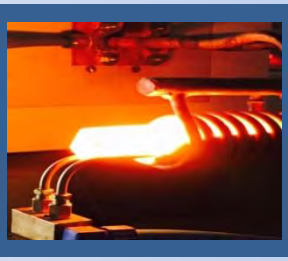
BEE's National Program

on

Energy Efficiency and Technology Up-gradation in SMEs

Ludhiana Forging Cluster

Post Implementation Audit Report
Global Exports India

Submitted to

ENERGY IS LIFE
BEE
CONSERVE IT

Submitted by

InsPIRE

InsPIRE Network for Environment

June 2016

Contents

List of Annexures

About The Project

The project titled "BEE's National Program on Energy Efficiency and Technology Up-gradation in SMEs" supported by Bureau of Energy Efficiency (BEE), Ministry of MSME and Ludhiana Auto Parts Manufacturers Association aims to bring down the energy demand of MSME industries located at Ludhiana Forging cluster. The project aims to support the MSME units in Ludhiana cluster to implement Energy Efficient Technologies.

There are more than 1500 Small and Medium Enterprise (SME) forging units operating in the various industrial pockets in and around Ludhiana, manufacturing products suitable for automotive, industrial and agricultural sector. The project aims to initially diffuse energy efficient technologies in selected units in the cluster. These units will act as demonstration units for long term and sustainable penetration of energy efficient technologies in the entire cluster. InsPIRE Network for Environment, New Delhi has been appointed as the executing agency to carry out the following activities in the cluster:

- Conducting pre-activity cluster workshop in the cluster.
- Conducting initial walk through audits in 5 representative units of the cluster.
- Identify and proposes BEE on energy efficient process technologies, relevant to the cluster, with highest energy saving and replication potential, and their cost benefit analysis.
- Identify local technology/service providers (LSP) for the above technologies in the cluster
- Identify SME units willing to implement and demonstrate the energy efficient technologies
- Assist BEE to enter into a contract with each of the shortlisted SME units to enable implementation and showcasing of Energy Efficient technology.
- Conduct comprehensive Baseline Energy Audits in the shortlisted SME units wherein these technologies can be implemented and document the findings in the form of a report.
- Develop technology specific case studies (Audio-Visual and print) for each technology
- Prepare Best Operating Practices (BOP) document for the top 5 energy using equipment / process in the industry cluster
- Enumeration of common regularly monitorable parameter at the process level which have impact on energy performance, and listing of appropriate instrumentation for the same with options including make, supplier, indicative cost specifications and accuracy of measurements.
- Carry out post implementation energy audit in the implemented units to verify energy savings as a result of EE technology implementation.
- Verify and submit to BEE all the relevant documents of each participating unit owner indicating his complete credentials, proof of purchasing the equipment, evidence of implementation and commissioning of the EE technology in the unit.

Based on the confirmation on installation from a unit, a 5 member team consisting of Shri Tarun Dixit, Project Engineer, BEE; Shri Madhur Gupta, Financial Expert, Ludhiana Forging Cluster, Shri Arindam Mukherjee, Sr. Program Officer; Shri S. Vamsi Krishna, Program Officer and Shri Chaman Shukla, Sr. Program Associate from InsPIRE Network for Environment carried out a cross-verification of the implementation. As part of the activities under the energy efficiency program in Ludhiana Forging cluster, post implementation energy audits in 8 forging units under Ludhiana cluster was conducted in the month of June'2016. This specific audit report details the findings of the post implementation energy audit study carried out at ***Global Exports India.***

Executive Summary

1. Unit Details

Unit Name	:	Global Exports India
Address	:	C-145, Near Canara Bank, Industrial Area, Jalandhar-04
Contact Person	:	Mr. Narindarpal Singh (Cell No: 9814061278)
Products	:	Various types of auto parts, Scaffolding
Production	:	1 Ton/day
DIC Number	:	030041100120
Bank Details	:	Canara bank; SME branch, Industrial Area, Jalandhar, Account Number: 2508766000028
TIN / PAN No.	:	PAN: AAFFG9183M
Contract demand	:	300 kVA

2. Energy Efficient Technologies implemented vis-à-vis baseline energy audit recommendation

Technology recommended as per baseline energy audit (as approved by steering committee)	Technology implementation and cross-verified during post implementation energy audit
Induction Heater (200 kW)	Induction Heater (200 kW)

3. Cost Economics Analysis: Projected (as per baseline) vs. Actual

Technology	Estimated Energy Savings (%)	Savings	Investment	Simple Payback period (years)
Installation of Induction Heater (200 kW)				
Baseline (Projected)	44	1,846,901	1,947,706	1.05 years
Post Implementation (Actual)	37	1,031,020	2,201,370	2.14 years

4. Project Impacts

Energy Efficient Technology implemented	Percentage Savings in specific energy consumption from baseline (%)	Annual Energy Savings (TOE)	Annual CO_2 emission reduction (tCO_2/year)
Induction Heater	37	15.30	13.97

Assumptions / conversion factors:

- Calorific Value of LPG has been considered as 11,900 kcal / kg
- 1 TOE (tonnes of oil equivalent) = 0.0148 TJ (Tera Joule)
- Emission factor LPG has been taken as 61.71 t CO 2 per TJ (IPCC Guideline)
- CO_2 emission reduction calculation has been done based on equivalent reduction in annual energy consumption.

Introduction

1.1 MSME SECTOR – AN OVERVIEW

The MSME sector is an important pillar of Indian economy as it contributes greatly to growth of Indian economy with a vast network of around 30 million units, creating employment of about 70 million, manufacturing more than 6000 products, contributing about 45% to manufacturing output and about 40% of exports, directly and indirectly. This sector even assumes greater importance now as the country moves towards a faster and inclusive growth agenda. Moreover, it is the MSME sector which can help realize the target of proposed National Manufacturing Policy of raising the share of manufacturing sector in GDP from 16% at present to 25% by the end of 2022. However, owing to the recent insecure market conditions and escalating energy expense, the economic scenario of MSME sector, is transpiring gloomier endangering the long term profitability, competitiveness and sustainability.

However, a significant portion of the MSME units are energy-intensive where the cost of energy is 20-40% of the production cost, which implies huge energy saving potential. A study by BEE appraises the total energy efficiency market in India as INR 74,603 crore out of which, the share for MSME sector has been estimated at INR 12100 crore. But, in spite of huge energy efficiency potential in MSME sector, it is hurdled largely by following major barriers:

- Obsolete technology and lack of access to modern technological solutions resulting in low productivity.
- Very few programs to support technology development.
- Lack of local service providers to sustain energy efficient technologies.
- Lack of knowledge, financing and dedicated personnel for identifying energy efficiency improvements & opportunities.
- 90% of units are proprietorship concerns, which are limited on their managerial skills as well as amenability to new ideas.
- Perceptions of Energy efficiency measures are financially unviable.
- MSME units are reluctant to change & seek external technical assistance.

In the wake of the need, Government of India has set ambitious target of energy saving of 44.85 BU at consumer side by the terminal year 2016-17 of 12th Five year Plan which is equivalent to 60.17 BU on Bus bar side translating into 12,350 MW avoided capacity. In addition, total thermal energy saving equivalent to 21.30 mtoe is targeted.

