National Program

on

Promoting Energy Efficiency and Renewable Energy in MSME Clusters in India

Jamnagar Brass Cluster

Detailed Energy Audit Report

Satyanam Engineering Industries

Submitted to

Submitted by

InsPIRE Network for Environment

February 2016

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Abbreviations

BEE	Bureau of Energy Efficiency
FO	Furnace Oil
GEF	Global Environment Facility
HP	Horse Power
kcal	Kilo Calories
kg	Kilogram
kVA	Kilo Volt Ampere
kW	Kilo Watts
kWe	Kilo Watts Electrical
MDI	Maximum Demand Indicator
MSME	Ministry of Micro Small and Medium Enterprises
PF	Power Factor
SEB	State Electricity Board
SEC	Specific Energy Consumption
SME	Small and Medium Enterprise
UNIDO	United Nations Industrial Development Organization
VFD	Variable Frequency Drive

About the Project

The project titled "Promoting Energy Efficiency and Renewable Energy in selected MSME clusters in India" supported by Global Environment Facility (GEF), United Nations Industrial Development Organization (UNIDO), and Bureau of Energy Efficiency (BEE) aims to bring down the energy consumption in Jamnagar Brass cluster located in Jamnagar (Gujarat) by supporting them to adopt Energy Efficient and Renewable Energy practices. There are more than 4,000 Small and Medium Enterprise (SME) Brass units operating in the various industrial pockets of the district. InsPIRE Network for Environment, New Delhi has been appointed as the executing agency to carry out the activities in the cluster.

The activities to be conducted under the proposed energy efficiency study in Jamnagar Brass Cluster include following:

- Conducting Pre-activity Workshop
- Comprehensive energy audit in 6 Brass units
- Discussion with 3 cluster experts and 2 equipment suppliers to develop best operation practice document for 5 key technologies
- Enumeration of common regularly monitorable parameter at the process level which have impact on energy performance, and listing of appropriate instrumentation for the same Development of Best Operating Practices Manual for top 5 technologies
- Identification of set of energy auditing instruments that should be used for carrying out periodic energy audits in the units. Identification of monitoring parameters and measuring instruments
- Conducting 3 post energy audit technical workshops for knowledge dissemination

As part of the activities conducted under the energy efficiency study in Jamnagar Brass cluster, detailed energy audits in 6 Brass units in Jamnagar was conducted in the month of July'2015.

Executive Summary

Name of SME unit : M/s Satyanam Engineering Industries

Location of the SME unit : Plot No. K-1/275, GIDC-1, Shankar Tekri, Udyognagar, Jamnagar, Gujarat

Based on the measurements carried out and data collected during field visit in the month of July'2015 and analysis of the data, process wise scope for energy efficiency improvement are identified and relevant recommendations are made. The proposed energy saving measures along with the annual savings, investment required and the simple payback period is given in the Table 1 below:

Table 1: ***Cost Economic Analysis***

SN	Energy Efficient Measure	Annual Savings (In Rs)	Estimated Investment (In Rs)	Simple Payback Period (Year / months)
1	Improving insulation of the Furnace	90,000	30,000	4 months
2	Replacement of Coke fired furnace with Gas fired furnace	225,439	350,000	1 year 7 months
3	Replacement of Coke fired furnace with induction furnace	359,424	10,00,000	2 years 9 months
4	Use of Thermocouple to measure temperature of molten metal	67,298	20,000	4 months
	Total	**742,161**	**400,000**	

▶ Coke Fired Pit Furnace:

Satyanam Engineering Industries has installed one hard coke fired brass melting pit furnace, locally known as "Bhatti", of crucible capacity 300 kgs. The annual production capacity of the unit is around 250 tons. The furnace design for brass melting operation is primitive and conventional technology prolonged for more than 40 years. It generally takes 1.2 to 1.5 hours for the material to melt. Completeness of melting is checked by testing the flowability of the molten material and based on the requirement hard coke is added to get the required temperature. The energy consumption, in terms of kg of coke per tons of molten metal (as defined as SEC), comes to around 145 kgs of coke per ton of material. There is no data log maintained by the unit. There is no temperature measurement devices used to measure the molten metal temperature. The surface temperature of furnace is high indicating poor quality of insulation used.

It is recommended that furnace should be redesigned by constructing minimum 3 layers of firebricks, then refractory lining and finally 2 layers of red brick. This would minimise the heat losses from the furnace and enhances the efficiency of the coke fired pit furnace. It is further recommended to replace conventional coke fired pit furnace with gas fired furnace. Use of thermocouple to measure the temperature of molten metal shall be better option rather depending upon the furnace operator's judgement. It is proposed to replace the existing char coke fired pit furnace with induction furnace with specifications as, crucible size of 100 kgs, medium frequency range of 1 kHz, 50 kW of power and melt rate of 110 kgs per hour.

Introduction

1.1 ABOUT THE UNIT

Satyanam Engineering Industries has started its commercial production in way back in 1979 and is engaged in manufacturing of Brass rods of 22 inch length and 8~10 mm diameter depending on customer requirements. The company does job work to produce castings and supply to the clients in Jamnagar for further processing.

The daily production capacity is around 1,000 kgs of Brass rods with batch size of 250 kgs. The production starts earlier in the morning and by noon hours produces around 4 to 5 batch.

