Capacity Building workshop

Sand preparation, moulding and regeneration

10th April 2018 at Coimbatore

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

teri gef UNIDO BEE COINDIA® COIMBATORE INDUSTRIAL INFRASTRUCTURE ASSOCIATION

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Workshop summary

Overview of workshop

Capacity Building workshop of Local Service Providers (LSPs) on Sand preparation, moulding and regeneration was organized by TERI on 10th April 2018 in association with COINDIA under GEF-UNIDO project. Total 63 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

The welcome address was made by Mr. S Kuppusamy, President & MD/CEO, COINDIA. He emphasized the importance of energy conservation in sand preparation and moulding in foundry, and thanked UNIDO and TERI for organizing the workshop.

Mr. Prosanto Pal and Mr Nilesh Shedge, TERI, made a joint presentation on the activities conducted in the cluster so far and the key highlights. Case-studies of energy monitoring in sand plant, power curves of sand plant motors, and other energy conservation options like variable frequency drives and timers were presented. Use of energy efficient motors and air management in sand plant were highlighted.

Mr. Arulmozhidevan, Integra Automation made a detailed presentation on green sand preparation. He explained in detail the green sand moulding process which is the most widely used process for casting production. Approximately 70-80% of the Grey/SG Iron castings are produced by green sand moulding process. Sand preparation and moulding is also very energy intensive. It is estimated that sand preparation alone account for up to 20% of the energy use in a mechanised foundry. Energy is typically used in sand conveying, preparation, moulding, mould handling, shakeout, reclamation, reconditioning and more conveying.

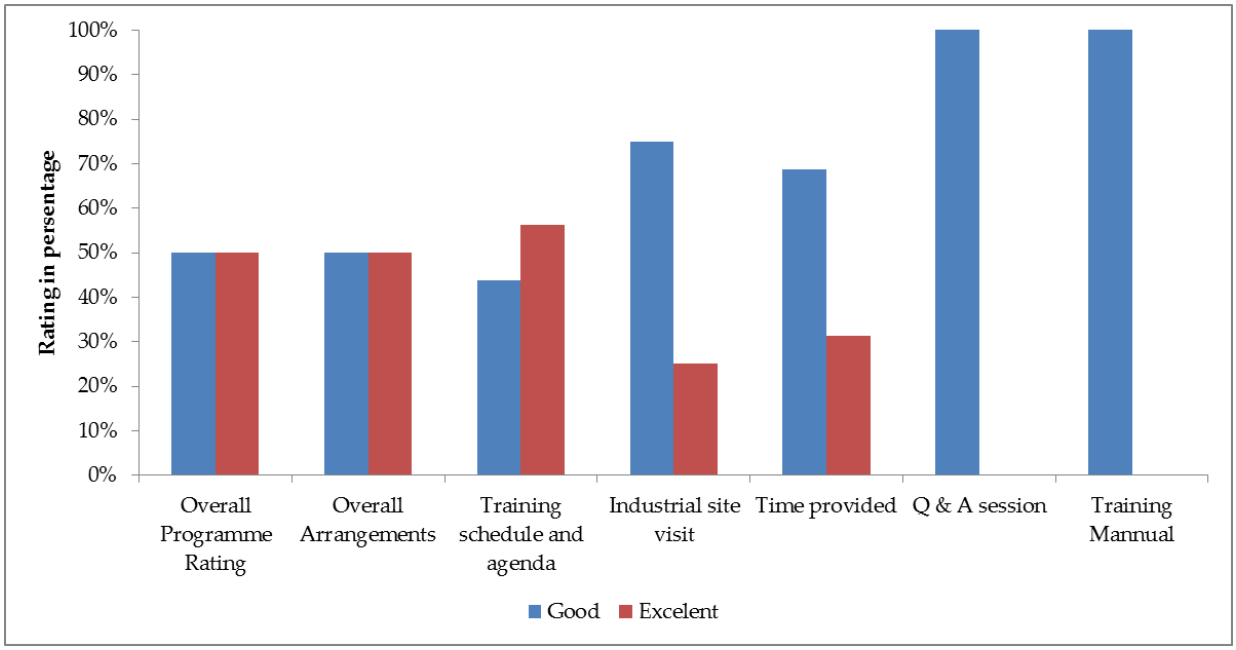
Mr Manish Kothari, Rhino Machines made a detailed presentation on principal moulding machines used in foundry viz. simultaneous Jolt Squeeze moulding technology working on compressed air, high pressure moulding technology working on combination of compressed air and hydraulic energy and high pressure moulding technology working on hydraulic. He explained that in terms of basic mechanical engineering, the efficiency of power transmission through compressed air has been considered the poorest – even if very popular and useful – to as low as 30%, which some manufacturers have been able to improve to a bit more. When comparing with Jolt Squeeze technology the high pressure routes have also a distinct advantage of weight saving as a result of the 5 to 6 times higher squeezing force applied with the right pre-compaction. The energy consumed per hour for a 600 x 600 mm box size in hydraulic was 0.19 kWh/mould while that for jolt squeeze technology pneumatic machine was about 0.3 kWh/mould (without factoring in the compressor efficiency here). This would impact a metal saving of about 2% from weight saving, about 0.5% from rejection and the contribution from 2.5% of additional saleable castings.

After the lunch, plant tour through the M/s Ammarun Foundries was arranged. The foundry is one of the leading foundries in Coimbatore and has a large and modern sand plant. Hence

the participants could see actual implementation of energy savings in moulding and other sections and benefit from the site visit. 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 80% participants were satisfied with foundry visit, Q&A session and training module provided to them. About 50% participants have rated overall program as "Excellent" while rest of them have rated it as "Good". More than 50% of participants were satisfied with arrangements made, training schedule and agenda of the program. 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) Regular program on different issues in foundries

Learning's by participants

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

1) Development of sand system with low energy consumption
2) EE applicability in foundry industries
3) Zone wise energy consumption data analysis
4) Green sand preparation control

Annexures

Annexure 1: Agenda of the program

Capacity Building Workshop

Sand preparation, moulding and regeneration

Tuesday, 10 April 2018

SIEMA Building,

8/4 Race Course, Coimbatore 641 018

Under the project:

Capacity Building of Local Service Providers (LSPs)

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Agenda

10:00 – 10:30	Registration
10:30 – 10:40	**Welcome Address** Mr S Kuppusamy, President & MD/CEO, COINDIA
10:40 – 10:50	**Special Address** Mr Suresh Kennit, National Project Manager, GEF-UNIDO-BEE Project on EE / RE in MSMEs
10:50 – 11:05	**Overview of activities conducted in Coimbatore cluster by TERI and energy saving opportunities in sand plant** Mr Prosanto Pal, TERI
11:05 – 11:45	**Green sand preparation & control** Mr Arulmozhidevan, General Manager, Integra Automation
11:45 – 12:45	**Sand mixing, moulding & regeneration** Mr Manish Kothari, Rhino Machines
12:45 – 13:00	Q&A
13:00 – 14:00	Lunch
14:00 – 16:00	**Site Visit / On-site training** Visit to an industrial unit
16.00 – 16:30	Feedback from participants
16:30 – 16:45	**Vote of thanks** Mr Niranjan Rao Deevela, National Technology Coordinator, GEF-UNIDO-BEE Project on EE / RE in MSMEs

