

Detailed Project Report On Energy Efficient pumping system

Integra Automation Private Limited (Foundry Division)
Coimbatore (Tamil Nadu)

Prepared for

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



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

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GEF-UNIDO-BEE Project, Bureau of Energy Efficiency, 2018
"Capacity Building of Local Service Providers"

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Acknowledgement

The Energy and Resources Institute (TERI) places on record its sincere thanks to Global Environment Facility (GEF), United Nations Industrial Development Organization (UNIDO) and Bureau of Energy Efficiency (BEE) for giving opportunity to partner in this prestigious assignment on Capacity Building of Local Service Providers (LSPs) under the GEF-UNIDO-BEE project 'Promoting energy efficiency and renewable energy in selected MSME clusters in India'.

TERI is particularly grateful to Mr Milind Deore, Director, Bureau of Energy Efficiency, Mr Sanjay Shrestha, Industrial Development Officer, Industrial Energy Efficiency Unit, Energy and Climate Branch, UNIDO, Mr Niranjana Rao Devela, National Technology Coordinator, Mr Sivakumar, Cluster Leader, Coimbatore Foundry Cluster, UNIDO, Mr. P. Arulmozhidevan (GM), Integra Automation private limited and Coimbatore Industrial Infrastructure Association (COINDIA) for their support and guidance during the project.

Last but not least, the interactions and deliberations with numerous foundry units, Industry Associations, technology providers and who were directly or indirectly involved throughout the study were exemplary and the whole exercise was thoroughly a rewarding experience for TERI.

The Energy and Resources Institute (TERI)
New Delhi

Table of contents

Acknowledgement	1
List of tables	1
List of figures	1
List of abbreviations.....	1
Executive summary.....	i
1.0 Details of the unit	1
1.1 Particulars of unit.....	1
2.0 Energy profile.....	3
2.1 Process flow diagram.....	3
2.1.1 Sand preparation plant	3
2.1.2 Core preparation and moulding.....	3
2.1.3 Melting	3
2.1.4 Knockout and finishing.....	3
2.2 Details of technology identified	4
2.3 Energy used and brief description of their usage pattern	4
2.4 Energy sources, availability & tariff details	4
2.5 Analysis of electricity consumption.....	5
2.6 Analysis of other energy forms/ fuels.....	6
3.0 Proposed technology for energy efficiency.....	7
3.1 Replacement of old and inefficient cooling water pumps with horizontal multistage mono-block pumps.....	7
3.1.1 Background.....	7
3.1.2 Observations and analysis	7
3.1.3 Recommendation.....	8
3.2 Cost benefit analysis	8
3.3 Pre-training requirements	8
3.4 Process down time for implementation.....	8
3.5 Environmental benefits.....	9
3.5.1 CO ₂ reduction.....	9
3.5.2 Reduction in other pollution parameters (gas, liquid and solid)	9
4.0 Project financials.....	11
4.1 Cost of project and means of finance.....	11
4.1.1 Particulars of machinery proposed for the project.....	11
4.1.2 Means of finance.....	11
4.2 Financial statement (project)	11
4.2.1 Assumptions.....	11

4.2.2 Payback	12
4.2.3 NPV and IRR	12
4.3 Marketing & selling arrangement.....	13
4.4 Risk analysis and mitigation	14
4.5 Sensitivity analysis.....	14
5.0 Conclusions & recommendations	15
5.1 List of energy conservation measures	15
5.2 Summary of the project	15
5.3 Recommendations.....	15
6.0 Financing schemes for EE investments for MSME sector	17
Annexures.....	23
Annexure 1: Budgetary offers / quotations	25
Annexure 2: Instruments used	27

