

Detailed Project Report (DPR) On Energy Efficient Cooling Water System

Aqua Alloys Private Limited,
Belgaum (Karnataka)

Prepared for

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



*Enhancing Performance,
Delivering Value*

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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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“Capacity Building of Local Service Providers”

For more information

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DPR –Abhishek Alloys (P) Ltd.

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List of abbreviations

BEE	Bureau of Energy Efficiency
CO ₂	Carbon Dioxide
D/E	Debt /Equity
DM	Demineralised
DPR	Detailed Project Report
DSCR	Debt Service Coverage Ratio
EE	Energy Efficient
FIs	Financial Institutions
GEF	Global Environmental Facility
GHG	Green House Gas
HESCOM	Hubli Electricity Supply Company Limited
IDC	Interest Defer Credit
IGDPR	Investment Grade Detailed Project Report
IRR	Internal Rate of Return
kg	Kilogram
kV	Kilo volt
kVA	kilovolt-ampere
kW	Kilo Watt
kWh	Kilo Watt Hour
LDO	Light Diesel Oil
LSPs	Local Service Providers
M	Meter
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
Rs	Rupees
SPP	Simple Payback Period
TERI	The Energy and Resources Institute
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 Aqua Alloys (P) Ltd.
Constitution	Private Limited
MSME Classification	Medium
No. of years in operation	10
Address: Registered Office:	Sanmathi Bldg., Plot no-108, 2 nd Main, 6 th Cross, Sadashiv Nagar, Belgaum, Karnataka-590 001
Industry-sector	Alloy steel
Products manufactured	Alloy steel products for cement, power, quarry and mining, mineral processing, steel and General Engineering
Name(s) of the promoters/ directors	Mr. Suryavanshi S. R. (Manager)

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 624.3 toe which is equivalent to 512.5 lakh rupees. The total CO₂ emission during this period is estimated to be 5952 tonnes. Electricity was considered for CO₂ emission estimation.

The unit manufactures alloy steel casting products for cement, power, quarry and mining, mineral processing, steel and general engineering. The total annual liquid metal production of the unit during 2017-18 is estimated to be 4,293 tonnes and good castings production is around 2,748 tonnes. The major source of energy is electricity, consume in the induction furnace, machine drives and lighting system.

Accepted/ recommended technology implementation

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

Energy Conservation Measures	Annual energy savings	Investment ¹ (Rs. lakh)	Savings (Rs. lakh/ year)	Simple Payback (Year)	Emission reduction (tonnes of CO ₂)
	Electricity (kWh)				
Replacement of old and inefficient cooling water system with energy efficiency cooling water system	40,296	6.28	2.86	2.2	33.0

Other benefits

- The proposed project is not expected to bring in any change in process step or operating practices therefore no change expected in the product quality.
- Implementation of the selected technology in the unit may result in reduction in CO₂ emissions.

Cost of project & means of finance

S. No.	Particulars	Unit	100% equity	D/E- 70:30	D/E- 50:50
1	Cost of Project	Rs. In Lakh	6.28	6.51	6.44
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	22.28	16.50	18.13
4	NPV	Rs. In Lakh	1.99	0.98	1.26
5	DSCR	-	-	2.14	2.95

¹Investment including the (i) cooling tower – Rs. 3.8 lakhs (ii) pumps – Rs. 2.48 lakhs

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 Aqua Alloys Private Limited
2	Constitution	Private Limited
3	Date of incorporation / commencement of business	2007
4	Name of the Contact Person	Mr. Suryavanshi S. R. (Manager)
5	Mobile / Ph. No	+91-831-6533990
6	Email	agm@aqualloys.com/projects@aqualloys.com
7	Address: Factory	Sanmathi Bldg., Plot no-108, 2 nd main, 6 th Cross, Sadashiv Nagar, Belgaum, Karnataka- 590 001.
8	Industry / Sector	MSME/Manufacturing
9	Products Manufactured	Alloy steel products for cement, power, quarry and mining, mineral processing, steel and General Engineering
10	No of hours of operation/shift	8
11	No of shifts/ day	3
12	No of days/year	300
13	Installed Capacity	5,000 MT per year
14	Whether the unit is exporting its products (Yes/ No)	Yes
15	Quality Certification, if any	ISO 9001:2004

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.

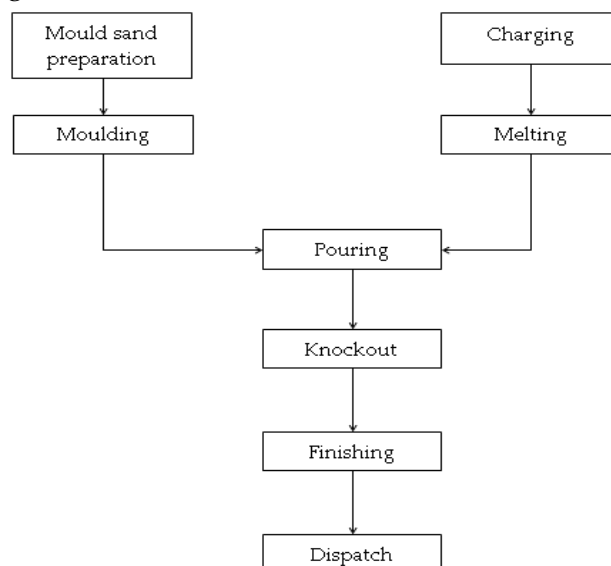


Figure 2.1.4: Process flow chart

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 two raw water networks are in place for cooling panel cooling water and soft water cooling in secondary circuit and the details are given in table 2.2.