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COINDIA

Annexure 2: List of participants

Capacity building workshop

Sand preparation, moulding and regeneration

10 April 2018, SIEMA building, Coimbatore

S. No	Name	Organization	Mobile No	Email ID	Signature
1.	N. Vijayakumar	Viking Industries	9487614155	Sales@vikingindustries.co.uk	
2.	S.R. Ravikumar	Ammaram foundries	7373723116	Lab@ammaram.com	
3.	A. SRIDHAR	APITCO	9159144666	cit.apitco@gmail.	
4.	T. Sivakumar	Mahendra Pumps	9786184734	V4Mbty@Mahendra	
5.	Sharma	"	"	"	
6.	S. Suresh Babu	APITCO	9790698889	aSureshbabu25@gmail.com	
7.	R.M Sahay	INDO SHELL CAST	99447.87007	—	

S. No	Name	Organization	Mobile No	Email ID	Signature
8.	A. Pradeepan	Indo Shell Cast Pvt Ltd. unit II	9965488444	mtc2@indoshellcast.com	[signature]
9.	S. ARJUNAN	SRI BAKGIYAM ENGG CORPORATION	7397518555	mr@bakgiyam.com	[signature]
10	M. Tamilarasan.	vasanthi foundry.	96550 64 67	vasanthifoundry@gmail...	[signature]
11	D. Balasubramani	Integra automation pvt LTD	8754924849.	balus161@gmail.com	[signature]
12	R. Devaraj	Integra Automation Pvt Ltd	801249494	devaraj080692@gmail.com	[signature]
13	Dr. S. R. SIVARASU	Department of EEE, Sri Eshwar College of Engg.	99420 29372 80567 19372	srseeesece@gmail.com	S.R. Sivarasu
14	M. Ponnusamy	Best Engineering Pumps	9786020017		[signature]
15	JAYAKUMAR	— do —	— do —		[signature]
16	R. Arun	Suguna	9524613333	arun@sugunagroup.com	[signature]
17	SRMD CHOUDHARY	Deeva Engg. foundry	9600652985	[illegible]1181@gmail.com	[signature]

S. No	Name	Organization	Mobile No	Email ID	Signature
18	Prakasesh a	Ramba castings Ltd	9942770729	[illegible]	
19	N. Shanmuga Sundaram	Ramba Castings Ltd	9952284674	Sundar@gmail.com	
20	B. SIVA [illegible]	Ramba casting Ltd	9843627693	-	
21	C.B. SENTHIL KUMAR	BLUEMOUNT CASTINGS	9363144885	bluemountcastings@gmail.com	
22	R. Shri. Vignesh	Integra Automation Pvt. Ltd	9500788876	Shri ma. vignesh@gmail.com	
23	T. SHREEVIGNESH.	PSG FOUNDARY.	9514415701.	Shreevigneshvicky@gmail.com	
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25	R. chandrasekar	Bakiyam foundry	7598263585	chandrasekar@bakiyam.com	
26	M. Maheshwaran	Shree Bhalathi Equipment Company.	9894241460	Maheshwaran.sec@gmail.com	
27	N. JAYAPRAKASH	TECA	9363228913	jayatecaltd@gmail.com	

S. No	Name	Organization	Mobile No	Email ID	Signature
28	R. Naresh kumar	Sanjitty Foundries (P) Ltd Unit-1	8220045740	Production@sandfdrs.com	
29	P. ADAK MOZUMDEVAN	Integracon Industries	9894784055	[illegible]	
30	M. Chandrasekar	PSG Foundry	9659616026	Chandrucs61@gmail	
31	D. Siva Chandrau	Sarthi Foundary	9345670077	Siadesign@gmail	
32	E. GOPINATH	Abirami Equipments	9789545778	mr.gopi64@gmail.com	
33	P. Ragul	Abirami Equipments	8883623029	rockragul17@gmail.com	
34	R. Soundara Rajan	Sree Rayavaradeva Industries	9865213757	rayavardeva71@gmail.com	
35	V. SIVAKUMAR	T/I Unicast Alloys (P) Ltd.	9842325854	sivakumar@unitedgroupcompanies.com	
36	S. Sowrirajan	Hi Tech Die cast	9842566201	sr@unitedgroupcompanies.com	
37	R. Manikandan	Craftsman Automation	9498987012	manikandan-12@craftsman.com	

S. No	Name	Organization	Mobile No	Email ID	Signature
38	C. INFANT NIRMAL	Sree Abirami Equipments Pvt. Ltd	8098329651	infantnirmal2112@gmail.com	
39	T.S. Aravindanathan	Rhino Machines pvt ltd	9244658898	rhino rhinoaround@gmail.com	
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41	SR SANKAR	R&M management consultants	98433-26947	rgsmanagementconsultants.hr@gmail.com	
42	R. BABU	BRIGHT CASTINGS	9003360801		
43	P. Suresh kumar	Agna Inc	9445788720	admin@agnainc.in	
44	Rayangam	Agna Inc	11	11	11
45	P. Senthil Kumar	PSG Polytechnic	9600569453	Psenthil15657@gmail.com	
46	P. R. Periasamy	Sri Dhanalakshmi Foundry	9843321211	drfpumps@gmail.com	
47	SANMUGAPPA DURAI. N	ACI Automation Pvt. Ltd.	9677716015	Sales.cbe@aciautomation.com	

S. No	Name	Organization	Mobile No	Email ID	Signature
48	V. Peachimuthu	Carfsman Foundries	9952440321	V. Peachimuthu@gmail	
49	C. Thiruvelkesi	Baalajiyan Engg (P) Ltd	9443736128	Lab@baalajiyann.com	
50	R. Theivendran	Baalajiyan Eng (P) Ltd	9443316944	—	
51	ANBU AYYANAN	RAJPRIATH Industries	94433 55533	rajpriath@gmail.com	
52	R. Divakar	Veesng Foundry.	9655709612	divakarraju@10gmail.com	
53	A. Vijayalakshmi	veesm Foundry	9994497472		
54	K. Prabakaran	Indo Shell Cast I	9344846943		
55	T. Bakthavathsalam	Manudhi Castings	9894633883	bakthavathsalam.t@gmail.com	
56	J. Santhana Bharathi	Sri Rama Krishna Industries	7200492895	Sandibharathi	
57	R. Saravanan	Sri Rama Krishna Industries	7418845475	Kumarsaravanan@gmail	

~~58 M. EASWARAMOORTHY Sri Gno~~

S. No	Name	Organization	Mobile No	Email ID	Signature
58	N. Easwaramoorthy	Sri Gnanamurugan Foundry.	9842266808	Srignanamuruga foundry @ gmail.com	
59	K. Raam Mohan.	Perumal foundry	9600736699	raammohan msc @ gmail.com	
60	Nilesh Shelge	TERE	9378601047	nil.shelge@gmail.com	
61	Manish Kotheri	Rhino	9227124977	manish@rhinomadores.com	
62	~~Prasanta Pal~~	~~TERE~~			
63	V.V. Nagaratnam.	Saravana Engineers.	9443147511	ca@pollutioncare.com	V.V.
64					
65					
66					
67					

Annexure 3: Selected photographs of the event

Annexure 4: Sample feedback forms

Capacity building workshop

Sand preparation, moulding and regeneration

Tuesday, 10 April 2018

SIEMA building, Coimbatore

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GEF-UNIDO-BEE Project

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

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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?			
Signature:			
Name of participant:	N. SANNAPPA DURAI.		
Organization:	ACI Automation Pvt. Ltd.		
Mobile No:	9677716015.		
Email ID:	sales.cbe@aciautomation.com, Sachin.kumar@aciautomation.com		

