



Encon opportunities in Foundry- Case study for KBL, K'vadi



Enriching Lives

Presentation by ,

KIRLOSKAR BROTHERS LIMITED
Kirloskarvadi Plant



Products – Pumps for Various Applications



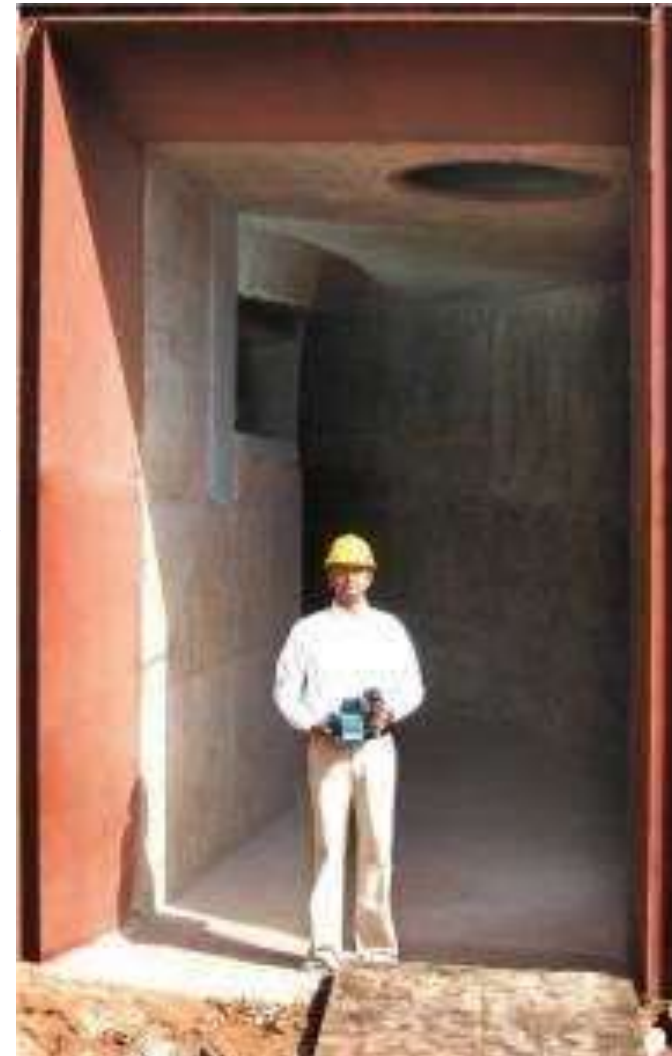
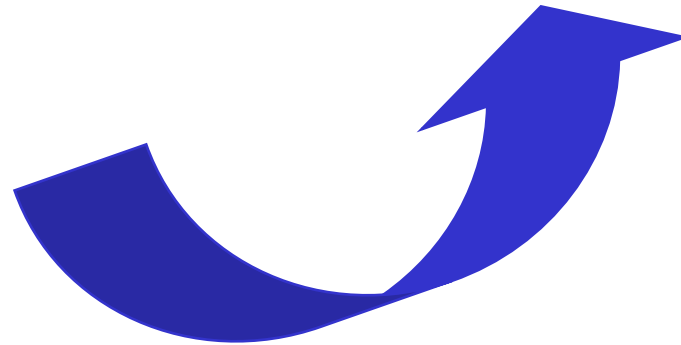
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Pumps range from $1/10$ kW to 12,000 kW

A man standing at the discharge pipe of a Concrete Volute Pump, KBL's biggest pump (126000 m³/hr), holding KBL's smallest pump (0.28 m³/hr.)



Monobloc Domestic Pumps
Capacity up to 0.28 m³/hr.



