BRAKES INDIA LIMITED
Sholinghur, Vellore (Tamil Nadu)

Brakes India Limited Foundry Division

Unit Profile

Brakes India Foundry was established in the year 1981 at Sholinghur, 120 KM from Chennai. From a modest beginning, BIF has been able to achieve a compounded annual growth rate of 18% in the last 10 years.

BIF specialize in the manufacture of safety critical ductile iron castings and export 51% of their output to all continents of the world mainly to the automotive and Refrigeration & Air-conditioning industries

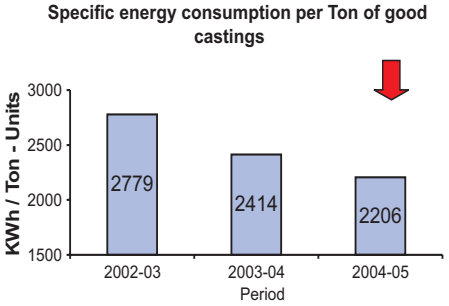
BIF is the only foundry in the world to get the Deming Application prize and the TPM Excellence award that too in the same year 2003. Their QMS is certified to be inline with ISO/TS 16949:2002 standards and EMS to ISO 14001:2004 standards.

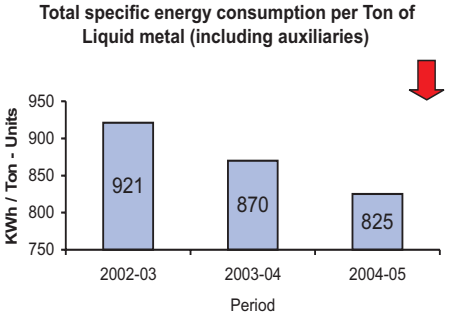
BIF's philosophy of inclusive and sustainable development has resulted in innovative utilization of solid waste for construction and green belt development. About 50% of their energy requirements are met by green power from windmills and flared natural gas.

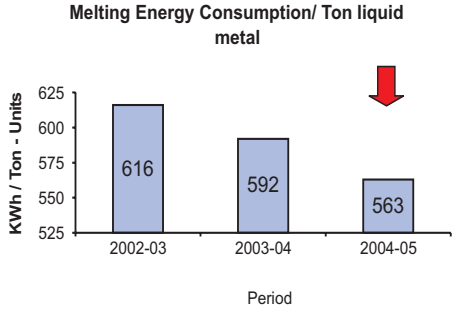
Energy Consumption

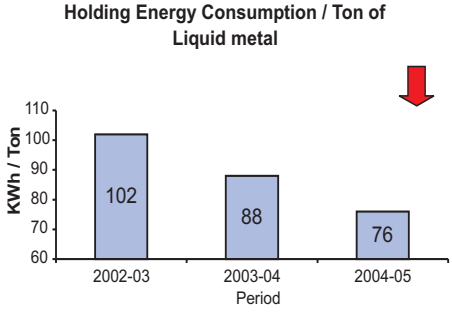
Energy Saving Measure	Unit	2002-2003	2003-2004	2004-2005
Annual production	MT	24913	33446	42441
Energy Cost as % of sales	%	24.06%	21.70	18.71
Specific energy consumption of the unit per ton of good castings	KWh/ton	2779	2414	2206
Specific energy consumption of the unit per ton of Liquid metal	KWh/ton	921	870	825
Cost saving obtained through the use of green energy from wind mills and gas energy.	Rs.in lakhs	54.57	71.08	75.67

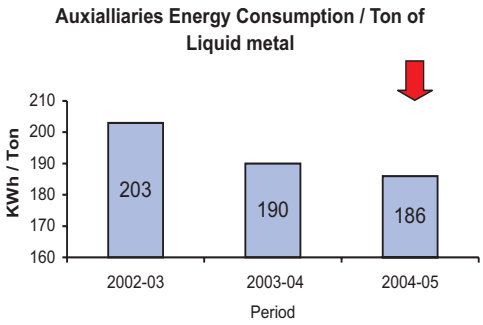
Graphical representation of energy consumption