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Capacity building workshop

Sand preparation, moulding and regeneration

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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:			
Sand Plant mulan System changing			
Name two learning, which from this programme you will be able to implement in your plant?			
Signature:			
Name of participant:	Santosh Sharma		
Organization:	Mahendra Pumps (P) Ltd		
Mobile No:	7871638093		
Email ID:	achhelasantosh@gmail.com		

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Capacity building workshop

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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:			
If possible this energy Saving Seminar often increasing like Textile Printing mills also			
If you need contact to me. Ram Sibi Energy Saving for manufacturing			
Name two learning, which from this programme you will be able to implement in your plant?			
Signature:			
Name of participant:	ANBU ARIYAMA		
Organization:	RAJPREATH INDUSTRIES		
Mobile No:	9442355534		
Email ID:	rajpreath@gmail.com		

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Capacity building workshop

Sand preparation, moulding and regeneration

Tuesday, 10 April 2018

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Parameter	***Feedback***		
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How would you rate the overall programme?	✓		
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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:			
Very nice this programme			
Name two learning, which from this programme you will be able to implement in your plant?			
Signature: D.			
Name of participant:	D. Siva Chandran		
Organization:	Free Sale This Equipment		
Mobile No:	9244309904, 9345670077		
Email ID:	Siva Design 7@Gmail.com		

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Annexure 5: Copy of presentations

TERI's activities and initial thoughts on energy savings in sand plant

Training Workshop

Sand preparation, moulding and regeneration

Coimbatore
10 April 2018

Prosanto Pal
The Energy and Resources Institute

- Foundry industry - TERI's experience
- Recent training activities in Coimbatore cluster
- Initial thoughts on energy savings in sand plant

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undry - TERI's experience

- Started working in foundries since 1991
- Initial energy audits in Agra and Howrah
- Demonstration DBC + PCS installed at Howrah in 1998
- Over 130 TERI designed DBC in operation
- 185 detailed energy audits conducted in induction furnace units in Kolhapur & Rajkot
- Over 60% of the audit recommendations implemented

Training programs at Coimbatore Foundry Cluster

S. No.	Training topic	Date	Number of participants
1	Energy conservation	9th Feb 2018	50
2	Pollution control system	2nd Mar 2018	53
3	Lean manufacturing	21st Mar 2018	60
4	Sand Preparation	10th April 2018	


Capacity building workshop on Energy conservation
teri
Creating Innovative Solutions
for a Sustainable Future


Field visit to M/s Aqua Sub Engineering Foundry (Unit II)
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for a Sustainable Future


Capacity building workshop on Pollution control system
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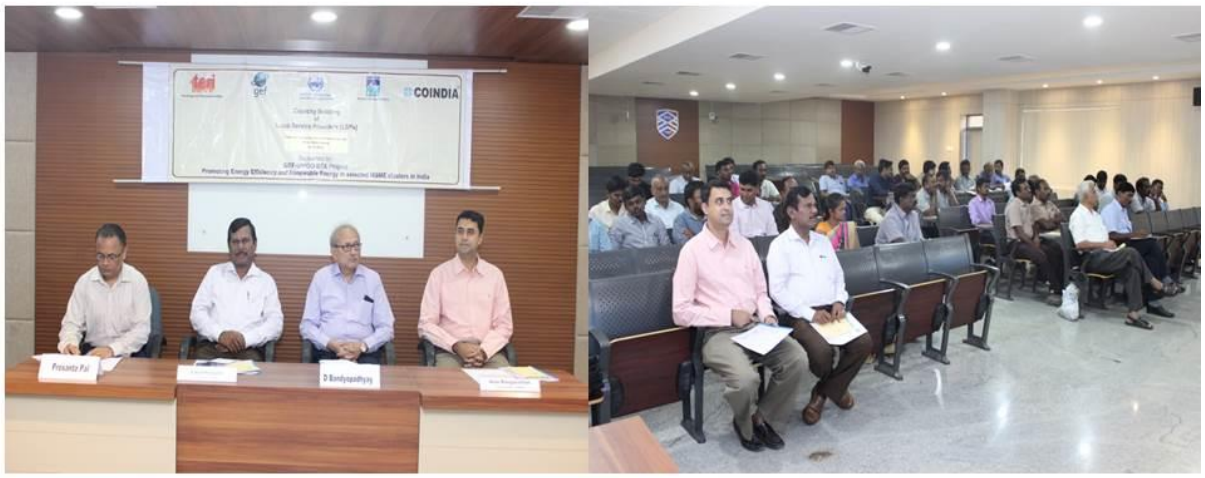
Creating Innovative Solutions for a Sustainable Future


COINDIA


Field visit to M/s PSG Foundries
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Capacity building workshop on Lean manufacturing
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for a Sustainable Future

9


Field visit to M/s Ellen Industries Pvt. Ltd.
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for a Sustainable Future

10

Areas of energy savings in a plant

(1) Improving energy efficiency of Induction furnace

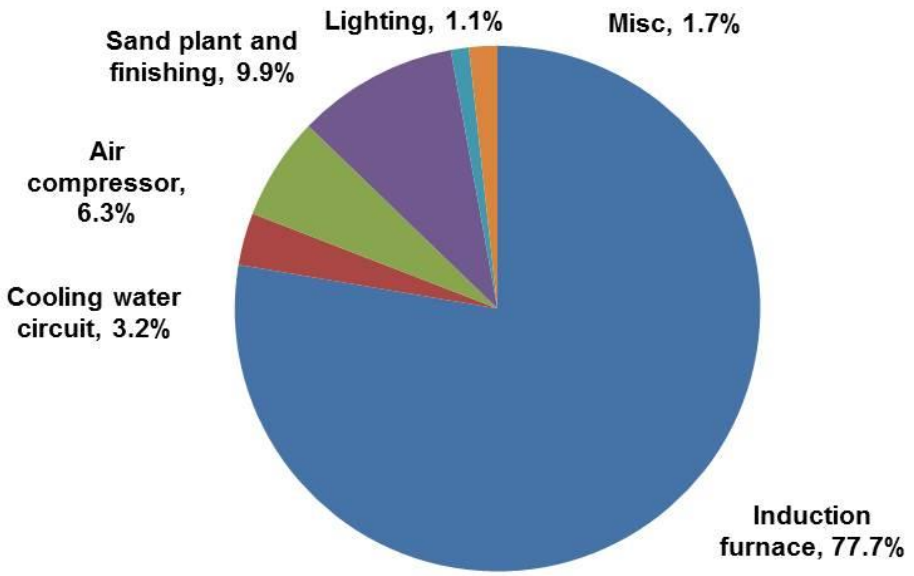
- BOP
- Retrofit
- Revamp

(2) Energy-saving in other areas (moulding, air compressor, lighting, ladle preheating, heat treatment)

(3) Energy-saving by improving yields

11

Energy usage in typical induction furnace foundry



Areas of energy savings in a plant

Creating Innovative Solutions for a Sustainable Future

(1) Improving energy efficiency of furnace

- BOP
- Retrofit
- Revamp

(2) Energy-saving in other areas (moulding, air compressor, lighting, ladle preheating, heat treatment)