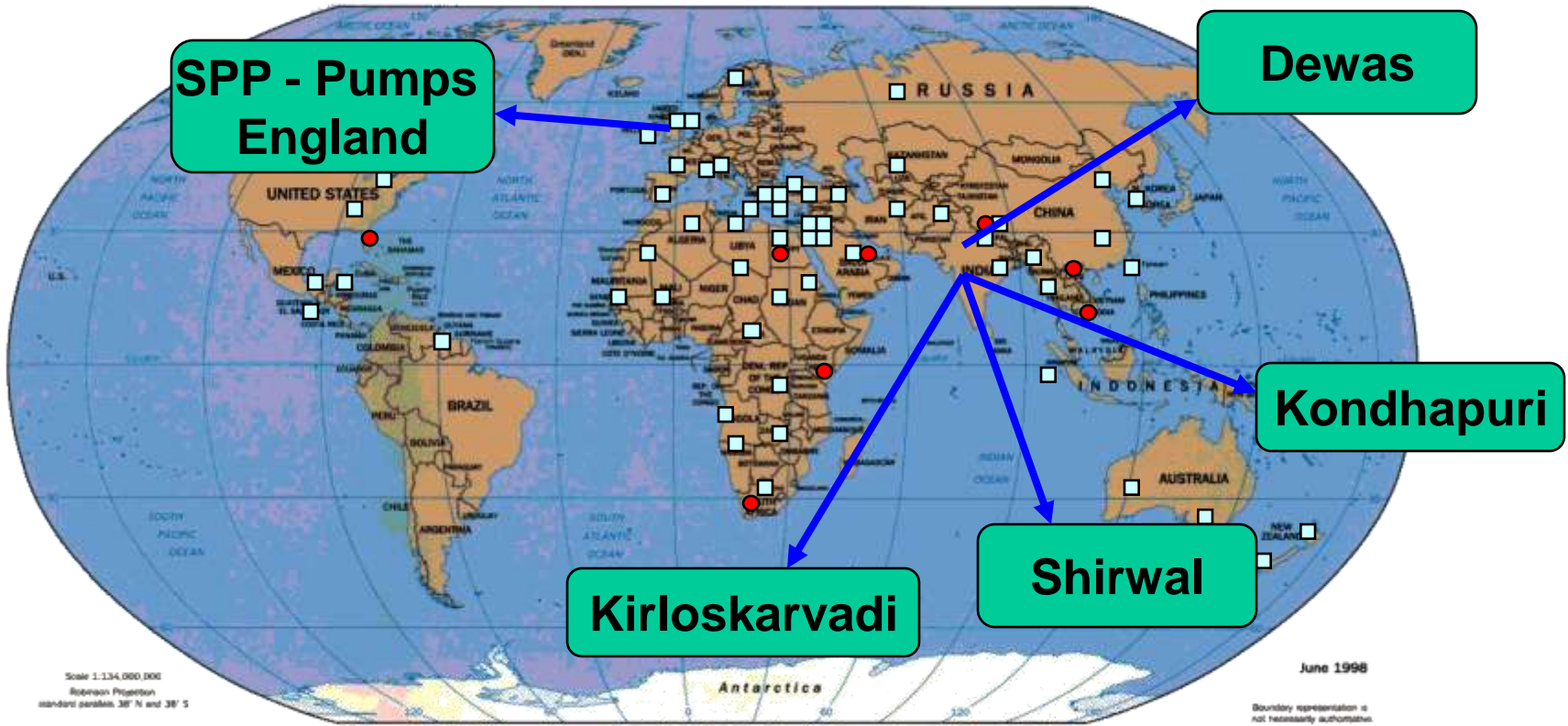


Manufacturing Plants



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Global Presence Over 70 Countries Worldwide



□ Overseas Customers

● Overseas Offices



Integrated Plant (Processes)



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- **Research and Engineering**
- **System Engineering**
- **Procurement**
- **Manufacturing – Pattern Shop, Foundries , Machining**
- **Testing - Asia's biggest Pump Testing Lab**
- **Quality Assurance**
- **Project management**
- **Erection and Commissioning**
- **Operation and Maintenance**
- **After Sales & Product Support**

