DETAILED PROJECT REPORT
ON
ENERGY COST REDUCTION WITH KWH INDICATOR CUM INTEGRATOR FOR INDUCTION FURNACE

(BATALA, JALANDHAR, LUDHIANA FOUNDRY CLUSTER)











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Bureau of Energy Efficiency (BEE)

Prepared By

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INSTALLATION OF KWH INDICATOR

CUM

INTEGRATOR FOR INDUCTION FURNACE

BATALA, JALANDHAR, LUDHIANA FOUNDRY CLUSTER

BEE, 2011

Detailed Project Report on KWH Indicator cum Indicator for Induction Furnaces in Foundry Units

Foundry SME Cluster, Batala, Jalandhar, Ludhiana (Punjab) (India)

New Delhi: Bureau of Energy Efficiency

Detail Project Report No.: **BJL/ FUR/ KIC/11**

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Acknowledgement

We are sincerely thankful to the Bureau of Energy Efficiency, Ministry of Power, for giving us the opportunity to implement the 'BEE SME project in "BJL Foundry Cluster, Batala, Jalandhar & Ludhiana". We express our sincere gratitude to all concerned officials for their support and guidance during the conduct of this exercise.

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CII – AVANTHA Centre for Competitiveness for SMEs, Confederation of Indian Industry (CII) is also thankful to Industry Associations for their valuable inputs, cooperation, support and facilitating the implementation of BEE SME program in BJL Foundry Cluster.

We take this opportunity to express our appreciation for the excellent support provided by Foundry Unit Owners, Local Service Providers, and Equipment Suppliers for their active involvement and their valuable inputs in making the program successful and in completion of the Detailed Project Report (DPR).

CII – AVANTHA Centre for Competitiveness for SMEs, Confederation of Indian Industry (CII) is also thankful to all the SME owners, plant in charges and all workers of the SME units for their support during the energy use and technology audit studies and in implementation of the project objectives.

CII – AVANTHA Centre for Competitiveness for SMEs

Confederation of Indian Industry

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List of Abbreviations

BEE	Bureau of Energy Efficiency
SME	Small and Medium Enterprises
DPR	Detailed Project Report
GHG	Green House Gases
PF	Power Factor
EEF	Energy Efficient Motor
CDM	Clean Development Mechanism
DSCR	Debt Service Coverage Ratio
NPV	Net Present Value
IRR	Internal Rate of Return
ROI	Return on Investment
MT	Metric Tonne
SIDBI	Small Industries Development Bank of India

EXECUTIVE SUMMARY

Confederation of Indian Industry is executing BEE-SME program in Batala, Jalandhar and Ludhiana Foundry Cluster, supported by Bureau of Energy Efficiency (BEE) with an overall objective of improving the energy efficiency in cluster units.

Batala, Jalandhar and Ludhiana Foundry cluster, is one of the largest Foundry clusters in India; accordingly this cluster was chosen for energy efficiency improvements by implementing energy efficient measures / technologies, so as to facilitate maximum replication in other Foundry clusters in India. The main energy forms used in the cluster units are grid electricity.

Most of the Industrial installations in the country have large electrical loads which are severely inductive in nature, such as motors, large machines etc which results in a high power consumption. This means loss and wastage of energy by electricity boards as well as for Foundry units. This can be taken care by replacing arc furnace with medium frequency induction furnace.

Implementation of KWH Indicators and integrators will help to reduce the power consumption of an Induction Furnace by effective monitoring. This device enables to set a predetermined value for melting the material to a desired temperature. Setting of the energy parameter is based on the lowest achieved energy consumption figure. Close monitoring of the set goal ensures reaching the optimum level of specific energy consumption. Project implementation will lead to reduction in electricity bill by ` 0.36 Lakh per year.

This DPR highlights the details of the study conducted for the Energy Meter in an Induction Furnace, possible Energy saving and its monetary benefit, availability of the technologies/design, local service providers, technical features & proposed equipment specifications, various barriers in implementation, environmental aspects, estimated GHG reductions, capital cost, financial analysis, sensitivity analysis in different scenarios and schedule of Project Implementation.

This bankable DPR also found eligible for subsidy scheme of MoMSME for “Technology and Quality Upgradation Support to Micro, Small and Medium Enterprises” under “National Manufacturing and Competitiveness Programme”. The key indicators of the DPR including the Project cost, debt equity ratio, monetary benefit and other necessary parameters are given in table.

S. No.	Particular	Unit	Value
1	Project cost	`(in lakh)	0.38

S. No.	Particular	Unit	Value
2	Annual Electricity Savings @` 5/kWh	kWh/ Year	7200
3	Monetary benefit	`(in lakh)	0.36
4	Debit equity ratio	Ratio	3 : 1
5	Simple payback period	Years	1.05
6	NPV	`(in lakh)	0.97
7	IRR	%age	75.03
8	ROI	%age	28.32
9	Process down time	Days	4
10	DSCR	Ratio	3.97
11	Co_2 reduction	Tonne/year	5.83

The projected profitability and cash flow statements indicate that the project implementation will be financially viable and technically feasible.

ABOUT BEE'S SME PROGRAM

Bureau of Energy Efficiency (BEE) is implementing a BEE-SME Programme to improve energy performance in 29 selected SMEs clusters. Batala, Jalandhar and Ludhiana Foundry Cluster is one of them. The BEE's SME Programme intends to enhance energy efficiency awareness by funding/subsidizing need based studies in SME clusters and giving energy conservation recommendations. For addressing the specific problems of these SMEs and enhancing energy efficiency in the clusters, BEE will be focusing on energy efficiency, energy conservation and technology up gradation through studies and pilot projects in these SMEs clusters.

Major Activities in the BEE - SME Program are furnished below:

Activity 1: Energy Use and Technology Audit

The energy use technology studies would provide information on technology status, best operating practices, gaps in skills and knowledge on energy conservation opportunities, energy saving potential and new energy efficient technologies, etc for each of the sub sector in SMEs.

Activity 2: Capacity Building of Stake Holders in Cluster on Energy Efficiency

In most of the cases SME entrepreneurs are dependent on the locally available technologies, service providers for various reasons. To address this issue BEE has also undertaken capacity building of local service providers and entrepreneurs/ managers of SMEs on energy efficiency improvement in their units as well as clusters. The local service providers will be trained in order to be able to provide the local services in setting of energy efficiency projects in the clusters.

Activity 3: Implementation of Energy Efficiency Measures

To implement the technology up gradation projects in clusters, BEE has proposed to prepare the technology based detailed project reports (DPRs) for a minimum of five technologies in three capacities for each technology.

Activity 4: Facilitation of Innovative Financing Mechanisms for Implementation of Energy Efficiency Projects

The objective of this activity is to facilitate the uptake of energy efficiency measures through innovative financing mechanisms without creating market distortion.

