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ArcelorMittal South Africa Limited
Air Quality Management

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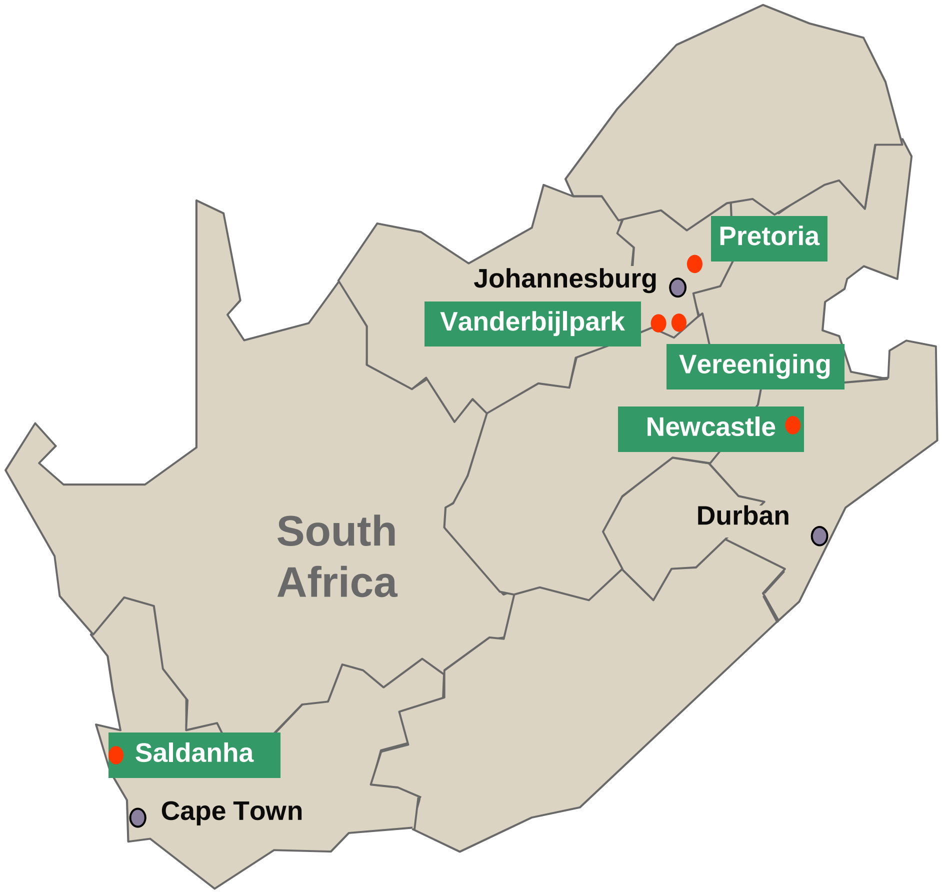
ArcelorMittal South Africa

Overview of Operations

- Flat Steel Products
    - Vanderbijlpark Works – 3.2 Mtpa*
    - Saldanha Works – 1.25 Mtpa*
- Long Steel Products
    - Newcastle Works – 1.9 Mtpa*
    - Vereeniging Works – 0.4 Mtpa*
- Coke & Chemicals
    - Coke - 597 000 tpa*
    - Tar - 133 000 tpa*