List of tables

Table 1.1: Particulars of the unit.....	1
Table 2.2: Details of cooling water pumps	4
Table 2.3: Energy used and description of use.....	4
Table 2.4: Energy sources, availability and tariffs.....	4
Table 2.5: Electricity consumption profile.....	5
Table 2.6: Analysis of other energy/ fuel consumption.....	6
Table 3.1.1 Details of cooling water pumps	7
Table 3.1.2: Performance of pumps.....	7
Table 3.2: Cost benefit analysis for recommended energy savings measures.....	8
Table 4.1.1: Particulars of machinery proposed for the project.....	11
Table 4.1.2: Means of finance	11
Table 4.2.1: Assumptions made	11
Table 4.2.2: Payback.....	12
Table 4.2.3a: NPV and IRR (100% equity)	12
Table 4.2.3b: NPV and IRR (D/E- 70:30)	13
Table 4.2.3c: NPV and IRR (D/E- 50:50).....	13
Table 4.3: Marketing & selling arrangements	13
Table 4.4: Risk analysis and mitigation	14
Table 4.5: Sensitivity analysis.....	14
Table 5.1: Summary of the energy conservation measures	15
Table 5.2: Summary of the project.....	15
Table 6.1: Major government schemes	17
Table 6.2: BEE's VCFEE and PRGFEE scheme.....	18
Table 6.3: IREDA's financing guidelines	19
Table 6.4: Major EE financing schemes/initiatives of SIDBI.....	20
Table 6.5: JBIC-SBI Green Line	21
Table 6.6: Canara bank scheme of EE SME loans.....	22

List of figures

Figure 2.1.4: Process flow chart	4
Figure 2.5: Electricity consumption profile.....	6
Figure 2.6: Percentage share of various fuel types in the unit	6

DPR –Integra Automation (P) Ltd.



List of abbreviations

BEE	Bureau of Energy Efficiency
CO ₂	Carbon Dioxide
D/E	Debt /Equity
DM	Demineralized
DPR	Detailed Project Report
DSCR	Debt Service Coverage Ratio
DISCOM	Distribution Company
EE	Energy Efficient
FIs	Financial Institutions
GEF	Global Environmental Facility
GHG	Green House Gas
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
PHE	Plate Heat Exchanger
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 Integra Automation (P) Ltd.
Constitution	Private Limited
MSME Classification	Medium
No. of years in operation	11
Address: Registered Office:	SF No 238, Kurunalli Palayam Village, Kinathukadavu, Coimbatore - 642 120.
Industry-sector	Graded CI and SGI castings
Products manufactured	Automotive, heavy industry and engineering
Name(s) of the promoters/ directors	Mr. Vikram Sokallingham (Director)

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 1,493 toe which is equivalent to 1,300 lakh rupees. The total CO₂ emission during this period is estimated to be 14,174 tonnes. Electricity and diesel were considered for CO₂ emission estimation.

The unit manufactures castings like automotive, heavy industry and engineering parts and supplies it to relevant industries. The total annual liquid metal production of the unit during 2017-18 is estimated to be 21,600 tonnes and good castings production is around 13,990 tonnes. The major source of energy is electricity, consume in the foundry, machining and lighting and diesel is used in DG set.

Accepted/ recommended technology implementation

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

Energy conservation measures	Annual energy savings	Investment ¹	Savings	Simple Payback	Emission reduction (tonnes CO ₂)
	Electricity (kWh)	(Rs Lakh)	(Rs. Lakh/year)	(Year)	
Replacement of existing inefficient pumping system with energy efficient pumping system	96,373	3.0	7.2	0.4	79

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

Sl. No.	Particulars	Unit	100% equity	D/E- 70:30	D/E- 50:50
1	Cost of Project	Rs. In Lakh	3.0	3.1	3.1
2	Means of Financing	-	-	7:3	1:1
3	Project IRR	%	197.8	186.3	189.5
4	NPV	Rs. In Lakh	16.1	15.3	15.5
5	DSCR	-	-	10.1	14.1

¹ Investment including the energy efficient pumps – Rs. 2.68 and Taxes and other misc. cost – Rs. 0.32 lakh

1.0 Details of the unit

1.1 Particulars of unit

Table 1.1: Particulars of the unit

Name of the unit	M/s Integra Automation Private Limited
Constitution	Private Limited
Date of incorporation / commencement of business	2007
Name of the Contact Person	Mr. P. Arulmozhidevan (GM-Production)
Mobile / Ph. No	+91-9894784055
Email	foundry@integraautomation.net
Address: Factory	SF No 238, Kurunalli Palayam Village Kinathukadavu, Coimbatore - 642 120
Industry / Sector	MSME/Manufacturing
Products Manufactured	Automotive, heavy industry and engineering
No of hours of operation/shift	8
No of shifts/ day	03
No of days/year	300
Installed Capacity	21,600 MT per year
Whether the unit is exporting its products (Yes/ No)	Yes
Quality Certification, if any	ISO 16949-2009

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.

