Report on

First Technical workshop for Kolhapur Foundry Cluster

Under

BEE-WB-GEF Proejct for Financing Energy Efficiency at MSMEs

Submitted to

Bureau of Energy Efficiency (BEE)
Ministry of Power, Government of India

Submitted by

Winrock International India

Contents

List of Annexes

List of Tables

List of Figures

CHAPTER 1

BEE-WB-GEF Project: Financing Energy Efficiency at MSMEs

1.1 BACKGROUND

The Indian SME sector is facing high and rising energy costs, unlike certain other sectors of the economy such as agriculture that benefit from subsidized energy prices, whereas export-oriented Indian SMEs are facing increased global competition. Price and cost pressures are of high and increasing importance to enterprise owners. Many Indian SMEs are energy-intensive, employing inefficient and outmoded technologies and operational modalities that endanger their competitiveness and future growth. Investments in cost-effective EE measures would improve their productivity and bottom-line profits.

SMEs, especially those for whom energy costs represent a large portion of total production costs, can reap especially high direct economic benefits from improving efficiency of energy conversion and reduction of energy losses. In the past, wide-ranging governmental programs of fiscal incentives and other interventions have been offered to SME units to address technology improvements and performance efficiency, despite the financial attractiveness of these types of investments and several efforts to support the development of EE investment projects and Indian technical capacity to deliver EE solutions, only a small number of projects have actually been implemented and there has been limited adoption of efficient technologies and replication of best practices, due to the existence of numerous barriers and market failures.

These barriers include not just market barriers typically seen in energy efficiency projects globally, but additional India-specific constraints in SME access to finance which have held back the establishment of small units, their overall growth and development, and their eventual graduation to medium sized enterprises. Indian SMEs typically face constraints in accessing adequate and timely financing on competitive terms, particularly longer tenure loans, but also, in the context of the 2008/2009 financial crisis, working capital loans. The Reserve Bank of India (RBI) statistics show that the year-on-year growth rate of local Indian bank credit to SMEs fell from 35.6% in 2007 to 7.4% in 2008, even while the overall year-on-year growth rate of bank credit to industry (including large corporations) increased from 24.9% to 30.2% over the same period.

A central barrier is the current **gap in understanding** between energy auditors and EE practitioners who prepare technical proposals for SME clients and the local banks who evaluate loan proposals as opposed to technical studies. EE investments usually do not generate additional revenues, but rather contribute to bottom line

earnings through a reduction in energy expenditures. This can make it difficult for banks to identify and capture cash flows from such projects, to assess their delivery risks, and to treat energy savings as assets of sufficient market value to justify a loan, despite the overall benefits which will accrue to the borrower if implemented. This often results in either rejection of EE loan applications or offering of unattractive financial terms due to high risk perceptions. As the EE components of SME loans are often small, they also carry **higher transaction costs** as a percentage of investment when compared to large loans, making them less attractive to the banks as a specific lending product. There is also a **lack of information among banking sector stakeholders** on the potential market for lending and the portfolio benefits in terms of improving asset quality which can be achieved by increasing their own lending for EE to existing clients. Despite several pilot efforts by the GOI and donors, **imperfect information about EE among SMEs** still persists, representing another barrier preventing increased adoption of efficient technologies. Many of the previous Government and donor programs were focused on outreach and preparation of energy audits, with limited translation of these initial audits into actual investments and replication by non-participants. SME units also remain generally **unfamiliar with the performance of readily available efficient equipment** in Indian conditions. Finally, top tier vendors of energy efficient equipment frequently give lower attention to individual SMEs due to their small size and the **perceived difficulties in working with this customer class**.

1.2 HIGHER LEVEL OBJECTIVES TO WHICH THE PROJECT CONTRIBUTES

This project is part of the GEF Programmatic Framework for Energy Efficiency in India whose objectives are to:

- Promote EE in buildings through increased market penetration of EE technologies, practices, products, and materials in the residential and commercial building markets;
- Increase deployment of EE technologies and support adoption of energy saving practices in the small and medium industrial sector (SMEs); and
- Implement EE technologies and measures in Indian railways.

While the objective of this project is well coordinated with the overall program objective, it will be implemented as a stand-alone project without any direct implementing agency linkages with other projects supported under the GEF Programmatic Framework. However, the increased FI capacity and knowledge built by this project as well as lessons learned would have direct benefits to the project on “Promoting Energy Efficiency and Renewable Energy in selected MSME Clusters in India” to be implemented by UNIDO.

The project directly supports the GoI EE program and is consistent with its goal of increasing energy efficiency by 20% by 2016-17 through the implementation of a set of EE interventions, spearheaded by the BEE. This GEF project also supports

broader GoI development goals for the MSME and SSI (Small-Scale Industry) sector, particularly increasing access to finance by these small industries, making the sector more competitive, and facilitating increased productivity.

1.3 PROJECT DEVELOPMENT OBJECTIVE

The Objective of the Project is to increase demand for energy efficiency investments in target micro, small and medium enterprise clusters and to build their capacity to access commercial finance. These project objectives would be realize through the achievement of the following intermediate outcomes:

- The project will create increased demand for EE investments by adopting a cluster approach to facilitate the development of customized EE products and financing solutions in five targeted industry clusters, and will build the capacity of identified apex organizations to assist 6 MSME units in identifying additional EE projects in the future, aiding in widespread replication.
- The project will raise the quality of EE investment proposals from a technical and commercial perspective, and will increase capacity of both project developers and bank loan officers and branch managers to help shrink the gap between project identification and successful delivery of commercial finance.
- The project will expand use of existing guarantee mechanisms for better risk management by banks to catalyze additional commercial finance for energy efficiency.
- The project will establish a monitoring and evaluation system for the targeted clusters, which could be of use to BEE's program.

The project has significant scope for replication and sustainability as it will develop and implement an approach that bridges the gap between the techno-economic and financial-institutional aspects related to EE investments. The capacity built in apex institutions and among key stakeholders will also support increased investment in efficiency in the SME clusters under BEE national programme, and will support replication of this project as MSME units become more cognizant of the ultimate financial returns available from soft cost expenditure for EE investment identification and subsequent project commissioning.

1.4 PROJECT DESCRIPTION

The project will be implemented as part of the larger SME EE program of the BEE. The main components of the project consist of, (a) Technical Assistance (TA) and Capacity Building in MSME clusters, (b) Activities to increase Investment in Energy Efficiency, and (c) Program Knowledge Management.

1.4.1 Component 1: Activities to Build Capacity and Awareness

The TA component would focus on increasing awareness of EE at the cluster and plant level on a large scale through the implementation of outreach efforts,

dissemination of information on successful projects and packaging potential investment proposals in EE for financing by local banks or other sources. Initially, 1000 units will receive support for assessment studies, and 500 of them will be targeted over a period of five years for DPR completion and investment. This cluster sub-component will encompass ongoing EE efforts by BEE in individual clusters. Efforts will also be made to increase the capacity of energy auditors, financial consultants/chartered accountants, vendors and service providers to improve project development capability, service delivery, and to improve the quality and acceptability of initial and investment grade audits and loan applications. This component will also include provision of major support for the existing and new schemes for EE financing by Indian banks.

➲ *Sub-component 1.1: Marketing and Outreach effort to clusters and capacity building at industry associations*

- Industry associations (IAs) of the five selected clusters will receive training that will enable them to carry out outreach activities in their respective clusters. They will also perform the necessary M&E on the project activities in their clusters. In this way, industry associations will be able to provide additional valuable services to their members and to contribute to the sustainability and replicability of the project.
- The project will also support industry association capacity building in the 25 additional clusters included in the BEE SME effort tailored to maximize effectiveness of the BEE co-financed efforts.
- Every year a national level workshop (five total) will be held to bring together the individual cluster IAs to share lessons from implementation experience and ideas for further success.
- Marketing and general outreach on EE schemes shall be undertaken to support dissemination of information about the MSME EE schemes and its project development and financing activities in national, regional and industry-specific media.
- A central hotline will be set up to enable MSMEs and other stakeholders to quickly and easily access web-based information about the project, experiences of completed EE projects in MSME cluster units, referral to energy auditors, vendors, and similar information.
- Capacity building programs will also be offered to units on improving their capacity to manage environmental and social issues.

➲ *Sub-component 1.2: TA to energy auditors: training, BEE certification, enlistment*

Energy auditors play a crucial role in the Indian MSME EE effort through their technical support of MSME EE projects. They need training, however, to ensure that the services in project identification and assessment which they provide are of high quality, and meet the requirements of clients and financiers, containing a minimum

level of financial information. As an additional quality improvement, the project will also support their certification within BEE's general energy auditor certification scheme and their enlistment within the project.

➲ *Sub-component 1.3: Specialized support to Financial Intermediaries*

To reach their MSME clients, bank staff in branch offices shall be better informed about EE options and trained in enhanced analysis of presented EE project applications from prepared DPRs. This subcomponent shall support expanding outreach and uptake of existing schemes such as the Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE, see section F. Alternatives) through awareness campaigns among potential users and workshops with relevant stakeholders. Several banks have developed EE financing schemes for SME clients under the 3 Country EE Project, but overall demand for these schemes has been low. To increase the uptake of those schemes among SMEs, activities that would improve uptake of the banks' schemes shall be undertaken. Detailed training support through Indian Bank Training Institutes to increase capacity at local branch offices in identifying and appraising EE projects shall be provided under this component for at least 1000 FI participants, and widespread dissemination of success stories and impacts of EE project implementation on improving asset quality shall be presented. Efforts will be made to formalize the participation of local banks in the project, either through their participation in the direct training programs, stakeholder capacity building efforts via conferences, building internal capacities, or project-executed consultancies supporting banks' own efforts in EE lending. Finally, this subcomponent shall also support pilot green rating system for SMEs through a focused consultancy activity to develop green rating models for different sectors and also to create awareness about green rating amongst SME stakeholders. This activity will support and align with the ongoing green rating initiatives taken by SMERA, SIDBI's associate organization. .

➲ *Sub-component 1.4: Unit-level support to MSMEs in accessing finance*

MSMEs in the selected clusters will receive support in accessing finance for the previously identified and assessed EE investments. For this purpose financial consultants/chartered accountants working with those MSMEs will receive relevant training and a sufficient number of them will be enlisted for use in the project. More detailed knowledge of financial assessment of EE investments and of banks' requirements will provide value added to financial consultants/chartered accountants and further contribute to the sustainability of the project.

➲ *Sub-component 1.5: Vendor outreach, enlistment and support, REEC*

Major manufacturers of EE equipment usually are not considering SMEs as valuable clients and are not in contact with them. The project will carry out an assessment of the relevant EE equipment manufacturers and vendors and will support appropriate

outreach activities. The project will also provide support in attracting vendors of EE equipment to participate actively in program efforts in the clusters. These markets are primarily served by so-called "second-tier" manufacturers due to the smaller aggregate market demand in the clusters for these specific products. It may be possible to attract first-tier manufacturers into subsequent program activities if sufficient tie-in with new demand generation is pursued. The project shall also engage a regional energy efficiency center of excellence for specialized technical capacity building activities for targeted SME clusters in the area of furnace optimization[1].

1.4.2 Component 2: Activities to Increase Investment in Energy Efficiency

The objective of this project is to contribute to the growth of EE investments in the Indian MSME sector that are financed from local commercial financing sources. Experience in many EE financing projects has shown that development of a firm project pipeline is a major challenge. This component will provide support in the development of this pipeline that goes beyond the TA support of Component 1 by decreasing the risks associated with such investments. On the demand side, MSMEs are unable to prepare EE projects but are also reluctant to spend any money on the preparation of a bankable proposal by a third party, particularly if this is an unfamiliar activity in the industry. Similarly fraught with risks and uncertainties is the initial use of unfamiliar technologies. This component will therefore cover the costs of developing an initial pipeline of about 500 projects and, if required, of performance-linked grants for the first demonstrations of EE technologies in each cluster.

➲ *Sub-component 2.1: Energy efficiency project development support*

This component will provide grant support to cover the 'soft costs' of an initial pipeline of 500 projects total from the five selected clusters for project development and final handholding support. Those costs will include:

- Conducting pre-assessment studies in 1000-1500 units to assess the possibility of cost effective low/medium investment oriented projects
- Preparation of at least 500 investment grade detailed project reports (DPR)
- Facilitation with local banks for arranging the loans, if so required and desired by the units
- Developing a vendor identification document to assist in procurement of identified measures based upon initial examination and implementation experience from provision of advisory services
- Advisory services to units throughout the implementation of the project, including commissioning.

[1] Improving the efficiency of small furnaces has been identified as a cross cutting technology of high potential in most of the target SME clusters. A new Regional Energy Efficiency Center (REEC) is being established at Nagpur with USAID support devoted to increasing awareness on options to improve efficiency in furnaces and increasing penetration rates of efficient alternatives.

➲ *Sub-component 2.2: Performance linked grants for demonstration of efficient technologies*

MSMEs are very reluctant to employ technologies they are unfamiliar with and that they consider potentially disruptive. However, it has been shown that MSMEs are willing to adopt those technologies once they have been demonstrated to work and to be advantageous in similar circumstances. This component shall provide a performance linked grant to be disbursed through a conditional cash transfer mechanism as an additional financial incentive for actual achievement of energy savings from implemented EE measures to encourage the demonstration effect from an estimated 25 early adopters. It includes the cost of third party verification. Conditions for performance-linked grant payment include:

- The Sub-Grant shall be obtained through application to SIDBI;
- The Sub-Grant shall be available to Beneficiaries participating in the Project, and receiving energy technical audit and follow up support by the consultants appointed under the Project; and
- The Sub-Grant shall be a one-time cash payment of up to 900,000 Indian Rupees, at 75% of capital expenditure upon demonstration of achievement of actual energy savings as defined in the SIDBI Operations Manual.

The procedures for implementation of performance linked grants are further elaborated in the SIDBI Project Operations Manual, and include the requirement of third party verification of achieved energy savings.

➲ *Sub-component 2.3: Private Sector Financing mobilized by MSME units*

This figure includes the expected final investment in energy efficiency goods and services ultimately made by the participating MSME units in the five target clusters resulting from project related activities. As previously noted, MSMEs shall be free to mobilize financing for identified investments from a variety of sources, including their own equity, additional loan from their existing bank, new term loan from another bank, the line of credit extended by the IBRD to SIDBI for the SME Financing and Development project, or other sources.

1.4.3 Component 3: Program Knowledge Management and Sharing

This component consists of a broad Programmatic EE Knowledge Management effort, which includes monitoring and evaluation, collection of best practice examples, dissemination, and policy development functions with the goal of ensuring effective implementation and replication of not just this individual project, but of BEE's entire EE effort implemented with GEF support. The knowledge management element will provide key cross-cutting inputs to help better inform GoI policy making and implementation of the entire GEF programmatic effort on improving EE in India.

1.5 PROJECT IMPLEMENTATION AGREEMENT

The GEF implementation agency for the project is World Bank. The project will be jointly executed by Bureau of energy Efficiency (BEE) and Small Industries Development Bank of India (SIDBI).

BEE will retain overall implementation responsibility for the project, and will directly implement activities which support its mandate. These would include project oversight, reporting and evaluation, implementation of certain national level outreach and capacity building activities, and cross cutting knowledge management activities. BEE will maintain implementation responsibility for certain targeted capacity building efforts, such as programs designed to improve technical capacity of energy auditors, etc, and disbursement of grant support to Industry Associations for monitoring, verification and widespread dissemination of success stories.

SIDBI shall assume implementation responsibility for the following key project components:

➲ *Mobilization activities in WB-nominated clusters for Demand Generation*

This will include procurement and supervision of:

- Consultancy services for outreach and education of EE technologies and existing GOI schemes and incentives
- Consultancy services for energy audits and DPRs
- Support to empanelled Industry Associations for providing outreach services to MSME units, arranging seminars, facilitation meetings with local banks etc,
- Consultancy services for transactional support in obtaining finance
- Outreach to vendors to address potential supply chain issues

➲ *Capacity Building Support to participating financial institutions*

This will include supervision responsibility of the following activities:

- Consultancy services for design and implementation of learning programs on Energy Efficiency lending for Bank officers through Bank training institutes.
- Targeted Marketing and awareness building at lead banks in identified clusters (WB-nominated and the 25 BEE clusters) on existing schemes, EE program, and availability of risk mitigation options such as the SIDBI-implemented Credit Guarantee Trust program.
- Consultancy services for tailored assistance to participating banks on their existing schemes-if requested.

CHAPTER 2

kolhapur Foundry Cluster : An Overview

2.1 INTRODUCTION

Kolhapur is a medium sized town in the state of Maharashtra, located at a distance of approximately 400 km from the state capital Mumbai. The town, since long, is deemed to have great importance from an industrial perspective. Kolhapur is a big energy intensive industrial town comprising of a number of iron / steel Foundry units. The cluster comprises of more than 250 Foundry units which convert iron/steel scrap, pig iron into high end utility castings.

The foundries in Kolhapur cluster are one of the prominent ones in India and cater to the market for high end castings in the automotive and electrical machinery sectors. The major components being produced in the cluster include automotive components, flywheels, motor and pump casings etc. The location of the Kolhapur foundry cluster is shown in following Figure 2.1.

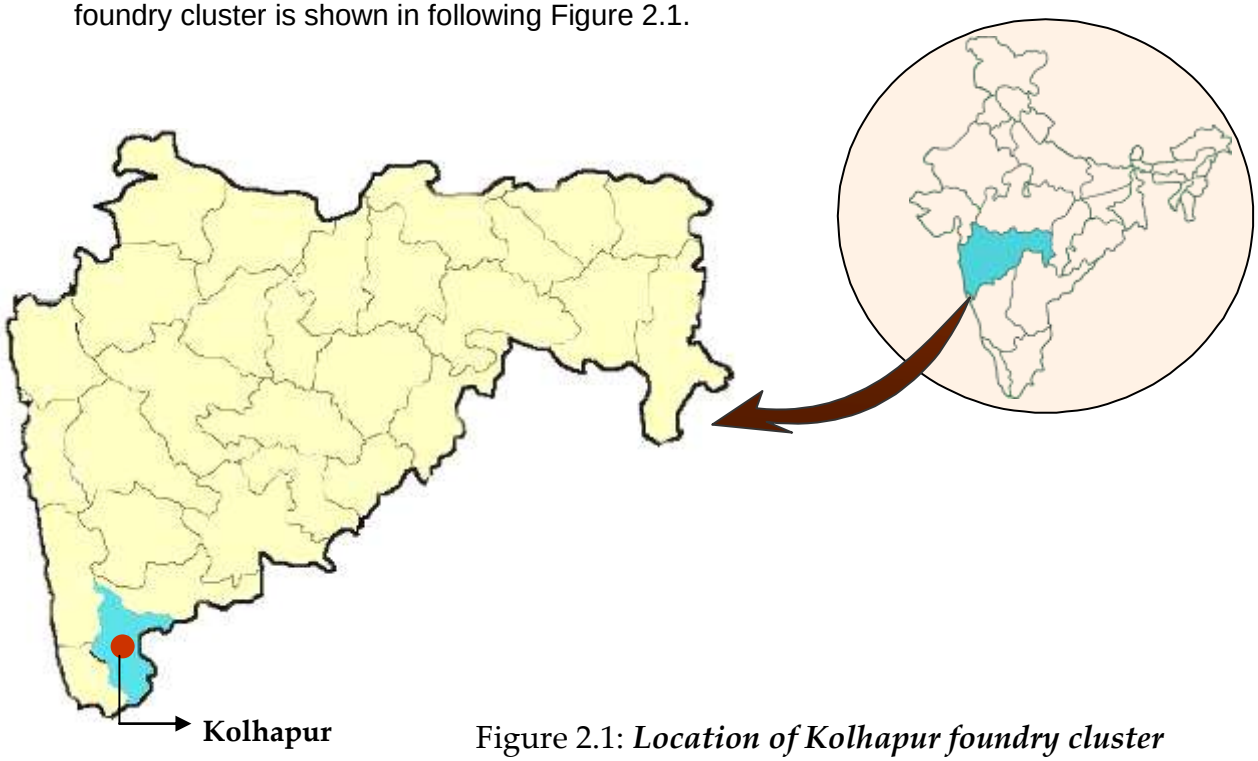


Figure 2.1: *Location of Kolhapur foundry cluster*

The foundry industry in Kolhapur is concentrated in several industrial pockets in proximity of Kolhapur city. The main industrial pockets in and around Kolhapur with significant number of foundry units are:

- Shiroli
- Udyamnagar
- Gokul Shirgaon
- Kagal

The foundry units in Kolhapur foundry cluster have organized themselves into several industrial associations. These associations serve as a platform for discussions on common issues as well as new research. The important foundry associations in the cluster along with coordinates of the contact person are provided in Table 2.1 below.

Table 2.1: *Details of foundry associations in Kolhapur*

Name of the Association	Office Address and contact details	Coordinating Person and Contact No.
Kolhapur Engineering Association	Karajgar Road, Shivaji Udyamnagar Kolhapur - 416012	Sh Shrikant D Dudhane, Director, +91 98220 56246
Institute of Indian Foundrymen, Kolhapur Chapter	Kolhapur Udyam Co-operative Society, New Complex, R.S. No.-857, Building "A", Y.P. Powar Nagar, Kolhapur - 416008	Sh Raju Somani, Vice Chairman, +91 99229 96040
Shiroli Manufacturers' Association, Kolhapur	P-12, MIDC, Shiroli, Kolhapur – 416112	Sh D D Patil, Vice Chairman, +91 93711 02574
Gokul Shirgaon Manufacturers' Association, Kolhapur	P-35,MIDC, Gokul Shirgaon Industrial Area, Kolhapur - 416234	Sh R P Patil, Chairman, +91 98220 44716
Manufacturers' Association of Kagal - Hatkanangale	A – 84, Five Star MIDC, Kagal Hatkanangale, Kolhapur - 416216	Sh Ashok Dudhane, President, +91 98225 99188

2.2 PRODUCTION PROCESS

The raw material for any typical foundry unit consists of different compositions of the following:

- Pig Iron
- Cast Iron (CI) scrap
- Mild Steel (MS) scrap
- Foundry returns
- Alloying elements – Silicon, Manganese etc

The composition of each of the above mentioned constituents of raw materials is varied to achieve the desired properties of the final product. Besides these constituents, other process additives/fluxes are also used, for example, limestone is an important constituent in the cupola based foundry process.

The foundry process consists of several principal operations, namely, sand preparation, mould preparation, charge preparation, melting and pouring. A schematic of the typical production process employed at foundry units is shown in Figure 2.2 below.

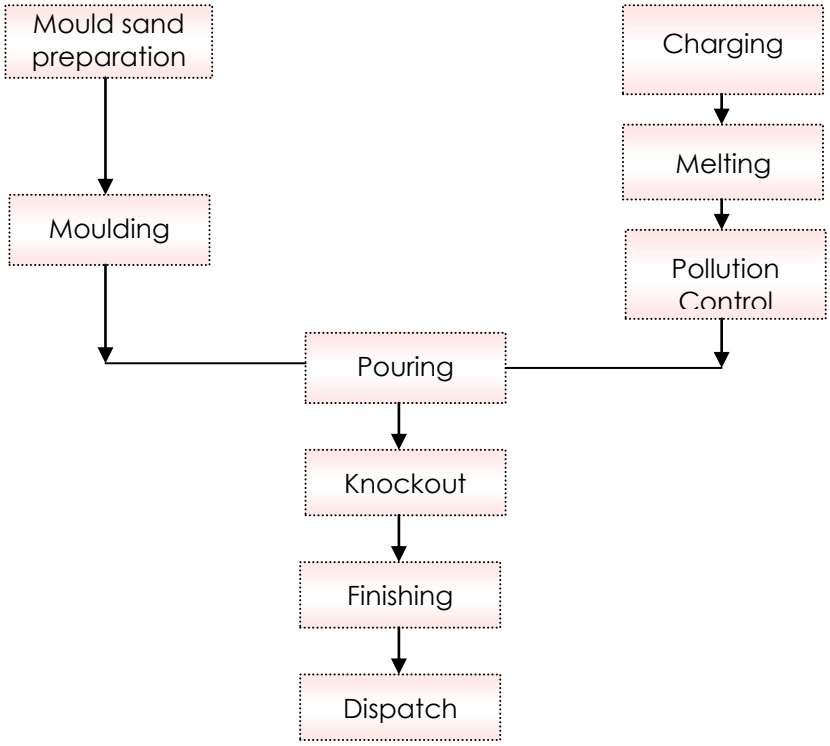


Figure 2.2: ***Typical operations in a foundry***

The above figure shows that the sand and mould preparation steps are carried out in parallel to the charge preparation and melting activities before finally the hot metal is poured into the moulds.