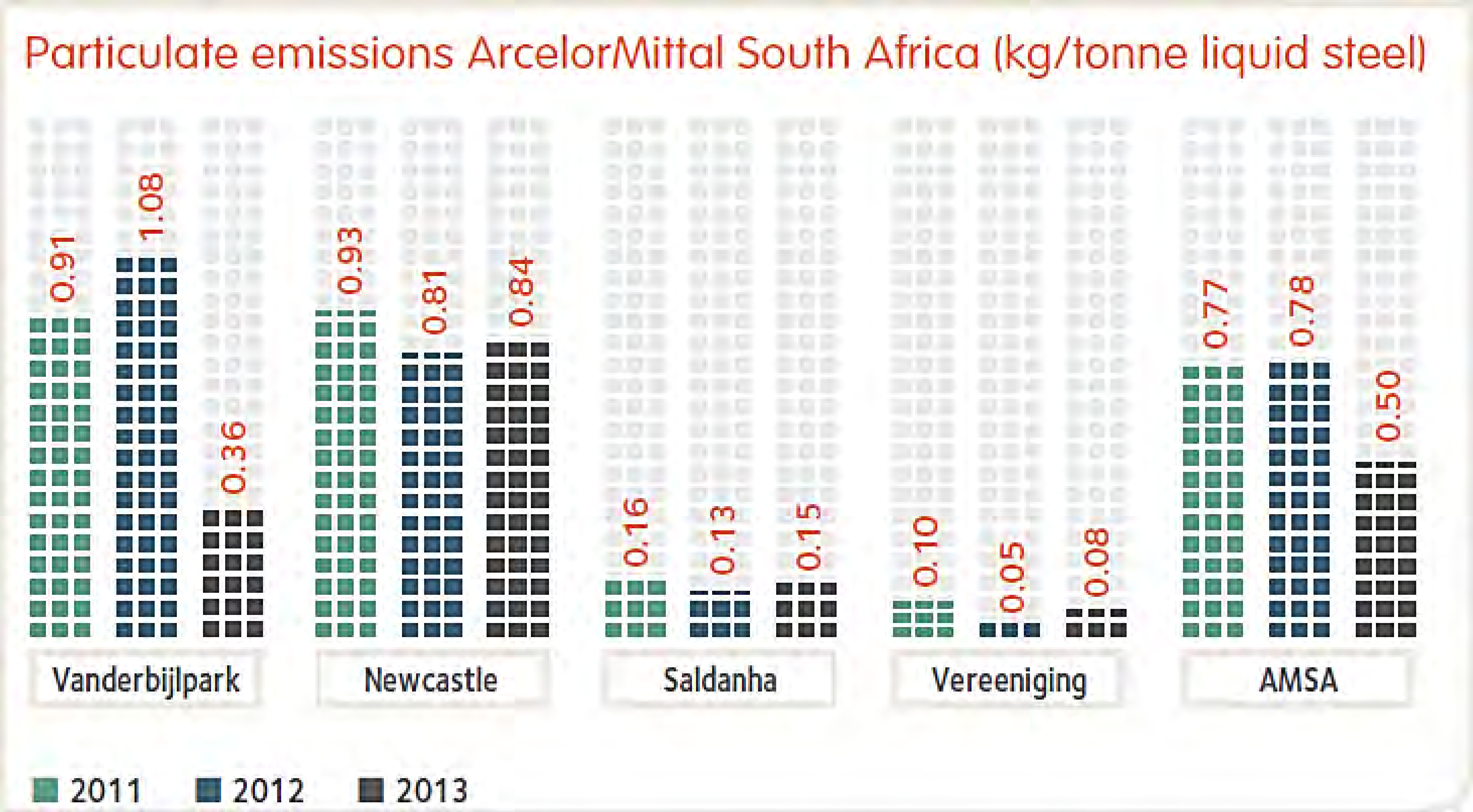


Steel plants in close proximity of key markets

Current Status

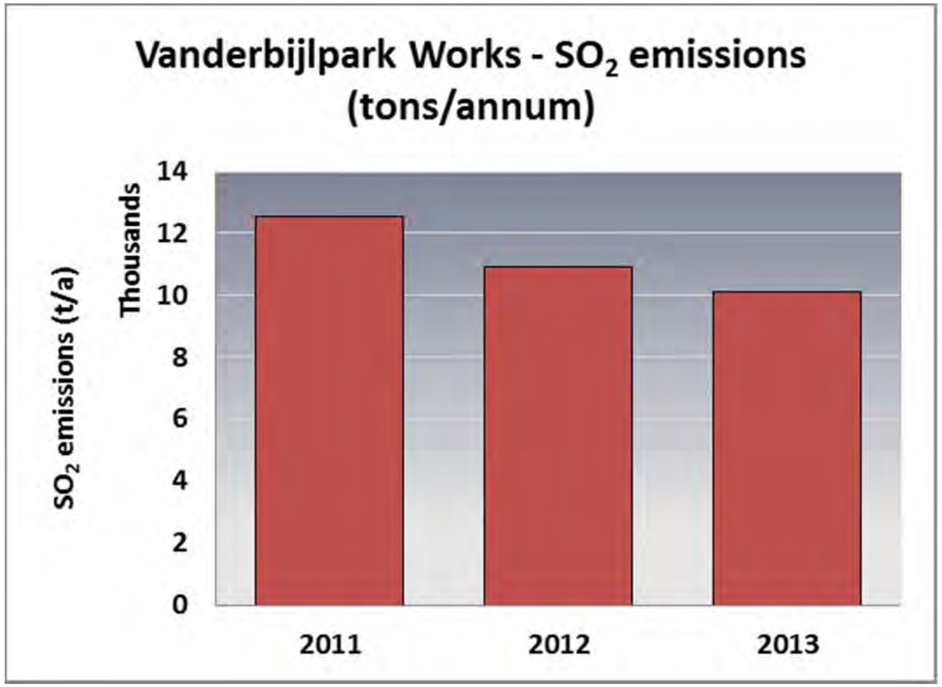
- Two facilities located in VTAPA of which Vanderbijlpark is the most challenging
- No postponement applications submitted to date, but there are challenges regarding 2020 standards
- Three production facilities at Vanderbijlpark taken out of operation due to compliance challenges and tight economic situation constrained their replacement
- Vereeniging plant has no Air Quality related compliance concerns
- Biggest challenge currently relates to fugitive emissions
- AMSA's VTAPA strategy successfully implemented to date.
- Tangible improvement achieved by various projects, large and small