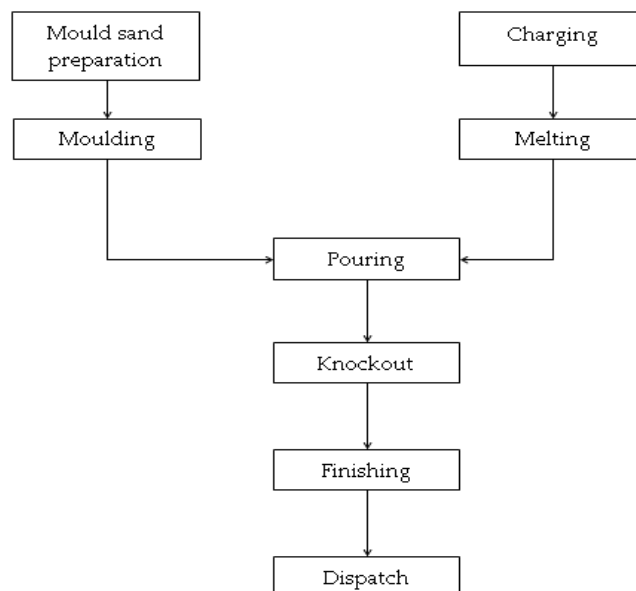


Figure 2.1.4: Process flow chart

2.2 Details of technology identified

Pumping systems and cooling towers were installed in the plant, mainly for supplying cooling water to induction furnace. The furnace panel has one DM water pump for its cooling. Soft water is circulated for coil cooling using another pump. The soft water and DM water is cooling using heat exchanger, where raw water flows in secondary circuit and the details are given in Table 2.2.

Table 2.2: Details of cooling water pumps

Design Parameters	Unit	Soft water pump (Coil cooling)	Raw water pump (PHE cooling)	DM water pump (Panel cooling)
Make	-	KSB	Kirloskar	-
Type	-	Mono-block	Mono-block	Mono-block
Flow rate	m ³ /hour	90.0	50.4	28.5
Head	m	48.0	34.5	38.0
Motor Power	kW	18.5	7.5	7.5
Overall Efficiency	%	64%	63%	39%

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-1(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	Diesel	DG set

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-1(A) @ 11 kV Demand charges: Rs 350/kVA Energy charges: Rs 6.35/kWh Time of day charges: 2200-0600 hrs: 5% rebate on energy charge 0600-0900 hrs: 20% additional energy charge

S No	Energy source	Availability	Tariff details
			1800-2100 hrs: 20% additional energy charge PF penalty charges: 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	Diesel	HPCL, BPCL, IOCL	Rs. 64 per kg

2.5 Analysis of electricity consumption

Table 2.5: Electricity consumption profile

Month	Electricity consumption, kWh	Auxiliary Energy consumption, kWh/month	Furnace Energy consumption, kWh	Pump energy consumption, kWh
Apr-17	14,49,730	3,00,850	11,48,880	56,248
May-17	13,43,920	2,93,040	10,50,880	57,422
Jun-17	17,41,930	3,89,200	13,52,730	60,143
Jul-17	15,84,540	3,73,010	12,11,530	53,572
Aug-17	14,73,730	3,38,430	11,35,300	52,772
Sep-17	14,06,690	3,35,210	10,71,480	52,132
Oct-17	12,78,880	3,08,350	9,70,530	48,852
Nov-17	11,63,610	2,57,780	9,05,830	37,792
Dec-17	14,98,760	3,19,950	11,78,810	53,950
Average	14,37,977	3,23,980	11,13,997	52,543
Annual	1,72,55,720	38,87,760	1,33,67,960	6,30,511

*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 electricity consumption profile of the unit.