The unit uses electricity supply from State Electricity Boards (SEBs) for various process and utility applications in premises and coke for melting furnace, however, there is no log book records of monthly production and energy consumption data. Thermal energy (in form of hard coke) consumption is required by the coke fired pit furnace of capacity 180 kgs for scrap melting operation.

Due to non-availability of log books to record various energy and production data, the historical consumption figures were verbally acquired during discussion with the Unit management and furnace operator. The monthly production is 20.8 tons of Brass rods. The monthly hard coke consumption is 3,900 kgs and the monthly electricity consumption is 800 kWh. According to the assessment of the energy consumption data collected, the specific thermal energy consumption and specific electrical energy consumption is 0.19 kgs per and 0.04 kWh per kg of product respectively. The total specific energy consumption (in kCal) is 1383.8 kCal per kg of product. Details of annual electrical and thermal energy consumption and Specific Energy Consumption (SEC) details in Satyanam Engineering Industries are presented in Table 1.1 below:

Table 1.1: ***Details of M/s Satyanam Engineering Industries***

SN	Parameter	Value	Unit
1	Name and address of unit	Satyanam Engineering Industries, K-1/275, GIDC-1, Shanker Tekri, Udyognagar, Jamnagar, Gujarat	
2	Contact person	Mr. Lakhabhai M. Keshwala, Phone: 0288-2560825, 2560850	
3	Manufacturing product	Brass Rods	
4	Monthly Production	20.8 tons	
	Energy utilization		
5	Average monthly electrical energy consumption	800	kWh per month
6	Average monthly thermal (hard coke) energy consumption	3,900	kgs per month
7	Average thermal specific energy consumption	0.19	kg of hard coke /kg of

SN	Parameter	Value	Unit
			product
		1350.8	kCal/kg of product
8	Electrical specific energy consumption	0.04	kWh/kg of product
		33.08	kCal/kg of product
9	Specific energy consumption	1383.8	kCal/kg of product
10	Electrical energy cost	0.29	Rs/kg of product
11	Thermal energy cost	4.3	Rs/kg of product
12	Total energy cost	4.60	Rs/kg of product

Note:
Specific gross calorific value of hard coke 7,204 kCal / kg (estimates from laboratory test report)
Thermal equivalent for one unit of electricity is 860 kCal / kWh
Cost of Electricity = Rs. 7.5 per unit

Figure 1.1 provides annual energy mix for both electrical and thermal energy on cost as well as kCal basis. It can be observed share of thermal energy is high as compared to electrical energy mainly due to presence of coke based pit furnace.

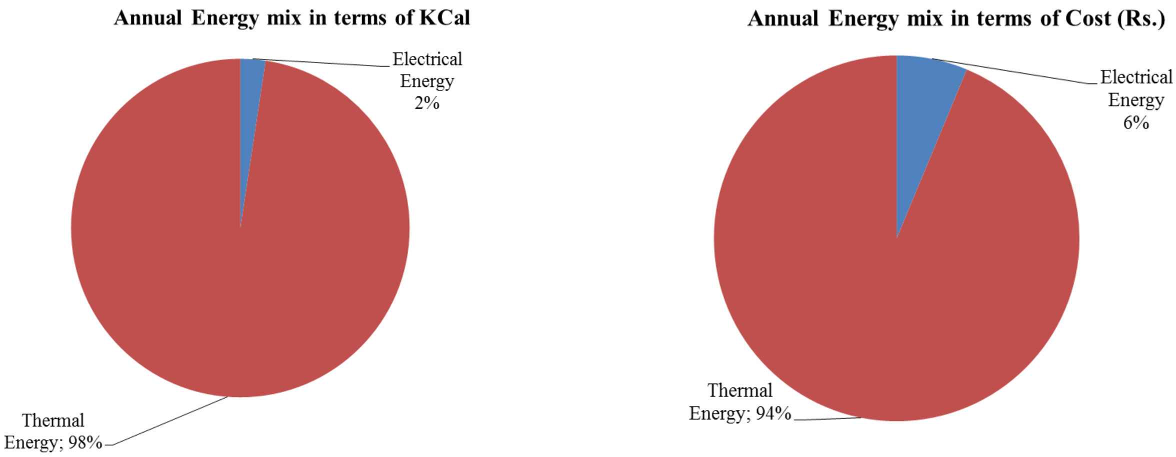


Figure 1.1: ***Annual energy mix in terms of kCal and Rupees***

1.2 ENERGY AUDIT METHODOLOGY

The primary objective of the energy audit was to study prevailing energy consumption pattern and to identify scope for energy efficiency improvement through technical intervention as well as inclusion of best operation practices. Figure 1.2 depicts the flow chart of activities being adopted for detailed energy audit study.

The activities for the current project started with organization of a pre-activity workshop attended by local unit owners, representatives from UNIDO. During the workshop, project objectives along with support required from the units were also discussed. After this workshop, six units for further consideration of energy audit studies were selected by the local association.