1.2 BEE-SME PROJECT AT A GLANCE

Under the 12th Five Year Plan, the Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India, has taken an ambitious program on energy efficiency and technology upgradation in SME clusters in India. The program titled "BEE's National Program on Energy Efficiency and Technology Upgradation in SMEs" is being implemented by BEE with support from Ministry of MSME in five selected clusters in India. These clusters include Ludhiana, Punjab; Pali, Rajasthan; Kochi, Kerala; Indore, Madhya Pradesh and Varanasi, Uttar Pradesh. The project aims to set up demonstration units in these clusters, wherein energy efficient technologies will be implemented. Efforts will also be made to replicate the successful technologies and wider penetration of energy efficient technologies in the sector as a whole. The key components of the project include:

- Conducting pre-activity cluster workshop in the cluster.
- Conducting initial walk through audits in 5 representative units of the cluster.
- Approve energy efficient process technologies, relevant to the cluster, with highest energy saving and replication potential, and establish their cost benefit analysis.
- Identify local technology/service providers (LSP) for the above technologies in the cluster
- Identify SME units willing to implement and demonstrate the energy efficient technologies
- Enter into a contract with each of the shortlisted SME units to enable implementation and showcasing of Energy Efficient technology.
- Conduct comprehensive Baseline Energy Audits in the shortlisted SME units wherein these technologies can be implemented and document the findings in the form of a report.
- Support the units towards implementation of energy efficient technologies.
- Carry out post implementation energy audit in the implemented units to verify energy savings as a result of EE technology implementation.
- Develop technology specific case studies (Audio-Visual and print) for each technology
- Prepare Best Operating Practices (BOP) document for the top 5 energy using equipment / process in the industry cluster
- Enumeration of common regularly monitorable parameter at the process level which have impact on energy performance, and listing of appropriate instrumentation for the same with options including make, supplier, indicative cost specifications and accuracy of measurements.
- Release of financial incentive to units on submission of the relevant documents of each participating unit owner indicating his complete credentials, proof of purchasing the equipment, evidence of implementation and commissioning of the EE technology in the unit.

The forging cluster located at Ludhiana, Punjab is one of the selected clusters under the BEE-SME program.

1.3 LUDHIANA FORGING CLUSTER – AN INSIGHT

Ludhiana is one among the biggest forging cluster in India consisting of over 1500 units, manufacturing a wide range of products, suitable for the use of automotive, agricultural and other engineering industry. A significant portion of the manufactured goods are also exported from the cluster. The units usually get raw materials in the form of steel and other ferrous products from the local industries and process the same using forging, machining and finishing process. The finished product is directly dispatched for the use of the target industry. The units are located in clusters in areas such as Focal Point (Ludhiana), Industrial Area (Jalandhar City), Industrial Area (Phagwara) and Industrial Area (Moga). Electricity is the main source of energy in these units. Majority of the units uses free hammer to forge the heated steel. The temperature required for forging is around 1150 - 1200 ^{o}C.

Despite being in large numbers, most of the units in the clusters are un-organized, using obsolete and high energy consuming equipment. Also, the cluster has seen limited development in terms of technology up gradation and automation, over the years. Some of the important barriers towards accelerated adoption of energy efficient technologies have been lack of knowledge, lack of government scheme to support technology up gradation, lack of skill manpower and lack of financing options available with these units. Because of the lower penetration about the knowledge of energy efficient technologies in the cluster, the units has been using age old practices of manual lathes for machining and batch furnaces for heating operations.

Twenty (20) units were selected from the cluster with the purpose of conducting baseline audit. Out of these, eight (8) nos. of units has completed implementation, within the stipulated time period and as per the guidelines of implementation.

1.4 ABOUT THE UNIT

Global Exports India is engaged in manufacturing of various auto parts of different sizes as per the customer requirement. The raw material procured by the unit for making bolts and other auto components include Mild Steel, EN8 etc.

The daily production of the unit is around 1000-2500 Kgs per day. Global Exports India is using energy in the form of electricity supply from Punjab State Electricity Board, for various process and utility applications in its premises. The average monthly LPG consumption in the unit (during baseline study) was 950 Kgs. During baseline energy audit, it was observed that the average monthly electricity consumption was 39,878 kWh.

1.5 PROJECT IMPLEMENTATION METHODOLOGY

The BEE's National Program on Energy Efficiency and Technology Up gradation at Ludhiana Forging Cluster followed the following implementation methodology:

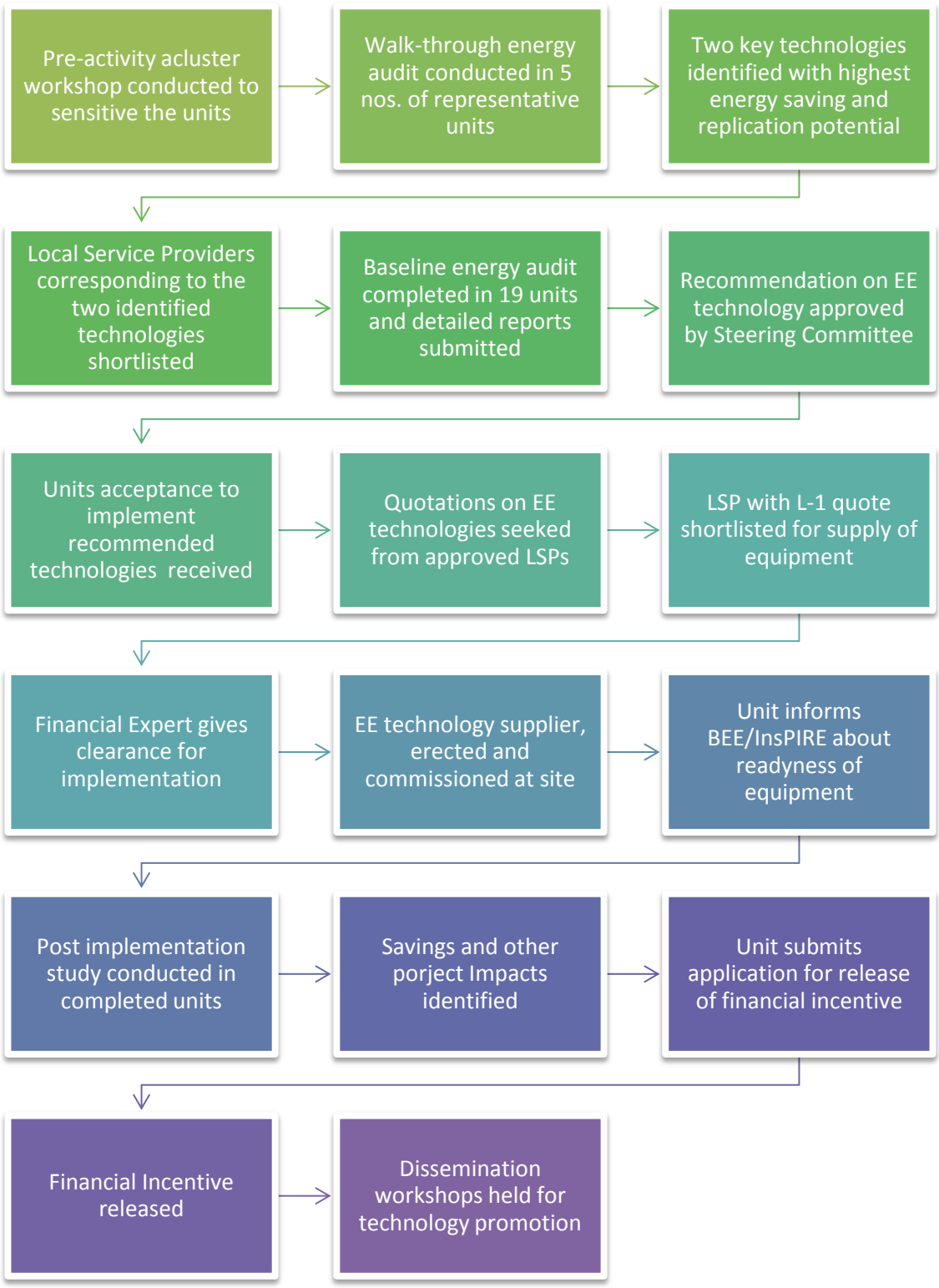


Figure 1.1: ***Project implementation methodology***

1.6 PRODUCTION PROCESS OF PLANT

The following figure shows the typical process employed at manufacturing of forged products at Global Exports India, Jalandhar:

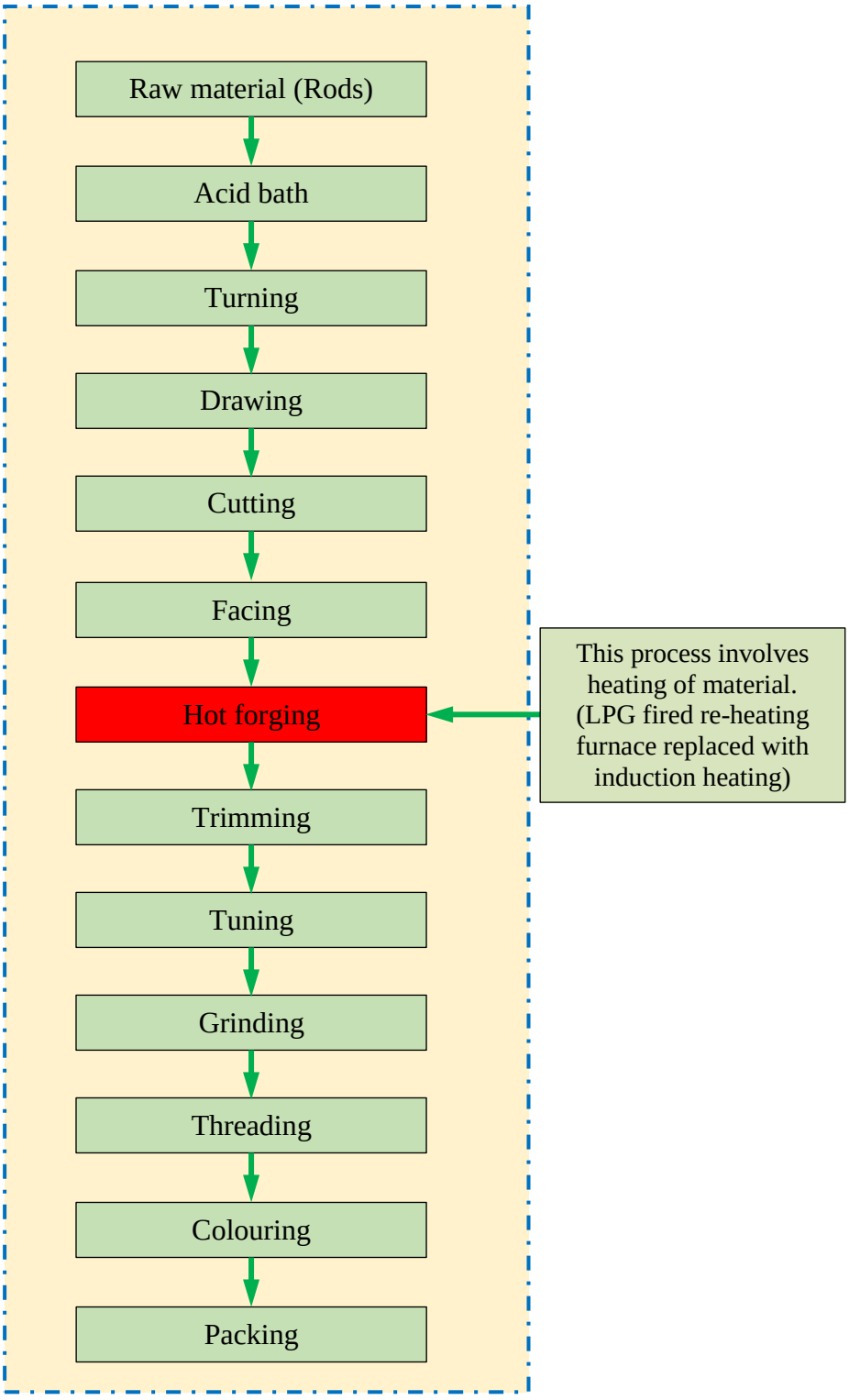


Figure 1.2: ***Production process***

1.7 ENERGY AUDIT METHODOLOGY

The primary objective of the baseline energy audit was to quantify the baseline energy consumption pattern and identify technologies which can lead to reduction in energy consumption. Based on the suggestions under the baseline audit, the units have implemented the technologies. The primary objective of the post implementation energy audit is cross-verify the implementation and document the impact. The key points targeted through energy audits were determination of specific energy consumption, both thermal and electrical, productivity etc. Pre – planned methodology was followed to conduct the energy audits. The energy audit methodology followed for baseline and post implementation energy audits is depicted in ***Figure 1.3*** below:

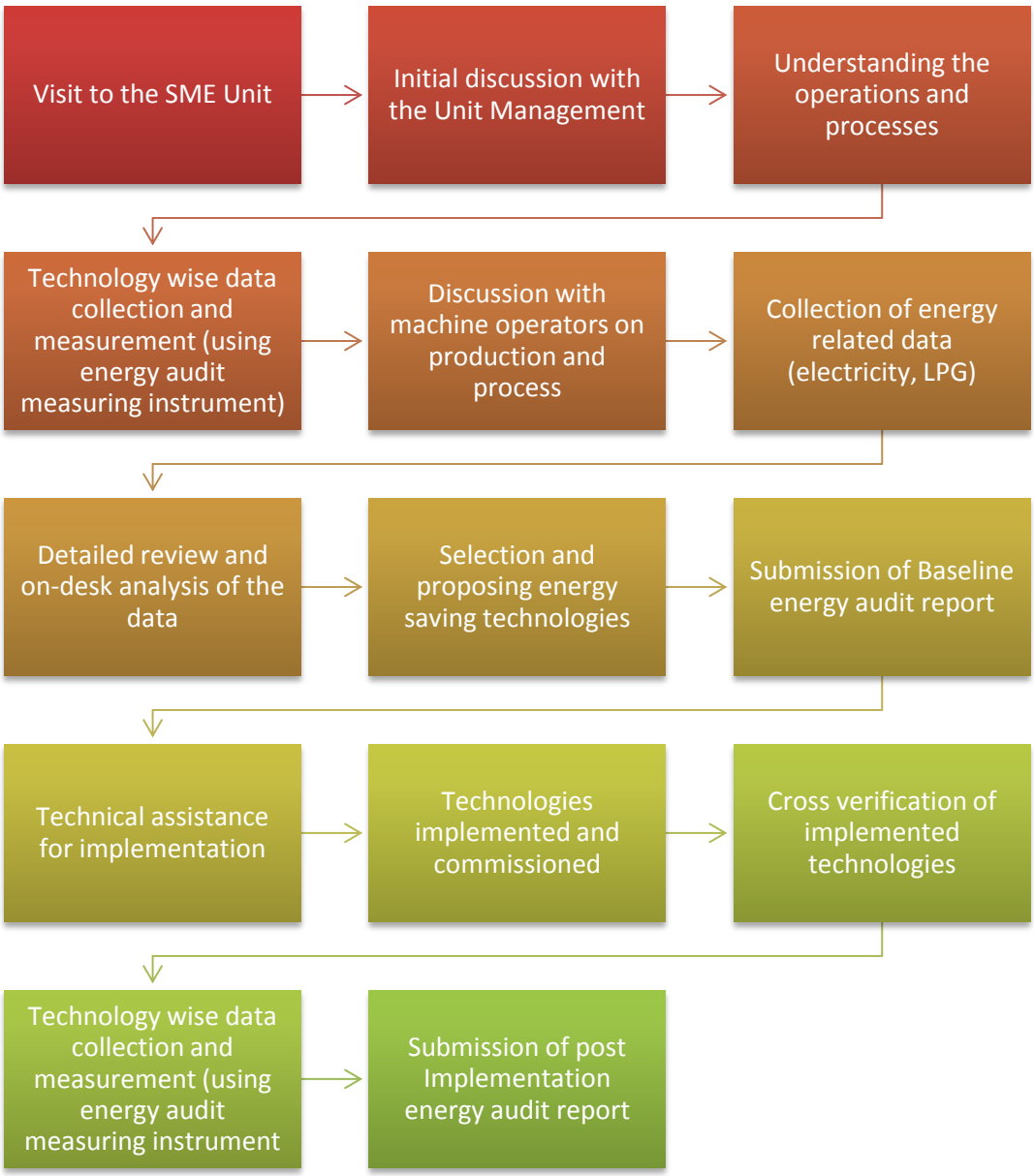


Figure 1.3: ***Energy audit methodology***

Post implementation energy audit outcome and results

2.1 INSTALLATION OF INDUCTION HEATER (200 KW)

2.1.1 Baseline Scenario

During the baseline energy audit, M/s Global Exports India was using a LPG fired batch type re-heating furnace to heat the metal pieces for forging. In a batch type re-heating furnace, the metal pieces are kept inside the furnace and heated for a period of 30 – 45 mins, depending upon the size/shape of the metal piece and final product to be formed. The metal piece to be forged is heated to a temperature of 1150~1200 deg. C. After the heating process, the red hot metal piece is kept on the forging die (using a tong) having the cavity of the product to be formed. The hot metal piece is forged using a free hammer on the forging press and the metal piece attains the required shape of the die. The re-heating furnace, used by the unit, was old having conventional design with manual control option for fuel firing. A large quantity of heat was seen penetrating from the furnace opening. Thus, the efficiency of the furnace was low. Further, the flame of the furnace directly touched the surface of the metal leading to high burning loss and scale formation due to oxidation ultimately leading to material/ production loss. In addition, the atomic/grain structure of the metal is deteriorated by this process.

2.1.2 Present Scenario

Based on the recommendation made as per the baseline energy audit, the conventional FO based re-heating furnace has been replaced by induction heating system of capacity 200 kW. As the Induction heater attains instant heating the metal can be able to reach the desired temperature within 6- 8 sec, thereby increasing the productivity by 3 to 4 times.

The operating principle and benefits of using an induction heating system has been summarized below:

Induction heating is the process of heating an electrically conducting object by electromagnetic induction, where eddy currents are generated within the metal and resistance leads to Joule heating of the metal. So it is possible to heat a metal without direct contact and without open flames or other heat sources (like IR). An induction heater consists of an electromagnet (coil), through which a high-frequency alternating current (AC) is passed. The frequency of AC used depends on the object size, material type, coupling (between the work coil and the object to be heated) and the penetration depth. An induction heating system is composed by an inductor (to generate the magnetic field) and a converter (to supply the inductor with a time-varying electrical current).

Operating Principle:

Alternating current flowing through an electro-magnetic coil generates a magnetic field. The strength of the field varies in relation to the strength of the current passing through the coil. The field is concentrated in the area enclosed by the coil;

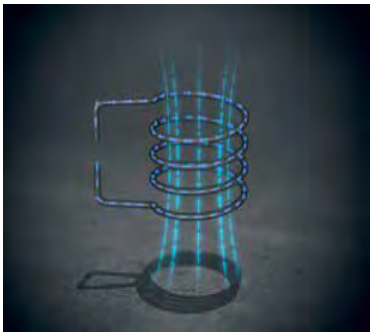


Figure 2.1: ***Induction heating coil***

Eddy currents are induced in any electrically conductive object—a metal bar, for example—placed inside the coil. The phenomenon of resistance generates heat in the area where the eddy currents are flowing. Increasing the strength of the magnetic field increases the heating effect. However, the total heating effect is also influenced by the magnetic properties of the object and the distance between it and the coil. In case of the forging process, the induction heating system is used to heat the metal bar to the forging temperature which is typically 1150-1200 ^{0}C depending on the material.

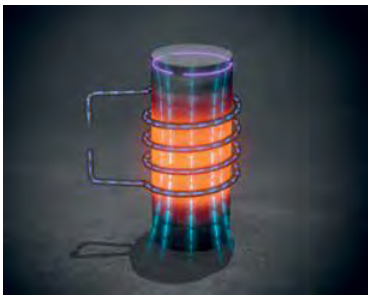


Figure 2.2: ***Induction heating coil***

Use of Induction Heating in Forging Process

Forging is a process where metal is formed into shape using pressure applied by an impact hammer or press. It is one of the oldest known metal working processes. Metals can be forged cold, warm or hot. Cold forging is used for forming softer materials and smaller steel parts, but this process hardens the material making it brittle and difficult to process after forging.

Hot forging is a process where the part is heated above the material recrystallization temperature before forging, typically 1100°C (2012°F) for steel. Hot forging allows a part to be formed with less pressure, creating finished parts with reduced residual stress that are easier to machine or heat treat. Warm forging is forging a part below the recrystallization temperature, typically below 700°C (1292°F). As a superior alternative to furnace heating, induction heating provides faster, more efficient heat in forging applications. The process relies on electrical currents to produce heat within the part that remains confined to precisely targeted areas. High power density means extremely rapid heating, with exacting control over the heated area.

