ArcelorMittal

AEL Stakeholder Engagement - 27 Nov 2014

ArcelorMittal South Africa

Vanderbijlpark Works background

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Overview of Operations

Flat Steel Products
- Vanderbijlpark Works: 3.2 Mtpa*
- Saldanha Works: 1.1 Mtpa*

Long Steel Products
- Newcastle Works: 1.5 Mtpa*
- Vereeniging Works: 0.94 Mtpa*

Iron ore supply
- 5.25 Mtpa from Sishen
- 2.5 Mtpa from Thabasimbi

Coke & Chemicals
- Coke: 597 000 tpa*
- Tar: 133 000 tpa*

*averaged

Steel plant in close proximity of key markets

Implementing a Corporate Responsibility strategy

Human Resources	Environment	Communities	Shareholders
Social commitments • Health & Safety • Equitable employment practices • World class training and skills development	**Environmental commitments** • Waste management and disposal • Ground and surface water management • Rehabilitation of legacy facilities • Environmental legal compliance	**Communities commitments** • Local economic development • Social investment • Community engagement	**Corporate Governance and sustainability reporting** • Road independence • Equal rights among shareholders • Best in class disclosure and shareholder dialogue

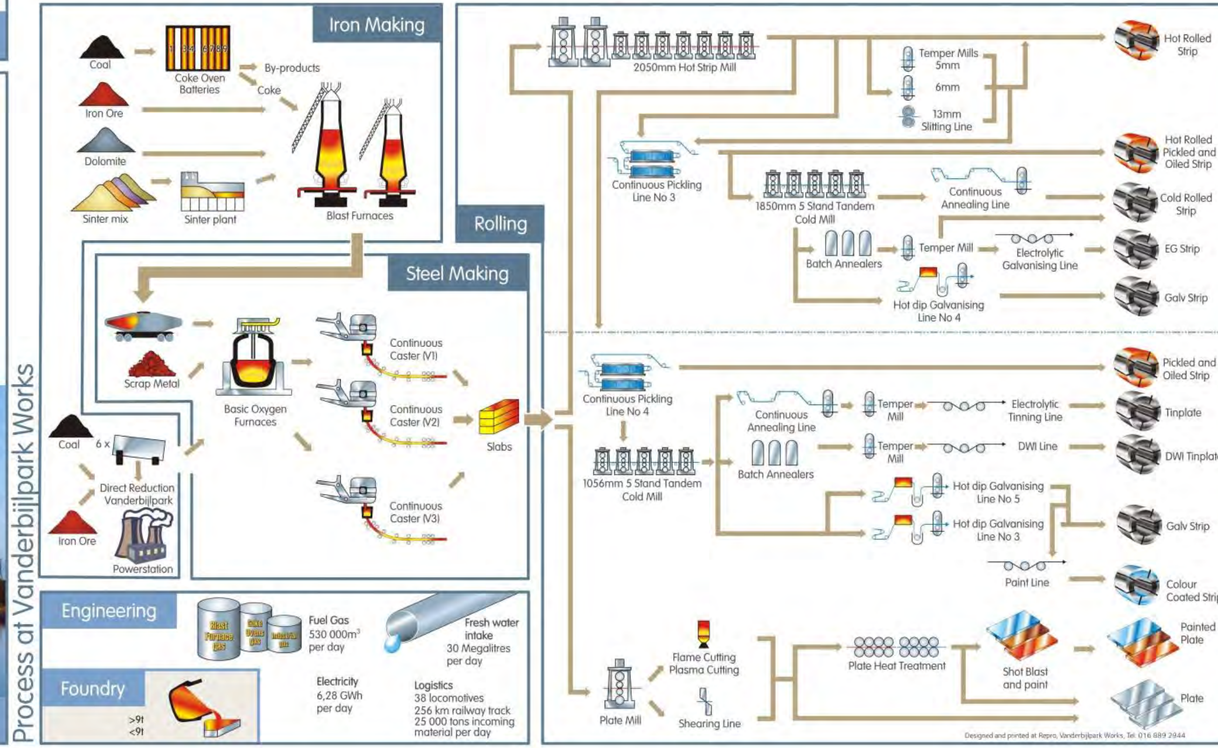
Evolution of ArcelorMittal South Africa

1928	1989	1997	2001	2002	2004/5	2006
Iscor founded	Iscor privatised and listed on the JSE	Iscor embarks on major restructuring programme	Unbundling of steel and mining into Iscor and Kumba	Iscor enters into strategic partnership with LNM (LNM 34% shareholding) start of BAA	LNM lifts stake to over 50% and name changes to Ispat Iscor LNM and Ispat merge to form Mittal Steel	Mittal Steel merge with Arcelor to form ArcelorMittal

General information on Vanderbijlpark Works

History/statistical information
- Vanderbijlpark Works was established in 1942.
- Area of site: 2.300 ha.
- Perimeter 20 km.
- Rail networks: 256 km and 38 locomotives.
- Daily electricity consumption: 6.56 GWh (230 000 families).
- Daily raw materials received: ±25 000 tons (650 wagons per day).
- Daily water consumption: 30 mega litres (100 000 families).
- Manpower: 4 786 (49% of total employees).
- Sales output more than 3.2 m ton per annum.
- Produces more than 80% of flat steel product requirements in the Republic of South Africa.
- Local market share 81%.

A flat steel producer with value adding capabilities



Enviro poster 01

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Vanderbijlpark Works air emission licence

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This Atmospheric Emission Licence issued to **Vanderbijlpark Works** in terms of section 41(1)(a) of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) ("the Act"), in respect of **Listed Activity No. 1.4, 3.1, 3.2, 3.3, 4.2, 4.5, 4.6, 4.7, 4.8, 4.10, 4.12, 4.22, 5.1, 7.2 and 8.**

- Name of the licensing authority – **Sedibeng District Municipality**
- Atmospheric emission licence number – **AEL0003/SDM/2012**
- Atmospheric emission licence ussue date – **29 February 2012**
- Atmospheric emission licence type – **Final**
- Review date, not later than – **30 March 2016**

AEL Monitoring requirements

The Atmospheric Emission Licence as contemplated in Section 43 of the National Environmental Management: Air Quality Act, 2004, (Act no. 39 of 2004) - The Atmospheric Emission Licence nr AEL0003/SDM/2012

Point source code	Pollutant name	AEL limit		Sampling frequency	Reporting frequency
		(mg/Nm³)	Date to be achied by		
Sinter A&B	PM	50	Immediately	Continues	Quarterly
	SO2	500	Immediately	Continues	Quarterly
	NOx	1200	Immediately	Continues	Quarterly
Sinter AG	PM	100	Immediately	Continues	Quarterly
Sinter BG	PM	100	Immediately	Continues	Quarterly
Sinter CG	PM	100	Immediately	Continues	Quarterly
Sinter FMB	PM	50	Immediately	Continues	Quarterly
Coke Making					
Coke 3	PM	100	Immediately	Continues	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
	H2S	45	Immediately	Quarterly	Quarterly
	SO2	No limit	31st March 2015	Quarterly	Quarterly
Coke 4	PM	100	Immediately	Continues	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
	H2S	45	Immediately	Quarterly	Quarterly
	SO2	No limit	31st March 2015	Quarterly	Quarterly
Coke 6	PM	100	Immediately	Continues	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
	H2S	45	Immediately	Quarterly	Quarterly
	SO2	No limit	31st March 2015	Quarterly	Quarterly
Coke 7	PM	100	Immediately	Continues	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
	H2S	45	Immediately	Quarterly	Quarterly
	SO2	No limit	31st March 2015	Quarterly	Quarterly
Coke 8	PM	100	Immediately	Continues	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
	H2S	45	Immediately	Quarterly	Quarterly
	SO2	No limit	31st March 2015	Quarterly	Quarterly
Coke 9	PM	100	Immediately	Continues	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
	H2S	45	Immediately	Quarterly	Quarterly
	SO2	No limit	31st March 2015	Quarterly	Quarterly
Coke Screen	PM	50	Immediately	Continues	Quarterly
Blast Furnace C & D					
BFC SH	PM	30	Immediately	Continues	Quarterly
	SO2	500	Immediately	6 monthly	6 monthly
	NOx	700	Immediately	6 monthly	6 monthly
BFC CH	PM	30	Immediately	Continues	Quarterly
	SO2	500	Immediately	6 monthly	6 monthly
	NOx	700	Immediately	6 monthly	6 monthly
BFC stoves	SO2	500	Immediately	Quarterly	Quarterly
	NOx	700	Immediately	Quarterly	Quarterly
BFD SH	PM	30	Immediately	Continues	Quarterly
	SO2	500	Immediately	6 monthly	6 monthly
	NOx	700	Immediately	6 monthly	6 monthly
BFD CH	PM	30	Immediately	Continues	Quarterly
	SO2	500	Immediately	6 monthly	6 monthly
	NOx	700	Immediately	6 monthly	6 monthly
BFC stoves	SO2	500	Immediately	Quarterly	Quarterly
	NOx	700	Immediately	Quarterly	Quarterly
	SO2	500	Immediately	Quarterly	Quarterly
	NOx	700	Immediately	Quarterly	Quarterly
PCI1	PM	50	Immediately	Continues	Quarterly
PCI2	PM	50	Immediately	Continues	Quarterly
DR Kilns					
Kiln 1	PM	50	Immediately	Continues	Quarterly
	SO2	1700	Immediately	Quarterly	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
Kiln 2	PM	50	Immediately	Continues	Quarterly
	SO2	1700	Immediately	Quarterly	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
Kiln 3	PM	50	Immediately	Continues	Quarterly
	SO2	1700	Immediately	Quarterly	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
Kiln 4	PM	50	Immediately	Continues	Quarterly
	SO2	1700	Immediately	Quarterly	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
Kiln 5	PM	50	Immediately	Continues	Quarterly
	SO2	1700	Immediately	Quarterly	Quarterly