(3) Energy-saving by improving yields

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Creating Innovative Solutions for a Sustainable Future

Thank You

Prosanto@teri.res.in

Energy saving opportunities in Sand Plant

Tuesday, 10th April 2018

Coimbatore

Nilesh Shedge

Contents

- Energy Monitoring
- Power Curves and Application of Kaizen
- Energy Saving Options

ENERGY MONITORING IN SAND PLANT

Energy Monitoring

Analog type

Digital type

Electronic Energy Meter

blog.electricalcommunity.com

Energy Meters

KAIZEN

Kaizen

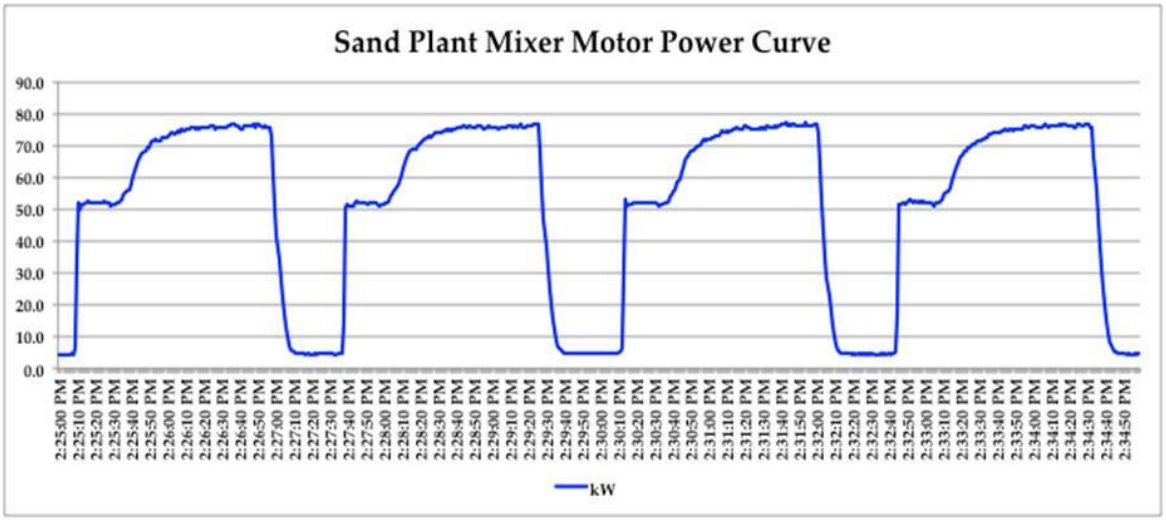
- **Data monitoring**
  - **Per day kWh**
  - **Per hour kWh**
  - **Per cycle**