Table 2.2: Details of cooling water pumps

Design Parameters	Unit	Soft/Raw water pump (Coil cooling and PHE cooling)	DM water pump (Panel cooling)	Soft/Raw water pump (Coil cooling and PHE cooling)	DM water pump (Panel cooling)
Make	-	Texmo	Ajay	Jyoti	Ajay
Type	-	Mono-block	Mono-block	Mono-block	Mono-block
Flow rate	m ³ /hour	93.6	25.8	52.6	30.0
Head	m	19.0	30.0	33.0	30.0
Motor Power	kW	7.5	3.7	7.5	5.0

2.3 Energy used and brief description of their usage pattern

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

Table 2.3: Energy used and description of use

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

2.4 Energy sources, availability & tariff details

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

Table 2.4: Energy sources, availability and tariffs

Particular	HT-2(a)
Demand charges	Rs. 200/ kVA/month
Energy charges	Rs. 6.6/ kWh (For first One lakh units) Rs. 6.8/ kWh (for balance units) at voltage higher than 13.2 KV
	<ul style="list-style-type: none"> 33/66 kV: 2 Paise/unit of energy consumed 110 kV: 3 Paise/unit of energy consumed 220 kV: 5 Paise/unit of energy consumed

2.5 Analysis of electricity consumption

Table 2.5: Electricity consumption profile

Month & Year	Electricity consumption (kWh)	Contract Demand (kVA)	Billed MD (kVA)	Demand Charges, Rs./month	Power factor	Total electricity bill (Rs)
Jan-18	5,87,516	2,870	1,872	4,68,000	1.00	45,07,348
Dec-17	6,48,974	2,870	1,883	4,70,625	0.99	41,69,328
Nov-17	6,63,745	2,870	1,860	4,64,822	0.98	46,40,316
Oct-17	5,31,482	2,870	1,812	4,53,117	0.97	40,18,079
Sep-17	5,92,867	2,870	1,502	3,75,603	0.98	40,18,922
Average	6,04,917	2,870	1,786	4,46,433	0.98	42,70,799
Total	72,59,002	-	-	-	-	5,12,49,583

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

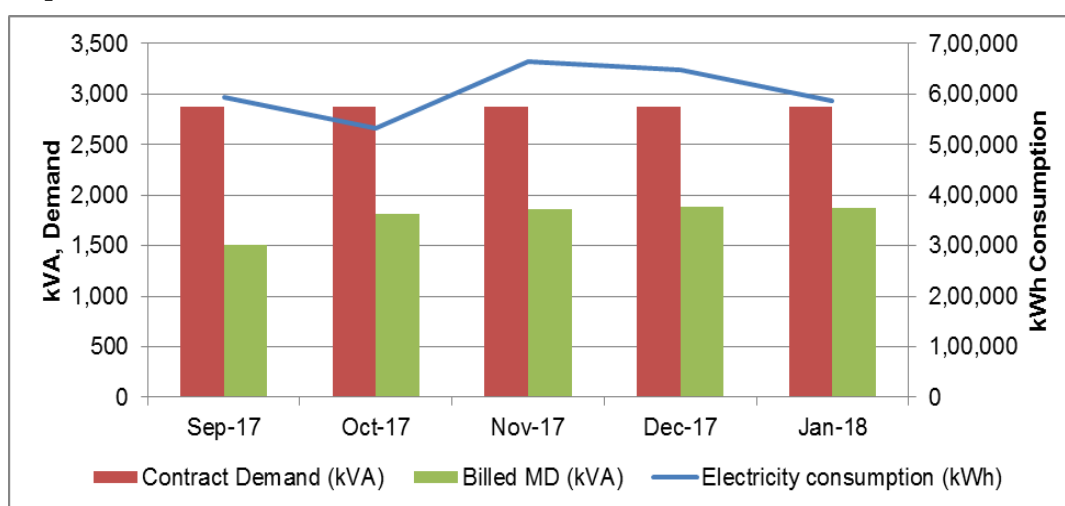


Figure 2.5: Demand pattern and energy consumption profile

The plant is consuming about 72,59,002 kWh of electricity per year. The total energy consumption of the unit during last 12 months is estimated to be 624.3 toe which is equivalent to 512.5 lakh rupees. The total CO₂ emission during this period is estimated to be 5952 tonnes. Electricity was 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 system with energy efficiency cooling water system

3.1.1 Background

The Aqua Alloys Private Limited is manufactures of the alloy steel casting products for cement, power, quarry and mining, mineral processing, steel and general engineering with installed induction furnace for melting.

Induction furnace is equipped with cooling tower and associated water pumps i.e. two soft water pumps for coil cooling and two DM water pumps for panel cooling. 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 two raw water networks are in place for cooling panel cooling water and soft water cooling in secondary circuit and the details are given in table 3.1.1.

