

Introduction to ArcelorMittal South Africa Vanderbijlpark Works

1. History

ArcelorMittal Vanderbijlpark Works is one of the world's largest inland steelworks. The increasing demand for steel during the late 1930's and the early years of the Second World War as well as the limited opportunity to expand the Iscor Pretoria Works, promoted the then state corporation to look for a suitable site for a second steelworks.

Four main factors influenced the decision to establish the new Works on the banks of the Vaal River – ample space, the availability of sufficient water and electricity supplies as well as its proximity to the then-developing heavy industrial area in and around Vereeniging. Iscor acquired a site of 97 square kilometres (9 700 ha) for the erection of its second steelworks some 70 kilometres south of Johannesburg.

By 1943, a plate mill was commissioned which produced heavy plate for ship repairs and the manufacture of armoured cars for South Africa's war effort.

The years 1947 to 1952 saw Vanderbijlpark Steel developing into a fully-fledged integrated steelworks processing iron ore and other raw materials from mines throughout Southern Africa into hot-rolled, cold-rolled, galvanised and tinned sheets and coils to meet South Africa's high demand for quality flat steel products. During these years, the Works production capacity was 360 000 tons of finished products per annum.

The second extension phase was from 1964 to 1968 when large extensions were added; older plants modernised to supply higher quality and value-added products such as electrolytic tinplate for the canning and beverage industries.

The period 1973 to 1977 was the largest expansion period for the Works. Iron making facilities were extended and the steel making processes modernised by the commissioning of basic oxygen furnaces and electric arc furnaces. A colour coating line was established at the South Works and a whole new works – the North Works – was established to manufacture wide hot-rolled, cold-rolled and galvanised products.

The focus of the 1980's was on capital expenditure aimed at increasing productivity and quality improvements. Increased continuous casting capacity and the addition of a continuous annealing facility were but two of the improvements brought about. The addition of a chrome coating line (TFS) and an electrolytic galvanising line in the early 1990's increased the range of value added products considerably.

The briquetting of coal partially alleviated the poor quality of available coking coal and the direct reduction of iron ore has made the Works less dependent on scrap iron and steel for use in the furnaces.

In 1989, the then South African government announced the privatisation of Iscor into a company listed on the Johannesburg Securities Exchange South Africa. Iscor Limited was listed on the JSE in November of that year.

Product and plant rationalisation and the total re-engineering of the Works continued during the 1990's and into the 21st century. The continued demand from local and world markets for more competitive steel products pressurised not only Iscor but the whole South African steel industry to contain costs, increase productivity and become truly world competitive in order to survive as a viable business.

2. Processes

2.1 Brief description of processes

Iron Making

The Iron Making Department consists of a raw material handling area, sinter plant and two blast furnaces. Raw materials such as iron ore, sinter coke and dolomite are charged into the blast furnaces where it is converted to liquid iron.

Vanderbijlpark Works has two blast furnaces in operation with a combined capacity of 240 000 tonnes of liquid iron monthly.

Direct Reduction

The Direct Reduction Plant is coal based and has six rotary kilns currently capable of producing 900 000t of direct reduction iron, or DRI. The main consumer of this product is the Electric Arc Furnaces.

Coke Making

The Coke Making Department produces coke from the carbonization of high grade coking coal. The coke is a raw material for use at the Blast Furnaces. The Coke Making Department consists of 6 coke batteries and there are a total of 334 ovens in the 6 batteries. The plant has the capacity to produce 1.4m tons of Coke per annum. The gas generated from the carbonization of coal is used in internal heating processes at Vanderbijlpark - mainly at the Hot Strip Mill and the Plate mill. Commercial grade coke can also be produced when there is spare capacity available.

Steel Making

The Steel Making department consist of an Oxygen Steel Making route, a Direct Reduction Unit and an Electric Steel Making route.

The premier steel making facility at Vanderbijlpark Works is the Oxygen Steel Making facility which consists of three 170 t basic oxygen furnaces (or BOF's), two ladle furnaces and a Ruhrsthal Heraeus or RH degasser in line with two twin strand slab casters.

The plant has a capacity of approximately 3 million tons liquid steel and produces various grades for Automotive, Plate, Tin as well as Draw and Wall Ironing or DWI, applications.

The Electric Steel Making route consists of three 155t eccentric bottom tapping Electric Arc Furnaces, two Ladle Furnaces, a Vacuum Arc Degasser (VAD) and twin strand slab caster. Current capacity of the plant is around 1.3 million tons liquid steel and produces mainly Plate Mill, Pipe and Galvanised applications.

Rolling

Slabs are hot rolled into heavy plate in the plate mill, or into coils in the hot strip mill. The coils are either sold as hot rolled strip or processed further into cold rolled and coated products, such as hot dip galvanised, electro-galvanised and pre-painted sheet, and tinplate.

Hot Strip Mill

Hot rolled coils ranging between 1.5mm to 23mm in thickness and widths of 750 to 1850mm through four furnaces, a 2-stand roughing mill, a 7-stand finishing mill and three coilers.

Slabs are reheated to approximately 1250 °C depending on product, reduced in the roughing mill from 240mm to the required transfer bar thickness of between 30 and 42mm. The transfer bar is then processed through the finishing stands and coiled.