1. INTRODUCTION

1.1. Brief Introduction about the Cluster

Indian foundry industry is very energy intensive. The energy input to the furnaces and the cost of energy play an important role in determining the cost of production of castings. Major energy consumption in medium and large scale foundry industry is the electrical energy for induction and Arc furnaces. Furnace oil is used in rotary furnaces. In Small foundry industry, coal is used for metal melting in Cupola furnaces. The energy costs contribute about 25 - 30% of the manufacturing cost in Indian foundry industry.

There are approximately 450 units, engaged in Foundry Cluster (automobile parts, agricultural implements, machine tools, diesel engine components, manhole covers, sewing machine stands, pump-sets, decorative gates and valves) production. The major locations wherein the units are spread are G.T. Road, Industrial area, Focal Point in Batala. In Jalandhar Dada Colony Industrial Area, Focal point, Focal Point Extn, Udyog Nagar, I.D.C, Kapurthala Road & Preet Nagar. In Ludhiana Focal Point Phase 5 to 8, Janta Nagar, Bhagwan Chowk Area & Industrial area – A/B. .

Availability of Electricity in Batala – across Dhir Road, GT Road is an issue; power is available from the grid for maximum 12/14 hours a day. There are some units in Jalandhar and Ludhiana having induction furnace in the range of 500 kg to 1 ton capacity whereas other units which are using local scrap as well as have high melting temperatures are having cupola and rotary furnace and has a capacity of minimum 5 ton per day.

The foundry produces a wide variety of castings such as manhole covers, pipe and pipe fittings, sanitary items, tube well body, metric weights, automobile components, railway parts, electric motor, fan body etc. 90% of the castings produced are from the SSI sector.

1.1.1. Energy Usage Pattern

Major energy sources being used in foundry cluster are electricity and fuels such as Coal, Furnace Oil, and Diesel. Electrical energy is being used in melting of iron in induction furnaces, operation of electrical utilities and thermal energy is being used in cupola furnaces operation.

1.2. Classification of Units

Broadly units are classified with respect to production capacity;

- Large Scale Units

- Medium Scale Units
- Small Scale Units

1.2.1. Production Wise Unit Breakup

Foundry cluster at Batala, Jalandhar and Ludhiana can be broken into three categories viz. small, medium and large size unit. Table 1.2 shows that production wise breakup of Foundry cluster.

Table 1.1 Production wise unit breakups

S. No.	Type of Unit	Production Capacity
1	Large scale unit	More than 1500 MT
2	Medium scale unit	250 to 1500 MT
3	Small scale unit	Less than 250 MT

1.2.2. Products Manufactured

Foundry SME cluster at Batala, Jalandhar and Ludhiana produces a wide variety of castings such as manhole covers, pipe and pipe fittings, sanitary items, tube well body, metric weights, automobile components, railway parts, electric motor, fan body etc.

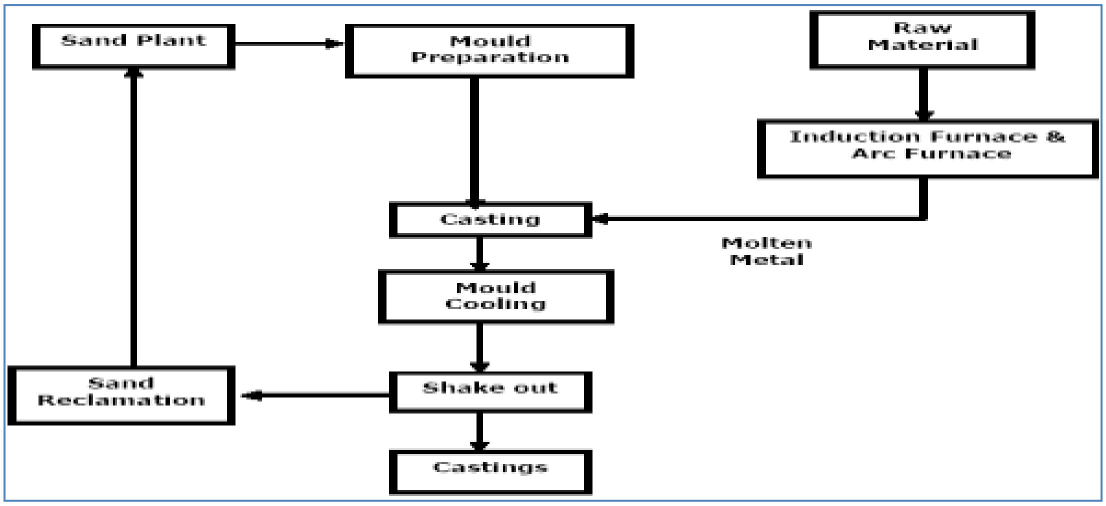

Figure 1.1: Process Flow diagram of a Foundry Cluster

The manufacturing process is described as below;

Melting Section: The raw material is melted in melting furnace. The melting furnace can be an induction furnace or rotary or arc furnace or cupola furnace. Molten metal from the melting furnace is tapped in Ladles and then transferred to the holding furnaces. Typically the holding furnaces are induction furnaces. The holding furnace is used to maintain the required molten metal temperature and also acts as a buffer for storing molten metal for casting process. The molten metal is tapped from the holding furnace whenever it is required for casting process.

Sand Plant:

Green sand preparation is done in the sand plant. Return sand from the molding section is also utilized again after the reclamation process. Sand Muller's are used for green sand preparation. In the sand millers, green sand, additives and water are mixed in appropriate proportion. Then the prepared sand is stored in bunkers for making moulds.

Pattern Making:

Patterns are the exact facsimile of the final product produces. Generally these master patterns are made of aluminum or wood. Using the patterns the sand moulds are prepared.

Mould Preparation:

In small-scale industries still the moulds are handmade. Modern plants are utilising pneumatic or hydraulically operated automatic molding machines for preparing the moulds. After the molding process if required the cores are placed at the appropriate position in the moulds. Then the moulds are kept ready for pouring the molten metal.

Casting:

The molten metal tapped from the holding furnace is poured into the moulds. The molten metal is allowed to cool in the moulds for the required period of time and the castings are produced. The moulds are then broken in the shake out for removing the sand and the used sand is sent back to the sand plant for reclamation and reuse. The castings produced are sent to fettling section for further operations such as shot blasting, heat treatment etc. depending upon the customer requirements.

1.3. Energy performance in existing situation

Major energy sources being used in foundry cluster are electricity and fuels such as Coal, Furnace Oil, and Diesel. Electrical energy is being used in melting of iron in induction furnaces, operation of electrical utilities and thermal energy is being used in cupola furnaces operation.

