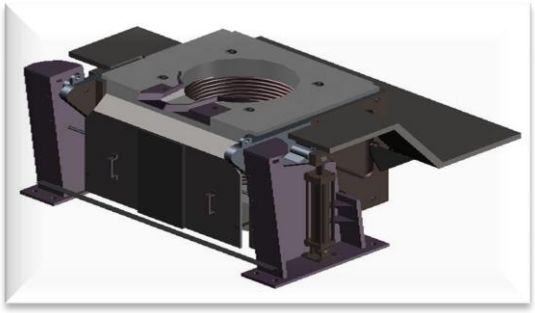
July 2018

DETAILED PROJECT REPORT
ON
REPLACEMENT OF EXISITING INDUCTION FURNACE NEW IGBT TYPE FURNCE

M/s Venus Brasotech –Jamnagar Brass Cluster



Submitted to

(Prepared under GEF-UNIDO-BEE Project)

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List of Abbreviations

AC	Alternate Current
ANSI	American National Standards Institute
BEE	Bureau of Energy Efficiency
DC	Direct Current
DPR	Detailed Project Report
EE	Energy Efficiency
GEF	Global Environmental Facility
IRR	Internal Rate of Return
kW	Kilo Watt
LSP	Local Service Provider
MSME	Micro and Medium Scale Industries
NPV	Net Present Value
OEM	Original Equipment Manufacturer
PGVCL	Paschim Gujarat Vij Company Ltd
TOE	Tonnes of Oil Equivalent
UNIDO	United Nation Development Organization
IGBT	Insulated Gate Bi-polar Transistor
SCR	Silicon Controlled Rectifier

ACKNOWLEDGEMENT

Confederation of Indian Industry (CII) would like to express its sincere thanks to United Nations Industrial Development Organization (UNIDO), Global Environment Facility (GEF) and Bureau of Energy Efficiency (BEE) for the role played by them in guiding and steering this prominent assignment - "Capacity Building of Local Service Providers in Jamnagar Brass Cluster"

CII would also like to give special gratitude to Jamnagar Brass Factory Owners' Association for supporting CII for carrying out this project at Jamnagar Brass Cluster and for their constant support and coordination throughout the activity.

CII is 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. Suresh Kennit, National Project Coordinator, UNIDO, Mr. Niranjan Rao Deevela, National Technology Coordinator, UNIDO and Mr. Samir Patel, UNIDO ,Cluster Leader, Jamnagar-Brass Cluster for their support and guidance during the project.

Last but not least we are thankful to Venus Brassotech, especially Mr. Keyur Khattar, for showing keen interest in the implementation of this technology and providing their wholehearted support and cooperation for the preparation of this Detailed Project Report.

We would take this opportunity to express our appreciation to the Original Equipment Suppliers and Local Service Providers for their support in giving valuable inputs and ideas for the completion of the Detailed Project Report.

We would also like to mention that the valuable efforts being taken and the enthusiasm displayed towards energy conservation by the Jamnagar Brass Cluster is appreciable and admirable.

1. EXECUTIVE SUMMARY

Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, in collaboration with United Nations Industrial Development Organization (UNIDO) is executing a Global Environment Facility (GEF) funded national project "Promoting energy efficiency and renewable energy in selected MSME clusters in India". The overall aim of the project is to develop and promote a market environment for introducing energy efficiency and enhanced use of renewable energy technologies in process applications in 12 selected energy-intensive MSME clusters across 5 sectors in India (with expansion to more clusters later). This will enable improvement in the productivity and competitiveness of units, as well as reduce overall carbon emissions and improve the local environment.

Key activities involved in the project are as follows:

- **LSP MAPPING:** Detailed Mapping of LSPs in the cluster.
- **TECHNOLOGY FEASIBILITY STUDIES:** Preparation of 10 bankable DPRs.
- **TRAINING MATERIALS:** Development of 5 customized training material based on mapping
- **TRAINING PROGRAM:** Conduct 4 training programs in the cluster for the capacity building of local service providers.
- **LSP's AS LOCAL DISTRIBUTORS:** Mapping of LSPs and OEMs so that LSPs can become local dealers for major OEMs.

1.1 Brief Unit Profile

Table 1: Unit Details

Particulars	Details
Name of Plant	Venus Brassotech
Name(s) of the Plant Head	Mr. Keyur Khattar
Contact person	Mr. Keyur Khattar
Constitution	Private Company
MSME Classification	Small
Address:	Plot No. 1/A, Shree Vishwanath Industrial Complex, Kansumra, Jamnagar - 361004
Industry-sector	Manufacturing

1.2 Proposed EE Measure

During the plant visit it was observed that the plant was operating with old (SCR) type induction melting furnace and has a scope of replacing it with energy efficient IGBT type induction melting furnace. After discussion with the plant team and technology supplier, it was proposed to replace

the old furnace at Venus Brassotech. The expected reduction in energy consumption is 77,703 kWh per year, which will lead to an annual cost savings of Rs. 6.06 lakhs. The details of the proposed EE measure are given in below:

Table 2: Proposed EE Measure

Sl No	EE Measure	Annual Energy Savings (kWh)	Monetary Savings (Rs. Lakhs)	Investment (Rs. Lakhs)	Payback (Months)	Annual GHG reduction (T CO_2)
1	**Replacement of existing induction furnace new IGBT type furnace**	77,703	6.06	31.62	63	63.7

1.3 Means of Finance

The details of means of finance for the proposed EE measure is as under:

Table 3: Project Finance

Sl. No.	Particulars	Unit	Value
i	**Total Investment (Incl. of Tax)**	Rs. Lakh	31.62
ii	**Means of Finance**	Self / Bank Finance	Bank (D70:E30)
Iii	**IRR**	%	29.3
Iv	**NPV at 70 % Debt**	Rs. Lakh	16.2

2. INTRODUCTION ABOUT VENUS BRASSOTECH

2.1 Unit Profile

Venus Brassotech is the latest endeavor by the Khattar Group, in the same industry the group started from in 1954. Founded formally in 2013, but drawing its lineage all the way down from 1954, Venus Brassotech extrudes high quality brass rods that meet the parameters of various Indian as well as International Standards.

Venus Brassotech, is an ISO 9001:2008 certified company, which is committed to providing quality products, services and value to the customers by creating an efficacy in manufacturing and delivery. Through excellence in its people, consistent quality and meticulous executions, they are providing raw materials to clients in various sectors such as auto components, plumbing, electric and agriculture. Venus Brassotech has developed practices to create a hazard free and accident free working environment and has installed safety systems such as fume arrestor and ETP plant for achieving zero discharge of water make the processes friendly to the environment.