Figure 2.5: Electricity consumption profile

2.6 Analysis of other energy forms/ fuels

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

Table 2.6: Analysis of other energy/ fuel consumption

Parameters	Electricity (kWh)	Diesel (litre)
Consumption unit/year	1,72,55,720	9,467
Calorific value per unit	860	9,827
Equivalent toe per year	1,484	9.3
Price (Rs per unit)	7.5	64
Total price per year	1,294	6.06

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

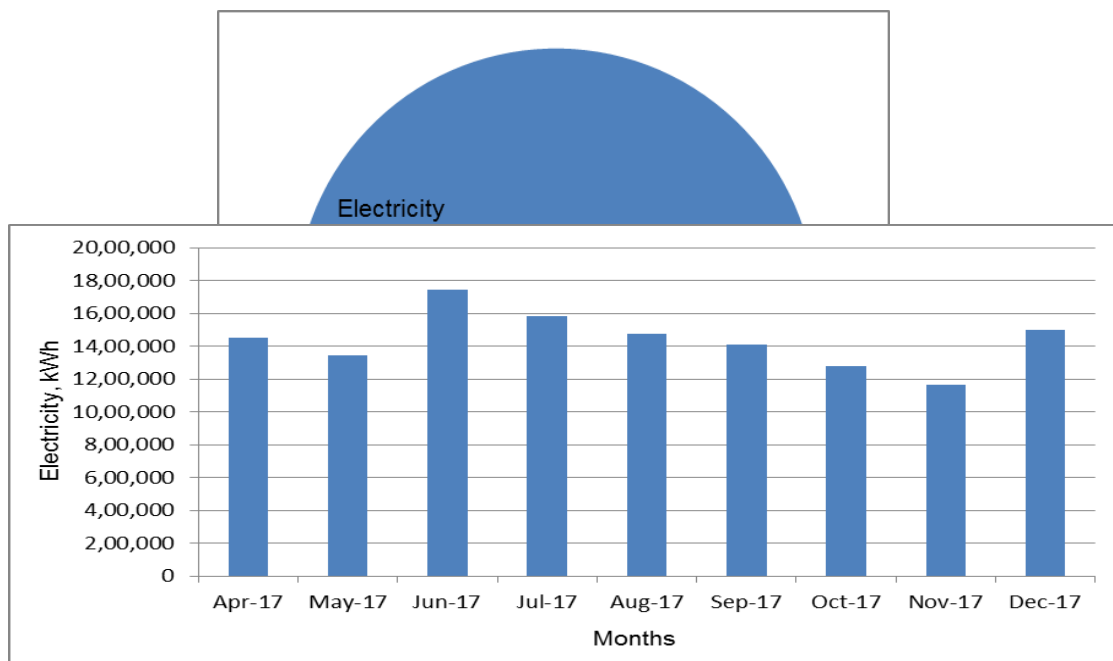


Figure 2.6: Percentage share of various fuel types in the unit

The plant is consuming about 17,255,720 kWh of electricity per year. The annual consumption of the diesel is 9.5 kL. The total energy consumption of the unit during last 12 months is estimated to be 1,493 toe which is equivalent to 1,300 lakh rupees. The total CO₂ emission during this period is estimated to be 14,174 tonnes. Electricity and diesel 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 old and inefficient cooling water pumps with horizontal multistage mono-block pumps

3.1.1 Background

The Integra Automation Private Limited is manufacturer of the castings for automobile and heavy industries and have installed induction furnace for melting. Pumping systems and cooling towers were installed in the plant, mainly for supplying cooling water to induction furnace. The furnace panel has one DM water pump for its cooling. Soft water is circulated for coil cooling using another pump. The soft water and DM water is cooling using heat exchanger, where raw water flows in secondary circuit and the details are given in Table 3.1.1.