After selection of units, preliminary information relating to the energy consumption by the units was collected in a structured questionnaire. The intent of this preliminary data collection was mainly to get preliminary details about the units to make the energy audit process more effective. A copy of the same questionnaire is attached as ***Annexure 1***. Thereafter, field visit to selected industries was carried on a mutually decided dates. During energy audits, detailed data related to specific fuel consumption, various losses, operation practices being followed at the units were measured and collected. Further the gathered data is analyzed to assess prevailing energy consumption of each unit. Further, based on the observation as well as data analysis recommendations related to energy conservation opportunities are also made. List of measuring instruments used during detailed energy audit are summarized in Table 1.2.

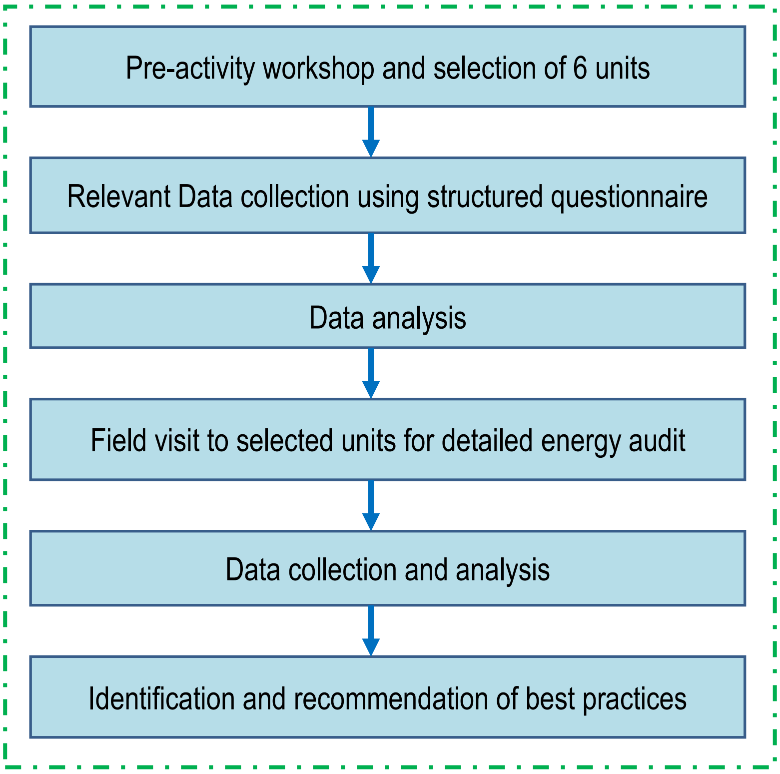


Figure 1.2: ***Flowchart depicting sequence of activities followed for carrying out detailed energy audit***

Table 1.2: ***List of instruments used during energy audit***

SN	Name of Instrument	Make / Model
1	Three Phase Power Quality Analyzer	Fluke/434/UNI
2	Single Phase Power Quality Analyzer	Fluke/43B
3	Ultrasonic Water Flow Meter	GE Panametrics/PT878
4	Rotating Vane Anemometer	Prova Ltd., Taiwan/AVM -05
5	Lux Meter	Metravi/1332
6	Portable Non-contact Infrared Thermometer	Raytek, USA/ST 80
7	Flue Gas Analyzer	Kan May, KM 900

CHAPTER 2:

Present Process, Observations and Proposed Technology

2.1 PRODUCTION PROCESS OF PLANT

Satyanam Engineering Industries is involved in the production of brass products via melting of scrap in a coke fired pit furnace. Figure 2.1 depicts the typical process employed at the unit. It can be seen that melting is the major energy consuming process in the overall manufacturing process of Brass rods. Brass Melting is done in crucibles made of silicon carbide, better known among the industry as “Graphite crucibles”. The crucibles are kept inside a round pit and hard coke is feed into the annular space between crucible & furnace. Annular space between the crucible and the furnace serves as the space for combustion. Presently the furnace at Satyanam Engineering Industries is using high grade hard coke as fuel for melting purpose. The hard coke sample from the unit was collected and same was used to carry out detailed ultimate and proximate analysis. The details of hard coke testing report are attached in ***Annexure 2***. Raw materials used in unit are Brass scrap which is mainly imported from abroad. The Scrap contains various types of copper alloy based items which are segregated according to the material composition. Segregated scrap is fed manually into the melting crucible while the furnace is kept on the firing mode. Generally it takes from 1.5 to 2 hours for the material to melt completely. Molten metal is poured into the box type sand moulds. The moulds are prepared by using wooden moulds and pattern of different shapes and size depending on the type of end product. After pouring molten material in the casting system, it undergoes fettling and cooling and finally packed for dispatch.

