



A Stressless E200 sofa, just one of the wide range of armchairs and sofas manufactured by Ekornes.

Photo: www.ekornes.no

## Induction heating that's good enough to sit on, jump on, bounce on and snooze on

It isn't easy being a sofa. You have to look good. You have to be comfortable to sit on. And you have to be strong enough to support years of relaxing adults, jumping kids and visiting relatives. So when it comes to ensuring their sofas are up to the job, Ekornes, the largest furniture maker in the Nordic countries, uses an EFD Induction mobile 'Minac' converter to braze steel support bars in their sofas.

The Minac, which has been in use by Ekornes since the middle of 2012, is a Minac 18/25, meaning the system has a continuous power output of 18 kW and a maximum power output of 25 kW. But why choose a Minac for such an application, particularly when there are alternative methods such as flame brazing on the market? For Terje Solgaard, Area Sales Manager at EFD Induction Norway, one of the main reasons why companies such as Ekornes opt for a Minac is the productivity of automated induction brazing. 'Induction heating is unrivalled when it comes to output. Put simply, induction can braze more parts per hour than any alternative process.'

But the real attraction of induction brazing is that it boosts output while simultaneously ensuring consistent, high-quality joints. 'Indeed,' says Solgaard, 'since induction quickly brazes individual work pieces, we can integrate the brazing process into a continuous produc-

tion flow. And as each work piece is brazed separately and with electronic controls, we can repeat the desired heating cycle with amazing accuracy and at high speed, too.'

Brazing is a relatively straightforward process that involves using heat to melt a filler metal that is absorbed by capillary action into two close-fitting pieces of metal. The resulting joint is exceptionally strong, typically being as strong, if not stronger, than the base metals it joins. But unlike welding, brazing preserves the integrity of the base metals by not melting them.

'There are other benefits, too,' adds Solgaard. 'The joint is a neat bead that is leak proof and shock resistant. Moreover, induction brazing is a non-contact process. No flames or other heat sources ever directly touch the base metals, which can warp the metal. And unlike gas brazing, where flames obscure the brazing process, induction brazing gives the operator a clear view of the complete brazing operation.'

There are health benefits too, as induction means less noise, heat and dust.'

### From weld to braze

But that's only part of induction heating's role in the sofas' construction. The steel tubes used by Ekornes have in turn been made by Sönnichsen, the Norwegian manufacturer of high-quality welded tubes and hollow sections. At its production facility in Fredrikstad 100 km southeast of the capital Oslo, Sönnichsen uses three solid-state EFD Induction 'Weldac' welders. One of the welders has an output power of 300 kW and was installed in 2008. The other two were installed in 2005, and comprise a 250 kW and a 300 kW system. Common to all three welders, however, are features that make Weldac the benchmark for high-uptime, high-quality induction welding.

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## Major chain hardening orders in China

EFD Induction has landed three large induction hardening orders from China's coal mining industry. The orders involve hardening and tempering lines for 5-60mm diameter chain. The systems are being constructed at EFD Induction facilities in Norway and China.

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One of the orders will be the world's largest induction heat treatment line for chain.

# Talkline

## From furniture to fiberizing —the flexibility of induction heating



Welcome to this latest issue of Hot Topics. Before continuing, I'd first like to say a few words about myself. My name is Bjørn Eldar Petersen, and I have recently taken over as CEO of EFD Induction from Eivin Jørgensen, who, as planned, stepped down after reaching his 60th birthday. I'm sure I speak for all of us at EFD Induction in thanking Eivin for his hard work over the years. The good news is, however, that Eivin remains at EFD Induction in our business development department.

One of EFD Induction's main strengths is our ability to devise solutions for multiple applications in many industries. An example of this is shown in our main cover story, where you can read how EFD Induction Weldac systems are used to weld steel tubes. The Nordic countries' largest furniture manufacturer then employs our Minac system to braze the same tubes for use in high-quality sofas. It's a perfect illustration not only of our wide expertise, but also of the incredible flexibility of induction heating.

