

Applied Welding

REAL ISSUES. REAL ANSWERS.

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\$400 to \$800
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RECEIVES \$26,000
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LAST ISSUE!

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**THIS IS
YOUR**



PUT OUT

THE FLAME

ProHeat 35 Saves Nuclear Component Fabricator \$400 to \$800 Per Day.

**BY AL SHERRILL,
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PIPE WELDING PRODUCTS,
MILLER ELECTRIC MFG. CO.**

WHEN IT COMES TO PRE-AND POST-WELD HEAT-TREATING, many fabricators see it as a choice between resistance heating and flame heating or between ceramic heating elements and “weed burners” (flame torches). However, a leading provider of material and OEM replacement parts for the nuclear power industry recently put away its weed burners in favor of two Miller ProHeat 35 Induction Heating Systems. These systems induce heat electromagnetically and can bring a part to temperature up to four times quicker than by resistance or flame heat. With the ProHeat 35, induction coils are positioned on or near the part to be heated while thermocouples monitor the process and provide accurate, minute-by-minute recordings of the temperature. The induction coils remain cool.

By switching to the ProHeat 35, Energy Steel & Supply Co., Lapeer, Michigan:

- Eliminated the safety concerns with using flame or resistance heat, including reducing exposure to hot heating elements or open flames, as well as reducing the need to store flammable materials.

- Saved \$400 to \$800 per day in propylene and unproductive labor costs lost to waiting for a part to get to temperature or by using a skilled welder to do his own pre-heating. Combined with savings from performing post-weld heat treatment in-house, the new machines quickly paid for themselves.

- Brings parts to temperature up to 400 percent quicker, allowing the company to better meet customer deadlines while keeping highly skilled welders doing what they do best: welding. In addition, they can maintain the

pre-heat temperature for days or weeks, eliminating the need to repeatedly heat and cool a part, which could place unnecessary stress on the component.

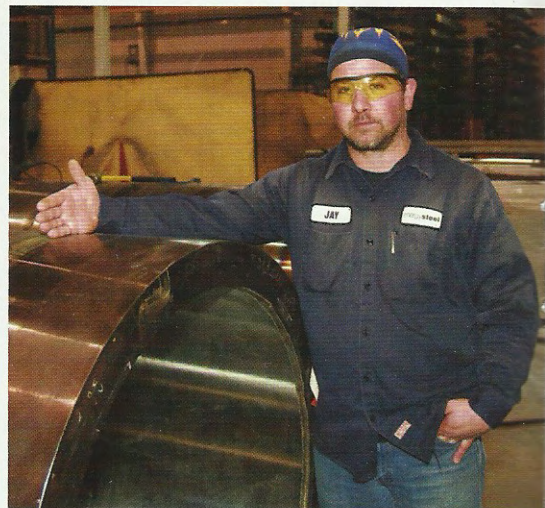
- Eliminated the need for shipping multi-ton components to a post-weld heat-treating facility, saving transport and facility rental costs. Since a QA specialist no longer needs to travel with the component to monitor the heat-treating, it also saved significant labor costs.

- Made it easier to document that components meet the stringent QA standards required by the nuclear industry by being able to reach and maintain the pre-weld and post-weld temperatures and provide verification throughout the heating cycle.

CARVING A NICHE AT THE TOP

Michael Mitchell founded the company in 1982 as a broker of raw steel. In 1996, with its increased knowledge of ASME codes and in response to an increased need for nuclear-qualified suppliers, the company decided to focus its efforts in that area. By 1998, the company expanded its capabilities and evolved into a value-added supplier, having the capability to weld to nuclear code requirements and supply machined products.

In 2003, Lisa Rice (Michael Mitchell's daughter) purchased the company, and under her leadership the company has continued to grow and expand its capabilities, becoming



John (Jay) Kelly, lead welder, shows the 3-T zone on a component of a hot-leg for a nuclear steam generator. The pre-heat zone must be 3 times the pipe thickness.