Plate Mill Route

Slabs are reheated in the plate mill furnaces and rolled into plates ranging between 5mm to 100mm in thickness and widths of up to 3500mm in different lengths. The plates cool down on the cooling beds before it goes through the different cutting units. Special grade plates get treated at the Plate Treatment Plant to achieve improved steel properties and wear resistance.

Cold Rolling

Hot rolled strip from the Hot Strip Mill is received at Continuous Pickling lines where scale is removed using Hydrochloric Acid. Coils are then sold in the pickled and oiled condition or sent for further processing at the 5- Stand Tandem Cold Mill. The material can then be processed further via two routes. The first route is through Batch Annealing, Temper Mill and Electro-galvanising Line where electro-galvanised material is produced for the automotive industry.

The second route is through the Continuous Annealing Line and a Hot Dip Galvanising Line where galvanised material is produced for dispatch or further processing at the Paint Line.

Tinning Line

Cold rolled coil is firstly annealed and then tempered to get the desired surface and metallurgical properties for the tinning process where the base metal is electrolytic alloy coated with tin for the food and beverage industries.

Galvanising Line

Cold rolled coil is heated in a reducing furnace and then coated with molten zinc using a hot dip process. The thickness of the coating is determined by air force applied on the strip. It can also be tempered and further processed through the Colour Line.

Colour Coating Line

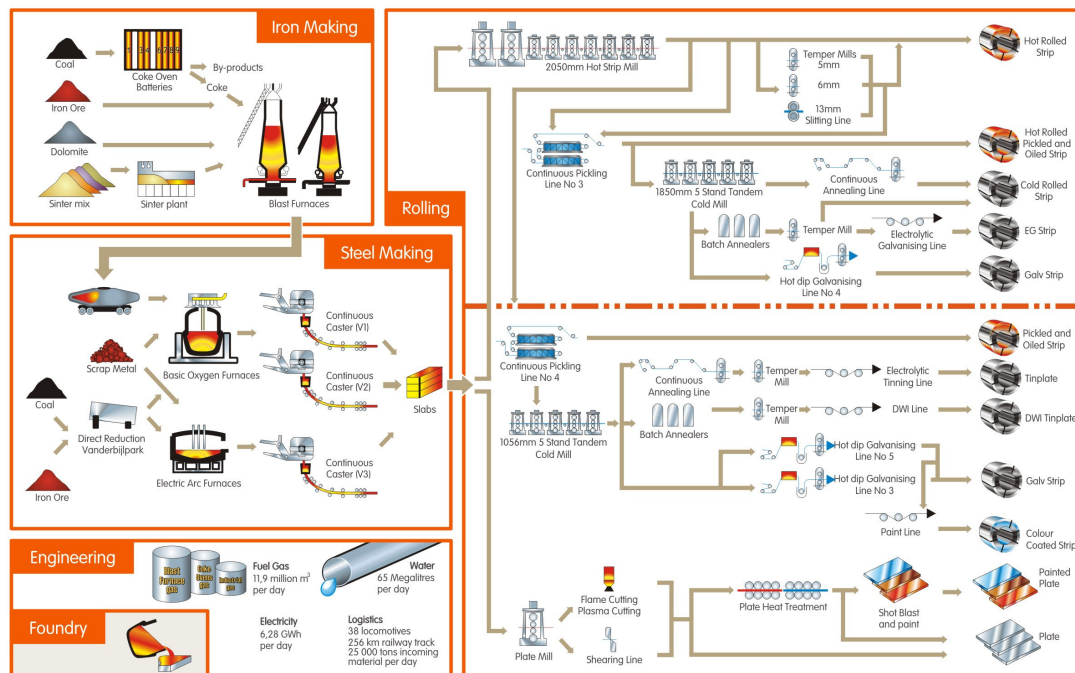
Galvanised coils are painted different colours for different end uses such as the appliance and construction industries.

Process Flow Chart

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Vanderbijlpark Works: Process Configuration

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General information about Vanderbijlpark

Vanderbijlpark is an industrial city next to the Vaal River. The towns of Vanderbijlpark, Vereeniging and Sasolburg lie in a triangle on the map and are commonly referred to as “the Vaal Triangle” - a major industrial region of South Africa. Vanderbijlpark is located in the district municipality of Sedibeng (which incorporates the local municipalities of Emfuleni, Midvaal and Lesedi). Since 1999, Vanderbijlpark has been part of the Emfuleni Local Municipality, along with Vereeniging and Three Rivers. The black townships Boipatong, Bophelong, Sebokeng and Sharpeville are close to the city.

Vanderbijlpark's 500 000 trees shade streets named after scientists, engineers, composers, poets, writers and medical practitioners. They house one of the most cosmopolitan communities in the country.

Vanderbijlpark started when Dr HJ van der Bijl, a brilliant young scientist working in the United States at the time, was called back to South Africa in 1920 by the then Prime Minister Jan Smuts to advise the government on planning South Africa's industrial development. Van der Bijl oversaw the Iron and Steel Corporation's first plant at Pretoria, but with the increased demand after World War II, 100 km² was bought to build a large steel works and model town. The steel works began operating in 1947 and the town was proclaimed in 1949. The town attained municipal status in 1952.