Of all the production steps mentioned above, melting consumes the major share of total energy consumption in a foundry unit. in Kolhapur foundry cluster, melting process is carried out by either of following two methods:

- Cupola melting
- Induction furnace melting

Relevant features of both these methods are discussed in further sections.

2.3 POPULAR TECHNOLOGIES

2.3.1 Cupola furnace melting

Cupola has been the most conventional method for production of iron castings. In Kolhapur foundry cluster too, almost half of the total operational foundry units are based on cupola operation. The construction of a conventional cupola consists of a vertical steel shell which is lined with a refractory brick. The charge is introduced into the furnace body by means of an opening approximately half way up the vertical shaft. The charge consists of alternate layers of the metal to be melted, coke fuel and limestone flux. The fuel is burnt in air which is introduced through tuyeres positioned above the hearth. The hot gases generated in the lower part of the shaft ascend and

preheat the descending charge. The cupolas installed are either the conventional single blast type or the more recent and more energy efficient divided blast type. However, it is important to note that in case of Divided Blast Cupola (DBCs) a well calculated design based system is far more efficient than a sub-optimal design based system.

The cupolas installed in majority of the foundries of Kolhapur cluster are either of 21", 24", 27", 30", 36" or 42 inch internal diameter. The hourly melt rate of these cupolas ranges from 1.6 to 6.0 tonnes per hour (TPH).

The energy efficiency parameter for cupola operation is measurement of coke to metal ratio. Usually, the coke to metal ratio varies from a relatively poor ratio of 8 (in case of single blast cupola or sub optimal DBC) to a relatively good ratio of 10 and more (in case of well-designed DBC). The following Figure 2.3 shows cupola operation in a foundry with details of divided blast mechanism.

Figure 2.3(a): ***Cupola operation in a foundry***

Figure 2.3(b): ***Divided blast mechanism in a cupola***

2.3.2 Induction furnace melting

The method of induction furnace melting is increasingly becoming popular owing to superior energy efficiency, control, and high productive characteristics of induction melting. The principle of induction melting is that a high voltage electrical source from a primary coil induces a low voltage, high current in the secondary coil, or metal placed in secondary coil. Induction furnaces are ideal for melting and alloying a wide variety of metals with minimum melt losses. The heart of the induction furnace is the coil, which consists of a hollow section of heavy duty, high conductivity copper tubing which is wound into a helical coil. Coil shape is contained within a steel shell and magnetic shielding is used to prevent heating of the supporting shell. To protect it

from overheating, the coil is water-cooled, the water being re-circulated and cooled in a cooling tower.

In induction heating method, the furnace volume is poured empty after every melt has reached the proper temperature and successive melts are started using unheated or preheated solid charge material. The biggest advantage on the side of induction furnaces is the high degree of control and range of available furnace capacities (from a few kgs to several tonnes of hot metal holding capacity). The following Figure 2.4 shows an induction furnace installed in a foundry unit.

Figure 2.4: *Induction furnace – melting and pouring operation*

2.4 ENERGY CONSUMPTION PATTERN

2.4.1 Energy consumption pattern in a Divided Blast Cupola

As stated earlier, the principal parameter to study the energy efficiency characteristic of a cupola furnace is the measurement of metal to coke ratio. The operation of a DBC was studied in order to find out the operating parameters and specific fuel consumption pattern of the cupola furnace. The important observations and measurements are provided in Tables 2.2 – 2.3 below.

Table 2.2: *Operating parameters of a typical cupola*

Cupola internal diameter (after refractory lining)	24”
Melting rate	2.5 tonnes/hr
Frequency of operation	Alternate days
Tapping	Continuous
Blast	Divided, Cold
Number of tuyers	4 Nos. in each row (2 rows)
Bed coke	300 kg
Metal tapping temperature	1460 ^{0}C
Bulk density of coke	561 kg/m^{3}

Table 2.3: *Cupola charging and coke consumption parameters*

Split Charge mix and charging sequence	
Metallics	200 kg
Alloying constituents	1.2 kg
Coke	13 kg
Limestone	15 kg
Booster Charge (every 6th charge)	30 kg
Bed Coke	300 kg
Cupola operation	10 Hrs
Molten metal yield as % of metallic	90%
Equivalent coke consumption per split charge (excluding bed coke)	18 kg
Total coke consumption per split charge (including bed coke, approx.)	20.4
Molten metal to coke ratio per split charge	8.8

Thus, it can be seen from above tables that the molten metal to coke ratio for the studied cupola is 8.8 which is relatively low. The resultant low metal to coke ratio of the cupola is attributable to two main reasons:

- Optimum energy efficient design of the divided blast cupola
- Adoption of best operating practices

Both the above mentioned factors can be overcome in an economically feasible manner in any foundry. The same has been discussed in later chapters of this report.

2.4.2 Energy consumption pattern in an Induction melting furnace

Electricity is the single energy source for melting of iron in an induction furnace. The furnace coil draws power from induction power supply unit supplied and installed with each furnace. The control panel for the induction furnace power supply unit is fitted with display panels for consumption of kWh, power drawn kW, frequency supplied Hz, etc.

The principal parameter for measurement of energy efficiency characteristic of an induction furnace is kWh consumption per unit melting and holding of metal. As holding time of molten metal is also included in the deriving the specific energy consumption of an induction furnace, unlike cupola, the specific energy consumption of induction furnace depends largely on operating practices. However, the effect of correct furnace capacity, coil losses etc, is also not negligible. The following Tables 2.4 – 2.5 present the operational parameters and specific electricity consumption details of a typical induction melting furnace.

Table 2.4: ***Operating parameters of a typical induction melting furnace***

Furnace capacity	300 kg
Rated power	175 kW
Rated Voltage	440 V
Frequency	1000 Hz
Make	Inductotherm India
Model	Power Trak/ 175 – 10R
No. of crucibles	1 No.
Refractory lining	Acid lined
Number of heats/day	
Maximum	18-19
Average	12-13
Contract Demand	275 kVA
Maximum Demand	265 kVA

Table 2.5: ***Specific electricity consumption in the induction melting furnace***

Charging Mix	
Metallics	325 kg
Ferro alloys	8.8 kg
Furnace heating load power	175 kW
Furnace holding load power	50 kW
Total heating time	67+14 = 81 min
Total holding time	11 min
Total tapping time	20 min
Total electricity consumption	245.4 kWh
Specific electricity consumption	735.2 kWh/tonne

The relatively high specific energy consumption is mainly due to the long cycle time of the melting and holding. However, for several product segments, a higher holding time is inevitable. Though efforts should be made in form of adoption of best operating practices and installation of energy saving equipment to reduce the cycle time and improve the specific electricity consumption of the induction melting furnace.

CHAPTER 3

Energy Conservation for Kolhapur Foundry Cluster: Measures & Technologies

3.1 ENERGY CONSERVATION BY ADOPTION OF BEST OPERATING PRACTICES IN FOUNDRIES

The operating practices of both the cupola and induction melting furnace units discussed in previous chapter were noted and compared with the standard operating practices for achieving maximum energy efficiency and least specific energy consumption. The same have been outlined below for each of cupola and induction melting furnace unit described previously, but also hold good for any foundry unit as well.

3.1.1 Energy conservation measures for cupola

The following observations were noted for operation of cupola furnace in the unit.

- The stack height of the cupola is not adequate. This refers to the height from upper tuyer to charging door
- No lime stone was being added to bed coke
- Cupola cycle timings are not recorded orderly
- Limestone size as big as 7 – 8 inches

To achieve best efficiency point in the existing cupola, following measures are suggested by the expert:

- The stack height of the cupola must be large enough to hold 2.5 tonnes of metallic charge (equal to hourly melting rate). This would ensure better preheating of charge.
- Cupola lit-on, lit-off, other timings must be necessarily noted.
- Size of lime stone should lie between 0.75 – 1.5 inches.

- Limestone should be added to bed coke @ 15% of the bed coke weight.
- Each split charge must contain limestone @ 1/3rd of the split charge coke weight.
- Dimension of single piece of metal should not be greater than 1/3 the hearth diameter.
- Weight of single piece of metal should be limited to 1% of the hourly melting rate.

3.1.2 Energy conservation measures for induction melting furnace

The following observations were noted for operation of induction melting furnace in the unit.

- The furnace tapping time is as high as 20 mins.
- The refractory ladle is preheated with the molten metal from the furnace.
- The size of mould bank is inadequate, leading to high tapping time.

To achieve best efficiency point in the existing induction melting furnace, following measures are suggested by the expert:

Reduce the cycle time by adopting the following:

- Plan the charge mix and material before hand.
- Keep the charge ready (after weighing) before charging along with alloying elements.
- The size of the charge materials should be preferably 1/3 rd the size of the crucible diameter.
- Steel and carburizers should be charged first in sequence.
- Keep the crucible full of charge always and keep poking to achieve maximum compaction.
- The furnace should be operated at full power always.
- Once the charge is complete cover the crucible with asbestos blanket.
- Standardize the time and temperature relationship so that frequent inspection is not required.
- Do not superheat the metal beyond the required temperature.
- Avoid holding.
- De-slagging operation should be done at least possible time.

3.2 REPLACEMENT OF EXISTING CUPOLA WITH WELL DESIGNED DBC

The proposed move is the most elementary energy conservation option. There are several critical design parameters which govern the efficiency of a divided blast cupola furnace. The specifications of the DBC such as dimensions of tuyers, spacing between rows, extent of turbulence in tuyeres, etc are very critical and need to be designed as per the specifications of the cupola furnace. An ill designed DBC can be even worse than a conventional single blast cupola in terms of energy efficiency.

A DBC reduces CO formation by introducing a secondary air blast at the level of the reduction zone. Thus, a DBC has two rows of tuyeres, with the upper row located about 1 m above the lower row. This 'divided blast' system gives a DBC the following advantages over the conventional cupola.

- It reduces coke consumption by upto 25%
- It increases tapping temperature by about 500C
- It increases the melting rate.

A schematic of a divided blast cupola is given in Figure 3.1 below.

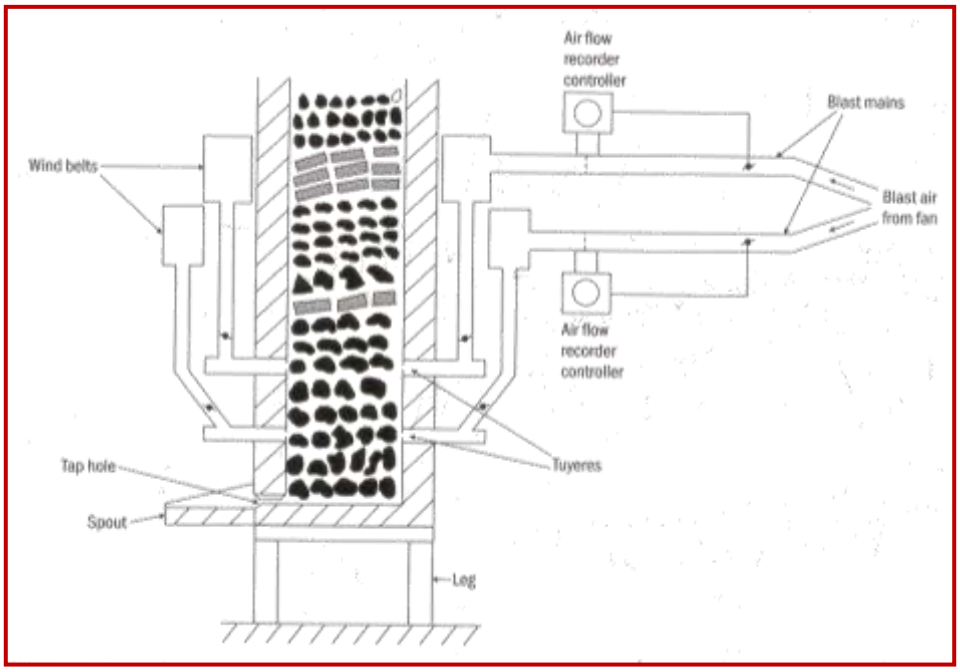


Figure 3.1: ***Sketch of DBC, showing two rows of tuyeres***

It has been time proven that if a single blast or sub-optimal divided blast cupola furnace is replaced with a well designed divided blast cupola furnace, it would lead to substantial improvement in metal to coke ratio and hence good energy and monetary savings. The cost benefit analysis for conversion of the audited cupola to a scientifically designed divided blast cupola is shown below in Table 3.1

Table 3.1: ***Cost benefit analysis for replacement of existing cupola by well-designed DBC***

Melting rate (Tonnes/hr)	2.5
Metal to coke ratio in existing cupola	8.8
Metal to coke ratio for well designed DBC	10
Coke savings (kg/hr)	34
Coke savings per run (kg) [2]	340
Runs in an year (Alternate day)	183
Yearly coke savings (Tonnes)	62.2
Monetary Savings (Million Rs. / yr)	1.5
Investment required for new DBC (Million Rs.)	3.0
Payback period (years)	2

.

3.3 GAS FIRED COKELESS CUPOLA

The discussion presented in this section has been made available by Dr B K Basak, Executive Director, Wesman Engineering Co. Pvt. Ltd., Kolkata.

[2] (Assuming 10 hrs average run)

3.3.1 Introduction

Today the Indian Iron Foundries mostly use Coke Fired Cupola for obtaining the necessary molten metal. From environmental, pollution and energy efficiency point of view, it is not at all a desirable situation for various reasons as mentioned below.

- Desired SPM level of 150 Mg / NM^3 is difficult to achieve with conventional cupola. The flue coming out of the cupola need filtration / treatment before releasing to the atmosphere. The wet process used for this purpose would further necessitate treatment of water used in the process.
- For 1 MT of Molten Iron, 374.4 Kg of CO_2 is generated which is very much detrimental from environmental point of view as it adds to the Green House effect.
- Besides above, the coke based cupola also emits CO, SO_2, and NO_X, which have adverse effect on the environment.
- Because incomplete combustion of coke and large quantity of excess air, thermal efficiency of Coke Cupola is very low. Also sensible heat carried away by large amount of hot slag, contributed by high ash content, adds to the thermal inefficiency.

For the detrimental emissions from various polluting activities in the nearby regions, including high coal/coke usage, the Taj Mahal at Agra was getting deteriorated. The Honorable Supreme Court of India passed on a judgment and thereby prohibited the use of coal/coke in the Taj Trapezium Zone.

3.3.2 Cokeless cupola furnace: A better alternative

The cokeless furnace - EcoMelt, as the name suggest, does not use coke as fuel. Instead it uses gaseous fuels. Since piped Natural Gas is becoming available at various locations throughout the country from indigenous sources, cokeless furnace should be used extensively. This will reduce the melting cost substantially. Where Natural gas is not available, other gaseous fuels like LPG, Propane or Coal bed methane may be used. Even sulphur free light oil may be used as a fuel. When the cokeless furnace was invented in UK, the availability of coke, quality of coke and the environment issues were not so much of problems in those days. But today, all these issues are very important and in that context, it is quite evident that for our country, the cokeless furnace is the right product at the right time. As the name suggests, EcoMelt is both eco-friendly and economic in operation.

3.3.3 EcoMelt: Important features

In a conventional coke fired cupola the coke has three functions. It acts as a source of heat, superheats the iron as it trickles over the coke and acts as a source of carbon. All these functions are mutually dependent and, therefore, difficult to control. In the cokeless EcoMelt furnace these functions are provided by three different means, which are explained with respect to the cross-sectional schematic of the furnace as shown in Figure 3.2 below.

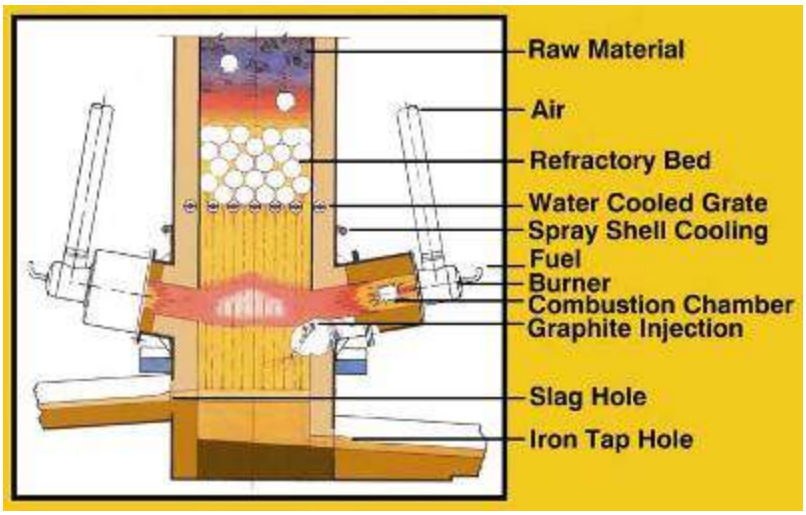


Figure 3.2: *Schematic representation of EcoMelt*

➲ Heating

Heat is provided by the burners, which can be fired with a variety of fuels such as natural gas, diesel oil, propane or other suitable fuels. Burners must of short flame design. Special Burners as shown in Figure 3.3 below have been developed for this purpose.

Figure 3.3: *High velocity short flameburner for EcoMelt*

➲ Super Heating

Superheating is done by the specially developed refractory spheres (as shown in Figure 3.4) that form the refractory bed. The refractory spheres are only heat transfer medium and not fuel. Water-cooled grate bars consisting of specially designed steel tubes, which may be coated with refractory, supports the spheres. The metal is superheated as it trickles over the red-hot spheres.

Figure 3.4: *Refractory spheres for super heating*

➲ Carbon pickup

As there is no carbon pickup in the EcoMelt, this is achieved by injection of graphite granule into the well of the EcoMelt by means of an injector. The rate of injection can be controlled. In case of duplexing, carbon may better be added in an electric furnace.

3.3.4 Advantages of EcoMelt

➲ Coke not required

India does not have reserve of good quality coking coal. We have to import coke from other countries. Use of cokeless EcoMelt furnace would eliminate the use of coke and, hence, would eliminate the associated environmental and commercial disadvantages. Though gas is becoming available at various locations in the country yet the same has not reached many of the areas where Foundries are located. In those areas the EcoMelt can be fired with LPG, or sulphur free light oil.

➲ No / Low Pollution

The gas fired EcoMelt for iron melting was developed over 30 years ago and a comment passed about its performance in the early days is still very appropriate and probably more relevant, particularly in view of today's stringent pollution norms. The comment was "What does not come out of the top is more important than the metal from the bottom".

Figure 3.5: *No emissions during melting in EcoMelt*

There is an increasing worldwide awareness of the impact that many processes can have on the environment. This is certainly true for foundries in India where the cost of meeting new regulations is significant.

Undoubtedly, a conventional / divided blast coke cupola does cause a lot of pollution as mentioned earlier. If the Coke cupola was converted to Gas fired EcoMelt there would be no visible emission (Figure 3.5), there would be no sulphur emissions and the amount of carbon emissions are approximately 1/6 that of coke operation. There is less than 1 % carbon monoxide in the waste gas. There will still be some dust emissions contained in the

charge but these can be readily removed if required. Depending on the regulations, there can be a considerable saving in capital cost as well as savings in running cost. In short there is a dramatic reduction in pollution level with the SPM level being much below the Indian pollution limit of 150mg/CuM.

Actual installation in India has been monitored for the emission level. The results are shown under "Emission level" at the end of the section.

➲ Higher Energy Efficiency – Energy savings and Cost Benefit Analysis

The following Table 3.2 gives the comparative cost of melting in terms of consumption of fuel (and heat transfer media in case of cokeless gas melting furnace) of different types of Melting furnaces. Price of both Gas and Coke vary at different locations. An average price has been considered in the following table.

Table 3.2: ***Cost benefit analysis and thermal efficiency comparison of EcoMelt with other technologies***

Technology/ Furnace	Specific Fuel/ Electricity Consumption	Unit Cost of Fuel (Rs)	Total Cost	Thermal Efficiency (%)
Induction Melting	600 kWh/ tonne	5.0	3,000	42**
Rotary	160 Lt FO /tonne	25.0	4,000	13.42
Cupola 1	150 kg coke/tonne	30.0	4,500	20.49
Cupola 2	120 kg coke/tonne	30.0	3600	25.61
Ecomelt - Small	65 SM^3 NG/tonne	20.0	1300 + 522* = 1822	39.25
Ecomelt – Large	60 SM^3 NG/tonne	20.0	1200 + 435* = 1635	42.50

* → Cost of refractory sphere

** → This is without considering the efficiency of conversion in a power plant using coal. Efficiency of a power plant varies from 30 to 70% depending on the design and other parameters. Considered the average to be 50%, the Efficiency of Induction Furnace would be reduced to 21% (without taking the transmission losses into consideration).

Thus, it can be seen from above table that cokeless Ecomelt cupola has high potential for energy saving and cost savings as compared to other prevalent technologies. Cokeless EcoMelt cupola generates as high as Rs 1965 per tonne of monetary savings as compared to an efficient running cupola.

➲ Other Advantages of EcoMelt

Once a cupola has been converted to EcoMelt, the foundry would be in a position to produce ductile iron and some graded iron without the need for an electric furnace. As this is a considerable growth area in India, it would offer the foundry an additional advantage over its competitors who were still using a conventional coke cupola.

The foundry industry in India is rapidly expanding and many foundries have adopted electric melting, particularly for the production of ductile iron. For these foundries where expansion is being considered, the capital investment of installing an EcoMelt could well be considerably less than additional electric furnaces. Liquid metal could be transferred from the EcoMelt to the existing electric furnaces where they would be used for superheating and recarburising the metal instead of purely melting. The existing electric capacity would increase as time for super-heating is much less than that of Melting and would be, in many cases, sufficient for any expansion. Less than 100 kW hrs per tonne are required for superheating and recarburising whereas generally more than 650 kW hrs per tonne are required for electric melting. Melting at low temperature in a cupola consumes comparatively less power. On the other hand superheating the molten metal in induction furnace consumes much less power. Therefore duplexing – melting at low temperature in Cupola / EcoMelt and super heating in electric furnace, would consume much less combined power compared to that while melting at high temperature in Cupola or in Induction furnace alone.

3.3.5 EcoMelt – Emission levels

To ascertain the level of various emissions a study of emission level was made by CTI, USA who gave financial aid to a Foundry at Agra where the first EcoMelt furnace was installed. Environment management group of National Productivity Council (NPC), an independent National body, New Delhi was engaged for air pollution parameters monitoring. The monitoring was done as per procedure prescribed by CPCB and US PBA (fig 5). The average of the observed figures is provided in Table 3.3 below.

Table 3.3: *Emission generation by EcoMelt*

	Without Wet cap	With Wet cap
Visible Emission	None	None
Particulate Matter	42 mg/NM^3	29 mg/NM^3
Other observations:		
CO	< 1%	
SO_x	NA	59

As may be seen from the observations made by the NPC team, the level of particulate emission of 42 and 29 mg / NM3 with out and with the wet cap respectively are quite low compared to the allowable norm of 150 mg / NM3 as per Central (as well as West Bengal) Pollution Control Board of India (CPCB). At present there is no regulation regarding the other emissions in our country. However as per US PBA, SO2 level has to be within 300 mg / NM3. The observed figure of 59 mg / NM3 (with wet cap on) is much below the norm. For Carbon Monoxide also there is no norm as per CPCB. The observed level of 1% CO is many times lower than what is generally observed in a Coke Cupola.