The story also touches on two topics that are dealt with in other articles in this issue. The first concerns Weldac, our family of high-uptime solid-state welders. Over the past year we have rolled out new, lower-power additions to our Weldac range. This issue reports on the successful unveiling of these new Weldacs in India. The second topic concerns our well-known mobile Minac system, which was recently awarded a gold medal at an international trade fair in Bulgaria.

Finally, I'd just like to mention one of my favorite parts of Hot Topics: the 'Induction Instruction' section. This issue contains a piece by Philippe Derain who is based at our facility in Grenoble, France. Philippe's article explains how induction heating is used for glass fiberizing—an application in which EFD Induction has world-leading expertise. The application is a perfect example of our skills at work, a real-life demonstration of how EFD Induction puts the smarter heat to smarter use.

Bjørn Eldar Petersen  
CEO, EFD Induction



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'These orders are a significant breakthrough for us into a vast and growing industry,' says Spencer Jones of EFD Induction Norway. 'For example, China's economic growth has pushed the country's annual coal production to about three billion tons. Also, China's coal industry is being modernized at an incredible pace, with significant investments being made to boost safety and efficiency. These factors help explain the demand for state-of-the-art mining chain. We've succeeded in this market because the Chinese customers were aware of our solid reputation among European chain manufacturers.'

The first order involves an induction hardening and tempering solution for the China Coal Zhangjiakou Coal Mining Machinery Company (CZCM). A subsidiary of the China National Coal Group, the country's second-largest coal producer, CZCM plans to install the

EFD Induction hardening line in a new chain manufacturing plant.

'The order,' says Jones, 'is for a complete line capable of heat treating 5-16mm diameter chain. The line will feature four induction heating units to harden and temper the chain. Our solution also offers selective heating of the straight part of the link, or "schenkel". Such selective heating increases ductility in the schenkel, resulting in optimal link properties. Only induction heating achieves localized schenkel tempering. Furnace heating, for example, cannot localize heat in a specific part of the link.'

The second order involves a complete hardening and tempering line for the Xian Heavy Equipment ChengHe Coal Machinery Company. The line, which is designed for 24-36mm diameter chain, will include four induction heating units. The third order—from the Changchun Northeast Conveyor

Equipment Manufacture Company—is for a hardening and tempering line for 36-60mm diameter mining chain. With six induction power sources and an hourly output capacity of up to 2,000kg, the system will be the world's largest induction heat treatment line for chain.

'We anticipate further chain hardening orders from China,' says Jones. 'Chinese manufacturers are not only impressed by our successful track record in chain-making, they are also impressed by our extensive presence in China. EFD Induction has been established in the People's Republic since 2001, and we now have bases in Shanghai, Beijing and Guangzhou. This local presence is a great reassurance for our Chinese customers, as they can always count on close support before, during and after the installation of their induction heating solutions.'

► Induction heating that's good enough to sit on, jump on, bounce on and snooze on, continued from page 1

'These features,' says Peter Runeborg, Sales and Service Manager at EFD Induction Norway, 'include sturdy IGBT transistors that, together with an advanced switching pattern and intermediate transformer design, make the Weldac extremely resistant to short circuits. This of course contributes to high uptime, something valued by customers like Sönnichsen, for whom tube and/or pipe welding is a core business.'

Other Weldac features that contribute to high output and product quality include automatic load matching. This means that the Weldac delivers full output power across an unusually wide range of tube sizes. When a differently sized induction coil is fitted, the welder automatically matches the load. The Weldac saves money in other ways, too. Thanks to the use of diode rectifiers, Weldacs maintain a high power factor of 0.95,

which means reactive power—and the money paid to power companies for such reactive power—is minimal. 'The cases of Ekornes and Sönnichsen highlight several key facts about EFD Induction', says Runeborg. 'First of all, we are able to meet the tough quality and productivity demands set by these two world-class companies.'



