hottopics

EFD Induction Heating News

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EFD INDUCTION

Contents

Clearing the path to higher output

Double the output. Better quality. Lower energy costs. It sounds too good to be true. But for Norway's Scana Steel, these were the results of switching to an EFD Induction brazing solution.

Stavanger on Norway's west coast is home to Scana Steel, a steelmaker with a world-class reputation as a manufacturer of specialist parts, including wear-resistant road maintenance equipment. In fact, Scana Steel makes the Joma 6000, a unique snowplough blade that delivers unrivalled effectiveness and wear life.

Speed up production

Scana Steel's Sigbjørn Vatland explains the blade in more detail: "Our snowplough blades are made by brazing tungsten carbide into specially profiled steel segments that are then encased in rubber. This rubber casing minimizes vibration and lets the blade adapt to a road's contours—but obviously, the brazing is absolutely critical if the blade is to work at all."

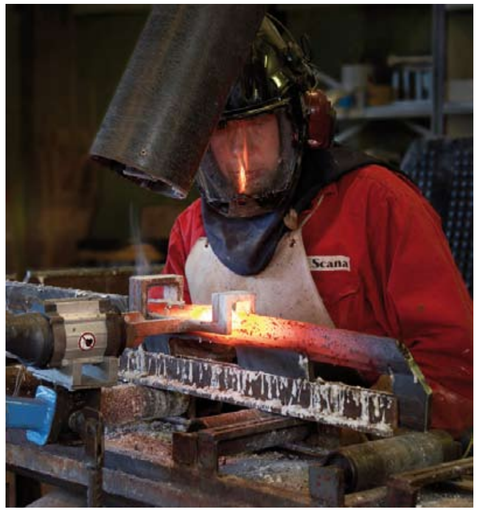
Previously, Scana Steel used ageing ASEA rotating converters as their brazing power sources. But reliability was an issue. And spares were becoming increasingly harder—and more expensive—to track down.

The pressure to find an alternative was made even more intense by the need to speed up production ahead of the peak Winter demand period.

Cut brazing times

Vatland recounts what happened next: "We contacted EFD Induction and explained that we wanted a power source that would improve our productivity and quality.The EFD Induction Sinac 25/40 Twin did this and more. Its two independent power outputs meant we could effectively double our output. At the same time, the Sinac cut brazing times, boosted quality, and reduced power consumption."

But there were other benefits. As part of the overall Sinac solution, EFD Induction optimised Scana Steel's existing coils. And since it is an application-independent power source, the Sinac can even be used for hardening applications.



Norway's Scana Steel replaced rotating converters with an EFD Induction Sinac 25/40 Twin. Output increased dramatically.

Keeping history afloat

Every service call is unique. However, we received one recently that was truly extraordinary. Tom Smith, machinist for the 1925 steamship 'Saltsjön', rang. Could we help restore the old vessel by heating rivets for new, below-deck flooring?

It sounded interesting, so we packed a Minac mobile induction heater and whizzed off to a boat dock in Stockholm, Sweden. Tom met us there, together with colleagues Janne Lundell and Mats Söderlund.

We began with a tour of the ship, a beautiful vessel steeped in history. She had transported Stockholm residents for many years, even serving in winter as an icebreaker. Now officially listed, she was undergoing extensive renovation.

Old Method, Modern Twist

Heat induction's many pluses were apparent from the start. Traditional heating methods are time-consuming and uncomfortable. If you use an on-site furnace, great amounts of coal and hard work are required to keep the temperature high. What's more, traditional riveting is cramped, dangerous work. Gas isn't much better. It's time-consuming, and it creates an uncomfortable working environment.

Instead, we simply brought the Minac aboard (it was easier than it sounds, it only weighs 50 kilos), connected it to electricity and water and started it up. Better yet, the induction coil (the actual heating tool) lies at the end of a 5-meter, water-cooled cable so it could easily be taken below-deck. Talk about an improvement in working conditions! Within seconds the rivets were glowing.

The work went quickly, and after a few hours we were done. A tong lifted the heated rivets, the bucking bar was positioned and a pneumatic hammer battered each rivet. Meanwhile, the next rivet was being heated.

Here's the team that carried out the "Saltsjön" induction work. They are (left to right): Leif Rahunen of EFD Induction, Janne Lundell, Mats Söderlund and Tom Smith.

