



HIGHVELD STEEL PROSPECTUS IRON MAKING PLANT 1



January 2018



IRON MAKING PLANT 1 – EXECUTIVE SUMMARY

Highveld Steel and Vanadium was founded in 1960 with the objective of building a unique plant with the ability to beneficiate vanadium bearing Titaniferrous ore from the Bushveld Igneous mineral complex. Highveld remains the only company in South Africa with the processing facility to beneficiate this ore reserve for the production of steel as well as vanadium slag.

The sale of Iron making Plant 1 offers investors a unique opportunity to acquire a versatile, state-of-the- art smelter plant capable of profitably producing a range of products including Pig Iron, Ferro Alloys and valuable slag by-products from fines.

The smelter plant, boasts three modern Open Slag Bath furnaces as well as 10 pre-reduction or preheating kilns. There is significant flexibility in operation and it is possible to spilt the plant into different product streams. With an estimated ramp-up to full production in approximately 12 weeks, the lead time to market is significantly reduced when compared to the construction of a similar sized green field smelter plant.



Kilns View



Structural Steel Sections



INTRODUCTION

- EVRAZ Highveld Steel and Vanadium (“Highveld Steel”) was, prior to the business rescue proceedings, South Africa’s second largest steel maker and the primary producer of medium and heavy structural sections.
- Highveld Steel has contributed significantly to the South African economy, supporting South Africa’s industrial and economic development.
- During April 2015, Highveld Steel filed for voluntary business rescue as a result of lack of funding in challenging market conditions and ceased operations during July 2015.
- Under the direction of the of the business rescue practitioners and management, Highveld Steel:
 - Agreed with creditors to enable suppliers to continue business with Highveld when operations restarts.
 - Performed various trials on the Open Slag Bath furnaces to verify the flexibility of units and suitability for ferroalloy production;
 - Successfully decommissioned the operations under a controlled environment and preserved assets for future start-up;
 - Identified various assets as future strategic assets which can be sold as loose standing operational units;
 - Ring-fenced the Iron making Plant facility for sale and future start-up.

De-commissioned operations

Preserved assets in care and maintenance mode

Identified strategic assets for future sale

- **Highveld Steel has identified Iron making Plant 1 as an strategic asset capable of profitably producing a range of products including Pig Iron and or Ferroalloys. The location and layout of the asset allows for a stand-alone operation.**



IRON MAKING PLANT 1: PROCESS OVERVIEW

- **Iron making Plant 1 comprises amongst others of:**

✓
Dedicated raw material receipt & storage area

✓
10x 60m rotary pre-reduction kilns

✓
Three 38 MW recently upgraded Open Slag Bath Furnaces

- Dedicated raw material handling equipment with both rail and road receipt infrastructure,
- Ten 60m co-current rotary kilns ideal for pre-reduction or pre-heating of ores,
- Hot charge transfer system to transfer hot material discharged from kilns in to smelting furnace with minimal heat losses,
- Three state-of-the-art 38MW Open Slag Bath Furnaces, capable of processing a variety of ores with sizes ranging from fines to lumpy material.
- Support services including electricity, compressed air, oxygen, water etc. to operate at a capacity of up to 1250t of liquid pig iron per day.
- Plant can be purchased as a single plant or be subdivided into smaller units dedicated to different products as shown in the layout slide
- Furnace feeding scheme from kilns is significantly more flexible as to what is shown in the layout and further details will be provided to interested parties.