Point source code	Pollutant name	AEL limit		Sampling frequency	Reporting frequency
		(mg/Nm³)	Date to be achied by		
	NOx	2000	Immediately	Quarterly	Quarterly
Kiln 6	PM	50	Immediately	Continues	Quarterly
	SO2	1700	Immediately	Quarterly	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
Taaibos	PM	50	Immediately	Continues	Quarterly
DR Raw	PM	50	Immediately	Continues	Quarterly
PSP	PM	50	Immediately	Continues	Quarterly
ESM					
EAF 1	PM	50	Immediately	Continues	Quarterly
	SO2	500	Immediately	Continues	Quarterly
	NOx	500	Immediately	Continues	Quarterly
EAF 2	PM	50	Immediately	Continues	Quarterly
	SO2	500	Immediately	Continues	Quarterly
	NOx	500	Immediately	Continues	Quarterly
EAF 3	PM	50	Immediately	Continues	Quarterly
	SO2	500	Immediately	Continues	Quarterly
	NOx	500	Immediately	Continues	Quarterly
EA LF1	PM	50	Immediately	Continues	Quarterly
	So2	No Limit		Quarterly	Quarterly
	NOx	No Limit	31st March 2015	Quarterly	Quarterly
EA LF2	PM	50	Immediately	Continues	Quarterly
	So2	No Limit		Quarterly	Quarterly
	NOx	No Limit	31st March 2015	Quarterly	Quarterly
EAF Sec	PM	30	31st Dec 2015	Continues	Quarterly
	SO2	500	31st Dec 2015	Continues	Quarterly
	NOx	500	31st Dec 2015	Continues	Quarterly
OSM					
BOF 1	PM	75	Immediately	Continues	Quarterly
BOF 2	PM	75	Immediately	Continues	Quarterly
BOF 3	PM	75	Immediately	Continues	Quarterly
BOF LF1	PM	50	Immediately	Continues	Quarterly
BOF LF2	PM	50	Immediately	Continues	Quarterly
Fume 3	PM	50	Immediately	Continues	Quarterly
Fume 4	PM	50	Immediately	Continues	Quarterly
Foundry					
MF1 (cyclone)	PM	30	Dec-12	Continues	Quarterly
MF2 (Baghouse)	PM	50	Immediately	Continues	Quarterly
HP Boiler Stacks					
B1	NOx	300	Immediately	6 monthly	6 monthly
B2	NOx	300	Immediately	6 monthly	6 monthly
B3	NOx	300	Immediately	6 monthly	6 monthly
Galvanizing Lines					
Galv 3	SO2	No Limit		6 monthly	6 monthly
	Nox	No Limit		6 monthly	6 monthly
Galv 4	SO2	No Limit		6 monthly	6 monthly
	NOx	No Limit		6 monthly	6 monthly
Galv 5	SO2	No Limit		6 monthly	6 monthly
	NOx	No Limit		6 monthly	6 monthly
Pickle Line					
PK 3	HCl	15	Immediately	monthly	Quarterly
PK 4	HCl	15	Immediately	monthly	Quarterly
Hot Strip Mill					
HM 1	SO2	500	Immediately	Quarterly	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
HM 2	SO2	500	Immediately	Quarterly	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
HM 3	SO2	500	Immediately	Quarterly	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
HM 4	SO2	500	Immediately	Quarterly	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
Plate Mill					
PM 1 /5	SO2	500	Immediately	Quarterly	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
PM 2 /6	SO2	500	Immediately	Quarterly	Quarterly
	NOx	2000	Immediately	Quarterly	Quarterly
ArcelorMittal Coke and Chemicals					
Lurgi 1	HCl	150	Immediately	monthly	Quarterly
Lurgi 2	HCl	150	Immediately	monthly	Quarterly

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Vanderbijlpark Works - Overall Air Quality

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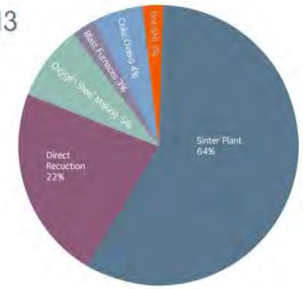
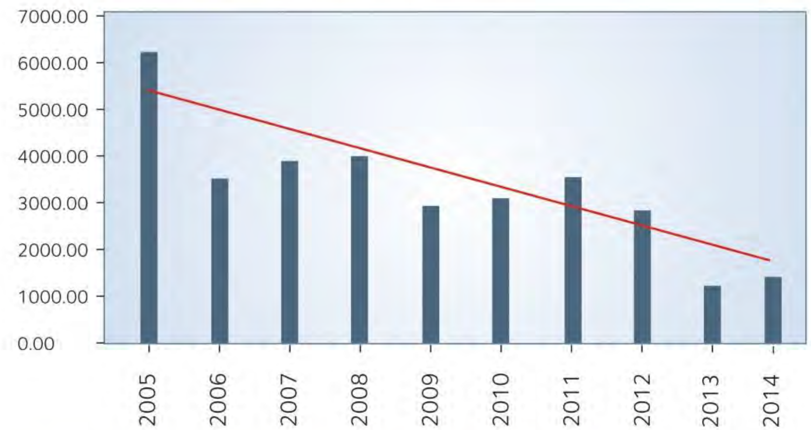
Point source PM 2013



Activity of plants vs Total dust

The table demonstrates the 83% overall emission reductions since 2005.



Emission reduction strategy

Project title	Project description	2007-2014	Emission status before interventions	Units to the reduction of pollutants	Challenges	Interventions to address challenges
Fugitive dust						
Roof emissions from Blast Furnace D	During the reline of BF-D, a baghouse was constructed to capture a significant portion of the roof emissions from the cast house	Completed	Fugitive particulate emission	300 tons per annum	Installation of environmental BAT tegnologie onto existing old non-compatible plants	Some adjustments and modifications had to be done onsite to ensure effectiveness of the BAT
Dust suppressions at waste disposal site	A dust suppression system, using high pressure to create a fine water mist, has been installed at the waste transfer station minimize fugitive dust emissions. 2013, 50% Enclosure of B tip station	Completed	Fugitive particulate emission reduction	44.08 tons per annum	None	Alteration of existing transfer stations
Secondary dust extraction system at EAF	Install secondary dust/fume extraction system with its own bagfilter system with an average capacity of ~5,000,000 m^3/hr. Thus will capture fumes and dust currently escaping through the openings in the roof. This project was not implemented and the EAF plant has switch off.	Plant closure 2013	Fugitive particulate emission	646 tons per annum	Capital constraints	Plant switched off
Replacement of old Coke batteries	Batteries 4, 8 and 9 will be operational until 2030 including certain upgrades and envisage construction of one new battery for 2020.	Long term planning	Fugitive particulate emission	Fugitive particulate emission reduction expected to be 772 tons per annum	Associated finances	Short term interventions – extensive ceramic welding, battery tightening project and automated exhausters (busy with implementation) Battery 1 and 3 has been shut down
Point sources						
Stoppage of dosing with spent pickling liquor at the Sinter Plant	Past practices included Spent Pickling Liquor to be sprayed into the mixing drum forming potassium chloride (KC) which form part of the gas released to atmosphere. The removal of KCl particulates downstream proved ineffective and the practice was stopped	Completed	Fugitive particulate emission	2782 tons per annum	None	None
Coke Oven Gas (COG) and Water Cleaning Plant Project	The technology was outdated and the COG and water cleaning project was initiated in 2003 to upgrade the system and reduce SO^2, NH^3 and HCN emissions.	Completed	Reduce SO2, NH3 and HCN	So2 emission reduction = 494 tons per annum	Sustainable operational challenges	Increase maintenance, investigate new solutions, get external technical expertise, technical modifications to design
Direct Reduction (kilns) Electrostatic Precipitator (ESP) rebuild	Rebuild and replaced the refractory linings that will improve the performance of the ESPs at the Direct Reduction kilns.	Problematic kilns were rebuild – improved maintenance	Fugitive particulate	301 tons per annum	Capital constraints	Modifications on kilns done in phases kilns 2 and 4 and upgrade on kiln 3
Sinter Clean Gas Unit	Installation of emission abatement technology (bag filter system) to reduce particulate emissions from the entire Sinter Plant. The addition of lime to the off-gas will be introduced to effectively remove SO^2.	Completed	PM, SO2	PM = 1 379 tons per annum SO2 = 743 tons per annum	Installation of environmental BAT techology onto existing old Sinter Plant	Some adjustments and modifications need to be done on site to ensure effectiveness of the BAT
Additional emission reduction interventions not committed to VTAPA AQMP						
Vegetation of open areas – 400 hectares	Rehabilitation of open areas inclusive of dam 10, dam 1-4 waste site, maturation pond CETP calculating to a total of 274 hectare of rehabilitated/vegetated land.	Completed	Fugitive PM	PM - 23 tons per annum		
Removal of historical ramp at metal recovery plant	Reduction of fugitive emissions	Completed	Fugitive PM	PM - 0.16 tons per annum		
Installation of new baghouse at Blast Furnace D stock house	Reduction of fugitive emissions at Blast Furnace raw materials handing	Completed	Point source PM	PM - 2847 tons per annum		
Installation of new BAT bagfilters at Blast Furnace pulverising plant	Installed best available technology bag filters to reduce dust emissions	Completed	Point source PM	PM - 0.74 tons per annum		
Installation of new bagfilter at Foundary	Installed best available technology bag filters to reduce dust emissions	Completed	Point source PM	PM - 50.6 tons per annum		
Emissions from Raw material stockpiles mitigation measures	Application of dust suppressants to reduce windblown dust	Completed	Fugitive PM	PM - 1 tons per annum		
Upgrade lancing booth	Reduction of fugitive emission from the lancing activities	Completed	Fugitive PM	PM - 1 tons per annum (estimation)		

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Vanderbijlpark Works - Sinter Plant