Table 2.2: Details of cooling water pumps

Design Parameters	Unit	Soft/Raw water pump (Coil cooling and PHE cooling)	DM water pump (Panel cooling)	Soft/Raw water pump (Coil cooling and PHE cooling)	DM water pump (Panel cooling)
Make	-	Texmo	Ajay	Jyoti	Ajay
Type	-	Mono-block	Mono-block	Mono-block	Mono-block
Flow rate	m ³ /hour	93.6	25.8	52.6	30.0
Head	m	19.0	30.0	33.0	30.0
Motor Power	kW	7.5	3.7	7.5	5.0

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 input were measured by using portable power analyser and the actual efficiencies achieved are given in the table below;

Table 3.1: Performance of pumps

Actual Parameters	Unit	Soft/Raw water pump-1 (Coil cooling and PHE cooling)	DM water pump-1 (Panel cooling)	Raw water pump-2 (Panel PHE cooling)	DM water pump-2 (Panel cooling)
Flow rate	m ³ /hour	48.0	20.0	23.8	24.0
Discharge Pressure	kg/cm ²	1.8	3.0	3.0	3.8

Actual Parameters	Unit	Soft/Raw water pump-1 (Coil cooling and PHE cooling)	DM water pump-1 (Panel cooling)	Raw water pump-2 (Panel PHE cooling)	DM water pump-2 (Panel cooling)
Differential Head	m	18	30	30	38
Power	kW	6.5	4.70	6.75	5.23
Overall efficiency	%	36.2	34.8	28.8	47.5

By installing new energy efficient cooling tower with thermostatic controller and high pressure horizontal mono-block pumps 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 cooling tower and associated pumps 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 40,296 kWh equivalent to a monetary saving of Rs 2.86 lakh. The investment requirement is Rs 6.3 lakh with a simple payback period of 2.2 years. The detailed calculations of the recommended energy conservation measures for DPR are provided in table 3.2a and 3.2b.

Table 3.2a: Cost benefit analysis for energy efficient pumps

Recommended Pump Specification	Units	Soft/Raw water pump (Coil cooling and PHE cooling)	DM water pump (Panel cooling)	Soft/Raw water pump (Coil cooling and PHE cooling)	DM water pump (Panel cooling)
Flow rate	m ³ /hour	75.0	26.0	52.0	34.0
Differential Head	m	18.0	30.0	30.0	30.0
Efficiency	%	66.0	64.0	65.0	66.0
Power	kW	5.50	3.00	5.50	4.00
Energy saving	kW	1.0	1.70	1.25	1.23
Operating period	hour	7,200	7,200	7,200	7,200
Annual energy saving	kWh/year	7,200	12,240	9,000	8,856
Energy cost per unit	Rs/kWh	7.09	7.09	7.09	7.09
Annual Monetary Saving	Rs lakh/year	0.51	0.87	0.64	0.63
Investment towards pumps ²	Rs lakh	0.69	0.52	0.65	0.62

² Quotation - 1 and 3 has been considered for estimation of investments

Table 3.2b: Cost benefit analysis for cooling tower with controller

Particular	Unit	Value
Total number of CT fans assessed	No	1
Additional thermostatic controllers proposed	No	1
Operating hours of CT fans without thermostatic control	Hour	7,200
Operating hours of CT fans with thermostatic control	Hour	6,200
Annual electricity consumption in existing case	kWh	21,600
Annual electricity savings with thermostatic controller	kWh/annum	3,000
Annual monetary savings	Rs. lakh/annum	0.21
Investment towards thermostatic controller	Rs. lakh	3.8

3.3 Pre-training requirements

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

3.4 Process down time for implementation

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

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 33.0 tonnes 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 & for electricity: CO₂ Baseline Database for the Indian Power Sector, user guide version 12.0, May 2017 (CEA)

4.0 Project financials

4.1 Cost of project and means of finance

4.1.1 Particulars of machinery proposed for the project

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

Table 4.1.1: Particulars of machinery proposed for the project

S. No.	Name of machinery (Model/ specification)	Name of manufacturer, contact person	Advantage	Disadvantage
1	Energy efficient cooling tower	National Cooling tower 26, Amrapali Industrial Estate, Ram Mandir Road, Goregaon (W), Mumbai - 400104, Maharashtra, Mobile: +91-9821055852 Email: nct@vsnl.com	Reputed supplier	-
2	Thermostatic controller	SyGuru Innovators Pvt Ltd. No. 820, Siddharth Complex, R.C. Dutt Road Alkapuri, Alkapuri, Vadodara - 390007, Gujarat	Reputed supplier	-
3	Horizontal multistage high-pressure mono-block pumps with SS impellers	Supreme pumps, Mr Mukesh Tholiya GF/ B-7, Krishna Complex, Sarkhej- Sanand Road, Ahmedabad, Gujarat, 382210	Reputed supplier	-
4	Energy efficient cooling tower	Delta cooling towers 1st Floor, Bhagwati Sadan, Plot no. 8, Community Centre, BH Block (East), Shalimar Bagh, Delhi-110088 Tel: +91-11-27495801 / 27495802 / 27495803 Email: delta@deltatowers.com, del ta@nde.vsnl.net.in	Reputed supplier	-
5	Horizontal multistage high pressure mono-block pumps with SS impellers/ along with Cooling Tower	Jay Pumps Pvt. Ltd Jay House', Near Stadium Circle, Navrangpura, Ahmedabad, Gujarat-380009. Email: info@jaypumps.com	Reputed supplier	-