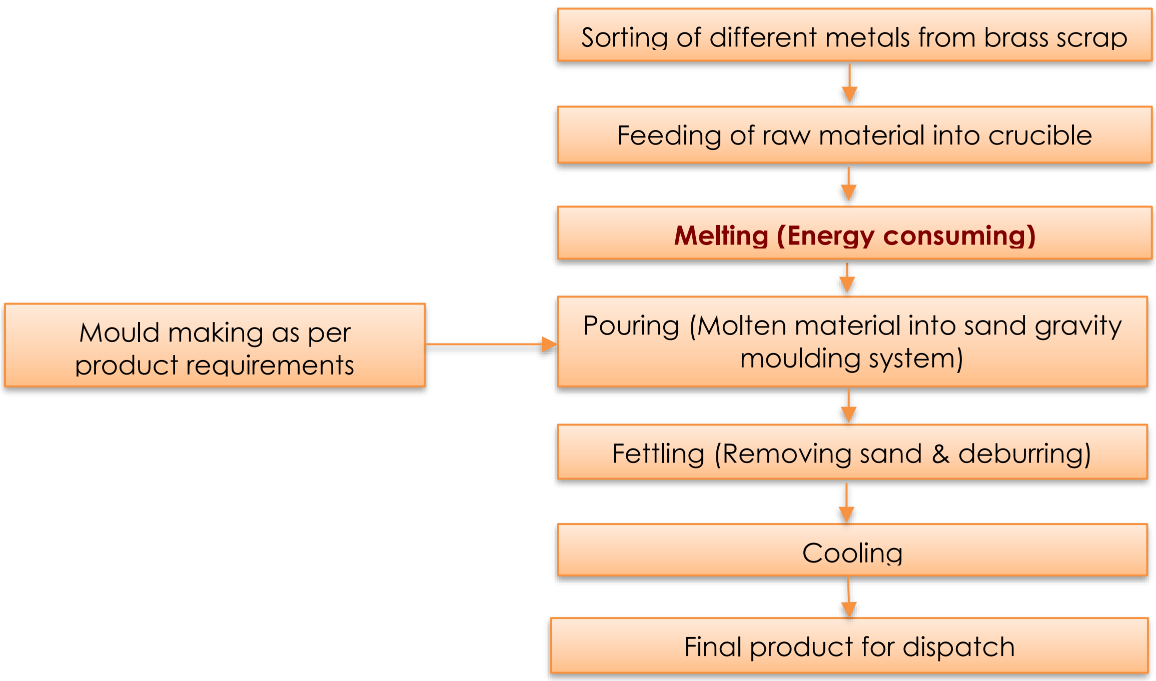


Figure 2.1: ***Manufacturing process of Brass rods***

Pictorial Representation of Production Process

Figure 2.2: ***Sand sieving machine rods***

Figure 2.3: ***Sand Muller machine for mixing of moulding sand***

Figure 2.4: ***Preparation of sand mould***

Figure 2.5: ***Scrap Material used for melting***

Figure 2.6: ***Filling of hard coke along the sides of crucible***

Figure 2.7: ***Separation of sand and casting in the knockout section***

Figure 2.8: ***Products after knockout section***

Figure 2.9: ***Removal of hot crucible at the end of operation***

Figure 2.10: ***Inner view of pit furnace being used for scrap melting***

2.2 PRESENT TECHNOLOGIES ADOPTED

Coke pit furnace is the major energy consumer in the unit consuming thermal (coke) energy. The coke pit furnace in local language is called "*Bhatti*". In addition to this there are various small size motors installed to carry out related operations. Table 2.1 summarizes the details pertaining to energy consuming devices in the unit.

Table 2.1: ***Details of equipment***

SN	Process	Number	Energy Source	Rated Consumption
1	Huller	1	Electricity	10 HP
2	Coke furnace (*Bhatti*)	1	Hard coke & Electricity	Hard coke *bhatti* crucible capacity 300 kgs, Blower 1 HP
3	Grinding	1	Electricity	1.5 HP
4	Mortar	1	Electricity (Blower) Thermal, (Kerosene)	2 HP

2.3 DETAILED ENERGY AUDIT

During the field visit to the unit detailed measurement of the following equipment were carried out. The primary objective of the energy audit was to quantify the existing fuel consumption pattern and to determine the operating efficiencies of existing systems. The key points targeted through energy audits were determination of specific fuel consumption, and other operational practices.

Following sections provides present observations and recommendations for each equipment's to improve energy efficiency.

2.3.1 Coke Fired Melting Furnace "*Bhatti*"

- **Present System:**

The major share of energy consumption is contributed by coke pit furnace. So the detailed energy audit by measuring important parameters, like hard coke input, scrap material feed, liquid metal temperature, time taken to melt and other important furnace parameters, was carried out.

The unit uses coke fired pit furnace of crucible capacity 300 kgs for scrap melting. Figure 2.11 provides schematic and actual presentation of coke pit furnace. The sequence of operation using coke pit furnace involves initial ignition using wood as fuel. After 20-25 minutes of this, crucible is put inside the furnace. Hard coke is then filled from the sides of the crucible from time to time. Thereafter, scrap material is placed inside the crucible. It is also mixed with in-house cutting and turning including runner and risers and return material. The scrap is fed manually into the melting crucible while the furnace is kept in the firing mode. It generally takes 1.2 to 1.5 hours for the material to melt completely. Completeness of melting is checked by testing the flowability of the molten material and based on the requirement further hard coke is added to get the required temperature. Molten metal is drawn from the crucible and the same is poured in the moulds.