Work on "Saltsjön" was a successful combination of a proven method (riveting) and modern technology (heat induction). And the advantages of heat induction were obvious: flexible equipment, fast and efficient heating and a comfortable working environment.

It was satisfying to help Tom and his co-workers and see how modern technology can preserve living history. To see how the restoration is going, log on to www.saltsjon.nu. If you are interested in what induction could do for you, just visit: www.efd-induction.com.

Once the rivet and the bucking bar are in place, a pneumatic hammer batters the rivet from above.

A rivet is heated to 1100°C in 7 seconds, consuming only 0.03 kWh.

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Here Comes the Sun (and the Silicon)

Silicon. It's the earth's second-most abundant element. And products containing silicon are widespread, the most common being semiconductors. But now induction heating is being applied to silicon to help solve one of humanity's biggest challenges: the production of clean, affordable and abundant electricity.

Silicon helps make solar photovoltaic panels (SPVs) that harness solar power, an energy source that's appealing for several reasons. First, abundant amounts of solar energy reach earth, and that energy is basically untapped. And of course, silicon reserves are pretty much endless.

Second, operating costs are extremely low compared to existing power technologies. Third, it's efficient (six times more than wind power). Fourth, it has great potential. France for example has a total yearly consumption of 350 TWh. If the country covered one-third of its roofs with solar panels, its energy needs would be satisfied. Finally, it's especially attractive to developing countries. They can quickly adopt SPV technology, skipping over the costly development of large-scale energy networks.

The future's bright

Of course, SPV technology alone will not meet all our energy needs. However, SPV technology is a giant step forward. But what role does EFD Induction play in all this?

Put simply, EFD Induction supplies the necessary equipment for the Photosil project, a revolutionary plan that uses a new process to manufacture SPVs at attractive prices. The three-year old project is owned by an international consortium that includes Apollon Solar, Ferro Atlantica, CEA (The French Nuclear Research Center), CNRS (The French National Research Center) and Cyberstar, a leading supplier of innovative crystallization furnaces.

The complex system built by EFD Induction for Photosil includes: a multi-axis robot, several protective atmosphere vessels, three crucible furnaces, four solid state frequency converters, one high frequency plasma generator, PLC and full control equipment, one special crystallization furnace, a water cooling circuit, and one plasma torch and gas supply panel. Together, this equipment transforms metallurgical silicon into Solar Grade Silicon.

There is no doubt that SPV technology will play a crucial role in energy production in the 21st century. In fact, according to a study by Greenpeace and the European Photovoltaic Equipment Association, SPV systems could be generating as much as 2,600 TWh of electricity around the world by 2030. That would be enough to meet the electricity needs of approximately 14% of the world's population. And with experimental solar cells already reaching efficiencies in excess of 40%, and governments worldwide pledging financial incentives for solar energy, the future for SPV technology definitely looks bright.

Unwrap the benefits of package hardening

EFD Induction is the world's no.1 induction hardening company. That's good news for us. But what's more important is why? One key factor is our proven success at 'package hardening'—the simultaneous hardening of three closely spaced camshaft lobes.

Traditionally, tightly grouped lobes have been difficult and/or slow to harden correctly. The problem is heat transference. When the distance between the lobes is less than 7 mm, heat transfer can easily preheat the next cam to be hardened. Or temper an adjacent cam that has already been treated.

But at EFD Induction we've perfected a package hardening technique that uses three independent coils to simultaneously heat the inlet, outlet and injector lobes. And since each coil has its own power source, we can adjust individual heating processes to suit each specific lobe.

EFD Induction package hardening in action. Each coil operates independently and is formed to match a specific coil.

Talkline

Welcome to *hottopics*.

As you probably already know, induction heating is a far "greener" alternative to furnaces and open flames. And in this issue you can read how we're finding new environmental-friendly applications for induction technology.

Consider the Photosil solar power project. On page one you can read how EFD Induction is a key equipment supplier. Solar power represents a tremendous opportunity for the world, providing reliable energy without significant environmental impact. And as the Photosil contract shows, solar power is also an enormous business opportunity. EFD Induction is right there.