Metallurgical and Operational specifics relating to Iron Plant Operation PIG IRON – *Raw Materials*



Mapochs ore – (Vanadium-bearing, titaniferous magnetite ore)

Fluxes – (Dolomite, Silica, Recycled BOF slag)

Species	Mass (%)
Fe ₃ O ₄	54
CaO	0.08
SiO ₂	2.35
MgO	1.4
Al ₂ O ₃	3
V ₂ O ₅	1.7
TiO ₂	13
Fe _{total}	56

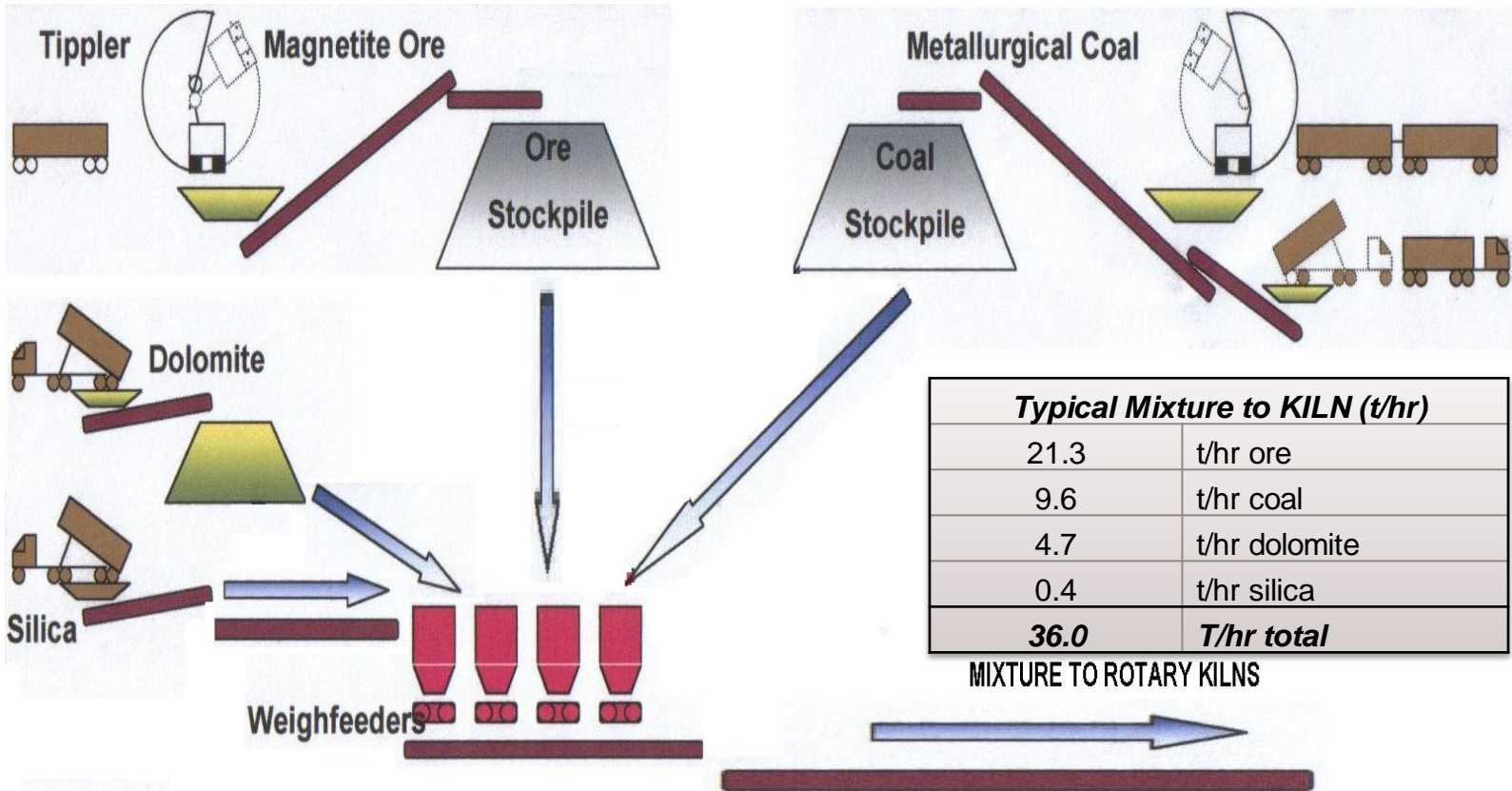
	SiO ₂	CaO	MgO	Al ₂ O ₃	Fe ₂ O ₃
Dolomite	2.64	28.80	19.20	0.19	1.60
Silica	98.20	0.19	1.09	0.52	0

