Capacity Building workshop

Kaizen in Induction furnace

20th February 2018 at Belgaum

Under the project

Capacity Building of Local Service Providers (LSPs)

Supported by

GEF-UNIDO-BEE Project

Promoting Energy Efficiency and Renewable Energy in selected MSME clusters in India

Table of contents

Workshop summary

Overview of workshop

Capacity Building workshop of Local Service Providers (LSPs) on Kaizen in Induction furnace was organized by TERI on 20th February 2018, Tuesday in association with Belgaum Foundry Cluster (BFC) under GEF-UNIDO project. Total 38 participants were present during the workshop and for the industry visit, which was organized after the workshop. Agenda of the workshop and list of participants are attached in the annexure 1 and annexure 2 respectively.

Summary of points discussed in the meeting

Mr. Sadanand Humbarwadi, UNIDO welcomed the participants in the capacity building workshop. He highlighted that, in a typical foundry unit induction furnace is primary equipment responsible for production and energy consumption and implementation of Kaizens can improve the productivity with reduction in energy consumption in induction furnaces significantly. He encouraged participants to take advantage of TERI experts during workshop, which are made available by UNIDO for capacity building of LSPs.

Mr. Ashish Sakhare, TERI, gave descriptive presentation on introduction to the Lean manufacturing with examples of types of wastes in foundries. He explained in details the principles of Lean manufacturing which will guide us to the perfection. He also mentioned the team efforts required for implementation of the Kaizens in the foundries with the help of a Suggestion scheme and shared some examples of Kaizens case studies.

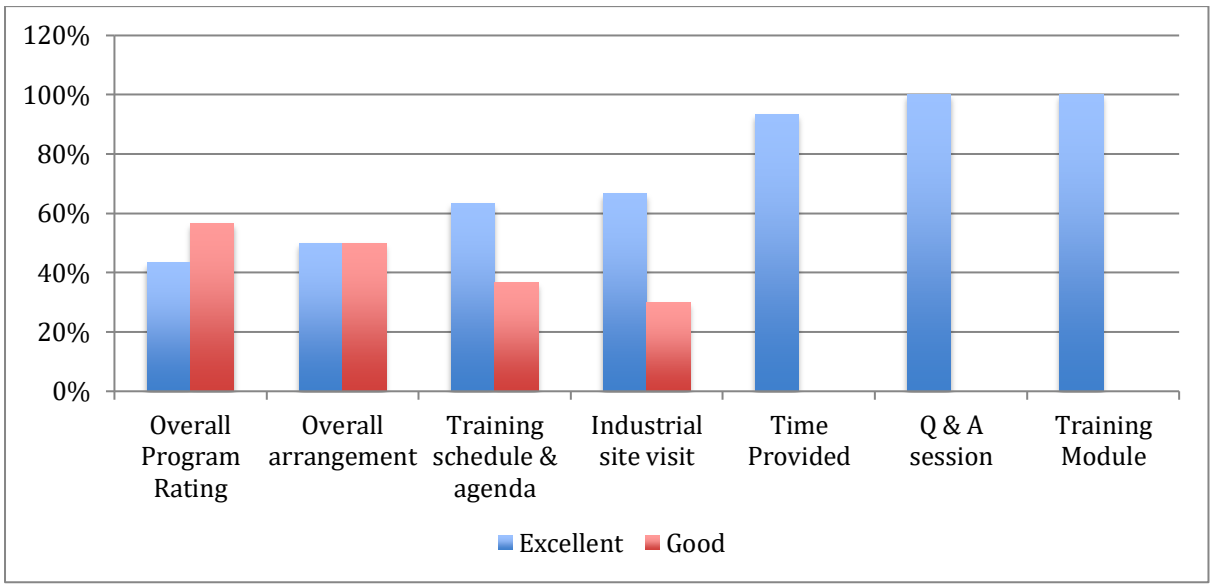
Mr. Jaydeep Lengade, lean expert from the cluster shared his experiences about the implementation of lean manufacturing in the Belgaum cluster. He also spoke about the importance of implementation of Kaizens in the processes associated to the Induction furnace to improve overall productivity of the foundry. He explained in detail the areas where it is possible to improve operating practices, which eventually results in significant amount of energy savings. He explained about how energy efficient machines though high cost can result in lower running cost over a lifetime due to its efficient operation.

Mr. Nilesh Shidge, TERI gave presentation on actual case studies of implementation of Kaizen in induction furnace and implementation done by TERI in foundries. He mentioned the importance of monitoring for identification of non-value added activities in the induction furnace operation. He also shared and experience of implementation of Kaizens and benefits of implementation in productivity, energy consumption, time reduction, workplace environment etc.

After the lunch, plant tour through the M/s Belgaum Ferrocast (I) Pvt. Ltd. And M/s J.P.F. Metacast Pvt. Ltd. was arranged, so that participants can experience the actual implementations done for productivity improvements (Kaizens) and lean practices followed by the unit. Selected photos of the workshop and visit are attached in the annexure 3.

Feedback forms

Based on the analysis of the feedback forms received from the participants, it is observed that workshop was well received by the participants and 100% participants were satisfied with Q&A session and training module provided to them. More than 60% of participants were rated training schedule and industrial site visit as "Excellent". More than 40% participants have rated overall program as "Excellent" while rest of them have rated it as "Good". About 90% of participants were satisfied with arrangements made and time provided. Few sample feedback forms are attached in the annexure 4.



Analysis of feedback forms

Suggestions by participants

Some participants have made suggestions as follows;

1) Requirement of detailed shopfloor training for Kaizen implementation
2) More detailed and specific case studies on the topic

Learning's by participants

Some of the topics learned by the participants and mentioned by them are listed below;

1) Brief understanding of Lean principles
2) Workplace organisation
3) Cycle time reduction
4) Feeding material sequence and size
5) Monitoring & data collection for induction furnace
6) Same size of crucible and pouring ladle to reduce losses

Annexures

Annexure 1: Agenda of the program

Capacity building workshop

Kaizen in induction furnace

Tuesday, 20 February 2018

Training Hall, Belgaum Foundry Cluster

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Agenda

10:00 – 10:30	**Registration**
10:30 – 10:35	**Welcome Address** Mr Ram Bhandare, Chairman, Belgaum Foundry Cluster
10:35 – 10:45	**GEF-UNIDO-BEE project and initiatives in Belgaum cluster** Mr Sadanand Humbarwadi, UNIDO Cluster Leader - Belgaum
10:45 – 11:15	**Introduction to lean manufacturing** Mr Ashish Sakhare, TERI
11:15 – 11:30	Tea Break
11:30 – 12:15	**Kaizen in induction furnace: Case study** Mr Nilesh Shedge, TERI
12:15 – 13:00	**Experience of lean cluster activity in Belgaum** Mr Jaydeep Lengade, Aditya Consultants
13:00 – 14:00	Lunch
14:00 – 16:00	**Site Visit / On-site training** Visit to a foundry unit in Belgaum
16.00 – 16:30	Feedback from participants
16:30 – 16:45	**Vote of thanks**