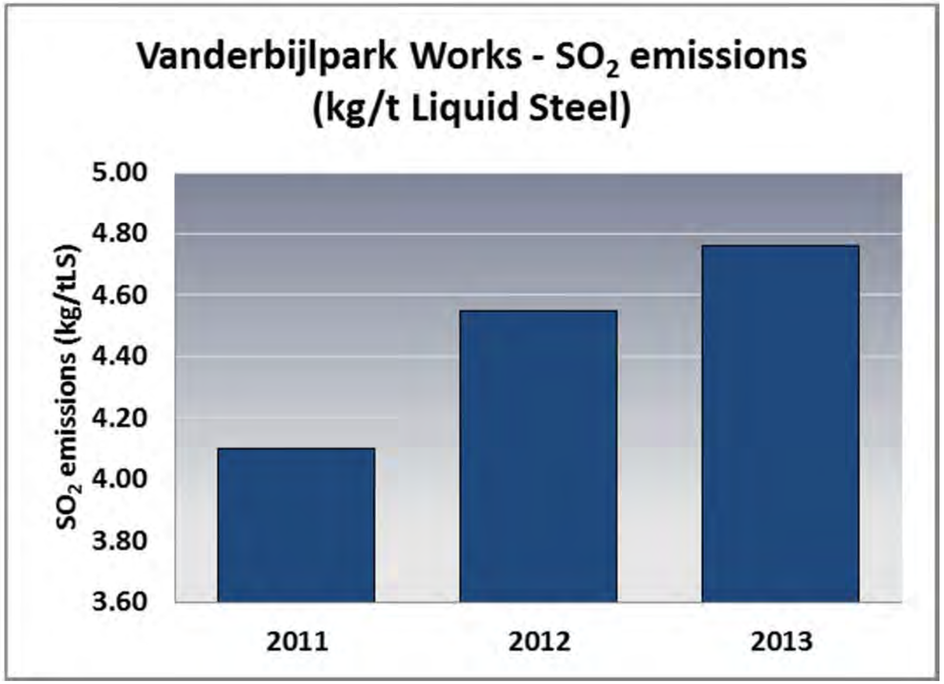
AMSA Particulate emissions from point sources (kg/tonne LS)



Vanderbijlpark Works SO_2 emissions

In absolute terms and in kg per ton of Liquid Steel





Specific emissions increased due to:

- Increased S-content in raw materials
- Changes in process configuration

Vanderbijlpark Works

VAAL TRIANGLE AIRSHED PRIORITY AREA

EMISSION REDUCTION STRATEGY AND INTERVENTIONS

PROJECTS IMPLEMENTED	PROJECTS OUTSTANDING	COMENCEMENT DATE	PROGRESS UP TO DATE	EMISSION STATUS Reductions Achieved: EMISSION STATUS BEFORE INTERVENTIONS	EMISSION STATUS Reductions Achieved: REDUCTION ACHIEVED	CHALLENGES	INTERVENTIONS TO ADDRESS CHALLENGES
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.	None	2007	Completed	Fugitive particulate emission	300 tpa	Installation of BAT technology onto existing old non-compatible plants	Some adjustments and modifications had to be done on site to ensure effectiveness of the BAT
Dust suppression at waste transfer station (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	None	A & B Tip station completed in 2005 Upgrade of B Tip station completed in 2013	Completed	Fugitive particulate emission	44.08t/a	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 m³/h. Thus will capture fumes and dust currently escaping through the openings in the roof. This project was not implemented and the EAF plant is out of operation.			Plant closure 2012	Fugitive particulate emission	646t/a	Capital constraints	Plant switched off