Coal – (Semi Metallurgical)

Typical coal analysis						
Species	Fixed C	Volatiles	Ash	Sulphur	Moisture	Inherent
%	53.7	28	15.0	0.51	7.8	1.32

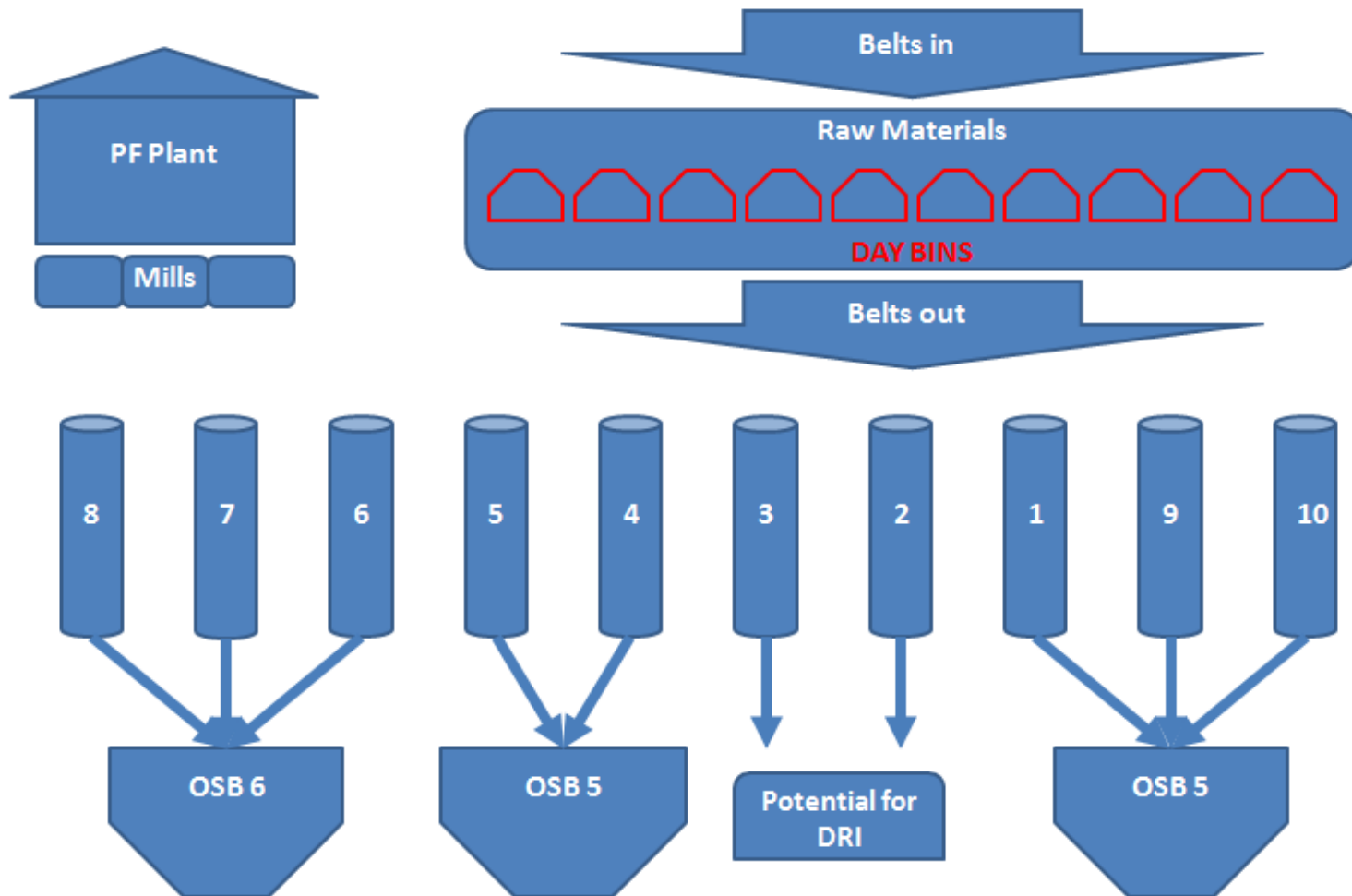


Metallurgical and Operational specifics relating to Iron Plant operation – Process Flow