This issue also shows how switching from gas or arc heating to induction heating benefits the environment. For instance, gas and arc heating can result in nitrous gases, something Mother Nature can do without. Of course, there are different types of "environment". Environment can also mean the area surrounding a worker. Workers on the 1925 steamboat "Saltsjön" (page 3) were more than happy to avoid cramped, oxygen-depleted quarters when they heated and battered rivets below deck.

Worldwide

This *hottopics* also has an international angle. EFD Induction is expanding into Canada and Romania. A Quebec company provides us with know-how in an exciting area of induction plasma new to us, nano-technology. While our expansion in Bucharest opens a door to Southeast Europe, a promising market.

So, from that old Swedish steamer to Romanian real estate, with stops at Canadian innovators and Chinese mills, EFD Induction is on the go in this *hottopics*. You can also read how induction heating is used to coat brake discs, normalize welds in welded pipes and optimize vehicle components.

As always, I hope you enjoy reading *hottopics*. If anything here peaks your interest, call or e-mail your nearest EFD Induction representative. The limits of modern induction heating have not been reached, but at EFD Induction, we're pushing that barrier.

Elvin Jorgensen
Chief Executive Officer

Add two more to the list

EFD Induction recently acquired 49% of Tekna Plasma Systems, Inc. The Quebec-based company develops and manufactures equipment that uses induction plasma technology in many areas. And Tekna is always on the lookout for novel ways to apply induction plasma technology, a quality we value.

Best of all, Tekna fits EFD Induction like a glove. Although both Tekna and EFD Induction are world leaders in induction plasma technology, EFD Induction has not used it to produce micron and nano size powder. That is Tekna's specialty. So overnight we gain market leadership in this area and expand business activity in a core competency. Meanwhile, Tekna gains access to EFD Induction's expertise and international network of subsidiaries.

Eastward bound, too

We also bought another 35% of Inductro Srl, a Bucharest company, raising our holding to 70%. Inductro, with 30 employees, makes forging and melting equipment, restores induction hardening machines, and produces coils.

We feel good about Romania. It's Southeast Europe's largest country, and its membership in the European Union has opened up immense business opportunities. Inductro itself is a true success story. After the 1989 fall of Communism, Liliana and Iona Bojita founded and built up the company, whose sales last year climbed 37%. We have bought 8,700 square meters of land to build a factory, where we plan to raise the annual output of induction heating machines to supply pan-European customers.

Tekna and Inductro represent great growth potential. And we are expanding into other parts of the world, too. So be on the lookout for more news in future issues.

Maher Boulos
Tekna Plasma Systems, Inc.

Liliana Bojita
Inductro Srl.

Ioan Mircea Bojita
Inductro Srl.

Small steps—huge impact

We all want to help the environment. But it can be tough deciding where to start. One small but important step is the change from gas or arc heating to induction heating. It's good for workers' environments, too.

Gas and electric-arc heating are used in a wide range of applications such as the joining, forming and cutting metal, as well as hull straightening. But there are of course other, more environmentally sound, heating methods. The three most common alternatives are induction heating, heating elements and resistance heating. Heating elements, however, are usually confined to applications with long exposure times such as construction and pipe work. While resistance heating is limited to very few applications. This leaves fast, accurate and repeatable induction heating as the only viable alternative.

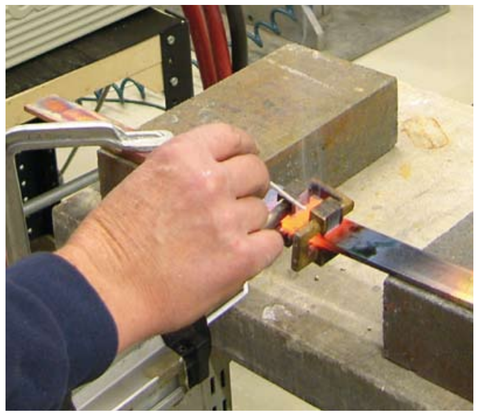
Precise, efficient…

So how do induction, gas and arc heating compare in terms of environmental impact? One major drawback of gas and arc heating is the production of hazardous gases such as ozone, nitric oxide and nitrogen dioxide. Induction heating on the other hand doesn't produce any gases. Then there's energy consumption. Induction heating offers unrivalled energy efficiency, as it only heats precisely defined zones directly in the workpieces. Gas and arc heating are not only wasteful, the high temperatures generated in the heating sources can be dangerous. Moreover, gas and arc heating raise ambient temperatures, leading to uncomfortable and less productive working conditions. Induction heating however is a 'cold' heating source—the induction coil does not heat up.

