TATA STEEL

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Recent Process Innovations Tata Steel UK

ICGSI January 2024

Together we make the difference

Agenda

2 stove operations

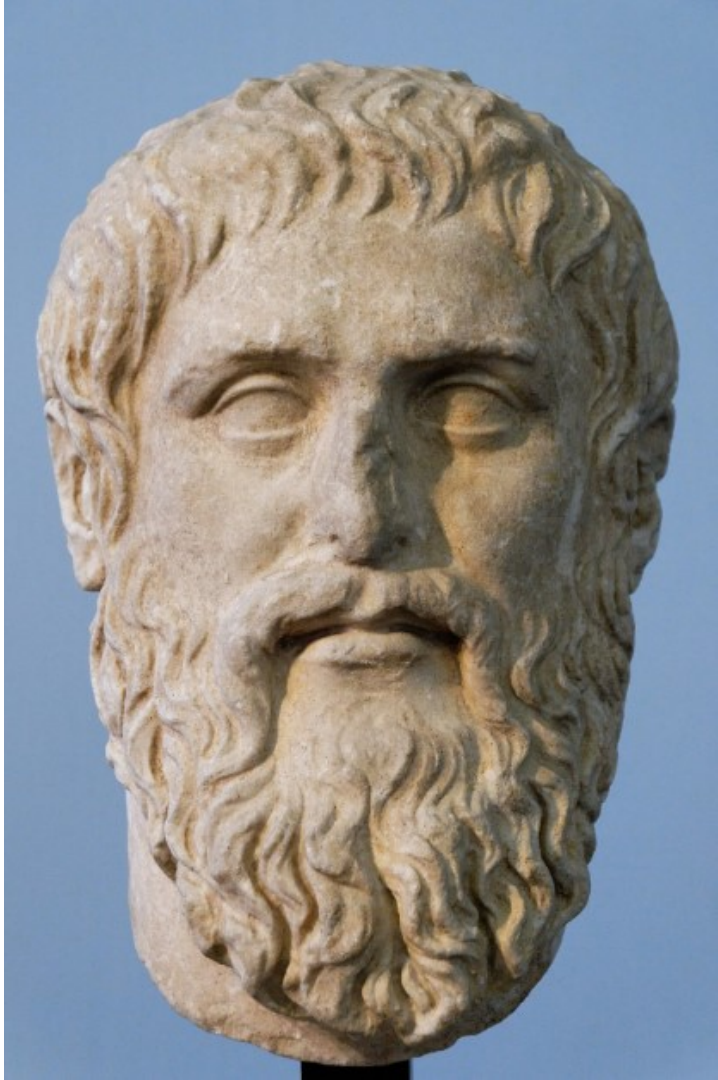
Nut coke rates / Bio materials

Zn loading

By product pellets

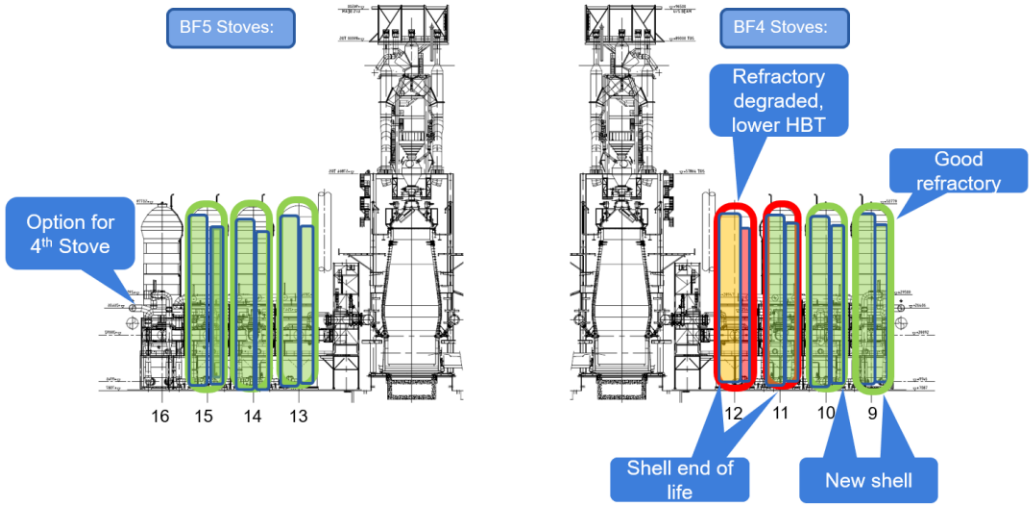
Metallic charging

Plato – ‘Necessity is the Mother of invention’



2 stove operations

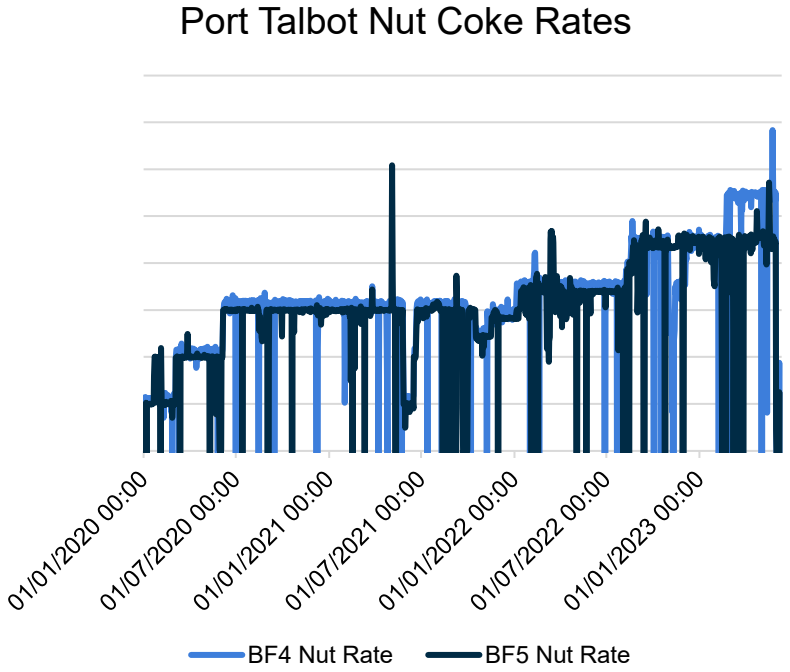
- Recent asset repairs and upgrades required extended periods of 2 stove operations.
- Operational procedures developed to permit 2 stove operations for several month.
- Maximise thermal input
- Blast volume and HB temperature reduction.
- Increase oxygen to maintain flame temperature and to minimise production loss
- Where possible increase coal injection (>180kg/thm with 2 stoves) to minimise coke increase.
- Vigilance required for any issues with the remaining stoves, but continued operation with 2 stoves proven