Table 3.1.1 Details of cooling water pumps

Design Parameters	Unit	Soft water pump (Coil cooling)	Raw water pump (PHE cooling)	DM water pump (Panel cooling)
Make	-	KSB	Kirloskar	-
Type	-	Mono-block	Mono-block	Mono-block
Flow rate	m ³ /hour	90.0	50.4	28.5
Head	M	48.0	34.5	38.0
Motor Power	kW	18.5	7.5	7.5
Overall Efficiency	%	64%	63%	39%

3.1.2 Observations and analysis

The operating parameters, such as flow and head, were measured for all operating water pumps. Suction & discharge head of the pumps was measured by using standard pressure gauge from the plant. The flow rate of water delivered by the pumps was measured by using non-intrusive type flow meter. Simultaneously, operating electrical parameters of pump mainly voltage, current, power factor and kW were measured by using portable power analyser and the actual efficiencies achieved are given in the table 3.1.2;

Table 3.1.2: Performance of pumps

Actual Parameters	Unit	Soft water pump (Coil cooling)	Raw water pump (PHE cooling)	DM water pump (Panel cooling)
Flow rate	m ³ /hour	55.6	25.5	20.0
Discharge Pressure	kg/cm ²	3.9	2.2	3.1
Differential Head	M	39	22	31
Power	kW	18.7	8.40	8.21
Overall efficiency	%	31.6	17.8	20.6

By installing new energy efficient high-pressure horizontal mono-block pumps with old ones will result in significant energy savings along with demand savings. Recommended

pumps have fabricated sheet metal impellers due to which smaller pump size is required to achieve desired head and flow. Also, new pumps will have negligible effect of water hammering and rusting and will allow the pumps to have a longer life.

3.1.3 Recommendation

The unit may adopt the new energy efficient pump to reduce the energy consumption. The proposed horizontal multistage pumps will have longer life along with smaller size motors.

3.2 Cost benefit analysis

The estimated annual energy savings by replacement of existing cooling water pumps with new pumps is 96,373 kWh equivalent to a monetary saving of Rs 7.23 lakh. The investment requirement is Rs 3.0 lakh with a simple payback period of less than 5 months. The detailed calculations of the recommended energy conservation measures for IGDP are provided in table 3.2.

Table 3.2: Cost benefit analysis for recommended energy savings measures

Recommended Pump Specification	Units	Soft water pump (Coil cooling)	Raw water pump (PHE cooling)	DM water pump (Panel cooling)
Flow rate	m ³ /hour	76.9	57.8	26.0
Differential Head	M	42.2	25.7	30.0
Efficiency	%	75.8	64.0	56.8
Input power	kW	11.655	6.315	3.742
Energy saving	kW	7.0209	1.8957	4.4686
Operating period	Hour	7,200	7,200	7,200
Annual Energy savings	kWh/year	50,550	13,649	32,174
Cost saving				
Energy cost per unit	Rs/kWh	7.50	7.50	7.50
Annual Monetary Saving	Rs lakh/year	3.79	1.02	2.41
Total investment ²	Rs lakh	1.52	0.77	0.71
Simple Payback Period	Years	0.4	0.8	0.3

3.3 Pre-training requirements

The training would be required on preventive maintenance of new pumps. Best practices to be adopted for housekeeping near the location of the machine.

3.4 Process down time for implementation

The estimated process down time required for implementation of recommended measure is estimated to be 1 day after commissioning and testing of the new pumps.

² Quotation - 1 has been considered for estimation of investments

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 79 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.