4.1.2 Means of finance

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

Table 4.1.2: Means of finance

S. No.	Details	100%equity	D/E- 70:30	D/E- 50:50
1	Additional (Share) Capital	6.28	1.88	3.14
2	Internal Accruals	-	-	-
3	Interest free unsecured loans	-	-	-
4	Term loan proposed (Banks/FIs)	-	4.39	3.14
5	Others	-	-	-
	Total	6.28	6.28	6.28

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	hours/year		7,200	
Installed production capacity	tonnes/year		5,000	
Production in last financial years	tonnes/year		2,748	
Capacity utilization factor	%		55	
Proposed investment (Project)				
Total cost of the project	Rs. (in Lakh)	6.28	6.28	6.28
Investment without interest defer credit (IDC)	Rs. (in Lakh)	6.28	6.28	6.28
Implementation time	Months	6.0	6.0	6.0
Interest during the implementation phase	Rs. in lakhs	-	0.23	0.16
Total investment	Rs. in lakhs	6.28	6.51	6.44
Financing pattern				
Own funds	Rs. in lakhs	6.28	2.1	3.3
Loan funds (term loan)	Rs. in lakhs	-	4.39	3.14
Loan tenure	Years	-	3.0	3.0
Moratorium period (No EMI (interest and principal amount)	Months	-	6.0	6.0
Total repayment period	Months	-	36	36
Interest rate	%	-	10.5%	10.5%
Estimation of cost				
Operation & maintenance costs	%		5	
Annual escalation rate of O&M	%		5	
Estimation of revenue				
Reduction in energy cost	Rs. lakh/year		2.86	
Total saving	Rs. lakh/year		2.86	

Details	Unit	100% equity	D/E- 70:30	D/E-50:50
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)	6.28	6.51	6.44
Cash flow as annual saving (Rs. In lakh/year)	2.86	2.86	2.86
O&M Expenses for first year (Rs. In lakh/year)	0.31	0.33	0.32
Net Cash flow (Rs. In lakh/year)	2.55	2.53	2.54
SPP (months)	29.59	30.82	30.46
Considered (month)	29.60	30.80	30.50

4.2.3 NPV and IRR

The NPV and IRR calculations are shown in table 4.2.3.

Table 4.2.3: NPV and IRR (100% equity)

Particulars/ years	0	1	2	3	4	5
	(Rs. in lakhs)					
Profit after tax	-	1.53	1.84	0.71	0.64	0.62
Depreciation	-	1.02	1.02	1.02	1.02	1.02
Cash outflow	6.28	-	-	-	-	-
Net cash flow	-6.28	2.55	2.85	1.73	1.66	1.64
Discount rate % @ WACC	9.30	9.30	9.30	9.30	9.30	9.30
Discount factor	1.00	0.91	0.84	0.77	0.70	0.64
Present value	-6.28	2.33	2.39	1.32	1.17	1.05
Net present value	1.99					
Simple IRR considering regular cash flow	22.28%					

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	-	1.26	1.69	0.46	0.45	0.50
Depreciation	-	1.06	1.06	1.06	1.06	1.06
Cash outflow	6.51	-	-	-	-	-
Net cash flow	-6.51	2.31	2.74	1.52	1.51	1.55
Discount rate % @ WACC	10.10	10.10	10.10	10.10	10.10	10.10
Discount factor	1.00	0.91	0.82	0.75	0.68	0.62
Present value	-6.51	2.10	2.26	1.14	1.03	0.96
Net present value	0.98					
Simple IRR considering regular cash flow	16.50%					

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	-	1.33	1.73	0.53	0.51	0.53
Depreciation	-	1.04	1.04	1.04	1.04	1.04
Cash outflow	6.44	-	-	-	-	-
Net cash flow	-6.44	2.38	2.77	1.58	1.55	1.58
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	0.62
Present value	-6.44	2.16	2.30	1.19	1.07	0.99
Net present value	1.26					
Simple IRR considering regular cash flow	18.13%					

4.3 Marketing & selling arrangement

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

Table 4.3: Marketing & selling arrangements

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

4.4 Risk analysis and mitigation

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

Table 4.4: Risk analysis and mitigation

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

4.5 Sensitivity analysis

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

Table 4.5: Sensitivity analysis

S. No.	Scenario	D/E ratio	SPP (months)	NPV (Rs lakh)	IRR (%)	DSCR	ROI (%)
1	10% increase in estimated savings	100% equity	26.6	2.74	26.87	-	16.72
		70:30	27.7	1.71	21.07	2.32	25.27
		50:50	27.3	2.00	22.70	3.22	21.67
2	10% reduction in estimated savings	100% equity	33.4	1.24	17.55	-	12.70
		70:30	34.8	0.25	11.75	1.95	19.29
		50:50	34.4	0.53	13.38	2.69	16.35
3	10% rise in interest rates	70:30	30.9	0.77	15.90	2.09	22.19
		50:50	30.6	1.11	17.70	2.89	18.99
4	10% reduction in interest rates	70:30	30.7	1.19	17.09	2.18	23.03
		50:50	30.4	1.42	18.55	3.02	19.50