3.3.6 Conclusion

From the above discussions it is clear that the Cokeless Cupola is a better option as a melting device compared to the widely used coke fired Cupola for melting Cast Iron as:

- It has much better Energy Efficiency.
- Its Emission level is much less.
- Melting cost is comparatively less.

3.4 IGBT INDUCTION POWER SUPPLY SYSTEM

3.4.1 Introduction

The IGBT based Induction power supply system are the latest addition in the series of innovations in the induction melting sector. Induction melting systems have shown continuous upwards trends with improvement of energy efficiency along with every new technology addition. This can be understood from the comparison presented in Figure 3.6 below.

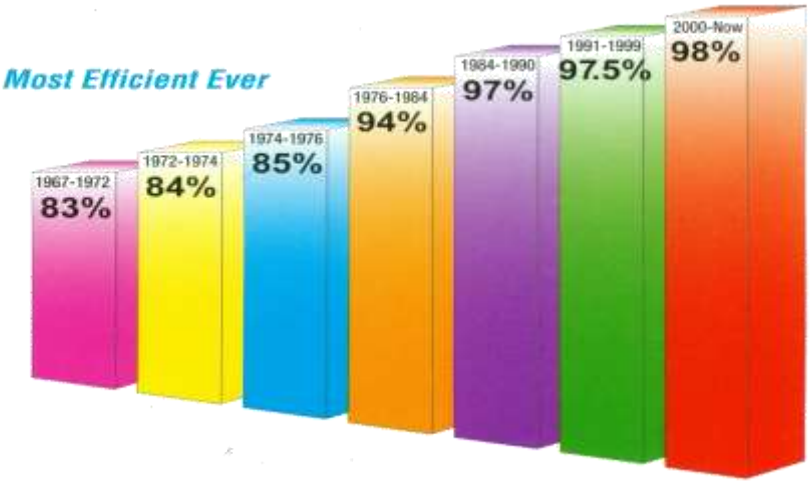


Figure 3.6: *Rising trend in the efficiency of induction melting systems*

3.4.2 Application

The IGBT based induction power supply system are applicable for a wide range of power levels from 5 kW to 500 kW with corresponding furnace sizes ranging from 5 kg to 1000 kg. in its standard configuration, the unit includes a digital control board with fibre-optic connectors for a clearer signal processing. The operational parameters are managed in different modes with facility to view system diagnostic results, kWh reading and alarm history. The following Figure 3.7 illustrates the IGBT Induction power supply system.

Figure 3.7: *IGBT based induction power supply system*

3.4.3 Advantage

The IGBT based induction power supply system result in reduction of electrical power in induction melting furnace and thereby lower the specific electricity consumption per tonne of molten metal output from the furnace. The following case study have been presented herewith to illustrate the energy saving potential of the IGBT based induction power supply system.

3.4.4 Case study 1

The IGBT based induction power supply unit was installed at M/s Krishna Engineering Company, Coimbatore. M/s Krishna Engineering Company is manufacturer of high duty iron, ductile iron, alloy iron and steel castings. The unit had been operating one 1000 kg, 250 kW furnace since 1989. The existing furnace was replaced by IGBT based furnace of same capacity and 350 kW power rating. The following observations as presented in Table 3.4 below were found by the unit after the installation.

Table 3.4: *Case study – IGBT based induction power supply unit*

Description	Old Furnace	New Furmace
Make	Inductotherm	Inductotherm
Model	VIP Power Trak 250 kW	VIP IGBT 350 kW
Rated furnace power	250 kW	250 kW
Furnace capacity	1000 kg	1000 kg
Unit's target specific electricity consumption	750 kWh/ tonne	750 kWh/tonne
Actual specific power consumption	770 kWh/tonne	620 kWh/tonne
Reduction in specific electricity consumption	-	150 kWh/tonne
Average production output	-	100 tonnes/month
Annual electricity savings	-	1.8 lakh kWh/year
Annual monetary savings	-	Rs 9 Lakhs/year

Thus, it can be seen that installation of new IGBT power supply panel at the induction melting furnace can result in great energy and monetary savings.

3.5 THERMAL SAND RECLAMATION SYSTEM

3.5.1 Introduction

In green sand, clay bonded, process the sand is used oven and over again after some treatment of the used (Return) sand. The treatment includes Sieving, Removal of Iron particles, Cooling, Water and binder addition etc.

But in case of chemically bonded sand system the mould / core strength is developed by chemical or thermal process. Contrary to the green sand system, binder once set by irreversible process and does not remain 'active' anymore and cannot take part in the

bonding of sand in the next cycle. After the mould / core are set and casting is done the binder present in the system is totally dead and fresh binder must be added before the sand can be used in the next cycle. Reuse of sand this way, will result in accumulation of 'dead' binder in the system making the sand totally unusable.

The other option is to discard and dispose the sand altogether after every use and start with new sand in every cycle. This is not a feasible proposition on economic and environmental consideration. The availability of dumping ground for used sand is becoming difficult day by day. Also Cost of dumping is going high and high. In addition to non availability of dumping ground and high dumping cost, the environmental problem is of critical concern. The dumped sand is likely to pollute air as well as the ground water. The government authority is becoming stricter these days.

Both the reuse and dumping options not being feasible and acceptable, the chemically bonded sand must be reclaimed to make it suitable for re-use in a no-bake sand foundry. In addition there are other good reasons for reclamation of chemically bonded sand.

3.5.2 Why Reclamation?

The dead binder present in the used sand increases the 'fines' in the system sand. The fines having more surfaces to volume ratio require more resin / chemical to achieve desired bond. The increase of fines in the system sand contributes to deterioration of sand property like permeability. These fines therefore are to be removed from the system.

Majority of the 'dead' binder, however, are present in the form of layers adhering to the surface of the sand grains. If these layers are not removed, the sand grain will be coated with multiple layers of such 'dead' chemicals in subsequent cycles. This deposit, being brittle, changes the sand property and makes the sand totally unsuitable for moulding as proper strength cannot be achieved even with higher percentage of chemical.

The presence of residual 'dead' binder in the system is a determining factor in arriving at the required chemical percentage in the next cycle. The amount of this 'dead' organic binder, usually determined by "Loss On Ignition" (LOI), is very important in chemically bonded sand system. If the LOI changes in every cycle then percentage of chemicals to be added will also change in every cycle. This situation cannot be accepted as a good operating practice. In practical situation it is not possible to determine the required chemical percentage and add the same accordingly in every cycle. Therefore every attempt is to be made to keep the LOI figure more or less constant making the system 'stable'. 'Stability' means to attain the LOI figure of the reclaimed sand at the end of the cycle equal to the LOI figure of the sand before addition of binder in the beginning of the cycle. This will ensure the same quality of sand (having the same LOI) in the beginning of every cycle. To attain this condition certain amount of NEW sand is added in the system.

Sand grain modification is another important aspect in considering reclamation. During reclamation, due to Grain-against-grain rubbing/abrading as well as grain rubbing against rubbing surfaces of various reclamation equipment at various stages of reclamation the sand grains get altered. The sharp corners get rounded, converting the sand grains from

angular to sub-angular to rounded. This improves the desirable property to a great extent. The surface to volume ratio gets reduced resulting in reduced binder demand. Due to this positive effect of reclamation the new sand, instead of adding to the system directly, is added in to the lump breaking stage of the reclamation unit so that grains are, to some extent, get modified before mixing and moulding.

3.5.3 Reclamation Process

Sand Reclamation can be termed as the process of reconditioning of used sand in a foundry without lowering its original properties, which are particularly required for foundry application.

Reclamation may be done by various methods- namely:

- Attrition (Mechanical) Reclamation
- Thermal Reclamation
- Combination of the above
- Wet Reclamation

Attrition reclamation process is capable of producing, at economic rate, sand with low binder content, without foreign material, at low temperature and with even grain size distribution - all that are required for producing good quality mould/ core. Attrition reclamation is done by wearing binders from the sand grain through a series of mechanical processes. Most of the cases about 10 to 20 % new sand is added to keep the LOI within limit. However it is clear that all the binder is NOT removed by this process.

In many case it is important that sand does not have any coating what so ever. In such cases Thermal Reclamation process is the answer for most of the binders.

Thermal Reclamation is the process in which the sand is heated to a temperature of about 800 deg. C, in a specially designed fluidized bed Combustor which is the main equipment of the thermal reclamation system.

In the Wesman Thermal Reclaimer, the sand grains obtained after breaking the lumps are pre-heated in a heat exchanger and fed into the Combustor at a pre-determined rate. Here it is fluidized by precisely controlled air. The fluidized bed of sand receives controlled stream of flame and hot products of combustion from a specially designed LPG / Natural gas combustion system. The binder in the sand is totally burnt and hot reclaimed sand is obtained at the outlet of the Combustor.

The hot sand from the Combustor is transported to a bunker and then made to pass through a Fluidized Bed Cooler having a water cooling system. The cooler is also connected with a dust extraction system for classification of sand. The reclaimed sand, cooled down to usable temperature and classified, is then pneumatically transported to the sand bunker for re-use.

3.5.4 Reclamation Advantages

Thermal reclamation is, in many ways, better than attrition (mechanical) reclamation process for the following reasons:

- New sand has higher thermal expansion. During pouring, the mould expands excessively and causes distortion, instability and dimensional inaccuracy. When sand is heated above 600 Deg. C, the same undergoes phase change which is permanent in nature. This phase-changed sand has lower thermal expansion and, therefore, all the problems mentioned above are less.
- Unlike mechanical reclamation, 100% sand, except those reduced to dust, is reclaimed to better-than-new condition.
- In majority of the cases thermally reclaimed sand, irrespective of the original sand system, can be used in any system of sand – green sand or chemically bonded sand with any chemical binder.

Though it is better to use Natural gas or LPG, Wesman's Thermal Sand Reclaimer can be fired with Light oil where the gaseous fuel is not available. This is a great advantage as most of the locations where Foundries are clustered do not have supply of Piped Natural Gas, CNG or CBM. If they have to use Gaseous fuel, they have to use LPG which comparatively more expensive.

Wesman's Thermal Sand Reclaimer is field tested and has been found to consume only 8 to 10 Kg of LPG per MT of shell sand. In case of OIL firing about 7 to 9 Liters of oil would be consumed for reclamation of 1 MT of sand.

Wesman's Thermal Sand Reclaimer can be used for reclaiming Shell sand, Phenolic 2-part/3-part sand, Furan sand etc. Even Green sand may be reclaimed with additional downstream equipment. Wesman currently manufactures in three standard capacities of 1, 2 and 3 MT/hour. Other sizes may be custom built on request.

3.6 CONCLUSION

The thermal sand reclaimer eliminates air and ground water pollution from discarded sand which are chemically bonded. It also reduces / eliminates requirement of natural resource like new sand which. This would help conservation of natural resources. This is very important especially in view of restrictions imposed by Government for mining sand in some states.

It may be mentioned that just for drying of 1 MT of new sand 8 to 10 Liters of oil is required in well-designed Fluidised bed sand dryer. Ordinary rotary sand dryer consumes at least 10 to 12 Liters of oil for drying 1 MT of new sand. Whereas for reclaiming 1 MT of used sand only 8 to 10 Kg of LPG or 7 to 9 Liters of oil would be required. Therefore one can obtain better than new sand at a cost lower than that of drying alone for the same quantity of sand. This is highly ENERGY EFFICIENT process.

Thermal reclamation should be adopted by the foundry men as it

- Is an economical proposition
- Eliminates cost of dumping of used sand
- Conserves natural resources by eliminating requirement of NEW sand
- Conserves energy spent in drying new sand as drying would not be required
- Conserves energy of transportation and eliminates related pollution
- Conserves natural environment by eliminating dumping of used sand
- Is an energy efficient process

CHAPTER 4

First Technical Workshop in Kolhapur Foundry Cluster under WB – BEE – GEF Program: Financing Energy Efficiency at MSMEs in India

4.1 INTRODUCTION

A Technical Workshop for Kolhapur Foundry Cluster was organized by Winrock International India (WII) on May 13, 2011 at Residency Club, Kolhapur. The workshop was supported by the Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India and conducted as part of the BEE-World Bank-GEF project "Financing Energy Efficiency at MSMEs".

The workshop was attended by more than 60 participants from small and medium scale foundry units of Kolhapur cluster, office bearers of various foundry associations and institutions like the KEA, IIF Kolhapur chapter, GOSHIMA, MAKH, SMAK etc., local technical resource organizations, equipment suppliers, technology developers, besides experts from BEE and WII. The final agenda of the event is enclosed in ***Annexure 1*** and the list of registered participants of the workshop is attached in ***Annexure 2***.

4.2 WORKSHOP PROCEEDINGS

4.2.1 Welcome of participants

The workshop was attended by entrepreneurs and consultants from the following sectors:

- Foundry units from Kolhapur foundry cluster
- Engineers and local equipment suppliers
- Officer bearers of major associations like KEA, IIF Kolhapur chapter, GOSHIMA, MAKH and SMAK
- Technology developers like Wesman Group and Inductotherm India
- Bureau of Energy Efficiency (BEE)
- Winrock International India (WII)

The workshop started with the welcome of the participants and the speaker panel. The speaker panel consisted of following personnel:

- Sh Shrikant Dudhane, Director, Kolhapur Engineering Association
- Sh Surjitsing Pawar, Institute of Indian Foundrymen, Kolhapur Chapter
- Sh Saurabh Yadav, Knowledge Management Specialist, BEE
- Sh Manish Soni, Program Officer – Energy and Environment, WII
- Sh S Subramanian, National Sales Manager, Inductotherm India Pvt Ltd
- Dr B K Basak, Executive Director, Wesman Group
- Sh Neeraj Verma, Assistant Manager, EEC, SIDBI

Sh Manish Soni introduced the workshop to the assembly and invited the speaker panel to take respective positions on the dais. The speaker panel was formally welcomed with presentation of bouquet of flowers. This was followed by a round of introduction of speakers and participants. Thereafter, Sh Shrikant Dudhane was invited to deliver the welcome address to the gathering.

4.2.2 Welcome address

Sh Shrikant Dudhane was requested to deliver the welcome address. Sh Dudhane informed the participants about the historical background of the project activities, the pilot studies commissioned by WII in Kolhapur foundry cluster as a part of the Programmatic Framework for Financing Energy Efficiency at MSMEs in India. He said that though Kolhapur foundry cluster is synonymous with the production of high grade castings and has been the most preferred vendor hub for precision casting products. He also said that Kolhapur foundry cluster has been able to upkeep its reputation as supplier of quality casting products to most price sensitive sectors like automobiles, electrical machinery components, engineering and so on.

However, in his address, Sh Dudhane also expressed his concerns about the ever rising and non reliable fuel cost which has become a major problem for the foundry units in the cluster. He said that there is threat from the international competitors which have lower operating cost primarily because of the lower specific energy consumption for manufacturing of the same categories of the products. He said that the ongoing initiative undertaken by the industry associations in Kolhapur for development of Kolhapur foundry cluster has also brought in the objective of bringing in energy efficiency in daily production related operations. However, in absence of the focused research for Kolhapur foundries the objective for energy efficiency can only be addressed by inviting agencies with energy conservation as primary mandate in the cluster. He further added that along with energy conservation, development and proper implementation of customized environment management programs is also one of the issues that the industry needs to address immediately.

Sh Dudhane expressed his hopes that by partnering with esteemed programs like the WB – BEE – GEF program for financing of energy efficiency in the Indian MSMEs, it will not be very difficult to address the issues of rising energy costs and environmental concerns. In the end, he proposed continued cooperation to the programmatic activities in the cluster by the way of collective efforts of KEA and other active

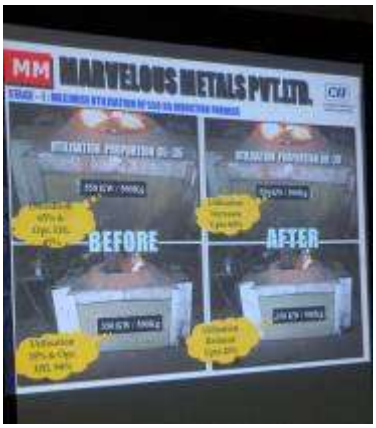
industrial associations in the Kolhapur foundry cluster.

4.2.3 Inaugural address

Sh Surjitsing Pawar, IIF Kolhapur chapter and leading industrialist of Kolhapur foundry cluster, was requested to deliver the inaugural address to the workshop. Sh Pawar shared the roadmap for future for the Kolhapur foundry industries as discussed in the recently organized forum Vision 2020 for Kolhapur Foundry Cluster by the Kolhapur chapter of the Institute of Indian Foundrymen. Sh Pawar informed the workshop participants about the continuous research and developmental activities and outreach and dissemination activities undertaken by the IIF Kolhapur chapter in particular. He also shared the vision statement of IIF for energy conservation and environment protection.

Further, Sh Pawar along with colleagues from his manufacturing unit Marvelous Metals Pvt Ltd, shared a case study on the successful implementation of various energy conservation measures undertaken at the above mentioned unit. case study touched upon the following important points:

- Energy conservation through Kaizen practices
- Stages for energy conservation
- Maximum utilization of 550 kW furnace
- Equal distribution of metal in pouring ladle
- Use of insulating cover on pouring ladle
- Use of RHA on the liquid metal
- Use of shot blast scrap
- Benefits and cost reduction by implementation of energy conservation measures



The energy conservation measures adopted by the management of Marvelous Metals Pvt Ltd were shared with the workshop participants in detail along with the associated energy saving and cost saving benefits of the same. The details of the presentation by Marvelous Metals Pvt Ltd have been attached as ***Annexure 3*** with this report.

4.2.4 Presentation on BEE – GEF – WB Project overview

Sh Saurabh Yadav, Knowledge Management Specialist, BEE gave a detailed presentation on the project overview of the BEE – GEF – WB project for the Kolhapur foundry cluster in particular and other MSME clusters in India in general. Sh Saurabh Yadav introduced the

project mechanism and roles and responsibilities of different project partners. Further, Sh Yadav presented details on the project components of financing energy efficiency at MSMEs in India. During his presentation, he also informed the workshop participants about various project activities and perspective of different stakeholders regarding the same. The details of the presentation by Sh Yadav have been attached as ***Annexure 4*** with this report.

4.2.5 Presentation on Direct & Co-benefits of Energy Efficiency and Opportunities for Energy Saving for Kolhapur foundry Cluster

Sh Manish Soni, Program Officer – Energy and Environemnt, WII presented the direct and co-benefits of the energy efficiency project in MSME units. Sh Manish Soni linked the adoption of energy saving technologies to other direct benefits like product quality, improved workplace environment, compliance with environmental regulations and presented the barriers and motivations associated with adoption of newer technologies. Further, Sh Soni presented no/low cost energy saving measures for cupola and induction based foundries based on the previous research conducted by WII in the sector. towards the later part, he also addressed the issue of energy conservation in plant utilities like compressed air system etc.

The details of presentation on Direct and co-benefits of Energy Efficiency and Energy Conservation Opportunities for Kolhapur foundry cluster have been provided as ***Annexure 5*** with this report.

4.2.6 Presentation on Upcoming energy efficient technologies for Foundry sector – Induction melting

Sh S Subramaian, National Sales Manager, Inductotherm India Pvt Ltd gave a detailed presentation on the upcoming energy efficient technologies in the foundry sector developed by Inductotherm. Sh Subramanian introduced the Inductotherm group and its operations in India and worldwide. This was followed by technical presentation on principles of induction melting and the newly developed technologies and their respective energy conservation features. He also presented the best operating practices for induction melting as well as various losses associated with the non-compliance with best operating practices. The main attraction of the presentation was information on relatively new technologies like dual, tri and multi trak power supplies and IGBT based induction furnaces which have immense energy saving potential for smaller foundries installing furnaces upto 550 kW ratings. He also presented successful case studies and experience sharing of units where IGBT induction furnaces have been installed already.

The details of presentation on Upcoming Energy Efficient Technologies for Foundry sector – Induction melting have been attached as ***Annexure 6*** with this report.

4.2.7 Presentation on Upcoming energy efficient technologies for Foundry sector – Cokeless cupola and Thermal Sand Reclamation

Dr B K Basak, Executive Director, Wesman Group presented a detailed and very informative presentation on energy efficiency and environment friendly technologies – the cokeless melting cupola and the thermal sad reclamation system. Dr Basak provided details on the already existing environment threat, ever rising GHG emission and its link with energy inefficiency, and the possible way ahead. In the technological sections, Dr Basak presented the details of the operating schematics of the cokeless cupola melting system and drew comparison of various parameters like specific energy consumption, pollution load of SPM, SOx, NOx etc, between the cokeless cupola and the conventional coke based cupola melting practices. This was strengthened by analysis of cost benefit parameters of the same where cokeless cupola was presented as better and financially viable energy saving project. in the second part of the presentation, Dr Basak provided the details of thermal sand reclamation system and its superiority over other prevalent sand reclamation systems. This technology too, was

presented along with the applicable cost benefit analysis.
The details of the technologies can be found in the earlier Section 3.3 and Section 3.5.

4.2.8 Presentation on SIDBI's Initiatives in Promoting and Financing Energy Efficiency in Indian MSMEs

Sh Neeraj Verma, Assistant Manager, Energy Efficiency Cell, SIDBI provided a detailed presentation on SIDBI's Initiatives in Promoting and Financing Energy Efficiency in Indian MSMEs. Sh Verma introduced SIDBI's objectives and background to the workshop participants and deliberated on how SIDBI stands out among other commercial lending banks by virtue of it being dedicated bank for the MSMEs in the country. Sh Verma also presented the various initiatives taken by SIDBI to improve the knowledge, accessibility and financing of energy efficient technologies among the MSMEs. He presented the various financing schemes available with SIDBI and also the ones wherein MSME units can avail term finance on relaxed interest rates for energy efficient technologies. He also discussed about the linkage of SIDBI with the BEE – WB – GEF program, its roles and responsibilities, different credit lines available with SIDBI and their respective objectives, governmental subsidy programs for EE channeled through SIDBI and examples of successful interventions by SIDBI in promotion of EE in various MSME clusters in India. During the presentation, Sh Verma was accompanied by Sh Umang Mistry, AGM, SIDBI Kolhapur XBO.

The details of presentation on SIDBI's initiatives in promoting and financing energy efficiency in Indian MSMEs are attached as ***Annexure 7*** with this report.

4.2.9 Presentation on development of Kolhapur Foundry and Engineering Cluster under IIUS

The last presentation on development of Kolhapur Foundry and Engineering Cluster under the Industrial Infrastructure Upgradation Scheme promoted by Ministry of Commerce and Industries, Government of India, was presented by Sh Deepak Zade, Sr Vice President, Energy and Carbon Services, MITCON. Sh Zade presented the details and updates on the multi year project objectives and activities and how the implementation of the same will be beneficial to the foundry and engineering industries in Kolhapur. He provided the details on the project's stakeholders and the proposed project components like common facility centers, sand reclamation plants, testing laboratory and tool room services, import export house, quality support systems, etc.

The details of the presentation on status of development of Kolhapur foundry and engineering cluster are attached as ***Annexure 8*** with the report.

4.3 INDUTRY VISIT

Technical visit to foundry industry was facilitated by WII for the experts from BEE and SIDBI. The team consisting of Sh Saurabh Yadav, Sh Vishal Aggarwal and Sh Neeraj Verma along with Sh Manish Soni visited M/s Abhijeet Castings, MIDC Shiroli, Kolhapur, after receiving consent from Sh D D Patil, Managing Director, Abhijeet Castings.