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Annexure 2: List of participants

S. No	Name	Organization	Mobile No	Email ID
1.	D P Yallurkar	A K P Foundries Pvt ltd	9448451855	akpfdy@akpfoundries.com
2.	Jotiba Hindole	A K P Foundries Pvt Ltd	9448497515	maintenance@akpfoundries.com
3.	N B Halolli	Allied Foundries	9449557943	nbhalolli@gmail.com
4.	Appaji Ehibbulkar	Prabat Castings	9483593204	appaji1994@gmail.com
5.	Sachin Chavan	Kapeel Foundries	9448076825	kapeelfoundries@yahoo.com
6.	Bhushan G Mayale	Shree Enterprises	9241695987	darshan_bgm@yahoo.co.in
7.	Balagouda S Patil	BIG Castings Pvt Ltd	9611991776	Pgouda8@gmail.com
8.	Anil D K	BIG Castings Pvt Ltd	9980508937	anilknot7262@gmail.com
9.	B L Patil	Ashok Iron Works Pvt Ltd	9527593415	-
10.	Raghavendra Hebsur	A K P Ferrocast Pvt Ltd	9481559411	raghavho24@gmai.com
11	M R Kulkarni	I H Castings	8217794727	ihckulkarni@gmail.com
12.	S N Kanchi	A K P Ferrocast	9480808964	
13	M A Bhajartai	Phoenix Products	9914020188	phoenixproductgm@gmail.com
14.	Gajanan A Uchukar	Phoenix products	8095081043	Gajananuchchukar60@gmail.com
15.	Sunay S Patil	Bharat Iron Works	9972492555	Sunay.bisw@gmail.com
16.	Nagaraj Mali	Akash Metal Forming	9611970449	nagrajmalo09@gmail.com
17.	Gaurav Pandit	J P F Metacast Pvt Ltd	9620201518	gauravpandit@jpfmetacast.com
18	Darshan Joshi	Plasma Induction	7507779938	kop@plasmainduction.com
19	Sameer Kanabargi	Phoenix Products	9448480724	phoenix_bgm@hotmail.com
20	P Nagaraj	Belgaum Ferrocast Pvt Ltd	9480839971	-
21	Vasu Hebbalkar	Belgaum Ferrocast Pvt Ltd	9480839929	-
22	M Z Maniyar	AIW PI	8147659959	mohdammar9959@gmail.com
23	K L Managaut	J P F Metacast Pvt Ltd	9449466565	-
24	N Chandilkar	Gokul Ferrocast	9972171300	lab@gokulferrocast.com
25	Namdev Patil	Gokul Ferrocast	9731791600	namdevyp@gmail.com
26	Basavarad K	Technosystems	8197616300	-
27	Jaydeep Lengade	Aditya Consultancy	9449666046	jaydeeplengade@yahoo.com
28	Somkumar D Patil	Belgaum Foundry Cluster	9742164712	bfcgubprojects@gmail.com
29	S M Kale	BFC	9449937897	-
30	Vinayak Havel	Mangal Founders	9343660377	info@mangalfounders.com
31	Shivayogi B	Atuni Steel Cast	9141824290	atunisteelcast@gmail.com
32	Veeresel N M	Siddeshwar Founders	8722483337	-
33	Nishant Madali	Hindustan Engineers	9035072766	nishant.bgm@gmail.com
34	Ramelh Khangaonkar	Allied Founders	9902852709	maintenance@alliedfoundersindia.com
35	Sunil Gaude	Glare Cast	8861857870	-
36	Nilesh Shedge	TERI	9978601047	nilesh.shedge@teri.res.in
37	Ashish Sakhare	TERI	8587923342	ashish.sakhare@teri.res.in
38	S D Humbalwadi	BEE	9448272499	sadanamddh@gmail.com

BELGAUM FOUNDRY CLUSTER

CAPACITY BUILDING WORKSHOP Kaizen in induction furnace					20.02.2018
SL NO	NAME OF THE PARTICIPANT	NAME OF THE COMPANY	CONTACT NO.	EMAIL ID	SIGNATURE
1	D. P. Yallurkar	A. K. P. Foundries Pvt.	9448451835	akpfdy@akpfoundries	
2	Jotiba Hindole	AKP Foundries Pvt. Ltd	9448497515	maintenance@akpfoundries.com	
3	N. B. Halolli	Allied Foundries	9449557943	nbhalolli@gmail.com	
4	Appaji. Shibbukar.	prabhat castings	9483593201	appaji1994@gmail.com	
5	Sachin. Chavan	Kapeel founders	9448076825	kapeelfounders@yahoo.com	
6	Bhushan G Magale	Shree Enterprises	9241695987	bhushan_bgm@yahoo.co.in	
7	Balagouda S. patil	BIR. Casting PVT. LTD	9611991775.	Pgouda8@gmail.com	
8	Anil. D. Kawal	BIR Casting PVT. LTD	9980508937	anilkawal7262@gmail.com	
9	B. L. Patil	Ashok Iron Works pt. I	09527593411		
10	Raghavendra. Hebsur	Akp Ferrocast. Pvt Ltd.	9481559411	raghavhs24@gmail.com	
11	MR Kulkarni	IH Castings	8217794727	ihckulkarni@gmail.com	
12	S. N. Kanchi	AKP Ferrocast	9480808964		
13	M. A. Bhajantri	Phoenix Products.	9964020188	phoenixproductbgm@gmail	
14	Ratanan A. Uchukar	Pheenix product. Bgm	8095081043	Ratananuchchukar66@gmail	
15	Sunay. S. Patil	Bharat Iron Works	9972492555	Sunay.bisw@gmail.com	
16	Nagaraj Mali	Akash met Form Foundry	9611970443	nagarajmali09@gmail.com	
17	Gaurav Pandit	J.P.F Metacast Pvt ltd	9620201518	gauravpandit@jpfmetacast.com	
18	Darshan Joshi	Plasma Induction	7507779938	kop@plasmainduction.com	

19	Sameer Kanabargi	Phoenix Products	9448450724	phoenix_bgm@hotmail.com	
20	P. Nagaraj	Belgaum Ferrocast (I) Pvt Ltd	9480839971		
21	Vasu Hebbalkar	———	9480839929		
22	M.Z. Maneyar.	ATW PI.	8147659959	mohdammar9959@gmail.com	
23	K.L Managuyi	JP. F metacast machine	9449466565		
24	N. Chandilkar	Gokul ferrocast	9972171302	lab@gokulferrocast.com	
25	Mamdev Patil	———	9731791660	namdevyp@gmail.com	
26	Basavaraj. K.	Technosystem.	8197616300.		
27	Jaydeep Lengade	Aditya Constructions	9449660446	jaydeeplengade@yahoo.com	
28	Sonukumar. D. Patil	Belgaum Foundry clusters	9742164712	bfcgub@gmail.com (projects)	
29	S M Kale	B.I.F.C	9449937897		
30	Vinayak Haval	Mangal founders	9343660377	info@mangalfounders.com	
31	Shivayogi Balagi	Atuni Steel Cast	9141524290	atunisteelcast@gmail.com	
32	Veeresh i NIM	Siddeshwar Foundry	8722248333		
33	Nishant Madali	Hindustan Engineers	9035042766	nishant.bgm@gmail.com	
34	Ramesh Ichangaonkar	Allied Founders	9902852709	maintainance@alliedfounders	
35	Sunil Gunde	Glow Cast	8861857870	inbox.com	
36	Nilesh Shedge	TERI	9378601047	nilesh.shedge@teri.res.in	
37	Ashish Sakhare	TERI	8587923342	ashish.sakhare@teri.res.in	
38	S.D. Humbarwadi	BEE	9448272493	sadanandh@gmail.com	
39					