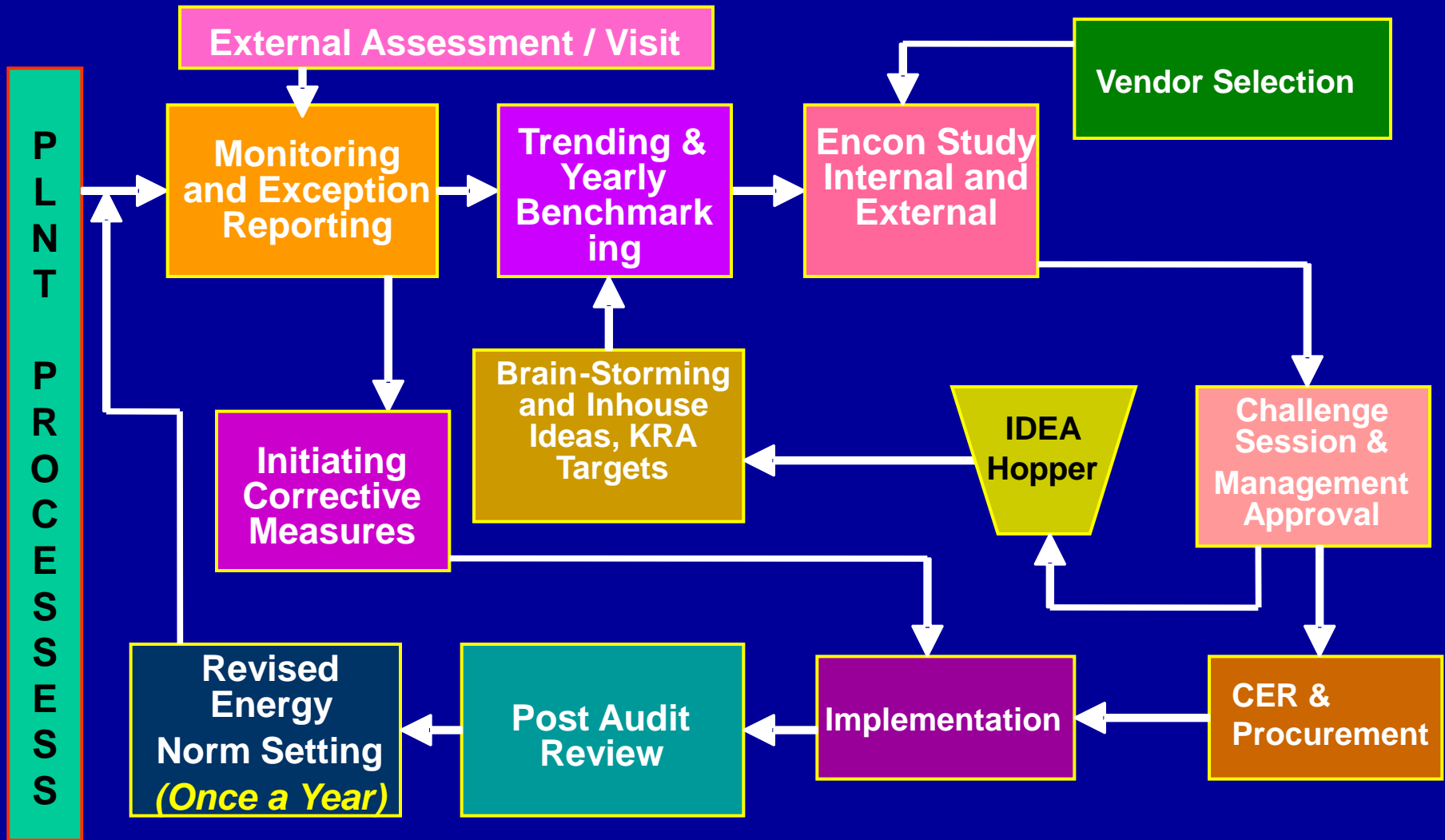


Approach

ENERGY CONSERVATION



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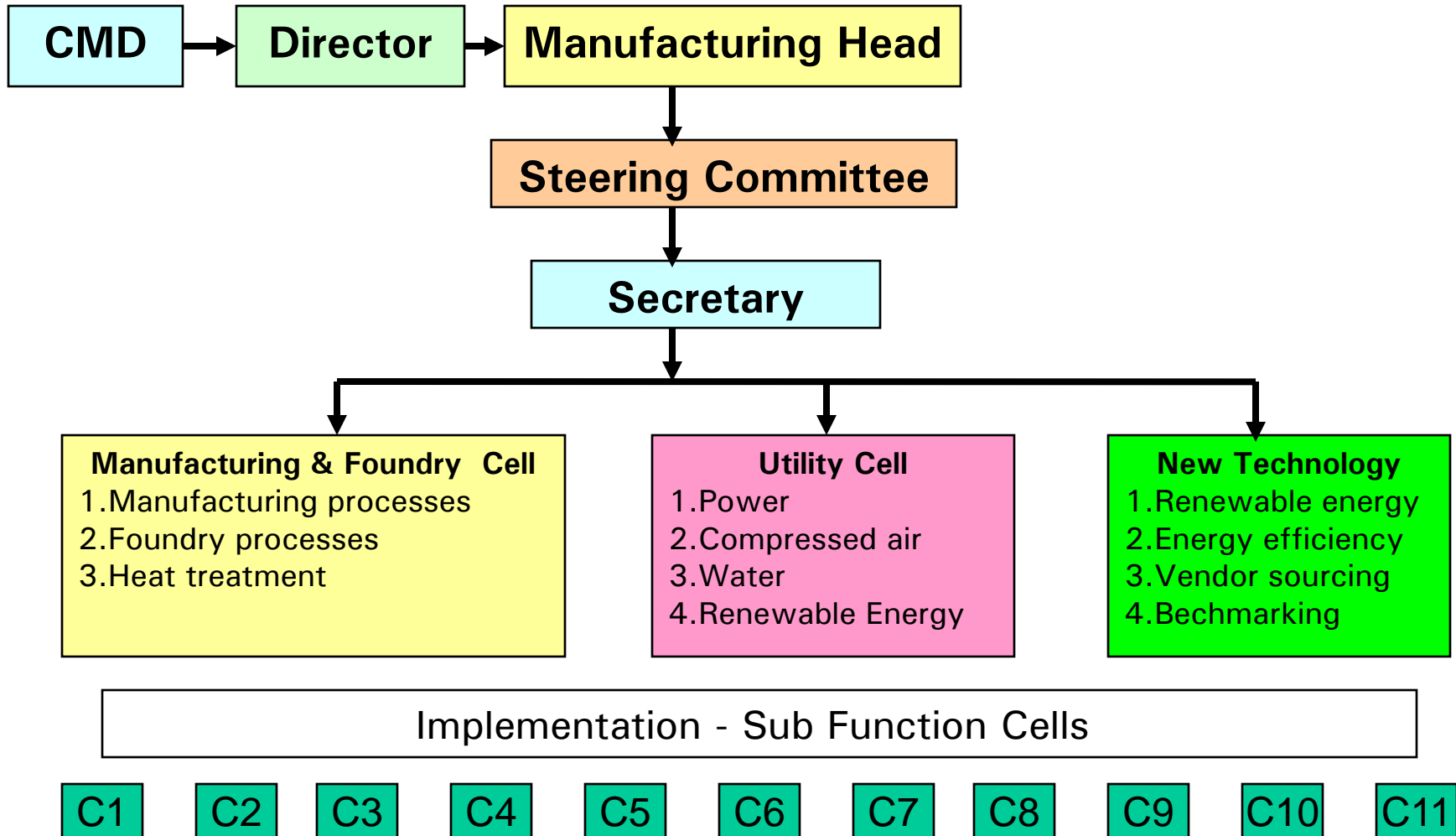




