INDUSTRY MARVEL – INNOVATION OF WASTE TO WEALTH

Selective utilization of waste to reduce fuel consumption

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Abstract: The coke breeze is the common solid fuel for iron sintering plants. The high consumption of coke breeze leads to depletion of the fossil fuels and increase in cost of production of Sintering process. Several researches, nowadays are concentrating on finding different alternatives for coke breeze that can either partially or completely replace it. In this study, high carbon blast furnace gas dust was used as a supplementary fuel in the iron ore sintering process. Coke breeze was partially replaced in sinter charge. The results of this work shows that the replacement of coke breeze with high carbon blast furnace gas dust helps in sintering process as it increases the vertical velocity of sintering process.

Index terms: Coke breeze, High Carbon Blast Furnace Gas Dust & Sintering Process.

Introduction:

Sintering is a process of heating of mass of the fine particles to the stage of Incipient fusion (temperature little below the melting or softening point) through amalgamation process to agglomerating them into lumps & the heat required for making sinter is usually provided by combustion of coke breeze.

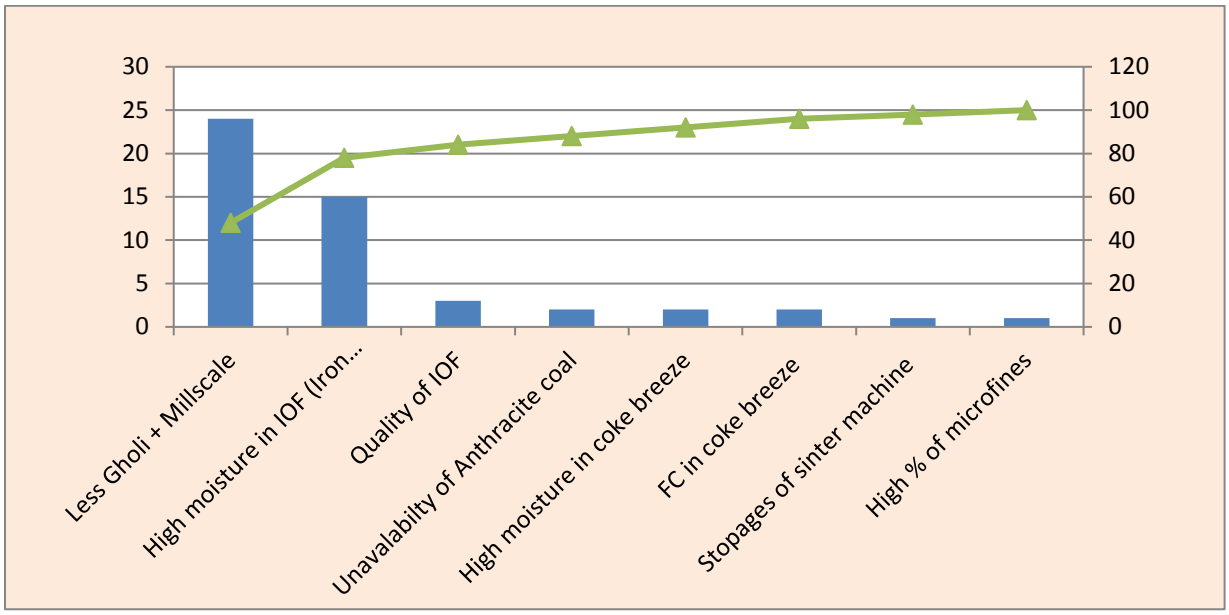
Coke breeze being the costlier material in sintering process, iron making industries are working on how to replace coke breeze with the cheaper solid fuels like Anthracite coal, Charcoal etc. to bring down the overall cost of iron making.

The main objective of this work is selective utilization of blast furnace waste material for reduction in cost of production of sintering process without compromising the quality of product.

Experimental Work:

After a series of brainstorming sessions within the team, reasons for higher specific coke breeze consumption were analyzed.

Pareto analysis for factors influencing coke breeze consumption



From the above analysis the major reason resulting in higher coke breeze consumption were identified as non-availability of costly Mill scale & -10 mm Fe chips (Gholi) and we realized that some of the measures cannot be implemented due to techno-commercial aspects. Therefore we checked all waste material available having carbon content. We came up with solution of selective use of high carbon dust of blast furnace. Earlier same were mixed with other fines and available carbon of blast furnace were diluting in the system.

The raw materials used in this work are iron ore fines, limestone, coke breeze and blast furnace gas dust. Their chemical analyses of Iron ore fines & Flux fines are shown in Table 1.

In addition, the physio-chemical characteristics of coke breeze & High carbon blast furnace gas dust are listed in Table 2 & 3.