Annexure 3: Selected photographs of the event






Annexure 4: Sample feedback forms

Capacity building workshop

Kaizen in induction furnace

Tuesday, 20 February 2018

Training Hall, Belgaum Foundry Cluster

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Evaluation Sheet for Participants

Feedback Form for Participants

Parameter	*Feedback*		
	Excellent	Good	Average
How would you rate the overall programme?	✓		
How would you rate overall arrangements?		✓	
How was the training schedule and agenda?	✓		
How was the industrial site visit?	✓		
Do you think that adequate time was provided for each topic?	Yes [✓]	No [ ]	
Do you think that satisfactory answers were given to your questions during the training programme?	Yes [ ]	No [ ]	
Do you think that the background training manual is informative and useful enough?	Yes [✓]	No [ ]	
Do you think that the discussion on EE/RE will help you in your work?	Yes [ ]	No [ ]	

Suggestions & Recommendations for improvement:

Name two learning, which from this programme you will be able to implement in your plant?

① Minimum air gap in Raw material.
② At the furnace loading time materials sorting

Signature:	Anand
Name of participant:	Anand Jungaweerkar.
Organization:	Glow Cast
Mobile No:	9980706732
Email ID:	glowcast14@gmail.com.

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The Energy and Resources Institute

Capacity building workshop

Kaizen in induction furnace

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Do you think that adequate time was provided for each topic?	Yes [✓]	No [ ]	
Do you think that satisfactory answers were given to your questions during the training programme?	Yes [✓]	No [ ]	
Do you think that the background training manual is informative and useful enough?	Yes [✓]	No [ ]	
Do you think that the discussion on EE/RE will help you in your work?	Yes [✓]	No [ ]	
Suggestions & Recommendations for improvement:			
More Examples of Case study on Implementations of Kaizens or steps taken for Energy conservations.			
Name two learning, which from this programme you will be able to implement in your plant?			
1) Using Lid Cover.			
2) Using good raw material & Kaizens on Bad raw material			
3) Electrical Safety Lug Temperature checking & Replacing.			
Signature:			
Name of participant:	Nishant Modale		
Organization:	Hindustan Engineering		
Mobile No:	9035072766		
Email ID:	nishant.bgm@gmail.com		

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How was the industrial site visit?			
Do you think that adequate time was provided for each topic?	Yes [ ]	No [✓]	
Do you think that satisfactory answers were given to your questions during the training programme?	Yes [✓]	No [ ]	
Do you think that the background training manual is informative and useful enough?	Yes [✓]	No [ ]	
Do you think that the discussion on EE/RE will help you in your work?	Yes [✓]	No [ ]	

Suggestions & Recommendations for improvement:

Nice training program, needes more time on detailed information about induction furnace

Name two learning, which from this programme you will be able to implement in your plant?

cleanliness

Time management cycle in melting

Signature:

Name of participant: Sanjaykumar D. Patil

Organization: Belgaum Foundry cluster

Mobile No: 9742164752

Email ID: bfcgubproject@gmail.com

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Do you think that satisfactory answers were given to your questions during the training programme?	Yes [✓]	No [ ]	
Do you think that the background training manual is informative and useful enough?	Yes [✓]	No [ ]	
Do you think that the discussion on EE/RE will help you in your work?	Yes [✓]	No [ ]	

Suggestions & Recommendations for improvement:

⇒ Over all training is good, but need shop floor training to worker and operator.
⇒ Involve maintainance person too.

Name two learning, which from this programme you will be able to implement in your plant?

(1) Monitoring furnace holding for low H.T.
(2) Will implement log sheet graph for kaizen

Signature:	
Name of participant:	Narayan L. Chameli / Kgr
Organization:	Gokul ferrocast Pvt Ltd.
Mobile No:	9972171300
Email ID:	lab@gokulferrocast.com.

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Annexure 5: Copy of presentations

20th February 2018

teri
Creating Innovative Solutions
for a Sustainable Future

teri
Creating Innovative Solutions
for a Sustainable Future

Content

- History
- Lean Principles
- Goals
- Type of wastes
- Lean Tools
- Kaizen

teri
Creating Innovative Solutions
for a Sustainable Future


History
In 1990 James Womack, Daniel T. Jones, and Daniel Roos wrote a book called "The Machine That Changed the World: The Story of Lean Production- Toyota's Secret Weapon in the Global Car Wars That Is Now Revolutionizing World Industry"
In this book, Womack introduced the Toyota Production System to World.
What was new was a phrase-
"Lean Manufacturing."
5S
TPM
Zero Defects
Zero Accidents
Zero Breakdowns
KANBAN
KAI=Change
ZEN=Good
KAIZEN
(Continual Improvement)
SMED
Single Minute
Exchange of Die
& Mold
Maintenance
teri
Creating Innovative Solutions for a Sustainable Future
Lean Principles
Value
Value Stream
Flow
Pull
Perfection
5S
Zero Defects
Zero Accidents
Zero Breakdowns
ZEN=Good
KAIZEN
(Continual Improvement)
Exchange of Die
& Mold
Maintenance
Creating Innovative Solutions for a Sustainable Future

(Source: Department of Chemicals and Petrochemicals, 2016)