Attention to detail—an EFD Induction engineer tests the brazing solution developed for Ekornes. The system is based on a Minac 18/25 converter, and features a customized coil and holding fixtures.

Second, the fact that we developed solutions for two radically different applications—brazing and tube welding—illustrates the range of technical competence available within EFD Induction. It's something we can be proud of, and our customers can benefit from.'

Ekornes is the largest furniture manufacturer in the Nordic countries, and owns the world famous "Stressless" brand of sofas and recliners. The company also produces "Svane" brand beds. In fact, Svane was the first trademark to be registered in the Norwegian furniture industry. Find out more at: [www.ekornes.com](http://www.ekornes.com)



Dramatic home for relaxing products: Ikornnes in western Norway, base for the corporate HQ of Ekornes.

Photo: [www.ekornes.no](http://www.ekornes.no)

# EFD Induction Minac mobile heating system wins gold medal at major international technical fair

EFD Induction and its 'Minac Twin' mobile heating system have won a gold medal at the International Technical Fair held recently in Plovdiv, Bulgaria. Explaining their choice of the Minac Twin, the award jury cited the system's energy efficiency, innovation and environmental friendliness.

'It's always an honour to receive an award such as this,' says Matthias Gruber, managing director of EFD Induction Austria, who accepted the award diploma and gold medal. 'It's public and independent confirmation of what thousands of customers around the world already know: that the Minac is a powerful cost-cutting tool—a rugged, multi-application system that is safe and easy to use.'

The Minac Twin displayed at the Plovdiv fair was a 25/40 Twin model. This means each independent power output has a continuous power of 25 kW, and a maximum power output of 40 kW. 'Having two independent outputs, each with its own control system, is what makes the Minac Twin so productive,' says Gruber. 'It is in effect two induction heating systems in one.'

The International Technical Fair is held every autumn in Plovdiv, Bulgaria's second largest city. The event, southeast Europe's largest forum for new industrial technologies, this year attracted more than 1,250 exhibitors from 43 countries. 'This year's fair,' says Gruber, 'had green and advanced technologies as focus

areas. So it is no surprise the Minac was so successful, as it is one of the greenest and most advanced industrial heating technologies on the market.'



Matthias Gruber, managing director of EFD Induction Austria, proudly displays the gold medal

## New Weldac range unveiled to Asian market

EFD Induction's 'Weldac' family of induction welders is well known for its high-uptime, high-throughput welding of larger diameter tube and pipe. 'However,' says Peter Runeborg, Sales and Service Manager at EFD Induction Norway, 'we have over the years received more and more enquiries for

the reduced footprint and power rating. Everything else, including EFD Induction's unique five-year warranty on the inverter modules and driver cards, is the same.'

Visitors to the Tube India International exhibition, held at the end of October 2012 in Mumbai, had a chance to view a 150 kW



The EFD Induction team at the Mumbai event welcomes visitors from Tata Steel. From left to right: Rakesh Verma (Tata Steel), Kiran I. Deyannavara, Mahesh Gupta, Peter Runeborg, Hubert Reilard and H. P. Singh and S. K. Takur of Tata Steel.

smaller, lower-powered Weldacs. For example, manufacturers who don't have large-diameter welding as their core business have been keen to gain the Weldac's cost-cutting benefits.'

To meet this demand, EFD Induction has launched a new range of small, lower-powered Weldacs in the 50-225 kW range. The new range is the same as the existing Weldac family. 'The only difference,' Runeborg says, 'is

model from the new range. Many visitors were particularly impressed by the new Weldacs' compact single-cabinet design that measures only 1,500mm long, 600mm wide and 1,800 high. The Weldacs' flexibility was also a popular talking point. 'The 50-100 kW models support one-turn coils for profiles, standard two-turn coils, and three-turn coils for welding aluminum,' says Runeborg.

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## Brazil! Brazil! Brazil!

