

Converters for Ambatovy Nickel on the High Seas

Bateman Engineering's portion of DMSA's Ambatovy Nickel Project, the engineering and procurement of the sulphuric acid facilities section in Tamatave, Madagascar, reached an important milestone with the shipping of the first of the two converters from the South African port of Durban to Tamatave in mid December 2008 – followed some 10 days later by the second converter.



The converter aboard the MV Fairlane at Madagascar's Tamatave port.



The two converters, each weighing 395 t, individually have a shipping envelope of 17.8 m by 15.5 m by 24.6 m in height – the equivalent of an eight storey building.

The project philosophy was to follow a piece-large shipping strategy, that is as far as possible all equipment was shipped to site as single units. This minimises site work requirements significantly. As a result of this philosophy, it was decided upfront to fabricate the converters on a private wharf for easy shipment. Furthermore, the converters were designed to be shipped in the vertical position. While it would have been possible to design them to be shipped horizontally, this would have caused a threefold increase in weight and subsequent cost impact, especially as

the converters are 100 % stainless steel vessels.

Fabrication of the two converters commenced in early 2008 at Metso ND Engineering's Bayhead facility in Durban, and was completed by December 2008. The fabrication required was in excess of 65,000 man-hours (completed injury free), occupying all of the available manpower at Metso ND Engineering's Bayhead works. In the process, ~10.5 t of flux core welding consumables, ~3.2 t of welding wire, ~2.0 t of welding electrodes as well as 2,000 litres of pickling solution were used.

Once completed, with Metso's fabrication facility located on Durban's dockside, the converters had to be moved only a few metres for loading

continued overleaf

Also in this issue

Converters for Ambatovy Nickel continued	2
Avebury Nickel Concentrator commissioned	8
FEED package for Karara Iron Ore	9
Gold processing plant refurbished for Sukari, Egypt	10
Appointments	11
BET expands its presence in North America	12

Converters for Ambatovy Nickel *continued*



onto the MV Fairlane from the Jumbo shipping line.

The ship arrived at Durban port on 17 December, 2008 and, once preparations for lifting were complete (which took about 12 hours), lifting of the converters took only about one hour. Prior to the arrival of the ship, however, a large amount of preparation was required, including mechanical dredging (by Subtech) of the sea bed. The bathymetry study had revealed this section of the harbour to be too shallow for the required 7.5 m draught of the loaded vessel.

The converters were fabricated approximately 6 m from the edge of the wharf – outside of the reach of the vessel’s cranes – and the completed converters were therefore lifted, rotated and moved closer to the edge in order for the lifting to be carried out.

The converter’s design incorporated a grillage beam system which allows for ventilation underneath the converter, as well as thermal expansion of the converter once it is operating at its design temperature of between 420 °C



Construction of the converters reaching completion at Metso ND Engineering. The scale of the converters can be clearly seen.



The Bateman Engineering designed stiffening beams and a plate girder that formed part of the lifting beams.



The converter being lifted onto the MV Fairlane.



The MV Fairlane with the converter standing upright on board sets sail for Madagascar.

The converter being lifted from the MV Fairlane onto the SPMT at the port of Tamatave.

and 620 °C. It was originally planned to lift the entire grillage beam assembly complete with the completed converter as a unit using 14 lifting points on the grillage beams. In practise, this turned out to be impractical and Bateman Engineering designed special lifting beams to effect the lift. The lifting beams comprised two plate girders (each 2.1 m high, 17 m long and weighing ~18 t each), two stiffening beams and four new lifting points. The new lifting gear was fabricated by MOCO Steel.

The MV Fairlane was stabilised in position ready for lifting the converters using two spacer barges between the dock and wharf as well as its own stabiliser. The converters were lifted onto the ship using the ship's two 400 t cranes.

Once the converter was secured to the deck of the MV Fairlane, five days were required to sail to the port of Tamatave. Here the converter was lifted from the ship directly onto a self propelled motorised trailer (SPMT) which, for this application, required individual trailers to be locked together to form one transport vehicle.

continued on page 6



Converters for Ambatovy Nickel *continued*



Overland voyage

Top: The SPMT transporting the converter leaves the port at Tamatave, Madagascar.