Energy Conservation - Team



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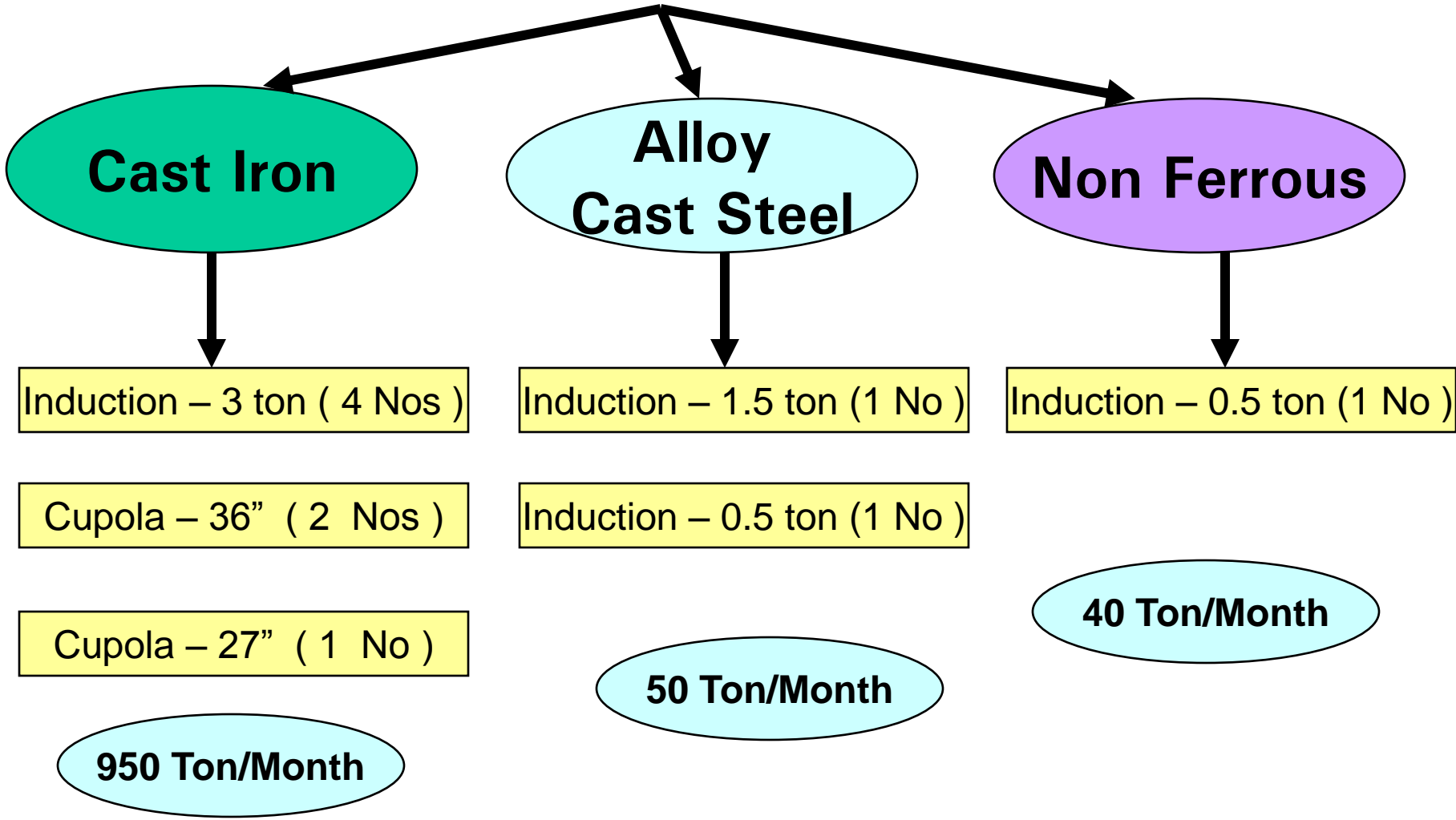




Foundries



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Benchmarks



Sr	Parameter	Unit	Theoretical	International 2008		National Best	KBL Target 08-09	Achieved 08-09		Target Mean 09-10
				Best	Mean			Best	Mean	
A1	Foundry Power Consumption									
1	Cast Iron small castings	kWh/ton	398	595	772	650	600	550	610	595
2	Cast Iron Heavy Casting	kWh/ton	398	595	772	650	700	648	678	650
3	Alloy Cast Steel	kWh/ton	406	620	872	750	700	644	715	700
4	Non Ferrous	kWh/ton	327	400	530	*	450	383	585	475
5	Coke to metal ratio	Ratio	**	1:12	**	1:10	1:6	1:6.5	1:5	1:7.5
A2	Foundry Yield									
1	Cast Iron small casting	%	**	84	66	65	75		74	75
2	Cast iron Heavy Casting	%	**	84	66	75	75		67	75
3	Alloy steel casting	%	**	57	58	**	57		54	55
4	Non ferrous	%	**	73	53	**	70		66	70
A3	Foundry productivity									
1	Cast Iron small casting	t/man/month	**	18.7	9.9	3	6.5		6.01	6.5
2	Cast iron Heavy Casting	t/man/month	**	18.7	9.9	3	3.5		2.8	2.9
3	Alloy steel casting	t/man/month	**	11.4	5.4	**	1		0.7	0.8
4	Non ferrous	t/man/month	**	10.8	4.1	**	4.1		1.2	1.3
A4	Foundry rejection									
1	Cast Iron small casting	%	0	**	**	**	2		2.2	1.8
2	Cast iron Heavy Casting	%	0	**	**	**	2		2.9	2.7
3	Alloy steel casting	%	0	**	**	**	1		1.4	1.4
4	Non ferrous	%	0	**	**	**	2		2.31	2.2
B	Others									
9	Power kWh/Pump (Total)	kWh/Pump	**	**	**	**	470	**	456.5	450
10	Compressed Air	kW/CFM	**	**	**	**	0.14	**	0.14	0.13
11	Compressed Air Leakage	%	0	**	**	8-10'	8	**	9	5
12	HSD Consumption for H.treatment	L/Ton	**	**	**	**	100	**	71	65
13	Power Cons kWh/Ton H.Treatment	kWh/Ton							512	300
14	Water consumption	KL/Pump	**	**	**	**	7.2	**	6.9	6.5
15	% Energy Cost w.r.t Production value	%	**	**	**	**	2	**	2	1.8

Source: http://oee.nrcan.gc.ca/cipec/ieep/newscentre/foundry/5/5_2.cfm
SMI News letter Sept 2004



Share of foundry



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- Out of total energy consumption 45% share is of foundry