VAAL TRIANGLE AIRSHED PRIORITY AREA

EMISSION REDUCTION STRATEGY AND INTERVENTIONS

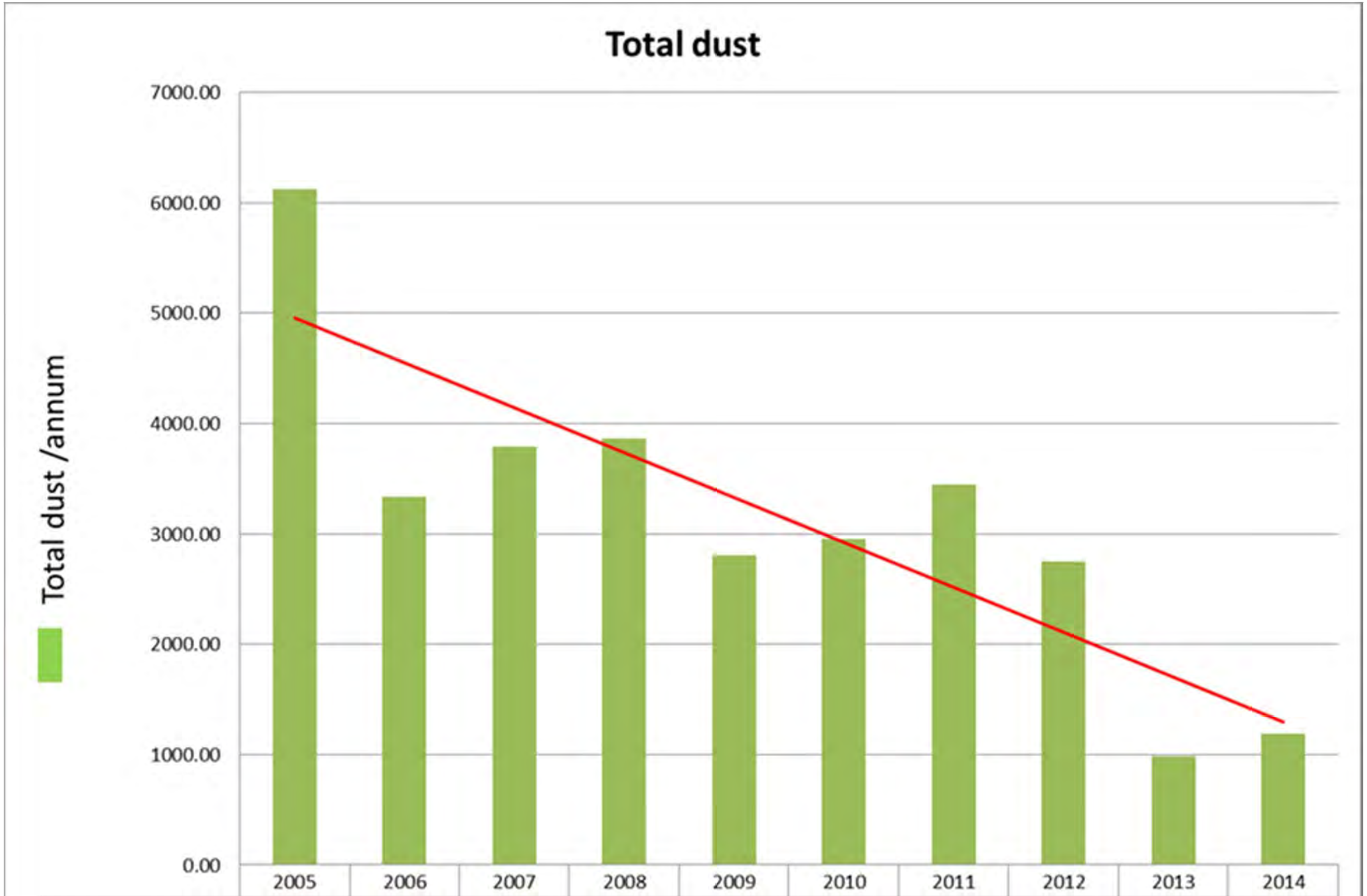
Replacement of old Coke Batteries - Batteries 4, 8 and 9 will be operational until 2030 including certain upgrades and envisaged construction of one new battery for 2020.		2020	Long term planning	Fugitive particulate emission	Fugitive particulate emission reduction expected to be 772 tpa	Associated finances	Short term interventions – extensive ceramic welding, battery tightening project and automated exhausters (busy with implementation) Battery 1 & 3 has been shut down
Stoppage of dosing with spent pickling liquor at the Sinter plant		2006	Completed	Point Source particulate emission	2782 t/a	None	None
Coke Oven Gas (COG) & Water Cleaning Plant Project - The technology was outdated and the COG & water cleaning project was initiated in 2003 to upgrade the system and reduce SO_2, NH_3 and HCN emissions.		2010	Completed	Point source SO_2, NH_3 and HCN	SO_2 emission reduction = 494 tpa	Operational challenges	Increase maintenance, investigate new solutions, get external technical expertise, technical modifications to design
Direct Reduction (kilns) Electrostatic Precipitator (ESP) rebuild, and replaced the refractory linings that will improve the performance of the ESPs at the Direct Reduction kilns		2008	Problematic kilns were rebuilt – improved maintenance	Point Source particulate emission	301t/a	Capital constraints	Modifications on kilns done in phases- kilns 2&4 and upgrade on kiln 3.
Sinter Clean Gas Unit - Installation of emission abatement technology (bag filter system) to reduce particulate and SO_2 emissions from the entire Sinter Plant.		2012	completed	PM, SO_2	PM = 1 379 t/a SO2 = 743 t/a	Installation of environmental BAT technology onto existing old Sinter plant	Some adjustments and modifications had to be done onsite to ensure effectiveness of the BAT