- **Specific Energy Consumption**
  - **kWh/kg of sand**
  - **kWh/cycle**

- **Frequent Energy Audits of Sand Plant**

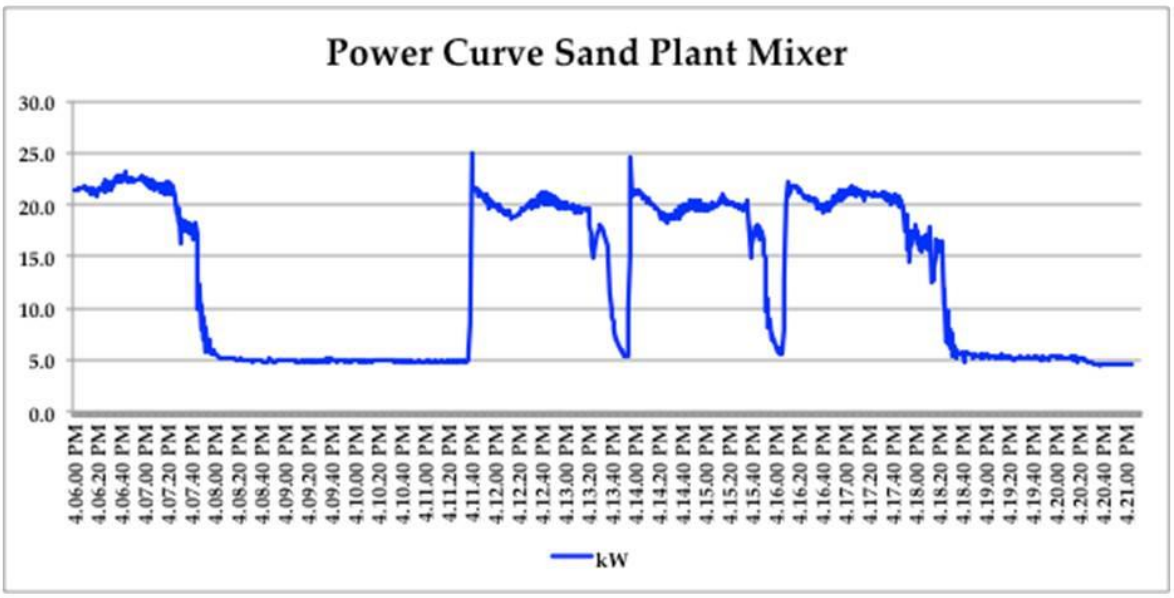
Power Curves

Typical Power curve of Sand plant Mixer



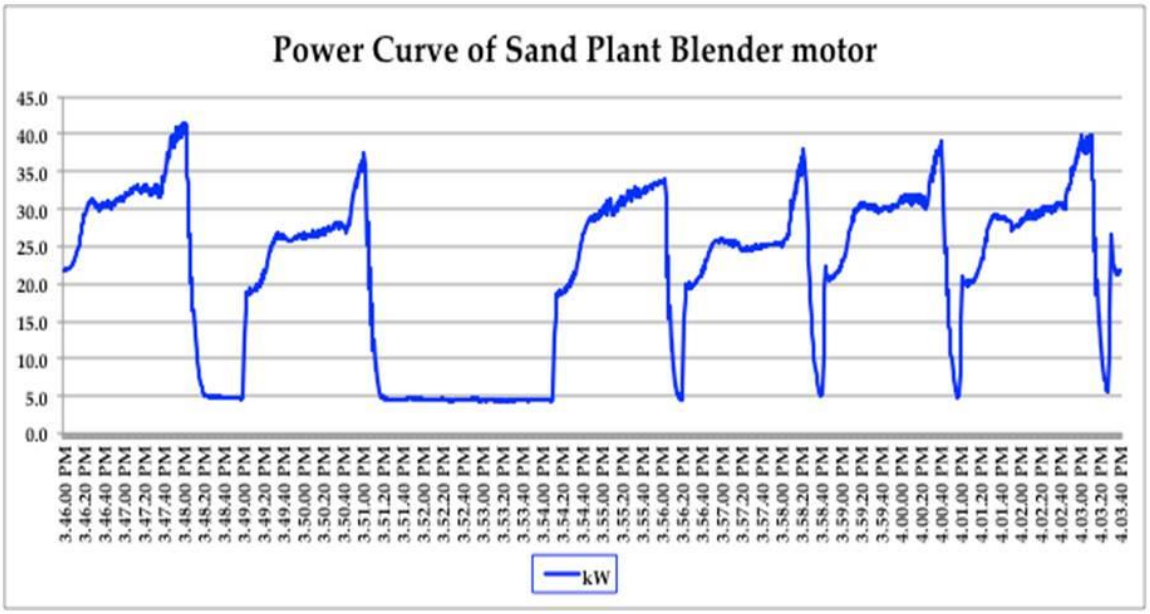
Power Curves

➢Typical Power curve of Sand plant Mixer



Power Curves

➢Typical Power curve of Sand plant Blender motor



ENERGY SAVING OPTIONS

Variable Frequency Drives

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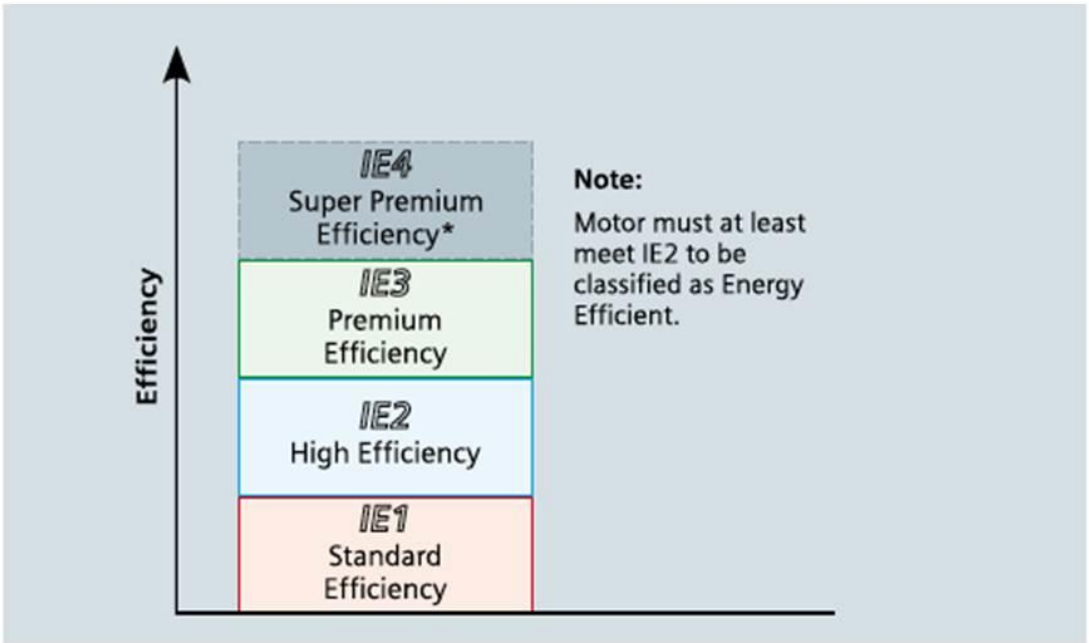
Timer Controls

Creating Innovative Solutions for a Sustainable Future

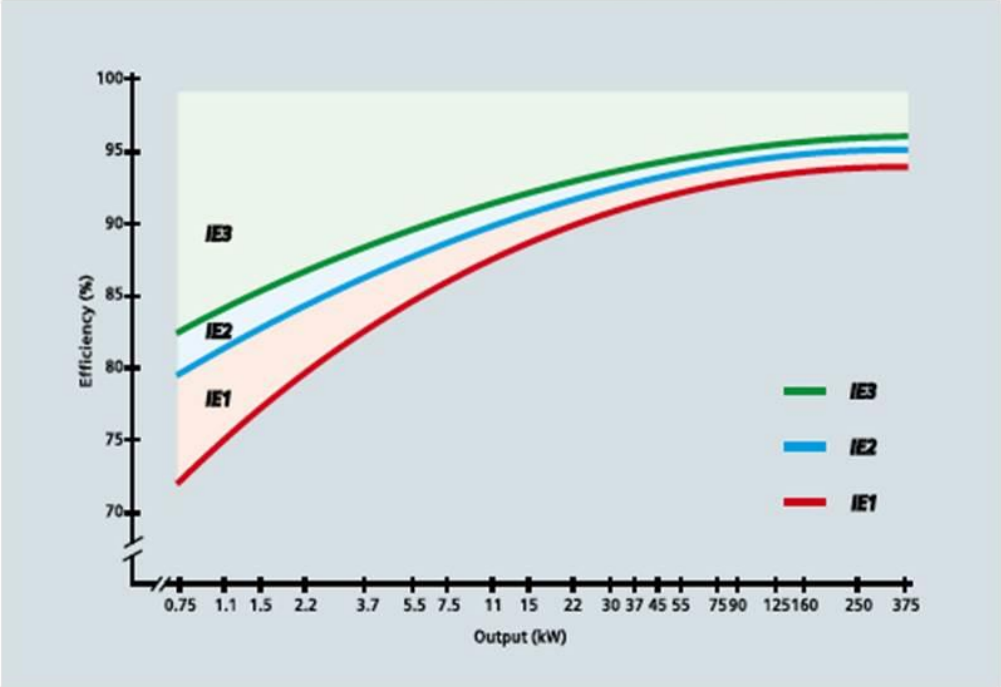
For Muller mixer machines

IE3 motors

Creating Innovative Solutions for a Sustainable Future



IE3 motors



Air management

- Optimum usage of air at optimum pressure
- Avoid leakages in the pneumatic systems
- Demand side management for air
- Use of dedicated receiver for sand plant
- Improved house keeping practices

The Energy and Resources Institute

Creating Innovative Solutions for a Sustainable Future

www.sameeeksha.org

For any information, please contact

Nilesh Shedge - 9978601047 (nil.shedge@gmail.com)

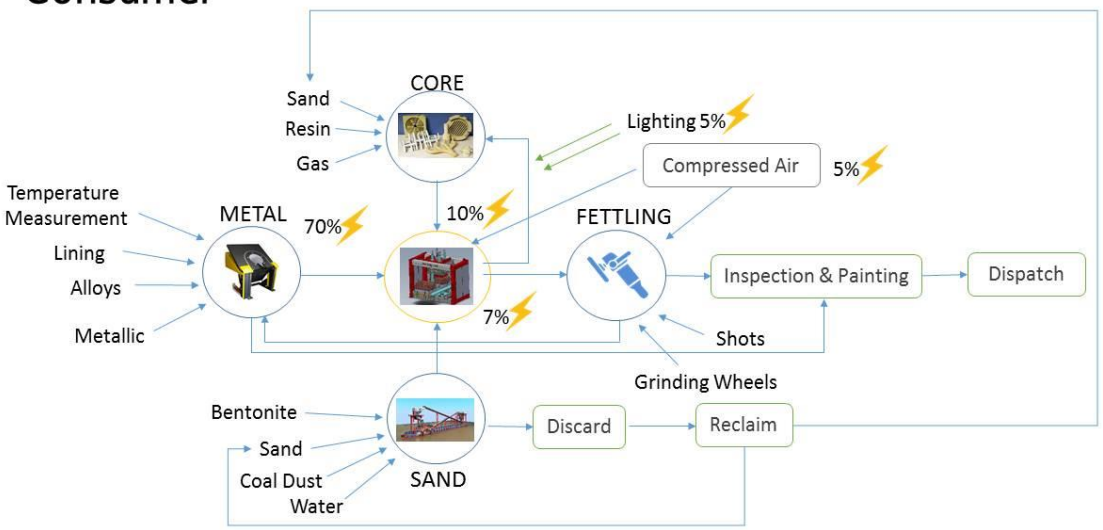
Adapting Energy Efficient Sand & Moulding Technology in Foundries