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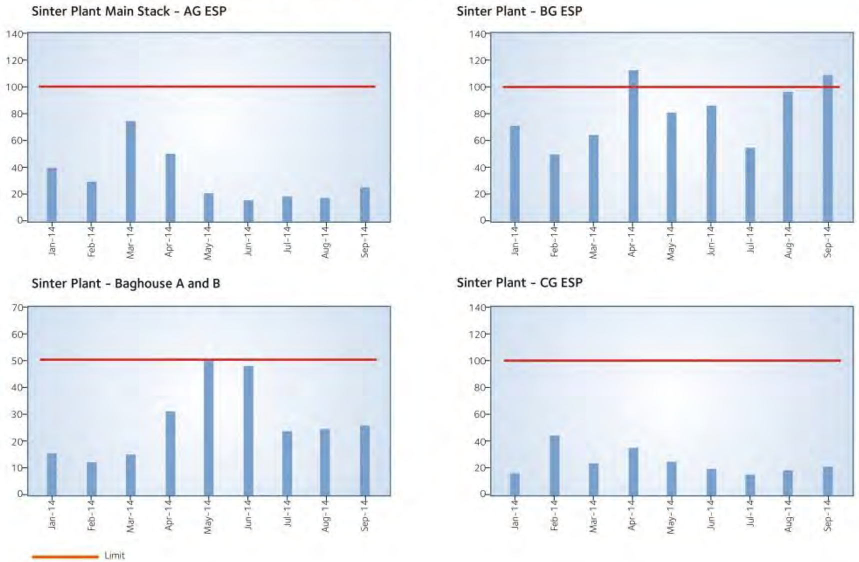
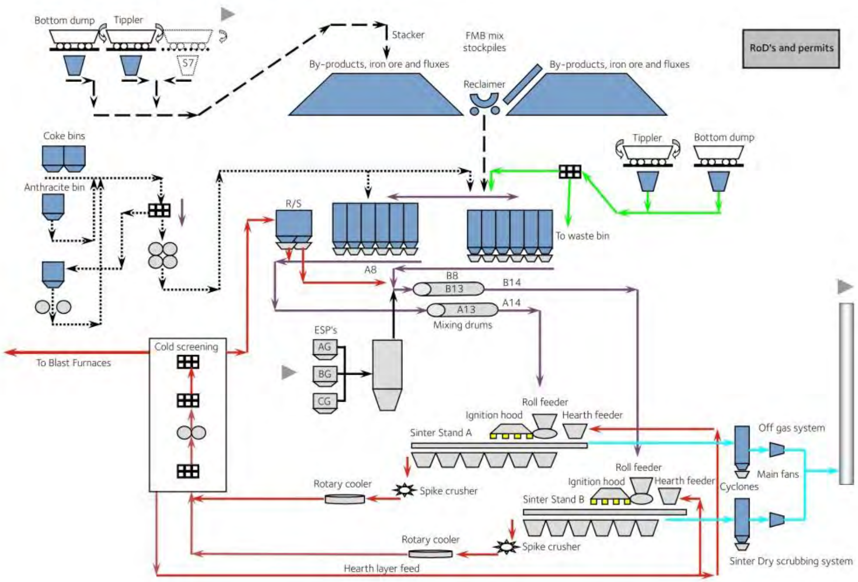
Sinter is produced through blending fine-sized iron ore, fluxes (limestone and dolomite) and other metallurgical by-products. These raw materials are ignited and heated (using coke and anthracite as a fuel) until they fuse into a solid stable mass known as sinter, which is an important feedstock for the blast furnaces. This heating and fusing process takes place on a conveyer-belt type structure known as the sinter strand. Currently Vanderbijlpark Works operates two such strands, Strand A and B.

Sinter Plant air quality results - Dust



Sinter Plant process flow diagram



Sinter Plant clean gas project

The Sinter bag house is one of various projects that were commissioned as part of our emission reduction strategy. The particulates (dust) emissions from the Sinter Main stack was the biggest single point source on site. The installation of abatement equipment to capture the emissions currently emitted from the stack was finalized and commissioned in October 2012. This project reduced the dust load for the Sinter plant by 93%. Construction of the Sinter dry scrubbing plant amounted to a total cost of R 260 million.

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Vanderbijlpark Works - Coke Making

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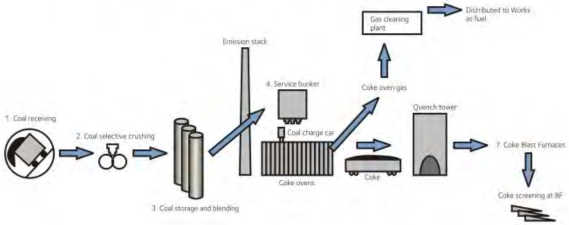
Coke Making process flow diagram



Coke is used in the Blast Furnace to chemically reduce iron-oxide to iron metal, it is also however a fuel. Coal is converted to coke by heating coal charged into a battery oven to about 1300ºC in an oxygen free environment for 15-21 hours. Subsequent to the heating process, coke is pushed from the ovens and dowsed with water to prevent further combustion. Vanderbijlpark Works operates five batteries, which supply coke to the blast furnaces on site.

Hot crude coke oven gas, which forms as a result of heating coal in the coke ovens, is cooled down from ~800°C to ~80°C by spraying it with flushing liquor. When the crude coke oven gas cools down, a mixture of volatile compounds condenses out of the gas.

The gas fraction is routed to the gas plant where it is cooled down further to remove more condensates in the primary coolers, cleaned of fine tar droplets in the electrostatic tar precipitators and H_2S and NH_3 removal by wet scrubbing. The scrubbing liquor used for the H_2S and NH_3 removal is stripped and the gas cleaned at the Elemental Sulphur plant. The final products from this plant are elemental sulphur that is sold, steam and tail gas that is mixed with the crude coke oven gas before the gas plant. droplets in the electrostatic tar precipitators and H^2S and NH^3 removal by wet scrubbing. Between 35 and 40% of the clean coke oven gas is returned to fuel the coke oven batteries, while a significant portion of the remainder is used in other operations within the integrated steel works

All condensates emanating from the crude gas and the gas plant are captured in a tar separator. Here the condensates are separated into: Light tar that is pumped to ArcelorMittal Coke and Chemicals for further processing. A heavy tar fraction that is either recycled back into the coke batteries or disposed on a certified waste site. Flushing liquor that is directed back into the coke ovens for cooling of the crude gas.

Emission Reduction Initiatives

In any coke making process, a certain amount of emissions (both fugitive and point source) are inevitable. In order to reduce the magnitude of emissions from the batteries at ArcelorMittal South Africa, Vanderbijlpark Works, various actions have been implemented, including the following:

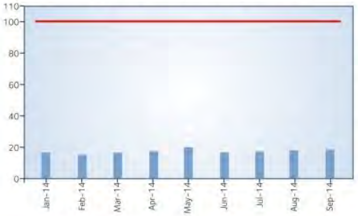
1. Ceramic Welding
Due to the extreme temperatures within the ovens of a battery, considerable heat stress is endured by the refractories which line the individual ovens. As a result, fine cracks form in the walls over time, which may have a negative effect on the emissions from the battery stack. To minimize emissions arising from this cause, extensive ceramic welding is performed on ovens in the different batteries on site. Ceramic welding is the process that is used to repair the coke oven refractories at operating temperature with minimal disruption to production. The repair material is ceramic bonded to the damaged refractory, utilizing a fusion process that generates an exothermic reaction in excess of 2000°C. Ceramic welding allows for a superior repair that restores structural integrity to the original brickwork.

2. Battery Tightening Project
Due to the great heat stress which exists within a battery, over time the sealing interfaces begin to shift in alignment. Consequently, the amount of fugitive emissions arising from the oven doors may increase. To curb such emissions, ArcelorMittal implemented a battery tightening project which focused on the bracing of ovens to realign door seal interfaces.

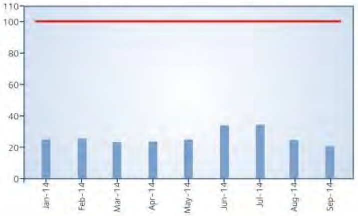
3. Exhauster Control
Another means of managing fugitive emissions emanating from the batteries is by means of exhauster control. The primary function of the exhauster is to suck the gas formed during the coke making process from the ovens for cleaning at downstream facilities. Slight pressure changes resulting from inefficient operation of the exhauster may cause elevated levels of fugitive emissions. ArcelorMittal is in the process of effecting upgrades to its exhausters to improve their control and thereby mitigate fugitive emissions.

Coke Making air quality results - Dust

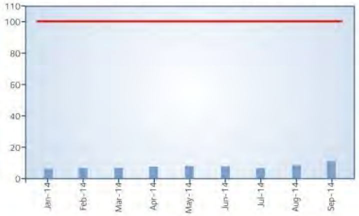
Coke Oven Battery 4 Concentration - Monthly Performance



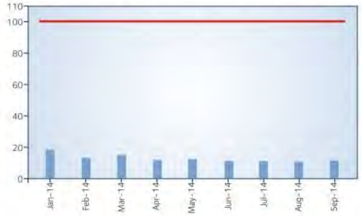
Coke Oven Battery 6 Concentration - Monthly Performance



Coke Oven Battery 7 Concentration - Monthly Performance



Coke Oven Battery 8 Concentration - Monthly Performance



Coke Oven Battery 9 Concentration - Monthly Performance

Limit

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Vanderbijlpark Works - Blast furnace

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Blast Furnace air quality results - Dust

Blast Furnace C - Stock House Bag house
Monthly Performance

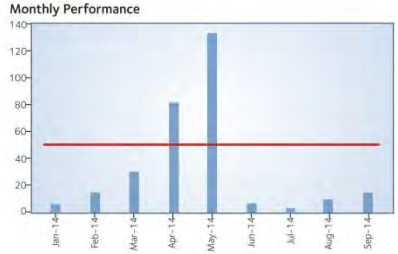
Blast Furnace D - Cast House Bag house
Monthly Performance

Blast Furnace D - Stock House Bag house
Monthly Performance

PCI Phase 1
Monthly Performance

Blast Furnace C - Cast House Bag house
Monthly Performance

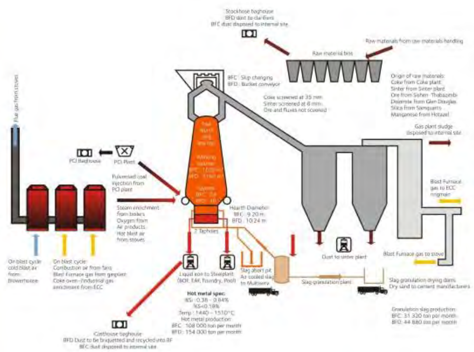
PCI Phase 2
Monthly Performance



Limit

The Blast Furnace is a counter current reactor in which iron-bearing materials are reduced to molten iron. The iron (Fe) containing materials (Iron ore and Sinter), fluxes (Dolomite, Silica stone and Limestone), Manganese ore and Coke, are added to the top of the furnace shaft. Hot blast air enriched with oxygen and steam is blown from the bottom of the furnace together with Pulverised Coal (PCI), producing a counter current of reducing gasses. The hot blast air reacts with carbon from the coke and PCI, to form carbon monoxide, which in turn reduces iron oxide to iron. The iron is tapped into torpedoes and transported to the steel plant. At Vanderbijlpark Works there are two Blast Furnaces, C and D, with a total capacity of 3.1 mt per annum molten iron.

Blast Furnace process flow diagram



The gas that is generated during the process is removed from the furnace top and cleaned from dust by the Dust Catcher, Vortex and Wet scrubber systems, before being introduced into the works BF gas ring main. The gas is used for re-heating of the stoves, at the Coke Ovens as well as at the boilers for energy generation. Excess Blast Furnace Gas can be flared off in Flares 1, 3 and 4.

During the Iron making process slag is also generated which is either granulated or tapped into an abort pit. The furnaces produce about 65 000t of granulated slag per month and approximately 4 000 t of air cooled slag per month.