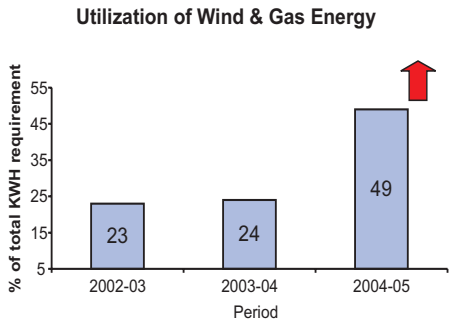




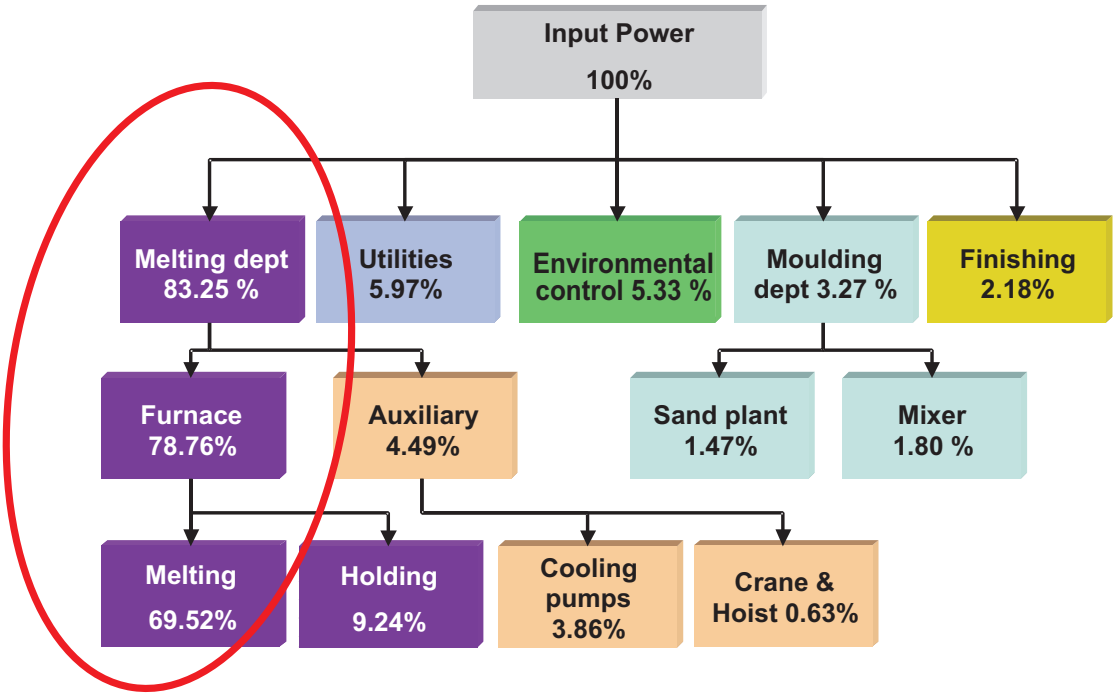








Energy distribution Tree



Major activities implemented to reduce energy consumption

Charge materials and charging operations

Process	Activity	Best Practices for energy conservation	Action Taken
	Condition of charge Metallics	Charges should not contain dirt and rust otherwise more specific energy required for melting	Kaizen 1,2
	Size of the charge materials	Small size of scraps to be used to yield the more melt rate otherwise melt rate will be low with more consumption	Kaizen 3
Melting	**Charging time**	Higher charging time will increase energy consumption & radiation losse	Kaizen 4,5,6
	Furnace operating techniques	Higher furnace charging time will contribute 1% energy loss	Kaizen 7
	Composition control time	Base metal chemistry checking time will increase the idle run with molten metal. Chemistry lab should very nearer to the melt platform	Kaizen 8
	Temperature control	When a metal reaches required tapping temperature, it should not wait for temp. check. This will increase the energy losses	Kaizen 9
Melting	**Slag removal practices**	Slag formation is an inherent reaction of molten metal with oxides and dirt in charges More slag removal time will increase energy losses	Kaizen 11,12
	Melt schedules	Schedule for next day to be released a day before. Otherwise furnace will be in idle state	Kaizen 13
	Holding practices	Holder should always be in closed condition otherwise it will increase the radiation losses	Kaizen 14,15
	Preheating the Furnace/ ladle	Furnace has to be started after preheating or to be filled with charges to absorb the residual heat in the furnaces otherwise cold starting will require more energy than normal melting.	Kaizen 17
Melting	**Increasing the bulk density of charge inside the furnace**	Less charge density will increase the power consumption significantly	Kaizen 18
	Interlocking auxiliaries	Interlocking of auxiliaries with main equipment will eliminate the idle running hours	Kaizen 19,20,21
	Modifying the equipment design	Equipment modification will increase the output of the melting furnace	Kaizen 22
	Reduction of power tariff through alternate sourcing	Utilization of non renewable energy sources and alternate sourcing will reduce the power tariffs	Kaizen 23
	Improving the power factor	Lower PF will increase the current and voltage drop across the transformer & throughout the distribution systemKaizen 24	