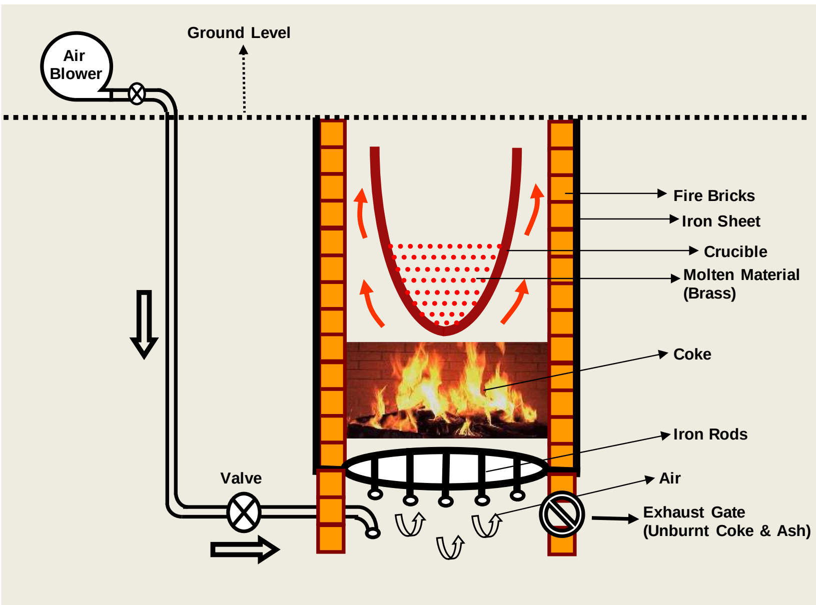


Figure 2.11: ***Schematic of a coke pit furnace***

Figure 2.11a: ***Actual coke pit furnace***

During field visit, detailed measurement of the coke pit furnace was carried out. The input material being fed into the graphite melting crucible of pit furnace included machining material, zinc, rejection material, lead and scrap material and hard coke is burned beneath the crucible. All the data pertaining to the material and energy inflow and outflow from the furnace was noted and are summarized in Table 2.2.

Table 2.2: ***Trial on coke pit furnace***

Charge No.	Total Material Input (kgs)	Total output (kgs)	Total hard coke Consumed (kgs)	Burning loss (%)	SEC (kg of coke /ton)
1	415.25	398	60	4.15	144.5

The key observations made during operation of coke pit furnace are presented below:

- The energy consumption, in terms of kg of coke per tons of molten metal (as defined as SEC), comes to around 145 kgs of coke per ton of material.
- There is no data log being maintained in the unit.
- Further, there is no temperature measurement devices used to measure the molten metal temperature. The *bhatti* operator makes his judgement by seeing the melt colour to decide the temperature.
- During pouring operation, air supply is reduced to 25% using damper.
- Substantial quantity of fumes and dust are observed when brass scrap is melted in crucible furnaces. This fumes and smokes are occurring due to burning of combustible matter, oil & grease that are stuck to the scrap and volatilization & oxidation of alloying metals having low boiling points (like Zinc).
- The presence of the black smoke indicates incomplete combustion of the coke fuel in the furnace resulting into lower operational efficiency.
- The surface temperature of furnace is high indicating poor quality as insulation used.
- No preheating of charge being carried out currently. Some fine brass chips are placed on the lid of the furnace to preheat.

- Flames were seen come out of the crucible mouth level, as the furnace operators were busy to melt more number of batches per shift by increasing air flow to rapidly fire coke which results in more heat loss from furnace.

Hence, there are possibilities of complete redesigning of the combustion system so that quantity of air and fuel can be regulated. Besides this, the whole system needs to be properly insulated because the heat losses from the furnace structure are huge.

Recommendations:

The melting furnace employed by the unit for brass melting operation is primitive and conventional technology prolonged for more than 40 years, providing scope for energy conservation. Based on the observations made during the visit, following recommendations are made to improve energy performance in the unit.

- Best Practice #1 (Material Log Book): Maintain log records of type and quantity of scrap material being used and coke consumed for every charge (See ***Annexure 3***).
- Replacement of conventional coke fired pit furnace with higher efficient and non-polluting gas fired furnace.
- Replacement of conventional coke fired furnace with induction furnace.
- Redesigning the existing brass melting furnace with better refractory lining and improving insulations to arrest heat dissipation.
- Use of thermocouples to measure the temperature of molten metal.
- Preheating of charge material.

These energy efficiency measures are discussed in detail in the following section along with the cost benefit analysis.

Improving Insulation of Furnace:

In the existing furnace insulation layer is constructed with locally available firebricks. These firebricks have low alumina content, tend to get worn out in short duration to a high extent. Also, the insulation required for plugging heat loss through the pit furnace is usually made up of locally available red bricks, which do not serve the purpose of insulation.

In existing furnace it was observed that average surface temperature is around 98^{0}C, which leads to high radiation losses through the furnace, which sometimes accounted as high as 3~5 % of the overall losses. To overcome this shortcoming, the insulation thickness and its layering and quality should be reconsidered. It is recommended to install suitable refractor lining and insulation system to plug the radiation losses from melting furnace.

It is recommended that furnace should be redesigned by constructing minimum 3 layers of firebricks, then refractory lining and finally 2 layers of red brick. This would minimise the heat losses from the furnace and enhances the efficiency of the coke fired pit furnace as shown in figure 2.12.