VAAL TRIANGLE AIRSHED PRIORITY AREA

ADDITIONAL EMISSION REDUCTION INTERVENTIONS

Additional emission reduction interventions not committed to VTAPA AQMP:							
• Vegetation of open areas – 400 ha	Completed	2014	Completed	Fugitive PM	PM – 23 t/a		
• Removal of historical ramp at metal recovery plant – Reduction of fugitive emissions	Completed	2013	Completed	Fugitive PM	PM – 0.16 t/a		
• Installation of new baghouse at Blast furnace D stock house - Reduction of fugitive emissions at BF raw materials handing	Completed	2014	Completed	Fugitive PM	To be assessed		
• Installation of new BAT bagfilters at Blast furnace PCI plant – installed best available technology bag filters to reduce dust emissions	Completed	2014	Completed	Point source PM	PM – 0.74 t/a		
• Installation of new bagfilter at Foundry - installed best available technology bag filters to reduce dust emissions	Completed	2012	Completed	Fugitive PM	PM – 50.6		
• Emissions from Raw material stockpiles mitigation measures - application of dust suppressants to reduce windblown dust	Completed	2013	Completed	Fugitive PM	PM – 1 t/a		
• Upgrade lancing booth - reduction of fugitive emission from the lancing activities	Completed	2012	Completed	Fugitive PM	PM – 1 t/a		