1.3.1. Average Production

The Average Production of the Foundry Units in above mentioned category during Year 2009-10 are as follows;

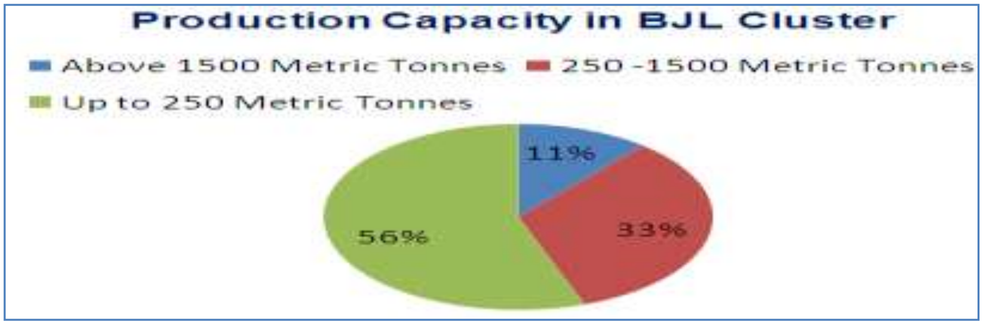

Figure 1.2 Production Capacity BJL Foundry cluster

1.3.2. Energy Consumption

Energy consumption (electrical) in a typical Foundry plant for different types of products is given in Table 1.5 below:

Table 1.2 Annual Energy Consumption

S. No.	Production Capacities	% of Units
1	Above 1500 Metric Tonne	11
2	250 to 1500 Metric Tonne	33
3	Below 250 Metric Tonne	56

Table 1.3 Annual Energy Consumption (Electricity)

Electricity Consumption Pattern	Unit Consumed in kWh	Total Unit Consumption kWh
Blower Motor for Cupola	962100	26.92 Lakhs
Rotary Motor for Rotary Furnace	330000	
Melting material in Induction Furnace	1400000	

Table 1.4 Annual Energy Consumption (Coal & Furnace Oil)

Thermal Energy Consumption Pattern	Consumption per Year
Coal for Cupola	5000 Metric Tonnes
Furnace Oil for Rotary Furnace	17.8 Lakhs Litter

1.3.3. Specific Energy Consumption

Specific energy consumption of Foundry units depends upon the production capacity & their corresponding power consumption. Specific energy consumption also depends on type of furnace. A brief summary of specific energy consumption depending upon type of furnace is shown in below table;

Table 1.5 Specific Energy Consumption

S. No	Types of Furnace	Types of Fuel	Specific Fuel Consumption / One kg Molten Material	Cost of Fuel in `
1	Cupola	Coal	0.2 kg	3.0
2	Rotary Furnace	Furnace Oil	0.15 Lt	4.20

S. No	Types of Furnace	Types of Fuel	Specific Fuel Consumption / One kg Molten Material	Cost of Fuel in `
3	Arc / Induction Furnace	Electricity	0.72 kWh	3.6

**Assuming Coal rate Rs.15.0 /kg*

**Assuming F.O rate Rs. 28.0 /Lt.*

**Assuming electricity rate Rs 5.0/kWh*

1.4. Existing Technology/Equipment

1.4.1. Description about the existing technology

Presently there are few Foundry plants at Batala, Jalandhar and Ludhiana which have induction furnaces. In induction furnaces the major energy losses are fixed losses such as loss due to heat to cooling water, radiation losses, etc. The component of these losses will increase with the increase in cycle time. Lesser power input to the furnace during the charging and melting period will also increase the cycle time thereby increase the specific energy consumption.

The factors contributing for the high specific energy consumption were analyzed

1. The power to the furnace was varied very frequently due to empty space in the crucible, excess charge & sample analysis delay and other operations.
2. The electrical parameters indicated that about 35-40% of the heat time the furnace was operated at 70-80% of rated power.
3. The raw materials are charged based on past experience rather than scientific method.
4. Medium frequency furnace is used for cast iron melting. The variation in per ton of metal melted is between 50 to 80 units.
5. The lowest specific power consumption achieved is 650 units/ton of molten metal.

The specific energy consumption in the furnaces was higher (580 Units/ Tn) than optimum (560 Units/ Tn) value may due to the one/all factors specified above. The furnaces do not have a KWH indicator cum integrator. Installation of a KWH indicator cum integrator to the induction furnaces will save the power as it helps to create a benchmark and enforced conscious practice to complete the job within the set goal. This energy integrator senses the inverter output power and integrates into energy delivered to the furnace. It is possible to set a predetermined energy requirement value for melting the material to the desired temperature.

1.5. Establishing the Baseline for the Proposed Technology

At Present all the Foundry plants at Batala, Jalandhar and Ludhiana are operating with

Induction Arc Furnace. The baseline is tabulated below:

Table 1.6 Baseline Establishment

S. No.	Particular	Unit	Value
1.	No. of operating days	Days	250
2.	Electricity Required per tonne for melting	kWh/tonne	580
3.	***Annual Production***	***Tonne***	***360***
4.	Annual electricity Consumption	MWh/Year	208.8
5.	Rate of Electricity	`/ kWh	5
6.	***Annual Expenditure on Electricity for melting***	***`in lakhs***	***10.44***

1.6. Barriers in adoption of proposed technology

1.6.1. Technological Barrier

- Lack of awareness and information of the loss in terms excess power consumption due to non monitoring of the temperature.
- Due to lack of technical knowledge and expertise, KWH indicator cum integrator are used less in the Foundry units.
- In this cluster, like many others, there is lack of leadership to take up the energy efficiency projects in the plant.

1.6.2. Financial Barrier

Availing finance is not the major issue. Among the SMEs, the larger units, if convinced they are capable of either financing it themselves or get the finance from their banks. The smaller units will require competitive loan and other support to raise the loan. However as most of them have been able to expand their setup and grow, there is readiness to spend for energy efficiency technologies which have good returns. Energy Efficiency Financing Schemes such as SIDBI's, if focused on the cluster, will play a catalytic role in implementation of identified energy conservation projects & technologies.

1.6.3. Skilled Manpower

In Foundry cluster at Batala, Jalandhar and Ludhiana, the availability of skilled manpower is one of the limitations; this issue gets further aggravated due to more number of Foundry units as compared to the availability of skilled manpower. For major equipments of Foundry units, maintenance or the repair works is done the equipment suppliers itself.

2. PROPOSED TECHNOLOGY

2.1. Detailed Description of Technology

2.1.1. Description of Technology

In some Foundry plants of Batala, Jalandhar and Ludhiana Medium frequency induction furnace is used for metal melting. The specific energy consumption pattern for each batch is monitored. There is a huge variation in the specific energy consumption. The variation in specific energy consumption is due to operational practices such as over shoot in metal temperature, holding of molten metal in the melting furnace due to break down in the molding line, metal waiting for tapping and furnace waiting for raw material etc. The lowest specific energy consumption is achieved in few batches due to adoption of the best operational practices incidentally in those batches.

The latest trend is installing kWh Integrator for the furnaces. The power consumption required for the melting has to be established based on the lowest specific energy consumption achieved in the past. The established power consumption should be set as a target for each melt.