Lean Tools
VSM (Value Stream Mapping)
5-S & Visual Management
Kaizen (Continuous Improvement)
Standardized Work
Kanban (Pull System)
Poka-Yoke (Error Proofing)
Root Cause Analysis
SMED (Single Minute Exchange of Dies)
TPM (Total Productive Maintenance)
Jidoka (Automation)
JIT (Just-In-Time)
One-piece Flow
Heijunka (Load Leveling)
(Source: Department of Chemicals and Petrochemicals, 2016)
5S
TPM
Zero Defects
Zero Accidents
Zero Breakdowns
KANBAN
KAI=Change
ZEN=Good
KAIZEN
(Continual Improvement)
SMED
Single Minute Exchange of Die & Mold Maintenance
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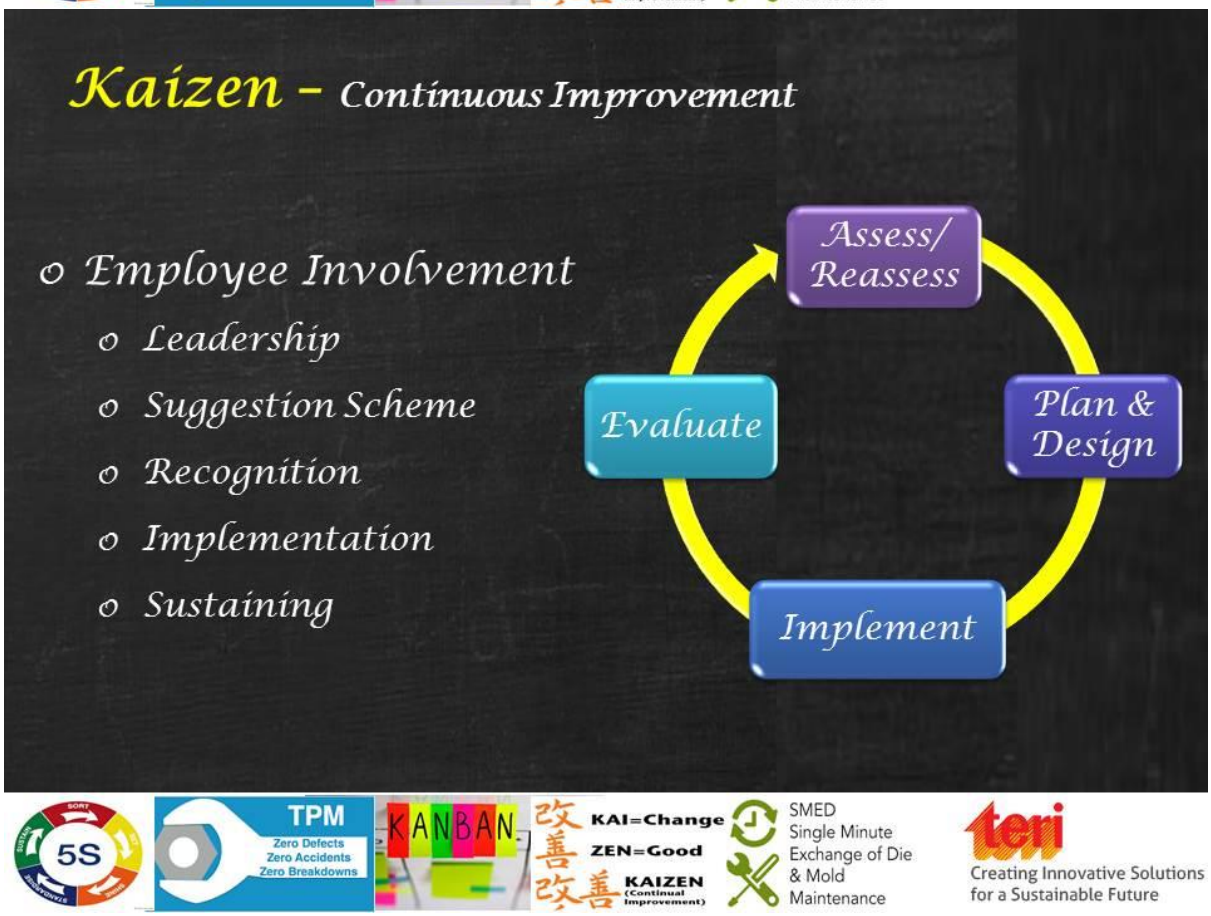
Kaizen – Continuous Improvement
Employee Involvement
Leadership
Suggestion Scheme
Recognition
Implementation
Sustaining
Assess/ Reassess
Plan & Design
Implement
Evaluate
5S
TPM
Zero Defects
Zero Accidents
Zero Breakdowns
KANBAN
KAI=Change
ZEN=Good
KAIZEN
(Continual Improvement)
SMED
Single Minute Exchange of Die & Mold Maintenance
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Kaizen – Suggestion Scheme

Date: .....

Suggestion Form

Name: .....

Department: .....

Emp. Code (If any): .....

Problem:
Solution Suggested (If any):

Emp. Signature

To Be Filled By Management

Suggestion categorisation (tick suitable)

A	B	C	D

Suggestion Related to (Tick suitable)

P	C	Q	S	E	M

Action Decided	Responsibility	Target Date

Benefit Achieved:

Horizontal Deployment possible (Yes/No)
It Yes, then where it will applicable

Signature (Scheme co-ordinator)

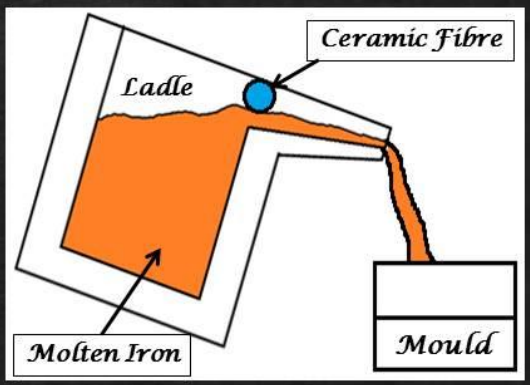
Note: A= If saving more than 10k
B= If saving between 2k -10k
C= Saving less but suggestion valid.
D= Invalid suggestion.

P = Productivity
C = Cost
Q = Quality
S = Safety
M = Morale
E = Environment

5S | TPM Zero Defects Zero Accidents Zero Breakdowns | KANBAN | 改善 KAI=Change ZEN=Good KAIZEN (Continual Improvement) | SMED Single Minute Exchange of Die & Mold Maintenance | teri Creating Innovative Solutions for a Sustainable Future

Kaizen – Implementation

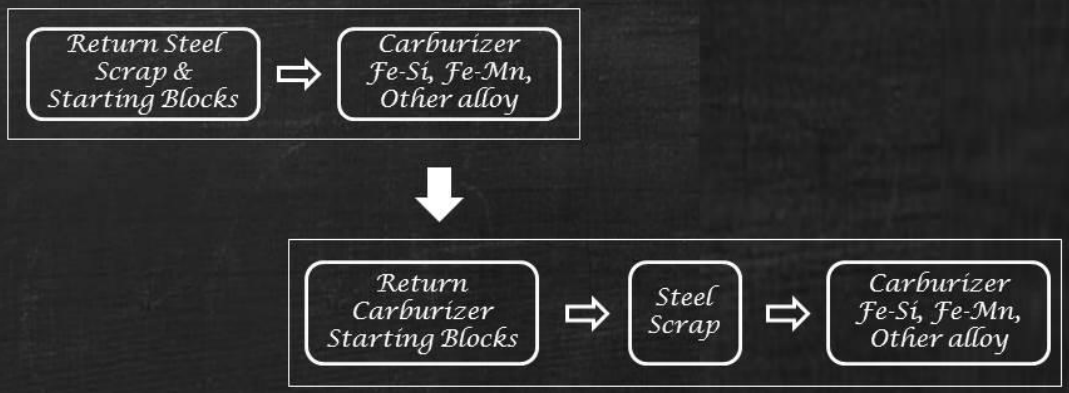
Problem	The slag in a pouring ladle comes into cavities in the mould during pouring process
Solution	Slag inclusion were able to be protected by using ceramic fibre as shown below



5S | TPM Zero Defects Zero Accidents Zero Breakdowns | KANBAN | 改善 KAI=Change ZEN=Good KAIZEN (Continual Improvement) | SMED Single Minute Exchange of Die & Mold Maintenance | teri Creating Innovative Solutions for a Sustainable Future

Kaizen – Implementation

Problem	It takes 120 min for cast iron melting in 200 kg melting furnace. This means that oxidation of materials will be likely to occur, and also melting efficiency is low
Solution	Melting procedure was changed as per sequence mentioned in below figure



Kaizen – Sustaining (PDCA)


THANK YOU.....