Recent advances in solid-state technology have made induction heating a remarkably simple and cost-effective heating method. Benefits of using Induction heating for forging are:

- Rapid heating for improved productivity and higher volumes
- Precise, even heating of all or only a portion of the part
- A clean, non-contact method of heating
- Safe and reliable – instant on, instant off heating

- Cost-effective, reduces energy consumption compared to other heating methods
- Easy to integrate into production cells
- Reduced scaling

Figure 2.3: ***Post implementation energy audit at Global Exports India***

Figure 2.4: ***Post implementation energy audit at Global Exports India***

2.1.3 Energy saving and Cost Economics Analysis (baseline vis-à-vis post implementation)

The table below summarizes the post implementation energy consumption figures of the unit vis-à-vis the baseline energy audit data.

Parameter	Unit	Value
Baseline Scenario		
LPG consumption on re-heating furnace	kg/hr	4.75
Production in terms of Kg	Kg/hour	90
Specific energy consumption on LPG based re-heating furnace	kg/Kg	0.053
Specific fuel consumption in terms of kcal	kcal/kg	628.06
Cost of energy consumption	Rs./Kg	5.02
Annual production	Kg/annum	216000
Post Implementation Scenario		
Power consumed by induction Heater (based on on-site measurement) Note: Induction Heater was observed to be running at 60 % loading	kWh	126.7
Production in terms of Kg	Kg/hr	275
Specific energy consumption on induction Heater	kWh/Kg	0.46
Specific fuel consumption in terms of kcal	kcal/kg	396.23
Cost of energy consumption	Rs/kg	3.46
Annual production based on post implementation productivity	kg/annum	660000
Savings		
Reduction in cost of energy	Rs/kg	1.6
Reduction in specific energy consumption in kcal	kcal/kg	231.8
Annual Cost Savings (in terms of energy cost)	Rs	1031020
Annual Reduction in Energy Consumption	TOE	15.30
Percentage reduction in energy consumption	%	36.91
Investment made Induction Heater (200 kW)	Rs	2201370
Simple payback period	years	2.14
Annual CO_2 emission reduction (based on post implementation productivity)	t CO_2/year	13.97

Assumption / conversion factors:

- Specific gross calorific value of LPG has been considered as 11,900 kcal /kg
- 1 TOE (tonnes of oil equivalent) = 0.0148 TJ (Tera Joule)
- Emission factor LPG has been considered as 61.71 t CO_2 per TJ (as per IPCC guideline)
- CO_2 emission reduction calculation has been considered based on equivalent reduction in CO_2 emission

▶ **Inference:**

The energy cost saved per kg of forged material is Rs. 1.6. The actual investment made to implement the energy efficient induction heater technology is Rs 22.01 lakhs with annual saving of Rs. 10.31 Lakhs. Thus, the investment made will be recovered within 2.14 years, if we consider the post implementation productivity.

2.1.4 Snap-shot of implementation (before and after)

A comparison of the snap-shots of LPG based re-heating furnace used during the baseline vis-à-vis the induction heating system used in the post implementation study has been shown below:

Figure 2.5: ***Snap shot of LPG based re-heating furnace at Global Exports India (operational during baseline)***

Figure 2.6: ***Induction heater of capacity 200 kW installed at Global Exports India***

Unit Photographs

Input raw material for forging in Global Exports India

Induction heater installed at Global Exports India

Forging Hammer installed at Global Exports India

Finished product at Global Exports India

New Induction heater installed of capacity 200kW at Global Exports India

New Induction heater installed of capacity 200kW at Global Exports India

Base Executive Summary

Unit Details

Unit Name	:	**Global Export India**
Address	:	C-145, Near Canara Bank, Industrial Area, Jalandhar-04
Contact Person	:	Mr. Narinderpal Singh - 9814061278
Products	:	Various types of auto parts
Production		1 Ton/day
TIN / PAN No.	:	
Contract demand		300 kVA

Existing Major Energy Consuming Technology

- Conventional Re-heating furnace with LPG firing
- Prevailing energy consumption 0.05 kg of LPG per kg of the production

Proposed Energy Saving Technologies with Cost Economics

Proposed Energy Measures

- Replacement of LPG fired re-heating furnace with an induction re-heating furnace of 200 kW

Table 1: *Cost Economic Analysis*

Technology	Estimated Energy Savings (%)	Savings	Investment	Simple Payback period (Years)
Induction re-heating furnace (200 kW)	44	1,846,901	1,947,706	1.05 years
	Total	**1,846,901**	**1,947,706**	

(BEE)

nsPIRE

PRESIDENT, APMA, LUDHIANA

17/3 MSME, LUDHIANA

Clearance by CA

MADHUR GUPTA
CHARTERED ACCOUNTANT
687 PREM NAGAR
CIVIL LINES, LUDHIANA
+99155-12967, 0161-5053340

To
M/s Global Exports India
C-145, Near Canara Bank, industrial Area
Jalandhar-144004

Subject:- Recommendation to place an order for procurement of Machinery.

Sir

This is in reference to your request for clearance to place an order with least amount quoted supplier to purchase an energy efficiency equipment.

The details of quotations submitted by you are mentioned in below table:-

Suggested Technology Measures	Summary of Quotation (L-1)	Summary of Quotation (L-2)	Summary of Quotation (L-3)
Induction Heating Equipment 200 KW	Induction Billet Heating System 200 KW amounting to Rs.19.40 Lacs	Induction Heating Machine 200 KW amounting to Rs.19.42 Lacs	200 KW Induction Heater amounting to Rs.20.50 Lacs
Total Cost	**Rs.19.40 Lacs**	**Rs.19.42 Lacs**	**Rs.20.50 Lacs**
Name of Service Provider	**M/s Electrotherm India Limited**	**Akal Induction Pvt Ltd**	**M/s G.R.D Induction**

Note:- The above said prices are ex-works prices and taxes are not included in it. However taxes are levied on as is basis i.e.rate prevailing at time of dispatch of machine. Thus comparison of quotations has been done on bases of tax excluded prices

Accordingly we recommend to place and order of Induction Heating Equipment 200 KW with M/s Electrotherm India Limited, being lowest among all.