The kWh integrator measures the power consumption as the melting progresses and indicates the units available to complete the batch as per the target. The kWh Integrator gives the signal to the operators to tap the molten metal within the target power consumption.

The advantages of installing kWh indicator cum integrator for the furnace are as follows:

- The furnace operators get an opportunity to take necessary steps online to complete the metal tapping within set target power consumption
- The lowest specific power consumption in the furnace for metal melting could be sustained

An energy meter is a device that measures the amount of electric energy consumed by a residence, business, or an electrically powered device.

Electricity meters are typically calibrated in billing units, the most common one being the kilowatt hour. A periodic reading of electric meters establishes billing cycles and energy used during a cycle.

In settings when energy savings during certain periods are desired, meters may measure demand, the maximum use of power in some interval. In some areas the electric rates are higher during certain times of day, reflecting the higher cost of power resources during peak demand time periods.

Figure 2.1 ENERGY METER (kWh METER)

2.1.2. Technology Specification

For implementation of the proposed project i.e. installing kWh indicator cum integrator in the Foundry units, the technical Specifications have been provided in Annexure 7, in Quotation provided by the vendor.

2.1.3. Suitability or Integration with Existing Process and Reasons for Selection

This is one of the simplest and widely accepted measures for energy cost reduction in all the industries. It does not affect the process but improves the process efficiency since these types of furnaces have low specific power consumption. Details in Annexure 8.

The Savings are basically due to better monitoring & control of temperature. Overshooting of temperature consume extra power. If temperature meter is installed, operator can view the status of consumption and could monitor/synchronize the process giving better operating efficiency. This practice could generate the savings of about 20 kWh per tonne of electricity savings in induction Furnaces.

2.1.4. Availability of Technology

As far as technology is concerned kWh indicator cum integrator are available in local/ national market. It is well proven technology which is adopted in many of the other similar and dissimilar units. Local vendors can arrange kWh indicator cum integrator at order. Local service providers are also available in Punjab. More details of service provider are given in annexure 6.

2.1.5. Source of Technology

The technology is wide spread and quite popular among modern entrepreneurs. The technology is commercial available in the market and the suppliers & vendors of the technology not only at major commercial cities but also are locally available.

2.1.6. Terms and Conditions after Sale

Warranty period of one year will be provided from the date of invoice against any manufacturing defects.

2.1.7. Process down Time during Implementation

Technology provider will bring the complete setup for the proposed project from their site and make all the arrangements for implementation at the client's site. The Process Down time would be about 4 days.

2.2. Life Cycle Assessment

Life of the proposed energy efficient motors will be around 3 to 5 years which depends on the operating conditions and maintenance at client's side.

2.3. Suitable Unit for Implementation of the Identified Technology

From estimation of the saving potential on implementation of this project, here the Foundry plants engaged in producing casting can be considered for implementation.

3. ECONOMIC BENEFITS FROM PROPOSED TECHNOLOGY

3.1. Technical Benefits

3.1.1. Electricity savings per year

Project of Installation of kWh indicator cum integrator with induction furnaces will result in savings of electricity consumption in Foundry plants, which is estimated to be about 7200 kWh of annual electricity consumption of the plant or unit.

The Savings are basically due to better monitoring & control of temperature. Overshooting of temperature consume extra power. If temperature meter is installed, operator can view the status of consumption and could monitor/synchronize the process giving better operating efficiency. This practice could generate the savings of about 20 kWh per tonne of electricity savings in induction Furnaces.

3.1.2. Improvement in product quality

This project is not contributing to any improvement in product quality, but it gives better working environment hence enhanced efficiency of the unit.

3.1.3. Improvement in production

This project is not contributing for increasing in production in Foundry plant. But it reduces the specific power consumption for producing same amount of castings.

3.1.4. Reduction in raw material consumption

Raw material consumption will be the same after the implementation of the proposed project.

3.1.5. Reduction in other losses

This project does not contribute to any reduction in any loss.

3.2. Monetary Benefits

Annual monetary savings on installation of kWh indicator will be `36000 per year.

Table 3.1 Monetary savings

S. No.	Parameter	Unit	Existing System	Proposed System
1.	No. of operating days	Days	250	250
2.	Electricity Required per tonne for melting	kWh/tonne	580	560
3.	***Annual Production***	***Tonne***	***360***	***360***
4.	Annual electricity Consumption	kWh/Year	208800	201600
5	Rate of Electricity	`/ kWh	5	5

S. No.	Parameter	Unit	Existing System	Proposed System
6.	Annual Expenditure on Electricity for melting	`in lakhs	10.44	10.08
7	***Annual electricity Savings***	***kWh/Year***		***7200***
8	***Annual Cost savings***	***`***		***36000***

3.3. Social Benefits

3.3.1. Improvement in Working Environment in the Plant

There is significant impact of this project in the working environment in the plant. This project will improve working condition for operators and improve the operator efficiency.

3.3.2. Improvement in Skill Set of Workers

The technical skills of operators will definitely improve. Training on the regular maintenance will help in improving the technical understanding of the workers.

3.4. Environmental Benefits

The major GHG reduction would be in Co_2 reduction. The technology will reduce grid electricity consumption and emission reductions are estimated at 5.83 tons of CO_2 per annum.

4. INSTALLATION OF THE PROPOSED TECHNOLOGY

4.1. Cost of Technology Implementation

Table 4.1: Details of Proposed Technology Installation Cost

S. No.	Particular	Cost in `
1	***Equipment cost (Annexure 7, Cost, Optional -2)***	***30000***
2	***Other cost (Taxes)***	***3752***
	Excise Duty @ 10%	3000
	Education Cess on Excise duty @ 2%	60
	Higher Education Cess on Excise duty @ 1%	30
	CST @ 2% against Form 'C'	661.8
3	***Misc***	***4000***
4	***Total Cost***	***37752***

4.1.1. Technology Cost

Cost of the project is about ` 37752 which includes the purchase of kWh indicator.

4.1.2. Other Cost

Other costs required will be ` 3752 which includes taxes and other miscellaneous costs will be `4000 as the contingency amount including commissioning, manpower cost, transportation etc.

4.2. Arrangements of Funds

4.2.1. Entrepreneur's Contribution

Entrepreneur will contribute 25% of the total project cost which is ` 0.09 Lakh.

4.2.2. Loan Amount

Remaining 75% cost of the proposed project will be borrowed from bank which is `0.28 Lakh.

4.2.3. Terms & Conditions of Loan

The interest rate is considered at 10% which is normal rate of interest for energy efficiency projects. The loan tenure is 5 years excluding initial moratorium period is 6 months from the date of first disbursement of loan.

4.3. Financial Indicators

4.3.1. Cash Flow Analysis

Profitability and cash flow statements have been worked out for a period of 8 years. The financials have been worked out on the basis of certain reasonable assumptions, which are outlined below. The cost of equipment considered is inclusive of hot water storage tanks also.