5.0 Conclusions & recommendations

The IGDP prepared for the replacement of old and inefficient cooling water system with energy efficiency cooling water 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 is 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 (tonnes of CO ₂)
	Electricity (kWh)	(Rs. lakh)	(Rs. lakh/year)	(Year)	
Replacement of old and inefficient cooling water system with energy efficiency cooling water system	40,296	6.28	2.86	2.2	33.0

The estimated annual monetary saving by implementation of the project is estimated to be of Rs 2.86 lakh. The investment requirement is Rs 6.28 lakh with a simple payback period of 2.2 years. 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	6.28	6.51	6.44
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	22.28	16.50	18.13
4	NPV	Rs. In Lakh	1.99	0.98	1.26
5	DSCR	-	-	2.14	2.95

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 under taken 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 style="text-align: center;">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”

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: National Cooling Towers

National Cooling Towers

ISO 9001-2008 CERTIFIED COMPANY

26, Amrapali Industrial Estate, Ram Mandir Road, Goregaon (West), Mumbai-400 104, INDIA
Tel.95-22-2676 50 10 / 11 / 12 / 6694 93 54 / 55 / 56. Fax.95-22-2676 50 13. Email: nct@vsnl.com
website: www.nationalcoolingtowers.com -----

PR/NCT/AS/03/18/65

Date:- 16th March, 2018

To
Mr. Ashish Sakhare
Mobile:- 8587 92 33 42
Email:- ashish.sakhare@teri.res.in

Subject: Your Requirement of Cooling Towers with basin

Dear Sir,

This refers to your email enquiry dated 13th March, 2018 regarding your requirement of Cooling Tower with basin. We thank you very much for the interest evinced in our product. As desired by you, we take pleasure to submit our offer for FRP Cooling Towers as under.

A) FRP COOLING TOWER MODEL NO. NCT-3750 WITH BASIN

Along with Technical Specification, Commercial Terms and conditions enclosed with the offer.

We are sure our specification will suit to your application and award us with your valued order at earliest. However if you have any query or need more information please feel free to contact us.

Thanking you,

Yours faithfully,

For National Cooling Towers

PRABHAKAR (9323 54 62 30)
(General Manager-Marketing)

National Cooling Towers

ISO 9001-2008 CERTIFIED COMPANY

26, Amrapali Industrial Estate, Ram Mandir Road, Goregaon (West), Mumbai-400 104. INDIA
Tel.95-22-2676 50 10 / 11 / 12 / 6694 93 54 / 55 / 56. Fax.95-22-2676 50 13. Email: nct@vsnl.com
website: www.nationalcoolingtowers.com

: 2:

FRP COOLING TOWERS MODEL NO. NCT-3750 WITH BASIN

A	DESIGN DETAILS CAPACITY	
01	Water Flow rate	3750LPM
02	Inlet temperature	37°C
03	Outlet temperature	32°C
04	Wet bulb temperature	28°C
05	Temperature difference	5°C
06	Approach	4°C
07	Cooling Tower Model No.	NCT- 3750
08	Total wetted surface area	1688 m ²
09	Cooling Capacity	11,25,000 Kcal/hr
B	COOLING TOWER	
01	Type of Cooling Tower	Induced Draft Square Counter Flow
02	Quantity	01No.
03	Tower dimension (L x W x H) MM	3200.4 x 3200.4 x 3505.2
04	Basin dimension (L x W x H) MM	3200.4 x 3200.4 x 304.8
05	MOC of Tower	FRP
06	MOC of Tank	FRP
C	PVC FILLS	
01	Material of fills	PVC
02	Type	Honeycomb
03	Size of PVC Fills (L x W x H) MM	600 x 300 x 150
04	Size of Drift Fills (L x W x H) MM	600 x 150 x 150
D	FAN ASSEMBLY	
01	Type	Axial Flow
02	Air quantity / Fan	31.95 m ³ /sec
03	BHP/BKW	8/5.968
04	No. of fan	01
05	Dia of fan	1900 mm
06	No. of blades in fan	06
07	Fan RPM	750+
08	Material of blade	FRP
09	Type of balancing	Static

For National Cooling Towers,

PRABHAKAR
(General Manager-Marketing)

National Cooling Towers

ISO 9001-2008 CERTIFIED COMPANY

26, Amrapali Industrial Estate, Ram Mandir Road, Goregaon (West), Mumbai-400 104. INDIA
 Tel.95-22-2676 50 10 / 11 / 12 / 6694 93 54 / 55 / 56. Fax.95-22-2676 50 13. Email: nct@vsnl.com
 website: www.nationalcoolingtowers.com

: 3:

E	ELECTRIC MOTOR	
01	No. of motor	01
02	Motor HP	10.0 HP
03	Type	Vertical flange mounted, squirrel cage TEAOM weather proof induction motor suitable for supply of 3Phase, 415V+6% 50Hz +3% with "F" class of insulation & IP-55 Degree protection.
04	Motor RPM	750+
05	Fan coupling	Direct
06	Class of Insulation	F
07	Make	LHP or Batliboi
F	MATERIAL OF CONSTRUCTION	
01	Structure	FRP
02	Casing	FRP
03	Nozzles	ABS
04	Fan blades	FRP
05	Fan Hub	HDG
06	Fill support	M. S. with epoxy coated
07	Drift eliminators	PVC
08	Drift eliminators support	M. S. with epoxy coated
09	Fill	Rigid PVC
10	Nut, Bolt & washers	GI
11	Motor shaft	EN -8
12	Ladder	M. S. with epoxy coated
13	Header pipe	PP with FRP Coating
G	DESIGN PERFORMANCE	
01	Evaporation loss	0.765% of circulating water flow
02	Drift Loss	0.005% of circulating water flow
03	Make-up water quantity	0.77% of circulating water flow
H	CONNECTION	
01	Inlet	150mm
02	Outlet	150mm