5S
TPM
Zero Defects
Zero Accidents
Zero Breakdowns
KANBAN
KAI=Change
ZEN=Good
KAIZEN
(Continual Improvement)
SMED
Single Minute
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Kaizen in Induction Furnace

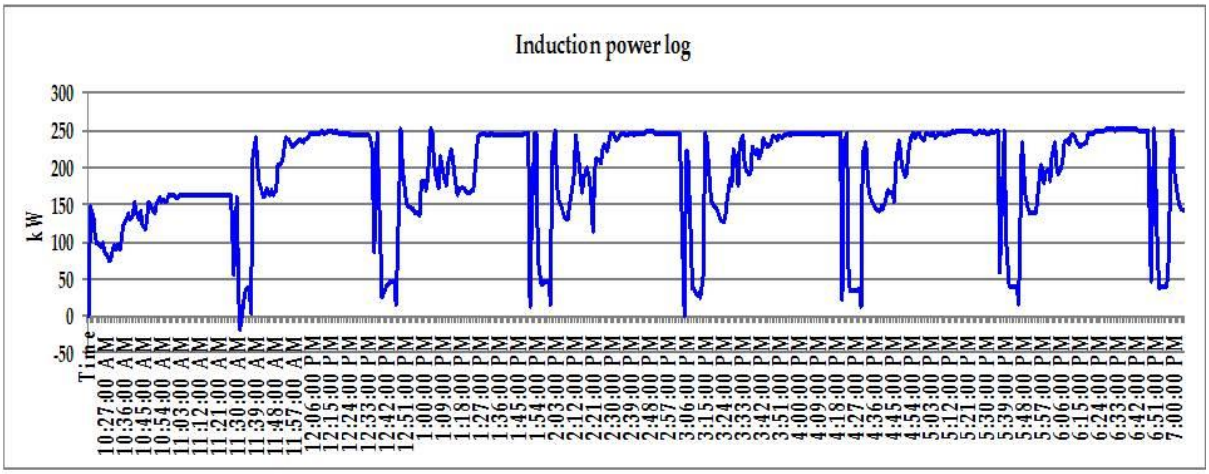
Tuesday, 20th February 2018

Belgaum

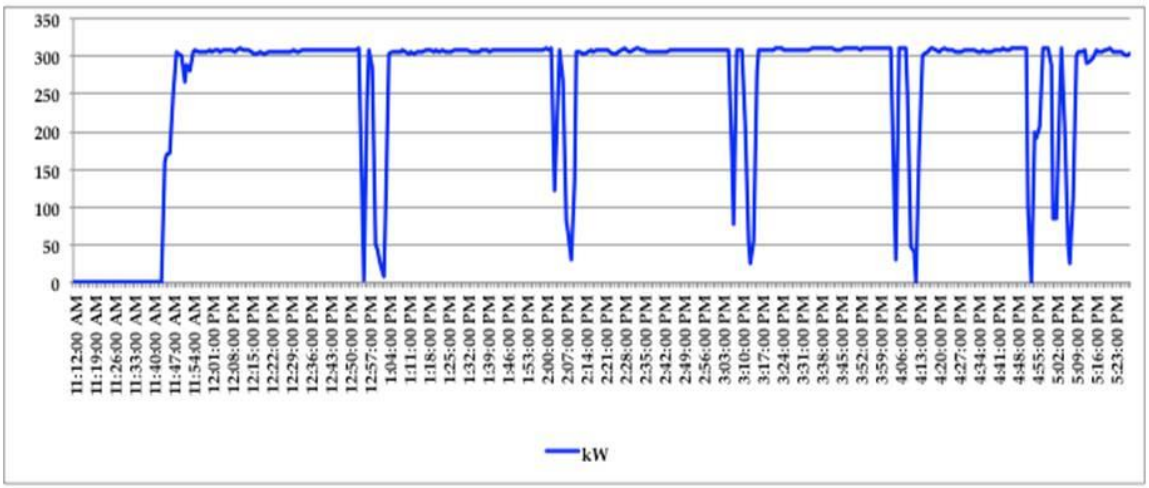
Nilesh Shedge, TERI

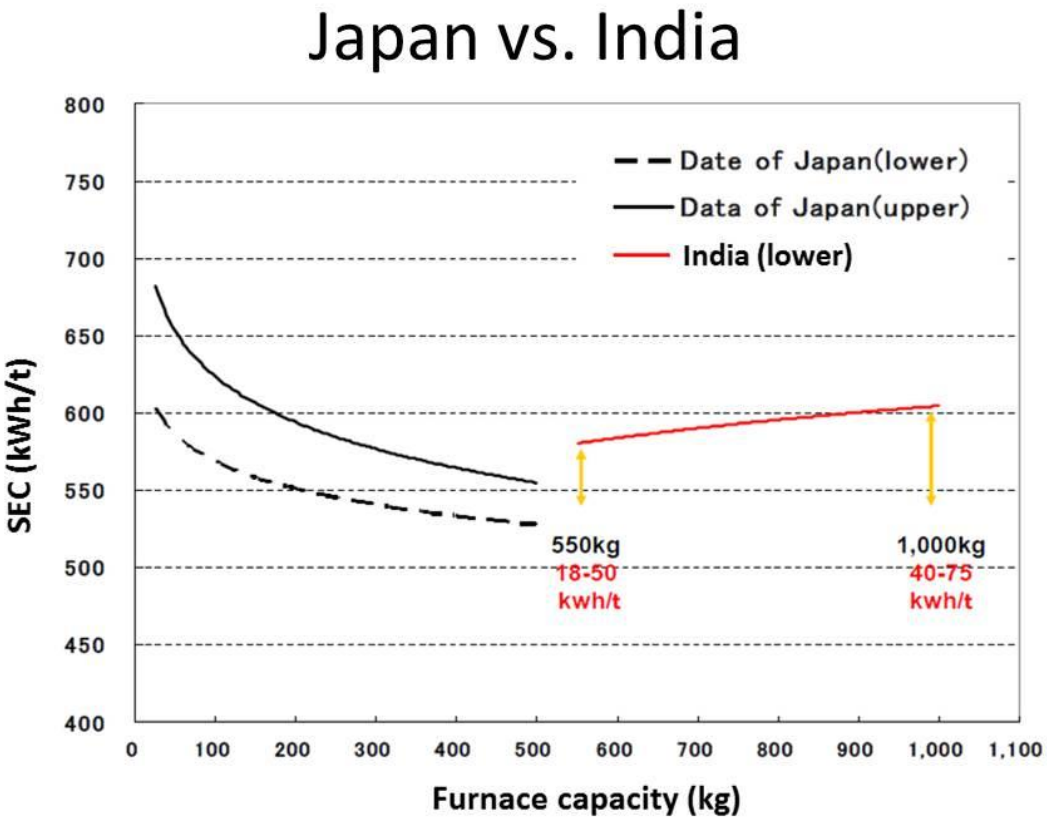
Induction Melting Furnace

Power lag/delay in Induction furnace
250kW/250 kg
SEC: 736kWh/tonne @1600 °C
Power delay: 25min