- The Operation and Maintenance cost is estimated at 4 % of cost of total project with 5 % increase in every year as escalations.
- Interest on term loan is estimated at 5 %.
- Depreciation is provided as per the rates provided in the companies Act.

Based on the above assumptions, profitability and cash flow statements have been prepared and calculated in Annexure-3.

4.3.2. Simple Payback Period

The total project cost of the proposed technology is `0.38 Lakh and monetary savings due to reduction in electricity consumption is `0.36 Lakhs hence, the simple payback period works out to be 1.05 years.

4.3.3. Net Present Value (NPV)

The Net present value of the investment at 10% works out to be 0.97 Lakhs.

4.3.4. Internal Rate of Return (IRR)

The after tax Internal Rate of Return of the project works out to be 75.03%. Thus the project is financially viable.

4.3.5. Return on Investment (ROI)

The average return on investment of the project activity works out at 28.32%.

Table 4.2: Financial Indicators of Proposed Technology

S No	Particular	Unit	Value
1	Simple Payback	Years	1.05
2	NPV	` In Lakh	0.97
3	IRR	%age	75.03
4	ROI	%age	28.32
5	DSCR	Ratio	3.97

4.4. Sensitivity analysis in realistic, pessimistic and optimistic scenarios

A sensitivity analysis has been carried out to ascertain how the project financials would behave in different situations like when there is an increase in rupees savings or decrease in rupees savings. For the purpose of sensitive analysis, two following scenarios have been considered.

- Optimistic scenario (Increase in monetary savings by 5%)
- Pessimistic scenario (Decrease in monetary savings by 5%)

In each scenario, other inputs are assumed as a constant. The financial indicators in each of the above situation are indicated along with standard indicators.

Table 4.3: Sensitivity Analysis in Different Scenarios

Scenario	Monetary Benefit(` Lakh)	IRR (%)	NPV(in Lakh)	ROI (%)	DSCR
Pessimistic	0.34	70.62	0.90	28.21	3.77
Base	0.36	75.03	0.97	28.32	3.97
Optimistic	0.38	79.43	1.04	28.42	4.17

4.5. Procurement and Implementation Schedule

Procurement and implementation schedule required for implementation of this technology is about 7 weeks and 4 days would required as a process break down. Details of procurement and implementation schedules are shown in Table 4.4 below

Table 4.4: Procurement and Implementation Schedule

S. No.	Activities	Weeks						
		1	2	3	4	5	6	7
1	Planning of kWh indicator	■						
2	Material order		■					
3	Procurement			■	■	■	■	
4	Commissioning							■

ANNEXURES

Annexure 1: Energy audit data used for baseline establishment

S. No.	Particular	Unit	Value
1.	No. of operating days	Days	250
2.	Electricity Required per tonne for melting	kWh/tonne	580
3.	***Annual Production***	***Tonne***	***360***
4.	Annual electricity Consumption	MWh/Year	208.8
5.	Rate of Electricity	`/ kWh	5
6.	***Annual Expenditure on Electricity for melting***	***`in lakhs***	***10.44***

Annexure 2: Detailed Technology Assessment Report

S. No.	Parameter	Unit	Existing System	Proposed System
1.	No. of operating days	Days	250	250
2.	Electricity Required per tonne for melting	kWh/tonne	580	560
3.	***Annual Production***	***Tonne***	***360***	***360***
4.	Annual electricity Consumption	kWh/Year	208800	201600
5	Rate of Electricity	`/ kWh	5	5
6.	Annual Expenditure on Electricity for melting	`in lakhs	10.44	10.08
7	***Annual electricity Savings***	***kWh/Year***		***7200***
8	***Annual Cost savings***	`		***36000***

Annexure 3: Detailed Financial Calculations

Name of the Technology	kWh Meter cum Energy Meter		
Rated Capacity	--		
Details	**Unit**	**Value**	**Basis**
No of Annual working days	Days	250	
Proposed Investment			
Plant & Machinery	` (in lakh)	0.34	
Civil Work	` (in lakh)	0.00	
Erection & Commissioning	` (in lakh)	0.00	
Misc. Cost	` (in lakh)	0.04	
Total Investment	` (in lakh)	0.38	
Financing pattern			
Own Funds (Equity)	` (in lakh)	0.09	Feasibility Study
Loan Funds (Term Loan)	` (in lakh)	0.28	Feasibility Study
Loan Tenure	Years	5.00	Assumed
Moratorium Period	Months	6.00	Assumed
Repayment Period	Months	66.00	Assumed
Interest Rate	%age	10.00%	
Estimation of Costs			
O & M Costs	% on Plant & Equip	4.00	Feasibility Study
Annual Escalation	%age	5.00	Feasibility Study
Estimation of Revenue			
Electricity Saving	kWh/Year	7200	
Cost of electricity	`/kWh	5	
St. line Depn.	%age	5.28	Indian Companies Act
IT Depreciation	%age	80.00	Income Tax Rules
Income Tax	%age	33.99	Income Tax

Estimation of Interest on Term Loan **` (in lakh)**

Years	Opening Balance	Repayment	Closing Balance	Interest
1	0.28	0.01	0.27	0.03
2	0.27	0.04	0.23	0.02
3	0.23	0.06	0.17	0.02
4	0.17	0.07	0.10	0.01
5	0.10	0.07	0.03	0.01
6	0.03	0.03	0.00	0.00
		0.28		

WDV Depreciation **`(in lakh)**

Particulars / years	1	2
Plant and Machinery		
Cost	0.38	0.08
Depreciation	0.30	0.06
WDV	0.08	0.02

Projected Profitability **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8
Electricity savings	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36

Particulars / Years	1	2	3	4	5	6	7	8
Total Revenue (A)	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Expenses								
O & M Expenses	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total Expenses (B)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
PBDIT (A)-(B)	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Interest	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00
PBDT	0.31	0.32	0.32	0.33	0.33	0.34	0.34	0.34
Depreciation	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
PBT	0.29	0.30	0.30	0.31	0.32	0.32	0.32	0.32
Income tax	0.00	0.09	0.11	0.11	0.11	0.12	0.12	0.12
Profit after tax (PAT)	0.29	0.21	0.19	0.20	0.20	0.20	0.20	0.20

Computation of Tax **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8
Profit before tax	0.29	0.30	0.30	0.31	0.32	0.32	0.32	0.32
Add: Book depreciation	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Less: WDV depreciation	0.30	0.06	-	-	-	-	-	-
Taxable profit	0.01	0.26	0.32	0.33	0.33	0.34	0.34	0.34
Income Tax	-	0.09	0.11	0.11	0.11	0.12	0.12	0.12