During the time of the visit, the unit was in operation and mould making and cupola maintenance operation were taking place. The team gathered information on day to day operation pattern of the foundry and energy consumption parameters. Sh Patil explained about the intricacies of foundry operation and issues related to energy consumption in the foundry.

4.4 FEEDBACK ANALYSIS

Feedback was requested from the participants regarding the workshop logistics and technical contents. A sample filled-in feedback form has been attached as **Annexure 9** with this report. The filled in feedback forms were collected from the participants who chose to provide their feedback. Details of the feedback analysis are presented below for reference:

- All the participants found the workshop logistics arrangements 'good' or better. 64% of the participants found workshop logistics arrangement 'good', 29% found it 'very good' and the rest found it 'excellent'.
- Similar encouraging response was received for the technical contents of the workshop. 21% participants found the technical contents 'excellent', 29% found it 'very good' and the rest found it 'good'.
- 93% participants confirmed that they have understood the broad objectives of the BEE – WB – GEF project for their cluster.
- 79% participants expressed interest to get associated with the project in either or all of:
    1. Media and out reach activities
    2. Walkthrough/preliminary assessment audits

3. Detailed energy audit and preparation of DPRs
4. Knowledge sharing

- The popular sources of industrial finance in the cluster are:
    1. Indian Overseas Bank
    2. IDBI
    3. SBI
    4. Cooperative banks
    5. Self finance
- Almost all the participants expressed their interest in implementing energy conservation measures in respective units

Annexure 1

Program Schedule for Workshop

FIRST TECHNICAL WORKSHOP AT KOLHAPUR FOUNDRY CLUSTER

Under

BEE – WB – GEF Project on Financing Energy Efficiency at MSMEs

Organized by

WINROCK INTERNATIONAL INDIA

Supported by

ENERGY IS LIFE BEE CONSERVE IT

Venue: Residency Club, Kolhapur

May 13, 2011

Program Schedule

17:00 – 17:30	**Registration**
17:30 – 17:45	**Welcome of Participants** *Sh Shrikant Dudhane, Director, Kolhapur Engineering Association*
17:45 – 18:00	**Inaugural Address** *Sh Surjit Singh Pawar , IIF Kolhapur*
18:00 – 18:20	**The BEE-WB-GEF Project on Financing Energy Efficiency at MSMEs** *Sh Saurabh Yadav, Bureau of Energy Efficiency*
18:20 – 18:35	**Direct and Co-benefits of Energy Conservation in MSMEs** *Sh Manish Soni, Program Officer, Winrock International India*
18:35 – 19:00	**Upcoming Energy Efficient Technologies for Foundry – Induction Melting** *Sh S Subramanian, Inductotherm India Pvt Ltd*
19:00 – 19:25	**Upcoming Energy Efficient Technologies for Foundry – Cokeless Cupola Melting** *Dr B K Basak, Wesman Foundry Equipment Pvt Ltd*
19:25 – 19:50	**Financing Schemes for Energy Saving Projects in MSME Sector** *Sh Pradeep Malgaonkar GM, SIDBI*
19:50 – 20:25	**Open house discussions & Roadmap for future**
20:25 – 20:30	**Vote of Thanks**
20:30 onwards	**Dinner**

Registration List of Participants

FIRST TECHNICAL WORKSHOP AT KOLHAPUR FOUNDRY CLUSTER

under

BEE – WB – GEF Project on Financing Energy Efficiency at MSMEs

Organized by

WINROCK INTERNATIONAL INDIA

Supported by

ENERGY IS LIFE BEE CONSERVE IT

Venue: Residency Club, Kolhapur
May 13, 2011
Registration

S. No	Name & Designation	Name of the Company	Telephone / Mobile No.	Signature
1.	S.G. Patil Sr. Manager	S.B. Resheflows Kolhapur	9689899652	
2.	M. Saravana Kumar · Director-Technical	Fortune Foundries pvt. Ltd Kolhapur	9545452945	
3.	Mahesh B. Patil Foundry Mr.	Yash Metallics Pvt Ltd. Unit I	8308807513	
4.	Finj. M. Bangwan melting I/c.	MMPL - I	92-2583553	
5.	Virendra Patil M.D	Shree Spheretech P.L	2469704	

S. No	Name & Designation	Name of the Company	Telephone / Mobile No.	Signature
6.	Sajid. A. Shaikh	Prime Industries	2858512	
7.	Sanjay Gurav Ravindra Sangar S.R. Subramanian	Inductotherm (I) Pvt Ltd	2537849	
8.	K. S. NAIR	Flawless Castings Pvt. Ltd.	9860582333	
9.	Ashish Jain	Tata Capital	9029037172	
10.	Deepak Zade	MITCON	09822684106	
11.	Kushire M. R.	Dynamic Industries	9604112341	
12.	Ashok Pudhane	Vishnusons Industries	9822599188	
13.	S. S. Patravale	Menon & Menon Ltd	9421175318	

S. No	Name & Designation	Name of the Company	Telephone / Mobile No.	Signature
14.	Mayuresh B. Dhanlikar	Mayuresh Engineering Works	9326487007	
15.	Sanjay B. Chavan	Menon and Menon Ltd	9860899718	
16.	G. D. Gore	Shriram Foundry Ltd.	9422033633.	
17.	S.S. Kulkarni	Shriram Foundry	9420403652	
18.	Shaikat D. Dudhae	Sai Udyog	9822056241	
19.	V. K Bagi	Fortune Foundry P. Ltd	9545452942	
20.	Gode D. M.	Yash Metallics pvt Ltd	8308807602	
21.	Jadav P. B	Yash metallics pvt Ltd	8308807608	

S. No	Name & Designation	Name of the Company	Telephone / Mobile No.	Signature
22.	Hudli S.M. Chairman	Hudli & Sons Metallics Pv. Ltd	9822098852 0231 2656861	
23.	Nivas M. Mane	Neelam Industries	9764154944	
24.	Aniruddha Kadam	MITCON	9890245967	
25.	Shantanu Gaikwad	MAKH- Secretary	9226391314	
26.	Mahesh Bhosale	Wesman	9980082789	
27.	Sangram Bhosale	Sangram Metal Processors	9822650407	
28.	Vivek Mahajani	Sangram metal Processors	7304423355	
29.	Patil D.D	Abhijeet casting Pvt Ltd	9371102579	

4

S. No	Name & Designation	Name of the Company	Telephone / Mobile No.	Signature
30.	Deshpande [illegible]	Sound castings pvt ltd	9371629306	
31.	Chilka S. V.	Shriram foundry	9422032228	
32.	Vilas D. Pawar	S.J. Iron	9325154492	
33.	A. B. Mohite	Ghatage Patil Ind. Ltd.	9423186952	
34.	D. S. Pasone	Mantri metallics	9049008457	
35.	Y. D Mundale	Mantri Metallic	9881197560	
36.	A. B. Agnihotri	Mantri Metallics P. Ltd	9049008456	
37.	Jagan. J. Kamath	Akshay Metals	9881250087	
38.	Vitthal Patil	Manules Vimukt Ltd	9881204647	

5

S. No	Name & Designation	Name of the Company	Telephone / Mobile No.	Signature
39.	Pradeep M. Vharambale	Secretary Kolh Engineering Associana.	0231-2654652 9421110862	
40.	Abhijeet Naik	I I F. Kolhapur	9673285534	
41.	M D Ganjale	Prabha Industries	9423858940	
42.	B. B. Warude A/c Manager	Mayura Steels Pvt. Ltd	9860196612	
43.	S.P. Patale Prod. Manager	Parikh Metallizing Pvt Ltd	07689949407	
44.	T.S. Ghatge, Secretary	SMAK	9422414029	
45.	D.R Kulkarni	Marvelous Metals P2	9225835504	
46.	Bapu Tendulkar	KGA	9823015905	
47.	Amrata Industries Prabjeet Dalvi	Amrata Industries	9921565959	
48.	B. SRINIVASA RAO	Anshul Steels Pvt	9225825521	

6

S. No	Name & Designation	Name of the Company	Telephone / Mobile No.	Signature
49.	KAMAL GUPTA (DIRECTOR)	Jai Amby Iron & Steel Ltd.	9225908333	[signature]
50.	Sunil Jain	Ambey Vardhman Steel	9225811533	[signature]
51.	Sumeet Chougule Director	Chougule Steels (I) Ltd	99227 21155	[signature]
52.	Pawan Mahesh K	The Kolhapur Steel Ltd	9822533772	[signature]
53.	Jadhav Rakesh S	—— " ——	9730279351	[signature]
54.	Vithal L. Patil	Marvelous V. Foundry PL	9881204647	[signature]
55.	PATIL S. M.	Marvelous Metals Pvt. Ltd.	9225835509	[signature]
56.	G. K. Iyer.	The Kolhapur Steel Ltd.	9325512020	[signature]
57.	Ravindra Sangar	Inductotherm India P.L.	9370981335	[signature]
58	Sanjay B. Gunavanthe	"	9323449853	[signature]
59.	S. Subramanian	"	"	[signature]
60.	Surjitsing Pawar	Marvelous Metals PL	9225833371	[signature]

7

Presentation by Marvellous Foundry, Kolhapur

MM MARVELOUS METALS PVT.LTD. CII Confederation of Indian Industry

ENERGY CONSERVATION

THROUGH VARIOUS

KAIZENS

MM MARVELOUS METALS PVT.LTD

KAIZEN :- SMALL, STEADY, CONTINUOUS

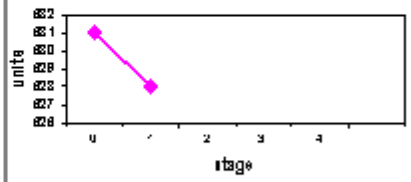
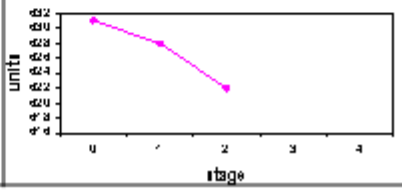
IMPROVEMENT FOR BETTER RESULTS

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

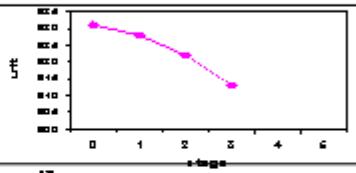
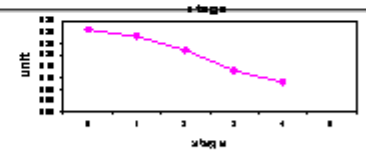
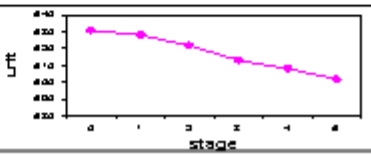
Energy saving achievements at various stages

Initial furnace consumption /MT. of liquid metal - 631kwh

Stage Nos.	Stages for energy conservation	Energy Saving (kwh) per month	Avg. units / MT of furnace metal
1	Maxi. Utilisation of 550 kwh furnace	3135 kwh (Rs.17250)	
2	Equal distribution of metal in pouring laddle	6760kwh (Rs.37180)	

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

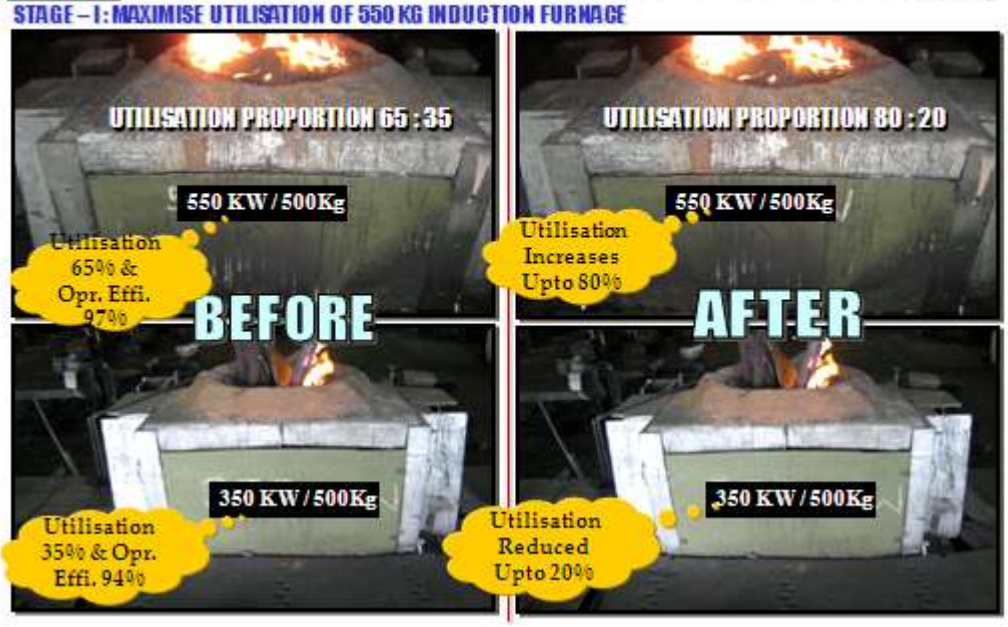
Stages Nos.	Stages for energy conservation	Energy Saving (kwh) per month	Avg. units / MT of furnace metal
3	Use of insulating cover on pouring laddle	10530kwh (Rs.58000)	
4	Use of RHA on the metal	5850kwh (Rs.32175)	
5	Use of shot blasted scrap.	7605kwh (Rs.41827)	

Total energy saving - 33880 kwh / Total Saving –Rs.186432

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

STAGE – I: MAXIMISE UTILISATION OF 550 KG INDUCTION FURNACE



MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

RESULTS : -

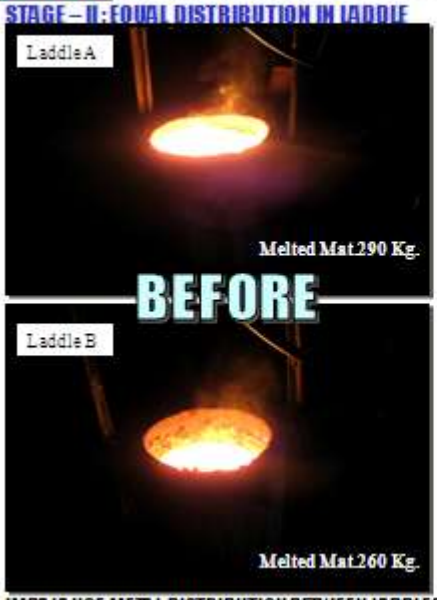
Proportion	Months melts (550kg /melt)	550kw melts (nos)	350kw melts (nos)
65% & 35 %	1100 melts	715	385
80% & 20%	1100 melts	880	220

Every month power saved – 3135 kwh / Rs – 17250 (kwh@ Rs 5.5)

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

STAGE – II: EQUAL DISTRIBUTION IN LADDLE



IMBALANCE METAL DISTRIBUTION BETWEEN LADDLES

EQUAL DISTRIBUTION OF METAL 275 KG EACH VARIENCE 2%

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

THEME :-

LEVEL MARKING ON LADDLE LINING

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

RESULTS : - BEFORE

AFTER

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

RESULTS : -

- **Benefits of equal distribution of metal**
- **Consistent metal quality because of correct proportion of inoculation.**
- **Daily 450kg saving in returned metal hence 260kwh saving in energy**
- **Monthly saving in energy 260kwh*26= 6760kwh**
- **6760kwh*Rs 5.5= Rs. 37180**

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

Zone : 09

Kaizen Sheet

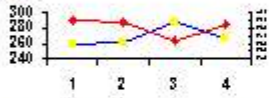
Marvelous Metals Pvt. Ltd

Kaizen Theme: Equal distribution metal in the pouring laddles

Kaizen Idea: Arrangement for distribution of equal metal in laddle.

Team: MrPMP, DEP

Problem Status : Unpropotional distribution of metal in the pouring laddle



Countermeasure : Provision of level mark in the laddle lining.

Start Date: 14.5.2010

Completion date: 18.5.2010

Bench Mark : Variation in metal distribution

Target: Arrangement for weigh scale

Benefits: correct proportion of inoculation & hence consistent metal quality
2.Reduction in return metal

Qualitative Quantitative

P-
Q-
C-
D-
S
M

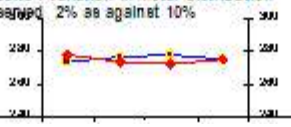
1.Reduction in inoculation Failure
2.Saving of 6750units per month(Rs 37000 /-)

Problem Analysis:.
Q:- Why unpropotional distribution of metal?
A:- Tapping of metal in the laddle by approximation
Q:-Why there is no provision of wighment of laddle during tapping?
A:- Existing monorll height is inadequate for arrangement of weighscale.

Before:

After:

Results : Variation in metal distribution observed 2% as against 10%



Plan for Horizontal Deployment:

For all such type of laddles

Root Cause : No provision of weighment of laddle during tapping

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

STAGE – III : USE OF INSULATING COVER ON POURING LADDLE

POURING LADDLE WITHOUT COVER
(HEAVY LOSS IN METAL TEMP. DUE TO RADIATION)

POURING LADDLE WITH CERAWOOL COVER
MIN LOSS IN METAL TEMP. DUE TO RADIATION.

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

RESULTS : -

Energy Benefits

- **20°c reduction in tapping temp. saving in electricity**

  9kwh / melt

  Every month energy saving

  9kwh*45melts*26days =10530kwh

  10530kwh*Rs5.5= Rs.58000

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

Zone : 09 — Kaizen Sheet — Marvelous Metals Pvt. Ltd

Kaizen Theme: Prevention of excessive loss during pouring	Kaizen Idea: cover the metal surface.	Team: Mr. S.N.P, MHP, FNB, VNM
Problem Status : Huge loss in metal temp. due to radiation during pouring of metal	Countermeasure : provision of cerawool cover on the pourig laddle Before: 	Start Date: 7.06.2010 Completion date: 18.06.2010 Bench Mark saving in 30°c temp.loss Target: 50°c saving in temp loss Benefits : Tapping temp. reduce by 20°c. saving in power consumption, Increase in Inoculation fading time Qualitative / Quantitative
Problem Analysis:. Q:- Why huge loss A:- As metal surface was open to atm. There was huge loss in metal temp due to radiation. Q:-Why A:-. There was no arrangement for prevention of temp.loss .	After: 	P- Q- C- D- S M 1. Temp related foundry defects reduced 2. 10 kwh / melt saving in electricity
Root Cause : Metal surface was open to atomosphere during pouring	Results : Temp. loss restricated in the range of 40 - 50 °c as against 70 – 80°c	Plan for Horizontal Deployment: For all pouring laddles

MM MARVELOUS METALS PVT.LTD.

Further improvement in prevention of heat loss

USE OF RHA ON METAL

USE OF CERAWOOL COVER AFTER RHA COVERING

MM MARVELOUS METALS PVT.LTD.

Further improvement in preventation of heat loss

- Use of rice husk ash on the metal. (RHA is the best heat insulating material easily available at very cheap rate) as a primary cover & cerawool as a secondary cover.
- Because of RHA we got further reduction of 10 -15 °c in temp. loss
- Tapping temp. reduced by 10°c. . Energy saving of 5kwh / melt considering 45 melts per day energy saving for the month

  5kwh*45melts*26days=5850kwh/per month

  5850kwh*Rs 5.5 =Rs 32175
- Use of RHA has increased life of cerawool almost double.

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

STAGE – III : USE OF RHA ON METAL

A
Temp. of furnace metal

B
Temp. after one minute
Rise in temp.16°C

C
Temp. after one minute with use of rice husk ash – rise in temp. 28°c

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

Kaizen Sheet — Marvelous Metals Pvt. Ltd

Kaizen Theme: Prevention of excessive temp. loss during melting	Kaizen Idea: cover the metal surface at the time of melting.	Team: Mr. S.N.P
	Countermeasure : use of heat insulating material (RHA) on furance metal.	Start Date: 18.6.2010 Completion date: 18.6.2010
Problem Status : Huge loss in furnace metal temp. due to radiation	Before: 	Bench Mark saving in 25°c temp.loss Target: Benefits: furnace melting cycle reduced by 2 min.
Problem Analysis:. Q:- Why huge loss A:- As metal surface was open to atm. There was huge loss in metal temp due to radiation. Q:-Why A:-. There was no arrangement for prevention of temp.loss .	After: 	Qualitative / Quantitative P- Q- C- D- S M 1 Saving of 12 units per melt 2 Rs. 77000/-per month
Root Cause : Metal surface was open to atomosphere during melting	Results : Minimum 25°c saving inTemp. Loss & hence saving of two min. in furnace melting cycle	Plan for Horizontal Deployment: For all melting furnaces

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

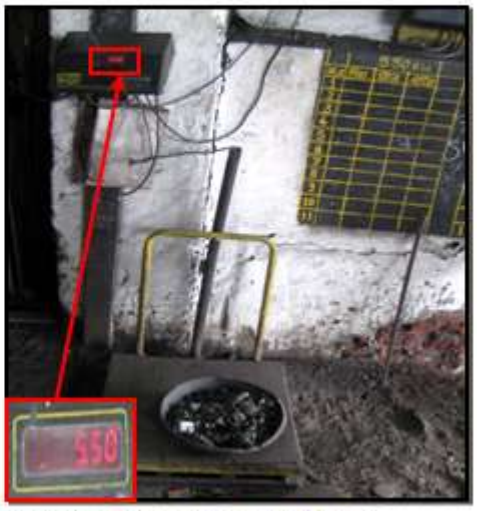
STAGE – V : USE OF SHOTBLASTED RUNNER AND RISERS

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

RESULTS : -

Slag generation fromwithout shotblasted RR



Slag generation fromwith shotblasted RR

MM MARVELOUS METALS PVT.LTD.

Confederation of Indian Industry

RESULTS : -

Benefits by use of shotblasted Runners & risers

1. Stress on operator reduced
2. Furnace output increased by 1%
3. Furnace lining life increased by 20%
4. 6.5 units Energy saving for every melt.
   (As slag consumes double energy)

Monthly energy saving --

6.5 units*45melts*26days =7605 kwh

7605kwh*Rs 5.5 = Rs 41827

MM MARVELOUS METALS PVT.LTD.

Confederation of Indian Industry

Kaizen Sheet — Marvelous Metals Pvt. Ltd

Kaizen Theme: To reduce the slag generation during melting	Kaizen Idea: Provision for shotblasted runners & risers.	Team: Mr.FNB, MHP
	Countermeasure : use of shotblasted runners & risers.	Start Date: 15.5.2010 Completion date: 17.5.2010
Problem Status : Excessive slag generation. Slag removing from molten metal was heavily trouble some.	Before: 	Bench Mark: Slag generation reduce by 50% Target: Further 50% redn in slag generation. Benefits – Reduction in slag quantity has increase furnace output. 1. Stress on furnace operator minimised. Qualitative / Quantitative
Problem Analysis:. Q:- Why excessive slag? A:- Use of un shotblasted Runners , Risers & C.I. boring Q:-Why A:-. No provision for shotblasting Runners, risers & separation of nonmetallic particles from CI boring	After: 	P- ☐ Q- ☐ C- ☐ D- ☐ S M 1. Production increased by 1% 2. Chances of slag defect in casting is reduced by 60% 3. Saving of 6.5units / melts.
Root Cause : Use of without shotblasted runners & risers	Results : Slag generation reduced by 50%	Plan for Horizontal Deployment: For other furnaces

MM MARVELOUS METALS PVT.LTD.

CII Confederation of Indian Industry

Furnacewise power consumption performance

Month	580 to 600 kwh/mt		601 to 620 kwh/mt		621 to 640 kwh/mt		Above 640 kwh/mt		Total melts
	550kw Melts	350kwMelts	550kw Melts	350kw Melts	550kw Melts	350kw Melts	550kw Melts	350kw Melts	550kw +350kw
April	242	-	413	69	94	25	26	151	1020
%	23.72		40.49	6.76	9.21	2.45	2.55	14.8	
May	408	-	412	95	48	52	7	110	1132
%	36.04		36.4	8.4	4.24	4.6	0.6	9.71	
June	426	-	443	89	68	41	3	92	1162
%	36.66		38.12	7.65	5.85	3.52	0.25	7.9	

Monthly expenses – A) shotblasting expenses - Rs.32000/-
B) Cerawool expenses - Rs. 5000/-
C) RHP - Rs. 2000/-

Total – Rs. 39000/-

Net saving - Rs.186432 – Rs.39000 = Rs.147432

MM MARVELOUS METALS PVT.LTD.