The ProHeat 35 will run continuously as an elbow of a steam generator is welded with an automatic TIG process.

Since switching to the ProHeat, I no longer need workers for pre-heating and my welders can concentrate on welding.

one of the top manufacturers of OEM replacement parts to the nuclear power industry. The company is ASME accredited—most of its work falls under the requirements of ASME Sections III and IX—and holds the N, NPT, NS, and U Code Symbol Stamps and Certificates of Authorizations. It is also accredited by The National Board of Boilers and Pressure Vessel Inspectors and has been awarded the R Code Symbol Stamp and Certificate of Authorization. The company focuses on parts and components related to the safe operation and shutdown of

nuclear facilities. Few other companies can equal Energy Steel's wide range of services, from material supply to welding and machining, or can equal its expedited services.

INDUCTIVE REASONING

An induction heating system, such as the ProHeat 35, induces heat electromagnetically in a metal part rather than by using a heating element to conduct heat, as does resistance heating, or an open flame. Induction heating systems employ non-contact heating. With induction heating, heat is

induced in the part by placing it in a high frequency magnetic field created by the induction heating coils. The induction coils can rest on or near the part and do not heat up themselves.

The magnetic field creates eddy currents inside the part, exciting the part's molecules and generating heat. Because heating occurs slightly below the metal surface, no heat is wasted.

"What really sold us on the ProHeat," says Patrick Siwa, shop foreman, "is that the person who came to demonstrate it wrapped the blanket around the pipe and brought it up to temperature in 15 minutes, something that would have taken flame torches an hour to do. Once the unit was switched off, the coils were cool enough to be removed by hand."

OLD FLAMES

Prior to adapting the ProHeat induction heating systems, Energy Steel used weed burners, wands with open flames fueled



Patrick Siwa, shop foreman, shows how easy it is to program the ProHeat 35.

by propylene. A direct comparison between the two systems is difficult, since the ProHeat allows Energy Steel to do much larger projects than before, but Siwa attempted to put it into perspective.

“Prior to using the ProHeat, welding on the discharge head would have taken three people,” Siwa says. “Two people with flame torches would hold the pre-heat temperature while the other guy welds. Then the welder would back away and the other guys would keep it warm.. If those are contract workers running the flame torches, it’s costing between \$13 and \$15 an hour each.”

At those prices, it would have cost \$208 to \$240 per day just for the contract workers; however, this is a conservative amount and doesn’t include the time to reach the pre-heat temperature. Either the contractor workers have to start two hours before the welder arrives, or the welder has to wait until the part is brought up to temperature.

“On one project, the welders did their own pre-heating,” Siwa says. “So, instead of welding the whole time they’re here, they would have to stop, heat the joint and then continue welding. On big jobs, we could have 10 people with flame torches heating up a part. Since switching to the ProHeat, I no longer need workers for pre-heating and my welders can concentrate on welding. Plus, the ProHeat can bring a large part to temperature about four times faster than with a weed burner.”

The costs of a highly skilled welder not welding can quickly add up—almost as quickly as the costs of the propylene. At \$70 per bottle, a company could go through between two and eight bottles per shift (\$140 to \$560).

As an example of how induction heating has changed the workflow, Energy Steel recently began work on a

hot-leg for a steam generator. When finished, it will carry steam at 12,000 PSI from the generator. Prior to cladding with 308L and 309L stainless steel, two plates, 4-in. x 96-in. x 120-in. were welded back to back to cut down on warpage. The Energy Steel team laid the induction cables in a circular pattern on top of a plywood platform. The coils were then covered by one inch of insulation to protect the cables from the heat given off by the plates. The plates rested on stops just above the insulation to prevent damage to the cables from the weight. While the company’s prototype submerged arc welder laid down a 60mm strip of cladding on one side, the ProHeat maintained heat from the other side.