Technical Workshop

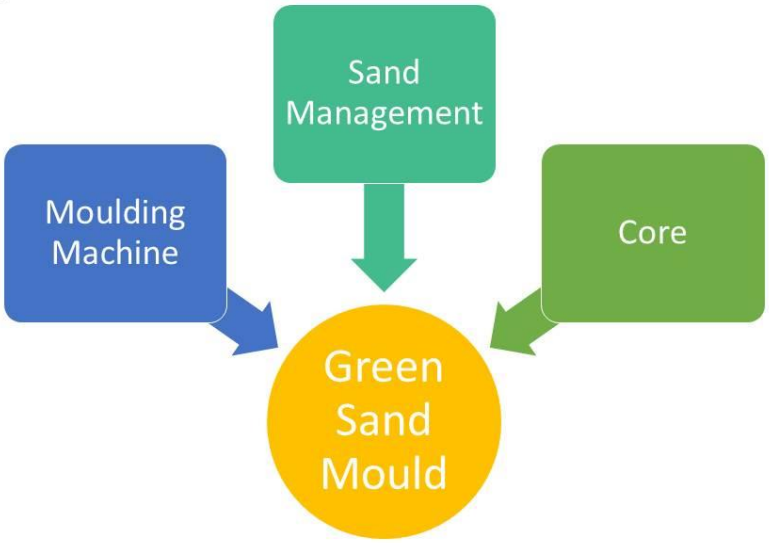
Manish Kothari – Managing Director
Rhino Machines Pvt Ltd
Anand, Gujarat, India.
10th April 2018 – Coimbatore
At Workshop Organised by TERI & COINDIA

Creating a Greener Sustainable Future for Foundries

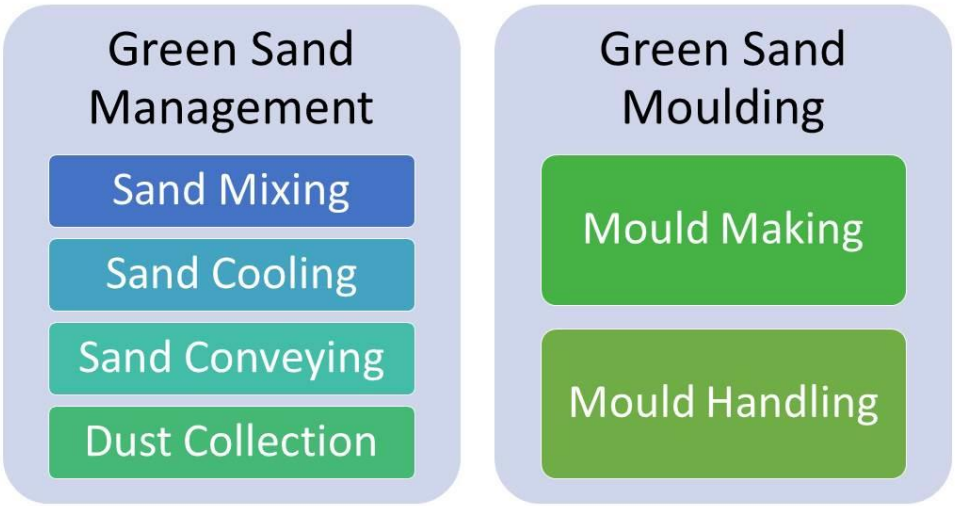
Moulding Process – 2nd Highest Energy Consumer



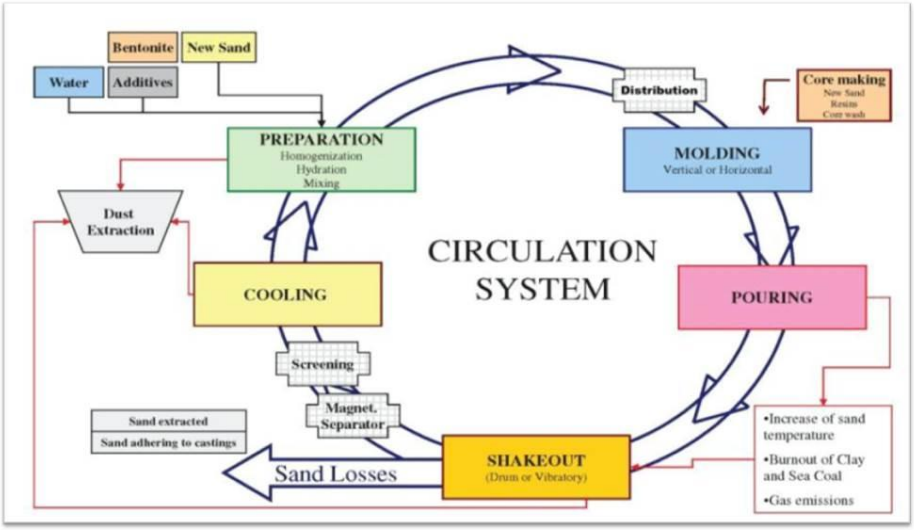
Moulding Technology Elements (Green Sand Process)



Energy Consumption in Green Sand Moulding



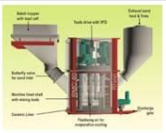
Elements of Sand Handling System



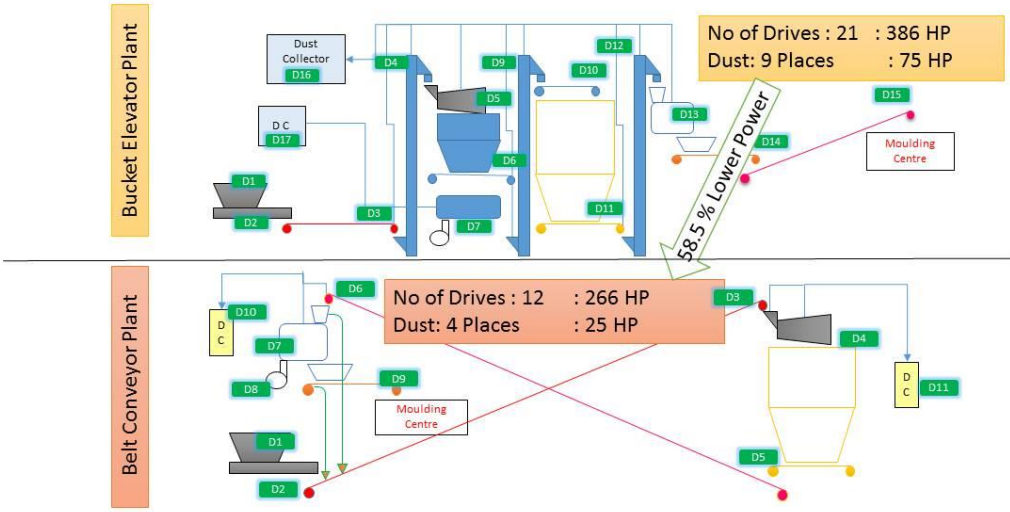
Sand Mixers – Energy Consumption

Specific Power Consumption kW/MT for Popularly Known Mixers					
					
	Mixer - Muller	Fixed Rotor, Fixed Tank Intensive Mixer (Slow Speed)	Fixed Rotor, Fixed Tank Intensive Mixer (High Speed)	Rotating Tank, Fixed Rotor, Planteary Mixer	Fixed Tank, Planetary Tools with VFD
Batch (kgs)	220	250	500	760	500
Process Time (sec)	360	180	100	120	140
Output kg/hr	2,200	5,000	18,000	22,800	12,857
Power (kW)	7.5	13	67.5	68.5	33
Utilisation	85%	85%	85%	85%	NA
Power Consumed kW/hr	6.375	11.05	57.375	58.225	NA
Specific Power Consumption kW/MT	2.90	2.21	3.19	2.55	1.60