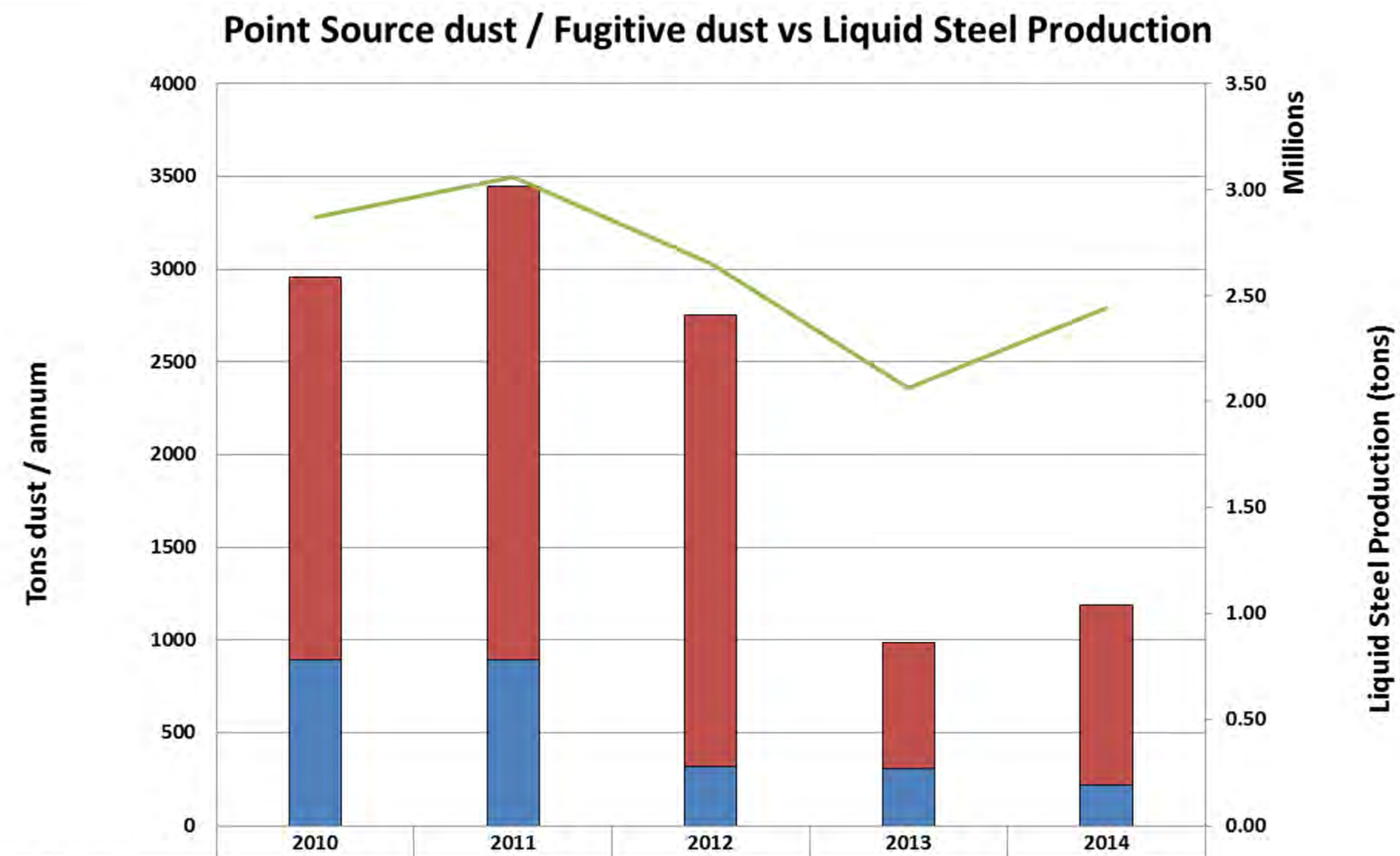
Vanderbijlpark Works
Dust emission reduction



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total Dust Per Annum	6120.86	3338.60	3793.18	3869.06	2804.51	2953.88	3446.64	2751.06	986.85	1187.19

Vanderbijlpark Works

Point Source/Fugitive emissions vs Liquid Steel Production



	2010	2011	2012	2013	2014
Total Dust - Point Source	2062.53	2557.35	2432.08	677.44	967.92
Total Dust - Fugitive Dust	891.35	889.28	318.98	309.41	219.27
Liquid Steel Production	2869037.00	3059802.00	2650627.83	2063395	2439584

Sinter Baghouse at AM Vanderbijlpark Works

Installation completed in 2012 at a cost of R260 million.

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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 R 87.7m

Designed and printed at Repro, Vanderbijlpark Works, Tel. 016 889 2944

Rehabilitation of Old waste disposal site

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Tip Station upgrade - sprays

Vanderbijlpark Works - Open area rehabilitation - fugitive dust reduction

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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.

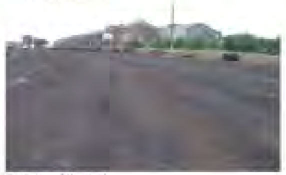
For dust suppression on unpaved roads suppressant products used include lignin sulfonate and calcium and magnesium chloride types.

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



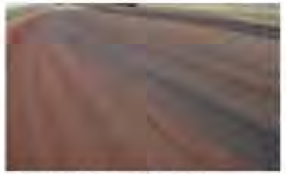
Final view of the road

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.

Sprayer 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-).

Sprayer 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.