Iron Making Plant 1: High level layout showing possible kiln and furnace configuration for multiple product streams



Plant can be purchased as a single operating unit

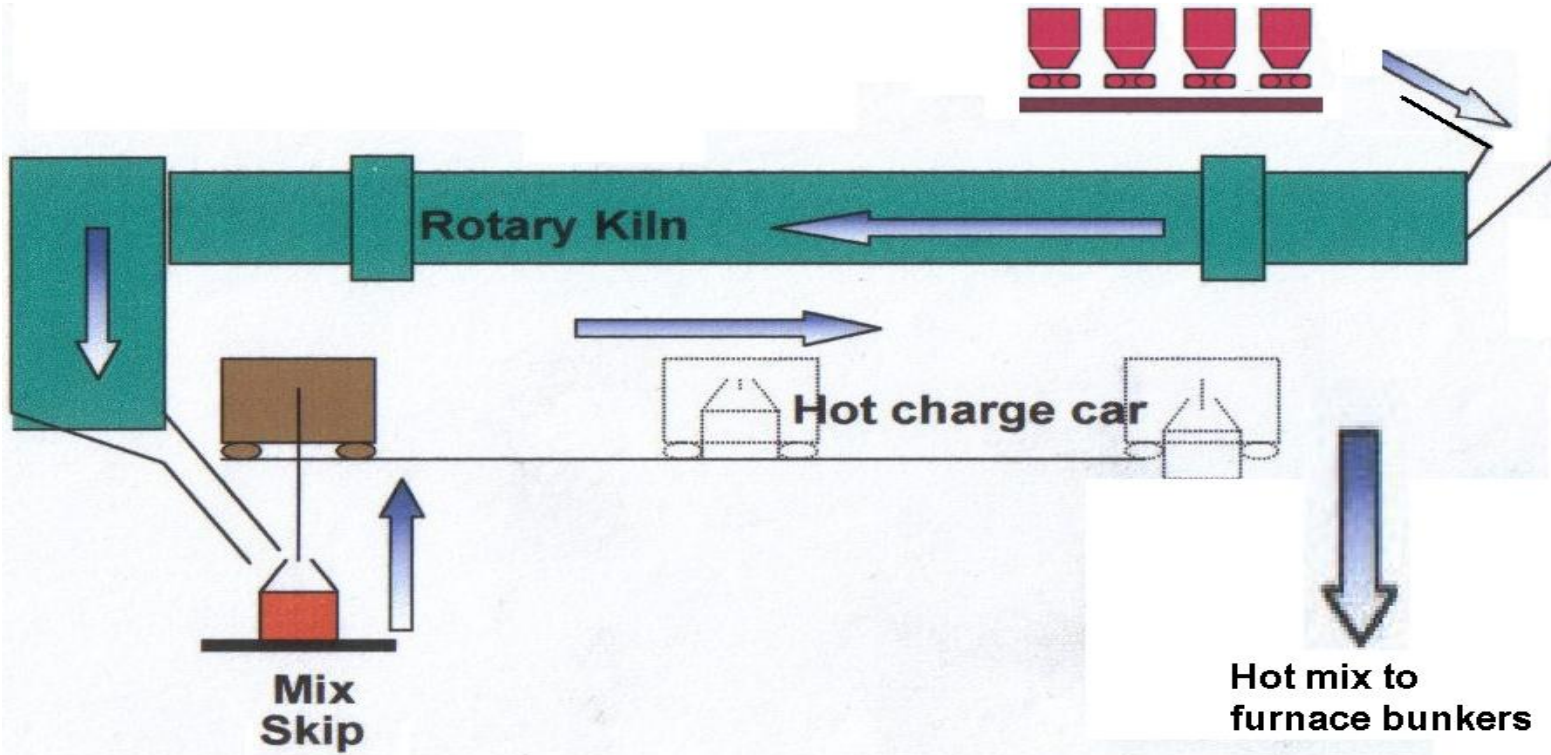


Plant can be divided into smaller components



Kiln feeding arrangements are more flexible than what is shown

Metallurgical and Operational specifics relating to Iron Plant Operation – Kilns



Number of Pre-reduction Kilns	10
Length	61m
Diameter (inside shell)	4m
Rotating Speed (variable)	0.40 – 0.5rpm



Metallurgical and Operational specifics relating to Iron Plant operation – *Kilns*

- All raw materials are blended in the correct proportions and fed to each of the pre-reduction kilns
- Each kiln is fired with pulverized coal, the burner being located at the charge end of the kiln. (co - current)
- Air fans, installed at intervals along the length of the kiln, inject air through pipes to burn the coal volatiles.