CI foundry – 42%

Heavy foundry – 41%

ACS foundry – 13%

NF foundry – 4%

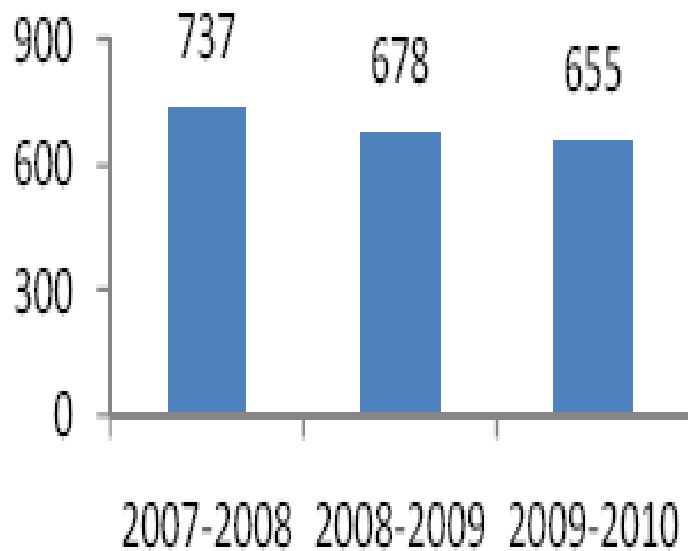


Specific Energy Consumption

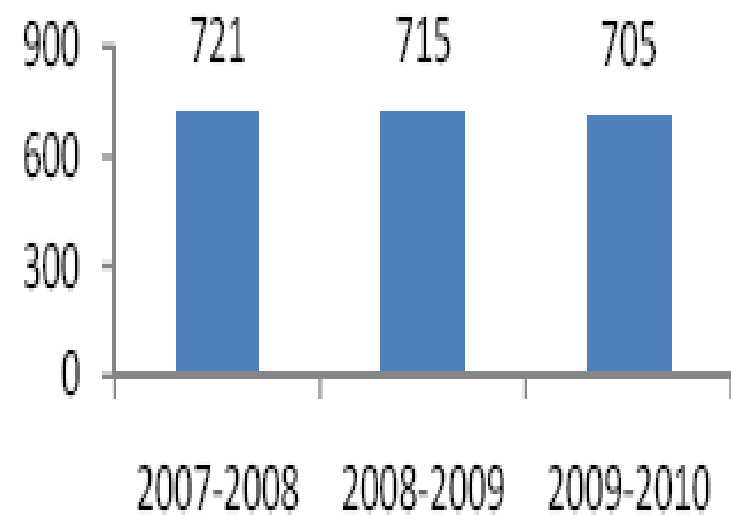


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Heavy Foundry kWh/TON



ACS Foundry kWh/TON

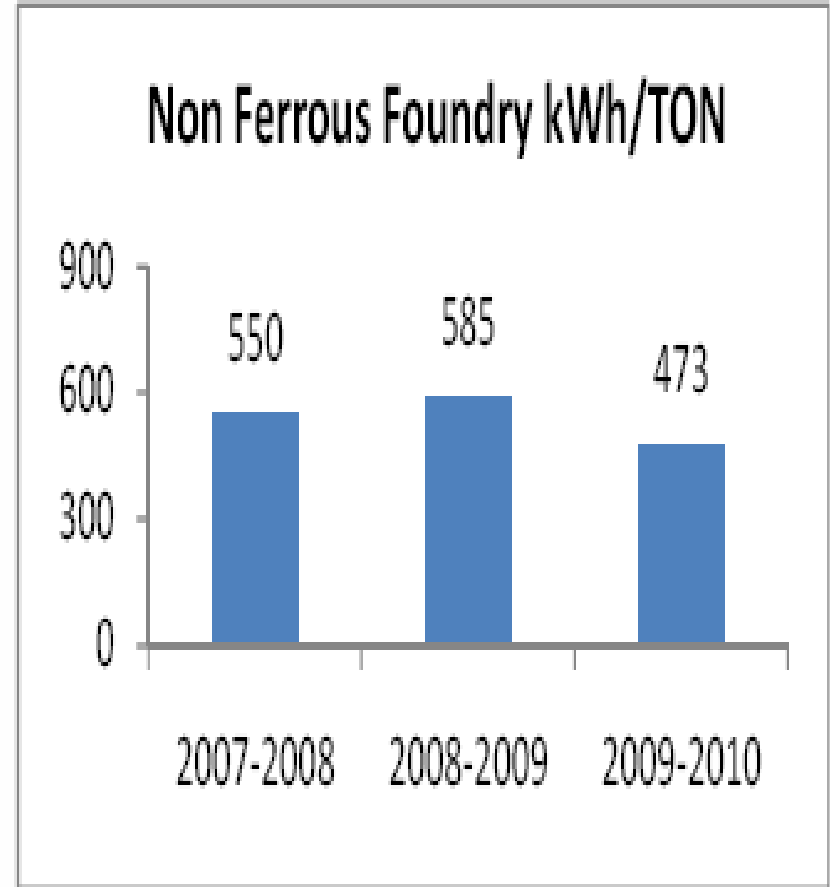
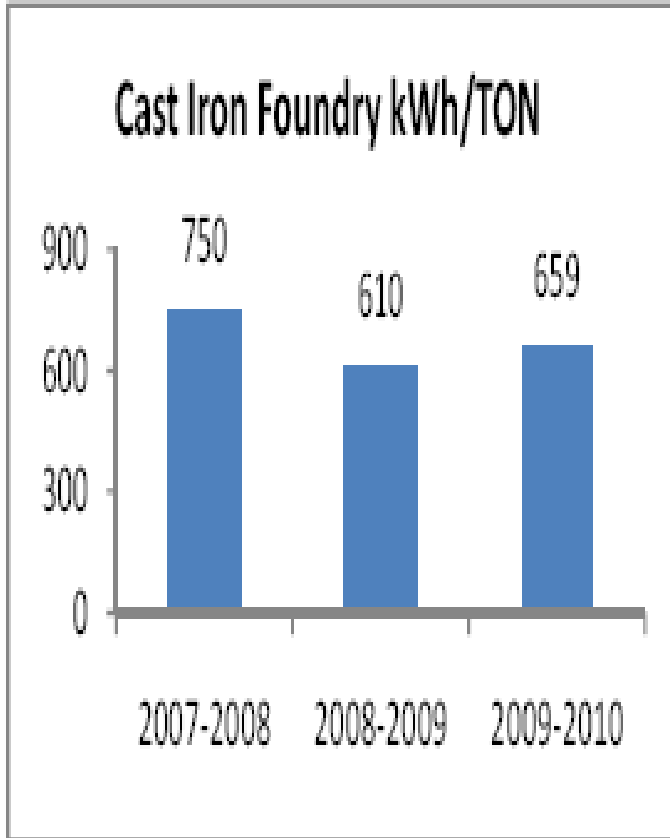