At the Pulverised Coal Injection Plant (PCI), coal is pulverised and dried to be used at both Furnaces. The coal size range is controlled to 80% less than 100 microns, and stored on site in two fine coal bins, before being injected into the furnaces along with the hot blast air. Approximately 25 000t of coal is pulverised per month to replace coke consumption on the furnaces.

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Vanderbijlpark Works Dust Extraction

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Dust Extraction system for Blast Furnace D Stockhouse

Background and reasons for implementing the project

The Blast Furnace D (BFD) Stockhouse was upgraded to reduce a source of fugitive dust emissions in Vanderbijlpark Works. This necessitated an improvement in the dust collection efficiency, and the abatement of fugitive dust emissions at both the Stockhouse and furnace top. The current abatement system can therefore not extract all the dust generated at the Stock house.

ArcelorMittal South Africa, Vanderbijlpark Works aims to reduce the Work's total emissions and impact on the receiving environment in terms of dust emissions.

Post implementation

- The visible dust emissions from the Stock house needs to be eliminated.
- The fugitive dust will be captured by the new extraction system.
- The baghouse will cater for future environmental legislation and be able to comply with an emission limit of 30mg/Am³ from the bag house stack.
- The total emissions of Vanderbijlpark Works will be reduced.

Total Cost

- Total cost of the bag house calculates to $12.67m/R87.6m.

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Vanderbijlpark Works - Direct Reduction

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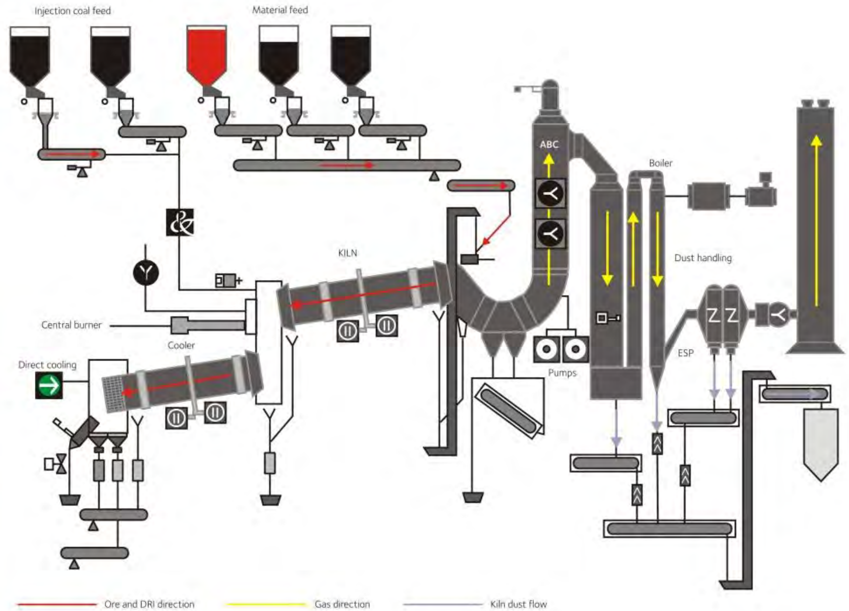
The Direct Reduction route is an alternative iron making route, which utilises coal to reduce the iron ore. At Vanderbijlpark Works, six rotary kilns are used to heat iron ore, coal and additives to produce sponge iron, which is then utilised in an electric arc furnace.

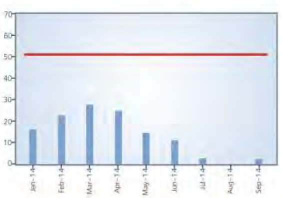
The waste gases from the process are drawn off and sent through a waste heat boiler to generate process steam. Dust particles are removed from this waste gas stream in the Electrostatic Precipitator (ESP), before the waste gas is discharged to atmosphere through the main stack. There is an emergency stack situated between the kiln and the boiler. This serves as a safety device for the boiler, should there be an unplanned boiler outage. There are presently 6 kiln per boiler trains in operation.

Direct Reduction process flow diagram



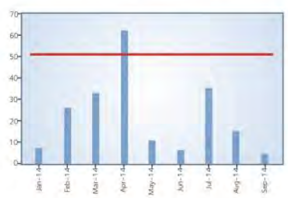
DR Kilns air quality results - Dust

DR Kiln 1 ESP - Monthly performance

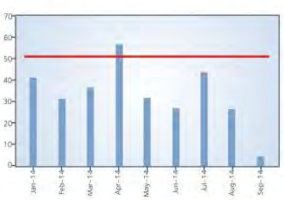


DR Kiln 2 ESP - Monthly performance

DR Kiln 3 ESP - Monthly performance

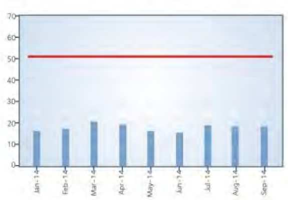


DR Kiln 4 ESP - Monthly performance



DR Kiln 5 ESP - Monthly performance

DR Kiln 6 ESP - Monthly performance



Taaibos ESP stack - Monthly performance

DR Old PSP ESP - Monthly performance

DR Raw material handling stack - Monthly performance

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Vanderbijlpark Works - Basic Oxygen Furnace

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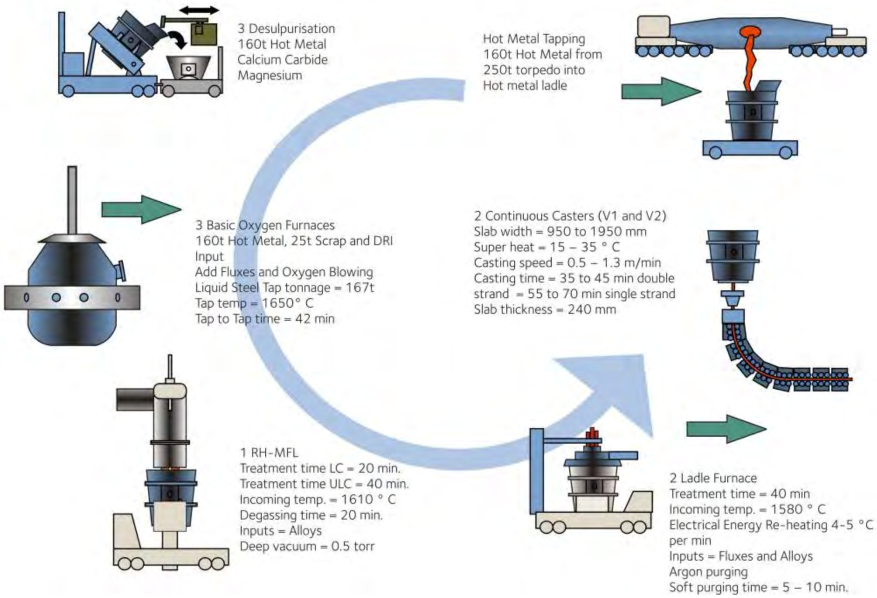
Basic Oxygen Furnace process flow diagram



Basic Oxygen Steel Making involves the conversion of iron from the blast furnace into steel by application of pure oxygen to remove carbon, silicon and other elements, and the addition of fluxes and alloying agents to remove impurities and alter the composition. De-sulphurisation is also carried out which is a pre-treatment of the hot iron. Vanderbijlpark Works operates three furnaces, which operate on molten iron, and scrap. The amount of scrap charged depends on scrap availability, hot metal availability, hot metal chemistry, final steel quality, etc. Pure oxygen is then top blown; during the process carbon is oxidised and released as carbon monoxide and carbon dioxide. Silicon, manganese and phosphorus are oxidised and captured in the slag. Further refining of liquid steel chemistry happens in a ladle furnace.

After the refining in the secondary metallurgical process (Ladle Furnaces and RH degasser), the liquid steel is cast into the continuous casters (V1 and V2) and cut into slabs.

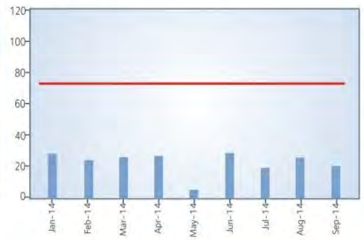
A fire which broke out at the Basic Oxygen Furnace 2 on Saturday, 9 February 2013 has caused extensive damage to Vanderbijlpark Works' Steel Making plant.
After the successful commissioning of BOF 3 on 19 March, the commissioning of BOF 2 was completed on 2 April. Twelve days earlier than planned, BOF 1 tapped its first heat on 8 April, this means that the BOF plant is once again fully operational - 59 days after the devastating fire.

Basic Oxygen Furnace air quality results - Dust

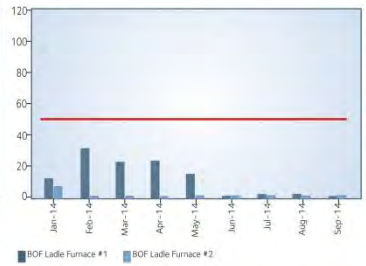
Oxygen Steel Making Primary Furnace #1 Monthly Performance

Oxygen Steel Making Primary Furnace #2 Monthly Performance

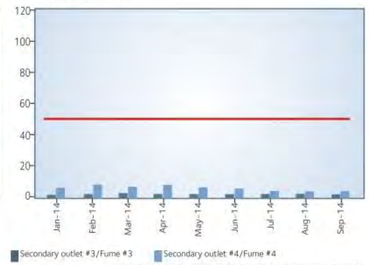
Oxygen Steel Making Primary Furnace #3 Monthly Performance



Oxygen Steel Making BOF ladle Furnace 1 and 2 Monthly Performance



Oxygen Steel Making BOF Secondary Outlet 3 and 4 Monthly Performance



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Vanderbijlpark Works - Foundry

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Foundry process

Foundry > 9 tons and Foundry < 9 tons

Foundry operations involve production of near shape castings in moulds made from resin bonded silica and sand. Molten steel or iron is poured into the moulds built in either pits or weld-fabricated steel boxes. After solidification and cooling of the metal, the sand is removed from the castings through a process called stripping. Fettling operation involves cleaning of castings through arc-air and grinding.

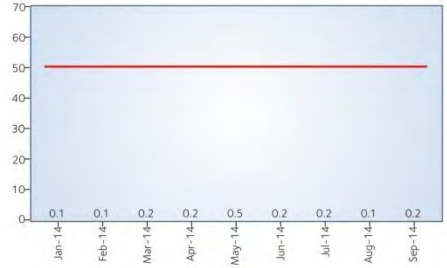
The Ferrous Foundry is made up of two main production sections:
>9Ton Section and
<9Ton section.