Nut Coke and bio carbons

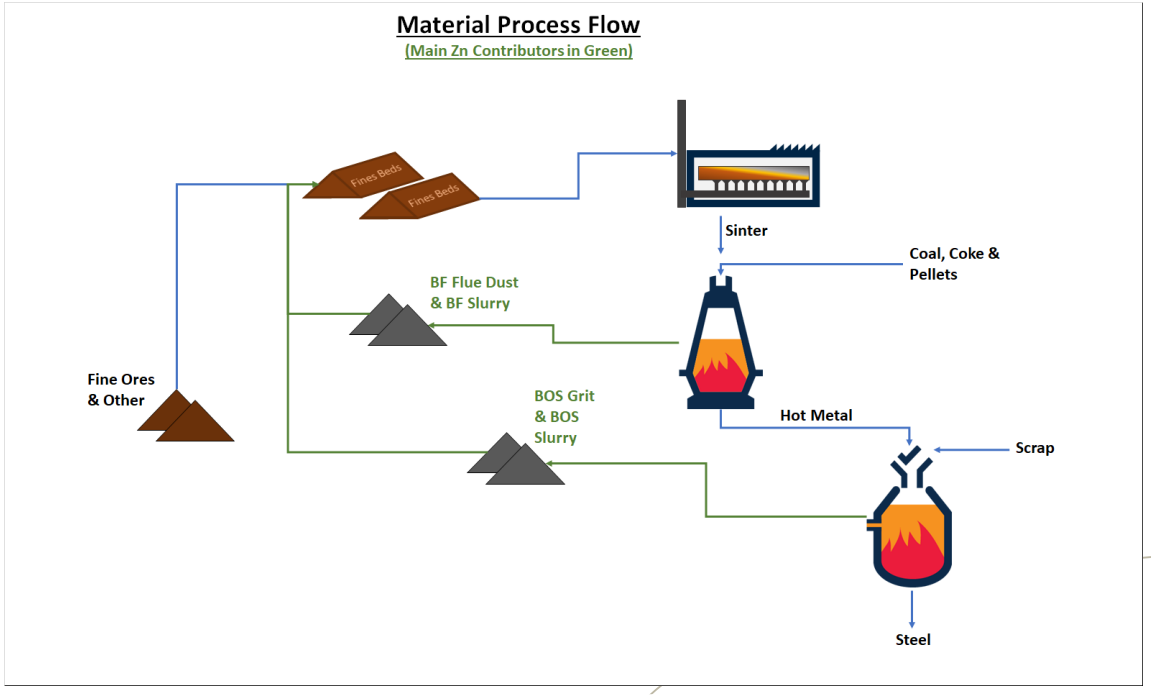
Coke Rate (kg/tHM @ 4% Moisture)	BF4 Nut Coke Rate (kg/tHM)	BF5 Nut Coke Rate (kg/tHM)
<400	70	65
400-440	75	70*
>440	80	75*

- Works constrained on coke so possible to buy cheaper external coke such as nuts. Drive to increase nut rate.
- Increase nut rate when on higher coke rates (when skips are less of a constraint).
- Come bio carbons trialled but limited supply



Zinc Balance

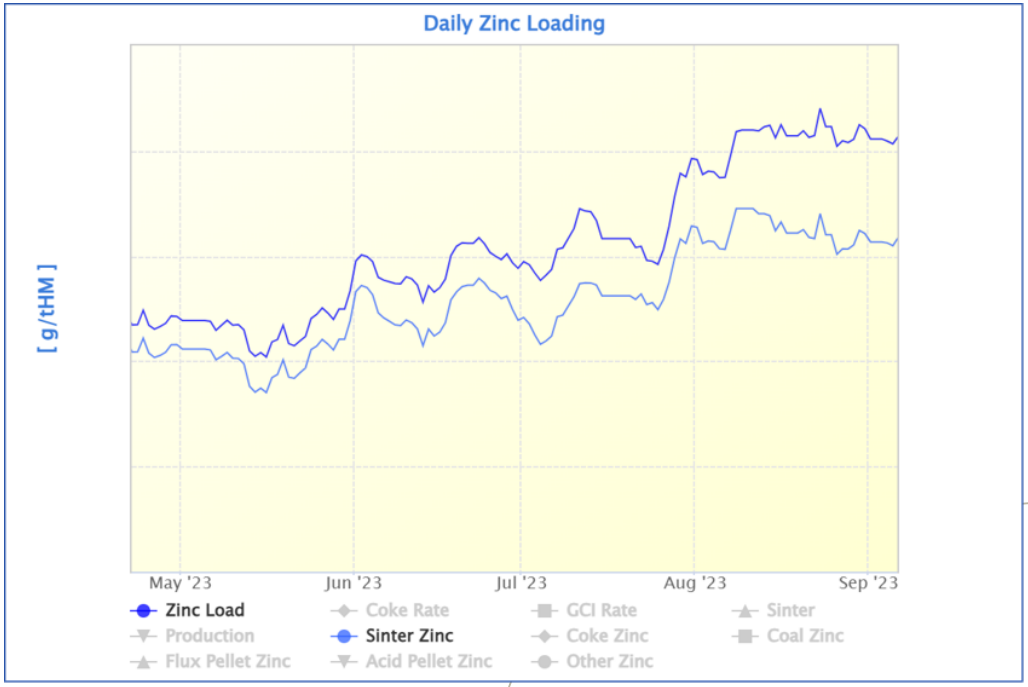
- BF Reverts (Dust and Slurry) and BOS Reverts (Grit and Slurry)
- Zinc level management permits use of 100% of arising BOS Grit, BOS Slurry and BF Flue dust each year.
- BF slurry use maximised to meet zinc loading limit
- Hydrocyclone installation ongoing to produce high and low Zn products from BF slurry to consume all BF slurry plus legacy stock..



