GESPL

GHALSASI ENGINEERING SYSTEMS PVT. LTD.

Smelting technology with arc furnaces

MANGANESE ORE SINTERING MISCONCEPTS AND FACTS

Technology Equipments Solutions

Presented by - Rajendra Sane

GESPL
GHALSASI ENGINEERING SYSTEMS PVT. LTD.

AGENDA

1.0 GESPL Company Introduction

2.0 Products and services

3.0 Misconcepts and Facts

4.0 Recommendations

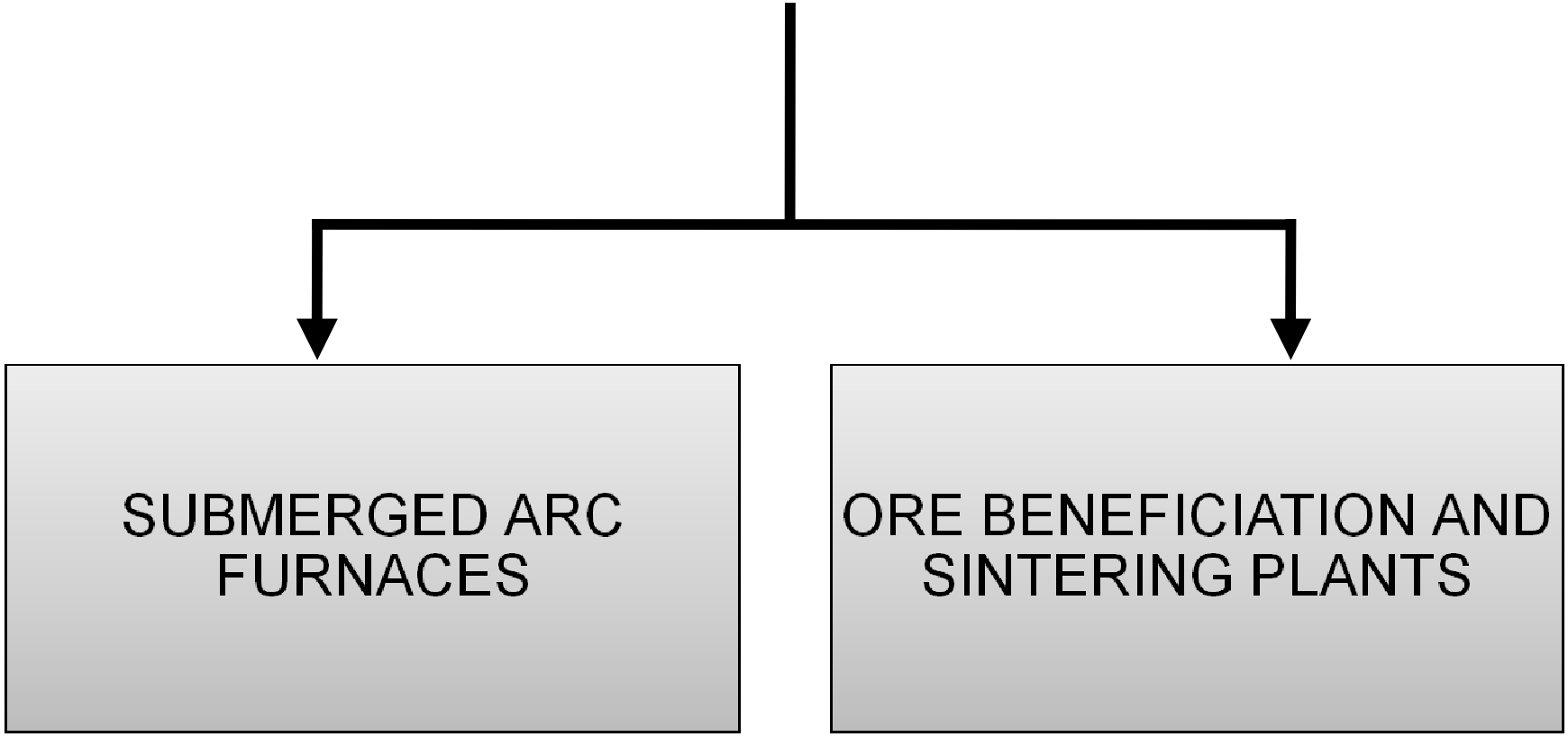
5.0 Conclusions

6.0 Sintering Solutions

COMPANY INTRODUCTION

- Established in the year **1986**, GESPL is a group of experts with collective domain experience of more than 35 years
- Leaders in our field, GESPL is the only Indian company to successfully commission close to **100 SAF's** in the last 24 years
- SAF designs from **3.6 MVA to 33 MVA** capacities
- In house engineering, design, manufacturing services (M.I.D.C area) with fully equipped installation and commission crew
- Vast international experience with establishments in countries Bahrain, Democratic Republic of Congo, Bhutan & Pakistan
- Projects under execution / active discussions in Iran, Oman, Vietnam, Kuwait, Kyrgyzstan, Tunisia, South Africa, Turkey, South America & Bangladesh

PRODUCTS AND SERVICES



FIRST MISCONCEPT

No need for sintering. Furnace of any size can easily tolerate fines of -6mm varying from 20% to 50% without any problem.

FACT

- Irrespective of furnace size, fines should not be used.
- Leads to technological abuses to smelting process, human health and equipment health.
- For short time gains, log time benefits should not be sacrificed.

Example

LUMPY ORE + FINES
(WITHOUT SINTERING)

SiMn – 2.2 T of 36-37% Mn ore is consumed.
Suppose 50% fines are charged. Cost of Lumps & fines at 50:50 is

1.1T @ Rs. 12000/T of Lumpy Ore	=	Rs. 13,200
+ 1.1T @ Rs. 6000/T of Fines	=	Rs. 6,600
	=	Rs.19,800 against Rs. 26,400 of

100% lumps i.e. difference of Rs. 6,600/T of SiMn. **This is the real culprit temptation.**

SINTERING OF ORE

Cost of sintering -- Rs. 1600 /T of fines