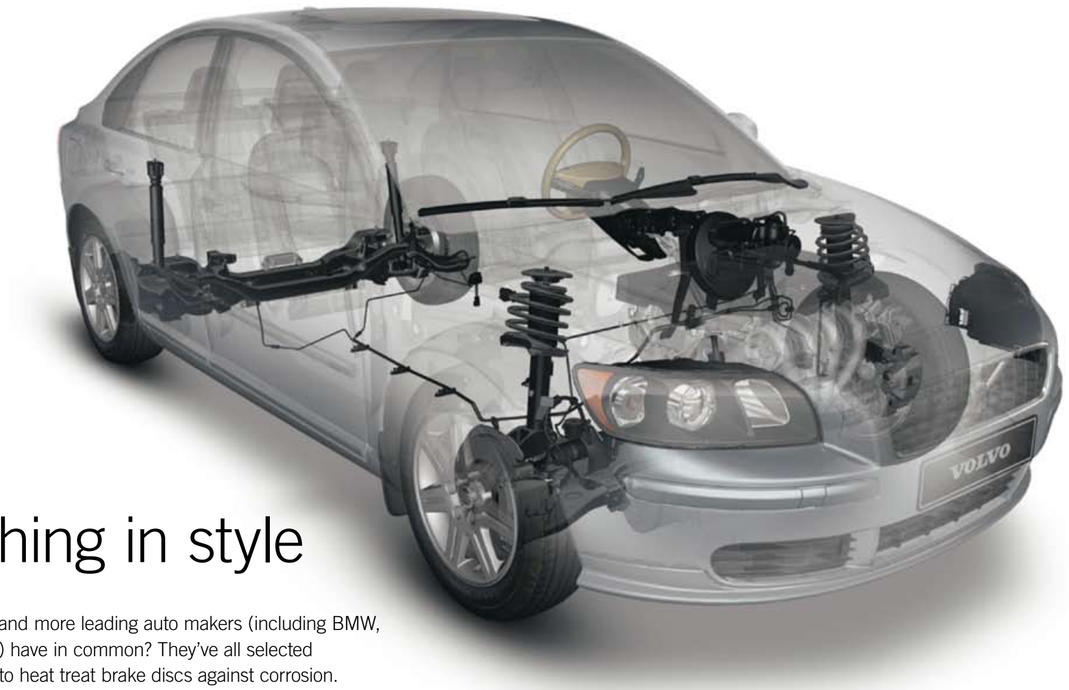
…and quiet

The fast and flameless accuracy of induction makes it ideal for awkward working areas (see the story "Keeping history afloat" in this issue for a perfect example). But there's another feature that helps make it superior to gas and arc heating: its virtual silence. Noisy gas and arc heating not only endangers worker's health and safety, it also lowers productivity.

So next time you have to choose a heating technology, take a closer look at induction. It's a wise choice for the environment—and an equally wise one for your bottom line.



Clean, safe and quiet. Induction heating delivers maximum control—while minimizing waste and occupational hazards.



Finishing in style

What do more and more leading auto makers (including BMW, Audi and Volvo) have in common? They've all selected EFD Induction to heat treat brake discs against corrosion.

Safety is of course a top priority for carmakers. Which is why they coat brake discs to prevent corrosion. Coating with Geomet—one of the world's leading coating products—ensures top-level protection, especially in salty atmospheres. But as we'll see, post-coating induction drying and curing finishes the job in style.

The process works like this. Once the discs have been coated, a conveyer transfers them to the induction heating booth where induction dries and cures them.

The discs' first stop is the induction drying stations, where the heat will range from 80–100°C. The number of stations depends on the weight and shape of the discs, as well as the induction coil shape, and the stations are usually equipped with SINAC PM 50 converters (50 kW each). Each station has a matching box consisting of capacitors, transformer and coil that is mounted on a double-axis moving table. That way, the coil is well-positioned for each brake disc. (Drying is basically a mass transfer process whereby water moisture or moisture from another solvent is evaporated.)