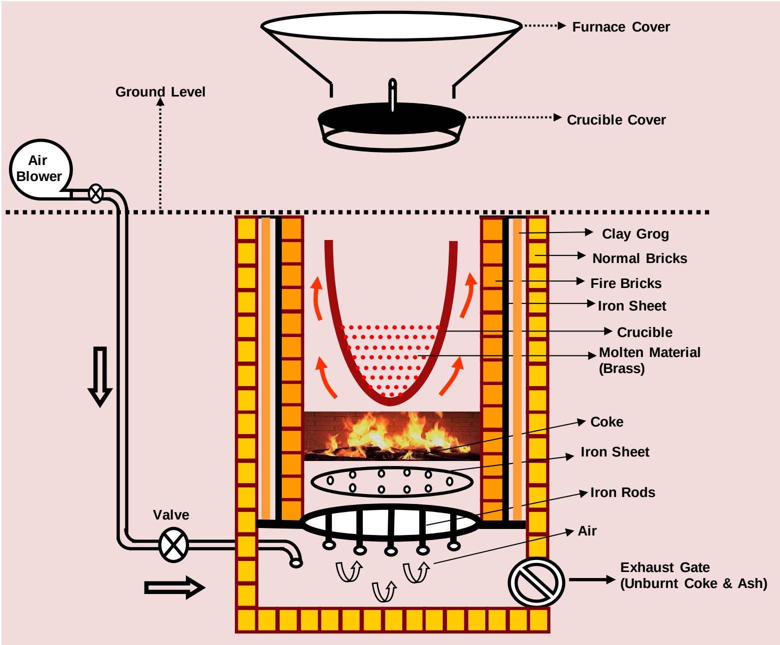


Figure 2.12: ***Conceptual design improved coke pit furnace***

Major advantages of improving the insulation of coal fired brass melting pit furnace will be;

- Arresting heat loss from furnace body to ground thereby improving coal consumption
- Reduction in melting time which automatically leads to energy savings
- Productivity improvement
- Improved working environment

The cost economic analysis of the above suggested measures are compiled in below Table. It can be observed that all the measures suggested towards energy efficiency improvements have good energy saving with less payback period.

Table 2.3: ***Cost Economic Analysis***

SN	Energy Efficient Measure	Estimated Fuel savings (kgs/year)	Annual Savings (In Rs)	Estimated Investment (In Rs)	Simple Payback Period (Year / months)
1	Improving insulation of coke fired pit furnace	5,000	90,000	30,000	4 months

Replace with Gas Fired Furnace:

Presently, Brass melting furnace at Satyanam Engineering Industries is using high grade hard coke as fuel for melting purpose. From energy use and technology audit study the efficiency of the furnace was found to be lower. In addition there are other environment related issues, like fumes and dust emissions with the hard coke furnace operations. The surrounding temperature becomes high which makes working conditions for the furnace operators extremely arduous. It is recommended to replace conventional coke fired pit furnace with gas fired furnace. Major advantages of replacing the conventional coke fired brass melting furnace with gas fired melting furnace will be;

- Specific fuel cost in gas fired melting furnace will be lower compared to coke fired melting furnace
- Can attain higher furnace efficiency
- Environment friendly
- Productivity improvements
- Improved working environment

The cost economic analysis of the above suggested measures are compiled in Table 2.4. It can be observed that the energy efficiency improvements of furnaces have payback period of only 1.6 years. Further contact details of suppliers of each energy efficient measures suggested are provided in A***nnexure 4.***

Table 2.4: ***Cost Economic Analysis***

SN	Energy Efficient Measure	Benefits	Annual Savings (In Rs)	Estimated Investment (In Rs)	Simple Payback Period (Year / months)
1	Replacement of coke fired furnace with Gas fired furnace	Fuel replacement with higher efficiency	225,439	350,000	1 year 7 months

Replace with Induction Furnace:

The replacement of currently used coke pit furnace with medium frequency induction furnace will be always a better option. This furnace replacement will lead to more accurate control of metal composition, temperature control, less pollution around, higher quality, less rejections, and less operating cost. The cost economic analysis of the suggested measure is compiled in Table 2.5. The cost economic is worked out for 100 kgs medium frequency (1 kHz) induction furnace with 50 kW of power and melt rate of 110 kgs per hour. It can be observed that the energy efficiency improvements of furnaces have payback period of only 2years 9 months.

Table 2.5: ***Cost Economic Analysis***

SN	Energy Efficient Measure	Benefits	Annual Savings (In Rs)	Estimated Investment (In Rs)	Simple Payback Period (Year / months)
1	Replacement of coke fired furnace with induction furnace	Fuel replacement with higher efficiency	359,424	10,00,000	2 years 9 months

Use of Thermocouple to Measure Molten Metal Temperature:

Molten metal temperature is critical parameter for pouring operation to reduce casting rejections, lessen material burning loss, and prevent energy loss. It was observed that the unit does not have any instrument to measure molten metal temperature, and henceforth it is not measured. The furnace operator with his past experience assesses the molten metal temperature and decided when to pour, this leads to habit of keeping higher molten metal temperature to reduce casting rejections. Higher temperature than the required once is major drawback depending on furnace operator judgement. It is suggested to use thermocouple to measure the temperature of molten metal. Major advantages of use of temperature measurement are presented below;

- Reduction of reheating time, it automatically leads to energy savings
- Reduction in material burning loss,
- Quality improvements
- Productivity improvements

The cost benefit analysis for use of thermocouple to measure molten metal temperature is given below in the table.