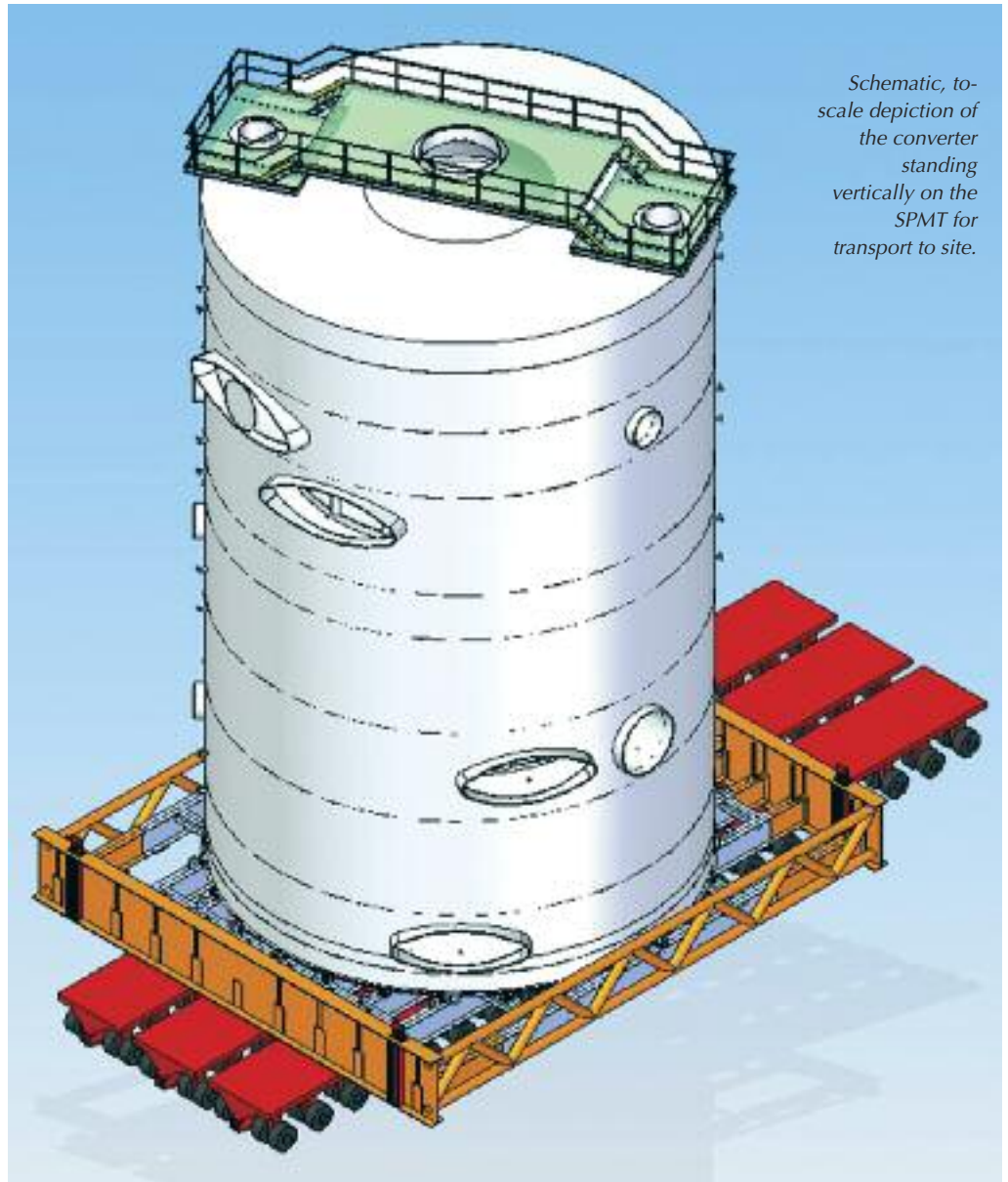
Above: An advantage of the SPMT is that its wheel heights can vary, thus keeping the load bed level on uneven surfaces.

Left: A converter being transported to site on the SPMT across one of the specially constructed bridges.



Below right: Other equipment also shipped piece-large included the acid towers, seen here en-route to port in China.

Below: Man-sized shackles for lifting the 395 t converter.



Schematic, to-scale depiction of the converter standing vertically on the SPMT for transport to site.



Converters for Ambatovy Nickel *continued*



A mobile 800 t crane at site lifted the converters from the SPMT into position onto the foundations.

The ALE SPMTs (free issued to Bateman Engineering by DMSA) are remote controlled by the operator and are ideal for the application as their load bed remains level with the wheel heights varying to accommodate any undulations in the road surface, thus keeping the load stable. Once again, the converters were transported in a vertical position on the SPMT.

With the SPMT's dimensions being 8.5 m wide and 16 m long, particular attention was required in terms of the

overhang of the converter, the base of which is 15.5 m by 17.5 m. The SPMT had previously been used to transport DMSA's autoclaves to site which, at 900 t, are more than twice the weight of a converter. However, they could be transported in a horizontal position and the physical dimensions are significantly less than that of the converters.

The distance covered to the site by the SPMT, accompanied by the

operator walking alongside, was 12 km, and the SPMT travelled between 3 km and 4 km per hour. Fortunately, the road to the site had been built at the outset of the project and Bateman Engineering was able to specify the width that would be required for transferring the converters. DMSA had also constructed and adequately-sized bridges where necessary.

As the SPMT occupied the full road width, road closures were organised with the Madagascan authorities. A mobile 800 t crane at site, provided and operated by SARENS and free issued to Bateman Engineering by DMSA, lifted the converters from the SPMT into position onto the foundations.

Despite tight clearances, the erection of the converters was achieved without mishap in under 10 hours (transport from port to site and lifting onto the foundations) and with perfect alignment.

The contract for the engineering and procurement phase of the project was awarded to Bateman Engineering in 2007 by Dynatec Madagascar SA (DMSA), and comprised the provision of a sulphur melting and filtration circuit with two separate stand alone 2,750 t/day sulphur burning sulphuric acid plants, thus providing 5,500 t/day of acid production capacity. The process engineering during this phase was undertaken in collaboration with the Canadian technology company Noram Engineering and Constructors Limited (Noram) and the Sinopec Nanjing Design Institute (SNDI) out of China. Noram are the holders of the acid plant process technology with whom Bateman Engineering has entered into a long term Technology Licence Agreement. SNDI provided the steam equipment for the project (superheaters and economisers).

The construction contract was subsequently awarded in August 2008, with construction and commissioning of the first acid plant due to be completed by the end of November 2009, and of the second acid plant by the end of January 2010.

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Above: The site ready for the converters.

Below: Converter No. 1 in place on site with No. 2 on its way. The mobile 800 t crane can be seen in the foreground.