Table No.1

Chemical Analysis of Iron Ore fines & Flux			
Components	**IOF**	**Dolomite**	**Limestone**
Fe	58.80		
Mn	0.79		
SiO2	4.83	5.60	6.02
Al2O3	2.97	0.86	0.95
P	0.05	0.03	0.044
LOI	6.17	40.15	42.13
CaO		29.02	48.60
MgO		19.23	1.76

Table No.2

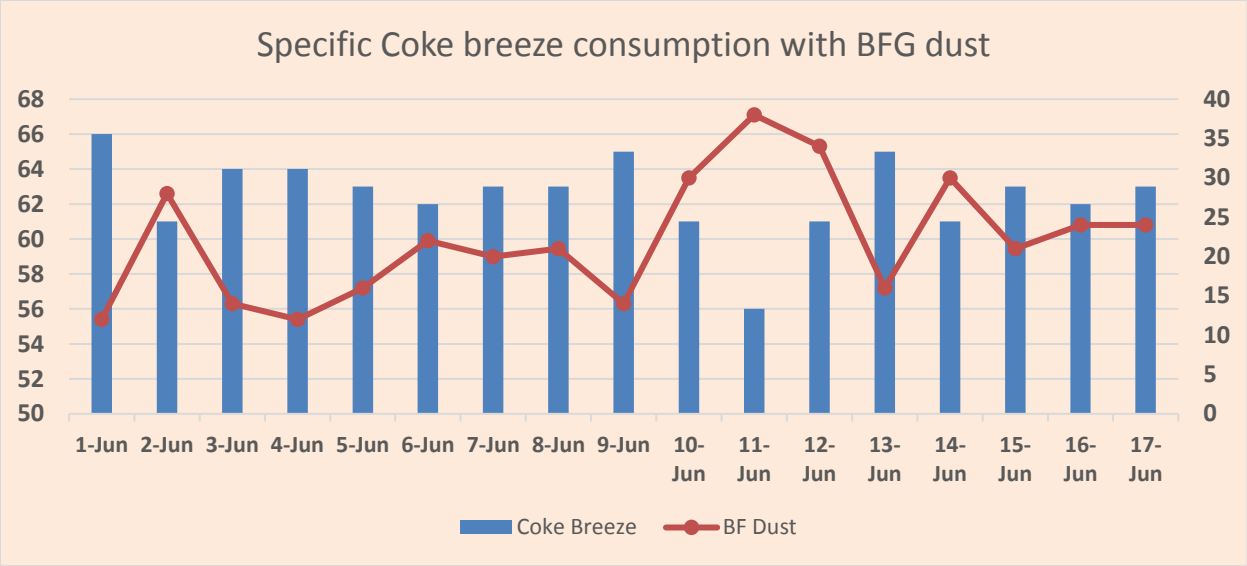
Chemical Analysis of coke breeze	
Components	**Coke Breeze**
VM	3.18
ASH	22.05
FC	75.04
H2O	11.94

Table No. 3

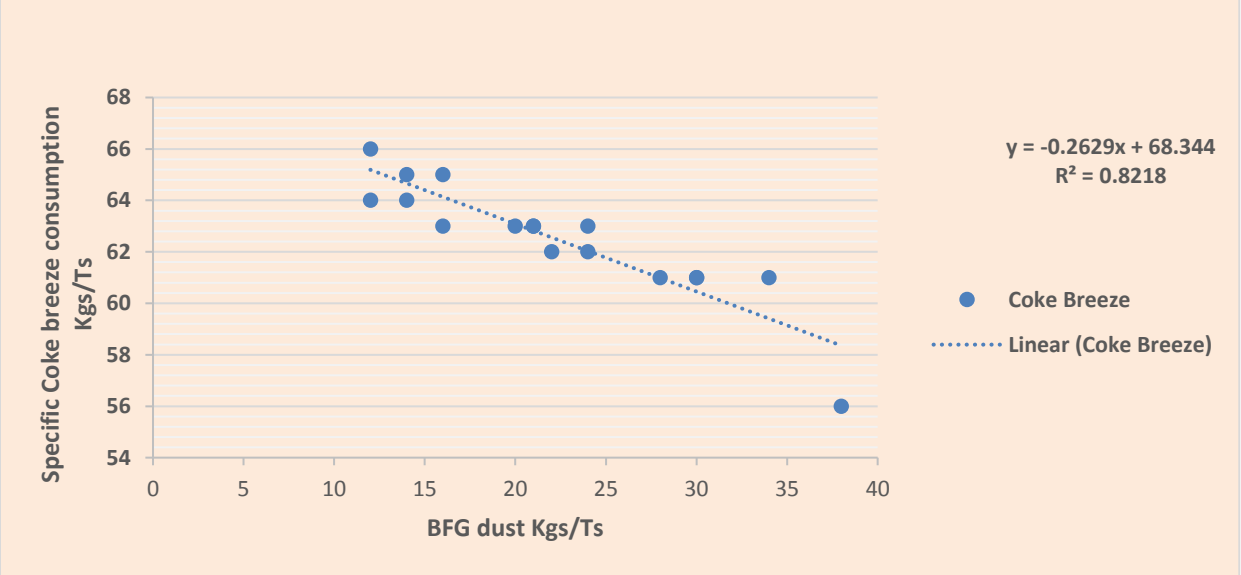
Chemical Analysis of Blast Furnace Gas Dust		
Components	**GCP (Gas cleaning plant)dust**	**Blast Furnace Dust catcher dust**
Fe	30.90	38.35
SiO2	9.48	8.06
Al2O3	5.90	5.32
MnO	0.88	0.82
CaO	6.36	4.78
MgO	3.22	2.32
P	0.07	0.05
CARBON	23.58	20.32

Blast furnace gas dust added in a quantitate manner in sinter feed mix to see the effect on specific coke breeze consumption, sintering process sintering rate & sinter product quality.