Table 2.6: ***Cost Economic Analysis***

SN	Energy Efficient Measure	Estimated Fuel savings (kgs/year)	Annual Savings (In Rs)	Estimated Investment (In Rs)	Simple Payback Period (Year / months)
1	Use of Thermocouple to measure temperature of molten metal	2,804	67,298	20,000	4 months

2.3.2 Exploring Opportunity for Renewable Energy Usage

During field visit, opportunities of using renewable energy applications were explored. However, based on the higher temperature requirement in the operation process possibility of using solar thermal technology for thermal applications may not be applicable. Further, there was also constrained related to the area. Finally, during discussion with unit owner, possibility of using renewable energy was ruled out due to lesser anticipated savings against the cost and operational complexity associated with renewable energy interventions.

Annexure 1:

Questionnaire*

Energy Audit – Questionnaire Form

"Promoting Energy Efficiency and Renewable Energy in MSME Clusters in India – Jamnagar Brass Unit"

Name of the MSME unit:	Satyanam Engineering Industries
Address:	K-1/275, GIDC-1, Shanker Tekri, Udyognagar, Jamnagar-4, Gujarat
Ph. No:	0288-2560825, 2560850
Name of the respondent	Mr. Khimjibhai Bharwad
Designation:	Partner

1. **Year of Establishment: 1985**
2. **Type of Products: a) One piece product**

   b) ________________

   c) ________________
3. **Installed Capacity: 21.5 kW**
4. **Operating hrs per day : 12 hours**
5. **Connected Load: (kVA or kW please specify)**
6. **Supply Voltage: 415 Volt**
7. **Annual Energy Consumption/ Production:**

Financial Year (April to March)	2012	2013	2014
Coke consumed (kg)	36000	36000	36000
Cost of coke (in Rs.)	720000	720000	792000
Electrical units consumed (In kWh)	7200	7200	9600
Electricity charges (in Rs.)	50400	58320	81600
LDO/HSD/ FO consumption (L)	-	-	-
Fuel Cost (in Rs.)	-	-	-
Production (kg)	210000	210000	249600

*Unit specific questionnaire were sent to units prior to the conduction of energy audits. Some portion of the questionnaire was not filled or left blank by the units, due to lack of understanding. However, data used for the energy audit calculations and reporting were subsequently collected during the physical visit of the energy audit team to the site.

8. **Source and Calorific Value of Fuels:**

Fuel	Source	Calorific Value (kCal)
Coke (Kg)	**Gujarat NRE**	**6500**
HSD (L)		
LDO (L)		
FO (L)		
Fuel	**Source**	
Electricity (kWh)	PGVCL	

9. **Monthly Energy Consumption and Production Data:**

Month	Production (kg)	Coke consumption (kg)	Electricity consumption (kWH)	HSD/LDO /FO (L)	Any other fuel (specify units)
April, 14	20800	3900	800		
May, 14	20800	3900	800		
June, 14	20800	3900	800		
July, 14	20800	3900	800		
August, 14	20800	3900	800		
September, 14	20800	3900	800		
October, 14	20800	3900	800		
November, 14	20800	3900	800		
December, 14	20800	3900	800		
January, 15	20800	3900	800		
February, 15	20800	3900	800		
March, 15	20800	3900	800		

10. **Duration of electricity supply: 24 Hours/ day**

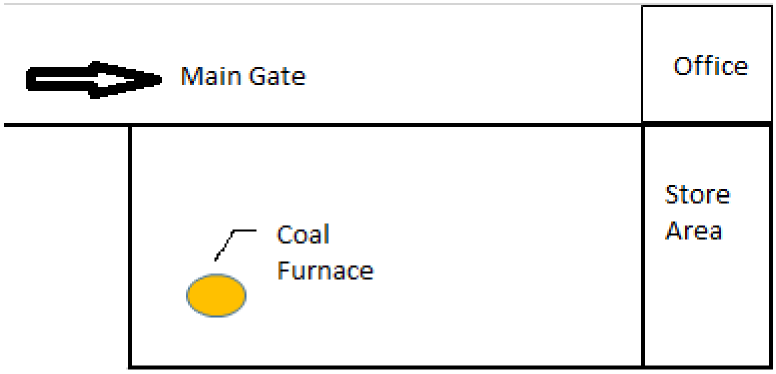
11. **Cost variables per Kg of Production:**

Cost Variable	Cost/ kg of production
Electricity Cost	Rs. 0.32
Coke Cost	Rs.4.12
Labour Cost	Rs. 2.23
Material Cost	Rs. 285
Other Cost	Rs.1.44 (Molasses) Rs.0.04(Sand) Rs2.09 (Crucible) Rs.0.375(Borax) Rs. 0.24(Lining) Rs.0.04(Sand)
Total Production Cost	Rs. 293.895

12. Major Energy Consuming Equipment:

SN	Equipment	Energy source	Make/ Supplier	Year of Installation	Technical Specification/ capacity	Use	Comments
1.	Huller		-		2 HP	To mix sand and molasses	
2.	Grinding				1.5 HP	To grind sand	
3.	Blower				1 HP		
4.	Mortar				2 HP	Separate remaining brass scrap from used sand	