Projected Balance Sheet **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8
Share Capital (D)	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Reserves & Surplus (E)	0.29	0.50	0.70	0.89	1.10	1.30	1.50	1.71
Term Loans (F)	0.27	0.23	0.17	0.10	0.03	0.00	0.00	0.00
Total Liabilities (D)+(E)+(F)	0.66	0.82	0.96	1.09	1.22	1.39	1.60	1.80
Assets	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Gross Fixed Assets	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Less Accumulated Depreciation	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16
Net Fixed Assets	0.36	0.34	0.32	0.30	0.28	0.26	0.24	0.22
Cash & Bank Balance	0.30	0.49	0.64	0.79	0.94	1.14	1.36	1.58
TOTAL ASSETS	0.66	0.82	0.96	1.09	1.22	1.39	1.60	1.80
Net Worth	0.39	0.60	0.79	0.99	1.19	1.39	1.60	1.80
Debt Equity Ratio	2.85	2.40	1.80	1.05	0.30	0.00	0.00	0.00

Projected Cash Flow **` (in lakh)**

Particulars / Years	0	1	2	3	4	5	6	7	8
Sources									
Share Capital	0.09	-	-	-	-	-	-	-	-
Term Loan	0.28								
Profit After tax		0.29	0.21	0.19	0.20	0.20	0.20	0.20	0.20
Depreciation		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total Sources	0.38	0.31	0.23	0.21	0.22	0.22	0.22	0.22	0.22
Application									
Capital Expenditure	0.38								
Repayment Of Loan	-	0.01	0.04	0.06	0.07	0.07	0.03	0.00	0.00
Total Application	0.38	0.01	0.04	0.06	0.07	0.07	0.03	0.00	0.00
Net Surplus	-	0.30	0.19	0.16	0.15	0.15	0.20	0.22	0.22
Add: Opening Balance	-	-	0.30	0.49	0.64	0.79	0.94	1.14	1.36

Closing Balance	-	0.30	0.49	0.64	0.79	0.94	1.14	1.36	1.58

IRR **` (in lakh)**

Particulars / months	0	1	2	3	4	5	6	7	8
Profit after Tax		0.29	0.21	0.19	0.20	0.20	0.20	0.20	0.20
Depreciation		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Interest on Term Loan		0.03	0.02	0.02	0.01	0.01	0.00	-	-
Cash outflow	(0.38)	-	-	-	-	-	-	-	-
Net Cash flow	(0.38)	0.34	0.26	0.23	0.23	0.23	0.23	0.22	0.22
IRR	75.03 %								
NPV	0.97								

Break Even Point **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8
Variable Expenses								
O & M Expenses (75%)	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
Sub Total(G)	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
Fixed Expenses								
O & M Expenses (25%)	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Interest on Term Loan	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00
Depreciation (H)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Sub Total (I)	0.06	0.05	0.04	0.04	0.03	0.03	0.02	0.03
Sales (J)	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Contribution (K)	0.35	0.35	0.35	0.35	0.35	0.35	0.34	0.34
Break Even Point (L= G/I)%	16.22%	14.04%	12.71%	10.97%	9.02%	7.40%	7.25%	7.34%
Cash Break Even {(I)-(H)}%	10.50%	8.31%	6.97%	5.23%	3.26%	1.63%	1.47%	1.54%
Break Even Sales (J)*(L)	0.06	0.05	0.05	0.04	0.03	0.03	0.03	0.03

Return on Investment **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8	Total
Net Profit Before Taxes	0.29	0.30	0.30	0.31	0.32	0.32	0.32	0.32	2.48
Net Worth	0.39	0.60	0.79	0.99	1.19	1.39	1.60	1.80	8.75
									28.32%

Debt Service Coverage Ratio **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8	Total
Cash Inflow									
Profit after Tax	0.29	0.21	0.19	0.20	0.20	0.20	0.20	0.20	1.30
Depreciation	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.12
Interest on Term Loan	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.10
Total (M)	0.34	0.26	0.23	0.23	0.23	0.23	0.22	0.22	1.52

DEBT

Interest on Term Loan	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.10
Repayment of Term Loan	0.01	0.04	0.06	0.07	0.07	0.03	0.00	0.00	0.28
Total (N)	0.05	0.07	0.08	0.08	0.08	0.03	0.00	0.00	0.38
DSCR (M/N)	7.34	3.80	3.04	2.73	2.94	7.73	0.00	0.00	3.97
Average DSCR	3.97								

Annexure 4: Procurement and implementation schedule

S. No.	Activities	Weeks						
		1	2	3	4	5	6	7
1	Planning of kWh indicator							
2	Material order							
3	Procurement							
4	Commissioning							

Annexure 5: Break-up of Process down Time

S No.	Activities (Commissioning)	Weeks	
		7/7	7/7
1	Installation of Medium Frequency Furnace kWh Indicator		
2	Testing & Trial		

Annexure 6: Details of technology service providers

S. No.	Source of product	Details of Local vendor / service provider
1.	INDUCTOTHERM (INDIA) PVT. LTD.	**Ajit Chaturvedi** Regional Sales Head Mobile# 91 93111 50284 **B-444, Pacific Business Park,** **Sahibabad Industrial Area, Site-IV,** **Ghaziabad-201010 (U.P.)** E-mail: ajitc@inductothermindia.com Phone: 0120-2771068, 2771069, 3143028.
2.	M/S ENCON INTERNATIONAL (P) LTD.	**Mr. R.P. Sood** 14/6, Mathura Road, Faridabad - 121 003 (Haryana) Tel: +91-129-2275307 Fax: +91-129-2276448 E mail: encon@ndb.vsnl.net.in
3.	ALIDIA POWERTRONICS PRIVATE LIMITED	Address: Shed 1, Computer Complex, DSIDC Scheme 1, Okhla Industrial Area Phase II, New Delhi - 110 020, India Tel:+(91)-(11)-4963017/4963028/4963163
4.	MACRO FURNACES PVT. LTD.	16/2, mathura road, faridabad -121002 Tel:+ 91-129-5260004 Fax: + 91-129-5260146 E-mail: aastha10@rediffmail.com

Annexure 7: Quotations or Techno-commercial bids for new technology / equipment

INDUCTOTHERM (INDIA) PVT. LTD.
An Inductotherm Group Company

ISO 9001 BUREAU VERITAS Certification

M/s. CII Avantha
Confederation of Indian Industries,
Block-3, Sector 31/A,
CHANDIGARH - 160030
Phone: 9872600687
Kind Attn: Mr. Gagandeep Mohey

18th July, 2011

Sub: Your requirement of Induction Furnace

Dear Sir,

This is in reference to your discussions with our Mr. Ajit Chaturvedi, in connection with your requirement of Medium Frequency Induction Melting Furnace. We really appreciate your interest in Inductotherm Induction Melting Furnace.

As per our discussion, we are pleased to enclose herewith following preliminary quotations for your perusal:

- Quotation No. QDE11278 for 1 No.250 KW/1000 HZ VIP POWER TRAK-R-PI with 2 Nos. 300Kg DURALINE FURNACES.

We are also enclosing herewith technical specification sheet, scope of supply, standard terms & conditions and other relevant literatures.