Specific Energy Consumption



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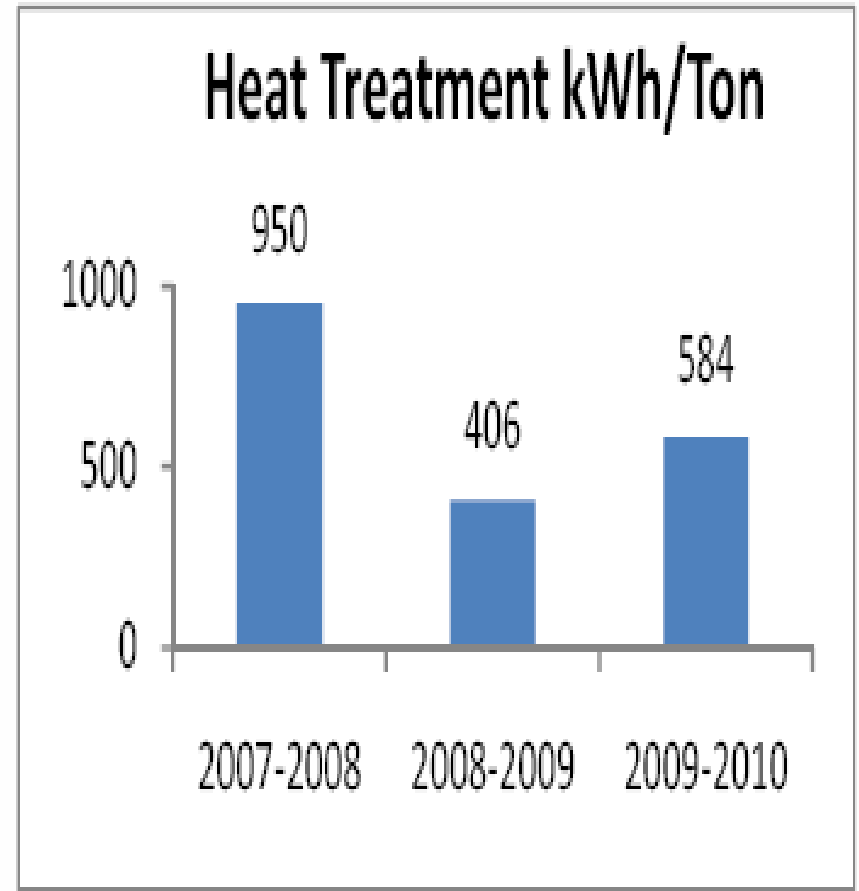
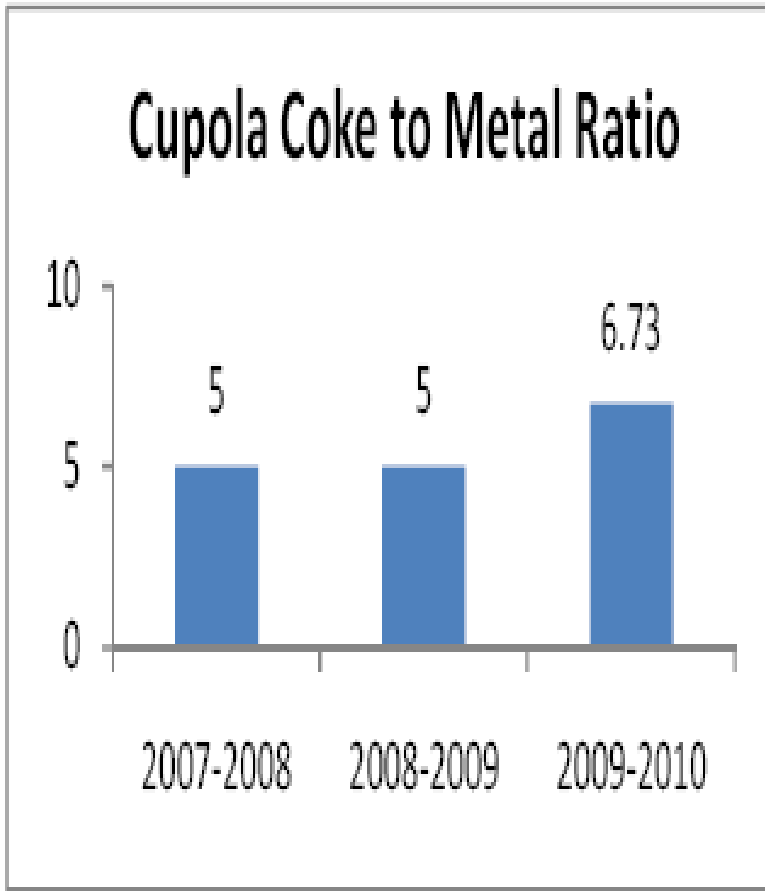






Specific Energy Consumption





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Multiple Pattern

Before	After
	
<ul style="list-style-type: none">• Box size 16" * 16"• No. of machines – 6 Nos• Total boxes per month - 3800	<ul style="list-style-type: none">• Box size 24" * 24"• No. of machines – 2 Nos• Total boxes per month - 2000

Annual Energy Saving in Rs Million : 1.05

Before	After
	
<ul style="list-style-type: none">• Oil fired Furnace• High melting cost• Rejection levels – 5%	<ul style="list-style-type: none">• Induction furnace• Low melting cost• Rejection levels – 3%


Annual Energy Saving in Rs Million : 3.6



Replacement of Wood fired core oven by Electric



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Before	After
Wood fired Core Oven	
<ul style="list-style-type: none">• Rejection due to blow defect 35%• Moderate core handling cost	<ul style="list-style-type: none">• Rejection due to blow below 10%• No handling cost – online