13. Factory Layout (Please provide sketch of factory layout):



14. Please provide detailed manufacturing process for each major products manufactured:

15. Any Energy Efficient Technology installed in the unit:

Technology	Specification	Cost	Year of Installation
-	-	-	-

16. Any Energy Efficient Technology the management wants to implement in the unit:

Technology	Cost	Use
Nil	Nil	Nil

17. Any factory expansion plan:

No

Annexure 2:

Hard Coke Test Report

SPECTRO® ANALYTICAL LABS LIMITED

SAL EXCELLENCE IN TESTING

TEST REPORT

E-41, Okhla Indl. Area, Ph-II,
New Delhi-110020 (INDIA)
Ph: - 91-11-40522000, 41611000
Fax : 91-11-40503150, 40503151
care@spectro.in www.spectro.in

CIN - U74220DL1998PLC092698

Issued To : INSPIRE NETWORK FOR ENVIRONMENT
IRIA HOUSE, C-5 QUTAB INSTITUTIONAL AREA

NEW DELHI – 110016

Phone/Fax:
Kind Attn. : MR. CHAMAN KUMAR SHUKLA

Report No.: 150810074/1508100241 Date: 21-Aug-2015
Sample Description : DOR 10-Aug-2015
COAL SAMPLE

Your Ref. No. :

ID- 1508100241 (Page 1 of 1)

(As received basis)

S.No.	Test Parameters	Observed Results	Test Method
1	Proximate analysis		
	Moisture, % by mass	1.41	IS: 1350 (P-1) 1984
	Ash content, % by mass	11.72	IS: 1350 (P-1) 1984
	Volatile matter, % by mass	2.90	IS: 1350 (P-1) 1984
	Fixed Carbon, % by mass	83.97	IS: 1350 (P-1) 1984
2	Gross calorific value, k.cals/kg	7204	IS: 1350 (P-2) 1970
3	Ultimate analysis		
	Carbon, %	84.29	IS: 1350 (P-4/sec-1) 1974
	Hydrogen, %	1.04	IS: 1350 (P-4/sec-1) 1974
	Nitrogen, %	1.03	IS: 1350 (P-4/sec-2) 1975
	Sulphur, %	0.46	IS: 1350 (P-3) 1969
	Ash, %	11.72	IS: 1350 (P-1) 1984
	Moisture, %	1.41	IS: 1350 (P-1) 1984
	Oxygen, %	0.05	By difference

-----*End of test report*-----

Analyst CCREQD\1\RA000\A5814

Authorised Signatory

TRA - 186394

BIS,DGS & D, DDA, MOEF, DGCA approved,
ISO - 9001: 2008, ISO 14001 : 2004 & OHSAS 18001:2007 Certified Laboratory
CORPORATE IDENTITY NUMBER : U74220DL 1998 PLC 092698
Subject to Terms & Conditions Overleaf

Material Log Book – Coke Pit Furnace

Furnace ID:	……………………………	**Date**	…………………	**Charge Number**	…………	**Material Type**	…………………	
Time Details						**Material Input**		
Melting		**Holding**		**Pouring**		**SN**	**Material Type**	**Quantity (kg)**
Start Time (A)	…………	Start Time (D)	……….	Start Time (G)	………			
End Time (B)	…………	End Time (E)	……….	End Time (H)	………	1	……………………………………	……………...
Total time (C) = (B) – (A)	…………	Total time (F) = (D) – (C)	……….	Total time (I) = (F) – (E)	………	2	……………………………………	……………...
Temperature Details						3	……………………………………	……………...
Melting Temperature (^{0}C)			……………………			4	……………………………………	……………...
Tapping Temperature (^{0}C)			……………………			5	……………………………………	……………...
Pouring Temperature (^{0}C) at start of pouring			……………………			6	……………………………………	……………...
Pouring Temperature (^{0}C) at end of pouring			……………………			7	……………………………………	……………...
Coal Consumption (kgs)						Total Input Material (M)		……………...
Total coke consumption (L)			……………………...			Total Material Output (N)		……………...
						Material Lost (O) = (M) – (N)		……………...
						Specific Coke consumption (kgs/tons) (P) = (L) * 1000/ (M)		……………...
Remarks: Please capture any other information related to operation like reason for furnace holding, higher time taken for furnace holding etc…								

InsPIRE

Annexure 4:

Contact Details of the Suppliers

SN	Equipment	Supplier contact details
1	Air Fuel controller	**WESMAN Group** 8 Mayfair RoadKolkata 700 019, India Tel: +91 (33) 40020300 Web: http://www.wesman.com/index.php/controls-and-accesories
2	Air preheater	**MICO HYDRAULICS** Plot No. 3653 / 3654, 'N' Road, Phase - III, G.I.D.C., Dared, Jamnagar - 361 004. Gujarat. INDIA. Phone: +91 288 2730439 **Mr. Prakash R. Parati (Proprietor)** Mobile : +91 98242 83806 E-mail : prakash@micohydraulics.com **Aerotherm Products** No. 2406, Phase - 4, G. I. D. C. Estate, G. I. D. C., Vatva Ahmedabad - 382445, Gujarat, India Mobile: +(91)-9879104473
3	Insulation	Local Suppliers
4	Gas fired Pit Furnace	**EM EM Engineers** A-4/235, Paschim Vihar, Paschim Vihar, New Delhi 110063 Mr. Manish Kumar Soota Mobile: 098104 30765