For National Cooling Towers,

PRABHAKAR
 (General Manager-Marketing)

National Cooling Towers

ISO 9001-2008 CERTIFIED COMPANY

26, Amrapali Industrial Estate, Ram Mandir Road, Goregaon (West), Mumbai-400 104. INDIA
Tel.95-22-2676 50 10 / 11 / 12 / 6694 93 54 / 55 / 56. Fax.95-22-2676 50 13. Email: nct@vsnl.com
website: www.nationalcoolingtowers.com

: 4:

Commercial Terms & Condition:

A) MODEL NO. NCT-3750 WITH BASIN:-

- | | | |
|---|---|--|
| 01. Price of Cooling Tower | : | Rs.2,51,000/- |
| 02. Price of Basin | : | Rs. 30,000/- |
| 03. Erection charges | : | Rs.15,000/- + tax
(separate bill provided) |
| 04. Packing charges | : | Extra at actual by client. |
| 05. Transport charges | : | Extra at actual by client.
(Ex-works Umbergaon, Gujarat) |
| 06. Octroi charges | : | Extra at actual by client. |
| 07. Excise duty | : | As applicable
at the time of dispatch |
| 08. Payment terms | : | 35% advance alongwith Purchase Order
& 65% against Proforma Invoice before
dispatch by way of D.D. in favour of
M/s. National Cooling Towers, payable
at Mumbai. |
| 09. Delivery period | : | within 4 to 5 weeks |
| 10. Unloading, Lifting
& Crane service | : | NOT in our scope of supply |
| 11. Offer validity | : | 60 days |
| 12. Warranty | : | One year from the date of dispatch |

For National Cooling Towers,

PRABHAKAR
(General Manager-Marketing)

NOTE:- MAKE UP WATER SOURCE AND CONNECTION, PIPE LINE, STARTER, PUMPS, PANEL BOARD, WIRING, RCC WORK, CIVIL WORK, VALVES, PAINTING, ELECTRICAL WORK, CABLING, UNLOADING, LIFTING, CRANE SERVICE NOT IN OUR SCOPE OF SUPPLY.

Quotation 2: SyGuru Innovators Pvt. Ltd

SyGuru Innovators Pvt. Ltd.

ISO 9001:2000 Certified



820, Siddarth Complex, Alkapuri, R C Dutt Road, Baroda 390007, India
Tel:+912652325024, Tel/Fax:+912652325034, email: info@syguuruace.com

SIPL/1534/CTFC/1718

Date: 10.04.2018

To,
TERI,

SUB: OFFER FOR COOLING FAN CONTROLLER

Dear Sir,

We are pleased to offer an advanced thermostatic cooling tower fan controller with many unique features. Our offer for SS sensor based temperature controller system for cooling tower fans; we are pleased to introduce SIPL-CTFC Energy Saver, a controller that automatically switches the FAN motor situated on the top of the Cooling Tower ON/OFF, with respect to the temperature of the water.

Special features of SIPL- CTFC are as follows.

- Saves Power upto 30 %
- Payback period – 30 to 45 days.
- Savings verified & Monitored by InBuild hour meters.
- Complete automatic Operations.
- Digital Display of Actual Water Temperature
- Independently Settable Motor On/Off // Hooter temp.
- Built – in 2 level Water Controller.
- Sturdy Wall Mounting Body

The Specifications are as follows::

Type -Micro processor based
Temperature Setting- 10 to 50 Deg.C.In step.Range of 0.5,
Delay- Programmable upto 30 minutes, with Sensor.
Display -Actual water temp.LCD Type.
Set Point- 2 set point design.
Manual option buypass setting available
Enclosure -Prewired in sheet metal enclosre.
Hour meter is in built,

SyGuru Innovators Pvt. Ltd.

ISO 9001:2000 Certified



820, Siddarth Complex, Alkapuri, R C Dutt Road, Baroda 390007, India

Tel:+912652325024, Tel/Fax:+912652325034, email: info@syguuruace.com

We are pleased to offer Our Energy Saver as for Cooling Tower Fan as under for export.

SyGuru CTFC Thermostatic controller for Cooling Tower: Rs. 19,500/-

(Main unit includes : Motor Off & Hooter Set points, 1' RTD sensor with 2 meter wire & sensor fixing bracket, Motor Off hour meter, 0.1 `C accuracy display, water level indicator/controller, Power, sensor break, Hooter, Motor, Water pump indicator etc.)

Optional items:

1. Traceable calibration certificate : Rs. 1,000/-
2. 4-20 mA output : Rs. 1,250/-
3. Motor On Hour meter: Rs. 1,150/-
4. Time lock for Motor Protection: Rs. 1,200/-
5. Extra Pt 100 Sensor : Rs. 2,650/-
6. Additional length of compensating sensor wire : Rs. 99 per meter

The prices are ex works Baroda

P&F: 3%

Excise: Nil

GST: As actual

Freight, insurance & customs on to pay basis by the client.

