:-For installation -50% advance against proforma balance payment after work completion.
2. **Delivery Term :3-4weeks after confirmation of PO.**
4. **Any extra material require will be charge extra as per mentioned terms and conditions**
5. **After work completion any material left will be taken back.**

COMPARISION SHEET FOR MS & AL PIPING FOR COMPRESSED AIR

SR. NO.		MS	GI	Alu Pipe
1	**INITIAL COST**	**MINIMUM**	**20% Higher than MS**	**Almost double of that MS**
2	**LIFE**	10-15 years	10-15 years	30-40 years
3	**Air quality**	worst	Slightly better than MS in initial few years but becomes almost same after 2-3 years of operation	Excellent air Quality meeting ISO 8573 class 1, since no rusting takes place in the system
4	**Leakage**	Most prone to leakages within a few years of operation, in general 5-7% leakges start within five years of operation	Most prone to leakages within a few years of operation, in general 5-7% leakges start within five years of operation	The system is designed for a leakage rate of 0.0001 scfm per joint and is guarateed for next ten years of operation, resulting in 5% saving on account of electricity cost
5	**Pressure drop**	maximum, due to rusting and rough surface	maximum, due to rusting and rough surface	Minimum as the inner suface of the piping is of glass finish and results in smooth flow of air. This is almost 50% in comparision to MS/GI piping, and results in 5% saving for a 0.5 bar presure drop
6	**Down Stream Equipment**	Because of high corrossion rate , the air quality is not good resulting in frequent breakdown of pneumatic cylinders, valves and othe accessories	Because of high corrossion rate , the air quality is not good resulting in frequent breakdown of pneumatic cylinders, valves and othe accessories	Because of low corrossion rate and better air quality, it helps in improving the life of downstream pneumatic cylinders, valves and othe accessories, resulting on higher availability of equipment, thus resulting in maximum productivity and lower maintenance cost of the down stream equipments
7	**Installation**	Needs long time and lots of labour is involved almost 40-50%	Needs long time and lots of labour is involved almost 40-50%	Fastest and labour cost involved is about 10% only. No specialised manpower is required
8	**Fire Hazard**	maximum, during welding and repair works	Not in case of thread joints but in case of welded joints fire hazard is as good as in case of MS	No fire hazard at all since no welding is required
9	**Maintenace cost of piping system**	Needs leakage test every six months and painting atleast once a year	Needs leakage test every six months and painting atleast once a year	No maintenace cost for next ten years
10	**Modularity**	Non modular, normally not usable after you shift your plant or change location of	Non modular, normally not usable after you shift your plant or change location of equipments	Modular, could be dismantled within hours and shifted to another place without wastages

Quotation – 2 : Global Airtech Systems

Atlas Copco
AUTHORISED DEALER

GLOBAL AIRTECH SYSTEMS

GLOBAL AIRTECH SYSTEMS

Office:- 219, Akshar Arcade, Opp.Memnagar Fire Station, Nr.Vijay Cross Road, Ahmedabad-380014.
Tel:- 079-26563142, Email:- info@globalairtechsytsems.com; Web : www.globalairtechsystems.com
Mobile- 9824035330.

To,
M/s. Oswal Pottery Works
Navagam Road
Opp. Sunrise Pottery
Amarapar
Thangadh

Date: 19-03-2018
Ref No: QA/2018/15

Kind Attn : Mr Kiritbhai

Ref. - Reference to Personal discussion with our Mr Nisarg Patadiya at your plant

Sub. : Offer for "Atlas Copco" Make "AIRNET" Pipes

Sr No.	HSN Code	Part No.	Descriprion	SIZE mm	Qty.	Rate/Each	Total
1	76082000	2811400005	Pipe	40 MM	25	5,424.00	135600.00
2	39174000	2811402220	Pipe Clip	40 MM	50	166.00	8300.00
3	39174000	2811400380	Elbow	40 MM	10	2,403.00	24030.00
4	39174000	2811400580	Equal Tee	40 MM	2	3,787.00	7574.00
5	76090000	2811441780	Nipple Socket	40X40	25	4,340.00	108500.00
6	39174000	2811420780	Reduction Tee	40X25	25	2,968.00	74200.00
7	76082000	2811200010	Pipe	25 MM	10	3,355.00	33550.00
8	39174000	2811202220	Pipe Clip	25 MM	25	134.00	3350.00
9	76090000	2811101780	Alluminium Nipple Socket	20X½	25	1,637.00	40925.00
10	76090000	2811441780	Alluminium Nipple Socket	40X40	5	4,340.00	21700.00
							457729.00
						Add: Pkg & Fwd @ 3%	13731.87
							471460.87
						GST @ 18%	84862.96
						[A]..	**556323.83**
						Round Off:	0.17
Rupees: Five lacs Fifty Six Thousand Three Hundred Thirty Four Only.						**Total:**	**5,56,324.00**
Note: Local Fabrication in your scope., Angle support will be provided by you. during installation, if required other material then charge will be extra							

Important Terms:

- **→ Freight Extra at actual**
- **→ Installation charge will be extra RS 50000 + GST 18% (Per Day)**
- → Price Ex. Ahmedabad
- → Delivery: 3 to 4 week after receipts of your order.
- → Payment: 100% advance against Proforma Invoice.
- → Validity: 30 days
- → Atlas Copco (India) Ltd will not be responsible nor will it be held liable for any loss or damages arising to the buyer, as a result of delay, if any, in delivery / commissioning of the machine/s and /or the products of the Company due to site in availability or reasons beyond the control of ACIL) or for any product deficiency arising by reason of improper or wrongful use by the buyers of the machinery and/ or the products of the Company.

Yours Faithfully,
For, Global Airtech Systems

Nisarg Patadiya
Mob No.9925002791
Authorized Signatory

Annexure 3: Instruments used

Instruments	Model/ Make	Application	Accuracy
Power analysers	Fluke: 435, Fluke: 43B,	Electrical Parameters Harmonics analysis, power logging	± 0.5%
Thermal imager	875-2/Testo	Surface Temperature & Image	± 2%
Anemometer	Testo: 425, Airflow: TA45	Air Velocity	±(0.03 m/s +5% of mv)
Infrared thermometer	Testo: 845	Surface Temperature	±0.75% of mv