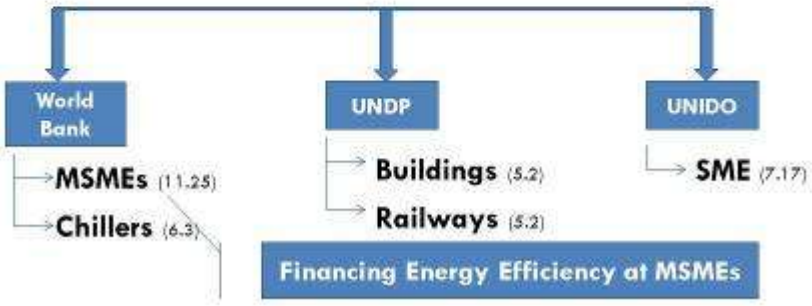
CII Confederation of Indian Industry

It is Just Begining.....!

Presentation by Sh Saurabh Yadav
Knowledge Management Specialist,
Bureau of Energy Efficiency (BEE)

GEF IV Cycle (2010 – 14)

- India has accessed USD 154 million for GEF IV cycle of which approximately USD 35 million is for Energy Efficiency promotion
- GEF Programmatic Framework for Energy Efficiency



Financing Energy Efficiency at MSMEs

- Project Grant - GEF (Global Environment Facility)
- Implementation Agency
  - World Bank
- Project Execution Agency
  - Bureau of Energy Efficiency, Ministry of Power, GoI
  - Small Industries Development Bank of India (SIDBI)
- Total Project cost: US$11.30 million (2010-2014)

"Financing Energy Efficiency at MSME"

- The Project objective is *to increase demand for energy efficiency investment in targeted MSME clusters and to build their capacity to access commercial finance*.
  - Increased awareness about Energy Efficiency thus increased demand for EE investment
  - Development of customized EE products and financing solutions
  - Improved quality of EE investment proposals – both technical and financial perspective
  - Use of existing mechanisms for better risk management
  - Establish a monitoring & evaluation system
- **Final Deliverable: Development of 500 Detailed Project Reports in 5 clusters identifying potential investment options for SME units, and total investment in EE goods and services.**

List of World Bank supported SME clusters

S. No	Cluster	Number of units	Main fuel	Apex Organization
1.	**Kolhapur (Foundry)**	350	**Coke/ Electricity**	**Kolhapur Engineering Association**
2.	Pune (Forging)	160	Furnace oil/ Electricity	Association of Indian Forging Industry (AIFI)
3.	Tirunelveli (Limekilns)	100	Charcoal/ Electricity	Tirunelveli District Lime Manufacturers Welfare Association
4.	Ankeleshwar (Chemicals)	250	Electricity/oil	Ankleshwar Industrial Associations
5.	Faridabad (Mixed)	2000	Electricity/ Automotives	Small Industries Association

Barriers and Approach

BARRIERS				
Gap in Understanding among stakeholders	Imperfect information about EE among MSMEs	Higher Transaction Cost	Lack of information among banking sector stakeholders	Performance guarantee of available efficient equipments
APPROACH				
A function that efficiently packages project design including marketing, development, and technical scoping with a financing function	Technical Assistance to increase knowledge on the technical, policy & regulatory aspects of market to allow improved understanding of sector risks	Standardization and enhanced familiarity by key stakeholders of indentified EE investments among units with similar characteristics	Large, holistic TA effort delivered over a longer term to build a sufficient level of knowledge, acceptance, trust and ultimate demand for EE goods & services	

Project Activities

Component 1: Awareness/ Capacity Building Activities

Activity 1.1: *Outreach effort to clusters,*

*Marketing and general outreach on EE schemes, media, dissemination of success stories (in 5 WB clusters & 25 BEE clusters) – **EOI has been published***

Activity 1.2: *Capacity Building at industry associations such as AIFI, Pune*

- *Project Monitoring & Verification*
- *Training & capacity building of w.r.t Energy Efficiency & Outreach*

Activity 1.3: *TA to energy auditors /for developing local workforce: Enhancing knowledge of local experts, training, BEE certification, enlistment*

- *Pre-assessment Study*
- *Development of Sector specific training Manuals*
- *Imparting Training*

Project Activities

Activity 1.4: *Specialized support to FI Sector, **(SIDBI)***

- *capacity building on EE for FIs, and*
- *outreach on various schemes for EE*

e.g. The Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE)

- *Web portal and Helpline*

Activity 1.5: *Support to SMEs in **accessing finance** **(SIDBI)***

- *Training financial consultants/ chartered accountants*
- *Enlisting of trained professionals*
- *Web portal and Helpline*

Activity 1.6: *Vendor outreach, enlistment and support **(SIDBI)***

- *Capacity building of Local service providers*
- *Capacity building of regional energy efficiency centres;*

Project Activities

Component 2: Activities to Increase Investment (SIDBI)

Activity 2.1 *Project Development Support*

- Pre-assessment studies across the five clusters
- Detailed Energy Audit (500 for five clusters)
- Preparation of investment grade DPRs (500)

Activity 2.2: *Monitoring and Verification (for Performance Linked Grants /conditional cash transfer for early adopters)*

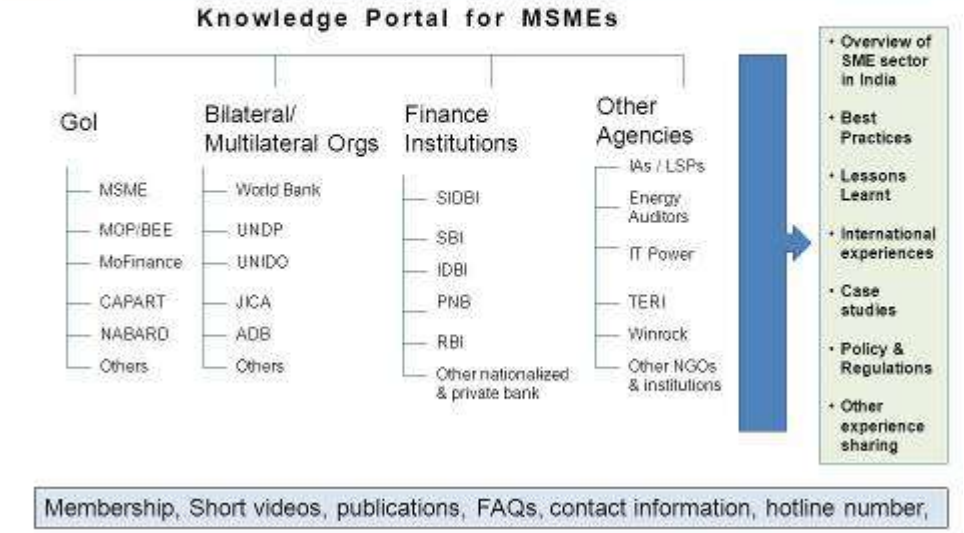
Component 3: Knowledge Management (BEE)

- *Cross cutting analytic work, collation of best practices and successful case studies of relevance for India, information on international EE benchmarks by sector, EE technology databases, dissemination of relevant information on EE programs and projects, and policy development functions. Development of* ***web portal and SME Helpline.***

Awareness & Outreach Activities

Target Group:	Awareness on:	Through:
Industrial Associations SME Units Financial Institutions Energy Auditors & Energy Managers Local Service providers	• Energy Efficiency • Potential in SME • Financing Mechanisms • Energy Audits • Energy Efficient Technologies • Case Studies • Social & Environmental Impact • Preparation of Bankable DPRs	• Workshops, Flyer/ Leaflets, • Programme Brochures, • Banking schemes report, • other national on-going programmes on financing SMEs, • short movies for experience sharing, • knowledge portal, • **helpline** etc.

Design of Knowledge Portal



Membership, Short videos, publications, FAQs, contact information, hotline number,

Stakeholders' Perspective

- MSME Entrepreneurs
  - General Awareness & Importance of Energy Efficiency
  - Assessment of EE Potential
    - 1000 walkthrough & 500 Detailed Energy Audits)
  - Project Viability (500 Detailed Project Reports)
  - Demonstration Projects
    - Incentive for early adopters
  - Information on EE Financing Options
- Industrial Associations (IA)
  - General Awareness & Importance of Energy Efficiency
  - Information on EE technologies
  - Project monitoring & Evaluation
  - Institutional capacity building

Stakeholders' Perspective

- Energy Professionals/ Local Service Providers
  - Acquaintance with MSMEs modus-operandi & requirements
  - Enhanced energy audit skills w.r.t MSMEs
  - Sector/ cluster specific EE technology & Best Industrial Practices
  - Training on preparation of bankable DPR's
  - Information on accessing finance for EE options
  - Energy professional and vendor enlistment
- Financial Institutions
  - Information on sector/ cluster specific EE options
  - Enhanced analysis of EE project applications
  - Outreach on existing financing schemes
  - Capacity building of local branch offices

Inputs from Industries

- Process & Production details
  - Total production capacity installed and the capacity utilization
  - Major technologies being used
  - Raw materials and their cost
  - Energy sources
    - Type of fuel, its cost and percentage share in total energy consumption
  - Specific energy Consumption
  - Share of energy cost in final product cost
  - Average employment per unit
  - End use market
- Cluster Information
  - List of Members/ Industries in Cluster
  - Information on local energy auditing agencies
  - Local Service Providers – Technology providers, FIs

Inputs from Industries

- Preferred Outreach Mode for Communication
  - Published Media – Newspaper, newsletter (any existing), flyer, leaflet
  - Workshop/ training prgs. – any suggestions?
  - TV/ Radio, Internet, Others, Most viewed channel (local)
- IA staff – dedicated resource for awareness?
- Training sites + identification of key stakeholders

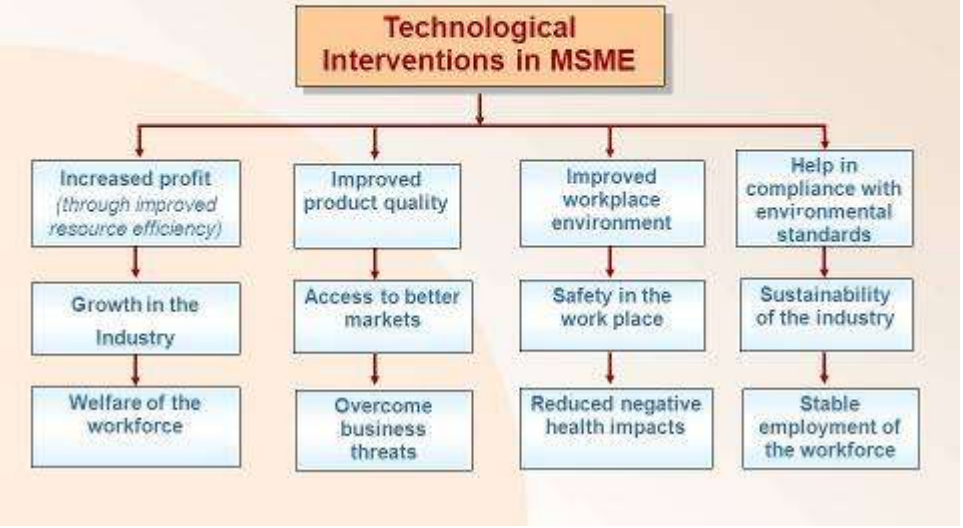
Next Steps for 2011

Jan. – Feb 2011	**Field visits; ToRs + hiring of media and training agencies; consulting with IAs**
Mar - May 2011	Project Inception/ Kick-off/ consultation meeting with various stakeholders Training of Industrial Associations
	World Bank Mission to Kolhapur
Apr – Dec 2011	**Media & Outreach Activities**
	Case studies based on pilot project
	Information on Existing schemes for financing EE at MSMEs
	Development of EE related literature focusing on forging industry – best practices; contacts (LSP; Fis; GoI/state agencies)
Jun - Jul 2011	selection of consultancy agencies & Identification of MSME units for Pre-assessment Studies – which begin in June-July 2011
Aug 2011 onwards	Walk through Audits.

Thank you

Presentation by Sh Manish Soni
Program Officer – Energy and Environment
Winrock International India

Energy Efficiency Projects
- Direct & Co-benefits



Barriers and Motivation in Adopting Energy Efficient Technologies

Energy Conservation Measures

Consider a hypothetical (?) story

A Foundry...

Energy Conservation Measures

contd...

About the Foundry...

- Cupola Installation – 1 No's.
- Alternate day operation
- 24" Cupola ID
- 2.5 TPH melting rate
- Continuous tapping, front slagging
- Divided Blast Cupola (DBC)

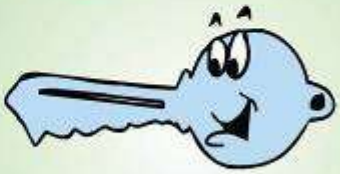
Energy Conservation Measures
contd...

One day...

- Rise in Fuel Price
- Gradually lowered profit margins
- Losing on competition

!!!

Energy Efficiency



IS THE KEY TO **SURVIVAL**

Save on Energy Costs and
get an edge over your competitors.

Energy Conservation Measures
contd...

Strategic move... Diagnostic Study

Energy Conservation Measures
contd...

Observations noted...Operation

- Charging Method → Skip Bucket Charging
- Charge Composition:
  - Pig Iron - 40 kg
  - Cast Iron - 105 kg
  - M.S. - 20 kg
  - Foundry Return - 35 kg
  - Ferro Alloys - As required
  - Limestone - 15 kg
- Total Metallics in one charge bucket = 200 kg

Energy Conservation Measures
contd...

Observations noted... Fuel Consumption

- Fuel input – Hard Coke
  - Per bucket coke input - 13 kg
  - Booster charge - 6 bucket cycle
  - Booster coke input - 30 kg
  - Bed coke input - 300 kg
- Metallics to coke ratio observed per split bucket – **20.4**
- Consider iron yield – 95%
- Overall metal to coke ratio – **9.3**

Energy Conservation Measures
contd...

Observations noted... Other

- Coke quality - Good
- Tapping temperature - Good
- Slag Fluidity - Good
- Slag Colour - Good

Energy Conservation Measures
contd...

Closer Look...Finer Observations

- Air Blast System

- The blower is located too close to the cupola

Energy Conservation Measures
contd...

Closer Look...Finer Observations

- Air Blast System

- *Too close placement of blower to wind-box causes high air turbulence*
- *Entry length of air duct at wind-box must be atleast 15 times the duct dia.*

Energy Conservation Measures
contd...

Closer Look...Finer Observations

- Limestone charging
  - Limestone charged as lumps
    - Limestone lumps as big as 8" – 10"

Energy Conservation Measures
contd...

Closer Look...Finer Observations

- Limestone charging
  - *Limestone size should be kept between 0.75" – 1.5"*

Energy Conservation Measures
contd...

Better Operating practices...

- Cupola stack height must be sufficient enough
  - *To ensure preheating of charge*
  - *To reduce exit flue gas temperature*
- Cupola lit-on, lit-off, other timings must be necessarily noted.
- Dimension of single piece of metal should not be greater than 1/3 the hearth diameter.
- Weight of single piece of metal should be limited to 1% of the hourly melting rate.

Energy Conservation Measures
contd...

Better Operating practices...

- A Divided Blast Cupola
  - *Reduces coke consumption*
  - *Increases tapping temperature*
  - *Improves melting rate*
- An ill designed DBC can be worse than a single blast cupola
- Important factors are tuyer dimensions, spacing, air inlet pattern, etc

Energy Conservation Measures
contd...

Recommendation...

- Adopt operating Practices as mentioned
- Review the cupola design with help of qualified manufacturer
- If found non optimum, replace the existing DBC with well designed DBC

Energy Conservation Measures

contd...

Recommendation...Cost benefit analysis

Melting rate (Tonnes/hr)	2.5
Metal to coke ratio in existing cupola	8.8
Metal to coke ratio for well designed DBC	10
Coke savings (kg/hr)	26
Coke savings per run (kg)	260
Runs in an year (Alternate day)	183
Yearly coke savings (Tonnes)	47.6
Monetary Savings (Million Rs. / yr)	1.4
Investment required for new DBC (Million Rs.)	3.0
Payback period (years)	2.1

(Assuming 10 hrs average run)

Energy Saving

is not so complex!

Energy Conservation Measures

Best Operating Practices - Induction Melting

- Plan the charge mix and material before hand.
- Keep the charge ready (after weighing) before charging along with alloying elements.
- The size of the charge materials should be preferably 1/3rd the size of the crucible diameter.
- Steel and carburizers should be charged first in sequence.
- Keep the crucible full of charge always and keep poking to achieve maximum compaction.

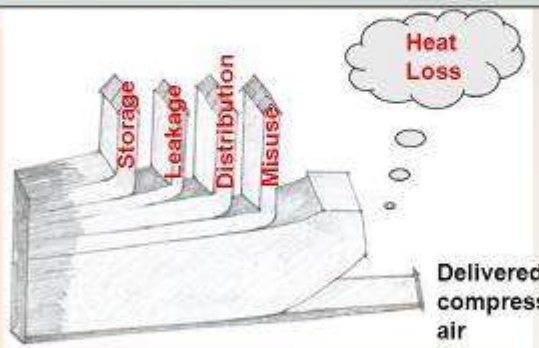
Energy Conservation Measures

Best Operating Practices - Induction Melting

- The furnace should be operated at full power.
- Once the charge is complete cover the crucible with asbestos blanket or lid.
- Do not superheat the metal beyond the required temperature.
- Avoid holding.
- De-slagging operation should be done at least possible time.

Energy Conservation Measures

Best Operating Practices – Compressed Air



Only 10 – 30% of input energy to the compressor reaches point of end use

Energy Conservation Measures

Best Operating Practices – Compressed Air

Compressor Location

- Location of the compressor should be away from the cupola, furnace, heat treatment area and other radiating equipment.
- Compressor location should be free of atmospheric particulate matter.
- The compressor should be placed away from the equipments which add moisture to the atmosphere like cooling towers, dryer exhaust, etc.

Energy Conservation Measures

Best Operating Practices – Compressed Air

Compressor Location

Every 4 °C rise in inlet air temperature results in a higher energy consumption by 1 % to achieve equivalent output

Energy Conservation Measures

Best Operating Practices – Compressed Air

Compressed Air generation

Energy Conservation Measures

Best Operating Practices – Compressed Air

Compressed Air generation

- Air intake filters should be cleaned at regular intervals to facilitate clean air intake from compressor and low pressure drop across the filters.

	With Choked Filter	With Clean Filter
Air flow, cfm	752	846
Improvement	12.5%	

- Maintain proper belt tension in compressors connected by belt drive. Regular up-keeping results in saving 5 – 6% energy.

Energy Conservation Measures

Best Operating Practices – Compressed Air

Compressed Air Distribution

- Minimize pressure drop in the line between generation and utilization points.
- Excess pressure drop is due to inadequate pipe sizing and choked filters.

Energy Conservation Measures

Best Operating Practices – Compressed Air

Compressed Air Distribution

TYPICAL ENERGY WASTAGE DUE TO SMALLER PIPE DIAMETER FOR 100 CFM FLOW

Pipe Nominal Bore (mm)	Pressure drop (kg/ cm^2) per 100 meters of pipe length	Equivalent power losses (kW)
40	1.84	9.5
50	0.66	3.4
65	0.22	1.2
80	0.04	0.2
100	0.02	0.1

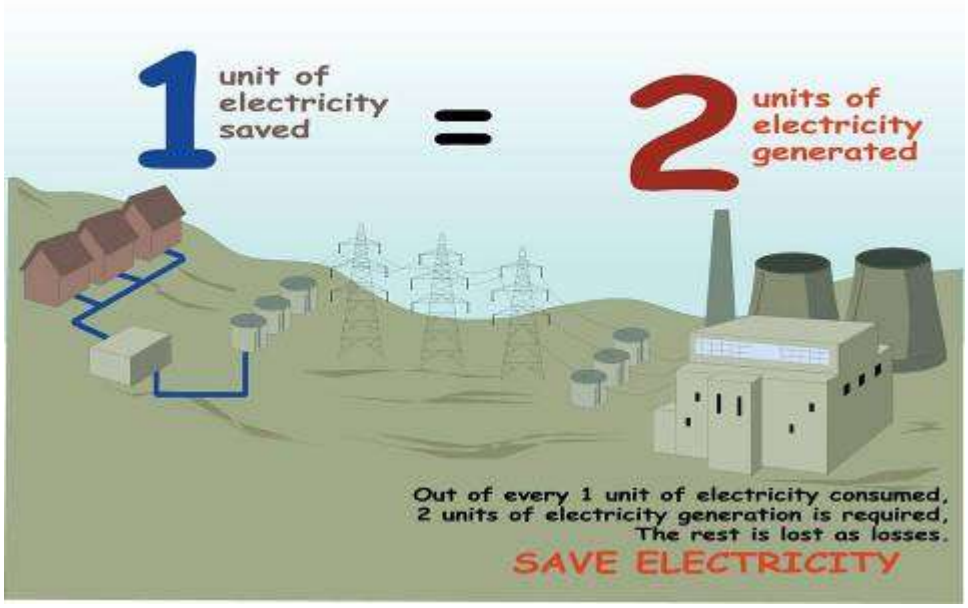
Energy Conservation Measures

Best Operating Practices – Compressed Air

Compressed Air Use

- Leakage test should be conducted on a monthly basis to remove air leaks in the compressed air system.
- It is possible to quantify the amount of leakage present in the system by conducting simple tests.
- Avoid misuse of compressed air. Use of compressed air for purposes like body cleaning, liquid agitation, floor cleaning, drying, equipment cooling and other similar purposes must be discouraged.