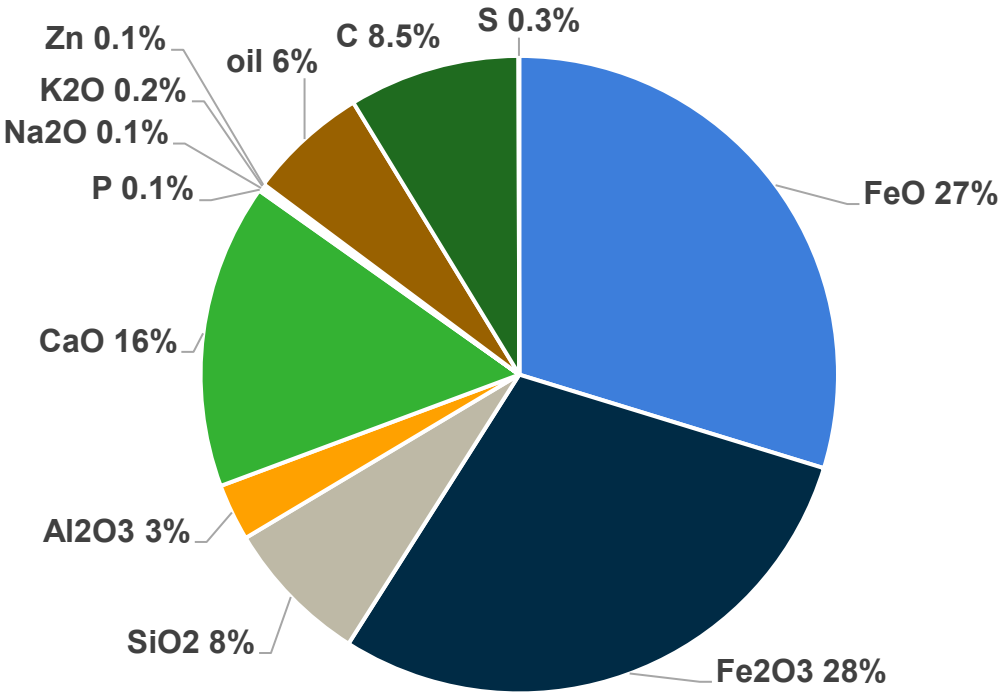
Tonnages Used	2020	2021	2022	2023	Typical Zinc Content
BF Slurry	14973	3750	8536	19004	1.50%
BF Flue Dust	37204	43397	32256	40721	0.25%
BOS Slurry	53393	56009	38611	50217	0.30%
BOS Grit	16100	15027	13005	13701	0.10%

BF Zinc Loading

- BF zinc loading aim of 190 g/thm
- Limit has been pushed for periods up to 250g/thm
- Zinc control achieved mainly through management of Sinter zinc content
- Resultant Sinter Zinc limit typical range of 0.017%- 0.020%