Sand Cooler – Energy Consumption

Specific Power Consumption kW/MT for Popularly Known Sand Coolers				
				
	Rotary Drum Evaporative Cooling	Fluidised Bed with Heat Exchanger Tubes	Eight Type Cooler Evaporative Cooling	Mixer cum Cooler Evaporative Cooling
Output kg/hr	10,000	1,000	22,000	20,000
Power (kW) - only cooling	7.5	18.5	44	11
Utilisation	85%	85%	85%	85%
Power Consumed kW/hr	6.375	15.725	37.4	9.35
Specific Power Consumption kW/MT	0.64	15.73	1.70	0.47

Handling Energy – Bucket Elevator vs Belt Conveyor



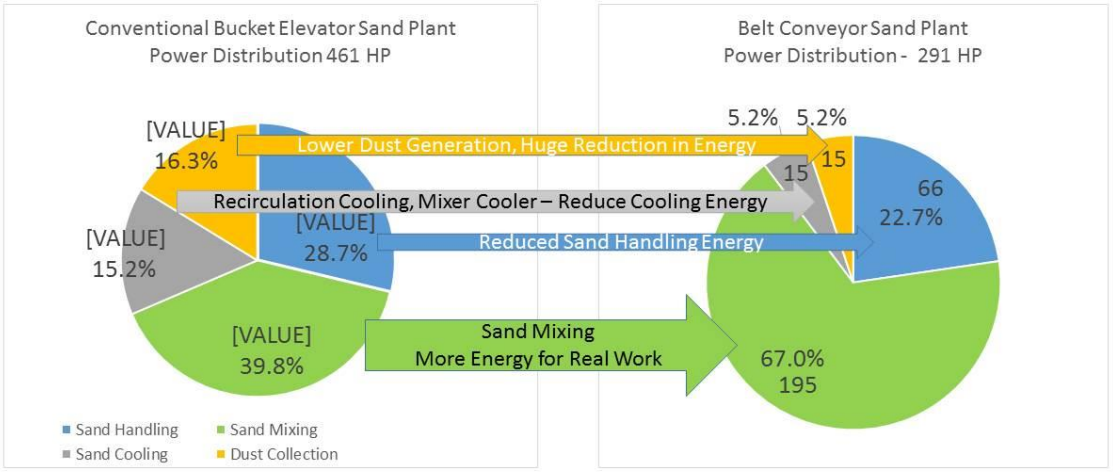
Sand Handling – Installed Energy Calculation

Belt Conveyor Plant – Eqpt & HP		Bucket Elevator Plant – Eqpt & HP	
KNOCK OUT M1 & M2	7.5	KO	10
VIB.FEEDER M1 & M2	3	VF	3
BC	10	BC	10
OBMS	2	OBMS	3
PS	10	BC	5
PS Suction	10	BE	15
BC	5	PS	7.5
BC	10	FBC	7.5
Screw	1	BC	5
RMC Drive	210	BE	15
RMC Dust Collector	15	BC	10
BC	7.5	FBC	7.5
		Screw Conveyor	4
		Mixer	183.6
		FBC	7.5
		BC	7.5
		BC	7.5
		BC	7.5
		Cooler Blower	40
		Cooler DC	30
		Central DC	75
TOTAL HP	**291**		**461.1**

	Belt Conveyor Plant		Bucket Elevator Plant	
	HP	%age of Total	HP	%age of Total
Sand Handling	66	22.7%	132.5	28.7%
Sand Mixing	195	67.0%	183.6	39.8%
Sand Cooling	15	5.2%	70	15.2%
Dust Collection	15	5.2%	75	16.3%
Total	**291**		**461.1**	

Comparison of Energy Utilisation

Installed Power Pie Chart of 40 MT/hr Plant



Estimated Impact of Energy on Casting Production Cost

	BE Plant	BC Plant
Installed Power HP	461	291
Utilisation of Power (Load)	85%	85%
Power consumed - kW/hr	288.13	181.88
Sand Plant Capacity MT/hr	40	40
Power for Sand Processing kW/MT	7.20	4.55
Saving in kWh/MT of Sand Processed		**2.66**
Sand : Metal Ratio	8.00	8.00
Power per MT of Casting kW/MT	57.63	36.38
Cost of Power Rs/kWh	8.00	8.00
Energy Cost Rs/MT of Casting	461.00	291.00
Impact on Casting Cost due to Energy in Rs/MT		**170.00**

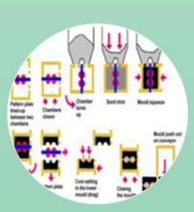
Sand Plant Energy Efficiency Differentiators

Sand Mixing	• Efficiently reaching to each grain of sand • Full power required only for 10 to 20% of the total cycle time when properties of sand are achieved
Sand Conveying	• Bucket Elevator – 75 to 90 m/min speed, lesser sand per meter, higher carrying load (buckets) • Belt Conveyor – 30 to 60 m/min speed, higher sand per meter, no additional load
Sand Cooling	• Mixer Cooler reduces duplication of energy to move sand while cooling • Energy used in proportion to the temperature of sand • Number of handling machines reduced if sand cooling & mixing are in the same machine
Dust Collection	• Bucket Elevator throws sand with high velocity leading to dust generation • More transfers generates more dust • Sand Cooler and Sand Mixer both require dust collection energy in conventional plant

Types of Moulding Machines – Broad Classification

100% Compressed Air

Simultaneous Jolt Squeeze Moulding Technology working on Compressed Air



Compressed Air & Hydraulic Energy

High Pressure Moulding Technology working on combination of Compressed Air and Hydraulic Energy

Full Hydraulic

High Pressure Moulding Technology working on Hydraulic Energy only

JSQ v/s FM – The Energy & Process Advantage of FM

Jolt Squeeze Machines

Specific Squeeze Force 1.5Kg/cm^2

30 HP

Reduces Weight Improves Dimensional Accuracy

Improves Global Competitiveness

Energy saving

30% in Machine

50% in Machining

2% in Material

Safe Working Conditions

Safety as per International Standards

Adheres to Pollution Norms

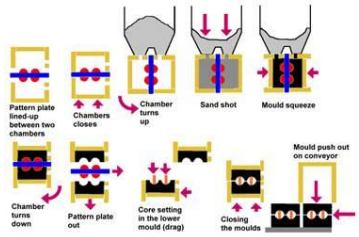
High Pressure Moulding

Specific Squeeze Force 10 kg/cm2 **(6 times)**

12.5 HP

Typical Energy Comparison Hyd-Air v/s Fully Hydraulic

Horizontal Flaskless Moulding



Hydraulics – 22 kW
Compressor – 75 kW

Typical Comparison Cake/Box Size 600 x 500 mm		
75,000	Moulds per Month	30,000
36,375	Units Consumed per Month	6,563
3.6	Power Cost per Mould	1.6
2,72,813	Estimated Energy Bill per Month	49,219
FM consumes 55% lesser Energy		