- Temperatures reach 1140 degrees C.
- Waste gas generated in kiln is cleaned in electrostatic precipitators. The hot pre-reduced charge leaving the kilns is hoisted in refractory - lined containers to the charging floor, which is above the closed-top electric smelting furnaces.



Metallurgical and Operational specifics relating to Iron Plant operation – *Furnaces*

The smelter furnaces each have three self-baking electrodes whose movements are hydraulically controlled

Venturi scrubbers installed on each furnace clean the gas generated during the smelting operation

CO is then collected in a gas holder and used as fuel for heating purposes in the works

Open slag bath	3
Furnace Transformer Rating	1,5 & 6 = 45MVA
Normal Power Input per Furnace	3 x 34MW
Tap to Tap Time	4 – 5 hrs
Tap Weight	80 ton



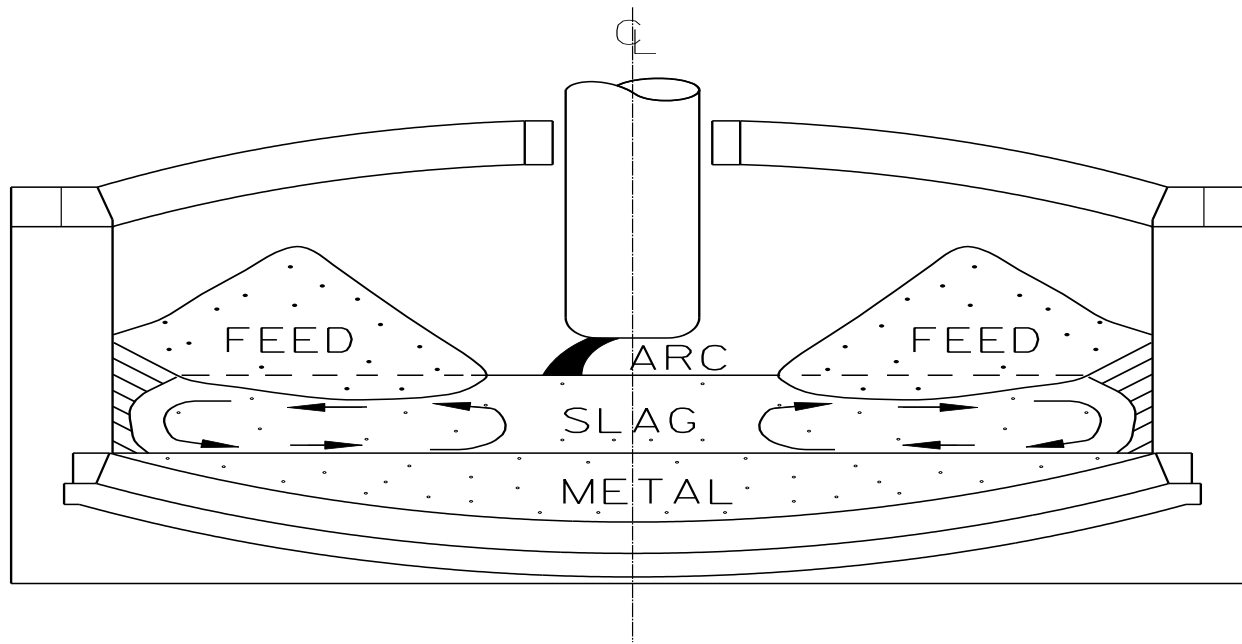
Metallurgical and Operational specifics relating to Iron Plant Operation – Open Slag Bath