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	Basis of selection of supplier	Remarks (after sales service etc.)
1	Horizontal multistage high-pressure mono-block pumps with SS impellers	CNP pumps	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	3.0	0.9	1.5
2	Internal Accruals	-	-	-
3	Interest free unsecured loans	-	-	-
4	Term loan proposed (Banks/FIs)	-	2.1	1.5
5	Others	-	-	-
	Total	3.0	3.0	3.0

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		21,600	
Production in last financial years	tonnes/year		13,990	
Capacity utilization factor	%		65%	
Proposed investment (Project)				
Total cost of the project	Rs. (in Lakh)	3.0	3.0	3.0
Investment without interest defer credit (IDC)	Rs. (in Lakh)	3.0	3.0	3.0
Implementation time	Months	6.0	6.0	6.0

Details	Unit	100% equity	D/E- 70:30	D/E- 50:50
Interest during the implementation phase	Rs. in lakhs	-	0.1	0.1
Total investment	Rs. in lakhs	3.0	3.1	3.1
Financing pattern				
Own funds	Rs. in lakhs	3.0	1.0	1.6
Loan funds (term loan)	Rs. in lakhs	-	2.1	1.5
Loan tenure	Years	-	5.0	5.0
Moratorium period (No EMI (interest and principal amount))	Months	-	6.0	6.0
Total repayment period	Months	-	66.0	66.0
Interest rate	%	-	10.5%	10.5%
Estimation of costs				
Operation & maintenance costs	%		5	
Annual escalation rate of O&M	%		5	
Estimation of revenue				
Reduction in energy cost	Rs. (in lakh)/year		7.2	
Total saving	(Rs Lakh/year)		7.2	
Straight line depreciation	%		16.21	
IT depreciation	%		80.0	
Income tax	%		33.99	
Period of cash flow analysis	Years		5	

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)	3.0	3.1	3.1
Cash flow as annual saving (Rs. In lakh/year)	7.2	7.2	7.2
O&M Expenses for first year (Rs. In lakh/year)	0.2	0.2	0.2
Net Cash flow (Rs. In lakh/year)	7.1	7.1	7.1
SPP (months)	5.1	5.3	5.2
Considered (month)	5.1	5.3	5.2

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	-	6.59	2.75	4.21	4.18	4.17
Depreciation	-	0.49	0.49	0.49	0.49	0.49
Cash outflow	3.00	-	-	-	-	-
Net cash flow	-3.00	7.08	3.24	4.70	4.66	4.65
Discount rate % @ WACC	9.25	9.25	9.25	9.25	9.25	9.25
Discount factor	1.00	0.92	0.84	0.77	0.70	0.64

Particulars / years	0	1	2	3	4	5
	(Rs.in lakhs)					
Present value	-3.00	6.48	2.72	3.60	3.27	2.99
Net present value	16.06					
Simple IRR considering regular cash flow	197.79%					

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	-	6.46	2.68	4.09	4.09	4.11
Depreciation	-	0.50	0.50	0.50	0.50	0.50
Cash outflow	3.11	-	-	-	-	-
Net cash flow	-3.11	6.97	3.19	4.60	4.59	4.61
Discount rate % @ WACC	10.09	10.09	10.09	10.09	10.09	10.09
Discount factor	1.00	0.91	0.83	0.75	0.68	0.62
Present value	-3.11	6.33	2.63	3.44	3.13	2.85
Net present value	15.27					
Simple IRR considering regular cash flow	186.34%					

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	-	6.50	2.70	4.13	4.11	4.13
Depreciation	-	0.50	0.50	0.50	0.50	0.50
Cash outflow	3.08	-	-	-	-	-
Net cash flow	-3.08	7.00	3.20	4.62	4.61	4.62
Discount rate % @ WACC	9.86	9.86	9.86	9.86	9.86	9.86
Discount factor	1.00	0.91	0.83	0.75	0.69	0.62
Present value	-3.08	6.37	2.65	3.49	3.17	2.89
Net present value	15.49					
Simple IRR considering regular cash flow	189.53%					

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 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	4.6	17.9	220.0	-	39.9
		70:30	4.8	17.1	207.7	11.1	44.7
		50:50	4.7	17.3	211.1	15.4	43.2
2	10% reduction in estimated savings	100% equity	5.7	14.2	175.8	-	38.2
		70:30	5.9	13.4	165.2	9.1	43.8
		50:50	5.8	13.7	168.2	12.7	42.0
3	10% rise in interest rates	70:30	5.3	14.9	185.2	9.8	44.2
		50:50	5.2	15.2	188.7	13.7	42.6
4	10% reduction in interest rates	70:30	5.3	15.6	187.5	10.3	44.3
		50:50	5.2	15.8	190.3	14.4	42.7

5.0 Conclusions & recommendations

The IGDP prepared for the replacement of existing inefficient pumping system with energy efficient pumping system based on the performance assessment study conducted at unit and the acceptance of the unit management. The brief of selected energy conservation measure is given below.