Table 4: Unit Profile

Particulars	Details
Name of Plant	Venus Brassotech
Name(s) of the Plant Head	Mr. Keyur Khattar
Contact person	Mr. Keyur Khattar
Contact Mail Id	venusbrassotech@khattar.co.in
Contact No	+91 7878787819
Constitution	Private Company
MSME Classification	SME
No. of years in operation	5 Years
No of operating hrs./day	12 hrs.
No of operating days/year	300 Days
Address:	Plot No. 1/A, Shree Vishwanath Industrial Complex, Kansumra, Jamnagar - 361004
Industry-sector	Manufacturing
Type of Products manufactured	Extruded Brass Rods, Brass Hollow Rods, Brass Wires & Coils, Brass Flat Bars, Brass Sections

2.2 Production Details

The various products manufactured in Venus Brassotech are Extruded Bars Rods, Brass Hollow Rods, Brass Wires and Coils, Brass Flat Bars and Brass Section & profiles. Last year plant had an average finished product output of 80.84 Ton per month[1]. The graph below shows the month wise production of brass products at Brassotech during last year:

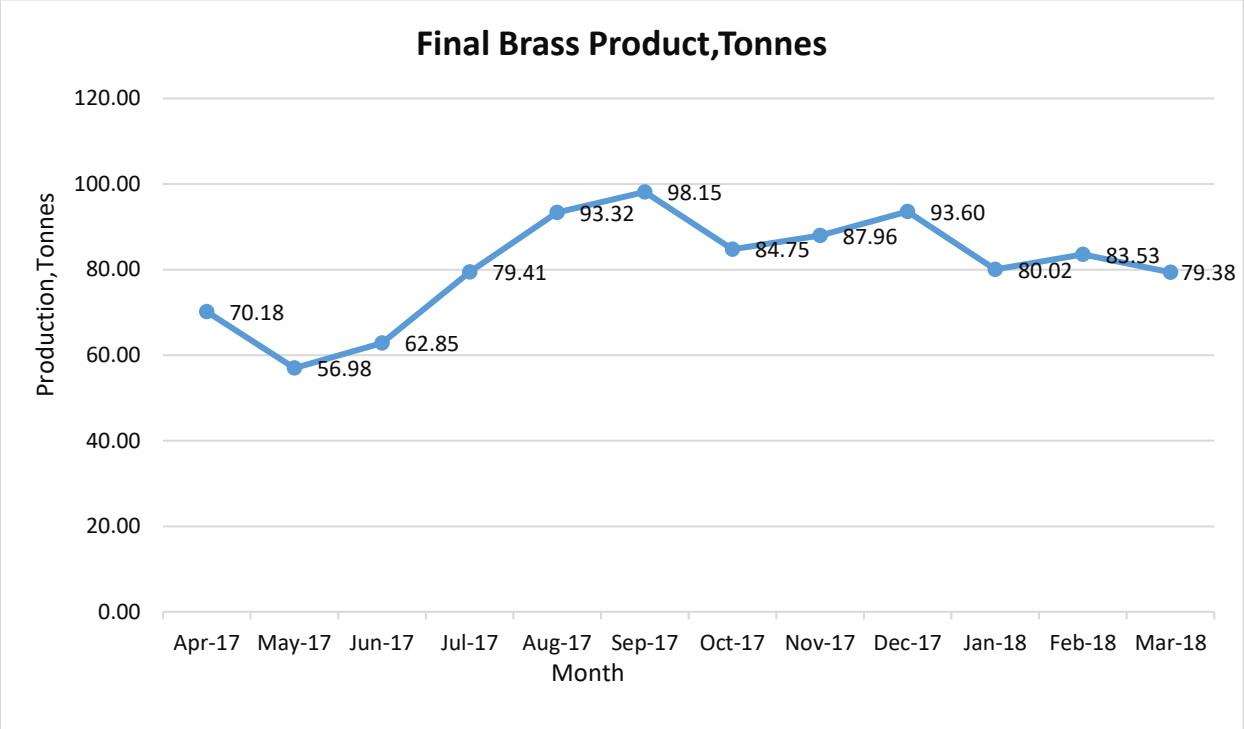


Figure 1: Production Details

[1] Finished brass goods

2.3 Typical Brass Production Flow Diagram

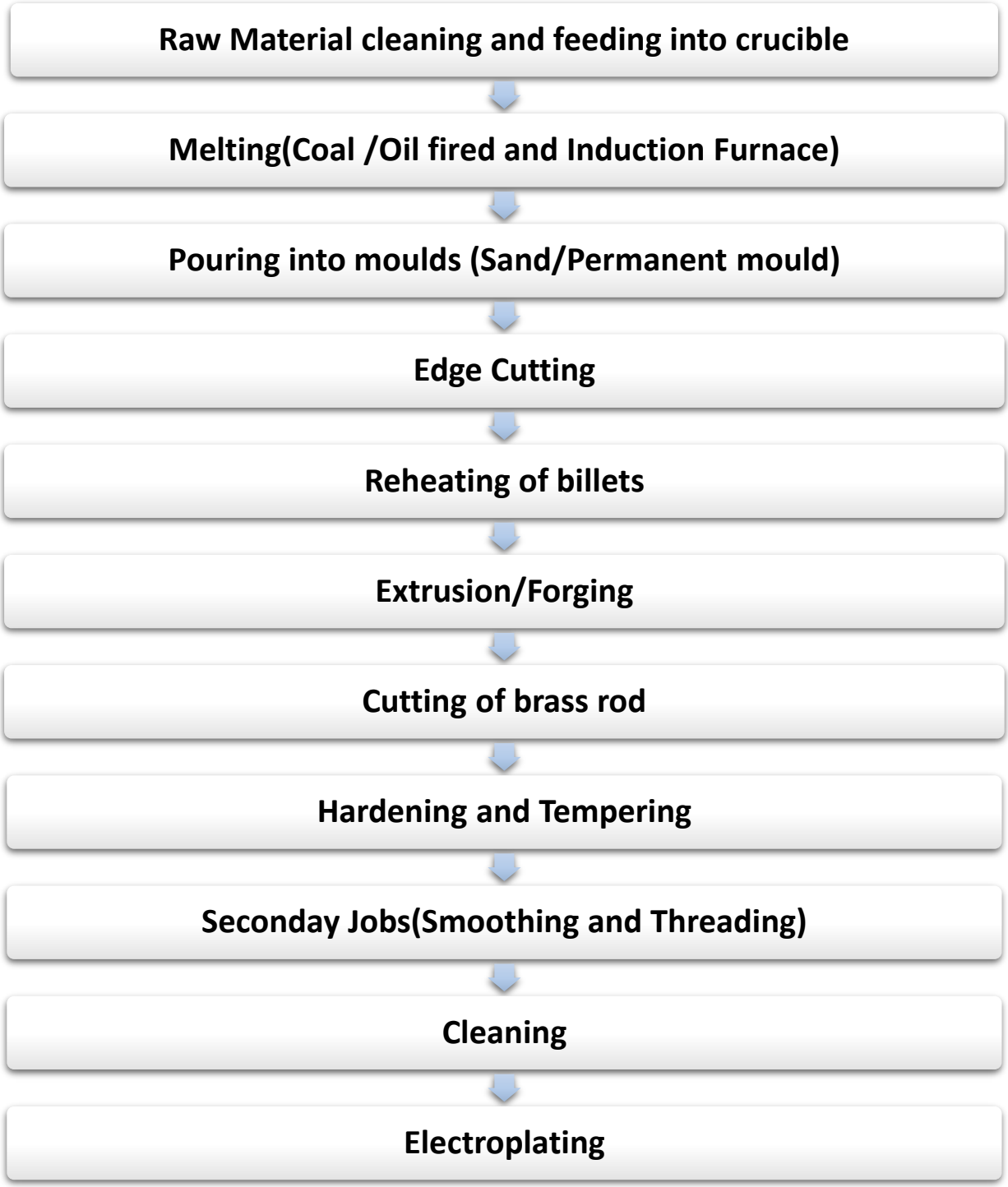


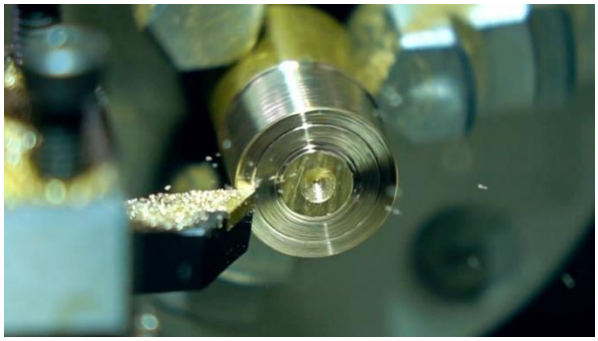
Figure 2: Typical Process Flow Chart

The production process mentioned in the above chart is almost similar to most of brass part manufacturing units in the cluster. However, depending on the final product, quality of final product and raw material properties, some of the stated process flow is altered to suit the requirement of industry. The major processes taking place at a typical Brass industry includes:

Melting: After separating the impurities form the brass scrap, the first step in making most of the products is melting the scarp in small furnace ranging from 100kg to 2000kg. Typically in Jamnagar pit type coal fired and induction melting furnaces are mainly used

Casting: After melting the next step involves casting molten brass in permanent mould or sand mould, depending upon the final product of the company. Sand moulding usually involves the preparing the consolidated sand mould around a pattern held within a supporting metal frame and removing the pattern to leave the mould cavity with cores. The liquid brass is poured into the cavity and allowed to solidify and when it does, the product is taken out of the mould cavity, trimmed and made to shape.

Machining: It is a broad term used to describe removal of material from a workpiece to get the desired shape and size of the material for further use. Machining is one of the key specialty of the products manufactured in Jamnagar clusters. Most of the plants are using traditional machines for grinding, grooving and other secondary jobs along with latest generation CNC machines for some specific jobs.



