

Cooperheat of Africa: Innovative purpose driven heat treatment solutions

Diresh Naicker, deputy GM of Cooperheat of Africa, talks about the innovative heat treatment services offered by the company and the purpose-driven solutions offered to clients with unique needs, most notably, induction heat treatment.

“We at Cooperheat have a full suite of heat treatment solutions available to us and a long history of applying these in unique ways to meet the needs of clients in industry,” begins Diresh Naicker, deputy GM at Cooperheat.

Core services include: electrical resistance heating, high velocity fuel heating, refractory dry-out and induction heating solutions,” he says. Cooperheat can construct and erect temporary heat treatment furnaces of any size, and it has an electric surface heating division dedicated to trace heating applications, where a product flowing in a pipe circuit needs to be maintained at a predefined viscosity to keep it fluid. “We install permanent trace heating elements across the whole circuit and then we monitor and control the temperature of the fluid to ensure flowability,” Diresh Naicker explains.

Turning attention back to the heat treatment offering, he says that Cooperheat can offer quenching and tempering, hardening and stress relieving heat treatment options for the welding and metal fabrication industries.

He says that stress relieving, especially for welded fabrications, can involve heating of material up to 760 °C, then holding at this temperature for a predetermined time. If using electric resistance heating, ceramic heating pads are placed around the pipe or nozzle or tank, and the temperature and

time requirement is programmed and then recorded. The same applies to high-velocity fuel heating, which can be heated by either an LPG or diesel flame forced into or onto the weldment using a blower.

“New refractory linings for furnaces and kilns, for example, must be carefully baked to prevent them from cracking. In principle, we simply create a large oven, heated by a burner with its temperature measured, controlled, and recorded,” Naicker tells African Fusion.

Describing the dry-out cycle for typical refractory lined furnace, he says that, from ambient the inside of the furnace is heated to 50 °C and held there for two hours. Then the temperature is ramped up to 150 °C for three hours, followed by 350 °C for 12 hours. Then the refractory is allowed to slowly cool back to ambient.

Induction heating: localised and fast

Unlike resistance and flame heating, induction heating can be easily localised to a small area of a fabrication, which makes the process ideal for heat treating welds. “Induction heating only works on magnetic materials, but this makes it ideal for the carbon steel welding work we do. The induction system generates a powerful magnetic field in a flexible coil, which is coiled over the area being treated. This creates eddy currents in the steel immediately under the coil which ultimately makes the material within the coil the heating element,” explains Diresh Naicker.

“We have had some amazing successes with this process. The heat is so focused, and the brilliant part is, the coils don't heat up at all. The heat goes directly into the steel plate or pipe,” he says.

Naicker goes on to show a video of just how fast the induction heating can raise the temperature of a steel pipe. Starting from 32°C, within 15 seconds the temperature underneath the pipe had risen to 150°; and it reached the target 300 °C temperature within 45 seconds. “This was a 4-inch/60 mm pipe with an 8.56 mm wall thickness, and we get it to heat treatment control temperature in matter



of 45 seconds. With conventional electrical resistance heating, it would take about two and a half hours to get to the temperature,” he points out.

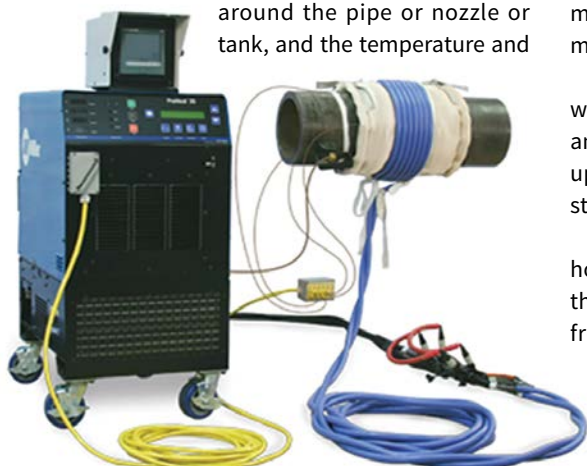
He describes a recent turnaround success at a refinery in South Africa. “On each cycle of each piping section sent for treatment, we saved them four hours: because the setup time is quicker, and getting to the control temperature is much quicker. The heat treatment cycle time is what it is – the controlled heating rate, soaking time at temperature and the controlled cooling rate are fixed and cannot be improved. But it's also much quicker to strip the induction heating system after the job has returned to a safe handling temperature,” he points out.

“We can do huge fabrications using pancake type coil set-ups. We simply shoot thermocouples onto places where we need them, then we place insulation over the treatment areas and simply lay the coils over the top of the insulation. The coils remain cold on top, and they heat the steel below through the insulation,” he says adding this makes working in the area much more convenient for operator and welders.

Highlighting some real-world data based on a heat treatment comparison of 300 welds using induction heating and electric resistance heating, he says that the number of welds processed per 12-hour shift using induction heating was 7, compared to 4 welds per shift for resistance heating. “Total shift requirements to complete 300 welds with one crew would be, for induction heating: 43 shifts; and for resistance heating: 75 shifts, so a total of 32 shifts were saved by switching to induction heating,” notes Naicker.

“This highlights a big opportunity for anyone wanting to switch to induction heating,” he concludes.

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