Electrodes not submerged, brush arc on slag

Continuous feeding, charging via screw feeders on side of furnace

Four tap holes, tapping Slag and Metal separately

Vanadium recovery is increased due to the higher reaction kinetics





Iron Making Plant 1: Investment Case

- **The purchase of Iron making Plant 1 has the following distinct advantages:**

- **The Flexibility of equipment:** The upgraded Open Slag Bath has a proven track record of producing a range of products including ferroalloys.
- **Open Slag Bath and pre-heating technology:** Inherent to the design of the plant is the ability to process large amount of fine material which are problematic in conventional Submerged Arc Furnaces. The plant furthermore boasts the ability to pre-heat feed material resulting in significant reduction in energy required.
- **Strategic location:** The Iron making Plant 1 is strategically situated close to major routes which allows easy access to various customers & distribution channels as well as key suppliers such as raw material suppliers etc.
- **Immediate access to market:** A project to erect a green fields plant similar to Iron making Plant 1 can take up to 4 years to complete. The purchase of the existing plant allows the investor immediate access to the market at a significantly discounted rate when compared to a green fields project of similar size.
- **Low Manning requirements:** The plant is substantially automated and skills required to re-start and operate the Iron making Plant 1 is readily available in the Witbank area.

✓
Production of range of products utilising lumpy or fines

✓
Strategically located to supply market & access to key suppliers

✓
Access to existing infrastructure





Iron Making Plant 1: Investment Case *(cont'd)*

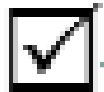
- **Established Infrastructure:** Although the sale transaction will ultimately revolve around the purchase of the smelter plant as an entire asset, the purchaser will have the option to access the following services:



Production of range of products utilising lumpy or fines



Strategically located to supply market & access to key suppliers



Access to existing infrastructure

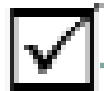


- On site laboratory services,
- Fire and rescue teams available on contract including life support Medics,
- Training facility adequate to perform both engineering and production related training ,
- Mechanical and electrical workshops to perform selected maintenance tasks,
- Information technology systems such as communication networks, weigh bridges etc,
- Roaming security including access control and perimeter guarding on site,
- Environmental monitoring services specifically related to water and waste streams,
- Slag handling facilities,
- Canteen and change-house facilities,