Electroplating: Is the process that is coating metals through reaction of the electrical conductive and chemical organics. The basic electroplating process consists of a plating bath filled with water containing a small amount of acid or alkali added to improve its conductivity.

- An anode (positive electrode) - either the plating metal or an inert electrode; this is expended as the process goes on and replenished periodically

- A cathode (negative electrode) - the item to be plated; these can be either hung inside the bath or placed in a barrel, which is rotated slowly to make the plating material deposited evenly

Usually, the bath is contained in metal container, lined with acid/alkali resistant membrane e.g. PVC sheet to make it insulated from electric circuit. The application of direct electric current across the bath solution causes the migration of positively charged particles (anions) towards the negative electrode (cathode) and negatively charged particles (cations) towards the positive electrodes (anode).

2.4 Energy Profile

Both electricity and thermal energy are used for carrying out various activities in plant like melting, reheating, extrusion, machining etc. The following fuels are used in the plant: -

Table 5: Type of fuel used

Type of fuel/Energy used	Unit	Tariff	GCV
Electricity	Rs./kWh	**7.8**	-
FO	Rs/kg	**32**	9800

The table below shows the average monthly energy consumption of the plant along with the average production of the finished goods during the last one year:

Table 6: Energy Consumption and Finished product Details

Month	Electricity Consumption (kWh)	Total Electricity Bill , Rs.(Lakhs)	Total Fuel Consumption, FO (Tonnes)	Total Fuel Bill, Rs(Lakhs)	Final Product, (Tonnes)[2]
Apr-17	41586	2.72	4.12	1.32	70.18
May-17	38844	2.59	4.00	1.28	56.98
Jun-17	42549	2.81	4.14	1.32	62.85
Jul-17	53100	3.39	4.24	1.36	79.41
Aug-17	47193	2.98	4.20	1.34	93.32
Sep-17	43308	2.81	4.10	1.31	98.15
Oct-17	38937	2.56	4.00	1.28	84.75

[2] Average annual final product output of the plant was approximately 23% less than the melting production due to processing losses of brass alloy at different stages like casting, reheating, extrusion, machining, etc.

Nov-17	38250	2.53	4.02	1.28	87.96
Dec-17	39720	2.61	4.10	1.31	93.60
Jan-18	42648	2.78	4.13	1.32	80.02
Feb-18	44094	2.82	4.16	1.33	83.53
Mar-18	40284	2.63	4.12	1.32	79.38

The major form of energy used in the plant is electricity which is imported from PGVCL grid supply at 11kV. Apart from electricity, furnace oil is the major source of thermal energy in the plant. Annually electricity cost accounts for 67.80% of the total fuel/energy cost and remaining 32.20% as thermal cost in the plant.

Based on the data collected from the plant, the graph below shows the variation of fuel cost over the last one year. Electricity cost is Rs. 2.77 Lakhs/month whereas the average thermal energy cost is Rs. 1.32 Lakh/month.