The >9 ton section is situated in the Basic Oxygen steel plant area from where its liquid steel supply is sourced. The <9ton section is situated close to the blast furnace D plant and has a small induction furnace to melt scrap metal.

Moulding in this section is done in steel boxes utilizing sand recycled from >9ton section. Metal for casting in this section comes from a twin 8 ton Induction furnace. Casting of cast iron jobs is made from Torpedo pig iron from Blast Furnaces C or D.

Foundry air quality results - Dust

Foundry, Sand Reclamation - Bag House - Monthly Performance



Foundry, Cyclone - Monthly Performance

Foundry Emission Reduction Project

In terms of the AEL the Foundry Cyclone's new emission limit is 30 mg/m3. To ensure compliance to the AEL limit, a mobile bag house was connected to the cyclone and readings is averaging at 3mg/Nm3.

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Vanderbijlpark Works - Pickle Line 3 & 4 and Lurgi 1-3

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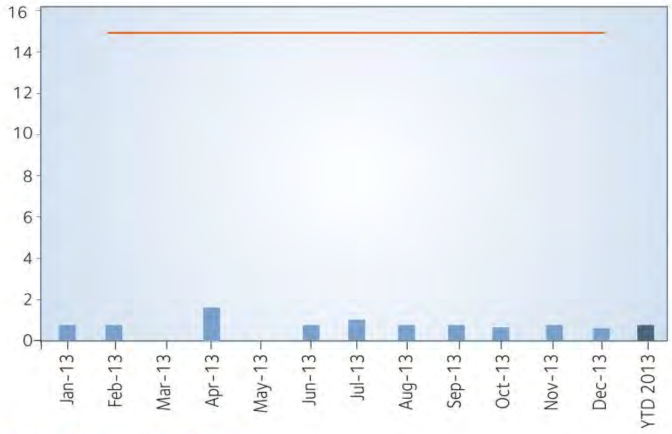
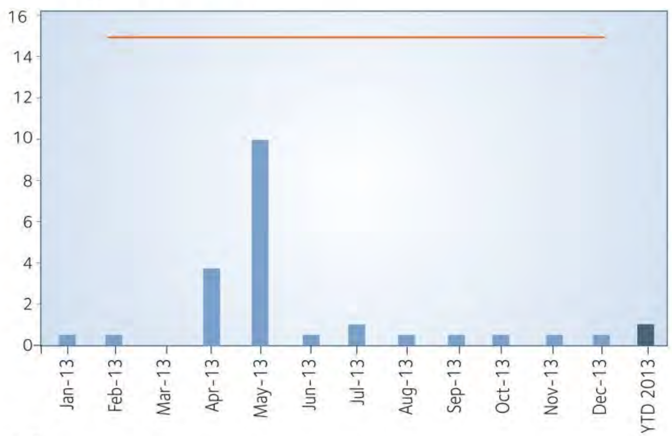
Pickle Line #3 and #4

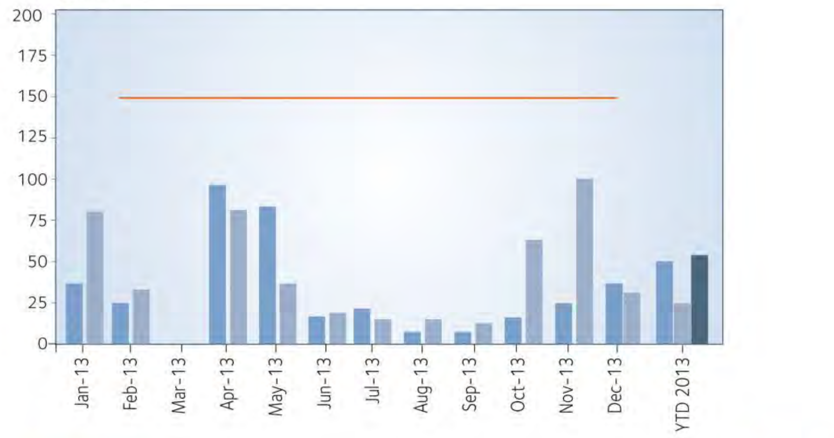
Pickle Line #3 North
Monthly Performance



Pickle Line #4 South
Monthly Performance



Lurgi 1-3



Continuous Pickling Line #4

The pickling line prepares strip coming from the hot strip mill for the cold rolling process by removing surface rust and dirt. This is achieved through a process of acid pickling and water rinsing. The line also oils the cleaned strip and side-trims it to the correct width in preparation for the 5 Stand tandem mills.

Output: Pickled and oiled hot rolled products.

BWG: This unit breaks up surface scale which improves pickling efficiency.

Acid concentration: 6.5 to 8% 80°C

Feedstock: Hot rolled coils from the hot strip mill.

Pickling process: Incoming hot rolled strip may be contaminated on the surface with dirt and mild oxidation produts. The pickler makes use of heated hydrochloric acid to clean the surface in preparation for further cold rolling processes.

Products: Hot rolled coil for direct dispatch. No kinks, no oil to Galv. #3. Oiled strip to 5 Stand South.

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Vanderbijlpark Works - Quarterly gas result

ArcelorMittal

Plant	Limit	Q1 2014	Q2 2014	Q3 2014	Q4 2014	YTD
Sinter Plant						
Sinter Main Stack	SO_2 < 500 mg/Nm3	31	0	36		22
	Nox < 1200 mg/Nm3	119	118	68		102
Blast Furnace						
Blast Furnace C Stock house Bag house	SO_2 < 500 mg/Nm3	1	3	0		1
	Nox < 700 mg/Nm3	1	1	0		0
Blast Furnace C Cast house Bag house	SO_2 < 500 mg/Nm3	1	0	34		12
	Nox < 700 mg/Nm3	4	0	0		1
Blast Furnace D Stock house Bag house	SO_2 < 500 mg/Nm3	0	0	0		0
	Nox < 700 mg/Nm3	2	0	0		1
Blast Furnace D Cast house Bag house	SO_2 < 500 mg/Nm3	17	0	23		13
	Nox < 700 mg/Nm3	4	3	0		2
Blast Furnace C Stoves	SO_2 < 500 mg/Nm3	0	1	0		0
	Nox < 700 mg/Nm3	14	27	9		17
Blast Furnace D Stoves	SO_2 < 500 mg/Nm3	1	0	0		0
	Nox < 700 mg/Nm3	59	39	104		67
Direct Reduction						
Kiln 1 ESP	SO_2 < 1700 mg/Nm3	82	572	P/O		327
	Nox < 2000 mg/Nm3	37	35	P/O		36
Kiln 2 ESP	SO_2 < 1700 mg/Nm3	950	832	314		699
	Nox < 2000 mg/Nm3	39	23	48		37
Kiln 3 ESP	SO_2 < 1700 mg/Nm3	870	267	438		525
	Nox < 2000 mg/Nm3	56	36	0		31
Kiln 4 ESP	SO_2 < 1700 mg/Nm3	904	764	475		714
	Nox < 2000 mg/Nm3	46	47	0		31
Kiln 5 ESP	SO_2 < 1700 mg/Nm3	764	883	350		666
	Nox < 2000 mg/Nm3	48	41	114		67
Kiln 6 ESP	SO_2 < 1700 mg/Nm3	769	865	510		715
	Nox < 2000 mg/Nm3	34	36	1		24
Coke Making Plant						
Battery #4	SO_2 No limit	40	76	64		60
	Nox < 2000 mg/Nm3	238	339	243		273
	H_2S 45 mg/Nm3	7	9	10		9
Battery #6	SO_2 No limit	452	645	545		547
	Nox < 2000 mg/Nm3	99	139	79		106
	H_2S 45 mg/Nm3	0	2	2		1
Battery #7	SO_2 No limit	581	655	412		549
	Nox < 2000 mg/Nm3	164	168	111		148
	H_2S 45 mg/Nm3	0	0	32		11
Battery #8	SO_2 No limit	255	218	164		212
	Nox < 2000 mg/Nm3	234	13	148		132
	H_2S 45 mg/Nm3	6	0	4		3
Battery #9	SO_2 No limit	318	238	204		253
	Nox < 2000 mg/Nm3	231	141	124		165
	H_2S 45 mg/Nm3	10	3	5		6
Other						
Boiler 1	NOx < 300 mg/Nm3	280	52	242		191
Boiler 2	NOx < 300 mg/Nm3	134	42	103		93
Boiler 3	NOx < 300 mg/Nm3	126	135	135		132
Galv 3	SO_2 - no limit	1	87	43		44
	NOx - no limit	47	13	26		29
Galv 4	SO_2 - no limit	12	9	9		10
	NOx - no limit	50	69	69		63
Galv 5	SO_2 - no limit	0	1	1		1
	NOx - no limit	14	2	8		8
HSM Furnace 1	SO_2 < 500 mg/Nm3	64	138	202		135
	NOx < 2000 mg/Nm3	79	129	174		127
HSM Furnace 2	SO_2 < 500 mg/Nm3	208	0	54		87
	NOx < 2000 mg/Nm3	172	83	44		100
HSM Furnace 3	SO_2 < 500 mg/Nm3	20	119	101		80
	NOx < 2000 mg/Nm3	44	29	15		29
HSM Furnace 4	SO_2 < 500 mg/Nm3	253	358	138		250
	NOx < 2000 mg/Nm3	205	315	60		194
Plate Mill Furnace 5	SO_2 < 500 mg/Nm3	146	237	20		134
	NOx < 2000 mg/Nm3	85	63	49		66
Plate Mill Furnace 6	SO_2 < 500 mg/Nm3	160	83	21		88
	NOx < 2000 mg/Nm3	160	83	43		95

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Vanderbijlpark Works -
Air emissions monitoring and Iso-kinetic sampling equipment

ArcelorMittal

Air Emissions Monitoring

Particulate Emissions (PM)

ArcelorMittal South Africa, Vanderbijlpark Works measure the dust inside permitted stacks (which contains dust) by utilising cross-stack measuring systems which uses a dynamic sensing technique to measure the rate of change of light (Ratiometric Opacity technology) as particulates pass through a modulated light beam.

These instruments are used for applications with Electrostatic Precipitators boilers, calciners and large diameter emission stacks.