You are requested to intimate us once the procurement and installation process is complete

Thanking You

Madhur Gupta

Chartered Accountant

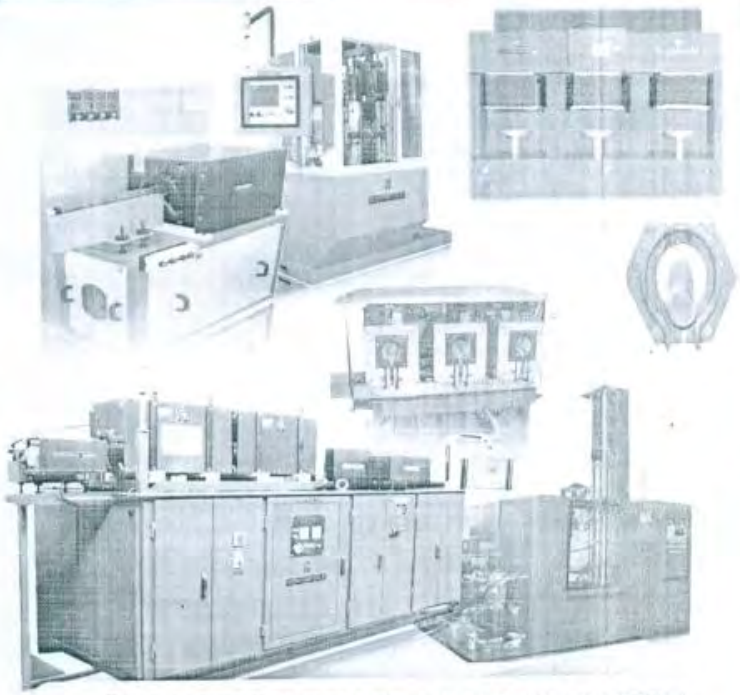
Madhur Gupta * Chartered Accountant * M. No. 516148

PROPOSAL

ELECTROTHERM (INDIA) LTD.

THE LEADER IN INDUCTION HEATING & HARDENING TECHNOLOGY

An Export Trading House



INDUCTION BILLET HEATING SYSTEM

(For Forging Application)

GLOBAL EXPORTS INDIA

C-145, NEAR CANARA BANK, INDUSTRIAL AREA
JALANDHAR-144004

E-mail: npskumar@yahoo.in

Kind Attn: Mr. Narinderpal Singh
Mobile: +91-98140-61278

From:
ELECTROTHERM (1) LTD
Cc: Mr. Lakshdeep -ET – Mandi (09855002992)

ELECTROTHERM (INDIA) LTD.
72, Palodia, (Via Thaltej), Ahmedabad - 382 115, Gujarat (INDIA) Phone: +91-2717-234558,234613,660550
Fax: +91-2717-234616, 234866 E-mail: hnb@electrotherm.com Website: www.electrotherm.com

For Global Exports India

Partner

INTRODUCTION

We acknowledge with thanks receipt of your valuable enquiry regarding your requirement of Induction Heating Equipment for Heating billets for forging application as per the details given by you.

We take this opportunity to introduce ourselves as the leading manufacturers of Medium Frequency Induction Furnaces for steel ingots and billets, Induction heating and Hardening equipments, DC Plasma Ladle Refining Furnaces, Contifur (Continuous Induction Furnace) and Metal Refining Converter.

Electrotherm (India) Ltd. started its manufacturing in 1983. Within a short span of 32 years, we have supplied more than 3500 Induction Equipments in India as well as abroad.

Electrotherm cater to ferrous and non-ferrous foundries as well as to all segments of the steel industry vis-à-vis Mini-Steel plants and Alloy steel by manufacturing and supplying medium frequency induction melting furnaces. It has manufacturing plant with modern office complex with full fledged R & D set at Palodia, near Ahmedabad. We have designed developed, manufactured and commissioned integrated Stainless Steel lines with Medium Frequency Induction furnace, Ladle Refining Furnace and Metal Refining Converter. We have already supplied 10 kW/ 1 Kg to 18000 kW/ 40 MT Medium Frequency Induction Furnaces. Our contribution to metal melting industry in terms of MW rating comes to around 2,500 as on date.

Full-fledged manufacturing plant & modern office set up with R & D Center at Palodia, near Ahmedabad

QUALITY POLICY

"We are committed to customer satisfaction

By providing cost effective,

Metallurgical equipment and services.

For Continuous improvement,

We rely on training, design and development."

GLOBAL EXPORTS
JALANDHAR

ET/IHH/MGG/RT/22-3/15-16
DATE: 23-JAN-16

For Global Exports India

Partner

PROPOSAL

OUR RECOMMENDATION TO YOUR REQUIREMENT:

Sr.No.	Description	Qty.	Price (Rs. In Lac)
1.	**200 KW/6-10KHz; Solid State Power Supply Unit With Energy Monitoring System.** • [illegible] power level • **95% efficiency at rated power & remain same up to 50% load.** • Highest short circuit protection • Highly reliable , efficient and less maintenance Circuit • Load resonant tank circuit • Simple and field proven control circuits	1 No.	
2.	**DM Water Circulation Unit for Power Supply & Induction Heating coil** consisting of: • Water storage tank. • Plate type Heat Exchanger. • Non-ferrous pump. • Resin cartridge. • Interconnecting pipes (within 5 Meters range) and other accessories.	1 No.	**19.40** (Ex-works)
3.	Induction Heating Coil Assembly suitable for Heating Billets of : ✓ DIA 20mm	1 No.	
4.	Induction Heating Coil Assembly suitable for Heating Billets of : ✓ DIA 36mm	1 No.	
5.	Robust base Frame for mounting Heating coil assembly.	1 No.	
6.	**Mechanical Handling system** consisting of: • In feed chain conveyor mechanism. • Job Presence Detecting Device. • Tractor Drive Mechanism. • Adjustable Guides. • Quick Extraction System With its interconnections.	1 Set.	

GLOBAL EXPORTS
JALANDHAR

[illegible]
DATE: 23-JAN-16

For Global Exports India

Partner

7.	PLC Based Operator Control Desk with Touch screen display having job data storage recipe feature.	1 No.
8.	Single color Infrared Pyrometer with its cooling jacket and Jumbo display unit	1 No.
9.	Instruction & Operation Manual	1 Set.
10.	Fully test equipment before dispatch at 100% power.	———
	Total Ex-works Price for the above Rs.19,40,000/- (Rupees Nineteen Lac & Forty Thousand Only)	
	Erection & Commissioning charges are Rs.35,000/- All other taxes and duties will be charged extra AS APPLICABLE.	

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

For ELECTROTHERM INDIA LIMITED

VIPLESH MODI
HEAD – SALES & MARKETING
Cell: + 91 98251 22997

Encl: 1. Technical Specification, Doc No. IH/MK/QG3.Rev.00
2. Scope of Supply, Doc No. IH/MK/QG4. Rev.00
3. Customer Scope. Doc No. IH/MK/QG5 Rev.00
4. Terms and Conditions, Doc No IH/MK/QG6 Rev.00

GLOBAL EXPORTS
JALANDHAR

ET/JHD/MGG/R1/[illegible]/15-16
DATE: 13-JAN-16

For Global Exports Inc.

Partner

Akal Induction Pvt. Ltd.