Induction furnace ideal curve
300kW/500kg
SEC: 610kWh/tonne @1650 °C





KAIZEN
CASE STUDY OF FOUNDRY

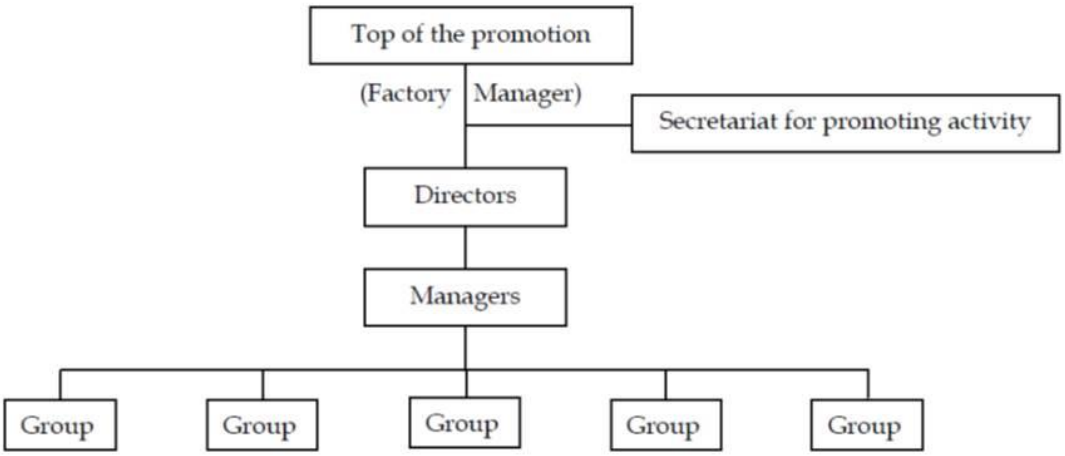
Background of the unit

- Located in Kolhapur Maharashtra
- Year of establishment: 1995
- Annual production of 1,450 tonnes
- Grey cast iron castings
- Sectors catered: Automobile, air compressors, tractor, railway and textile
- Induction furnace: 550 kW, 500 kg, SCR type

Kaizen – Methodology

- Formation of implementation support group
- Formation of small groups
- Formulating criteria and means of evaluation of the activities
- Data collection, analysis and visualization
- Identification of problem statements
- Looking for solutions with help of “small group activity”
- Validation and implementation of suggested solution
- Post implementation verification by data collation

Implementation support group



Data Collection format

PART 1 – Basic data

Melt No.	Date	Operator Name	Material Grade

PART 2 – Raw material composition data

Charging Weight (kg)					Supplementary Material (kg)	
Pig iron	Steel Scrap	C.I Scrap Boring	Domestic Scrap (RR)	Heel Metal	Inoculant	Graphite Agent

Data Collection format

PART 3 – Time and power reading

Material charging start		Material charging End		C.E. Meter Check		Tapping start		Tapping End	
Time	Power	Time	Power	Time	Power	Time	Power	Time	Power

PART 4 – Temperature and energy

Tapping temperature (^{o}C)	Total time (min)	Total power consumption (kWh)	Specific energy consumption (kWh/t)

Data Collection format

PART 5 – Chemical composition

Standard Chemical Composition (%)					
C	Si	Mn	P	S	C.E

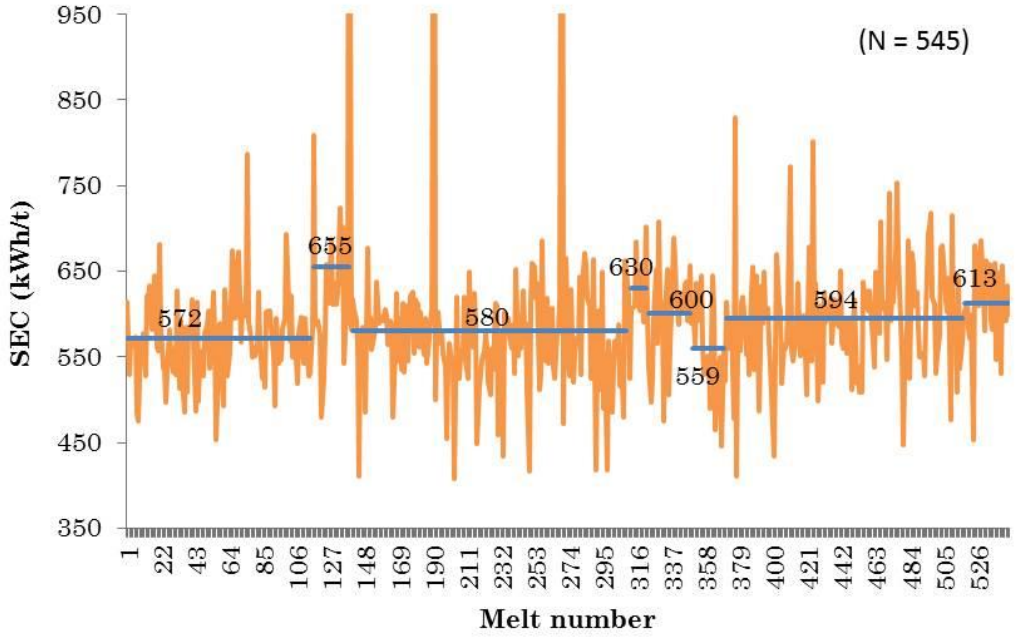
Summary data Collected

- Monitoring of furnace for 8 months
- Grades manufactured by foundry: FG220, FG260, FG300 and FG350
- Most common grade FG220: considered for study
- 545 heats of FG220 grade monitored
- Total quantum of data collected – 16,955 values