Actual instruments (note green light on left hand side)

Real "life" controller

Illustration of light used by instruments

Different controllers and displays

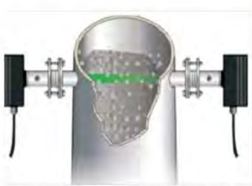
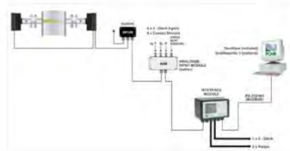


Illustration of instrument set-up in stack

Combined display of dust (mg/m^3) and opacity readings

Display as seen on instrument when in use (example)



Illustrating a single stack configuration from the monitors at the stack through to the actual reading displayed on a PC

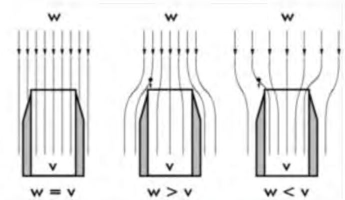
Iso-kinetic sampling equipment

The term "isokinetic" comes from root words meaning "**same**" and "**movement**."

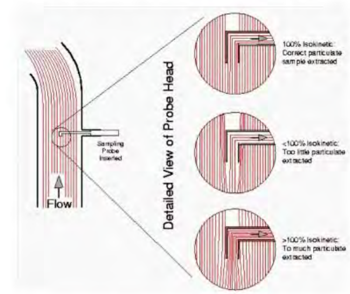
In an isokinetic sampling procedure, the testing nozzle is set up to allow the sample stream to enter without changing speed. This reduces the risk of concentrating larger or smaller particles. If the stream moves too slowly into the collector, it increases the number of large particles. Too fast, and large particles are lost. In either case, the sample collected wouldn't be an accurate reflection of what is in the overall stream.

Iso-kinetic sampling collects particles in a moving stream at the same velocity in the sampling nozzle as elsewhere in the streams.

Actual instrument used for sampling purposes at Vanderbijlpark Works



When w = v (stream = sampling velocity) sampling is Iso-kinetic



Showing when Iso-kinetic sampling is taking place

Quality Assurance and Quality Control (QA and QC)

- Iso-kinetic sampling calibration and verification of continuous analysers used on stacks
- External maintenance contract for continuous PM analysers
- SANS calibration of weighing scale and verification weights
- Weekly verification of weighing scale
- Anti-static mat on scales

Weighing scale used and verification weights

Close up of verification weights

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Vanderbijlpark Works - Ambient Air Monitoring

Introduction

ArcelorMittal South Africa monitors ambient air as an indicative tool to measure the efficiency of environmental emissions reduction plans. This also severs as an indicator tool to develop emissions reduction strategies.

ArcelorMittal South Africa utilizes ambient air monitoring stations which are located in the four directional outskirts of the works to monitor ambient air quality. Dust buckets are also utilized to monitor dust fallout according to ATSM D1739.

ArcelorMittal South Africa are not legislated to monitor ambient air.

Equipment and methods

An ambient station comprises of multiple measuring instruments to measure ambient air quality and meteorological data.

Ambient Monitoring Station

Parameters measured in ambient stations

Meteorology	Gases	Particulate matter
Wind Speed	SO2 – Sulphur Dioxide	PM 10
Wind Direction	NOx - Nitrious Oxides	PM 2.5*
Rainfall	O3 - Ozone	
Solar Radiation	C6H6 - Benzene	
Humidity	CO – Carbon Monoxide	
Temperature	H2S – Hydrogen Sulphide	

List of parameters measured at ambient stations.

Quality Assurance and Quality Check

- Quarterly SANAS calibration of gas emissions measurement instruments.
- Yearly SANAS calibration of meteorological measurement instruments.
- Quality control manuals.

Equipment and methods

Method of measuring gas: optical path measurement

Light transmitter

Light receiver

- Transmitter and receiver are positioned far apart to define monitoring path.
- The light source in the transmitter is a high pressure xenon lamp.
- The light source radiates a smooth spectrum between 200nm to 500nm.
- There is a specific absorbtion spectrum for every gaseous substance.
- The captured light from receiver goes via an opto-fibre to the analyser.
- The opto-analyzer records the measured values of a specific gas for reporting purposes.

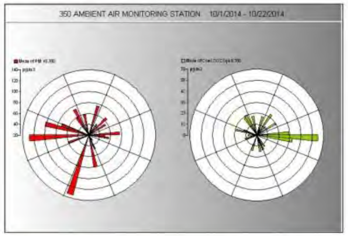
Gas measurements through drawing in air

Measuring rack

Sampling head

- Sampled air is drawn via sampling head to the measuring rack.
- Measuring rack consists of API analysers.
- API analyzers are used to measure different gases.

Interpretation of results



Particulate matter measurement

Sm200 PM 10 analyzer

Sm200 PM 10 analyzer

Sm200 PM 10 sampling head

Air is sampled at 1000l/hr to the analyzer. Beta rays are referenced to zero air and passed through to PM. The results are then computed. PM10 and PM2.5 are both measured.

Dust fall-out

Location of dust buckets

Dust bucket

Dust fallout buckets are utilized to monitor fugitive emissions entering and exiting the works. ASTM D1739 method was utilized as a guideline in the installation and measuring of dust buckets.

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Vanderbijlpark Works - Zero Effluent Discharge

ArcelorMittal

Vanderbijlpark Works became a Zero Effluent Discharge (ZED) Facility in 2006 with the implementation of the MTP Project

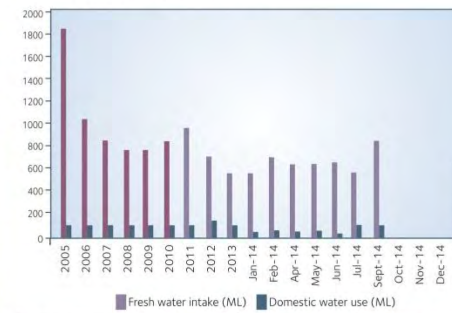
The Main Treatment Plant (MTP) was officially opened on 5 April 2006 by the Hon. Rejoice Mabudafhasi, Deputy Minister of Environmental Affairs and Tourism at the time.

ZED and the MTP Project resulted in:

- Termination of effluent discharge
- 50 % Reduction in raw water abstraction
- ArcelorMittal South Africa received an environmental sector reward from the Department of Water Affairs.

Vanderbijlpark Works commenced with a project of R90 million in October 2014 to upgrade the water treatment system. The project mostly entail upgrades in order to improve the efficiency of the RO (reverse osmoses) and the salt removal systems.

Fresh Water Abstraction ML/month



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Vanderbijlpark Works - Waste management

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Enviro poster 16

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Vanderbijlpark Works - Recycling

ArcelorMittal

Reduce

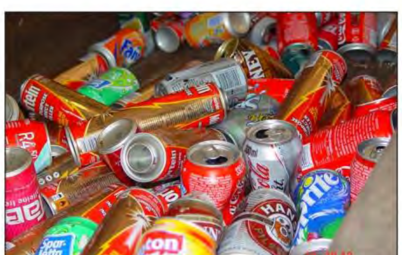
Minimizing the amount of general domestic waste disposed e. g using less of paper.

Reuse

To ensure that material is optimally utilized prior to final disposal, e.g. reuse glass water bottles.

Recycle

Putting material through a process that allows for the product to be reused again, e.g. the melting of plastic bottles for reprocessing.



Colour coded wheely bins

Collect-a-can

Collect-a-can is a not-for-profit company established in 1993 dealing with recovery of used metal cans mainly from the beverage industry but also aerosol, food, oil and paint cans. It is a joint-venture between ArcelorMittal South Africa (60 %) and Nampak (40 %), established to ensure that steel cans have minimum impact on the environment. Since its formation 20 years ago, **Collect-a-can** has become a highly successful operation, a prime example of how industry can contribute to corporate social responsibility in a sustainable manner.

Collect-a-can has returned considerable value by:
- Reducing waste from metal cans in landfills. Estimates indicate that metal can share of litter has decreased from 8 % of total waste to less than 1%. Beverage can recovery rate is 72% currently, which is on par with reported rates from developed countries.
- Paid over R20 million to an estimated 100 000 collectors, most of whom have no other source of income.
- Raising awareness and creating a culture of recycling. Collect-a-can organises a school recycling competition with 300-500 parliament schools annually reaching 250 000 students.

Collect-a-can has received a number of awards and recognition over the years including:
- A Guinness World record for most cans collected in one month with over 2.5 million cans in October 2010.
- Mail & Guardian Greening the Future Award for Best Environmental Practice and Sustainability.
- WWF Green Trust Corporate Conservation Award.

We Can

Reduce-Reuse-Recycle

Recycling Project

Recycling forms part of the waste minimisation strategy which involves separating articles from the waste stream and processing them as products or raw materials. To support this waste management approach, Vanderbijlpark Works took on the recycling of domestic waste as of August 2011 as part of responsible waste management. An independent contractor has been appointed to recycle general waste generated from the offices, plants and the internal restaurant. Recovery of the recyclable waste will reduce the volume of waste disposed of on the general disposal site, thereby increasing the lifespan of the newly built facility.

The waste is separated at source and disposed of into different, colour-coded wheelbins. The bins have been strategically placed to ensure that there is a clear distinction between the disposal areas for recyclable waste and other general or process waste. The waste is collected and taken to the internal sorting station, which is enclosed to prevent any environmental pollution that may occur. The recycled waste is then sold to recycling or reprocessing facilities and the income generated through this process is used to fund the project, making it a self sustainable project.

The yellow bins are used for the disposal of all plastics containers, including beverage and food containers, detergent bottles, household cleaner bottles, yogurt cups and rigid plastic containers such as pipette trays.

The white bin is dedicated to the sorting of paper and boxes.
These include:
- All boxes
- Shoe boxes
- Computer printouts
- Photocopier/paper/boxes
- Fax machine/paper
- Printer paper
- Newspapers
- Magazines
- Telephone directories
- Junk mail
- Coloured paper
- Soft folders
- Envelopes
- Tissue paper
- General office paper (e.g. invoices, statements.)

Subsequent to sorting, the recovered material is packaged and transported to reclamation businesses for re-use or recycling.

Internal sorting station

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Vanderbijlpark Works - Open area rehabilitation - fugitive dust reduction

ArcelorMittal

Open areas

Open areas (areas not covered by natural vegetation such as grass or artificial covering such as paving) contribute towards the generation of fugitive dust emissions on site. In order to reduce the amount of fugitive emissions generated, ArcelorMittal South Africa Vanderbijlpark Works has embarked on a drive to cover these open areas. The advantage of covering open areas is that it contributes towards reducing fugitive dust emissions, improves storm water runoff quality and also looks aesthetically pleasing. To date approximately 400 hectares, including hydroseeding as part of remediation activities on site of previous open areas has been vegetated.

Before

After

Before

After

Before

After

Before

After

Before

After

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ArcelorMittal South Africa

Vanderbijlpark Works - Waste management

ArcelorMittal

Remediation of old waste disposal site

Background

The Vanderbijlpark Works old waste site was commissioned in the 1960's where the disposal of metallurgical waste on approximately 170 ha of land took place.