Warrantee: 1 year at free delivery at our works & to pay basis after repair Validity of offer : one month from the date of offer.

SyGuru Innovators Pvt. Ltd.

ISO 9001:2000 Certified



820, Siddarth Complex, Alkapuri, R C Dutt Road, Baroda 390007, India
Tel:+912652325024, Tel/Fax:+912652325034, email: info@syguuruce.com

Other Terms and Conditions:

Delivery: 2-3 Weeks from the date of receipt of Order.
Installation and commissioning: 100% against proforma invoice before dispatch.
Payment terms: 100 % against proforma invoice before diapatch by swift transfer to our bank account as below.

Bank: IDBI Bank
Address: 46- A, Gautam Nagar Soc, Nr. MGVCL Building , Race Course Circle,
Vadodara - Gujarat India – PIN – 390007
Account No. 021102000013101
RTGS ID : IBKL0000021

Thanking You & awaiting for your valued order.

Yours Faithfully,

Som Derashri
+919375279910



820, Siddarth Complex, Alkapuri, R C Dutt Road, Baroda 390007, India
Tel:+912652325024, Tel/Fax:+912652325034, email: info@syguuruace.com
AUTOMATIC TEMPERATURE CONTROLLER FOR COOLING TOWER FAN



A digital microprocessor based thermostatic controller that automatically switches the Cooling Tower FAN motor ON/OFF based on the set point of the cooling water supply at the water basin. The temperature is sensed using a 60 cm long sensor fitted onto the water tank, below the cooling tower.

PRINCIPLE OF OPERATION OF COOLING TOWER ENERGY SAVER:

A Cooling Tower works on the principle of evaporative cooling with air to water contact forced through an Induced draft Fan. The water in the cooling tower is made to flow by gravity through fills/splitters to increase surface area for better heat exchange between air and water. The air is sucked through the cooling tower fills/splitters and mist eliminator over coming the resistance in the path using a induced draft Fan so that depending on the cooling tower design it brings the cooling water temperatures down depending on the ambient conditions and L/G ratio. Once the basic designed Approach (Temperature difference between ambient air's wet bulb and the cooled water Temperature) of cooling tower has reached, further cooling of water is not possible even if we run the fan and thus under such circumstances we could switch off the fan without compromising on the cooling efficiency to save energy. Many a time during the winter season or cooler nights or

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even when the system heat load are not enough for the cooling tower design, the Fan may be switched off as the hot water falling through the cooling tower will naturally reach the desired temperature. The purpose of cooling tower is to cool the hot water to a desired level and once such temperatures are achieved, we can switch off the fan saving in energy and maintenance cost in the system. This is what is automated using our microprocessor based cooling tower fan controller. It also has two on time and off time logger (optional) so that the actual off time of the fan can be logged daily to know the amount of energy saved.

This savings may go up 70% in certain climates and cold & dry regions, whereby the cost of the energy saver is recover in just 25 – 30 days!!!!.

The Cooling Tower Energy Saver unit comes with time delay in restarts and is also available with soft starter (Optional), if needed. The soft starter ensures a jerk free start of the fan motor. The Cooling Tower Energy Saver is available in Standard Model with MOTOR ON and MOTOR OFF Hour meter (optional).

SALIENT FEATURES:

- ⌚ Completely Automatic operation.
- ⌚ Continuous Digital Display of Actual Water Temperature.
- ⌚ Individually settable MOTOR ON & MOTOR OFF temperatures (0-80°C). (This feature customizes Digital Energy Saver to your System)
- ⌚ Independently settable Hooter (warning) temperature (0 – 80°C). (In case the water temperature overshoots, the set Hooter temperature, it gives a warning signal.)
- ⌚ Built-in Water Level Controller for 2 levels (upper & lower)
(Connect to your fresh water pump to control water level in your tower water tank)
- ⌚ MOTOR ON & MOTOR OFF Hour meters provided. (Hour meters help you to calculate and verify and monitor the savings)
- ⌚ Can be connected with Motor of any capacity, with any kind of starter.
- ⌚ Automatic switch over to MANUAL mode in case of emergency. (By Pass provided)
- ⌚ RTD sensor used (60 cm length provided as a standard feature)
- ⌚ Can be fixed with your existing MOTOR & STARTER configuration.
- ⌚ Sturdy Wall Mounting metal body duly powder coated

Quotation 3: Supreme Pumps



Supreme pumps

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

Date: 12/04/2018

Ref No: SUP/120418

To,
Teri

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.	(5.5 KW / 7.5 HP) MODEL: ZS 80-65-125/5.5 Flow 1250 LPM 18 Meter Head Max consumption: 5.5 unit/hr.	61816	1no	61816.00
2.	(3.0 KW / 4.0 HP) MODEL: ZS 65-40-160/3.0 Flow 433 LPM 30 Meter Head Max consumption: 3 unit/hr.	46512	1no	46512.00
3.	(5.5 KW / 7.5 HP) MODEL: ZS 65-50-200/5.5 Flow 866 LPM 30 Meter Head Max consumption: 5.5 unit/hr.	57969	1no	57969.00
4.	(4 KW / 5.0 HP) MODEL: ZS 65-40-200/4.0 Flow 567 LPM 30 Meter Head Max consumption: 4.0 unit/hr.	55404	1no	55404.00
	Total Amount			221701.00

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.
- ❑ 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



Quotation 4: Delta Cooling Towers Pvt. Ltd

DELTA COOLING TOWERS P.LTD.