Therefore Cost of Sinter	= 2.42T @ Rs. 6,600/T	= Rs. 15,972
	+ 2.20T @ Rs.1,600/T	=Rs. 3,520
+ Add : interest and depreciation @ Rs. 700/T		
		=Rs. 20,200/T of SiMn

Difference is only Rs. 400/T which can be compensated with all the benefits of use of lumpy, porous, highly resistive sinter.

SECOND MISCONCEPT

During sintering, the silica content in finished sinter increases to great extent leading to higher slag volume, higher Mn losses and higher power, so sinters are uneconomical.

FACT

- Oxygen loss during sintering is 9 to 10 % only ($MnO_2 \rightarrow Mn_3O_4$).
- Silica (SiO_2) addition through coke is 1 to 1.2 % only.
- Overall silica (SiO_2) increase in Mn input is 0.6 to 0.65 % only.

THIRD MISCONCEPT

Sinters are very weak, friable and generate excessive fines during handling inside the plant.

FACT

- Mn ore sinters are almost as strong as iron ore sinters.
- TI & AI can be controlled by proper coke rate, moisture content, sintering time & RF addition.
- Mn ore sinters with 80 – 84 % TI & less than 3 % AI can be produced.

FOURTH MISCONCEPT

Sinters can not be transported by road or rail.

FACT

- Sinters are stable and have good physical strength.
- Can be transported by road / rail, if required, without generating excessive fines.

FIFTH MISCONCEPT

Fines of -1mm or -0.5mm in size can not be sintered.

FACT

- Fines (all -1mm with more than 50% -0.5 mm fraction) can also be sintered.
- Achievable through control of balling method, moisture control, coke size, permeability & suction control.

RECOMMENDATIONS

- Please get to know your ore – not only chemical analysis but its mineralogy and mineral association also.
- Every deposit is different than other. Response to sintering process parameters may be different.
- Conduct basic sintering study to understand amenability of your ore to sintering. A small amount invested in R&D study will be beneficial & cost saving in the long run.
- Overcome the fear and misconcept about Mn Ore sinters, with pragmatic thinking.