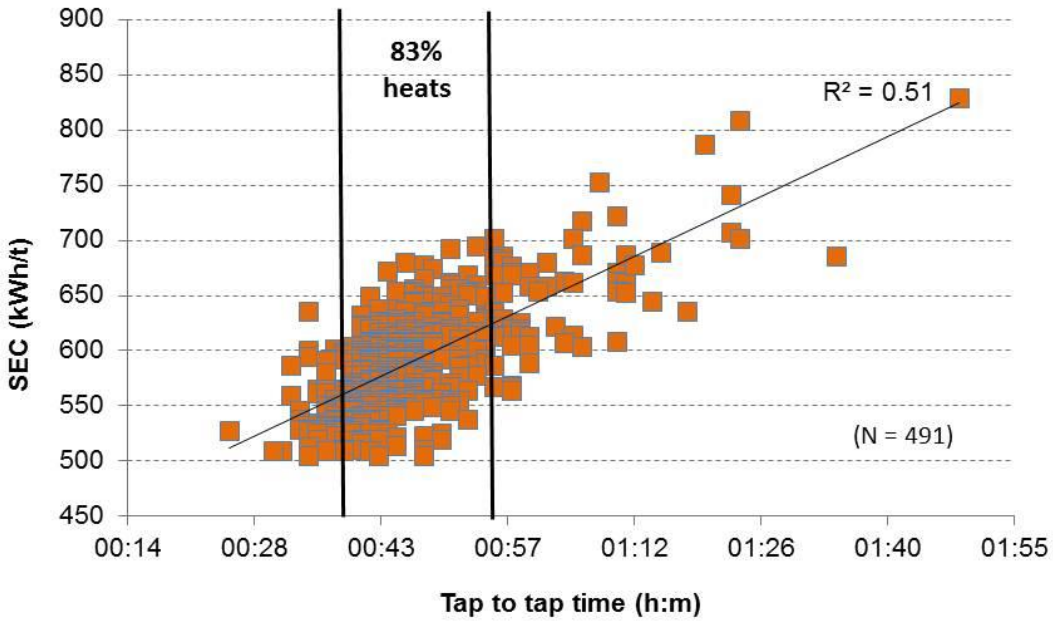
Visualization of data

S. No.	Data analysis	Visualization tool
1	Melt no. vs. SEC	Line graph
2	TTT vs. SEC	Scatter plot
3	TT occurrence	Histogram
4	TT vs. SEC	Scatter plot
5	SEC vs. Operator	Line graph
6	Rejection vs. Occurrence	Pareto chart

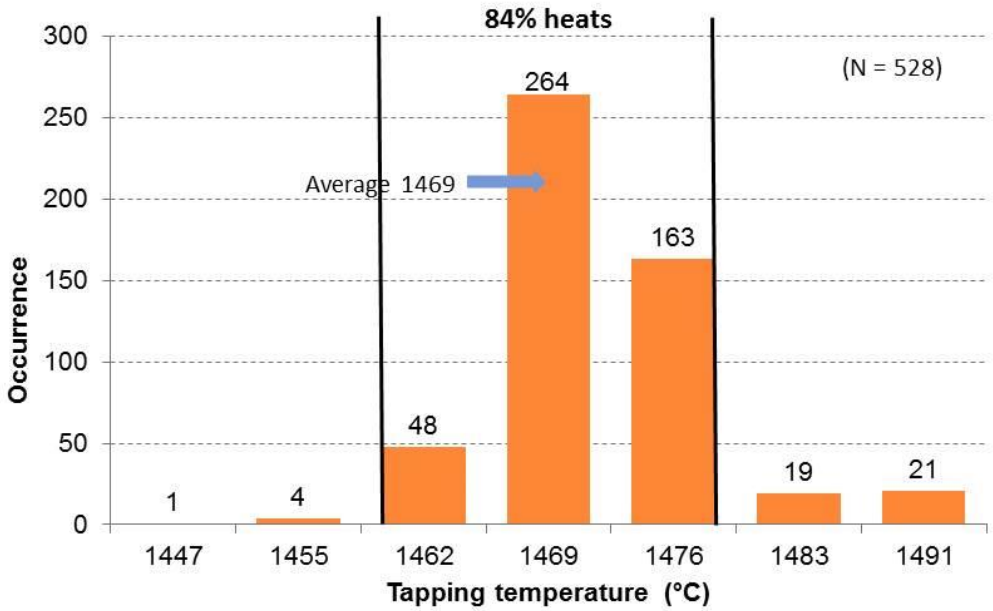
Melt no. vs. SEC (Line graph)



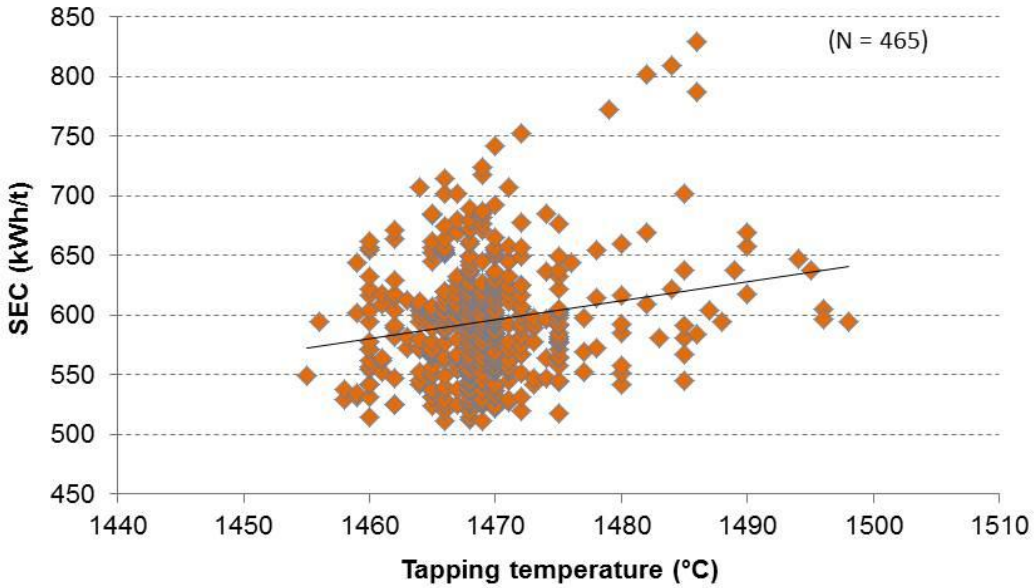
TTT vs. SEC (Scatter plot)



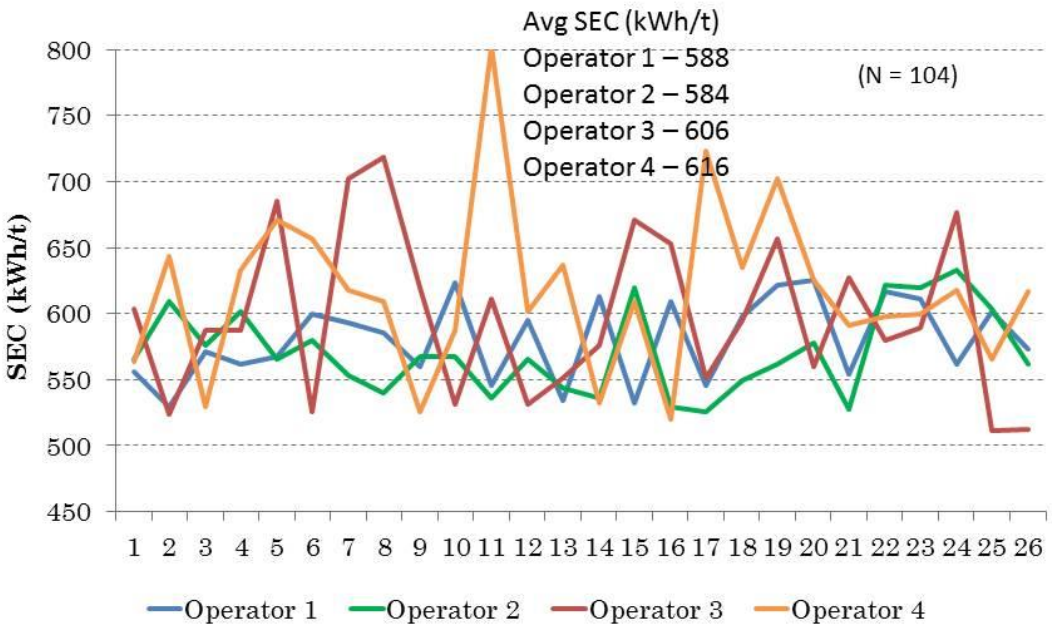
Tapping temperature occurrence (Histogram)