Annual Saving in Rs Million : 0.2



Adoption of Divided blast Cupola



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Before	After
	
<ul style="list-style-type: none">• Coke to metal ratio 1:5• Temp range 1350 to 1400	<ul style="list-style-type: none">• Coke to metal ratio 1:7• Temp range 1400 to 1450



Annual Energy Saving in Rs Million : 3.0



Adoption of Unit Sand System



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Before	After
	
<ul style="list-style-type: none">• Two part moulding system• Poor sand quality• 20% addition of fresh sand• Poor surface finish• High maintenance cost	<ul style="list-style-type: none">• Unit sand system• Best quality of sand• 5% addition of fresh sand• Good surface finish• Low maintenance cost



Annual Saving in Rs Million : 1.0



Energy Saving in Felling Operation





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Before	After
	
<ul style="list-style-type: none">• High rejection due to breakage• Poor surface finish• High Handling cost	<ul style="list-style-type: none">• Zero rejection• Best surface finish• Low handling cost

Annual Energy Saving in Rs Million : 0.5




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Project No: A1		Title of the Project: Substitution of Fuel from HSD to LPG for Core Baking			Area: HF / ACSF / NFF	
Description of the energy conservation measure: Initially Core Baking was done with help of HSD. It is replaced by LPG for Fuel cost Saving, Oil leakage problems, Smooth operations, new Technology.						
Picture/ sketch/ drawing before modification (if available)			Picture/ sketch/ drawing after modification			
Diesel consumption - 200 Lit/Month Cost in Rs 200 X 12 X35 =84000.00 per annum 			LPG consumption - 4 Cylinder / 1.5 Months Cost in Rs 4 X 8 X 740 = 23680.00 Other Benefit - Rejection percentage reduced up-to 0.5% 			
Equipment Supplier Name : M/s. Kulkarni Gas Agency, Sawantpur Vasahat						
Total investment, Rs.450000/-			Implementation Date: October 2009			
Annual energy cost savings, Rs. 60000.00						
Other benefits :: Reduction in GHG emission						
On annual basis	kWh	Coal (Tonnes)	Gas kg	Oil (kL)	Other	
Energy consumption before				24		
Energy consumption after			608			
Energy tariff, Rs/ kWh/ Tonnes/ kg/ kL ...			41			
Team Members : ARG/RL/SVY						



ing Lives

Project No: A4	Title of the Project: Quality improvement for Furnace Raw maintenance	Area: CIF			
Description of the energy conservation measure: Runners & riser were cleaned by manually. It affects on Furnace Consumption as well as lining & decreases furnace efficiency.					
Picture/ sketch/ drawing before modification (if available)	Picture/ sketch/ drawing after modification				
TOTAL QUANTITY OF RUNNER & RISER IN TON USED PER YEAR = 8400 REQUIRED ENERGY FOR MELTING IN KWH = 5040000	TOTAL QUANTITY OF RUNNER & RISER IN TON USED PER YEAR = 8223 REQUIRED ENERGY FOR MELTING IN KWH = 4951579 				
Equipment Supplier Name : In-house					
Total investment, Rs.50000/-	Implementation Date: October 2009				
Annual energy cost savings, Rs. 460000					
Other benefits:					
On annual basis	kWh	Coal (Tonnes)	Gas Nm ³	Oil (kL)	Other
Energy consumption before	5040000			24	
Energy consumption after	4951579				
Energy tariff, Rs/ kWh/ Tonnes/ Nm ³ / kL ...	5.69				
Team Members : NNN/SNK/ARG/HSM/RKD					



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Project No: A28	Title of the Project: Replacement of MS fabricated elevator buckets by FRP buckets.	Area: CI Foundry
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Description of the energy conservation measure:
 Before – 1) MS Elevator bucket weight = 15.280kg
 2) Extra Self weight on belt(Tension) Due to MS bucket = 1.0Ton.
 3) Power consumption = 3.98kWh.
 4) Material cost = Rs 5500*74 = Rs.4,07,000
 After – 1) FRP bucket weight = 2.280kg.
 2) Extra self weight minimized by 1 Ton
 3) Power cons = 3.18 (0.80*10*25*12 = 2640kWh * Rs.6 = 15840 /Annum.
 4) Material cost = Rs.750*74 = Rs.55500/

Picture/ sketch/ drawing before modification (if available)	Picture/ sketch/ drawing after modification
	

Equipment Supplier Name: Patil Thermoplast, Palus.

Total investment, Rs. 58000/- Implementation Date: 18-08-2009

Annual energy cost savings, Rs. 15,000/-

Other benefits : Material cost Saving Rs.351000/-

On annual basis	kWh	Coal (Tonnes)	Gas Nm ³	Oil (kL)	Other
Energy consumption before	3.98				
Energy consumption after	3.18				
Energy tariff, Rs/ kWh/ Tonnes/ Nm ³ / kL ...	5.69				



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Project No: A27	Title of the Project: Automation for fresh sand conveying in H/F & ACS sand Plant.	Area: H/F & ACS FDY.
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Description of the energy conservation measure:
Reduction in Energy cost as well as eliminated manual operation

Picture/ sketch/ drawing before modification (if available)	Picture/ sketch/ drawing after modification
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Equipment Supplier Name: In House.