Energy Conservation



Request

- Kindly fill-up the "Feedback Form" indicating the details of energy saving projects being planned at your factory


THANK YOU

Presentation by Sh S Subramanian
National sales Manager
Inductotherm India Pvt Ltd

INDUCTOTHERM

Presentation On

"Upcoming Energy Efficient Technologies for Foundry"

Friday 13th May, 2011

Organised by
Winrock International India
At Kolhapur Foundry Cluster

S.R.Subramanian
National Sales Manager

INDUCTOTHERM

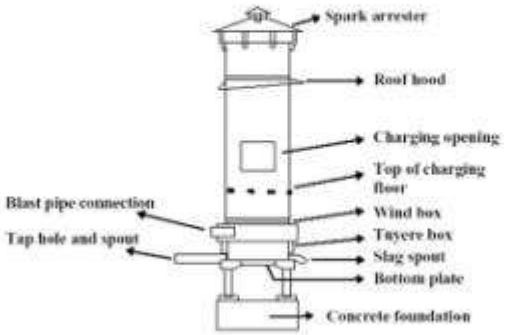
INDUCTOTHERM

Melting by
Rotary Furnace

INDUCTOTHERM

INDUCTOTHERM

Melting by Cupola Furnace



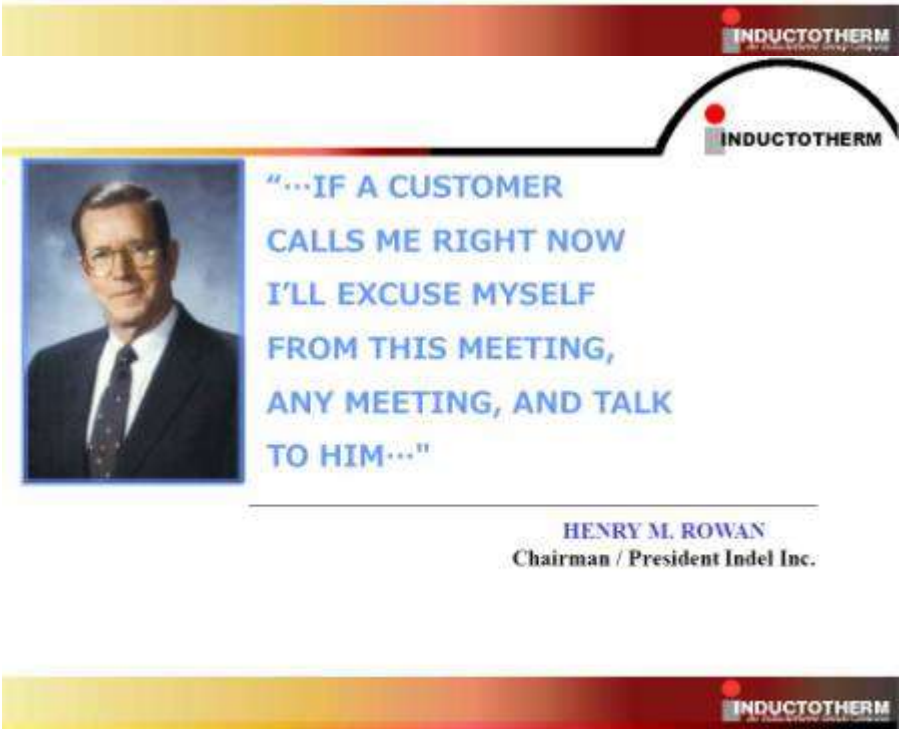
INDUCTOTHERM

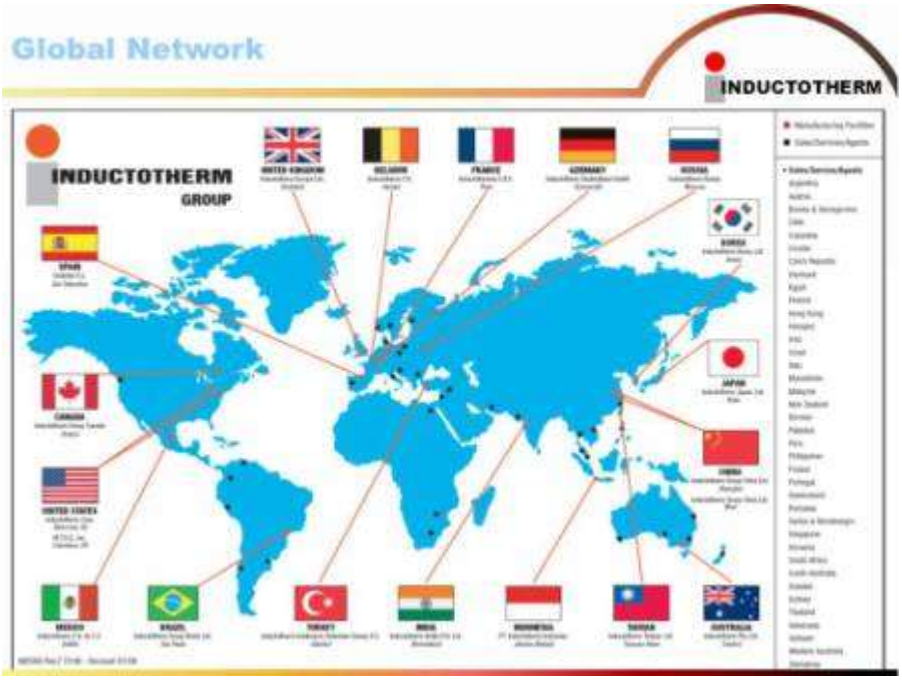
INDUCTOTHERM

Melting through Medium Frequency Induction Furnace

INDUCTOTHERM

INDUCTOTHERM (INDIA) PVT. LTD
An Inductotherm Group Company





INDUCTOTHERM GROUP

MAIN BUSINESS ACTIVITIES

INDUCTION MELTING - HOLDING & AUTOMATIC POURING

INDUCTION HEATING

INDUCTION TUBE WELDING

VACUUM INDUCTION, VACUUM ARC, ESR & PRECISION CASTING SYSTEMS

VACUUM HEAT TREATMENT

FOSSIL FUEL FIRED REHEAT FURNACES FOR STEEL

MASS INDUCTION HEATING FOR ROLLING, CONTINUOUS GALVANIZING BATHS & GALVANNEAL FURNACES

INDUCTOTHERM (INDIA) PVT. LTD.

ESTABLISHED IN 1983

360 EMPLOYEES

TURNOVER IN EXCESS OF 300 CRORE INDIAN RUPEES

LARGEST FURNACE EVER BUILT 55 TONNES

LARGEST POWER SUPPLY EVER BUILT 18,500 kW

OVER 4,000 MELTING SYSTEMS SUPPLIED

INDUCTOTHERM

POWER SUPPLY DESIGN

POWER-TRAK

Dual-Trak

Multi-Trak

Power Supplies with single or dual frequency outputs for single or multiple furnace applications

Batch or Heel Melting

Holding/Duplexing

POWER SUPPLY RATINGS
From 5 to 25,000 kW
From 60 to 10,000 Hz

INDUCTOTHERM


COMPUTER CONTROL &
MONITORING SYSTEMS
INDUCTOTHERM


INDUCTOTHERM

FURNACE ACCESSORIES






INDUCTOTHERM

AUTOMATED POURING SYSTEMS
Pressurised and Unpressurised




INDUCTOTHERM

SE FORGE 3 x 8,000 kW Dual-Traks with 6 x 12 Tonne Steel Shell Furnaces

INDUCTOTHERM

INDUCTOTHERM GROUP

WHY INDUCTION FURNACES

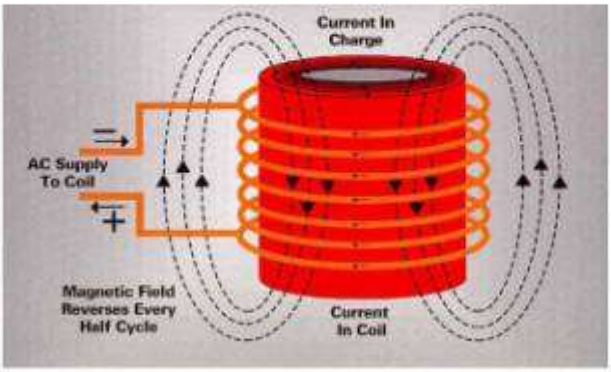
1. Fastest Melt Rates.
2. Better Alloy Flexibility
3. Light Material Melting
4. Flame less operations
5. Smaller Bath Size
6. Stirring
7. Lower energy consumption.
8. Lower kVA requirement.
9. Higher power factor & Lower Harmonic distortion.
10. Safety.

16

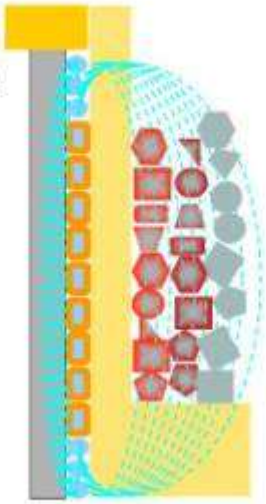
INDUCTOTHERM

PRINCIPLE OF OPERATION

A VARYING MAGNETIC FIELD INDUCES CURRENT IN THE CHARGE



The material closest to the coil heats up first.

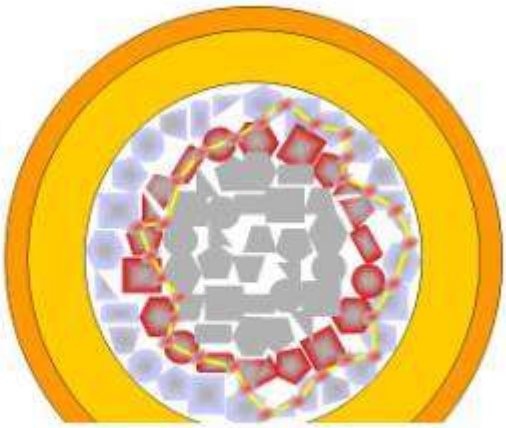


INDUCTOTHERM

With power on, a current is induced into the surface of each piece of charge material.

At the same time secondary currents flow within the charge.

The contact point between each piece of charge material is a point of high resistance.



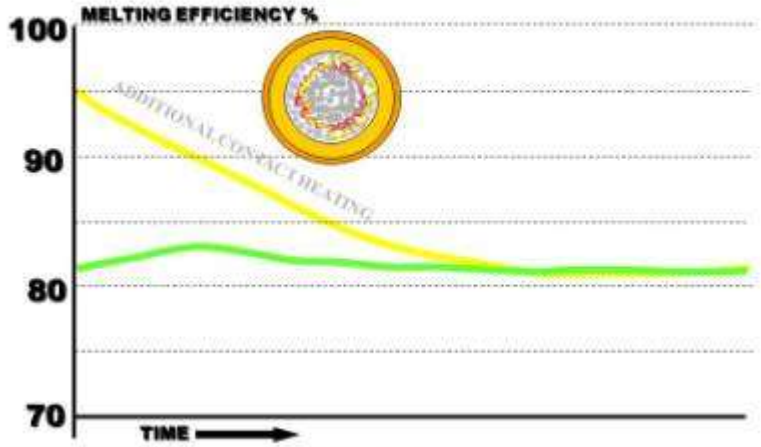
The heat generated at each of these points is additional to the heat generated by the induced currents and boosts the melt rate.

INDUCTOTHERM

INDUCTOTHERM

MELTING EFFICIENCY

HEEL MELTING vs BATCH MELTING



INDUCTOTHERM

AUTOMATIC ROBOTIC MELT SHOP

"ARMS"

REMOVE THE MAN FROM THE MELT PLATFORM

INDUCTOTHERM

INDUCTOTHERM

CHALLENGE TO INDUCTION FURNACE MANUFACTURER

HEAT CONTENT OF STEEL @ 1600°C – 398 KWH/TON

HEAT CONTENT OF IRON @ 1480°C - 370 KWH/TON

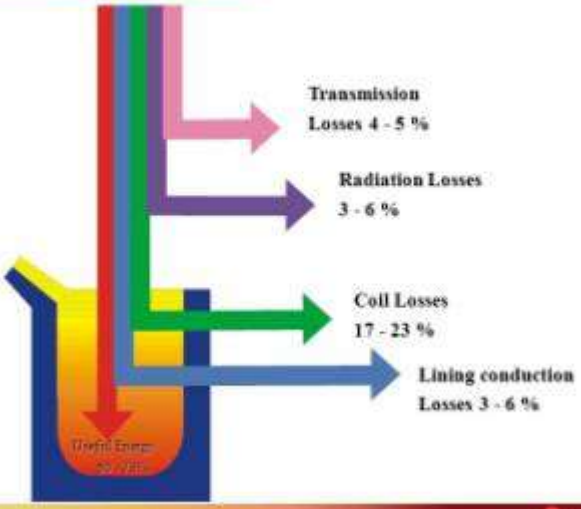
THE CHALLENGE IS TO PUT EFFORTS TO COME NEARER TO THIS i.e. 100% EFFICIENCY WHICH MAY NOT BE PRACTICALLY POSSIBLE

INDUCTOTHERM

Energy Losses in Medium Frequency Coreless Induction Furnace

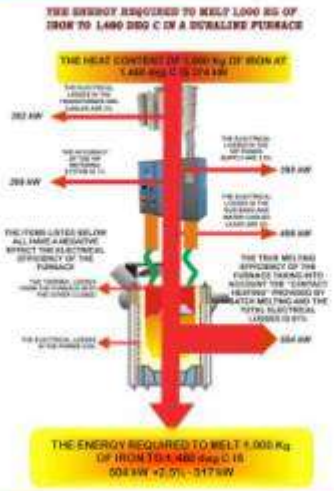
Total Energy Supplied - 100%

INDUCTOTHERM



INDUCTOTHERM

INDUCTOTHERM



INDUCTOTHERM

INDUCTOTHERM

INDUCTION FURNACE POWER SUPPLIES CURRENTLY IN USE

- MAINS FREQUENCY FIRST USED 1925-30
- CURRENT FED INVERTERS FIRST USED 1968
- VOLTAGE FED INVERTERS FIRST USED 1976

INDUCTOTHERM

SUPPLY LINE DISTORTION GENERATED BY STATIC POWER CONVERTERS

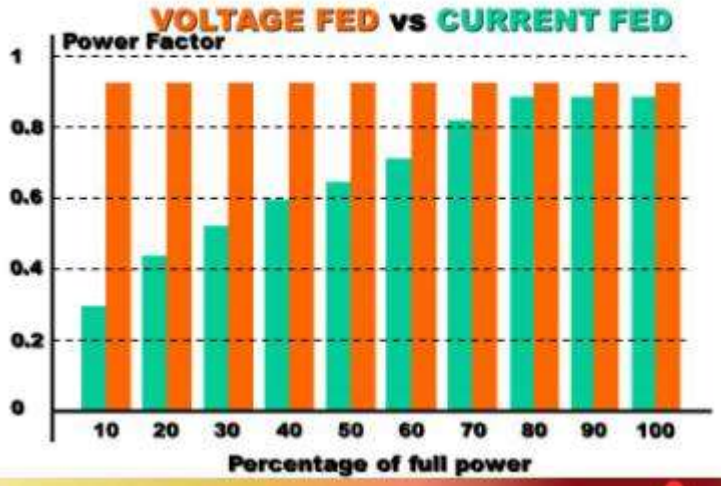
1 - POWER FACTOR

2 - CURRENT DISTORTION

3 – LINE VOLTAGE NOTCHING

INDUCTOTHERM

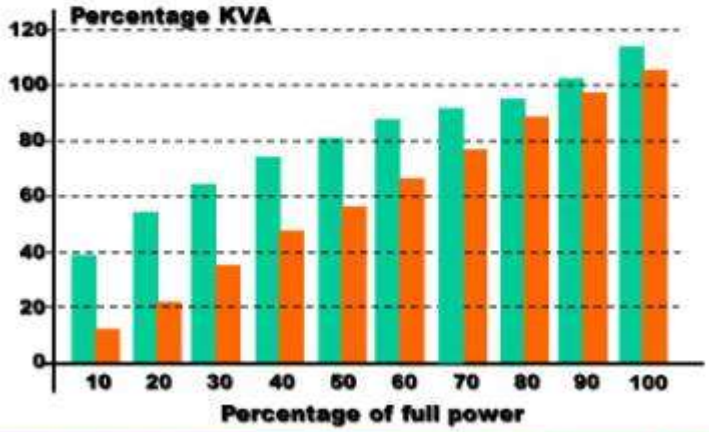
LINE POWER FACTOR



INDUCTOTHERM

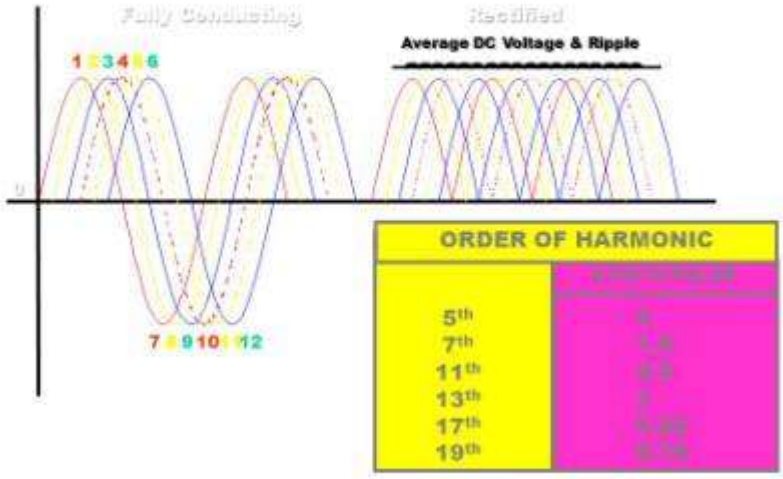
LINE INPUT KVA

VOLTAGE FED vs CURRENT FED



INDUCTOTHERM

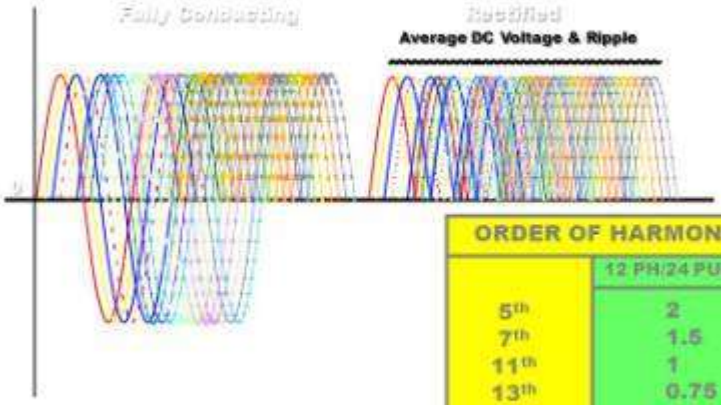
TWELVE PULSE SUPPLY



VOLTAGE FED INVERTER LINE POWER FACTOR 0.98

INDUCTOTHERM

TWENTY FOUR PULSE SUPPLY



ORDER OF HARMONIC	12 PH/24 PULSE
5th	2
7th	1.5
11th	1
13th	0.75
17th	0.22
19th	0.15

VOLTAGE FED INVERTER LINE POWER FACTOR 0.985

INDUCTOTHERM

SUPPLY LINE DISTORTION GENERATED BY STATIC POWER CONVERTERS

	CURRENT FED	VOLTAGE FED
POWER FACTOR		
CURRENT DISTORTION	High	Low
LINE VOLTAGE NOTCHING		

INDUCTOTHERM

A VOLTAGE FED INVERTER WITH AN
UNCONTROLLED AC/DC SECTION
HAS THE
LOWEST KVA RATING
OF ANY INVERTER

THE HIGHEST LINE
POWER FACTOR

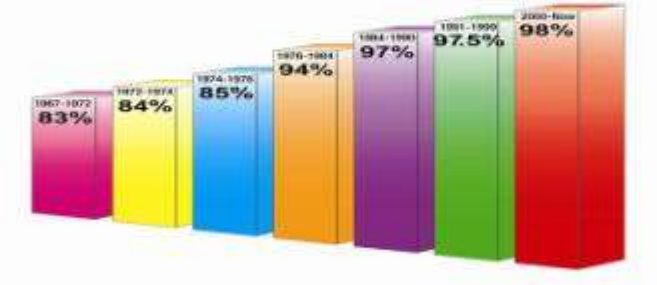
GENERATES THE
LOWEST HARMONICS

ALL WITHOUT FILTERS OR POWER FACTOR CORRECTION

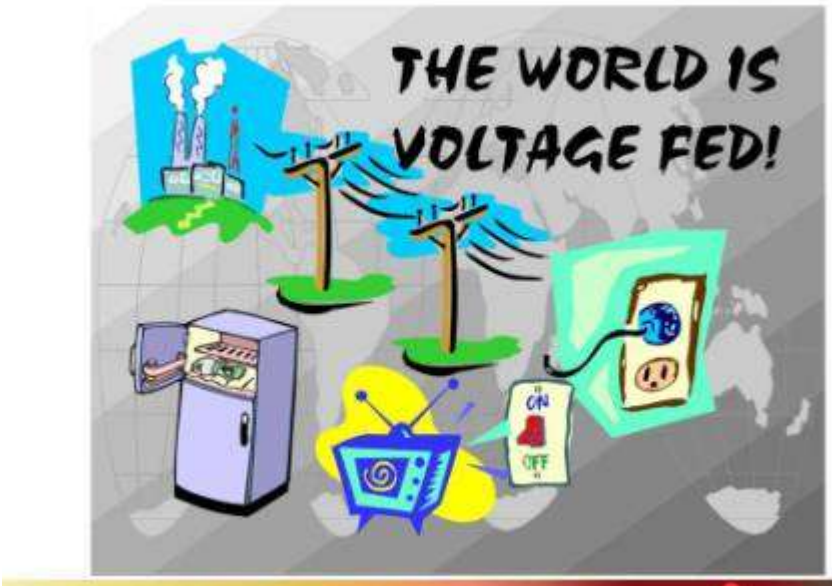
INDUCTOTHERM

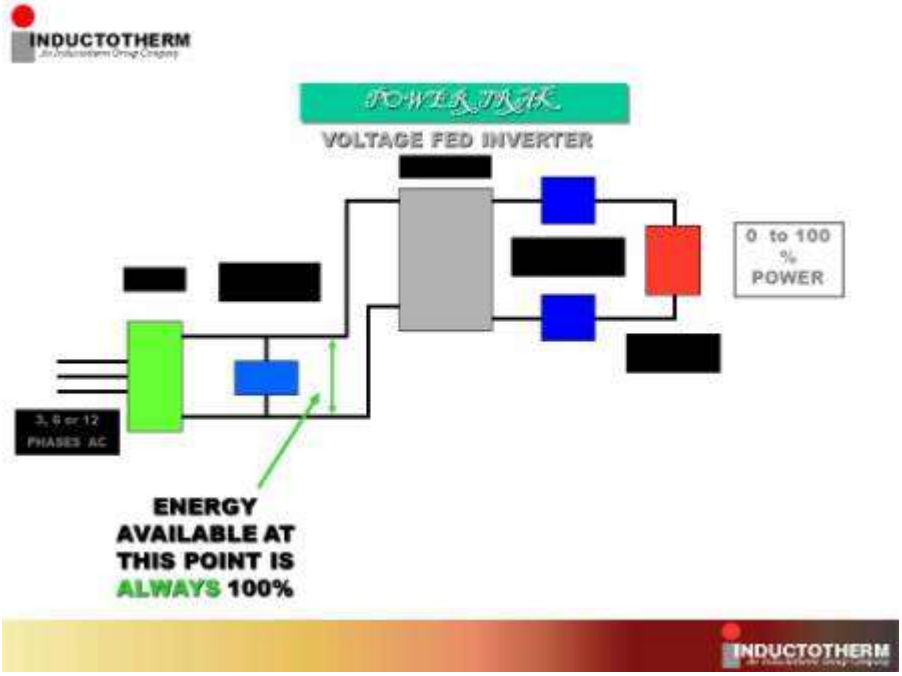
INDUCTOTHERM

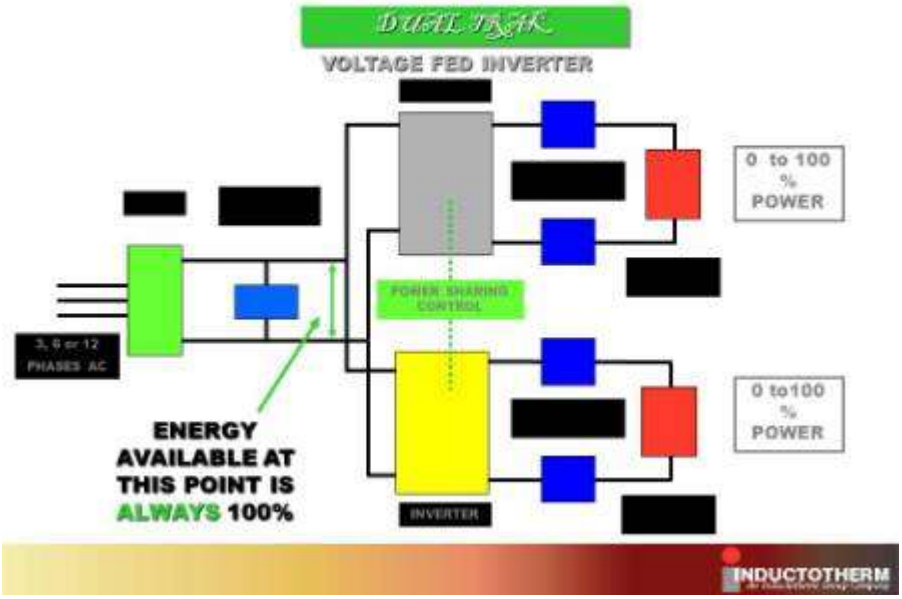
INDUCTOTHERM VIP INVERTER POWER SUPPLY
EFFICIENCIES OVER THE YEARS.