In below graph explained the impact of Blast furnace gas dust quantity on coke breeze consumption (Duration: 1st June ‘17 to 17th June ‘17)



Co-relation between specific Coke breeze consumption and BFG dust.

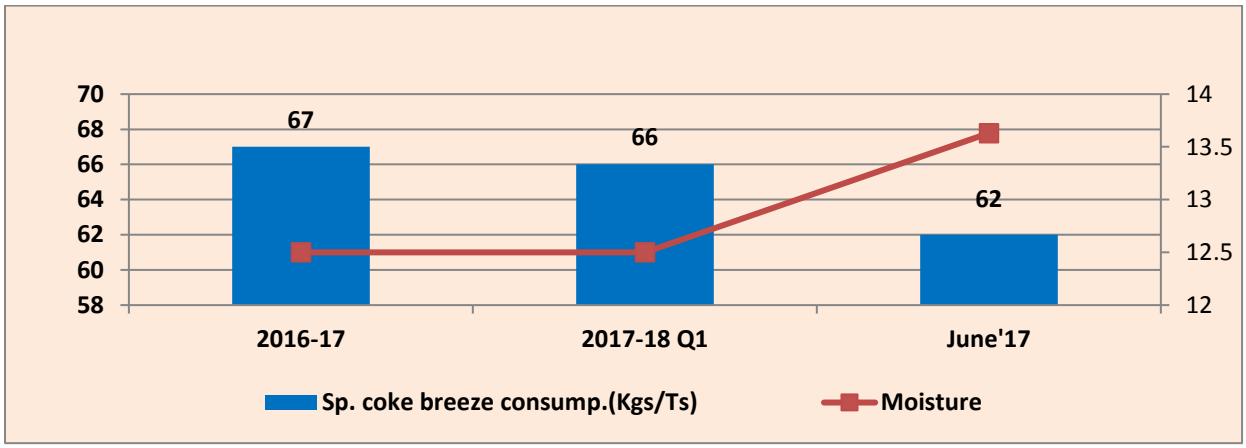


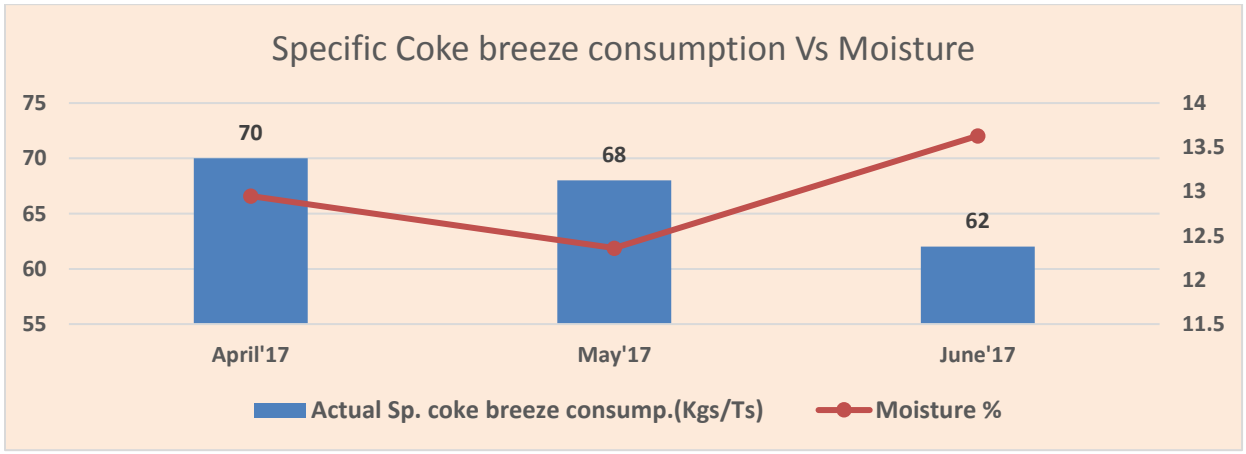
Result & Discussion:

Effect on Coke breeze consumption rate:

From the below tables it can be seen that with increase in moisture content of iron ore fines the specific coke breeze consumption increases.

In the month of June'17 by using 30 to 35 kg/ts blast furnace gas dust, it can be seen that coke breeze consumption has reduced by 4 Kgs/ts even with increase in Iron ore fines moisture.





Effect on sintering Process & sintering rate:

There is no negative impact on sintering process like (permeability of bed, VSS).

Effect on sinter product quality:

Same Sinter product quality maintained like TI more than 72, Mean size 22.

Thus our objective of reduction in fuel consumption (coke breeze) in sintering process by selective utilization of blast furnace waste material was successfully achieved. Selective utilization and innovative use waste materials gave us the fruitful results of reduction in the fuel consumption and saving cost thus decreasing overall cost of production.