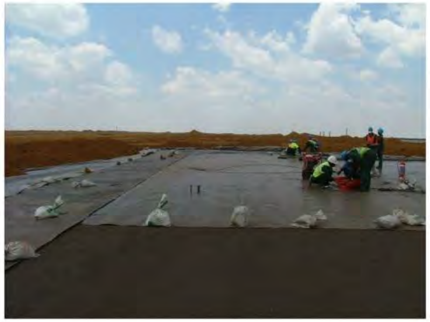
The old waste site was decommissioned on the 31 December 2010 and closed off for disposal as per the Water Use License requirement. The Department of Water Affairs was satisfied with the measures ArcelorMittal had put in place to reduce the possible impact from the waste site, and the Department of Environmental Affairs was content with the overall protection of the environment. To date R87 million has been spent on the remediation of the old site.

Disposal on the new GLB+ waste disposal site commenced in January 2011. The new waste disposal site and associated leachate collection system was designed and constructed according to the approved designs at a cost of R32 million.

Remediation of old waste site

A phased approach has been adopted for the rehabilitation of the old waste disposal site due to its size. There has been great success in the achievement and completion of project milestones, namely:

- Phase 1 of the remediation that entails capping of the old waste disposal facility. This was successfully completed in 2010 and vegetation was established in 2011.
- Phase 2 of the remediation of the decommissioned waste disposal facility commenced in 2011 and was completed by March 2012.
- Final rehabilitation of the site will be achieved with the completion of Phase 3 and is expected in 2017.



Phase 1 and 2 of remediation of the old waste site

Vegetation at phase 1

Vegetation at phase 1

Before Capping at phase 2 - near tip station

After Capping at phase 2 - near tip station

After Capping at phase 2 - drainage channel

Before Capping at phase 3 - drainage channel

Before Capping at phase 3

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Vanderbijlpark Works -
Rehabilitation of Dam 10 - Transformation of a Legacy Dam

ArcelorMittal

History

Commissioned in 1960 as a number of earth dams for the purpose of waste water storage and evaporation
Dam 10 area is 80 ha.

Disposal of various process related waste streams.
Two of the 10 dams was used for organically contaminated waste water.
Remaining dams used for inorganic waste water.

Use of the dam ceased in 2000.
Since then the site has been dried and a large portion of hazardous organic material has been removed from the area.

Project history

1960 – 2000: Dam 10 operational.

2000 – 2001: Use ceased.

2002 – 2004: Empty Dam 10 and implement storm water canals.

2005 – 2007: Investigate alternative remediation plans and methods.

2008 – 2010: Remediation activities 95% completed

2011: Complete decommissioning.
Final organic remediation and spreading material.
Final storm water measures and vegetation.

2012 – onward: Continue surface & ground water monitoring.

Organic soil remediation

Innovative breakdown of organic contaminated soil through Enhanced Archaea Treatment.

Custom made Windrowers were sourced for application to soil.

Microbial breakdown of material to pre-determined clean-up levels.

Required results obtained and organic breakdown extremely successful.

Treated soil and material spread on Dam 10 surface to serve as topsoil for in-organic soil stabilisation to follow.

In-organic soil stabilisation

The remaining inorganic soil compounds was stabilised as per pre-determined soil requirements.
The area of the dam was sampled and analysed in order to determine the correct portions of material required to achieve optimal stabilisation of the soil.

Chemical stabilisation of the soil profile with the addition of gypsum, limestone, organic compost and fertiliser (N, P and K) in ratios pre-determined.

Benefits: Improved quality of seepage into ground water as well as surface water run-off quality.
Reduced dust generation and transformed appearance.

Cost: R46 million

Enviro poster 14

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Vanderbijlpark Works -
CETP Sludge Dams 1 and 2 rehabilitation

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CETP

Central Effluent Treatment Plant (CETP) sludge originated from the CETP as underflow of the thickeners. With the construction of the Main Treatment Plant (MTP) in 2005, certain infrastructure at the CETP were also upgraded including new filter presses that press the sludge into dry filter cake that is authorised to be dispose of on the internal disposal site.

Historically, CETP sludge was disposed of in two dams, namely CETP Dam 1 (old CETP dam) and CETP Dam 2 (new CETP dam) both located in the Consolidated Residue Management Facility (CRMF) area. These dams were constructed with soil and without any liners or concrete walling.

- CETP sludge Dam 1 was commissioned in 1963 and consisted of 13 dams combined in one system. Sludge disposal into Dam 1 was terminated in 1997.
- CETP sludge Dam 2 was commissioned in 1975 and consisted of 6 dams combined in one system. Sludge disposal into Dam 2 was terminated in 2005.

The combined volume of CETP Dam 1 and Dam 2 was 700 000m^3 .The major constituent of the sludge was tallow (a lubrication product used in the Rolling Plants and derived from animal fat).

After different trials and investigations were completed it was concluded that the best remediation option will be the following:

- Enhanced microbial treatment of the organic contaminated sludge. This entails the addition of microbes, fertilizer and windrow application.
- Soil stabilisation of the remaining soil in the dams and finally re-vegetation with indigenous grass species.

Remediation of CETP Dam 1 is already completed.

Remediation of CETP Dam 2 is currently in the preparation phase, with residue stockpiled in windrows for bioremediation.

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Vanderbijlpark Works - Metal Recovery Plant

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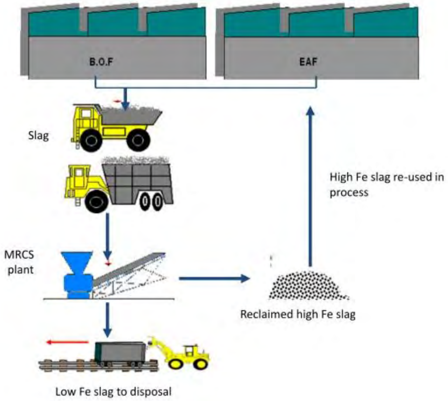
Metal Recovery Crushing and Screening Plant (MRCS)

The purpose of the Metal Recovery Crushing and Screening Plant is to minimise the amount of waste disposed of on the Vanderbijlpark Works site and to optimise the recycling of waste streams back into the process.

During the steel making process slag is generated when impurities is removed from the liquid steel enable to arrive at the desired chemical composition. The slag contains a measurable amount of metal that can be recovered. The slag instead of being directly disposed of onto the internal waste site is diverted to the MRCS plant to recover the usable metallic material that can be utilised in the steel making process. The MRCS plant plays a vital role in avoiding the disposal of usable by-products.

Lined operational area

Process Flow diagram



Process flow of the MRCS plant

Liquid Steel is produced at the Oxygen Steel Making plant.

A by-product of this process is the generation of Slag.

Slag is transported to the MRCS plant where the slag is crushed and screened.

The high Fe (metal) content slag is separated from the low Fe slag and is re-used in the steel making process.

The remainder of the material is disposed at the internal waste disposal site.

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Vanderbijlpark Works - Waste site

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The new Dry Metallurgical waste disposal site

Operations of the new waste disposal site are currently being conducted according to the site operational plan. As of December 2011 approximately 65% of the total estimated airspace at the site had been filled up. The waste management licence for this activity was issued and received.

Operation of Dry Metallurical waste site (G:L:B+)

Leachate collection dam

The H:H leachate collection system and associated dam was constructed with the new waste site to collect and contain contaminated run off and leachate produced from the waste site tip station, the new dry metallurgical waste disposal site and the new general domestic waste disposal site. The leachate dam was constructed in line with and H:H lagoon design.

The leachate dam is currently functioning well and there have been no leaks detected or any structural or wall failure to the dam. The water from the dam can be pumped to the Main Treatment Plant (MTP) for treatment and re-used in the Works as and when required.

New leachate collection dam

New domestic waste site

- Site clearing and area preparation at the new domestic waste disposal site commenced in September 2011, and construction commenced in October 2011.
- The liner system (consisting of a 150mm in situ base preparation, 100mm sacrificial layer, 1.5mm HDPE liner, A4 biddum, a composite capping layer consisting of 450mm compacted clay layer (3x 150mm layers) and a 100mm stone leachate collection layer) has been completed, and the drainage systems are currently being completed.
- The construction of the new general domestic waste site was completed at the end of February 2012 at a cost of R7 million.

Domestic site: Laying of plastic liner

Domestic site: Clay liner layer

Domestic site: Stone protection layer and drainage collection channel

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Vanderbijlpark Works - Tip station upgrade

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Forming part of ArcelorMittal South Africa Vanderbijlpark Works drive to reduce fugitive emissions as new R 2.5 million steel frame overhead spryer system was recently installed at B-tip on the waste disposal site. The purpose of this system is to aid in supressing fugitive emissions arriving form off-loading activities involving both trail and road transported waste to the waste site. High pressure water in sprayed from the roof spryer system upon commencement of the off-loading activities.

Construction of support beam platforms

Construction of steel support beams for the roof

Completed steel frame

Installation of steel roof completed

Completed structure including steel roof and steel side covers

Sryper system in operation to reduce fugitive emissions

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Vanderbijlpark Works - Salt Cell

ArcelorMittal

Introduction

ArcelorMittal South Africa Vanderbijlpark Works was issued with a Waste Management License (12/9/11/L118/3) for the construction of a Salt Cell from the Department of Environmental Affairs (DEA).

Construction of the salt cell commenced in September 2013 according to approved design drawings. The inner liner system used for the slat cell consisted of 2 x cuspate geosynthetic drainage layers followed by 3 x 1.5 mm HDPE (High Density Polyethylene) liners. Filling of the salt cell took place during July and August 2014, the dry season, in order to keep the salts as dry as possible before capping took place.

The filled salt cell was sloped according the design drawing requirements after which it was covered with 2 x 150 mm clay layers compacted, 1.5 mm HDPE liner and 200 mm of topsoil that will be hydro seeded with indigenous grass in November 2014.

The salt originates from the evaporizer crystallizer at the Main Treatment Plant (MTP) and from the Desalination Plant. The salts are generated when brine water from the reverse osmosis RO plant is evaporated and salt is crystallized.