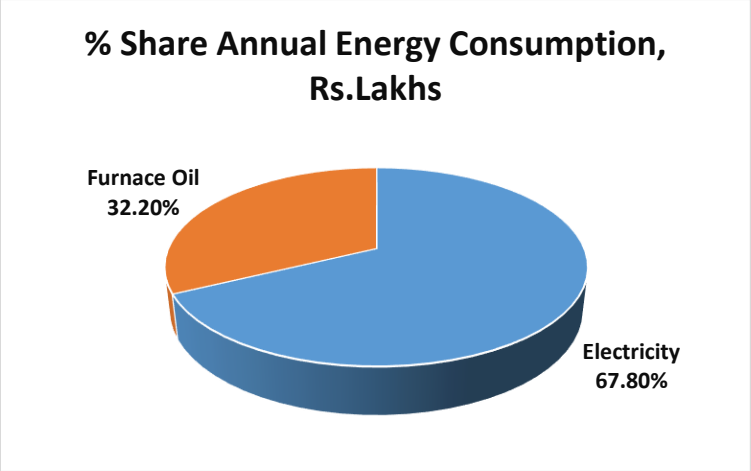


Figure 3: Percentage share of fuel cost

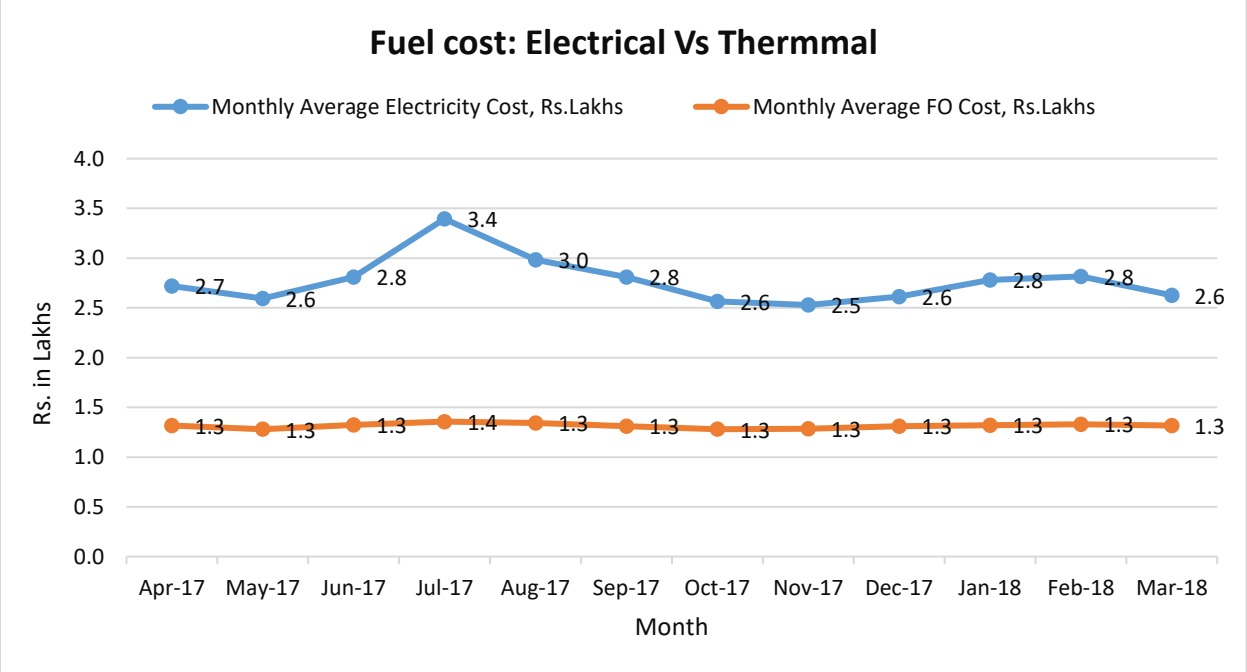


Figure 4:Energy Cost- Fuel & Electricity

3. PROPOSED EE MEASURE – REPLACEMENT OF EXISTING INDUCTION FURNACE WITH NEW IGBT TYPE INDUCTION FURNACE

3.1 Present System

Based on the measurements, observations/ findings during detailed assessment study conducted in the unit, it was found that the plant has the scope of improving the energy efficiency in the induction melting furnace. The Venus Brassotech has installed an induction furnace of rated capacity of 120 kW with two crucible of capacity of 350 kg each for melting.

The operational parameters of the induction furnace including the electricity consumption and material charged were measured during the detailed assessment study along with the analysis of the past one-year energy consumption and yield data. The operating parameters of the furnace during the study were given below:

Table 7: Existing Furnace Operating Parameters

Operating Parameters	Value
Equipment	Induction furnace
Type	SCR
Make	-
Purpose/Application	Melting
Rated Capacity	350kg
Operating Capacity of the furnace	380kg to 391kg
Operating Temperature (°C)	1100
Mode of operation (batch/continuous)	Batch
Batch duration , minute	63.30-74
Electricity consumption, kWh	294.57 - 342.11 units/ tonne of melt

3.2 Observation and Analysis

The specific power consumption of the induction furnace was estimated based on the data measured/collected during the field visit in the unit. The electrical unit consumption was taken for 6 cycles from the dedicated electricity board energy meter provided for the induction furnace. The unit was charging approximate 100% brass scrap (approximately 60% and 40% Zinc) in a batch. The average melting per batch has been estimated to be 384.67 kg per batch. During the

assessment it was also observed that the plant was taking more liquid metal yield from the crucible than the design capacity.

The detailed observed parameters for the 6 cycles are given below:

Table 8: Operating Parameters for different cycles

Parameters	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6
Unit Consumption	121	118	119	114	130	116
Liquid Metal Yield, kg	382	380	391	387	380	388
Cycle Time, Minutes	67.70	65.60	67.80	63.30	74.00	65.00
SEC (kWh/Tonne)	316.75	310.53	304.35	294.57	342.11	298.97

The average production of the melting section of the unit is estimated to be 4,231.33 kg melt production per day. The specific power consumption of the unit is estimated to be 311.21 kWh per tonne of liquid metal. The trend for power consumption and Brass melt in the induction furnace is shown below:

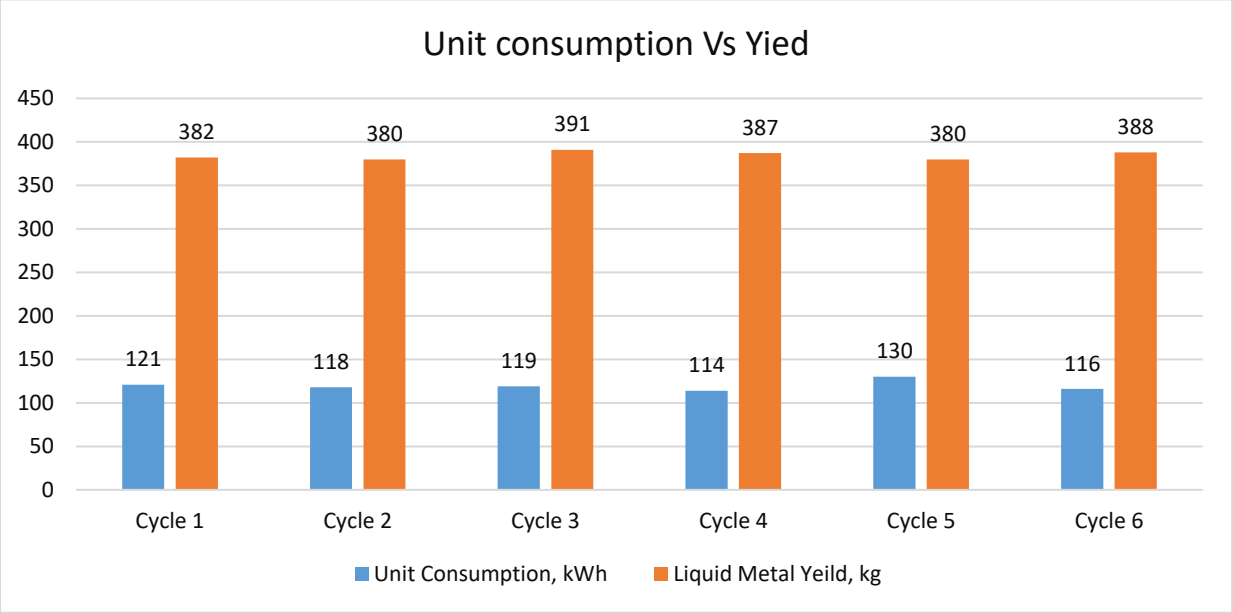


Figure 5: Trend for Energy consumption Vs Brass melt

The specific energy consumption was higher than the consumption in similar categories of furnaces with IGBT technology. Therefore, it is recommended to replace the existing induction furnace with a new induction furnace.

3.3 Recommendation

The unit has expansion plans and wants to upgrade the induction melting capacity from existing 350 kg to 750 kg with new IGBT technology. The proposed induction furnace specifications

include 250 kW capacity of power panel and 750 kg crucible capacity. The specific energy consumption of new furnace would be 210 kWh per tonne as specified by vendor.

Key advantages of replacing the conventional furnace with energy efficient furnace are:

- Inbuilt touch screen human machine interface (HMI) for better monitoring and controlling of power consumption and have up to 10 years storage facility of data like KWh consumed, daily/shift wise production report, tripping log ETC.
- IBGT based furnaces have higher efficiency in comparison to thyristor one
- Automatic Sintering facility with different sintering pattern to optimize the power consumption as the requirement of refractory mass material
- Near unity power factor (> 0.98) at any power level and any metal level which will reduce the overall power consumption in the furnace
- Constant output within specified range of input voltage variation to have better melting rate

The design specifications of the new IGBT type 250kW induction furnace are given below:

Table 9: Design Details of the new Furnace

Description	Rating
Rated Power, kW	250
Total Input, kVA	266
Input PF	0.98
Input Voltage, Volts	415
Output Frequency, Hz	500
Output Voltage, Volts	1050
Pouring Temperature for Brass, °C	1175
Nominal Capacity of furnace, Kg	750
Melting Rate for Brass at Pouring Temperature, kg/hr	823

3.4 Suppliers Details

Table 10: Supplier Detail

Equipment Detail	IGBT Induction Furnace
Supplier Name -1	Electrotherm India
Address	Survey No. 72, Village, Palodia, Taluka, Kalol, Dist. Gandhinagar - 382 115 Gujarat, India.
Contact Person	Kalpesh Chavda
Email Id	kalpesh.chavda@electrotherm.com
Supplier Name -2	Inductotherm India
Address	Plot no. SM-6, Road no. 11, Sanand-II Industrial Estate, BOL Village, Sanand, Ahmedabad - 382170

Contact Person	Nishant Singh
Email Id	nsingh@inductothermindia.com
Supplier Name -3	Indo Power Furnace Pvt Ltd
Address	No. 56/ A - 4, Phase - 1,G. I. D. C., Vatva, Ahmedabad - 382445, Gujarat, India
Contact Person	Nandlal Pate
Email Id	indopowerfurnace@gmail.com

3.5 Savings

The estimated annual energy savings by replacement of existing Thyristor (SCR) type induction furnace with IGBT type furnace is 77,703 kWh equivalents to a monetary saving of Rs. 6.06 lakh. The investment requirement is Rs 31.62 lakh with a simple payback period of 63 months.
The replacement of the furnace will lead to an energy saving of 6.7 TOE/year and GHG reduction of 63.7 Tonne CO_2/year.

Detailed savings calculations are given in below table:

Table 11: Savings Calculation

Parameters	Unit	Existing System	Proposed System
Furnace Type	-	Thyristor	IGBT
Electrical Capacity of furnace	kW	120	250
Capacity of Crucible	Kg	350	750
Average Specific energy consumption	kWh /Tonne	311.21	250
Average Cycle time	Minute per batch	67.23	54.55
Average heat Cycles per day		11	
Annual Operating days		300	
Average melting of Brass per cycle	kg	384.67	
Annual Melting of Brass	Tonne	1,269.40	
Annual Energy consumption on base brass production (Existing)	kWh/ Year	3,95,053	3,17,350
Annual energy saving on existing melting	kWh/year		77,703
Electricity cost	Rs/kWh		7.8
Total annual monetary saving	Rs. Lakhs		6.06
Investment Including GST@18%	Rs. Lakhs		31.62
Payback period	Months		63
Annual Energy Saving	TOE/Year		6.7
CO_2 Reduction	Tonnes/year		63.7

4. FINANCIAL ANALYSIS

4.1 Project Cost

Table 12: Project Cost

Parameter	Amount in Rs Lakhs
Installation of new IGBT type induction furnace	26.80
GST @18%	4.82
Total Project Cost	32.62

4.2 Assumptions for Financial Analysis

- Cost of Debt (Interest rate) taken as 12%
- Yearly increase in fuel cost by 2% for cash flow analysis
- Depreciation method: Reducing balance method
- Depreciation rate: 40% [3]
- Life cycle of the project is taken as 7 years
- Three different Capital Structure considered
    - CS1 – 70:30 Debt Equity Ratio
    - CS2 – 50:50 Debt Equity Ratio
    - CS3 – 100 % Equity
- Return on equity is taken as 15 %
- Operation and Maintenance Cost taken as 5% of Initial investment
- For calculating weighted average cost of capital, the corporate tax rate is assumed as 30 %

4.3 Cash Flow Analysis

Table 13: Cash flow of the project

Cash flow for the project		1	2	3	4	5	6	7
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Required Investment	31.62							
Energy Savings		6.1	6.2	6.3	6.4	6.6	6.7	6.8
O&M Cost		-1.6	-1.6	-1.6	-1.6	-1.6	-1.6	-1.6
Depreciation		12.6	7.6	4.55	2.7	1.6	1.0	0.6
Net Cash Flow	-31.62	17.1	12.2	9.3	7.6	6.6	6.1	5.8

[3] https://www.incometaxindia.gov.in/charts%20%20tables/depreciation%20rates.htm

The table below shows the WACC at various capital structure assumed for the financial analysis

Table 14: Capital Structure

Capital Structure			
Particulars	CS 1	CS 2	CS 3
Debt	70	50	0
Cost of Debt	0.12	0.12	0.12
Tax 30%	0.3	0.3	0.3
Equity	30	50	100
Sum of debt& Equity	100	100	100
Cost of Equity	0.15	0.15	0.15
WACC	10.38	11.7	15

Table 15: NPV Calculation

NPV Calculation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	NPV
NPV at CS 1 (70:30)	-31.62	15.5	10.0	6.9	5.1	4.0	3.4	2.9	16.2
NPV at CS 2 (50:50)	-31.62	15.3	9.8	6.7	4.9	3.8	3.1	2.7	14.6
NPV at CS 3 (100% Equity)	-31.62	14.9	9.2	6.1	4.3	3.3	2.6	2.2	11.0

4.4 Sensitivity Analysis

A sensitivity analysis has been carried out to ascertain how the project financials would behave in different situations such as

- Change in energy savings
- Change in operating hours
- Change in interest rate

The sensitivity analysis will help to estimate the impact of key project indicators on attractiveness of the project, thereby helping to understand the financial viability.