After drying, the discs move to the induction curing stations, where temperatures reach around 340°C. The number of stations here also depends on the discs' weight and shape, as well as the coil shape, and each station has a SINAC PM 100 converter (100 kW). Curing refers to the toughening or hardening of polymer material by cross-linking polymer chains. It can be achieved by chemical additives, ultraviolet radiation, electron beams, or, in this case, heat.

Well-known benefits

One coil can process all the discs on a production line. However, because all kinds of discs are included on the line, coil efficiency compromises must be made.

Also, disc temperature varies during the process. To overcome this, "free stations" between the stations create a more homogenous temperature.

Each heating station's power is controlled separately in relation to the brake disc to be heated, and the MF frequency used on the existing installations is 7–12 kHz. Once cooled in a cooling chamber, the discs are placed on an exit conveyor for unloading.

Throughout, induction heating delivers well-known benefits: optimized consistency, maximum productivity, extended product life, minimal environmental impact, and reduced energy consumption.

Ultimately, applying heat induction to brake disc drying and curing illustrates once more how induction saves time and money. It also underlines how EFD Induction plays a role in making our roads safer—for everyone who uses them.

Three ways to cool down

When producing welded pipes according to API specification or similar, the weld and the heat affected zone (HAZ) have to be normalized. EFD Induction has three solutions.

Before we start, we need to know more about normalization. Put simply, it's the air-cooling of metal to reestablish a homogenous and fine-grained microstructure in the HAZ. There are two requirements when normalizing. You have to limit the temperature of the pipe's external surface closest to the coil to avoid grain re-growth. And you have to reach a high enough austenitisation temperature in a sufficiently wide zone at the inner surface.

EFD Induction has designed three systems that satisfy those requirements. We call the designs Seam Annealing with Horizontal Tracking, Seam Annealing with Orbital Tracking and a Travelling Seam Annealer. Each deserves a closer look.

Seam Annealing with Horizontal Tracking can be supplied with either fully automated or manual tracking. Here, induction coils are adjusted according to the weld seam in a horizontal plane.

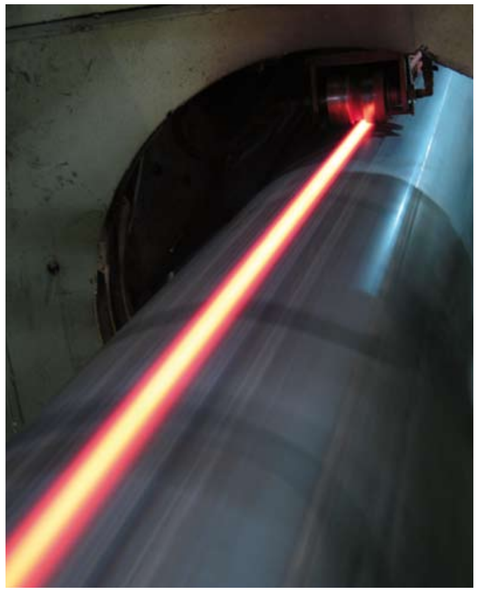
Seam Annealing with Orbital Tracking can also be supplied with either fully automated or manual tracking. The coil follows a twist in the seam here, keeping a constant distance between the coil and the weld seam. This design is most common for pipes with large outer dimensions (OD).

Finally, a Travelling Seam Annealer, part of the normal annealing system, reduces scrap in shut down situations. Because the last section of the seam annealer is movable, the unit can still seam anneal pipes not properly annealed when the line has stopped.

One of several processes

Besides Normalization, we supply seam annealing equipment for the Normalization, Quenching and Tempering process (NQT) and the Normalizing, Quenching and Normalization process (NQN). For example, our Baoshan Steel installation in Shanghai, China, designed for pipes with a maximum OD of 24" and wall thickness of 19.6 mm, uses the NQN process.

Seam annealing, in all its variations, is one more area where we apply induction heating. So if you need a seam annealing system or would like to know more about EFD's extensive experience with the process, e-mail us at *sales@no.efdgroup.net* (We might even talk about our special coil design for heavier walls. But that's another story.)



A 2,400 kW EFD Induction seam annealer in action. The orbital tracking system is fully automated.