“We used the ProHeat to heat up that eight inches of metal to 250 degrees (F) and hold it there continuously for a week,” Siwa says. “If we had to do that with flame torches, it would have taken four to six weeks and we would have gone through four or six bottles of propylene a day. Plus, every time we flipped the plates, we’d add another hour of pre-heating to



Dale Nurmi, lead fitter/welder/sub arc operator (left) and John (Jay) Kelly, lead man/welder/fitter/sub arc operator, examine the data monitoring of the ProHeat 35.



From right to left with a combined 150 years of welding experience, Energy Steel's welding team: Raymond (Butch) Tithof, John (Jay) Kelly, Dale Nurmi, James Schocke, Daniel (Dan) Dixon, Ryan Dean, Patrick Siwa.

our time (using four flame torches) before we could start welding again. Without the ProHeat, I would have either had to have somebody keeping it hot with flame torches during the night so we could start welding right away in the morning, or we would have been down two or three hours each day warming it back up again."

THE SAVINGS HEAT UP

The cost of four welders using four bottles of propylene a day for six weeks is enough to pay for a ProHeat system. But that's only half of the savings. The other half comes in post-weld heat-treating. Prior to using the ProHeat, Energy Steel would ship components to a heat-treating facility accompanied by a QA expert who would hook up thermocouples to the part and monitor the part temperature. Now the part is heated in the shop, saving transportation costs, and the information is gathered by the ProHeat's thermocouples and stored on a digital recorder and can be downloaded to a computer and shared with others via a USB drive or Ethernet connection.

"We're on a schedule at the heat-treating facility," adds John "Jay" Kelly, lead welder. "We have to reserve that furnace time. If for some reason we're held up and we miss our window, they'll go ahead and put the next job in there and we'll have to wait, which will delay delivery of our job. So by us being able to do it whenever we're ready is going to save us money. We're also saving shipping charges of a semi trailer sending it there and bringing it back again."

THE HEAT IS ON

"Many of the nuclear suppliers entered the industry at the same time," says Waylon Waters, sales manager, Energy Steel, "We've added capabilities and have expanded our business in ways that others have not. The added value of fabricating an entire component through material supply, machining and ASME code welding is very special in the nuclear power industry."

The change to induction heating fits in well with these company values.

"There are very important benefits to using the ProHeat 35," he says. "We have confidence in this equipment. The fabricators know that they can come in the morning and start welding immediately. We get accuracy with this product, not only from a quality assurance perspective, but it allows us to be more accurate without bids and timing for estimates. It helps in every aspect of our scheduling, it saves money and other resources within the company, and it eliminates the safety concerns associated with the burners. All those things are positive when you look at it from a sales and productivity perspective. The best part is that we can pass those benefits on to the customer. We work very hard to stay ahead of our competitors by continuing to improve our skill levels and equipment in every aspect of the business. The economy affects everybody and being able to win as many bids as we can and make safe, on-time delivery of top quality products is very important to us."

For the full text of this article, visit MillerWelds.com



THE BOTTOM LINE



ProHeat 35

APPLICATION:

Material and OEM replacement parts for the nuclear power industry.

REAL ISSUES:

KEY ISSUE: Productivity.

CHALLENGE: Reduce pre-heat time.

PREVIOUS WELDING EQUIPMENT:

Flame torches fueled by propylene.

REAL ANSWERS:

NEW SOLUTION: ProHeat 35 Induction Heating System.

REAL RESULTS:

INCREASED PRODUCTIVITY:

- Brought parts to temperature up to 400 percent quicker, allowing the company to better meet customer deadlines while keeping highly skilled welders doing what they do best: welding.

REDUCED OPERATING COSTS:

- Saved \$400 to \$800 per day in propylene and unproductive labor costs lost to waiting for a part to get to temperature or by using a skilled welder to do his own pre-heating.
- Eliminated the need for shipping multi-ton components to a post-weld heat-treating facility, saving transport and facility rental costs.