INDUCTOTHERM


THE WORLD IS
VOLTAGE FED!
ON
OFF
INDUCTOTHERM

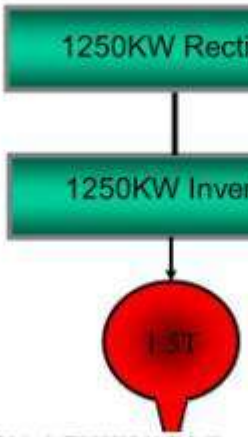

INDUCTOTHERM
POWER FLOW
VOLTAGE FED INVERTER
0 to 100
%
POWER
3, 6 or 12
PHASES AC
ENERGY
AVAILABLE AT
THIS POINT IS
ALWAYS 100%
INDUCTOTHERM


DUAL TRAK
VOLTAGE FED INVERTER
0 to 100 % POWER
POWER SHARING CONTROL
3, 6 or 12 PHASES AC
ENERGY AVAILABLE AT THIS POINT IS ALWAYS 100%
0 to100 % POWER
INVERTER
INDUCTOTHERM


DUAL-TRAK
0
kW
100%
FURNACE 1
POWER CAN BE SHARED IN ANY RATIO WITHIN THE RATED POWER
FURNACE 2
100%
kW
0
VIP
INDUCTOTHERM

1250 KW MONO TRAK

INDUCTOTHERM



PRODUCTION ACHIEVABLE : 35 – 36 TONS / DAY

INDUCTOTHERM

INDUCTOTHERM

A 1250 KW / 1.5T MELTING CYCLE CONSISTS OF

1.	Initial Scrap Charging Time	- 2 Mts
2.	Melting Time	-35 Mts
3.	Deslagging Time	- 3 Mts
4.	Sampling / Chemistry Adjustment Time	- 5 Mts
5.	Pouring / Emptying Out Time	- 15 Mts
	Total Cycle Time	60 Mts

Power Utilization : 58 – 60%

INDUCTOTHERM

INDUCTOTHERM

POWER CRISIS EVERYWHERE

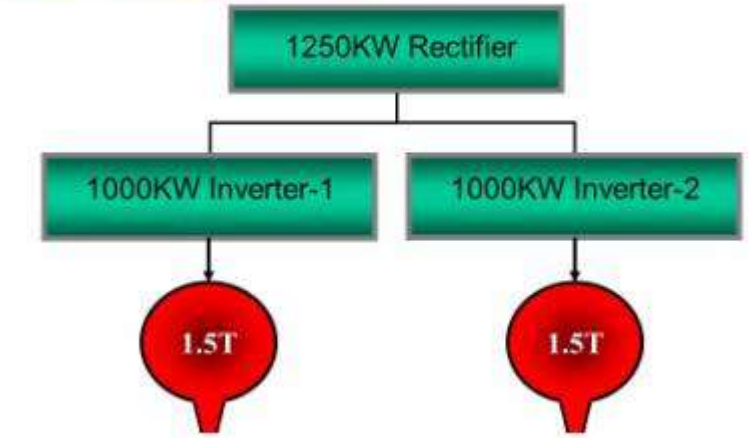
NEED OF THE HOUR IS

- TO MAXIMIZE THE POWER UTILIZATION
- TO INCREASE PRODUCTIVITY
- TO INCREASE LOAD FACTOR

INDUCTOTHERM

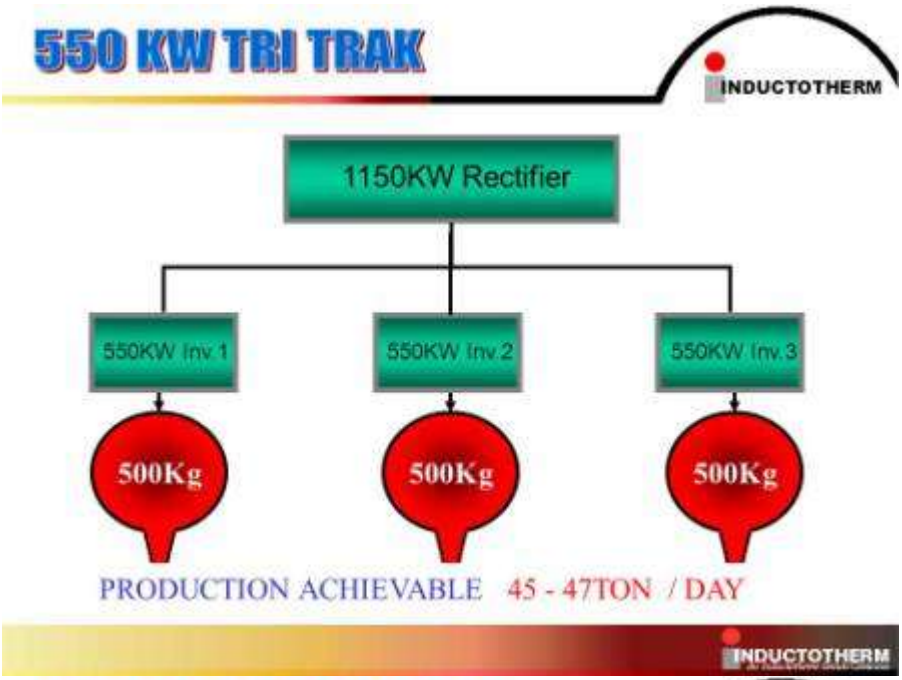
1000 KW DUAL TRAK PLUS

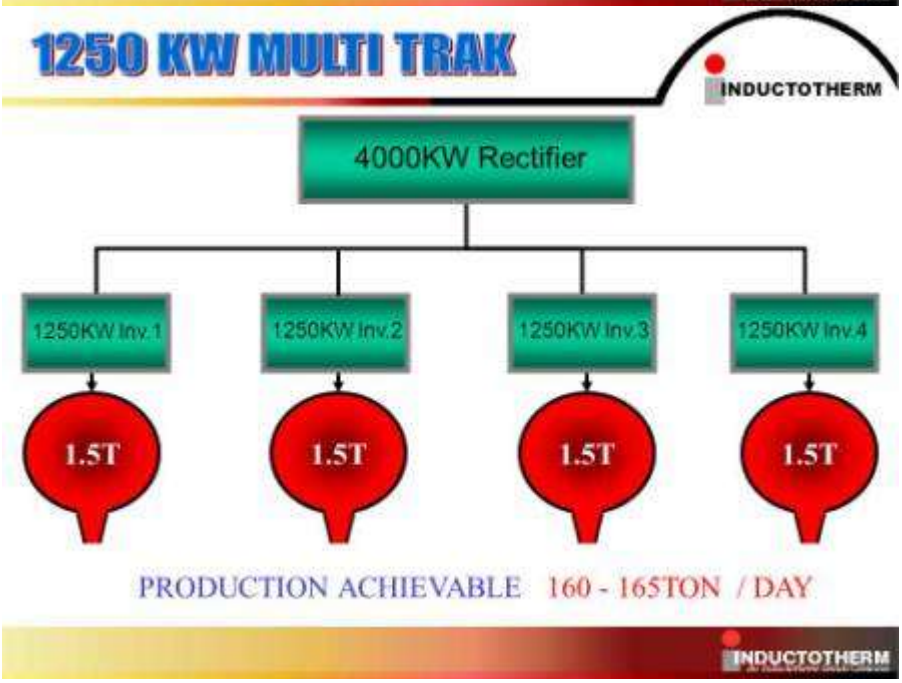
INDUCTOTHERM



PRODUCTION ACHIEVABLE 44 - 45 TONS / DAY

INDUCTOTHERM


550 KW TRI TRAK
INDUCTOTHERM
1150KW Rectifier
550KW Inv.1
550KW Inv.2
550KW Inv.3
500Kg
500Kg
500Kg
PRODUCTION ACHIEVABLE 45 - 47TON / DAY
INDUCTOTHERM


1250 KW MULTI TRAK
INDUCTOTHERM
4000KW Rectifier
1250KW Inv.1
1250KW Inv.2
1250KW Inv.3
1250KW Inv.4
1.5T
1.5T
1.5T
1.5T
PRODUCTION ACHIEVABLE 160 - 165TON / DAY
INDUCTOTHERM

RECOMMENDED MELTING PRACTICE FOR IRON MELT @ 1480°C

INDUCTOTHERM

1. Furnace lining Must be Hot (Round the clock Operation is advisable). The melt must start with known charge weight and calibrated submersible temperature measurement unit.

2. A continuous supply of electrical energy to the power supply and all auxiliaries is required. The supply line voltage to be in the range -5% to +10% at all times.

3. These charge materials should be dry, free of rust, foundry sand and combustible materials with a minimum of 98% metallic content. For every percentage increase in non-metallic inclusions, the melt rate will decrease by approximately 2% and the consumption of power will increase by adding approximately 10 Kwh / M.Ton.

INDUCTOTHERM

RECOMMENDED MELTING PRACTICE FOR IRON MELT @ 1480°C

INDUCTOTHERM

4. Charge material dimension should not exceed 50% of the furnace melt diameter. The melt should commence no longer than 5 minutes after the previous melt and full power must be drawn.

5. Melt starting with an empty furnace, the weight of the charge material in the furnace must be not less than 30 to 50% of the rated capacity of the furnace.

6. The melting indicators must be closely monitored for maximum power delivery to the furnace.

INDUCTOTHERM

RECOMMENDED MELTING PRACTICE FOR IRON MELT @ 1480°C

INDUCTOTHERM

a) Full Power Lamp - Max. Power
b) Volt Limit Lamp - Add Charge to Furnace
c) Excess Charge Limit Lamp - Sufficient Charge in Furnace

"Full Power" lamp must be "on" through the melt cycle delivering maximum power to the furnace to achieve the Maximum Efficency

"Volt" and "Excess Charge" limit should be used as a guide in feeding the scrap into the furnace, ensuring proper charge amount.

Limit lamp activation requires the furnace operator to add or stop adding charge to the furnace.

INDUCTOTHERM

RECOMMENDED MELTING PRACTICE FOR IRON MELT @ 1480°C

INDUCTOTHERM

2% added for every 10 Kg of non metallic content per M.Ton of charge.
5% added for charge density drop from 1600 to1300 Kg /Cu M

4% added for every 10 Kg /M.Ton of recarburizer.
4% added for melting with 50% of maximum power.
8% added if melting with a heel.

2% added when lid is open for more than 20 minutes while in molten condition.
4% added for superheating per 50°C.

INDUCTOTHERM

VIP – IGBT

INDUCTOTHERM

INDUCTOTHERM

PLASMA DISPLAY

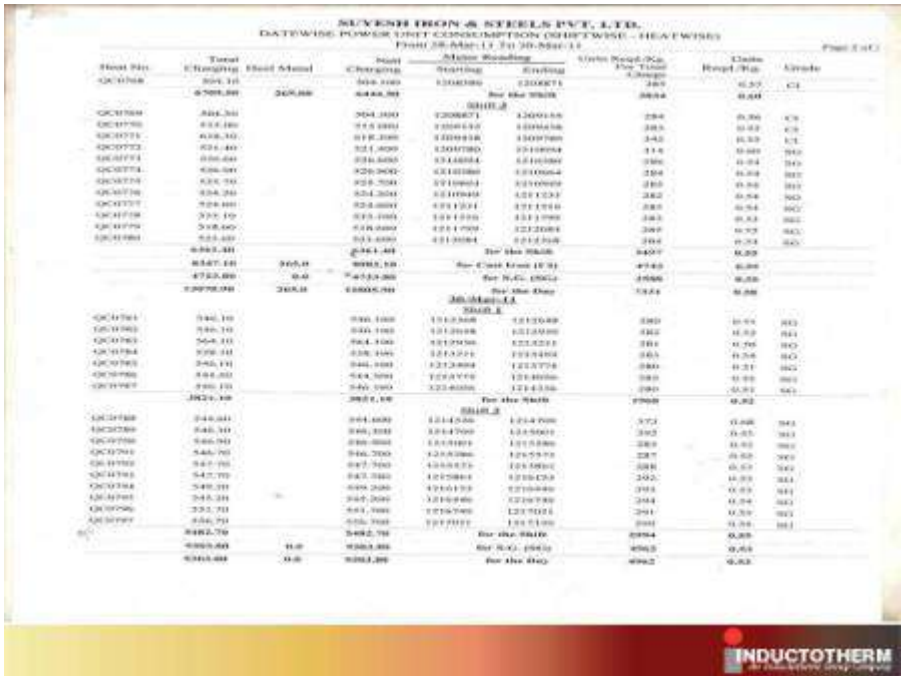
INDUCTOTHERM

INDUCTOTHERM

FIRST IGBT INSTALLATION AT MARVELLOUS VIMARCATTI

IGBT INSTALLATION AT HI – CAST, KOLHAPUR

VIP-IGBT –Performance Feedback

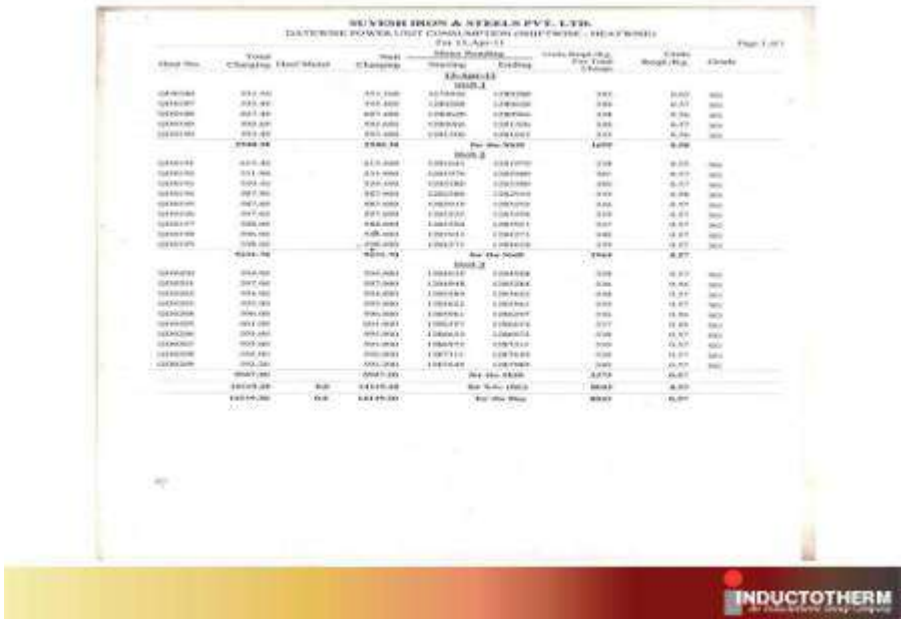


SUVESH IRON & STEELS PVT. LTD.

DATEWISE POWER UNIT CONSUMPTION (SHIFTWISE - HEATWISE)

From 30-Mar-13 To 30-Mar-13

Heat No.	Total Charging	Heel Metal	Net Charging	Meter Reading Starting	Meter Reading Ending	Units Reqd./Kg. For Total Charge	Units Reqd./Kg.	Grade
QC0768	504.10		504.100	1208386	1208871	285	0.57	C1
	6709.00	265.00	6444.00		For the Shift	3854	0.60	
				Shift 2				
QC0769	504.30		504.300	1208871	1209155	284	0.56	C1
QC0770	514.80		514.800	1209410	1209658	283	0.55	C1
QC0771	458.30		458.300	1209658	1209986	342	0.53	C1
QC0772	521.40		521.400	1209780	1210064	314	0.60	SG
QC0773	550.60		550.600	1210054	1210360	286	0.52	SG
QC0774	526.00		526.000	1210360	1210664	284	0.54	SG
QC0775	535.70		535.700	1210664	1210969	283	0.53	SG
QC0776	534.20		534.200	1210969	1211231	282	0.53	SG
QC0777	524.60		524.600	1211231	1211516	285	0.54	SG
QC0778	533.10		533.100	1211516	1211799	283	0.53	SG
QC0779	518.60		518.600	1211799	1212084	285	0.55	SG
QC0780	521.60		521.600	1212084	1212368	284	0.54	SG
	6363.40		6341.40		For the Shift	3407	0.53	
	8347.10	265.0	8082.10		For Cast Iron (CI)	4743	0.59	
	4753.00	0.0	4753.00		For S.G. (SG)	3586	0.75	
	13070.10	265.0	12805.10		For the Day	7329	0.58	
				30-Mar-13				
				Shift 1				
QC0781	546.10		546.100	1212368	1212648	280	0.51	SG
QC0782	546.10		546.100	1212648	1212930	282	0.52	SG
QC0783	564.10		564.100	1212930	1213211	281	0.50	SG
QC0784	558.10		558.100	1213211	1213493	282	0.50	SG
QC0785	545.10		546.000	1213493	1213774	280	0.51	SG
QC0786	544.00		544.000	1213774	1214056	282	0.52	SG
QC0787	546.10		546.100	1214056	1214336	280	0.51	SG
	3921.10		3921.10		For the Shift	1968	0.52	
				Shift 2				
QC0788	544.60		544.600	1214336	1214709	373	0.68	SG
QC0789	546.30		546.300	1214709	1215001	292	0.53	SG
QC0790	546.90		546.900	1215001	1215286	285	0.52	SG
QC0791	546.70		546.700	1215286	1215573	287	0.52	SG
QC0792	547.70		547.700	1215573	1215862	289	0.53	SG
QC0793	547.70		547.700	1215862	1216154	292	0.53	SG
QC0794	549.20		549.200	1216154	1216446	292	0.53	SG
QC0795	548.20		548.200	1216446	1216738	292	0.53	SG
QC0796	551.70		551.700	1216738	1217031	293	0.53	SG
QC0797	550.70		550.700	1217031	1217320	289	0.53	SG
	5482.70		5482.70		For the Shift	2994	0.55	
	9403.80	0.0	9403.80		For S.G. (SG)	4962	0.53	
	9403.80	0.0	9403.80		For the Day	4962	0.53	



SUVESH IRON & STEELS PVT. LTD.

DATEWISE POWER UNIT CONSUMPTION (SHIFTWISE - HEATWISE)

For 31-Apr-13

Heat No.	Total Charging	Heel Metal	Net Charging	Meter Reading Starting	Meter Reading Ending	Units Reqd./Kg. For Total Charge	Units Reqd./Kg.	Grade
				31-Apr-13				
				Shift 1				
					For the Shift			
				Shift 2				
					For the Shift			
				Shift 3				
					For the Shift			
					For S.G. (SG)			
					For the Day			

LIST OF IGBT CUSTOMERS IN KOLHAPUR REGION

1.	MARVELOUS VIMERCATI PVT.LTD	500KW / 500KG
2.	UJWAL ENGINEERING	175KW / 150KG
3.	ALTECH ALLOYS INDIA PVT.LTD	550KW / 500KG
4.	SHREE GANESH FOUNDRY	550KW / 500KG
5.	SUYESH IRON & STEEL PVT.LTD	500KW / 500KG
6.	JSONS FOUNDRY	250KW / 300KG
7.	JSONS FOUNDRY	500KW / 1000KG
8.	HICAST FOUNDRY	350KW / 500KG
9.	MALATI FOUNDERS PVT.LTD	500KW / 500KG
10.	SANMATI COMPONENTS PVT.LTD	550KW / 500KG
11.	NETMECH FOUNDRY	550KW / 500KG
12.	TECHNOSYSTEM	350KW / 500KG
13.	J P F METACAST PVT.LTD.	450KW / 500KG
14.	VICTOR ENTERPRISES	500KW / 500KG

INDUCTOTHERM

INDUCTOTHERM

Presentation by Sh Neeraj Verma
Asst Manager, Energy Efficiency Cell, SIDBI

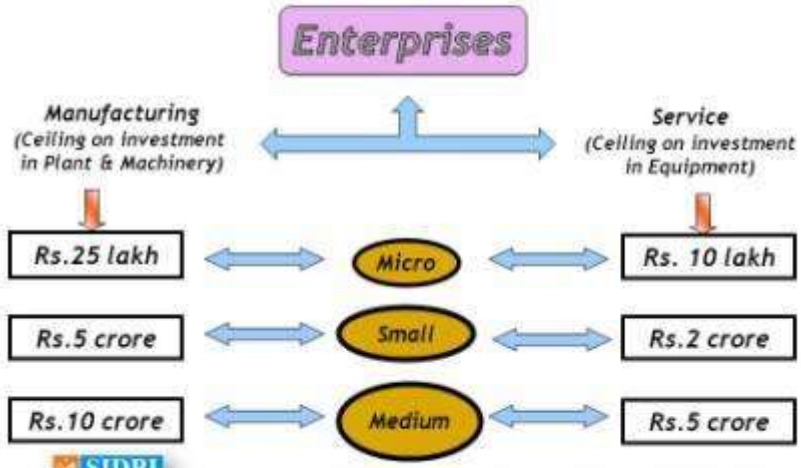
SIDBI's INTIATIVES IN PROMOTING & FINANCING ENERGY EFFICIENCY IN INDIAN MSMEs

Neeraj Verma
Assistant Manager
Energy Efficiency Centre
SIDBI, New Delhi

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

MSMEs - NOMENCLATURE & CLASSIFICATION



SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

An overview of Indian MSME

- **MSME Sector Contribution to Indian Economy**
  - ✓45% of industrial production
  - ✓40% share in exports
  - ✓More than 8000 products
- **Second largest sector after agriculture**
  - ✓More than 2.6 crore units
  - ✓Provides employment to over 6 crore
- **Accelerates the growth of Economy**
  - ✓MSME Growth higher than GDP & industrial growth

MSMEs drive the Indian Economy

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

An Overview of Indian MSMEs

FEATURES –

- Small in size (majority are MSE units)
- Majority of units are proprietorship / family owned concern
- Limited professional management
- Low capital investment & labour intensive
- Obsolete technology/ production process
- Highly energy inefficient.
- Lack of Knowledge about energy efficient production options / technology

Tradition drives the MSMEs

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Why Energy Efficiency

- India has become 5th largest energy consuming country
- Increasing demand of energy
- Huge gap in demand & supply of power / energy
- For economic growth at an average rate of 8% over the next 25 years
  - Energy supply should increase by 3-4 times
- Urgent need to save energy for sustainable development
- Goal to achieve 20% energy efficiency by 2017 (12th Five year Plan)

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India
GO GREEN WITH SIDBI

How MSMEs can benefit from EE

- Opening up of global market → Stiff competition.
- Quality & Cost competitiveness are key factors to sustain.
- Benefits of adopting energy efficient measures.
  - Cost competitiveness, better margins & bottomline
  - Improved quality of finished product
  - Environment issues are also taken care of
- Investment in EE technologies / process may have a pay back period of around 18-30 months or even lower.

Opportunities : Attain high growth trajectory

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India
GO GREEN WITH SIDBI

High Energy Intensive Sectors

Energy Intensive Clusters	No. of Clusters	Remarks
HIGH	152	Casting, engineering, agri implements, auto components, electroplating, fabrication, Powerlooms, stone crushing, ceramics, glass products
MEDIUM	162	Food processing, leather, chemicals, Engg. Equipments, packaging, machinery, rice mills
LOW	74	Weaving, jewellery, toys, silk, etc.
	388	

SIDBI
Small Industries Development Bank of India

GO GREEN WITH SIDBI

SIDBI - BACKGROUND

✓**Established** - in 1990 under an Act of Parliament.

✓**Objective** - Promotion, Financing & Development of MSMEs and Coordinating the activities of institutions engaged in similar activities.

✓**Ownership** - Government of India through Public sector banks/FIs/Insurance Cos. owned or controlled by it.

✓**Structural Linkage** - With Ministry of Finance and Ministry of MSME.

✓**Nodal Agency** - For MSME Schemes of GoI like CDP, TUFS, CLCSS, IDLSS, Food Processing Scheme, etc.