Hydraulic Horizontal Flask Moulding Machine

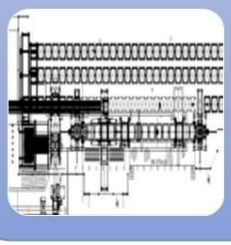
Hydraulics – 12 kW

Disclaimer: Data are indicative – tabulated to invoke the energy efficiency debate

Commercial Comparison Comp Air v/s Fully Hydraulic

Process & Energy Economics 350 TPM FM v/s JSQ		
Weight reduction saving @ 2.5%	@ Rs 15,000/MT	Rs 12.6 Lakhs
Power Saving @0.2 kWh/mould (600x600 box)	@ Rs 8.0/kWh	Rs 17.28 Lakhs
Manpower Reduction in Process	@ Rs 15,000/man/month	Rs 5.40 Lakhs
Recurring saving year on year Rs. 35.28 Lakhs out of which 50% is from Direct Energy and 30% contributes directly to Melting Energy		

Mould Handling – the energy efficiency market evolves



Use of Customised Machines for Turnovers, Box Closing, Box Separation, Box Cleaning, Sprue Cutting, Hydraulics

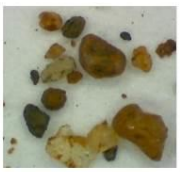
Robots working with Servo Motors, more than 50% energy reduction in Mould Handling

Mould Plant Energy Differentiators

Moulding Machine	• Compressed air is known to have 12 to 30 % conversion of energy from Electrical Energy to Compressed Air • Minimising movements for the same process requirements • Calculating peak energy requirements with detailed energy demand study on timeline basis
Mould Handling	• Optimising the number of movements with good time & motion study can reduce the energy in conventional process • Understanding the actual need of movements for meeting process requirements – use of Robots have a huge saving

Green Sand to Core Sand Reclamation Reclamation Courtesy – Flometallics (Brakes India) Jhagadia

Test Results:

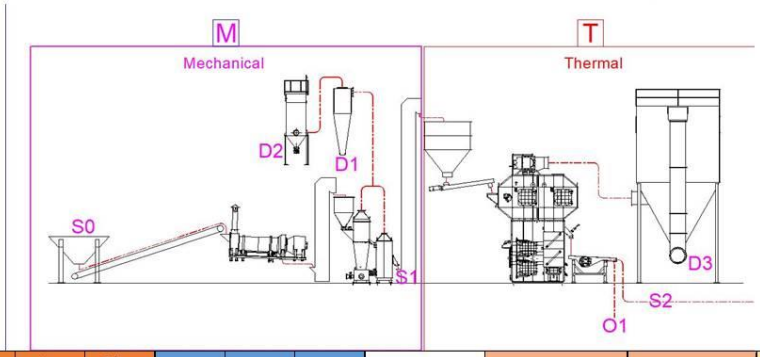
Original Sand	Test Data	Accepted S2 Reclaimed Sand at Rhino	Accepted S3 Reclaimed Sand at Rhino	Accepted S3 Reclaimed Sand at FIPL
58 to 60	AFS	54 to 58	50 to 52	52 to 54
6 to 8%	LOI	0.06 to 0.08	0.03 to 0.06	0.03 to 0.06
Not checked	ADV	3.5 to 4 @ 7.5 pH	3.5 to 4 @ 7.5 pH	2.2 to 2.5
				

RECLAIM SAND STRENGTH TEST SAMPLES

Dog bone sample

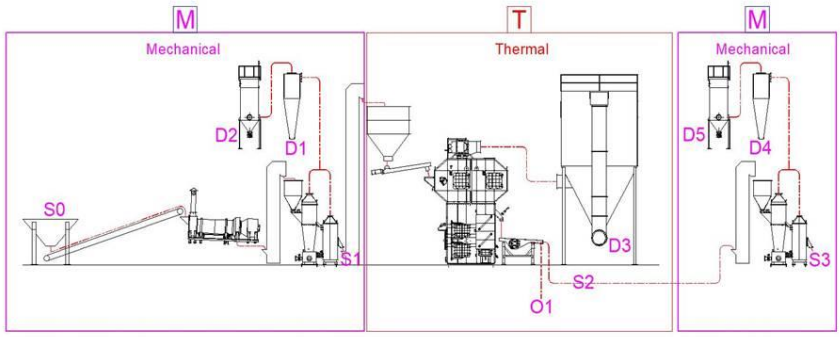
Transverse sample

Green Sand to System Sand (Mech + Thermal)



Sr.No.	S0 (In Ton)	Avg Total Clay TC	Silica Content Approx S0-Si	S1 (In Ton)	D1 (In Ton)	D2 (In Ton)		S2 In-Put (In Ton)	S2 Out-Put (In Ton)	O1 (In Ton)	D3 (In Ton)
1	100.0	12.0	88.0	84.0	15.2	0.8	→	84.0	81.5	0.3	2.3
%age		12%		95.5%	15.2%	0.8%			97.0%	0.3%	2.7%
		Sand Recovery		95.5%				Sand Recovery	92.6%		

Green Sand to System Sand (Mech + Thermal)



Sr.No.	S0 (In Ton)	Avg Total Clay TC	Silica Content Approx S0-Si	S1 (In Ton)	D1 (In Ton)	D2 (In Ton)		S2 In-Put (In Ton)	S2 Out-Put (In Ton)	O1 (In Ton)	D3 (In Ton)		S3 In-put (In Ton)	S3 Out-Put (In Ton)	D4 (In Ton)	D5 (In Ton)
1	100	12	88	84	14.0	1.9	→	84.0	81.5	0.3	2.3	→	81.5	70	11.2	0.2
%age		12%		95.5%	14.0%	1.9%			97.0%	0.3%	2.7%			86.0%	13.8%	0.2%
		Sand Recovery		95.5%				Sand Recovery	92.6%				Sand Recovery	79.7%		

Processing Cost Moulding Sand(S2) & Core Sand (S3)

S2 Green Sand Recamation Input - Return Sand from Green Sand System Output - Thermally Reclaimed Green Sand for Moulding Process			
Green Sand Reclamation Plant Cost			
	Qty	Unit Rate in INR	Cost per MT in INR
Direct Processing Costs			
PNG m3/MT, Rs/M3 (running)	33	38.0	1,254
Energy Cost (kWh, Rs/kWh)	86	8.0	688
Direct Cost of Regenerated Sand in Rs/MT of Useful Sand			1,942
Manpower Cost/MT (B)			152
Cost of Cold Start - Rs/MT (C)			43
Total Cost of Sand Processing with Manpower & Cold Start			2,137

S3 Green Sand Recamation Input - Return Sand from Green Sand System Output - Reclaimed Sand for Cold Box/Hot Box Core Production			
Green Sand Reclamation Plant Cost			
	Qty	Unit Rate in INR	Cost per MT in INR
Direct Processing Costs			
PNG m3/MT, Rs/M3 (running)	33	38.0	1,254
Energy Cost (kWh, Rs/kWh)	116	8.0	928
Direct Cost of Regenerated Sand in Rs/MT of Useful Sand			2,182
Manpower Cost/MT (B)			108
Cost of Cold Start - Rs/MT (C)			43
Total Cost of Sand Processing with Manpower & Cold Start			2,334

THANK YOU

Manish Kothari – www.rhinomachines.net