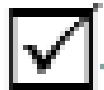


Iron Making Plant 1: Manning Requirements

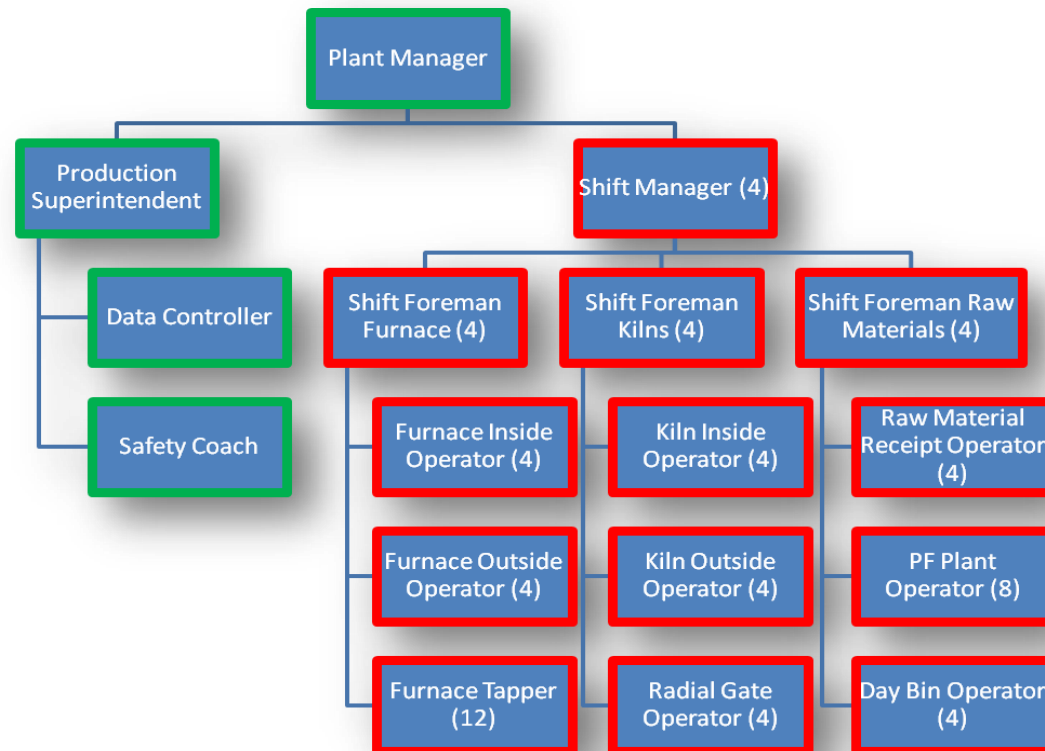
- The total compliment will be dependant on the product and plant configuration. The organigram below is an example of a 3 kiln one furnace structure
- The majority of Ironmaking plant's employees are located in Witbank.
- Following the large scale retrenchment of workers in the broader smelter industry – particularly in Witbank and Middelburg – it is expected that the majority of ex-Highveld employees will still be available for re-employment.