Designed and printed at Repro, Vanderbijlpark Works, Tel 016 889 2544

Vanderbijlpark Works - Open area rehabilitation - fugitive dust reduction

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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

Before

Before

Before

Before

After

After

After

After

After

Rehabilitation in progress

Dust Extraction System at Vereeniging Works

Before (March 2007)

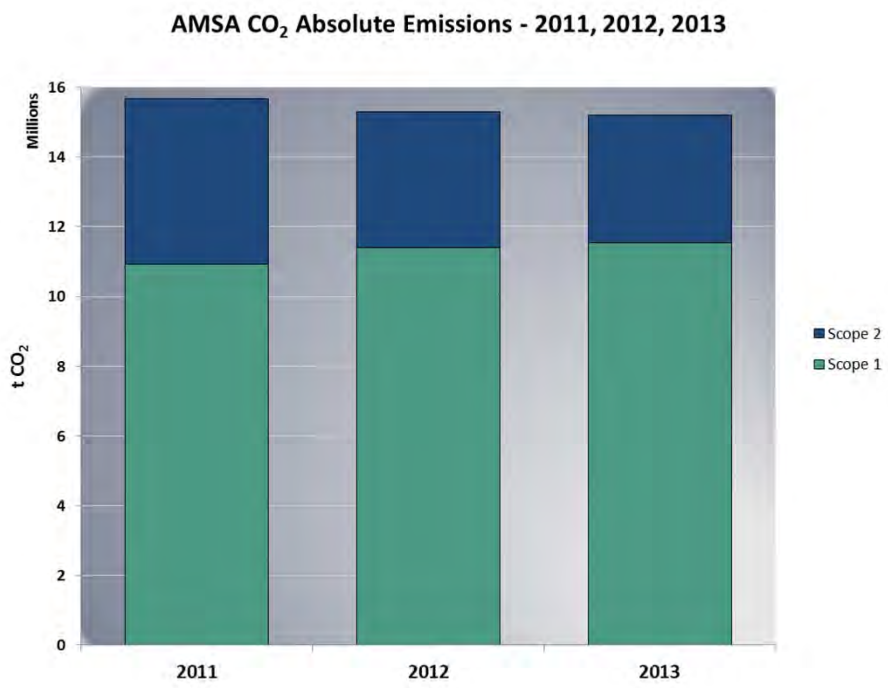
After (January 2010)

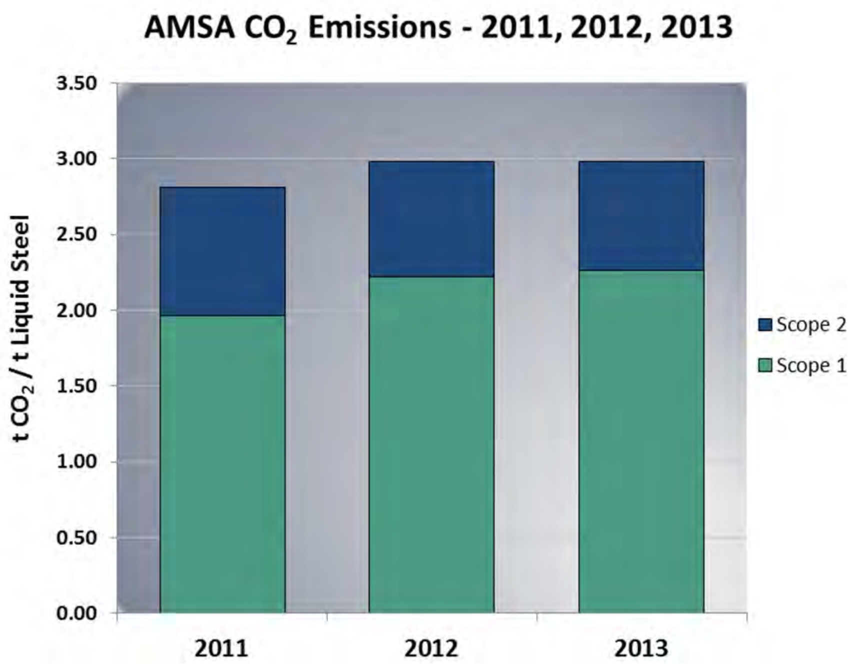
Completed in 2010 at a cost of R 230M

Newcastle Works

Saldanha Works

AMSA CO_2 emissions
In absolute terms and in t CO_2 / t Liquid Steel





Questions?

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