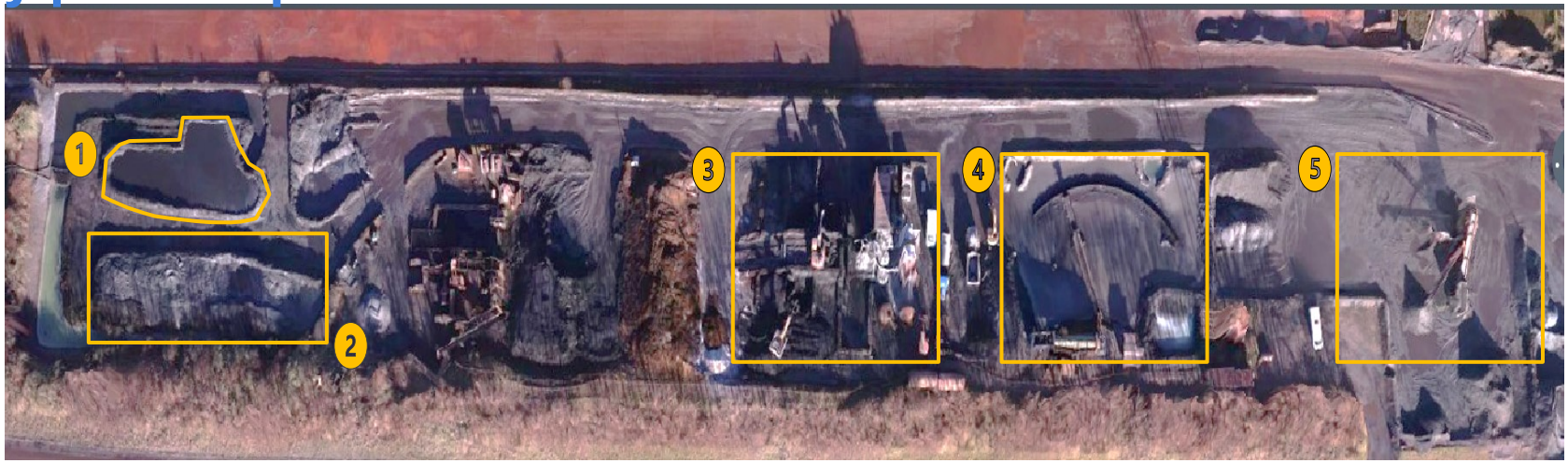


By Product Pellet Chemistry



Materials that are difficult to reuse are combined and pelletised on site. >100kt in the last 5 years

By product pellets



1 Sludge Lagoon
Sludges are combined in the lagoon, this allows oils and water to settle. Other smaller amounts of arising sludges will also be added.

2 Drying
After being lagooned the sludge mixture is removed and left to dewater.

3 Conditioning & Cement Addition
A conditioning agent further dries the material and encourages pelletisation

4 Pelletisation
Now the sludge mixture is put into a rotating granulation drum.

5 Curing and Sizing
Finally, the pellets are cured and screened to 10 – 35 mm

Blast Furnace Metallic Charging

- Steel plant recovered skulls historically charged circa 10kg/thm. Not classed by customers as ‘recycled content’

- Additional external scrap:
  - Displacement of iron ore pellet
  - Lower coke rate requirement (30 kg/thm coke rate saving per 100 kg/thm scrap)
  - Lower CO2 generation (1 tonne CO2 saved per tonne scrap charged)
  - Higher recycled content in steel product – marketing advantage
  - Higher BF production rates possible (4-6% at 100 kg/tHM scrap rate)

Blast Furnace Scrap Charging

Scrap Types

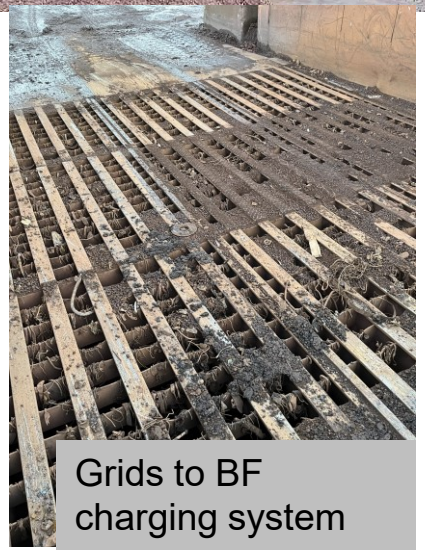
- BF Scrap Requirements:
  - Size range (generally screened 6-60 mm)
  - Low Zn levels
  - Other residual elements restricted in line with steel plant spec (Cu, Ni, Cr, Sn, Mo)