Plant layout lends itself to a flexible manning structure

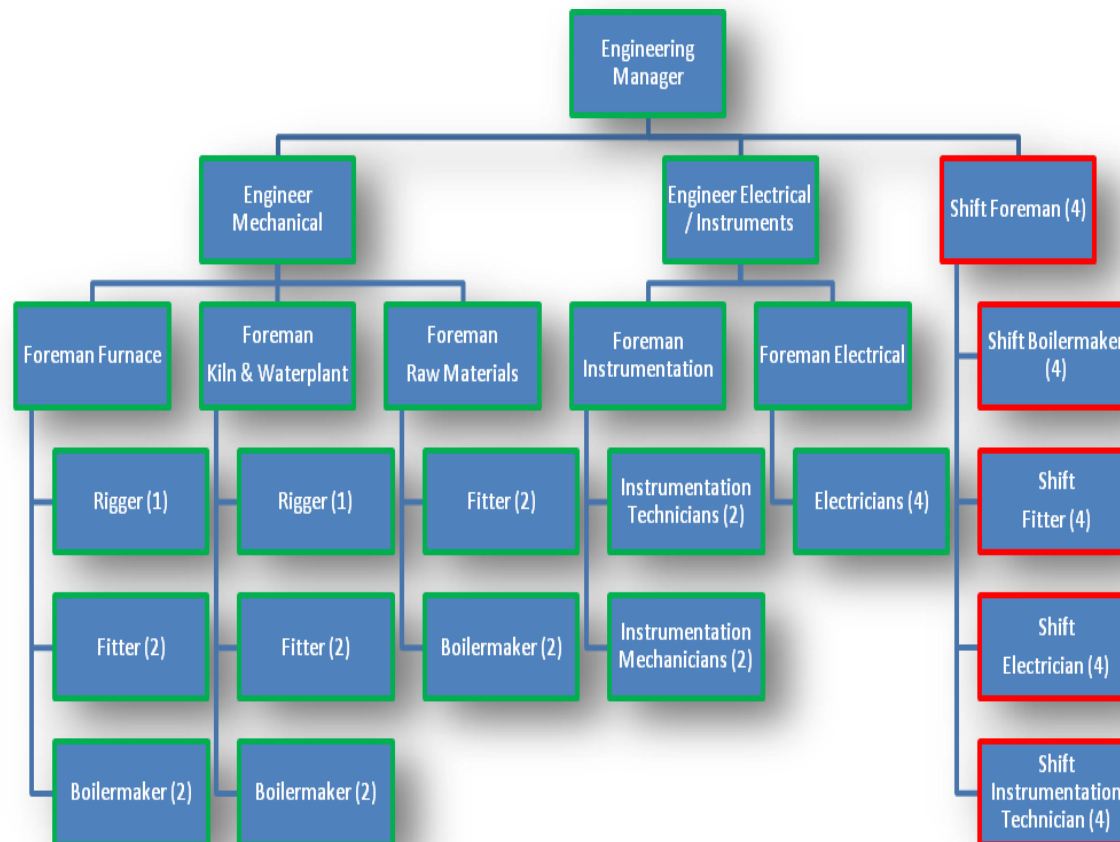


Majority of work force based in Witbank





Iron Making Plant 1: Manning Requirements (cont'd)



Engineering manning design can be flexible

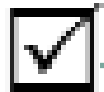


Majority of work force based in Witbank

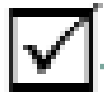


Iron Making Plant 1: Maintenance Requirements

- **Whilst planning the shut down, careful consideration was given to the restart of the operations. This included the following important aspects:**
 - Melting down and draining of the Open Slag Bath furnace to reduce impact on refractory lining,
 - Emptying out of the kilns prior to switch out to avoid uneven cooling and distortion of kilns,
- Following the switch out of the plant, routine maintenance is being performed to ensure that equipment is ready for start-up.
- It is anticipated that the furnace and associated kilns can be brought back to full capacity within a period of 12 weeks.
- **Start-up maintenance costs may include:**
 - Maintenance to critical raw material conveyors
 - Various routine maintenance tasks on kilns
 - Load testing and other statutory testing of lifting equipment, such as cranes etc,
 - Replacement of Kiln ESP (3 of) to ensure environmental compliance
 - Upgrade of furnace roof refractory anchoring system, (3 of)



Switch out of plant carefully planned & coordinated



Kilns & Furnace back on line in approximately 12 weeks



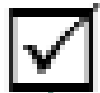


Iron Making plant 1: Environmental Considerations

- Iron making Plant 1 operates under the Atmospheric Emissions License.
- In line with the requirements of the AEL, Iron making Plant 1 is predominantly compliant with AEL, with the exception of Kiln three electrostatic precipitators for the kilns.
- The current licenses are applicable to the production of steel and vanadium. In the event of alternative products being produced, or changes made to the raw material feed, new licences would have to be obtained from the relevant licensing authority.
- Storm and process water will need to be separated and this cost must be determined.
- Dry handling of precipitator dust must be investigated, in order to reduce the impact of water and slime management.
- Detailed environmental information will be made available.



Highveld Steel in possession of AEL



Most of the waste management activities are existing lawful activities



New AEL required for different products





Conclusion and Way Forward

- As illustrated in this presentation, Iron Making Plant 1 is well positioned to offer an investor the opportunity to produce a wide range of products.
- **This plant offers, amongst other things, the following opportunities to a potential investor:**
 - Versatile equipment supported by a newly upgraded Open Slag Bath furnace which allows the processing of fines and pre-heating of feed material.
 - A strategically located facility situated close to major routes.
 - Access to established infrastructure, including electricity supply, oxygen supply, rail links ,etc.
 - Immediate access to market compared to a similar sized green fields project which could take up to four years to complete.
 - Direct access to required skills to re-start and operate the facility.
- Indicative financial estimates indicate that the plant is capable of producing Pig Iron as well as Ferrochrome profitably – even at current depressed market prices.
- In order to preserve the asset, it was placed under care and maintenance.



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