1st Floor, Bhagwati Sadan, Plot no. 8, Community Centre, BH Block,
Shalimar Bagh, (East) Delhi-110088 (India)

Tel : +91-11 -27495801/02/03
Fax : +91-11-27495804
Email : delta@deltatowers.com

Date: 10th April 2018

Subject: Your Requirement of Cooling Towers with basin

Dear Sir,

This refers to your email enquiry dated 31st March, 2018 regarding your requirement of Cooling Tower with basin. We thank you very much for the interest evinced in our product. As desired by you, we take pleasure to submit our offer for FRP Cooling Towers as under.

COOLING TOWER MODEL NO. 6150
FRP SQUARE SHAPE COUNTER FLOW COOLING TOWER
CAPACITY : 150 TR
DIMENSIONS : 2850 MM X 2850 MM X 3000 MM
FAN DIAMETER : 1500 MM
MOTOR HP : 7.5 HP
RS. 2,38,500.00

COOLING TOWER MODEL NO. 6175
FRP SQUARE SHAPE COUNTER FLOW COOLING TOWER
CAPACITY : 175 TR
DIMENSIONS : 3150 MM X 2850 MM X 3000 MM
FAN DIAMETER : 1500 MM
MOTOR HP : 7.5 HP
RS. 2,59,200.00

Regards,
DELTA COOLING TOWERS P. LTD.
Tel : +91-11-27495801 / 27495802 / 27495803
E-mail : delta@deltatowers.com, delta@nde.vsnl.net.in

Quotation 5: Jay Pumps Pvt. Ltd



Jay Pumps Pvt. Ltd.

"Jay House",
Stadium Circle, Navrangpura,
Ahmedabad - 380 009,
Gujarat, India.

Phone : +91-79-26561054 - 55
E-mail : info@jaypumps.com
Website : www.jaypumps.com
CIN : U29120GJ1994PTC021839

Branches :

Rajkot | Surat | Vadodara
New Delhi | Mumbai | Pune
Bangalore | Chennai
Tiruppur

Date: May 2018

To,
Mr. Vivek Sharma

Kalawad Road, Rajkot - 360005
Gujarat, India
08866088066

Dear Sir,

We are pleased to quote as per your requirement as attached

Please feel free to contact for any further techno commercial assistance.

These are cost of pumps for reference only. Final quotation will vary on the negotiation with the client.

Assuring you of the ultimate water management solution

Regards

Jay Pumps Pvt. Ltd.

For JAY PUMPS PRIVATE LIMITED

Suketu J Trivedi
Prepared by

Suketu J Trivedi
Verified by

Authorized Signatory





Jay Pumps Pvt. Ltd.

"Jay House",
Stadium Circle, Navrangpura,
Ahmedabad - 380 009,
Gujarat, India.

Phone : +91-79-26561054 - 55
E-mail : info@jaypumps.com
Website : www.jaypumps.com
CIN : U29120GJ1994PTC021839

Branches :

Rajkot | Surat | Vadodara
New Delhi | Mumbai | Pune
Bangalore | Chennai
Tiruppur

Quotation

To Mr. Vivek Sharma Kalawad Road, Rajkot - 360005, Gujarat, India 08866088066		Quotation No. Q-JPPL-HO-1516-050-8		Quotation Date 20/03/2018			
		Reference No.		Reference Date 05/03/2018			
		Payment Terms 100% Advance Against PI				Delivery Remarks :	
		Sr. No		Description		Qty	
				Unit Price (reference cost) INR			
				Tax (%)			
				Total Price INR			
1	GRUNDFOS Q-1250lpm, H-18, Monoblock horizontal multistage	1 Nos	65,000.00	12.00	72,800.00		
2	GRUNDFOS Q-440lpm, H-30, Monoblock horizontal multistage	1 Nos	42,000.00	12.00	47,040.00		
3	GRUNDFOS Q-870lpm, H-30, Monoblock horizontal multistage	1 Nos	55,000.00	12.00	61,600.00		
4	GRUNDFOS Q-570lpm, H-30, Monoblock horizontal multistage	1 Nos	47,000.00	12.00	52,640.00		
5	Cooling Tower, Horizontal draft , 500lpm, 32oC-40oC	1 Nos	125,000.00	12.00	140,000.00		
Sub Total					374,080.00		
Grand Total (INR)					374,080.00		
Amount In Words : Three Lakh Seventy Four Thousand & Eighty Rupees Only							

Commercial Terms And Conditions:

Validity: 30 Days From Date of Quote
 Delivery : Ex stock subject to prior sales
 Payments :100% advance
 Taxes: Extra as applicable
 Octroi :Extra as applible

For JAY PUMPS PRIVATE LIMITED

Suketu J Trivedi
Prepared by

Suketu J Trivedi
Verified by

Authorized Signatory



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	$\pm 1\%$
Anemometer	Testo: 425, Airflow: TA45	Air Velocity	$\pm(0.03 \text{ m/s} + 5\% \text{ of mv})$
Infrared thermometer	Testo: 845, Comark: KM848	Surface Temperature	$\pm 0.75\% \text{ of mv}$