Table 16: Sensitivity analysis: based on energy savings

Sensitivity analysis: based on energy savings			
	at 100% Savings	at 75% Savings	at 50% Savings
IRR	29%	21%	12%
NPV at CS 1 (D70:E30)	16.2	8.6	0.9
NPV at CS2 (D50:E50)	14.64	5.68	-1.26
NPV at CS3 (D0:E100)	11.04	4.42	-2.20

Table 17: Sensitivity analysis: change in operating hrs.

Sensitivity analysis: based on operating hours			
	at 100% Operating hours	at 90% Operating hours	at 80% Operating hours
IRR	29%	26%	23%
NPV at CS 1 (D70:E30)	16.2	13.2	10.1
NPV at CS2 (D50:E50)	14.64	11.7	8.8
NPV at CS3 (D0:E100)	11.04	8.4	5.7

Table 18: Sensitivity analysis: change in interest rate

Sensitivity analysis: change in interest rate						
	at 9.5% Interest rate	at 10.05% Interest rate	at 11% Interest rate	at 12% Interest Rate	at 12.5% Interest Rate	at 13% Interest Rate
NPV (70:30)	17.81	17.17	16.86	16.24	15.94	15.64

5. ENERGY EFFICIENCY FINANCING IN MSMEs

Financing plays a key role in facilitating procurement and implementation of energy efficient technologies and products in any industry. Government has given EE financing in MSMEs top priority since the sector contributes significantly towards India's economic growth. However, existing financing options are not sufficient to meet the financing requirement in the sector due to the large size of the sector. MSMEs using various financing schemes for technological up-gradation are still very less, as most of them use their own capital fund rather than making use of external financing models. Although financing models were very successful in some clusters, the scale-up of such activities is rather slow. This slow pace in implementation of energy efficiency financing in MSMEs is due to the various sector specific challenges in the sector.

Some of the key barriers to finance EE projects in the sector are: -

- Lack of available capital for investment as EE interventions being small may not get financed through FIs as they do not qualify as term loans
- Lack of clarity on financing schemes- repayment mechanism and complex procedural requirements
- Lack of availability of financing model that cater to the particular requirement of the MSME
- Lack of awareness among MSMEs with respect to benefits of implementing EE technologies
- FIs consider MSMEs as a high-risk category due to low credit flow to this sector. This is due to several factors such as poor book-keeping practices, weak balance sheets, poor credit history and smaller sizes of MSME loans.
- Collateral based lending, advocated by FIs, restricts MSMEs from availing loans
- No formal M&V procedure available to estimate the savings achieved by implementing EE measure
- Risks associated with repayment of loans which include technical, commercial and performance risks

5.1 FI Schemes in Gujarat

Table 19: FI schemes in Gujarat

Sl.No	Name of Scheme	Purpose	Financial Details	Contact Address
1	**SIDBI Make in India Soft Loan Fund for Micro, Small & Medium Enterprises (SMILE)**	• The focus of the scheme is on technology upgradation which helps in reducing the impacts from process and operations as the reduction in resource consumption and productivity improvements are major outcome of technology upgradation • The program aims to bridge the gap by providing financial support to the companies.	• Rate of interest is according to credit rating • Interest rates for soft loans are from (8.90 % to 8.95 % pa) and term loans are in the range of (9.45% to 9.60% pa) • Min loan amount: Rs 25 Lakhs • Term Loan: 75% of the project cost as debt	Mr.Chandra Kant SIDBI, NO.1-2-3/4, Shreeji Patel Colony, Jamnagar-361008. Contact no : 0288 275 3954 Mail id : chandrakant@sidbi.in
2	**4E scheme (End to End Energy Efficiency Financing scheme)**	• The 4E scheme promoted by SIDBI aims to assist the industries in implementation of energy efficiency and renewable energy projects. • The scheme addresses all aspects of energy efficiency in a company from assessment and identification of energy efficiency interventions to facilitating implementation by providing technical and financial support	• Interest rate - 2.5% below market interest rate • Min loan amount: Rs 10 Lakhs • Max loan amount: Rs 150 Lakhs • 90% of the project cost as debt	Mr.Chandra Kant SIDBI, NO.1-2-3/4, Shreeji Patel Colony, Jamnagar-361008. Contact no : 0288 275 3954 Mail id : chandrakant@sidbi.in

3	**Partial Risk Sharing Facility for Energy Efficiency project (PRSF)**	• The partial risk sharing facility aims at transforming the energy efficiency market in India and promotion of Energy Service Contracting Model for the Energy Efficiency. • The scheme address barrier related to the financing aspects for energy efficiency	• Term Loan: 12%-15% • Min loan amount: Rs 10 Lakhs • Max loan amount: Rs 15 Cr • Total Project funding of – USD 43 million • Risk Sharing facility component of USD 37 million to be managed by SIDBI • Technical assistance component of USD 6 billion to be managed by SIDBI and EESL	Mr. Chandra Kant SIDBI, NO.1-2-3/4, Shreeji Patel Colony, Jamnagar-361008. Contact no : 0288 275 3954 Mail id : chandrakant@sidbi.in
4	**Bank of Baroda's Scheme for Financing Energy Efficiency Projects**	All these Schemes from various banks (SBI, Bank of Baroda, and Canara Bank) have their focus towards technology upgradation. Technology upgradation can lead to improvement in energy, productivity, and lower emission from the MSME company. As technology upgradation could be capital intensive most of the	• Loans of up to 75% of the total project cost, subject to maximum of Rs. 1 crore, will be provided. (Minimum amount of loan Rs. 5 Lakhs • Collateral will be required for all loans. An interest rate of bank base rate + 4% will be applicable, to be paid back over a period of 5 years.	Bank of Baroda Saru Section Road,Swastik Society,Park colony,Jamnagar,Gujarat,361008 Contact no : 0288 266 0779 Mail Id : Jamnag@bankofbaroda.com
5	**Canara Bank's Loan scheme for Energy Savings for SMEs**		• The scheme covers up to 90% of project costs of up to INR 1 million (EUR 13,000). • Max. loan: INR 10 million (EUR 130,000) • Security: collateral free up to INR 5 million (EUR 65,000), beyond INR 5 million collateral required as determined by the bank • Margin: 10% of project costs	Canara Bank, 1st Floor, New Super Market, Bedi Road,Jamnagar,Gujarat,361001 Ph. no: 0288 267 6597