Salt Cell after earth moving work and shaping has been completed

2 x Cuspate geosynthetic drainage layers followed by 3 x 1.5 mm HDPE (High Density Polyethylene) liners being installed

Salt being deposited into the lined Salt Cell

Filled Salt Cell covered with 2 x 150 mm clay layers compacted (beneath the black liner) and 1.5 mm HDPE liner

Salt Cell being covered with 200 mm top soil for hydro seeding purposes

Salt Cell covered with top soil awaiting hydro-seeding

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Vanderbijlpark Works - Open area rehabilitation - fugitive dust reduction

ArcelorMittal

Dust suppression trials

ArcelorMittal South Africa, Vanderbijlpark Works is committed to reducing fugitive emissions and therefore has invited companies specialising in dust suppression to conduct trials on open roads within the works. The purpose behind the trials was to evaluate the performance of the applied products and to arrive at conclusions regarding the best possible dust suppression product and impacts that these products can have on the surrounding environment.

For dust suppression on unpaved roads suppressant products used include lignin sulfonate and calcium and magnesium chloride types.

4 Different companies have conducted dust suppression trials on the site. All of the trials were conducted on gravel roads.


Product being applied to the road


View of applied product


Road directly after product application


Final view of the road

Trial 1

Conducted on a section of the M 6 weighbridge road located in the south-east section of the works. The product used was a formula of blended emulsified co-polymers and ionic modifiers (An emulsion is usually a mixture of two products such as oil and water that do not mix together).

The advantage of this product is that it binds finer soil particles of the unpaved road, thereby reducing the load of vehicle/wind entrained dust. The disadvantage of using this product is the cost associated with road preparation prior to application.


Spryer system used to spray product onto the road


Trial road directly after product application


Light vehicle passing over road


Close up of the trial road and applied product

Trial 2

Conducted on a section of the west bank road leading to the waste tip stations. The product used to supress the dust was a Calcium chloride, $CaCl_2$, this is a salt of calcium and chlorine. The advantage of using a product based on $CaCl_2$ is that it attracts moisture from the air, keeping the road damp even under hot, dry conditions.

The negative of utilising Calcium and chlorine is that the leachate generated by adding these products to the soil (road) results in runoff that has a very high concentration of Calcium and Chloride (Cl^-).


Spryer system used to spray product onto the road


Trial road directly after product application


Clear distinction between treated and untreated section of roads


Clear crust formation after product application (blue outline)

Trial 3

Conducted on a section of the road passing the pool pits in the eastern side of the works. The product used for this trial was a Lignosulfonate. Lignosulfonate are derived from lignin, a naturally occurring polymer found in wood that acts like glue holding the cellulose fibers of pulp together. Advantages of using this product is that its non-corrosive and non-toxic and Lignin Sulfonate treatments tend to be more effective than Chlorides on gravel roads containing higher levels of sand.

Laboratory leachate test results found a high electrical conductivity (EC), Calcium (Ca) and Sodium (Na) concentrations this will have a negative influence on storm water quality at ArcelorMittal.


Side view of mould


Top view of mould

Trial 4

Basic Oxygen Furnace (BOF) slag was mixed with an additive that to create a cement like compound that can be used as a road building mixture.

The advantage of this trial was that BOF slag, a waste stream, is utilised as an aggregate to create the mixture resulting in the waste being reused instead of disposal. This contributes towards less waste being disposed of internally extending the life span of the waste disposal facility and reducing the burden of waste on the natural environment.

Currently laboratory tests are underway to determine the effectiveness of this product and to identify any possible impacts that may occur as a direct result of using the product.

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Vanderbijlpark Works - How things degrade

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How long does it take to decompose?

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Vanderbijlpark Works - Wetlands and Alternative energy

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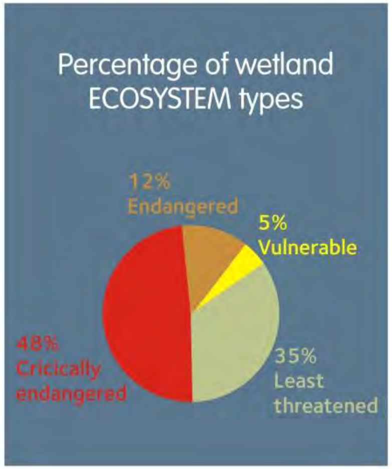
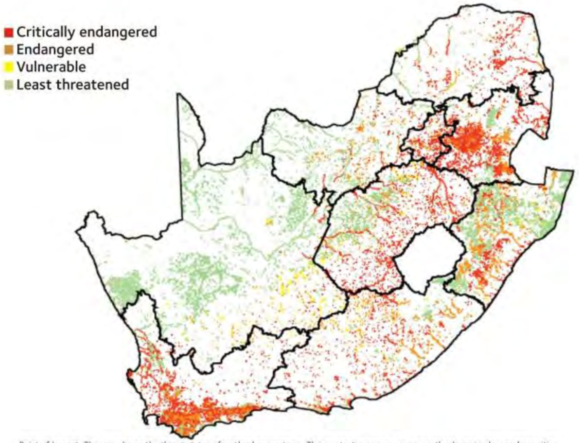
Wetlands

What are Wetlands?
Wetlands form a fundamental part of any nation's water resources and are vital to the health of waterways and communities downstream. Wetlands include swamps (vlei's), marshes and bogs. Wetlands vary widely because of differences in soils, topography, climate, hydrology, water chemistry and vegetation to mention just a few variables.

Wetlands feed downstream water sources; they trap floodwaters, recharge groundwater supplies, and provide fish and wildlife habitats.

South Africa's wetlands are severely under-protected. Very few wetland ecosystem types, just over 10% in all, are adequately represented within South Africa's formally protected areas such as National Parks and Nature Reserves; meanwhile 70% are unprotected. Wetlands are protected by legislation such as the National Water Act, the Conservation of Agricultural Resources Act and the National Environmental Management Act. The best legislation in the world is meaning less with implementation and us as South African citizens taking responsibility in protecting and conserving our and future generations natural capital.





Point of Impact: Ths map shows the threat status of wetland ecosystems. The greatest pressures on our wetlands are in placec where cities, cultivated farmlands and mining are most widespread.

Alternative energy/Renewable energy

Renewable energy is a clean energy source which can be regenerated for an indefinite period of time. Eventually fossil fuels (like coal, oil and gas) will become depleted or be uneconomically to access. Most renewable energy sources are clean sources of energy in the sense that they don't emit any greenhouse gasses.

Examples of renewable energy sources:
- Solar energy (Both heating and electricity generation)
- Wind energy
- Hydro power
- Biogas and biofuel
- Geothermal energy sources

Advantages of renewable energy:
- Potentially unlimited supplies
- Clean energy without production of greenhouse gasses
- Cost of generating electricity besides initial investments is low

Disadvantages of renewable energy
- Intermitted supplies (i.e. solar power only works during the day)
- Storage cost for renewable energy can be high (e.g. batteries to store solar energy for night time usages)

Renewable energy from wind power

Renewable energy from the sun

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Vanderbijlpark Works -
Understanding greenhouse gases and carbon tax

ArcelorMittal

Understanstang gases

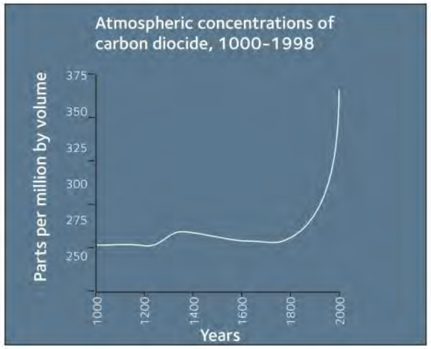
Planet Earth is warm enough to sustain life thanks to gases in the planet's atmosphere that hold heat. These gases are called greenhouse gases because they act just like a greenhouse - trapping the heat inside the planet's atmosphere, making the average temperature on Earth 15 degrees Celsius. Humans have increased the amount of greenhouse gases in the atmosphere by about 35 percent. The more greenhouse gases in the atmosphere, the warmer the average temperature gets.

The main greenhouse gases

The two major greenhouse gases both occur naturally and can be increased due to human activity.

- Carbon dioxide (CO_2): Responsible for 63 percent of global warming over time, and 91 percent in the last 5 years, this gas is produced from burning fossil fuels, such as coal and oil.
  It also occurs naturally as it flows in a cycle between oceans, soil, plants and animals.

- Methane (CH_4): Responsible for 19 percent of global warming, this gas is produced by rotting garbage and wastewater, gas from livestock, and rice crops. Swamps and anything that decomposes without air naturally creates methane.



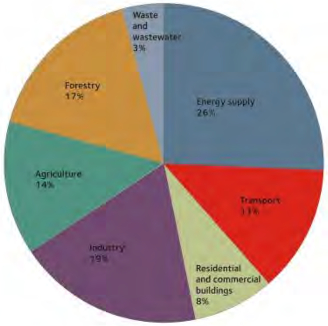
Two main sources of greenhouse gases

- **Energy use:**

  Humans derive energy from burning fossil fuels, which releases almost three quarters of all human-produced greenhouse gases into the atmosphere. Half of all fossil fuels are burned to provide electricity and heat; the next big users of fossil fuels are manufacturing and transportation.

- **Land use:**

  How humans remove forests and use land contributes over one quarter of all human-produced greenhouse gases to the atmosphere. Trees absorb carbon dioxide from the atmosphere, so logging and clearing forest land for agriculture and development means more carbon dioxide stays in the air.



Carbon Tax

Carbon tax is a form of pollution tax. The government sets a price per ton on carbon, then translates it into a tax on electricity, natural gas or oil. Because the tax makes using dirty fuels more¬ expensive, it encourages utilities, businesses and individuals to reduce consumption and increase energy efficiency. Carbon tax also makes alternative energy more cost-competitive with cheaper, polluting fuels like coal, natural gas and oil.

For the last decades climate change has been a global concern attributed to the Green House Gas emissions. In an attempt to minimize and stabilize those emissions, the United Nations Framework Convention on Climate Change (UNFCCC) was implemented. In parallel, the Kyoto Protocol has classified countries by their level of industrialization and committed certain countries to GHG emission-reduction targets to combat the problem worldwide.

South Africa, a non-annex 1 developing country, being part of the top 20 countries measured by absolute carbon dioxide (CO_2) emissions, has voluntarily in 2009 announced that it would act to reduce domestic GHG emissions by 34 per cent by 2020 and 42 per cent by 2025.

In South Africa a Carbon Tax is expected to be implemented in 2016 as a measure to mitigate GHG emissions.

- ArcelorMittal Vanderbijlpark: R 229 million

- ArcelorMittalSouth Africa: R 523 million

The proposed carbon tax poses a significant financial risk to the company. Iron and Steel producers are faced with the problem that a carbon tax will not change the industry's behaviour as no alternative low carbon technologies exist at this stage to produce iron and steel.

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Vanderbijlpark Works - Rehabilitation

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Enviro poster 22

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