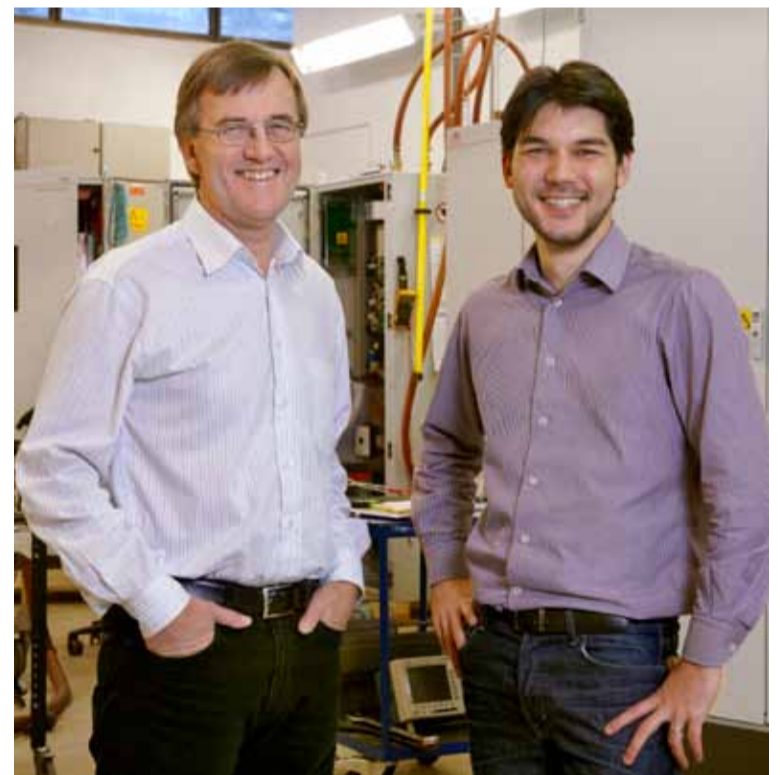
It's justifiably famed as the home of Copacabana, Pelé and the girl from Ipanema. But it's also one of the world's fastest growing economies—and the base for the newly launched EFD Induction Brazil.

EFD Induction's worldwide network expanded recently with the launch of its Brazilian subsidiary. The new company—with the formal name of EFD Induction Ltda.—is based in the city of Sorocaba, about 60 kilometres from São Paulo. 'This is a milestone in our growth,' says Eivin Jørgensen, EFD Induction's Director of Business Development. Having a subsidiary in Brazil's economic heartland means we can offer better and faster support to customers in the region.'

The new subsidiary is headed by Evandro Nishimuni, a mechanical engineering graduate who has previously worked in France and in the Brazilian automotive industry. 'EFD Induction and Brazil have so much to offer each other,' says Nishimuni. 'There is growing awareness in Brazil that sustained economic growth can only be maintained by investing in modern, efficient and proven technologies. There is also a growing demand for technologies that save energy and minimize environmental impact. Induction heating satisfies all these demands.'

EFD Induction Brazil will initially focus on the electro-technical market. 'EFD Induction has already made headway in this vast sector,' says Nishimuni. 'For instance, several of our Minac systems are being used to braze stators at the Santo Antônio and Jirau dams, key structures in a new hydroelectric complex being constructed in Amazonia.'

Nishimuni is however keen to stress that most of the new company's



Evandro Nishimuni (right), heads the new EFD Induction subsidiary in Brazil. Beside him is Eivin Jørgensen, EFD Induction's Director of Business Development.

business will most likely occur much closer to home. The state of São Paulo where we are located is Brazil's dynamo. In fact this state is responsible for a third of all Brazilian GDP. That gives you some idea of just how economically vibrant the region is.'