6	**SBI's Project Uptech for Energy Efficiency**	schemes from banking institutions aim at bridging the gaps for access to finance for MSME sector	• SBI identifies industrial clusters with potential for quick technology upgradation and a supporting environment. Based on studies in interested units, technology upgradation is undertaken if the same in viable. • With a ceiling of INR 1 lakh, an amount equal to that invested by the unit is provided under this loan. There is a start-up period of 3 years, with a repayment period of 5-7 years, at zero interest.	SBI Regional Office Junagadh Jamnagar Highway, Maheswari Nagar, Opp Anupam Cinema Hall, Kadiawad, Jamnagar, Gujarat 361001. Ph. no : 0288 2554026 Mail id : sbi.01816@sbi.co.in
7	**Solar Roof Top Financing Scheme IREDA**	The loan scheme is applicable to grid interactive, rooftop solar PV plants for industries, institutions and commercial establishments. Financing can be accessed for single or aggregated investments.	• Interest rate: 9.9% - 10.75% • Max. repayment time: 9 years • Minimum promoter's contribution: 30% • The applicant's minimum capacity needs to be 1MW	IREDA Camp Office 603, Atlanta Towers Near Panchvati Circle, Gulabi Tekra Ahmedabad Ph. No : 9811889805 Email Id : ashokyadav@ireda.in

6. ENVIRONMENTAL AND SOCIAL BENEFITS

6.1 Environmental Benefits

A resource-efficient business demonstrates a responsibility towards the environment. Energy and the environment are so closely linked, that, in addition to saving energy and reducing utility expenses, there are additional and often unreported benefits from conserving energy, saving natural resources being an important benefit.

Energy efficiency plays a major role, even where company output is increased, energy efficiency improvements can contribute significantly in most cases to reducing the negative impact of energy consumption per unit of output. Any increase in pollutant emissions will thus be minimized. Significant environmental benefits gained by adopting energy efficient technologies and processes may include lowering the demand for natural resources, reducing the emission of air pollutants, improving water quality, reducing the accumulation of solid waste and also reducing climate change impacts. Improving energy conservation at the facility can improve the facility's overall efficiency, which leads to a cleaner environment.

Reduction in Pollution Parameters

The proposed energy efficiency measure of installing energy efficient furnace will result in reduction of 6.7TOE per annum. The proposed EE measure will result in decrease of CO_2 emissions by 63.7 TCO_2 annually, thus resulting in reduced GHG effect.

6.2 Social Benefit

Work Environment

The Factories Act, 1948 covers various aspects relating to working environment maintenance and improvement. The good maintenance practices, technology up gradation, efficient use of energy and resource conservation not only contribute to energy and pollutant reduction but also contributes in ensuring safe and clean working environment to the employees of the organization. Many units have also been doing review of safety process and have provided access to safe working environment to the workers. Basic facilities such as first aid kit, PPE gears and many others have been made available

Skill Improvement

Implementing energy efficiency measures requires mix of people and skills. It involves upskilling workers at all levels from the shop floor to the board room to understand how companies manage their energy use—and to identify, evaluate and implement opportunities to improve energy performance. As the project involved identifying energy saving projects, implementing

and verifying the savings, the unit have understood how to estimate energy savings with respect to energy saving proposals and also energy wastage have been identified. The activity has been successful in bringing the awareness among workers on energy wastage reduction, technology up gradation possible, etc. Each new technology implemented in a brass unit will create an impact on the entire cluster as each unit can replicate the new technology and promote the concept of energy efficiency and renewable energy in entire Cluster and thus reduce the overall energy consumption of the cluster as a whole. Technical skills of persons will be definitely improved as the training provided by the OEMS' on latest technology will create awareness among the employees on new trends happening in market. The training also helps in improving the operational and maintenance skills of manpower required for efficient operation of the equipment.

7. CONCLUSION

Energy efficiency is an instrument to address the issue of energy crisis and also be employed as a cost effective means to attain sustainability and business. Cost of energy is considered as a vital component for industries and warrant judicious use of energy. Amid spiraling power cost energy efficiency assumes at most importance for the sector to remain competitive.

The GEF, UNIDO and BEE project through its various engagements is able to demonstrate energy efficiency potential in Jamnagar Brass cluster. The project is able to promote the concept of energy efficiency and renewable energy in brass cluster through various capacity building programs for local service providers, technology feasibility studies in brass units, training programs on EE/RE technologies and also helped in penetrating new /latest technologies into the cluster.

The DPR on replacing the existing old FO fired furnace with EE NG fired furnace is prepared after the OEM came to the unit and also did a detailed feasibility study. This measure will significantly reduce the dependency on furnace oil which will result in an annual energy savings of 6.7TOE per year with 63.7 TCO_2 reduction annually.

The following table gives the overall summary of the savings achieved: -

Table 20: Proposed EE Measure

Sl No	EE Measure	Annual Energy Savings (kWh)	Monetary Savings (Rs. Lakhs)	Investment (Rs. Lakhs)	Payback (Months)	Annual GHG reduction (T CO_2)
1	**Replacement of existing induction furnace new IGBT type furnace**	77,703	6.06	31.62	63	63.7

The summary of financial analysis given in the below table clearly indicates that implementation of this project is economically and financially viable with an attractive payback period. So it is recommended to install new IGBT based reheating furnace.