Trust our offer is in line with your requirement. If you need any further information/assistance from our side, please feel free to contact our Mr. Ajit Chaturvedi, Regional Sales Head (Cell#9311150284).

Thanking you,

Sincerely,

S.R.SUBRAMANIAN
NATIONAL SALES MANAGER (MELTING)
Cell # 09344130922
Encl: Quotation consists of price sheet, technical specification, bulletins, standard terms & conditions (TAC-03).

INDUCTOTHERM — Induction Melting | INDUCTOHEAT — Induction Heating | THERMATOOL — Induction Welding

Regd Office & Works:
Shri Kishorebhai D. Vyas Building, Ambli-Bopal Road, Bopal, Ahmedabad - 380 058. Ph.: (02717) 23 1961. Fax: (02717) 23 1256/88
E-mail: iil@inductothermindia.com Website: www.inductothermindia.com
Branches & Service Centres: Bangalore, Chennai, Coimbatore, Delhi, Dhanbad, Hyderabad, Jaipur, Kolhapur, Kolkata, Ludhiana, Mumbai, Muzaffarnagar, Pune, Raipur, Rajkot, Rourkela

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CHANDIGARH

Pricing

INDUCTOTHERM
Quotation # QDE11278
Date: 18th July, 2011

250KW /1000 Hz VIP POWER-TRAK-R-PI		
A.	**Power Unit** **One (1) No. 250KW/1000Hz Power & Control System** *with internal water circulating system, manual furnace changeover arrangement and one hydraulic power supply unit.*	Rs.16,75,000
B.	**Melting Furnace** **Two (2) Nos. 300Kg DURALINE FURNACES** *with hydraulic tilting arrangement, standard set of water cooled copper tubing, and water cooled leads (without lid).*	Rs.8,00,000
C.	**Optional**	
1.	Two (2) Nos. Handle operated Furnace Selector Switches	Rs.80,000
2.	One (1) No. Energy Meter	Rs.30,000

All the above quoted prices are ex-works, Bopal (Ahmedabad). They do not include any applicable excise duty or sales tax. Packing, Forwarding and Insurance charges will be extra.

Presently excise duty @ 10%, education cess @ 2% on excise duty, secondary & higher education cess @ 1% on excise duty and CST @ 2% against form "C" will be applicable on Induction Furnace. However, duties and taxes ruling at the time of delivery will be applicable.

The quoted prices are strictly valid for Thirty (30) days. Thereafter, you have to obtain fresh quotation. The quoted prices are valid only if the equipment is to be installed and commissioned in India by Inductotherm (India) Pvt. Ltd.

Delivery will be within [3] Three to [4] Four months. Other terms and conditions are as per the enclosed Standard Terms and Conditions (Bulletin No. TAC-03).

Sincerely,

S.R.SUBRAMANIAN
NATIONAL SALES MANAGER (MELTING)
Cell # 09344130922

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Technical Specifications

INDUCTOTHERM
Quotation # QDE11278
Date: 18th July, 2011

250 KW/1000 HZ VIP POWER-TRAK-R-PI

A.	APPLICATION REQUIREMENTS		
1.	Alloy to be melted	Steel	Iron
2.	Melt temperature	1650^{O} C	1480^{O} C
B.	CHARACTERISTICS OF RECOMMENDED POWER UNIT		
1.	Rated KW	250 KW	
2.	Maximum KW	250 KW	
3.	Nominal Furnace Frequency	1000 Hz	
4.	Line Power Factor	0.95 and above	
5.	KVA required at input of VIP POWER TRAK-R	280 KVA on load	
6.	Melt Rate at 250 KW **	445 Kg/hr – Steel 490 Kg/hr – Iron	
7.	Power Connection	460 V, 3 Phase, 50 Hz	
C.	CHARACTERISTICS OF RECOMMENDED MELTING FURNACE		
1.	Nominal capacity (Steel capacity)	300 Kg	
2.	Style of Furnace	Duraline	
3.	Pouring Mechanism	Hydraulic tilt	
4.	Furnace Lining *(Recommended - to be provided by the customer)*	Silica .... Iron Mgo...... Steel	

** The above melt rate is based on a nominal furnace size for second heat when lining is hot, charge is dense and bus runs proper. The voltage should be steady within allowable range. Cooling water should be as per our specification. Melt rates will be for the weight of charge and does not include time for initial charging, pouring, superheating, deslagging or chemical analysis. Please note that slag consumes nearly double the power.

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Scope of Supply

INDUCTOTHERM
Quotation # QDE11278
Date: 18th July, 2011

A. POWER UNIT

I. ELECTRICAL PANEL

1. CABINET

Metal cabinet, duly painted fitted with panel doors, which are gasketed and equipped with locks. In addition, micro switches are provided which illuminate a lamp on the monitor board and shut off power to prevent injury to personnel when the lift off panel or doors are opened.

Power connections are easily made through the top **and** water connections are through the side of the cabinet.

2. PROTECTION

a) Fast acting MCCB mounted in the cabinet to serve as isolation from the plant power line. It is equipped with a manual ON/OFF switch.

b) Fast acting semi-conductor fuses.
Instantaneous fast acting MCCB is used for circuit protection.

3. RECTIFIER SECTION WITH FILTER

a) High power diodes with snubbers for rectification.
This rectifier is designed to minimize line harmonics compared to phase controlled rectifier.

b) Air core encapsulated current limiting reactor(s).

c) DC capacitors located in capacitor section.

This design of converter and filter section reduces losses compared to iron core current limit reactor(s) and helps to provide constant DC voltage to the voltage fed inverter.
This design helps to achieve the conversion efficiency not less than 96%

4. INVERTER SECTION

a) This section contains inverter panel containing high power inverter SCRs with snubbers, anti parallel didoes and DI/DT reactors. This helps to provide full power throughout the melt cycle.

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Scope of Supply

INDUCTOTHERM

Quotation # QDE11278

Date: 18th July, 2011

5. CAPACITOR SECTION

a) This section contains required DC filters and medium frequency AC Capacitors.

b) One pressure switch, installed in each capacitor

c) One indicating lamp located on the monitor board to notify the operator, when the capacitor pressure switch has been actuated.

6. GROUND/METAL LEAK DETECTOR

One sensing ground/metal leak detector ready to sense and indicate any ground and metal leak. Consisting of indicating lamp, milliammeters, probe disconnect switch to disconnect the probe from the power supply.

7. CONTROL & MONITOR SYSTEM

a) Three direct reading instruments, including frequency meter, kilowatt meter and furnace volt meter.

b) One main control board for controlling of the equipment, which eliminates electronic complexity and simplifies maintenance. This board is located in a compartment. A cooling fan with heat exchanger is provided for temperature control.

c) ON/OFF push buttons are provided on the control door.

d) One power control knob is provided on the control door to set the desired power level.

f) One circuit monitor for monitoring and indicating functional parameters, such as water pressure,water temperature and other electrical faults.