- Types of scrap used in BFs includes:
  - External steel skull
  - Shredded tin can
  - Incinerator scrap
  - Fragmented scrap
  - Steel turnings
  - Cast Iron borings

Blast Furnace Scrap Charging

- Scrap delivered to stockyard by road
- Scrap laid in base of direct charge bed (DCB) and mixed with other internal scrap types and revert materials
- Iron ore lump and pellet laid over top of DCB base using stacker. Blend fed to BF

- Highest scrap rate so far is over 130 kg/thm (plus normal 10kg/thm internal skull)
- No adverse effects to stockhouse, furnace top charging system or BF process
- Residual management ongoing and forward prediction for the BOS plant.


Grids to BF charging system


Scrap in BF Stockhouse Feeder

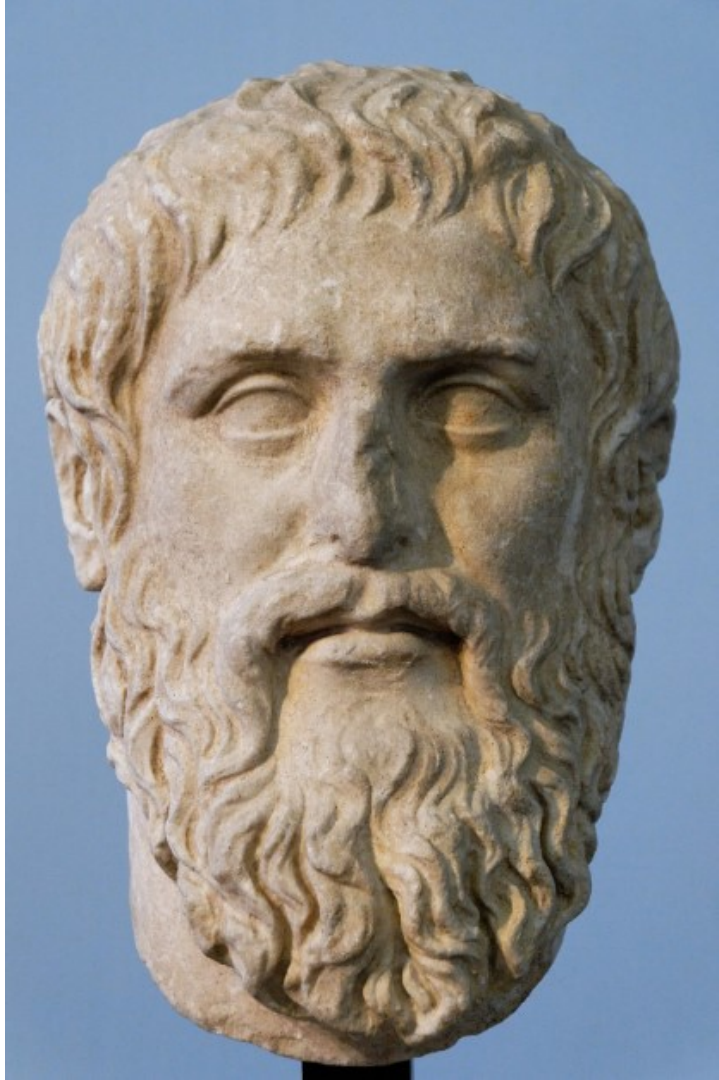
Conclusions

The blast furnace process development cannot stand still. Boundaries and limits must be challenged.

Practices need to change in response to local drivers. Some of ours have been highlighted here.

Thanks and recognition to the individual technologists running these developments.

Questions?



Do you have any questions?

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