Table 21: Financial Analysis

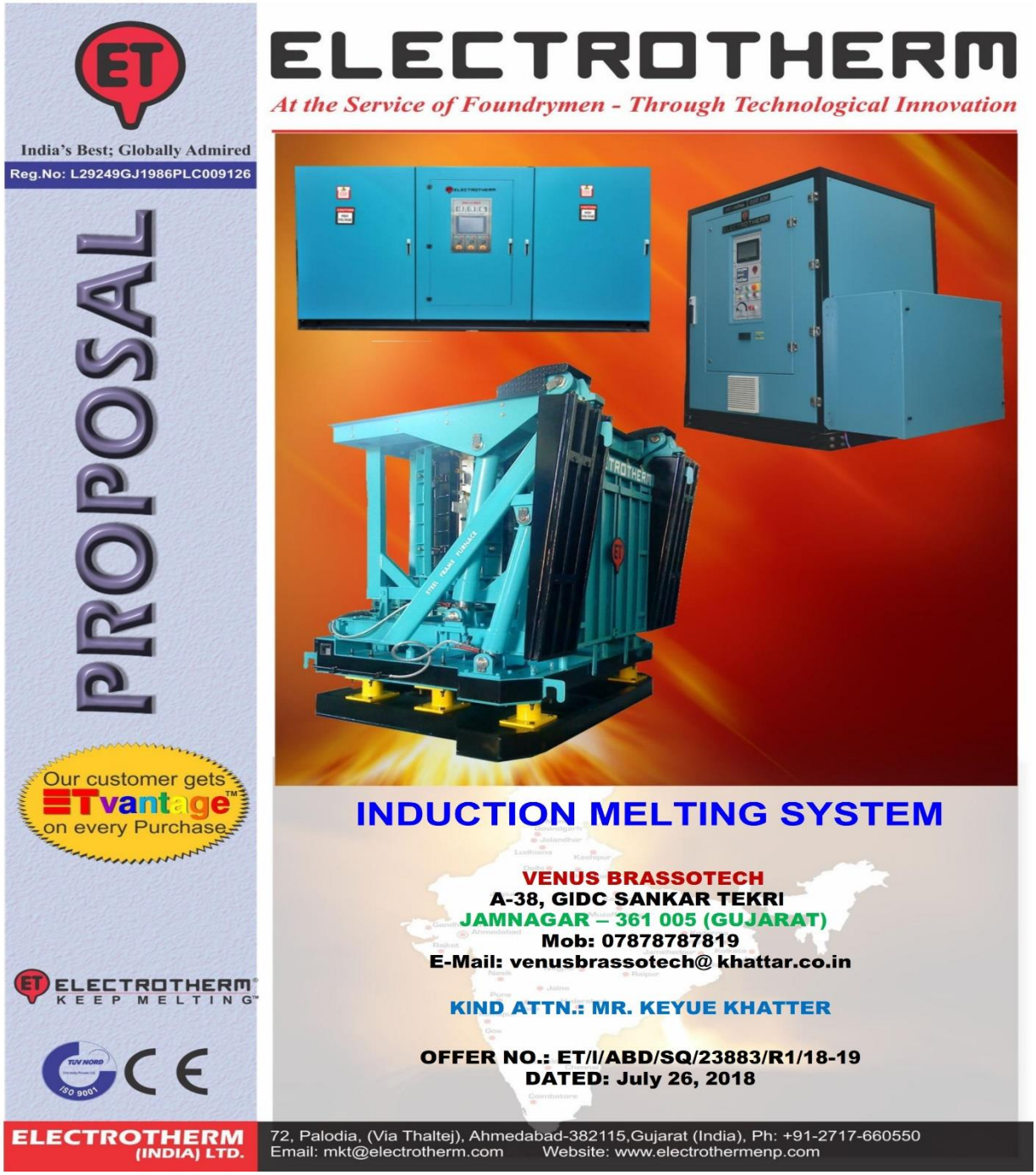
Sl. No.	Particulars	Unit	Value
i	**Total Investment (Incl. of Tax)**	Rs. Lakh	31.62
ii	**Means of Finance**	Self / Bank Finance	Bank (D70:E30)
Iii	**IRR**	%	29.3
Iv	**NPV at 70 % Debt**	Rs. Lakh	16.2

7.1 Replication Potential

Most of the units in Jamnagar brass cluster are using basic design furnace oil fired reheating furnace and has huge replication potential. The implementation of this project will inspire other units to take up similar energy efficiency initiatives which eventually will lower the bottom line and increase the top line therefore the margin increases. Secondly, the very clear specifications on vendor and the cost base is already available which makes it easy for other units in the Jamnagar Brass cluster to access the technology and gives them a very good idea about the cost and benefits associated with the projects. Overall, the holistic approach adopted by the project will be extremely useful in achieving the goal of improving EE in the cluster.

8. ANNEXURE

8.1 Quotation



Venus Brassotech, Jamnagar

Dear Sir,

This has reference to the discussions Mr. Kalpesh Chavda had with you regarding your requirement of induction melting furnaces for your foundry. We thank you very much for your interest in Electrotherm foundry melt shop solutions.

Established in 1983, Electrotherm has supplied over 3300 induction furnaces in over 36 countries for a wide ranging applications in iron, steel and non-ferrous induction melting. The state of the art manufacturing facility in Ahmedabad, supported by the full-fledged R & D centres in Ahmedabad and Coimbatore can provide optimum solutions for all induction melt shop requirements.

With a network of over 32 sales and service centres spread across India, Electrotherm sales and service personnel will always be at your service for prompt assistance when required.

Based on your requirement, we are sending our offer no. **ET/I/ABD/SQ/23883/R1/18-19** for

- **One 250 kW / 500 Hz Quick-Melt "IG-nite"- Series Solid State Power Supply Unit with one 750 Kg ET- Steel Frame Melting Furnace.**

The offer consists of quotations, technical specifications, scope of supply and terms and conditions.

We trust that you will find the above offer in line with your requirement. If you need any further information/details, please feel free to contact us.

With a copy of this offer we are advising our regional office to get in touch with you for techno-commercial discussion.

Thanking you,

Yours faithfully,
for ELECTROTHERM (INDIA) LIMITED

SUNDAR SWAMI (HEAD - FOUNDRY FURNACE DIVISION)
(M) 9879204104 E-mail: sundar.swami@electrotherm.com

Copy to:

Mr. Kalpesh Chavda (M) 9825150066 E-mail: Kalpesh.chavda@electrotherm.com
Mr. Jaimin Shah (M) 8154001245 E-mail: jaimin.shah@electrotherm.com
Mr. Jaimin Trivedi (M) 9909004541 E-mail: jaimin.trivedi@electrotherm.com

Venus Brassotech, Jamnagar

E/CS/MK/QF04 Rev.00

OFFER FOR 250 KW / 750 KG MEDIUM FREQUENCY INDUCTION FURNACE

Sr. No.	Description	Qty.	Price (₹. in Lacs)
1	**250 kW "IG-nite"- Series Solid State Power Supply Unit** with DM Water Circulating Unit.	1 No.	16.20
2	**750 Kg ET-Steel Frame Melting Furnace** complete with refractory top & bottom, Copper Coil with Cooling Turns, Lamination Packets secured in a Frame Structure, Hydraulic Cylinders and Inlet & Outlet Sub-Manifolds etc.	1 No.	10.60
3	**Hydraulic Power Pack**	1 No.	
	Total Ex- works Price for above: ₹ 26.80 Lacs (RUPEES TWENTY SIX LACS EIGHTY THOUSAND ONLY)		

Please refer to our standard terms and conditions attached with this offer for price basis and commercial terms.

for ELECTROTHERM (INDIA) LIMITED

SUNDAR SWAMI
HEAD - FOUNDRY FURNACE DIVISION