After implementing the best practices, BIF achieved the following results

Activities	Time taken in Minutes	
	Earlier practice	New practice
Foundry returns charging	27	17
Steel Charging	15	9
Melting	20	15
Super Heating	10	10
Deslagging	5	4
Total	**77**	**55**

Results :

•Melt cycle time reduced from 77 to 55 minutes

•Melt rate increased from 3 MT to 4 MT per hour

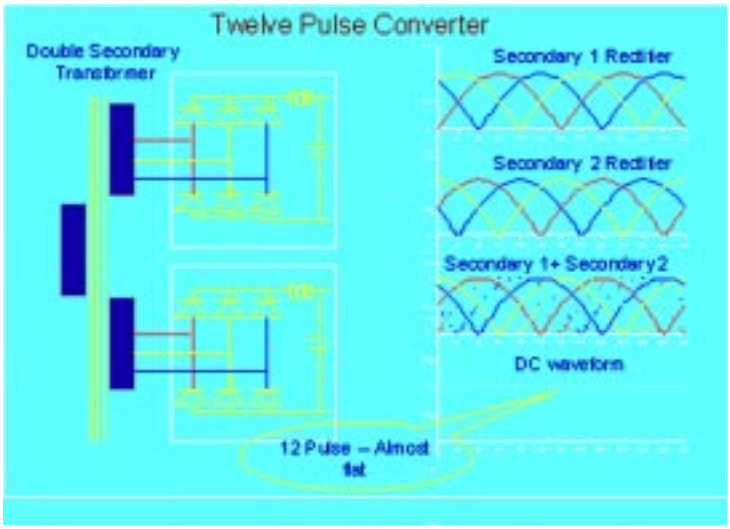
•Melting Energy consumption reduced from 592 to 563 KWH/T.

Major energy conservation projects implemented during year 2004-05

BIF has implemented many energy saving proposals of small, medium and large scale.

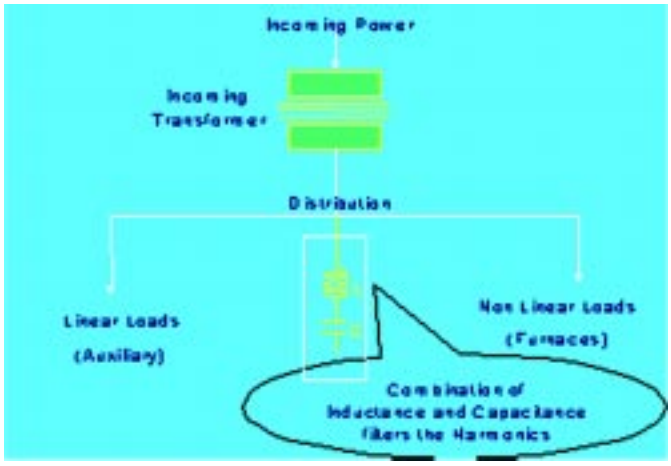
1) BIF has installed 12-pulse converter and harmonic filters in the induction furnaces to achieve unity power factor.

A. Installation of 12 pulse converter



After implementing 12 pulse converter, Power factor improved from 0.954 to 0.9886

B. Installation of harmonic filter



HARMONIC FILTER

Result
Power factor 0.9999

2). Reducing the melting energy consumption by increasing the bulk density of the steel scrap bundles