BULL POWER
HIGH FREQUENCY & MEDIUM FREQUENCY HEATER

Near Duggal Petrol Pump,
G.T. Road, Phagwara-144 401 (Pb.) India
Tel. +91-1824-261533, 98766-38533 Fax : +91-1824-261733
E-mail: akalind@gmail.com
Website : akalinduction.com

QUOTATION

Dt.:19-02-16

To
M/s Global Exports
C-145,Canara bank
Industrial Area
Jalandhar

Sub.: Quotation of 200KW Induction Heating Machine

Dear Sir,

We are pleased to give you the quotation of the Induction Heating Machine required by you as follows :-

Description	Qty
200 Kw Induction Heating Machine	01 No.
Heat Exchanger,Cooling Tower,Water Pump & Water Pump	01 No.
Machanical System Feeder With Adjustable Speed	01 No.
Coil 22 MM Coil 25 MM	01 No 01 No
PLC Base HMI Touch with programmable Job Display Isolation Transformer	01 No.
Total Price	Rs.19,42,000.00 (Nineteen Lakh Forty Two Thousand only)

Terms & Conditions of our trade are as follows :-

1. Freight, & Loading will be charged extra.
2. Vat @6.05% or CST @ 2% will be charged Extra & Excise duty @12.50% will be charges extra as applicable at the time of delivery of machine.
3. Delivery of Machine within 30 days from the date of Confirmation of order.
4. 30% Advance & balance at the time of delivery of Machine.
5. Packing & forwarding will be charged Extra

Thanking you and assuring you our best attention at all time.

With regards
for Akal Induction Pvt. Ltd.,

Director
JATINDER SINGH.

For Global Exports India

Partner

Ph. 0181-6576159
G.R.D. INDUCTION
MFRS. OF : H.F. INDUCTION HEATERS & POWER ELECTRONICS EQUIPMENTS
G.T. ROAD, OPP. HOTEL COUNTRY INN, JALANDHAR

QUOTATION

M/S Globel Exports India.,
Near Canara Bank, Ind Area,
Jalandhar.

Date:18.02.2016.

Dear Sir,

While thanking you for your enquiry for "GRD INDUCTION HEATER", we are pleased to quote our best price as under.

Sr. No.	Particular	Qty.	Amount
1	200KW Induction Heater	1	20,50,000.00
	Vat @ 6.05%		1,24,025.00
	Grand Total		**21,74,025.00**

(Rs Twenty One Lac Seventy Four Thousand Twenty Five Only)

Term & Condition

1. Machine would be delivery after one month from the date of Confirmed Purchase Order.
2. Payments 30% Advance along with Purchase Order and Balance 70% against deliver of machine before dispatch.
3. Taxes will be charged extra as applicable at the time of delivery.
4. Prices are Ex our works at Jalandhar. Packaging, forwarding and insurance charges extra.
5. Quotation is valid for 30 days.

For Global Exports India
Partner

Ph. 0181-6576159
G.R.D. INDUCTION
MFRS. OF : H.F. INDUCTION HEATERS & POWER ELECTRONICS EQUIPMENTS
G.T. ROAD, OPP. HOTEL COUNTRY INN, JALANDHAR

Warranty

200 KW Induction Heater is covered under one year warranty from the date of dispatch against any defect caused by faulty material or workmanship. Company would replace/repair any such part free of charge, as required to rectify the problem.

Note: -Power semiconductors (IGBTs) are covered under six month warranty.

Condition of warranty

1. The machine is installed and operated in accordance with our recommendation.
2. No repair or alteration should be conducted without our approval.
3. Defective parts replaced by us are our property.

For GRD Induction

Prop.

For Global Exports India

Partner

Completion Letter

GLOBAL EXPORTS INDIA

EXPORTERS & MANUFACTURERS

C-145, Near Canara Bank, Industrial Area, JALANDHAR - 144 004
Phone : 0181-2291744 E-mail : gblexpo@yahoo.in

Ref. No. .....

Date .....

26/03/2016

The Energy Economist

Bureau of Energy Efficiency

Swewa bhawan, R.K.Puram,

New Delhi

Sub: - Request For Inspection. Of 200kw Biller Heater Machine.

Sir,

We may inform that our machine i.e.200kw Billet Heater Machine has been Installed, at our unit. So we request your honor to inspect the machine as Soon as possible (Manufacturer Invoice Attached)

With Regards

Global Exports India

Near Canara Bank, Ind Area

Jalandhar .Punjab

Mobil 09814061278

Energy Saving calculation for Induction Heating

Parameter	Unit	Value
Baseline Scenario		
Furnace oil consumption on re-heating furnace	ltr/hr	9.00
Productivity in terms of Kg	kg/hour	100
Specific energy consumption on FO based re-heating furnace	Ltr/Kg	0.09
Specific fuel consumption in terms of kcal	kcal/kg	918.00
Cost of energy consumption	Rs./Kg	4.50
Annual production (based on baseline productivity)	Kg/annum	240000
Post Implementation Scenario		
Power consumed by induction furnace (based on on-site measurement) Note: Induction furnace was observed to be running at 60 % loading	kWh	42.00
Productivity in terms of Kg	Kg/hr	208
Specific energy consumption on induction reheating furnace	kWh/Kg	0.20
Specific fuel consumption in terms of kcal	kcal/kg	173.65
Cost of energy consumption	Rs/kg	1.51
Annual production (based on post implementation productivity)	Kg/annum	499200
Savings		
Reduction in cost of energy	Rs/kg	3.0
Reduction in specific energy consumption in kcal	kcal/kg	744.3
Annual Cost Savings (in terms of post implementation productivity)	Rs	1490400
Annual Reduction in Energy Consumption (based on post implementation productivity)	toe	37.16
Percentage reduction in energy consumption	%	81.08
Investment made Induction furnace (50 kW)	Rs	731745
Simple payback period	years	0.49
Annual CO_2 emission reduction	t CO2/year	40.11

Annexure 5

GHG Emission Factor

Emission Factors for Greenhouse Gas Inventories

Last Modified: 4 April 2014

Red text indicates an update from the 2011 version of this document.

Typically, greenhouse gas emissions are reported in units of carbon dioxide equivalent (CO_2e). Gases are converted to CO_2e by multiplying by their global warming potential (GWP). The emission factors listed in this document have not been converted to CO_2e. To do so, multiply the emissions by the corresponding GWP listed in the table below.

Gas	100-year GWP
CH_4	25
N_2O	298

Source: Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report (AR4), 2007. See the source note to Table 9 for further explanation.