CONCLUSIONS

Characteristics comparison between fines and sinters of Mn Ore for FeMn / SiMn production

SN	DETAILS	Mn ORE FINES	Mn ORE SINTERS
1	Use in FeMn / SiMn Production	Limited to 10% (maximum) along with lumpy ore. Otherwise screened ore i.e. +3mm or +5mm only be used. 100% fines are never tolerated in furnaces, however, few cases have been reported to use 12mm ore fines with furnace cap of 7.5 MVA / 9 MVA only. Tolerance in large furnaces (12 MVA & above) is restricted to 5 to 8% only.	Varying from 30% to 85% in various plants. Recent development – 100% use in SiMn production plant in France.
2	Silica content	Normally higher than lumps, leading to higher slag volume which in turn increases power.	Increases by 1%(Max) over fines due to addition of Coke fines during sintering

CONCLUSIONS

Characteristics comparison between fines and sinters of Mn Ore for FeMn / SiMn production

SN	DETAILS	Mn ORE FINES	Mn ORE SINTERS
3	Phos content	Normally higher than lumps.	Part of Phos reacts during sintering and hence there is slight decrease in phos content
4	Porosity	NIL. Fines tend to decreases permeability of charge mix and with moisture, certainly forms crust. Tendency to hold moisture and with low permeability leads to furnace explosions and eratic eruption.	35% to 45% porosity, which helps in better permeability of charge and much better gas solid reactions. Smelting time reduces.
5	Thermal dissociation in the furnace	Eratic dissociation. Fumes losses are high.	Sinters are stable upto 900 degree C which maintain excellent material descend in F/C and good reaction zone is achieved.

CONCLUSIONS

Characteristics comparison between fines and sinters of Mn Ore for FeMn / SiMn production

SN	DETAILS	Mn ORE FINES	Mn ORE SINTERS
6	Coke consumption	Same as lumps.	Coke consumption is slightly reduced as sinters are partially prereduced. Coke breeze i.e. -5mm fines of coke are fully used in sintering.
7	Electrical advantage	Resistivity is uncertain. Segregation of different mineral particles likely to take place. Adverse effect on specific power is noticed. High power and reduced productivity.	Due to high porosity, charge resistance is increased which leads to improved power factor and in turn deeper penetration of electrode. This results into reduced power consumption and increased productivity.

CONCLUSIONS

Characteristics comparison between fines and sinters of Mn Ore for FeMn / SiMn production

SN	DETAILS	Mn ORE FINES	Mn ORE SINTERS
8	Thermal stability	Eruptions and slag boils become unavoidable. Often crust formation is observed leading to eratic behavior, electrode slipping problems, electrode tilting and breakage leading to high power and paste consumption.	There is no moisture or fines in charge. Furnace operation is very stable and charge movement in and around electrode is very smooth. There are no eruptions or slag boil or explosions with use of sinters.
9	Pollution Control	Lot of dust nuisance. Otherwise -2 or -3 mm material needs to be totally removed leading to heavy wastage of material.	Since fines are separated and agglomerated there is no dust nuisance. '

CONCLUSIONS

Characteristics comparison between fines and sinters of Mn Ore for FeMn / SiMn production

SN	DETAILS	Mn ORE FINES	Mn ORE SINTERS
10	Financial Gains/ Losses	Due to heavy moisture and crust formation, electrical power is very high leading to production and productivity loss. On an average fines tend to increase specific power consumption by 200 to 400 Unit/T of alloy.	i) All the fines are used including fines generated during sintering. ii) Coke fines are gainfully utilized. iii)Entire moisture is driven off in sintering and product is totally dry. iv) Fines are available at reduced prices. Even with cost of sintering it is comparable to lumps. v) Expected saving in power upto 200 KWH/T of product. (75-80% sinters in feed) Productivity increases between 4 to 7%.