Technical analysis

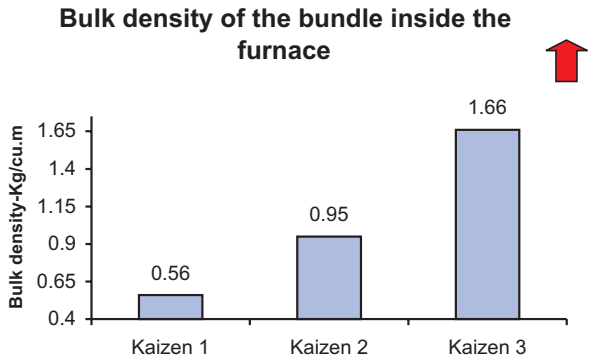
The bulk density of steel bundle charge depends on the following 3 factors:

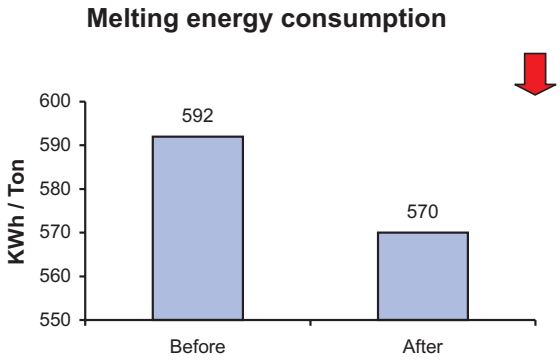
- Size of bundle
- Density of each bundle
- Shape of the bundles

Kaizen 1 **Kaizen 2** **Kaizen 3**

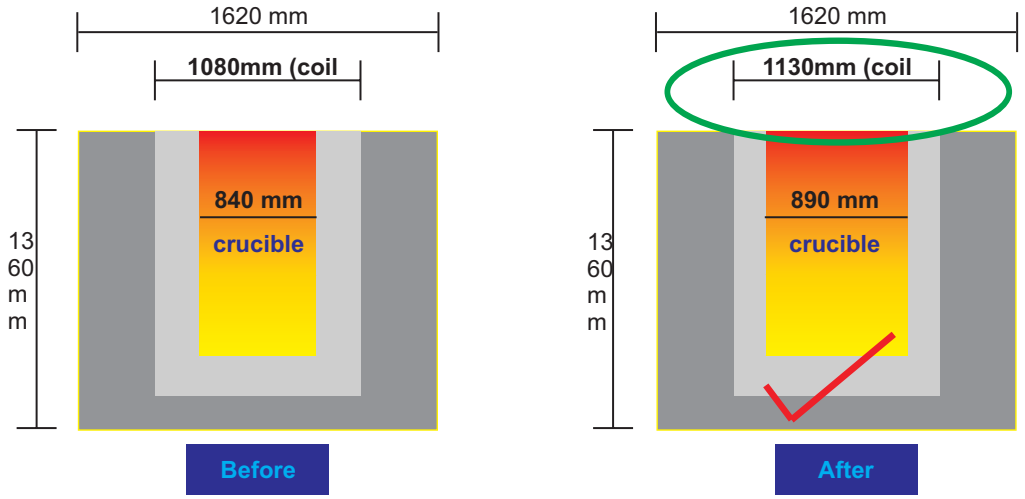
Kaizens	Bundle Size	Area of squeeze	Density of bundle	Bulk density in the furnace	Comparison of bulk density	Weight of charge in the furnace
Kaizen 1&2: To increase the bulk density of stee scrap bundle	20"x12"x12"	240 Sq.inch	0.95	0.56	1	630 Kg
	12"x12"x12	144 Sq.inch	1.58	0.95	1.75 times	1080 Kg
Kaizen 3: To further increase the bulk density of steel scrap bundle by converting to hexagonal shape	12"diagonal Hexagonal	94 Sq.inch	2.45	1.66	3 times	1890 Kg

In order to get higher bulk density, the equipment design was changed to produce hexagonal bundles





3) Increasing the molten metal output with same energy input by modifying the crucible diameter



Result

Increasing furnace coil diameter by 50 mm leads to increase crucible capacity by approximately 15% (Melt rate increased from 4.1 to 4.7 MT per heat per furnace for the same energy input) This is horizontally deployed to remaining three melting furnaces.

Energy Consurvation Plans and Targets

S No	Activity	Unit	Target- 2005-06	
			From	To
1	Reduction of specific energy consumption per ton of liquid metal	KWh/MT	825	792
2	Reduction of specific energy consumption per ton of good castings (Product)	KWh/MT	2206	2000
3	Increase the utilization of Gas Energy	%	37	41
4	Improve on the power factor	-	0.99	1