

Sohar Aluminium – The World’s Longest Smelter Potline Nears Completion

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Sohar Aluminium Company (SAC) in the Sultanates of Oman is the first aluminium smelter operating with 1,650 VDC – and with 360 pots, it is the longest potline in the world.

Construction of ABB’s rectifier station are now in full swing. Each of the five rectifier units can deliver 103 kA at 1,650 VDC in an ambient temperature of 55°C, making them world’s largest rectifier units ever built.

The substation for Sohar’s potline consists of five conversion units fed via 220 kV GIS switchgear. Two power lines then connect the smelter to a gas-combi-power plant located within the

Sohar harbour area. The power plant in turn is connected via two underground cables to the Sohar grid.

Sohar Aluminium Company (SAC) has set new records with the 360 AP35 pots and maximum 1,650 VDC operating voltage

Substation design

The use of gas-insulated switchgear is common practice for aluminium smelters due to a number of factors but reliability and availability are the most important.

Sohar Aluminium Company (SAC) has set new records with the 360 AP35 pots and maximum 1,650 VDC operating voltage. Higher current has until recently not been a problem but the voltages were limited by the availability of suitable fuses.

Going to these higher voltages, it was appropriate for ABB to conduct a fuse and semiconductor (diode) Type Test to ensure that the components installed at SAC would be fit for the intended purpose.

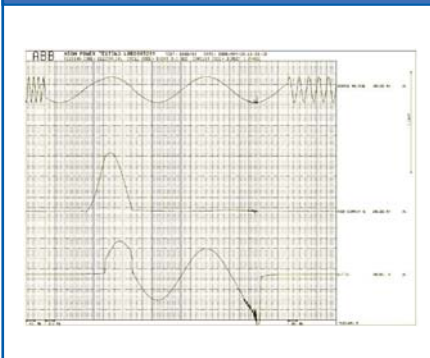
Transformer design review

As currents of 100 kA per single unit have already been used, the relays were

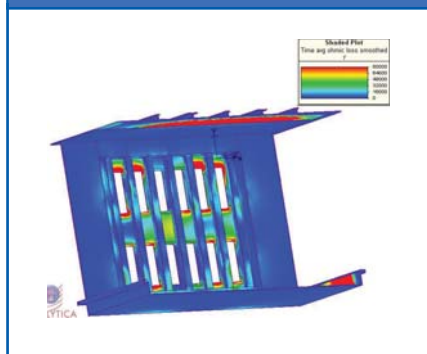
Fuse and diode Type testing



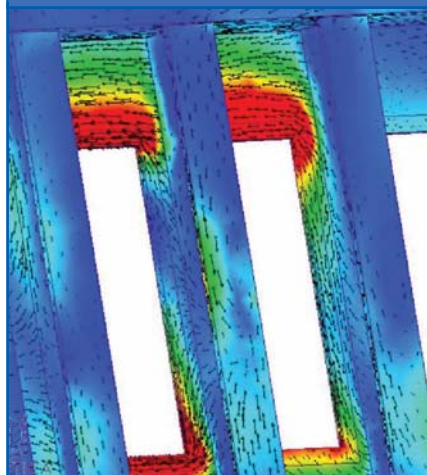
Fuse and diode test chart showing (top to bottom) reference voltage, fuse current, voltage on diode



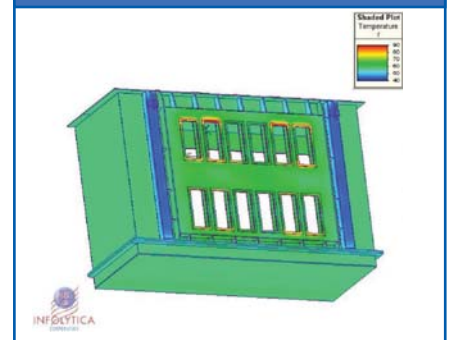
Eddy current simulation



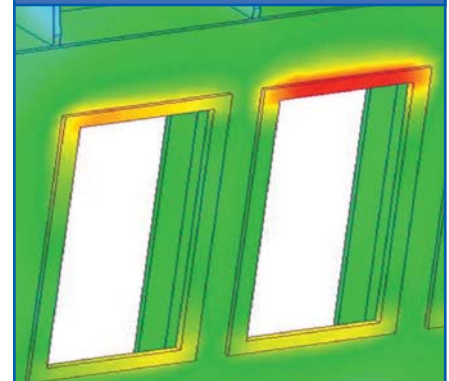
Eddy currents at LV bushing



Thermal map of tank



Thermal map of tank window bushing



Sohar control panel



not an issue for the rectifier but the transformer design needed to be carefully checked to ensure the high electro-magnetic fields, especially in respect of the tank wall heating, were not a problem.

ABB used special software to simulate and map the eddy currents within tank wall.

The Sohar control network can be said to have set an operational benchmark for future smelters

Enhanced controls

An enhanced control system was selected for Sohar's new rectifier station capable of combining all possible operational scenarios taking into consideration the 55°C ambient temperature.

The Sohar control network can be said to have set an operational benchmark for future smelters.

Transportation not an easy task

Having dealt with all technical issues, it was necessary to investigate and

Two ship cranes were required to offload the transformers at the port of Sohar



Going down the Rhein by barge



First bay construction at Sohar nearing completing in August 2007



Placing the rectifier



solve the problems presented in transporting such large units. Each stage in the route had to be checked to ensure that size no limitations would be encountered. The first leg of the journey to Sohar was by barge from Bad Honnef in Germany down the Rhein. After loading the units onto a ship equipped with its own heavy lifting gear, the transformer units sailed for the port of Sohar.

Construction at 55°C

Construction of the rectifier station at Sohar was undertaken by Bechtel International. Prior to commencing installation, detailed construction schedules were prepared and a method statement for each task worked out. With these programmes in place, construction was straightforward.

An open design was adopted at Sohar, so equipment has been given a coat of white protective paint to reflect the heat of the sun.

Summary

Sohar's smelter, the largest in the world, has set new industry standards. Larger smelters that will follow will benefit of Sohar's ground-breaking experience.

The Sohar is scheduled to start production in 2008. ■

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