GESPL SOLUTION FOR INDEGINEOUS SINTER PLANTS

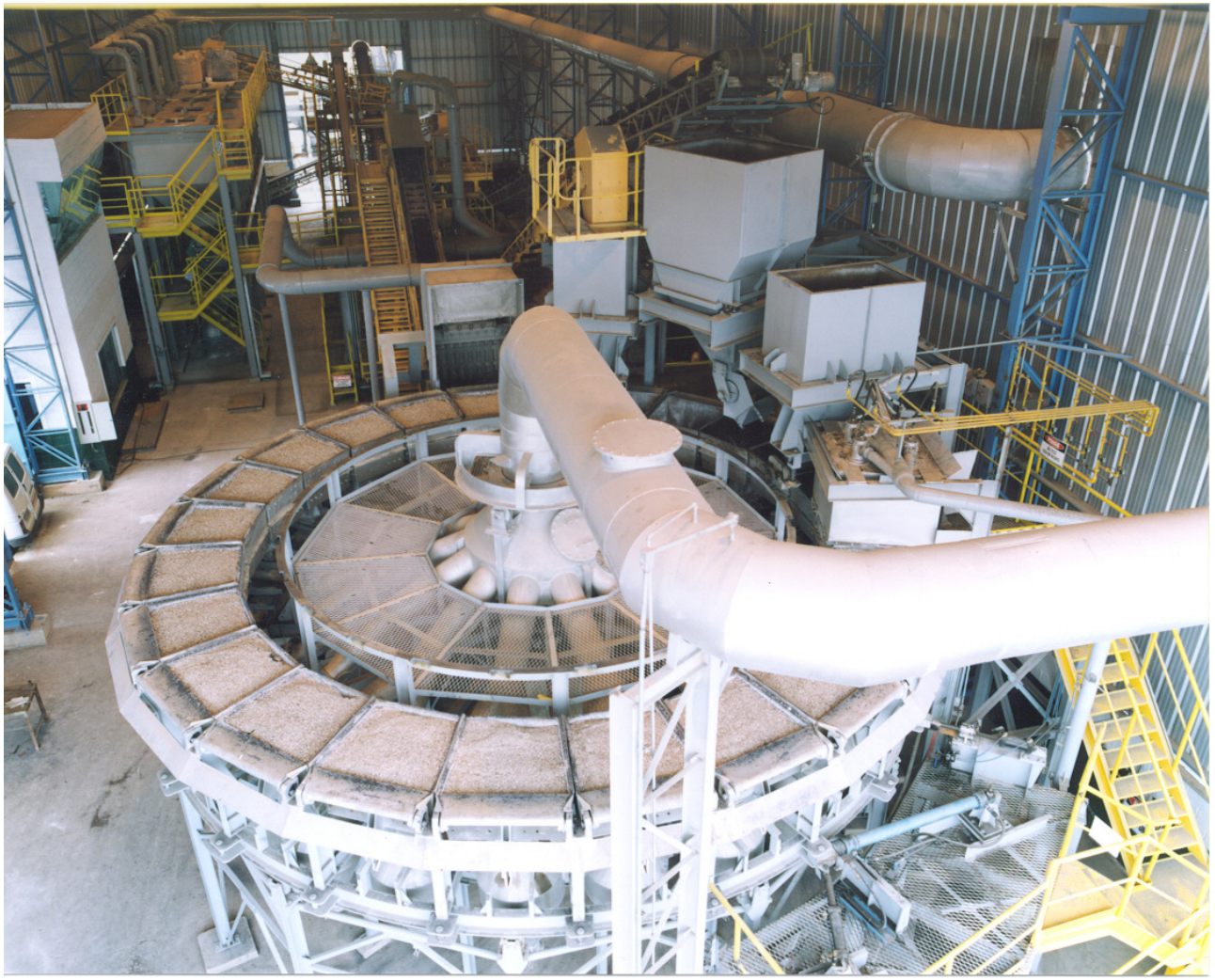
Exclusive Licensee Agreement with **MINITEC - Brasil**

Unique carousal design for sinter plants – cost effective

World class technology from Brasil, manufacturing in India

Sintering for iron, manganese, tin ores

GENERAL VIEW - CAROUSEL SIDE



ADVANTAGES OF MINITEC-GESPL SINTER PLANTS

- Low specific investment
- Waste gas leak proof system
- Excellent sinter quality
- Full process automation
- Low cost of production
- High operational flexibility
- Maintenance free design
- Very compact – saves space

GESPL

GHALSASI ENGINEERING SYSTEMS PVT. LTD.

Smelting technology with arc furnaces

GESPL – A Total Solution for Beneficiation, Sintering & Smelting Technology & Equipments

THANK YOU