



COMPLETE DESIGN CHANGE UNDERWAY ON MASSIVE 28 MW SYNCHRONOUS MOTOR

Marthinusen & Coutts (M&C), a leading local repairer of rotating electrical equipment, completed a repair and design change on a 28 MW Jeumont Schneider synchronous motor operating at the Saldanha Steel plant on the Cape West Coast.

This motor incorporates an 18 ton stator which is 3 metre in diameter, making it one of the largest non-power generating stators ever to be repaired in South Africa — and at M&C.

M&C marketing executive Mike Chamberlain says Saldanha Steel was experiencing repeated failures on the exciter of the 28 MW Jeumont Schneider synchronous motor.

“This motor drives the primary compressor that feeds the entire plant,” he explains. “A motor failure would result in massive production losses, so there was a need to ascertain and address the root cause of the failures. Local companies had been called in to attend to previous breakdowns, but the ongoing failures made it apparent that the underlying cause had still not been identified.”

Since plant production at Saldanha Steel is of a continuous nature, a temporary spare motor was installed and the problematic motor was sent to M&C for root cause failure analysis.

“Before Saldanha Steel approached us for assistance, they had contacted the

OEM who told them the motor had to be sent to France for repair work,” Chamberlain says. “This exercise would have presented a major problem in terms of cost and lead time.

“M&C has an entirely different approach to dealing with issues like this. We believe that in order to conduct a comprehensive failure inspection, it is critical to examine a problematic motor in situ to garner crucial information about its operation and performance.”



To begin with, M&C conducted a heat rise test on the exciter to determine where the repair work should start. This not only identified where the problem lay, but will be used to substantiate the repair at M&C's facility prior to sending the motor back to the customer, ensuring that there is no risk to the production once the motor is recommissioned at the plant.

“The heat rise test indicated that there was a problem on the motor cooling circuit that had never been identified or addressed,” Chamberlain says. “Based on this, we recommended to the customer that the motor should be dismantled, as we needed to open it up to effectively address the problem.

“However, our advanced testing and assessment on the motor also identified a completely unrelated defect to the rotor damper cage. The welding used by the OEM to make the short circuit connection was severely cracked in more than 30% of the slots. This could have caused the damper cage to break, completely destroying the motor.

“During the assessment, our advanced testing on the stator winding also identified an inter-turn short. Owing to the critical nature of the machine driven by the motor, we proposed that the machine be rewound.

“Based on these findings, we recommended a complete design change, as the original method of manufacture would repeatedly result in similar problems, as there was no allowance for thermal expansion of the wedges.”

Ansaldo

Ansaldo Sistemi Industriali Spa – for whom M&C is the authorised repair centre in southern African — agreed to assist with the repair design, involving finite element analysis techniques. Chamberlain says Ansaldo has extensive experience with the manufacture of synchronous motors up to 50 MW, making for an ideal project partnership.

The combined input of M&C and Ansaldo resulted in an appropriate and suitable redesign that harnessed techniques used on large turbo-generator machines.

M&C's experience with repairing turbo-generating machines such as the Sasol 36 MW 2 pole oxygen compressor motors, created an excellent working platform. The redesign proposal was approved by Saldanha Steel and the project is currently underway.



“This type of extensive repair work requires the use of highly specialised materials and components and we are fortunate to have established solid relationships with international suppliers during other projects involving large motors and turbo-generators,” Chamberlain says.

The cracked welding on the rotor has already been machined off using a large lathe operating at M&C’s sister division, Metalplus, and chrome copper zirconium rings have been ordered from a supplier in Europe. M&C has also ordered 18/18 specialised steel external damperings.

M&C conducted design verification on the stator and, based on the massive size of the motor, proposed an advanced insulation system. The company then developed a rotate cure process specifically for this particular motor repair, to ensure maximum retention of the VPI resin during the curing process. The VPI process was completed successfully and M&C achieved excellent tan delta results substantiating good penetration and retention of the VPI resin, as well as integrity of the system.

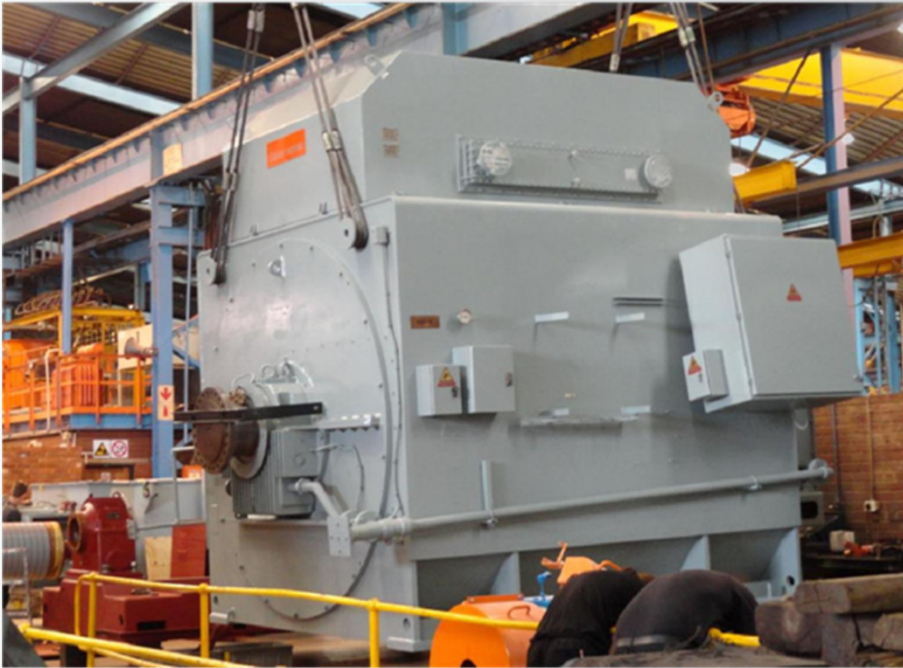
The rotor was balanced on M&C’s recently commissioned new multi-million Rand 32 ton Schenck HM U/S balancing machine at the company’s 9 500 m² state-of-the-art workshop in Cleveland, near Johannesburg. This is the only machine of its type and capacity in South Africa and the third largest high speed dynamic balancing machine in Sub-Saharan Africa.

The repair was completed and delivered to Saldanha Steel at the end of March 2012.



Marthinussen & Coutts

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The 28 MW Jeumont Schneider synchronous motor at M&C's Cleveland facility being loaded for delivery to Saldanha Steel



Extensive repair work was undertaken by M&C on a 28 MW synchronous motor for Saldanha Steel.

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