



ferro ALLOYS

FURNACE ROOFS WITH COPPER CENTRE

In a South African first, leading smelting engineers Metix has taken delivery of the two furnace roofs with forged solid copper centre section panels that the company designed and commissioned for Heric Ferrochrome's F1 and F2 furnaces.

Metix technology equipment director Jacques Venter says: "The roofs are currently on site and will be erected over the next few weeks while the furnaces are down. The carbon steel outer panels were manufactured by a local supplier."

Venter says that traditional roof centre section designs involve a thick layer of refractory material. "This portion of the roof is usually made of stainless-steel; however, the material does tend to show fatigue quickly once the refractory lining is worn away. Copper; however, needs no refractory lining, even in this extreme environment. We expect a lifespan of at least ten years with copper, which is 25 times more heat-conductive than stainless steel."

Heric Ferrochrome, located 50 km outside of Johannesburg, produces 420 000 mt of ferrochrome annually. To facilitate the installation of the new furnace roofs, Heric Ferrochrome has already shutdown these two furnaces, which are scheduled to be completed in the second quarter of 2009.

"While a shutdown can ultimately be the most expensive part of any furnace operation, the copper section of the roof will result in a great reduction in downtime in the future," says Venter. "Typically, stainless-steel furnace roof centre sections encounter problems from the very first year of installation - especially if the furnace operations experience instabilities. What's more, they often need to be maintained and sometimes replaced. On typical applications, steel roofs aren't expected to last more than five years, and on a closed ferrochrome furnace, the process is significantly hotter than traditionally-anticipated on the larger furnaces, and problems arise quickly."

In addition, the danger is enormous: If the smelting process becomes unstable, the roof takes a hammering. If a panel bursts and enough water gets into the furnace it can explode, which poses a massive risk for workers.

Venter says that the copper roof life expectancy should be equal to that of the furnace itself, and should only need replacing when the furnace is rebuilt entirely. "This type of roof centre section has not been used on ferrochrome furnaces before - it has been developed by Metix and has generated a lot of interest. Every closed furnace operator in the country is keeping an eye on this project," Venter says.

The centre of a furnace needs to be made of non-magnetic material and; therefore, stainless steel is usually the material of choice. However, it has only 4% of the thermal conductivity of copper, and cannot survive without the refractory. "Copper doesn't need refractory at all," Venter says. "Most of the copper in the roofing is left bare. It absorbs the heat, which is transferred to water that runs through the copper. As long as there is water on it, it will survive."

Venter notes that because these panels are forged and not cast, they are lighter. "Castings are porous and often leak. They are not as reliable as forged panels and conductivity is not as high, however with these panels, we run at 99% conductivity."

Metix faced certain challenges throughout the project, not the least of which was to convince its client that copper panels was the way to go. "It must be said, though, that Heric Ferrochrome has always been eager to innovate. Heric Ferrochrome was our first client to install Metix pressure rings, which have proven very successful. On Heric F2 our pressure rings and the rest of the electrode column has experienced 100% availability since installation in 2005 and zero percent downtime due to electrode equipment failures".

With a 50% share of the pressure ring market in South Africa, Metix continues to make great strides in this arena. Having supplied Rand Carbide with two sets of pressure rings in 2004, the company recently ordered a third set, which is due for delivery in March 2009.

"Silicon Smelters bought Rand Carbide in the interim, which has enabled them to see the efficiency and longevity of our pressure rings," says Venter. "In changing it lower electrode and standardising on Metix pressure rings, the client is assured of complete interchangeability. Essentially, it means the company will only need to have one set of pressure rings in stock, which will save on the spare stock requirement."

In customising solutions for Silicon Smelters, Metix has increased the cooling of its pressure rings to suit "one of the hottest processes we have endured so far. Flames have been measured at 2 800 degrees Celsius", says Venter. The initial set of rings has withstood this environment for four years, where many pressure rings would have required replacement after a year of service.

"A lifespan of this sort is not always a given, as it varies with conditions in the furnace. However, so far it has been significant."

With a management team that offers over 130 combined years of experience in the South African smelter industry, Metix continues to find innovative solutions that focus on safety, efficiency, durability and time savings.