Total investment, Rs.3,17,000 /-	Implementation Date: 17-08-2009.
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Annual energy cost savings, Rs. 4, 17,776 /-

Other benefits Rs. 95,952 /-

On annual basis	kWh	Coal (Tonnes)	Gas Nm ³	Oil (kL)	Other
Energy consumption before	69696				
Energy consumption after	Nil				
Energy tariff, Rs/ kWh/ Tonnes/ Nm ³ / kL ...	6.00				



Synchronization of melting zone to reduce power demand



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Before	After
4800 KVA	3500 KVA
<ul style="list-style-type: none">• All furnaces in first shift• Low utilization of furnaces	<ul style="list-style-type: none">• Melting zone staggered in 3 shifts• Optimum utilization

Annual Energy Saving in Rs Million : 1.8



Additives to improve coke to metal ratio





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Before	After
Ratio 1:4.9	Ratio 1:5.5
<ul style="list-style-type: none">• Low temp• Low melting rate• Metal pigging	<ul style="list-style-type: none">• High temp• High melting rate• No metal pigging

Annual Energy Saving in Rs Million : 2.5

Gas operated mould box heater



Before	After
	
<ul style="list-style-type: none">• Fuel - HSD• High Fuel cost• Pollution	<ul style="list-style-type: none">• Fuel – LPG• Low Fuel cost• No pollution

Annual Energy Saving in Rs Million : 0.2

Before	After
<p>Mains Frequency Induction Furnace</p> 	<p>Medium Frequency Induction Furnace</p> 
<ul style="list-style-type: none"> • Operates at 50 Hz • Diode Technology • Power factor 0.94 • Efficiency of equipment 80-85 % • Melting rate 2 ton / Hour • Specific Energy - kWh/ton – 850 	<ul style="list-style-type: none"> • Operates at 500 Hz • IGBT Technology • Power Factor 0.987 • Efficiency of equipment 96-98 % • Melting rate 3.2 ton/Hour • Specific Energy - kWh/ton – 615

Annual Saving Rs Million : 8.80

Energy Saving thru New Pattern

Before	After
<p>No Centre hole in Core</p> 	<p>Centre Hole in Core print</p> 
<ul style="list-style-type: none"> • Energy consumption in Drilling • Additional set up for drilling • Additional 0.85 kWh power for melting 	<ul style="list-style-type: none"> • No Energy for Drilling • No set up , direct boring • No additional power for core material

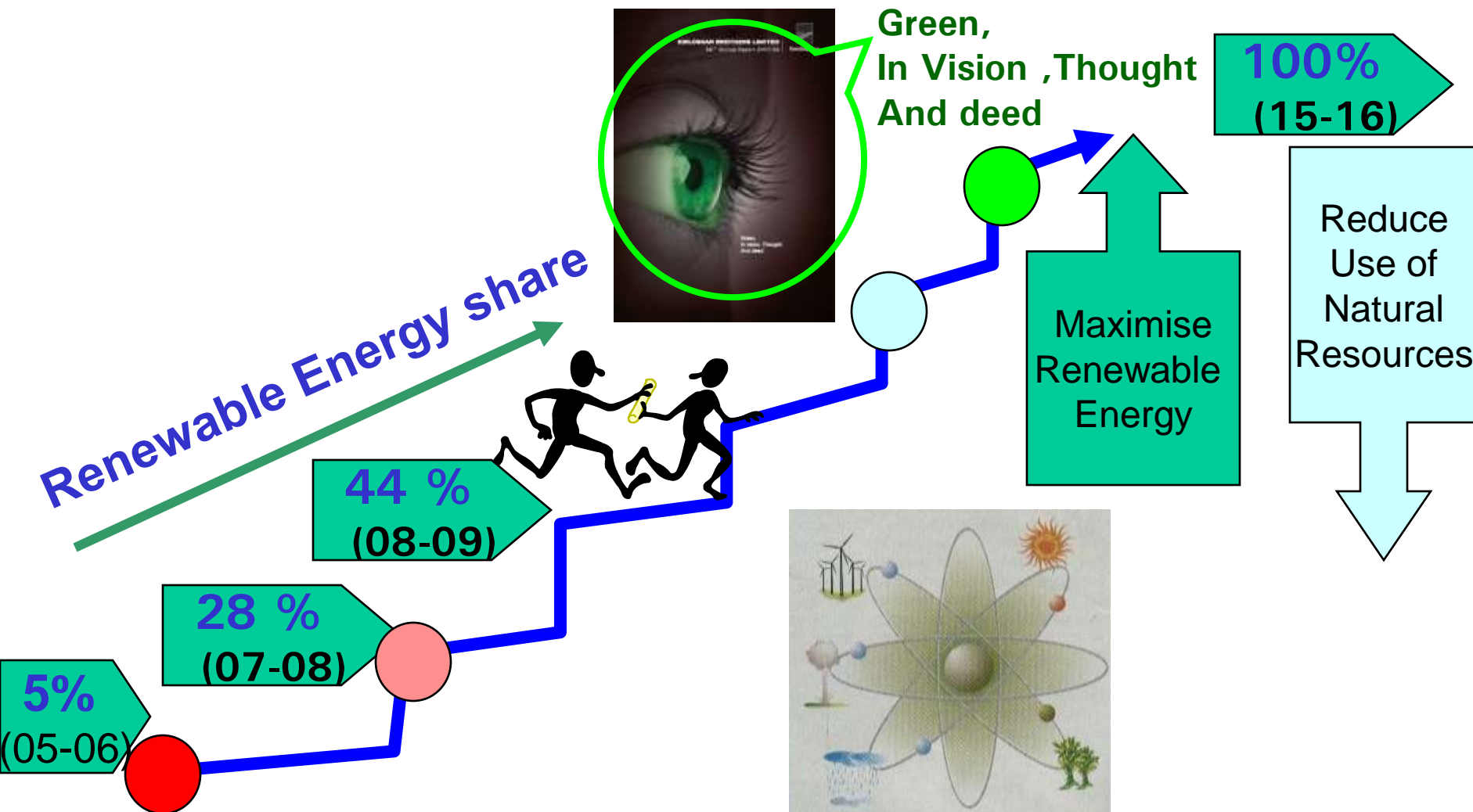
Annual Energy Saving in Rs Million : 0.75



Energy Milestone



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THANK YOU



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Energy Conservation