Table 1 Stationary Combustion Emission Factors

Fuel Type	Heating Value	CO_2 Factor	CH_4 Factor	N_2O Factor	CO_2 Factor	CH_4 Factor	N_2O Factor	Unit
	mmBtu per short ton	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per short ton	g CH_4 per short ton	g N_2O per short ton	
Coal and Coke								
Anthracite Coal	25.09	103.69	11	1.6	2,602	276	40	short tons
Bituminous Coal	24.93	93.28	11	1.6	2,325	274	40	short tons
Sub-bituminous Coal	17.25	97.17	11	1.6	1,676	190	28	short tons
Lignite Coal	14.21	97.72	11	1.6	1,389	156	23	short tons
Mixed (Commercial Sector)	21.39	94.27	11	1.6	2,016	235	34	short tons
Mixed (Electric Power Sector)	19.73	95.52	11	1.6	1,885	217	32	short tons
Mixed (Industrial Coking)	26.28	93.90	11	1.6	2,468	289	42	short tons
Mixed (Industrial Sector)	22.35	94.67	11	1.6	2,116	246	36	short tons
Coal Coke	24.80	113.67	11	1.6	2,819	273	40	short tons
Fossil Fuel-derived Fuels (Solid)								
Municipal Solid Waste	9.95	90.70	32	4.2	902	318	42	short tons
Petroleum Coke (Solid)	30.00	102.41	32	4.2	3,072	960	126	short tons
Plastics	38.00	75.00	32	4.2	2,850	1,216	160	short tons
Tires	28.00	85.97	32	4.2	2,407	896	118	short tons
Biomass Fuels (Solid)								
Agricultural Byproducts	8.25	118.17	32	4.2	975	264	35	short tons
Peat	8.00	111.84	32	4.2	895	256	34	short tons
Solid Byproducts	10.39	105.51	32	4.2	1,096	332	44	short tons
Wood and Wood Residuals	17.48	93.80	7.2	3.6	1,640	126	63	short tons
	mmBtu per scf	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per scf	g CH_4 per scf	g N_2O per scf	
Natural Gas								
Natural Gas (per scf)	0.001026	53.06	1.0	0.10	0.05444	0.00103	0.00010	scf
Fossil-derived Fuels (Gaseous)								
Blast Furnace Gas	0.000092	274.32	0.022	0.10	0.02524	0.000002	0.000009	scf
Coke Oven Gas	0.000599	46.85	0.48	0.10	0.02806	0.000288	0.000060	scf
Fuel Gas	0.001388	59.00	3.0	0.60	0.08189	0.004164	0.000833	scf
Propane Gas	0.002516	61.46	0.022	0.10	0.15463	0.000055	0.000252	scf
Biomass Fuels (Gaseous)								
Landfill Gas	0.000485	52.07	3.2	0.63	0.025254	0.001552	0.000306	scf
Other Biomass Gases	0.000655	52.07	3.2	0.63	0.034106	0.002096	0.000413	scf
	mmBtu per gallon	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per gallon	g CH_4 per gallon	g N_2O per gallon	
Petroleum Products								
Asphalt and Road Oil	0.158	75.36	3.0	0.60	11.91	0.47	0.09	gallon
Aviation Gasoline	0.120	69.25	3.0	0.60	8.31	0.36	0.07	gallon
Butane	0.103	64.77	3.0	0.60	6.67	0.31	0.06	gallon
Butylene	0.105	68.72	3.0	0.60	7.22	0.32	0.06	gallon
Crude Oil	0.138	74.54	3.0	0.60	10.29	0.41	0.08	gallon
Distillate Fuel Oil No. 1	0.139	73.25	3.0	0.60	10.18	0.42	0.08	gallon
Distillate Fuel Oil No. 2	0.138	73.96	3.0	0.60	10.21	0.41	0.08	gallon
Distillate Fuel Oil No. 4	0.146	75.04	3.0	0.60	10.96	0.44	0.09	gallon
Ethane	0.068	59.60	3.0	0.60	4.05	0.20	0.04	gallon
Ethylene	0.058	65.96	3.0	0.60	3.83	0.17	0.03	gallon
Heavy Gas Oils	0.148	74.92	3.0	0.60	11.09	0.44	0.09	gallon
Isobutane	0.099	64.94	3.0	0.60	6.43	0.30	0.06	gallon
Isobutylene	0.103	68.86	3.0	0.60	7.09	0.31	0.06	gallon
Kerosene	0.135	75.20	3.0	0.60	10.15	0.41	0.08	gallon
Kerosene-type Jet Fuel	0.135	72.22	3.0	0.60	9.75	0.41	0.08	gallon
Liquefied Petroleum Gases (LPG)	0.092	61.71	3.0	0.60	5.68	0.28	0.06	gallon
Lubricants	0.144	74.27	3.0	0.60	10.69	0.43	0.09	gallon
Motor Gasoline	0.125	70.22	3.0	0.60	8.78	0.38	0.08	gallon
Naphtha (<401 deg F)	0.125	68.02	3.0	0.60	8.50	0.38	0.08	gallon
Natural Gasoline	0.110	66.88	3.0	0.60	7.36	0.33	0.07	gallon
Other Oil (>401 deg F)	0.139	76.22	3.0	0.60	10.59	0.42	0.08	gallon
Pentanes Plus	0.110	70.02	3.0	0.60	7.70	0.33	0.07	gallon
Petrochemical Feedstocks	0.125	71.02	3.0	0.60	8.88	0.38	0.08	gallon
Petroleum Coke	0.143	102.41	3.0	0.60	14.64	0.43	0.09	gallon
Propane	0.091	62.87	3.0	0.60	5.72	0.27	0.05	gallon
Propylene	0.091	65.95	3.0	0.60	6.00	0.27	0.05	gallon
Residual Fuel Oil No. 5	0.140	72.93	3.0	0.60	10.21	0.42	0.08	gallon
Residual Fuel Oil No. 6	0.150	75.10	3.0	0.60	11.27	0.45	0.09	gallon
Special Naphtha	0.125	72.34	3.0	0.60	9.04	0.38	0.08	gallon
Still Gas	0.143	66.72	3.0	0.60	9.54	0.43	0.09	gallon
Unfinished Oils	0.139	74.54	3.0	0.60	10.36	0.42	0.08	gallon
Used Oil	0.138	74.00	3.0	0.60	10.21	0.41	0.08	gallon
Biomass Fuels (Liquid)								
Biodiesel (100%)	0.128	73.84	1.1	0.11	9.45	0.14	0.01	gallon
Ethanol (100%)	0.084	68.44	1.1	0.11	5.75	0.09	0.01	gallon
Rendered Animal Fat	0.125	71.06	1.1	0.11	8.88	0.14	0.01	gallon
Vegetable Oil	0.120	81.55	1.1	0.11	9.79	0.13	0.01	gallon
	mmBtu per gallon	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu				
Steam and Hot Water								
Steam and Hot Water		66.33	1.250	0.125				mmBtu

Source:

Solid, gaseous, liquid and biomass fuels: Federal Register (2009) EPA; *40 CFR Parts 86, 87, 89 et al; Mandatory Reporting of Greenhouse Gases; Final Rule*, 30Oct09, 261 pp. Tables C-1 and C-2 at FR pp. 56409-56410. Revised emission factors for selected fuels: Federal Register (2010) EPA; 40 CFR Part 98; Mandatory Reporting of Greenhouse Gases; Final Rule, 17Dec10, 81 pp. With Amendments from Memo: Table of Final 2013 Revisions to the Greenhouse Gas Reporting Rule (PDF) to 40 CFR part 98, subpart C: Table C–1 to Subpart C—Default CO2 Emission Factors and High Heat Values for Various Types of Fuel and Table C–2 to Subpart C—Default CH4 and N2O Emission Factors for Various Types of Fuel.

Steam and Hot Water: EPA (2008) *Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance - Indirect Emissions from Purchases/Sales of Electricity and Steam*. Assumption: 80% boiler efficiency and fuel type assumed natural gas. Factors are per mmBtu of steam or hot water purchased.

http://www.epa.gov/ghgreporting/documents/pdf/2013/documents/memo-2013-technical-revisions.pdf
http://www.epa.gov/ghgreporting/reporters/subpartc/c.html