8. INTERNAL CLOSED WATER SYSTEM (Inside the cabinet)

This contains one feed manifold with temperature and pressure switches and one drain manifold with temperature sensors for different paths of cooling system

II. INTERNAL CLOSED WATER SYSTEM (Outside the cabinet)

This structure contains one plate type water to water heat exchanger, expansion/air separator tank, one mono block non-ferrous pump with starter and one deionizer cartridge for continuous purification of internal water.

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Scope of Supply

INDUCTOTHERM
Quotation # QDE11278
Date: 18th July, 2011

III. HYDRAULIC POWER UNIT

One hydraulic pumping unit (without oil and starter) to supply pressurized fluid to the tilting cylinders complete with pump, pump motor, fluid reservoir, pressure relief valve, pressure gauge, return line filter and filter air breather cap all mounted on a common base with seamless pipes and fittings.

B. MELTING FURNACE

DURALINE FURNACE

Hydraulically tilted coreless melting furnace for housing and providing rigid support to the induction coil. Constructed out of cast aluminium alloy side plates, top and bottom made out of refractory with stainless steel fibre reinforcement. This coreless Duraline without shunts design helps in reducing energy loss.

Included in each furnace will be:

1. A set of shrouded hydraulic cylinders with check valve for the hydraulic tilting of the furnace.
2. Manually operated hydraulic direction control valve for tilting.
3. Leak detector assembly with stainless steel probe wires and hardware.
4. Set of flexible water-cooled power leads for connection between the power induction coil and power supply unit. Water-cooled leads are with sleeves for protection against metal splash.
5. Furnace is mounted on the pair of self-aligning, pillow block type pivot bearings.

Refractory melt-out former is not in our scope of supply as it is easily available in the market and you need this material as consumable.

INTERCONNECTING ARRANGEMENT

A suitable size of air/water cooled copper conductor is provided to connect the power panel with the crucible.

C. DRAWINGS & MANUALS

Equipment layout drawings, wiring and water diagrams, equipment outline, furnace cross section drawing and an operating and maintenance manual.

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Customer's Scope of Supply

INDUCTOTHERM
Quotation # QDE11278
Date: 18th July, 2011

Necessary Requirements at Customers end:

Procurement and installations of following equipment and systems is customer's responsibility.

1. Power line up to furnace transformer.
2. Furnace Transformer
3. Power line from transformer to panel
4. 433V, 3 Phase/50 Hz power supply to all the auxiliaries like external pumps, cooling tower, internal water pump and hydraulic power unit with suitable starter.
5. Cooling water system including RCC / Plastic water tanks, cooling tower, pumps, plate type heat exchanger (mentioned in our drawing as PHE2), D.M. or soft water treatment unit, piping, fittings as suggested by our Project Engineering Department.
6. Overhead tank for emergency water supply to coil, in case of failure of water system.
7. Complete civil work like furnace platform, foundations, overhead tank, underground tank etc. Supplier will provide necessary foundation layout drawing/load data.
8. Pressurized air supply, if required.
9. Overhead crane, pouring ladles/system, pyrometer, charging device, ramming tools and other misc. equipment/tools required to start/run the system.
10. Consumables like hydraulic oil, distilled water, asbestos/silica paper/board, coil grouting material, ramming mass etc.
11. Statutory of electricity board, factory inspectorate, pollution control and any other statutory requirements.
12. Lining former.

Annexure 8: Justification of Proposed technology against existing Technology

World Bank/UN Foundation-UNEP Technical Assistance Project

Manual for Appraising Energy Efficiency Projects

- Optimise cooling water supply to the induction furnace
- Install kWh indicator cum integrator for induction furnace
- Install medium frequency induction furnace of main frequency furnace
- Install spectro meter for analyzing the molten metal
- Install online shot blasting machine for cleaning the returns

Extract from IREDA's "***Manual to Appraising Energy Efficiency Project***" 5.1 Annexure I Foundry Industry '***Indicative list of Possible Energy Efficiency Project in specific Industries***', page no. 42.

Case study - 1

INSTALL KWH INDICATOR CUM INTEGRATOR FOR INDUCTION FURNACE

Background

Medium frequency induction furnace is used for metal melting. The specific energy consumption pattern for each batch is monitored. There is a huge variation in the specific energy consumption.

The variation in specific energy consumption is due to operational practices such as over shoot in metal temperature, holding of molten metal in the melting furnace due to break down in the moulding line, metal waiting for tapping and furnace waiting for raw material etc. The lowest specific energy consumption is achieved in few batches due to adoption of the best operational practices incidentally in those batches.

The latest trend is installing KWh Integrator for the furnaces. The power consumption required for the melting has to be established based on the lowest specific energy consumption achieved in the past. The established power consumption should be set as a target for each melt.

The KWh integrator measures the power consumption as the melting progresses and indicates the units available to complete the batch as per the target. The KWh Integrator gives the signal to the operators to tap the molten metal within the target power consumption.

The advantages of installing Kwh indicator cum integrator for the furnace are as follows:

- The furnace operators get an opportunity to take necessary steps online to complete the metal tapping within set target power consumption
- The lowest specific power consumption in the furnace for metal melting could be sustained

Previous status

Medium frequency furnace is used for cast iron melting. The variation in per ton of metal melted is between 50 to 80 units.

The lowest specific power consumption achieved is 650 units/ton of molten metal.

Energy saving project

KWH indicator cum integrator was installed for the medium frequency furnace.

The power consumption per ton of molten metal is established based on past records. Target for power consumption per ton of molten metal is set as 650 units/ton.

Implementation methodology

The KWH indicator and integrator could be installed with very minimal downtime of the furnace. The indicator should be provided in the prominent location, visible to all the operators.

Benefits

The variation in power consumption of the furnace is minimised. Atleast 20 kWH /batch reduction in power consumption was achieved.

Extract from IREDA's "***Investor Manual***" Foundry Industry '***Case Study 1'***, page no. 413.

Bureau of Energy Efficiency (BEE)
(Ministry of Power, Government of India)
4th Floor, Sewa Bhawan, R. K. Puram, New Delhi – 110066
Ph.: +91 – 11 – 26179699 (5 Lines), Fax: +91 – 11 – 26178352
Websites: www.bee-india.nic.in, www.energymanagertraining.com

Confederation of Indian Industry
CII – AVANTHA Centre for Competitiveness
Block No.3, Dakshin Marg
Sector 31-A, Chandigarh - 160030
Tel: 0172-5080784 (D) / 2666517-19
Fax: 0172-2606259 / 2614974
E-mail: harinder.singh@cii.in
Website: www.ciicfc.org

India SME Technology Services Ltd
DFC Building, Plot No.37-38,
D-Block, Pankha Road,
Institutional Area, Janakpuri, New Delhi-110058
Tel: +91-11-28525534, Fax: +91-11-28525535
Website: www.techsmall.com