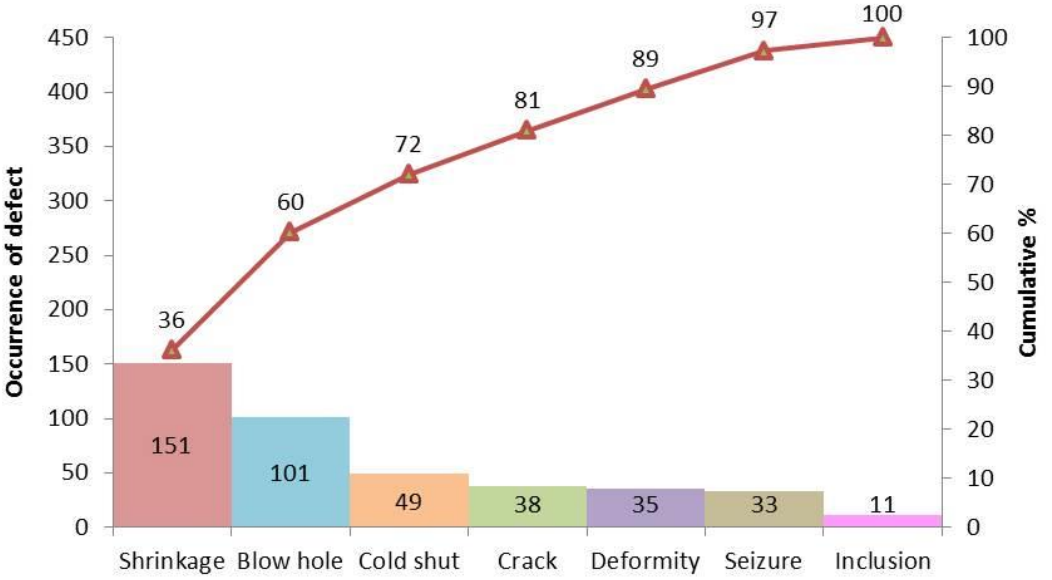
Tapping temperature vs. SEC (Scatter plot)



SEC vs. operator (Line graph)



Rejection occurrence (Pareto chart)



Activities for implementation

Category	Proposal	Priority
Operation of high frequency induction furnace	Creation of the check standard list based on the past troubles	△
	Creation of the prior checking standard for oil pressure and water system	△
Maintenance of high power factor operation	Prior-operation check of the installation state of magnetic shield board	◎
	Connection situations, and cleaning situation of bus bar, etc.	◎

Activities for implementation

Category	Proposal	Priority
Heat radiation from furnace body	Heat radiation from cooling coil (amount of cooling water)	○
	Heat radiation from an outer wall (furnace building plan, consideration of insulation)	△
Shortening of materials charging (input) time	Form (shape) of input materials, proper charging amount	◎
	Mixing of different materials (Prevention from adhesion of slag, sand, refractory, etc.)	◎

Activities for implementation

Category	Proposal	Priority
Management of the ladle preheat	Enhancement of back (rear) insulation	○
	Consideration of ladle cap	Δ
Creation of production plan and accomplish	Reduction of residual hot water, reduction of waiting time of mould	Δ

Activities for implementation

Category	Proposal	Priority
Melting operation	Prevention from overheat of molten metal in operation	◎
	Consideration of heat radiation prevention cap from molten metal surface	◎
	Creation of operation melting work standard	◎

◎ *Taking immediate action is recommended,*

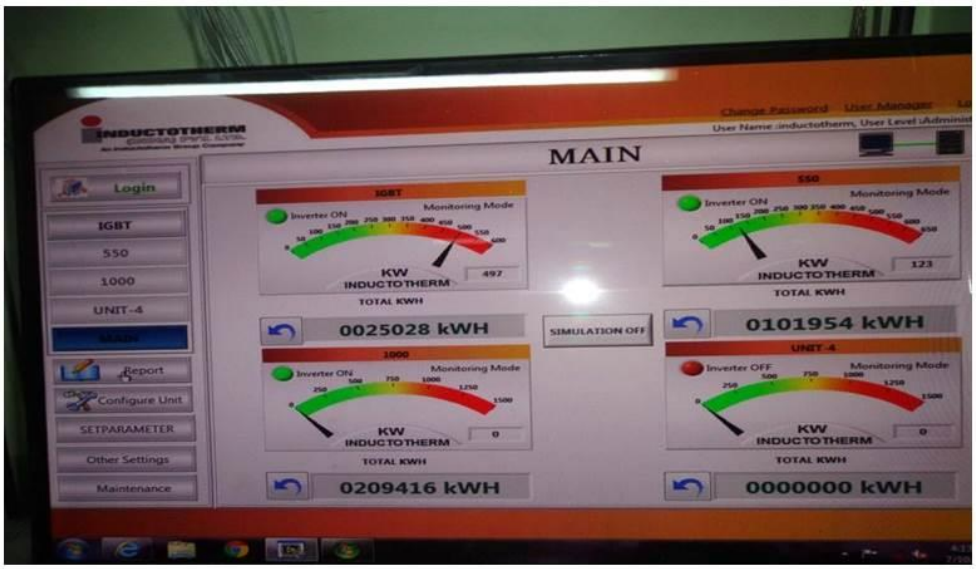
○ *Taking an action not immediately but sometime after is recommended,*

Δ *Taking an action carefully and thoroughly*

Activities carried

- Installed the energy monitoring system on Induction Furnaces
- Training of two young operators by experienced operators and foundry manager
- Better line-up of moulds for liquid metal – no holding
- Lid mechanism for Induction furnace
- Replacement of soft water pump with energy efficient pump
- Replacement of raw water pump with energy efficient pump
- Replacement of aluminium blades of cooling tower fan by FRP blade
- Removal of enclosure at air inlet in Cooling tower no.1
- Replacement of existing lighting system with efficient lighting system in phase manner
- Provided cerawool cover on ladle to prevent radiation losses

Implementation



Installation of induction furnace energy monitoring system

Implementation

Lid mechanism for induction furnace crucible

Implementation

Proper sizing of pump and improving energy efficiency

Implementation

Removal of obstruction to cooling tower air intake and FRP blades

Implementation

Cerawool cover for pouring ladle

Implementation

Proper sizing of the former

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