✓**Associate Institutions** - Credit Guarantee Fund, SME Rating Agency, SIDBI Venture Capital Ltd., India SME Technology Services, etc.

SIDBI - Apex Development Financial Institution for MSMEs

SIDBI
Small Industries Development Bank of India

GO GREEN WITH SIDBI

SIDBI : Sphere of activities

Direct Finance : Term Loans, Working Capital, Guarantees, Letters of Credits, Equity, Receivable Finance.

Indirect Finance : Resource support to Banks, NBFCs, SFCs, other State & central financing / development agencies.

Promotion & Development : Rural Industrialisation Programme (RIP), Marketing Support, Cluster Development Programme, Awareness Creation ...

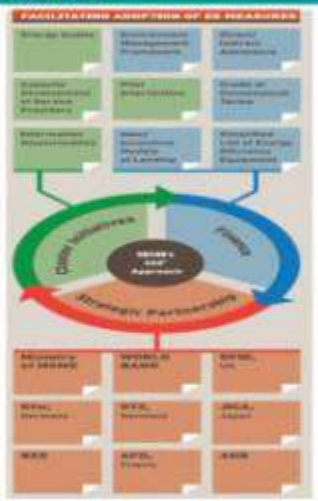
Dedicated office for EE initiatives / interventions -
"ENERGY EFFICIENCY CENTRE" at Okhla, New Delhi

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

SIDBI's Approach in promoting Clean & EE projects in MSME sector

- Recognized sustainable development is the key to MSMEs survival & growth.
- Introduced lending schemes for promoting EE & CP options project in MSME sector.
- Identified list of EE equipments / technologies for each sector.
- Entered into strategic partnership with BEE, TIFAC, The World Bank, DFID, JICA, KfW, Gtz & AFD for promoting & financing clean & EE investments in MSME sector.
- Launched awareness campaigns, energy audits, pilot interventions in MSME clusters.
- Created a separate "Energy Efficiency Centre" for focused approach.



SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Our Strategic Partners in Sustainable Development Initiatives

kfw BANKENGRUPPE

DFID Department for International Development

JICA Japan International Cooperation Agency

TIFAC TECHNOLOGY INFORMATION, FORECASTING AND ASSESSMENT COUNCIL
DEPARTMENT OF SCIENCE AND TECHNOLOGY, GOVT. OF INDIA

afd AGENCE FRANÇAISE DE DEVELOPPEMENT (AFD)

ENERGY IS LIFE B E E CONSERVE IT
Bureau of Energy Efficiency
(Government of India, Ministry of Power)

THE WORLD BANK

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India
GO GREEN WITH SIDBI

SIDBI : Direct Schemes for SME

Eligible projects
- New / Existing projects; expansion / modernization / diversification, marketing requirements, etc.
- Both manufacturing & services sector are covered.

Assistance : Need based

Interest : Competitive depending on the rating of the customer – Current PLR (fixed / floating)
For EE projects / Cleaner Production – May reduce by 0.5% to 1.5%

Security : Flexible, including collateral free lending for loans upto Rs.100 lakh under Credit Guarantee Fund Trust for Micro and Small Enterprises(CGTMSE).

Other Benefits : Dovetailing with GoI subsidy schemes such as CLCSS, TUFS, IDLSS, NMCP, Food Processing based on eligibility.

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India
GO GREEN WITH SIDBI

Government subsidy schemes

Credit Linked Capital Subsidy Scheme (CLCSS):
Capital subsidy of 15% of cost of plant & machinery or Rs.15 lakh, whichever is lower for adoption of proven technologies for approved products / sub-sectors.

Technology Upgradation Fund Scheme (TUFS) for Textile & Jute Industries: Interest subsidy of 5% plus additional capital subsidy of 10% or capital subsidy of 15% under CLCS - TUFS.

Integrated Development of Leather Sector Scheme : Scheme for existing units in leather and leather products. GoI provides grant upto 30% of cost of plant and machinery for SSIs and 20% for non SSIs subject to a ceiling of Rs.50 lakh.

Government subsidy schemes

Technology Upgradation / Setting up / Modernization / Expansion of Food Processing Industries
25% of the cost of eligible P&M and technical civil works subject to a maximum of Rs.50 lakh in general areas and 33.33% up to Rs.75 lakh in Difficult areas.

Technology and Quality Upgradation Support to MSMEs (TEQUP Scheme)
- Under National Manufacturing Competitiveness Programme (NMCP) of Ministry of MSME, GoI.
- 25% of the Cost of P&M for implementation of Energy Efficient Technologies (EET) or Rs.10 lakh, whichever is lower.

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India
GO GREEN WITH SIDBI

Green Loan Scheme for MSMEs
(For SIDBI's Existing Borrowers)

Eligible Activities:

- Purchase of equipments / machinery as per EE equipment list.
- Investment in Renewable Energy for captive consumption.
- Expenditure on energy audit / environment compliance audit / pollution control & management consultancy services.
- Expenditure on green rating, BEE star rating of its product, etc.
- ISO 14000 or other accredited environmental certification.
- CDM registration related expenditure.

Annual Quantum of Assistance: 50% of average net cash accruals for last two years, subject to maximum of Rs.25 lakh per financial year.

Simplified & quick sanction mechanism

Interest rate : Fixed interest rate of PLR -1% p.a.

SIDBI
Small Industries Development Bank of India

GO GREEN WITH SIDBI

SIDBI : Equity Assistance Scheme for SME

Equity support to well run SMEs to enable them to scale up their operations

Deal Size - Generally upto Rs.5 crore

Instruments

Equity capital or Equity linked Instruments
Sub-ordinate Debt

Investment Tenure : Horizon of about 5-7 years

Exit : Trade sale or listing / Buyback

SIDBI
Small Industries Development Bank of India

GO GREEN WITH SIDBI

TIFAC-SIDBI Fund for Technology Innovation (Srijan Scheme)

- Revolving Fund of Rs.30 crore.
- For development, upscaling, commercialisation of innovative technology projects.
- Development loan at soft & flexible terms.
- Assistance upto 80% of the project cost which generally would be Rs.100 lakh. Intangibles like Patents / Copyrights / Technology Transfer fee / licensing / marketing / brand building expenses are also eligible.
- Interest rate – Not more than 5% p.a.

SIDBI
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Line of Credits to SIDBI

- **KFW Environmental Line I-** **Euro 15.24 million** from KfW, Germany in 2003.
  Duration of the Project – Feb. 2004 – Dec.2008
  Status : Fully utilized, 39 projects covered.
- **JICA Energy Saving Line** - **JPY 30 billion [Rs.15.8 billion]** from Japan International Cooperation Agency (JICA).
  Duration of the Project – 3 years from August 2008
  Status : Fully utilized, provided assistance to more than 3400 MSMEs.
- **KFW Environmental Line II-** **Euro 38.50 million** from KfW, Germany in 2009.
  Duration of the Project – Nov.2009 – Oct. 2011
  Status : Provided assistance to around 100 MSMEs with aggregate assistance of around Rs.18 crore.

SIDBI
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Line of Credits to SIDBI

- **KFW Energy Efficiency Line** - **Euro 50 million** from KfW, Germany in 2009

  Duration of the Project – Nov.2009 – Oct. 2011

  Status : Provided assistance to around 200 MSMEs with aggregate assistance of around Rs.80 crore
- **AFD Energy Efficiency Line** - **Euro 50 million** from AFD, France in 2010.

  Duration of the Project – May 2010 – May 2014

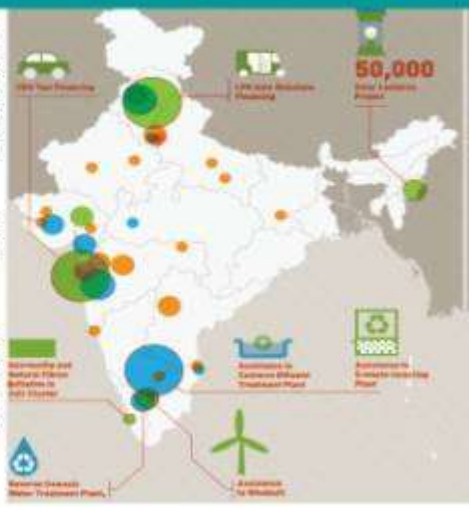
  Status : Fully utilized provided assistance to around 1200 MSMEs.
- **WorldBank Line of Credit** - Environment and Social Risk Management Framework (ESMF) under WB-LoC (**USD 120 Million**) and WB-LoC-Additional (**USD 400 Million**).

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Some examples....

- **CNG Taxi Financing, Mumbai –** Collateral free loans provided to **950 taxi drivers** in Mumbai to phase out their old taxis under a structured arrangement with Taxidrivers Association and Maruti Suzuki.
- **Solar Lanterns in Manipur –** Micro loans to the ultimate beneficiaries in Manipur for purchasing **50,000 solar lamps**.
- **Channel Financing** - Partnered with NBFCs, to provide loans to MSEs to acquire energy efficient equipment under a simplified credit delivery mechanism without any collateral security.



SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Other Initiatives

- MoU with BEE – Financing for 500 DPRs from 25 clusters
- Information Dissemination
  - 4 handbooks on EE measures in Ceramics, Engineering, Foundry and F&V processing sectors released in Hindi and English and multiple languages (Gujarati, Marathi, Oriya, Kannada, Tamil & Bengali).
  - 6 EE Posters – 3 General & 3 sector specific.
  - Tip Sheets for increasing EE of MSMEs.
  - Awareness programmes in MSME clusters.
- Facilitated over 100 walk through EE audits in 19 MSME clusters with 15 complete audits.
- Supported SMERA to develop Green Rating model for MSMEs. Green Rating for Steel sector developed and for other sectors is in offing. Grant support to 50 MSME units to take up green rating of their facilities.

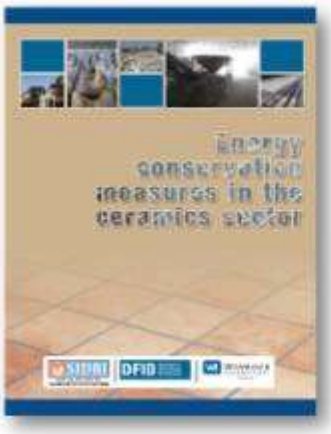
SIDBI
Small Industries Development Bank of India
GO GREEN WITH SIDBI

Awareness Campaigns- Sectors / clusters covered

1. Kolhapur- Foundry
2. Rajkot- Forging
3. Morbi -Ceramic
4. Surat- Textile
5. Pune-Auto Comp. & Food Processing
6. Mumbai-General Engineering
7. Vapi- Paper & Chemicals
8. Coimbatore- Forging
9. Chennai- Leather
10. Tirupur -Textile
11. Bangalore-Electricals & Electronics
12. Ludhiana -Textile
13. Jalandhar- Hand Tools
14. Faridabad-General Engineering
15. Gurgaon-Auto, Engineering & Textile
16. Jaipur-Foundry & Steel re-rolling
17. Indore- Pharma & Engineering
18. Kolkata – Foundry & leather

SIDBI
Small Industries Development Bank of India
GO GREEN WITH SIDBI

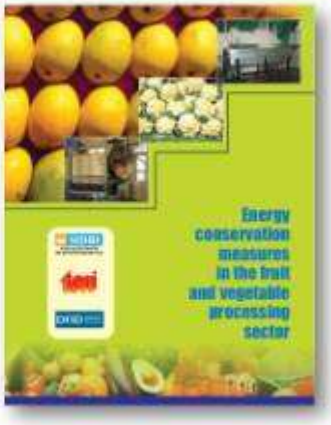
Energy Efficiency Booklets



SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

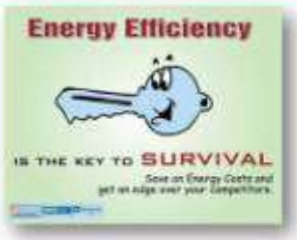
Energy Efficiency Booklets



SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

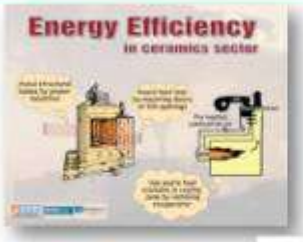
Energy Efficiency Posters

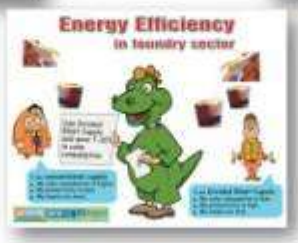


SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Energy Efficiency Posters

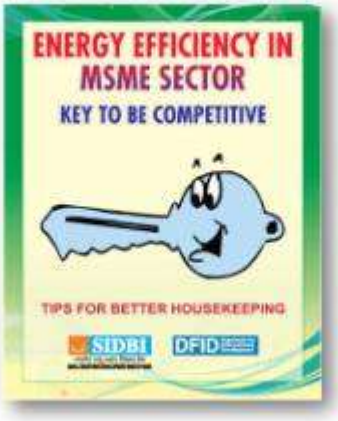




SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Energy Efficiency TIPS Booklet



SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Other Initiatives...

- **World Bank – GEF Project (Co-implementing by SIDBI and BEE)**
- **Objective**:
  - To increase EE awareness and Capacity Building of Industry Associations, Training of Bank officers to evaluate EE projects.
  - To increase EE investments and knowledge management activities.
- Focused effort in 5 energy intensive clusters (**Kolhapur** - Foundry, **Pune** - Forging, **Tirunelveli** - Limekilns, **Ankaleshwar** - Chemicals, **Faridabad** - Mixed) and Broad Support to BEE in additional 25 clusters.
- 100% support to cover the 'soft costs' of an initial pipeline of approx 500 projects.

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Other Initiatives...

- **CDM Project for MSME Stainless Steel Re-rolling sector**
  - In association with ISTSL and KfW
  - Baseline has been created
  - Implementing a pilot demonstration project in Jodhpur
  - Validators are being appointed
  - Project to be registered with UNFCCC
  - MSME units implementing EE technologies under the project shall be provided financial assistance as soft terms
  - Carbon Credits generated under the project shall be shared with the Industry
  - Around 400 MSME units in Steel Re-rolling sector shall be benefited from the project
  - Model to be replicated for other industry sectors.
- **Identify synergy in activities with BEE, Ministry of MSME, IREDA, etc. for focused interventions & and joint initiatives.**

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Other Initiatives...

- **Launch of website (**www.msmementor.in)
  - Joint initiative of SIDBI, NSE and PRIME Database.
  - India's first online platform where Professionals/ BDS Providers from all over the country and across all disciplines are available to mentor, guide and hand-hold MSMEs. MSMEs can identify and reach the experts they need, through a simple but powerful search mechanism.
  - Free for both Professionals/ BDS Providers to enrol and for MSMEs to search.
  - Around 6150 Professionals/ Experts have already submitted their detailed profiles and are available to mentor MSMEs. This includes:
    - 1860 Engineers of which 481 are from IITs, 83 from BITS
    - 191 are/were Civil Servants, 352 IIM Graduates, 559 PhDs
    - 105 Current/Ex Professors at IITs/IIMs/IISc
    - 452 Graduates from Foreign Universities
    - 1393 CAs, 754 Company Secretaries, 318 Cost Accountants
    - 980 Lawyers and 63 Medical Doctors

SIDBI
भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Thank You

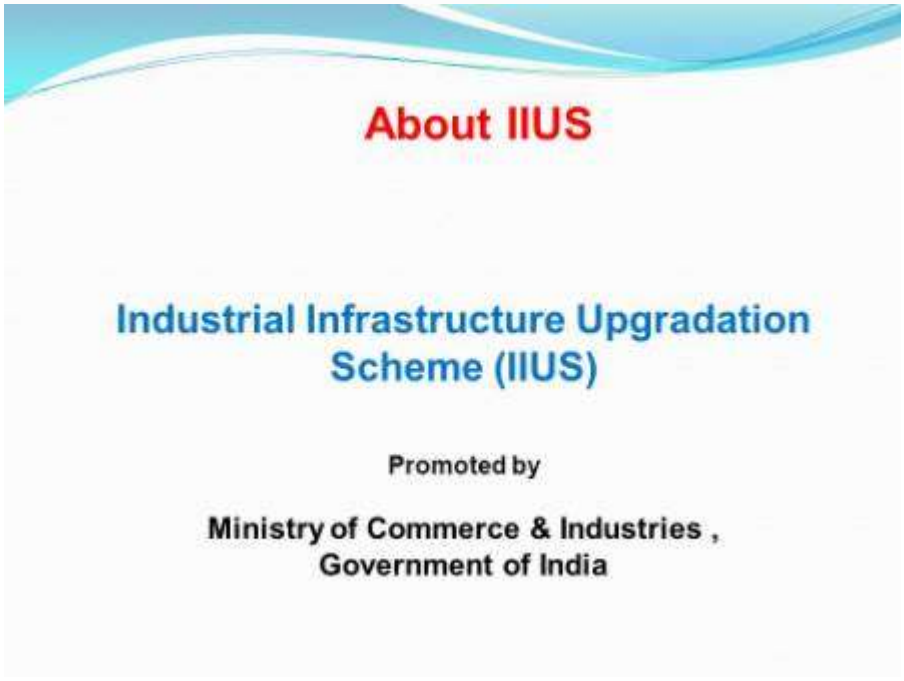
For any further information You can mail to:
Shri Rajiv Kumar (rajivkr@sidbi.in)
DGM, Energy Efficiency Cell
&
Shri Neeraj Verma (neerajverma@sidbi.in)
AM , Energy Efficiency Cell

SIDBI

भारतीय लघु उद्योग विकास बैंक
Small Industries Development Bank of India

GO GREEN WITH SIDBI

Presentation by MITCON



OBJECTIVE

To enhance Competitiveness of the Industry located in the Cluster by providing quality Infrastructure through Public-Private Partnership

FUNDING PATTERN

GoI support under the Scheme by way of Grant Upto 75 % of the project Cost with a ceiling of Rs. 60 crore.

IMPLEMENTATION

The Implementing Agency is Special Purpose Vehicle (SPV) Company registered under Company Act 1956 , Section 25

ABOUT

KOLHAPUR FOUNDRY & ENGINEERING

CLUSTER UNDER IIUS

SPV MEMBERS

- KOLHAPUR ENGINEERING ASSOCIATION
- GOKUL SHIRGAON MANUFACTURERS ASSOCIATION (GOSHIMA)
- SHIROLI MANUFACTURER'S ASSOCIATION KOLHAPUR (SMAK)
- L.K. AKIWATE INDUSTRIAL CO-OP. ESTATE
- CHATRAPATI SHAHU CO-OP. INDUSTRIAL ESTATE
- ADVISORY ROLE : INDIAN INSTITUTE OF FOUNDRYMEN (IIF)

PROPOSED PROJECT COMPONENTS

• Sand Reclamation Plant

- More than 250 Foundry Units in Kolhapur region
- Total Casting of 25,000 Tons per month
- The quantity of sand dumping is about 2500 Tons per month
- Major problems of waste material management
- Dumping & land filling sites are not available
- Two plants proposed at Shiroli and Gokul shirgaon for

PROPOSED PROJECT COMPONENTS

- **Testing Laboratory & Tool Room**

  - To certify material as per worldwide standards
  - To guide Cluster members about Material Qualities
  - To advise for Equivalent Materials
  - To guide about Material Specifications for Designing any Product

PROPOSED PROJECT COMPONENTS

- **Testing Laboratory & Tool Room**

  - Advanced Machines for Tool Making
  - Rapid Prototyping Facility

PROPOSED PROJECT COMPONENTS

- **Import Export House**
  - Information about Global Scenario of Foundry
  - Conduct Program on Awareness Creation for Export Potential
  - Information about Export Documentation
  - Arrange Buyers Sellers Meets
  - Participate in International Trade Fares
  - To act as a Catalyst for Foreign Collaboration

PROPOSED PROJECT COMPONENTS

- **Quality System Support**
  - To Train the Cluster Members for Advance System Tools & Technique such as 6 sigma, TQM, MQV, etc.
  - Conducting Training Programs for Middle Management
  - Consultation for Quality System Certification
  - Conducting Internal Quality Audit at Member Industry

PROPOSED PROJECT COMPONENTS

- **CAD-CAM Center**
  - CAD - CAM Facility
- **Common Facility Center**

  (With facilities like Exhibition Hall, Conference Room, Meeting Hall & Auditoriums)

PROPOSED PROJECT COMPONENTS AT KOLHAPUR ENGINEERING ASSOCIATION

- **CAD-CAM Center**
  - CAD - CAM Facility for undertaking Projects & Training
- **Pollution Control Laboratory**

i

PROPOSED PROJECT COMPONENTS AT AKIWATE INDUSTRIAL ESTATE

- **Up gradation of Infrastructure Facilities**
  - Roads
  - Drainage system,
  - Water supply,
  - Street lights
  - CETP
- **Marketing Center**

PROPOSED PROJECT COMPONENTS AT SHAHU INDUSTRIAL ESTATE

- **Up gradation of Infrastructure Facilities**
  - Roads
  - Drainage system,
  - Water supply,
  - Street lights
- **Information & Communication Center**

COST OF PROJECT & MEANS OF FINANCE

- Total Project Cost : Rs. 74.84 Crore
- Share of SPV @ 15% : Rs. 11.22 Crore
- Grant from GoM @ 10% : Rs.07.48 Crore
- Grant from GoI @ 75% : Rs. 56.14 Crore under IIUS

Implementation Schedule

Implementation Period of 24 months from the Sanction of the Project

Present Status of the Project

- In-principal sanction has been received for the Project from Ministry of Commerce & Industries ,Govt. of India
- Project will get Final Sanction shortly.

THANK YOU

Sample filled-in Feedback Form

First Technical Workshop

Kolhapur Foundry Cluster

(Under BEE-WB-GEF Program)

Organized by

WINROCK INTERNATIONAL INDIA

Residency Club, Kolhapur

May 13, 2011

Supported by

Bureau of Energy Efficiency
Ministry of Power, Government of India

FEEDBACK FORM

1. Name & Address of the Company with Phone / Fax No.

   SHREE SHEROTECH PVT. LTD.
   D-31 MIDC Shiroli,
   Kolhapur - 416122
   TEL - 0230 - 2469704

2. Name & Designation of the contact person with Phone / Mobile No. and E mail

   MR VIRENDRA S. PATIL
   cell +91-9970966333
   email patil_virendra@hotmail.com

3. How do you rate this Technical Workshop:

   a) Logistics Arrangement:

   Poor Average Good ✓ Very Good Excellent

   b) Technical Contents:

   Poor Average Good Very Good ✓ Excellent

   What improvements would you like to see in future programmes?

   On time start.

4. Have you understood the broad objectives of BEE-WB-GEF project for your cluster?

   ☑ Yes ☐ No

   Please mention any additional information/ clarification required:

   Starting point for above project.

5. How would you like to get associated in future project activities:

   - Media & Outreach Activities;
   - ✓ Walkthrough/ Preliminary Assessment Audits;
   - ✓ Detailed Energy Audit & preparation of DPRs;
   - ✓ Knowledge Sharing, etc.

1

6. Have you availed any financing facility in the past? If yes, from which bank.

SBI

7. Have you ever applied/ availed any financing for technology transfer/ up-gradation? Please mention the diffuculties faced, if any

NONE. NOT YET.

8. Are you interested in implementing energy saving projects in your unit?

☑ Yes ☐ No

Please specify: Melting efficiently.

9. Are you interested in upgrading the present processing method to DBC/IGBT/Multiple Output power supply/ Cokeless Cupola?

YES.

10. Are you willing to be part of Cluster Common Resource Person?

YES.

11. Please let us know the support you would like to seek from the BEE-WB-GEF Project

- ✓ Technical inputs support for energy saving project identification & implementation
- ✓ Training of plant personnel
- ✓ Financing Support for identified energy saving project
- ✓ Institutional development
- ✓ Information dissemination
- Any other support (Please indicate)