EFD Induction Brazil currently has three employees—Nishimuni as manager and salesman, Aline Gonçalves as administrator, and Carlos Feliciano Ferreira as engineer and after-sales support technician. 'Carlos is undergoing advanced training right now at various EFD Induction facilities in Europe. Once

back in Brazil his main tasks will be manufacturing and maintaining coils, and maintaining our customers' heating solutions. I hope he had a chance to rest in Europe, because when he returns it's nothing but work. The interest in our products and services here in Brazil is already intense—a good sign for any fledgling company!'

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# Induction instruction

Philippe Derain of EFD Induction France gives a brief introduction to one of the lesser-known uses of induction heating: glass fiberizing.

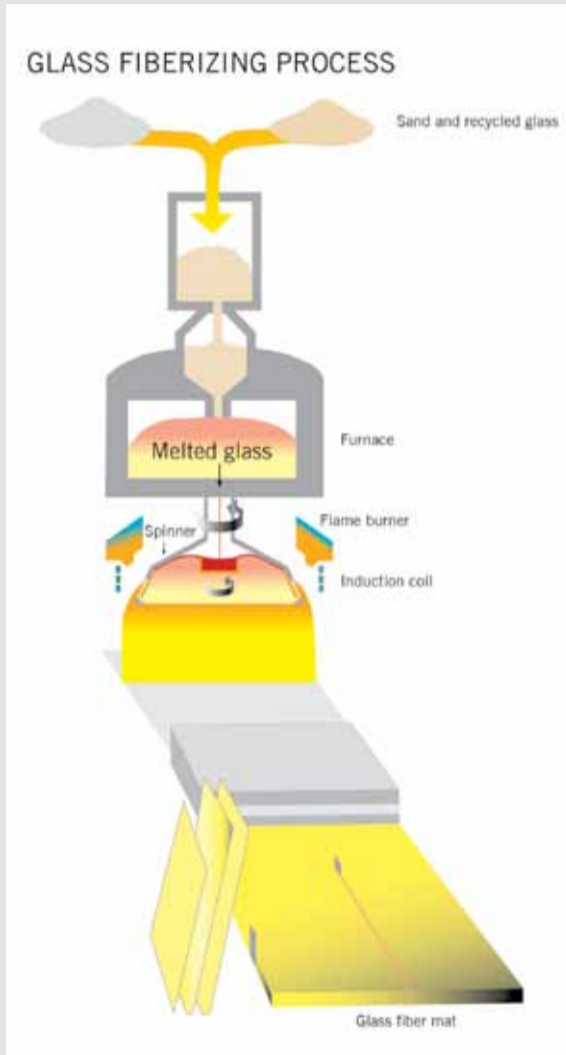
Next time you visit a funfair or circus, take a few minutes to see how candyfloss—known as cotton candy in the US—is made. You'll see how melted sugar is spun at high speeds to form fine, long filaments. These then cool rapidly in the air to form a mass of low-density 'floss'—the sweet bundle we remember from our childhoods.

An almost identical method is used to produce glass fiber. Heated glass is fed into a spinner that rotates at high speeds. The lower edge of the spinner features numerous tiny holes. As the spinner rotates, the molten glass is forced through the mesh of holes, exiting as filaments that cool upon contact with the air. The cooled

filaments then cool upon contact with the air. The cooled filaments which in turn compromise the insulation capabilities of the final product. However, maintaining a stable temperature is extremely challenging—especially at the approximately 1,400°C typical of glass fiberizing. Fortunately, maintaining a stable temperature is one of the main features of induction heating, which is why induction is widely used in the glass fiberizing industry.

EFD Induction glass fiberizing systems typically include: a Sinac converter, a matching station specially tuned for glass fiber spinners, concrete-insulated induction coils and a cooling unit. The EFD Induction Sinacs used for glass fiberizing are usually in the 50-100 kW power range, but much higher ratings are of course available. Medium frequencies are common for this application, typically up to 10 kHz. But as the Sinac features IGBT transistors and EFD Induction's patented switching technology, the Sinac can operate at frequencies up to 200 kHz. The power supply chosen for glass fiberizing is usually determined by the diameter of the spinner plate.