5.1 List of energy conservation measures

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

Table 5.1: Summary of the energy conservation measures

Energy conservation measures	Annual energy savings	Investment	Savings	Simple Payback	Emission reduction	Annual energy saving
	Electricity (kWh)	(Rs Lakh)	(Rs. Lakh/year)	(Year)	(tonnes CO ₂)	(toe)
Replacement of existing inefficient pumping system with energy efficient pumping system	96,373	3.0	7.2	0.4	94.4	79

The measure has an estimated investment of 3.0 lakh rupees and can yield a savings of 7.2 lakh rupees per year. The total annual reduction in emission by implementation of recommended measure is estimated to be 79 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

Sl. No.	Particulars	Unit	100% equity	D/E- 70:30	D/E- 50:50
1	Cost of Project	Rs. In Lakh	3.0	3.1	3.1
2	Means of Financing	-	-	7:3	1:1
3	Project IRR	%	197.8	186.3	189.5
4	NPV	Rs. In Lakh	16.1	15.3	15.5
5	DSCR	-	-	10.1	14.1

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

Quotation 1: Supreme Pumps



Supreme pumps

B-7, Krishna complex,
Opp. Old Essar petrol pump
Sarkhej-sanand road,
Ahmedabad – 382210
Mo. 8000 256 356


Date 29/03/2018

Ref No: SUP/290318

To,
Vivek sharma

Sub: Quotation of "CNP" brand power saving mono block pump.

The prices & the terms are as under:

	Horizontal multistage mono block pump. MOC- Complete SS304 , Mechanical seal design with Max. 120 degree hot water, three phase, 380 – 415V, 50 Hz. Motor:- Efficiency class – IE2, 83.2%			
Sr. No.	Description	Price/pcs.	QTY	Amount
1.	Model ZS 100-80-200/22.0 For 1281 LPM, 42.16 Meter Head	135850	1	135850.00
2.	Model: ZS80-65-125/7.5 For 963 LPM, 25.66 Meter Head	68685	1	68685.00
3.	Model: ZS65-50-160/5.5 For 433 LPM, 30 Meter Head	63080	1	63080.00

TERMS & SCOPE:

The above prices hold true for 30 days from the date above.

12 % GST Extra

All plumbing and fitting will be charged extra.

Payment: 100% advance with purchase order before delivery.

Material delivery: Within 7 working days from the date of PO, prior to sales. Our pump is guaranteed against:

1. Any manufacturing defect for the period of 1 year.
2. Any motor winding or other electrical failures are not covered.
3. Our system is not covered against any abuse or accident under these guarantees.

We thank you once again for your interest. Please feel free to call up the undersigned for any further information / clarification.

Thank & Regards,
Mukesh Tholiya



Cell: 8000 256 356

Ahmedabad Office: GF/B-7 Krishna Complex, Opp. Essar Petrol pump, Sarkhej-Sanand Road, Ahmedabad - 382210
ISO 9002 authentication, CE certification and ISO 9001: 2000 new edition authentic



Annexure 2: Instruments used

Instruments	Model/ Make	Application	Accuracy
Power analysers	Fluke: 435, Krykard ALM 10,	Electrical Parameters Harmonics analysis, power logging	$\pm 0.5\%$
Ultrasonic flow meter	PT878/GE parametric	Water Velocity, Volume & Temperature	$\pm 0.5\%, \pm 0.15^\circ\text{C}$
Digital Temperature indicator	Comark: N1001, Testo: 925	Temperature	$\pm 1\%$
Infrared thermometer	Testo: 845, Comark: KM848	Surface Temperature	$\pm 0.75\%$ of mv