Growing concerns about global climate change—plus spiraling energy costs for consumers—have helped generate strong demand for thermal insulation materials, particularly for the proven method of glass fiber. Many governments even offer subsidies or other incentives for house owners to retrofit their properties with glass fiber insulation. Demand for glass fiber has also been driven by a growing awareness of the importance of quiet indoor climates. Another driving force has been the regeneration of city centers, and the vogue for dense city living, with urban dwellers opting to live in apartment buildings. EFD Induction has developed specialist expertise to meet this growing demand for glass fiberizing. In fact, our glass fiberizing solutions can be found in Finland, France, Germany, India, Italy, Kuwait, Norway, Poland, Russia, Spain, Sweden, Switzerland and Turkey.



filaments are then collected as mats of entangled fibers which are subsequently formed into continuous rolls called 'blankets', or into pre-cut shapes, usually square-shaped slabs called 'batts'. Two of the best-known applications for glass fiber are thermal and sound insulation, made possible by glass fiber's extremely high ratio of surface area to weight.

Two factors are especially critical for successful glass fiberizing. First, the molten glass must be fed at the correct rate into the rotary spinner. Second, the molten glass must be consistently maintained at the correct temperature. Unwanted temperature fluctuations, for example, can result in inconsistent fiber characteristics,



Philippe Derain, Export Sales Manager at EFD Induction in France, explains the art and science of glass fiberizing.

► *New Weldac range unveiled to Asian market, continued from page 3*

'The 100-200 kW models support one- and two-turn coils, and the 225 kW version supports one-turn.'

Several new Weldacs have already been ordered by customers in India, and talks are underway with other interested companies. 'It's still

early days for the new Weldacs in India,' says Runeborg. 'But there is definitely space for them in India's fast-growing market. And of course, our customers in India are supported by our large manufacturing and service facility in Bangalore.'



Peter Runeborg beside one of the new small-footprint, lower-power Weldac welders.

- About the new Weldacs
- Same features as larger Weldacs—only smaller and with lower power.
  - Rugged IGBT transistors and patented switching pattern make the Weldac short-circuit resistant.
  - High and constant displacement power factor of 0.95 at all power levels. No need for expensive reactive power compensation capacitors. No need for costly de-ionized cooling water.
  - Available at 50-225 kW in 25 kW steps. Frequency range is 200-400 kHz, may be extended in special cases.
  - Options include: frequency switching feature, positioning tables, temperature and quality monitoring systems, coils, heat exchangers. The new models also support contact welding heads.

## EFD Induction Minac boosts productivity for world-leading maker of rigging hardware

A heating solution based on EFD Induction's Minac induction heating system has succeeded in improving output for Blue Wave, one of the world's largest manufacturers of rigging hardware for the marine, architectural and industrial markets.

The new solution, which is installed at Blue Wave's production facility in Haderslev, southern Denmark, uses an EFD Induction Minac 18/25 to heat workpieces such as shackles, bolts, cones and fork terminals. 'The goal,' says Allan Klostergaard of EFD Induction Denmark, 'is to heat the workpieces to around 1,100°C (2,010°F) in order to achieve austenite transformation—a change in the workpiece's microstructure that enhances malleability prior to hot forging.'

Blue Wave's new Minac system has a continuous output power of 18 kW and an intermittent maximum power of 25 kW. It also, like all EFD Induction Minacs, features automatic electronic matching. This optimizes energy transfer into the workpiece during

the entire heating cycle.

According to Blue Wave's head of production Helmer Knudsen, the new Minac has had a major impact on productivity. 'The Minac has significantly reduced heating times. At the same time, we can now heat larger workpieces compared to our previous heating system.'

'But higher output isn't the only benefit brought by the Minac,' says Klostergaard in conclusion. 'The system's electronic controls help ensure precise repeatability. This of course helps Blue Wave maintain the high quality standards for which they are so well known.'



Right: a rigging component heated by induction. Left: after hot forging.

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