

innovative  
heating

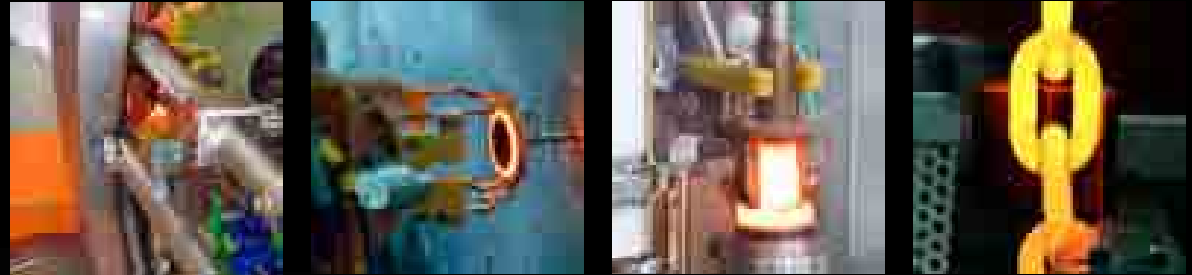


**innovativeheating**

Innovative projects that make your business more profitable

technological innovation  
within the reach of the industry





### Induction heating:

An ecological, fast, clean, precise, controllable and repeatable process.

Without smoke, flame or contact.

It is based on current induced by electromagnetic field.

## Induction Technology

**GH Group** designs, manufactures, commercializes and offers turnkey solutions for induction heating systems. **GH Group** serves a multitude of industrial sectors, where the application has benefits that other technologies cannot efficiently satisfy.

The combined experience of the R&D, Applications and Engineering departments of the **GH Group** offers the necessary flexibility and technical capability in order to develop advanced solutions and convert good ideas into reality for the benefit of its customers.

The continuous collaboration with Customers, Universities, Technological Research Centers, Institutes, national and international Associations and Organizations guarantees the incorporation of the latest technology.

The recognition of the customer, awards and patents demonstrate the continuing pursuit of innovation, and advances in induction heating technology. Since the worldwide introduction of transistor generators took place in 1986 by **GH Group**, more than 5000 units have been provided.



### Security of your investment

More than 50 years of experience and 4000 customers worldwide from different industrial sectors allow **GH Group** to operate a multitude of synergies that insure its customers the success of their investment.

### The right decision

The presale services available from the **GH Group** include research laboratory, computer simulation by computer, 3D design of the facilities and tests on-site. Combined with the experience and know-how, customers are assured that the decision is always the optimal one before undertaking their investments.

### A customized project

Thanks to the extraordinary frequency and power range of its generators and to the team of engineers and services, **GH Group** adapts the solution in accordance with the needs of each customer while attaining the expected quality levels.

### Flexible project management

**GH Group** adjusts to all requirements and specifications of its customers, developing innovative solutions together with them making their production more profitable.

# efficiency and profitability for your company

### Improvement of the heating process

Replacing other heating methods, updating and exchanging equipment with the high-tech GH generators results in: increasing the energy efficiency, improving the installation reliability, minimizing stoppage in the production line and increasing the quality control.

### Energy efficiency

The transistor generators of **GH Group** using IGBT or Mosfet technologies, serial or parallel outputs and advanced digital control, obtain a very high efficiency with performance up to 95%.

### Reduction of Operating Expenses

**GH Group** designs the equipment, the installation and the control systems with the aim reducing power consumption, cost of operation and maintenance, quality result costs, changeover times, and increasing the lifespan of the inductors (made by microfusion, a patented process of **GH Group**).

Working with **GH Group** is more than just having a supplier of induction systems. It is a solid, reliable company, with more than 50 years international know how, innovation, expertise and pioneering in induction technology.

**GH Group** offers its customers everything needed to make their business more profitable and their investments safer.

### The GH Group Team:

6 production plants

375 employees

in 8 countries: Spain  
France  
Brazil  
Germany  
USA  
Mexico  
India  
China

# our team of personnel as a basis of innovation



The **GH Group** team of personnel, its main asset, is formed by 375 highly qualified employees distributed in 6 manufacturing plants over 8 countries.

**GH Group** has developed a philosophy in which the most important thing is the collaboration between the teams of professionals formed by the company and the customer.

The experience at the customer's disposal, team work and a firm commitment to quality represent the identity of GH Group.

For **GH Group**, ethics and responsibility are fundamental values of its activity.





our mission is to improve  
the productivity of our customers





## Know-how

**GH Group** knows how to apply technology to create increased value while reducing its costs. The key to making technology more useful and beneficial for the customers is the capacity to adapt the experience and the innovation acquired over more than 50 years.



## Green Heating: Ecology

The ecological objective of **GH Group** is to be consistent with the nature of the induction technique: a clean process that takes better advantage of resources and that does not contaminate.

**GH Group** is an organization conscious of the reduction of environmental impact.



## Guarantee

**GH Group** assures its customers long term attention thanks to the international coverage of its services and its membership in a large industrial group.

The fulfillment of ISO 9001 for more than 15 years reflects the early commitment to the highest quality results.



## Flexibility

**GH Group** offers to its customers a complete complement of generators covering the widest frequency and power range on the market and a large team of specialists in applications and engineering that allows the design of systems in accordance with each customer's requirements.



## Reliability and security

The robustness, the implementation of strict standards and the quality tests which every system is subjected to, guarantees the reliable functioning of each installation.

This is supported by more than 5000 supplied systems using Transithermic® generators for more than 25 years.



## Control

**GH Group** offers a total control of the heating process, the operation and the maintenance of the system.

The development of software for system monitoring and application tracking, the local and/or remote communications and the modular design of the systems are among the characteristics which allow this control.



## Pre-sale Services

**GH Group** offers customized services to each of its customers to guarantee the viability of each project. Computer simulation of the heating, 3D mechanical design, definition and development of the parts processes, validation and tests in GH laboratory, as well as at the customer facilities.



## Customer Care Services

The relationship between **GH Group** and its customers continues after the sale, 24 hours a day and 7 days a week, offering services such as: installation and start-up, preventive and corrective maintenance, repair and spare parts, remote maintenance, replacement of generators, telephone service and training on an international level.

# international projection

## Our Customers

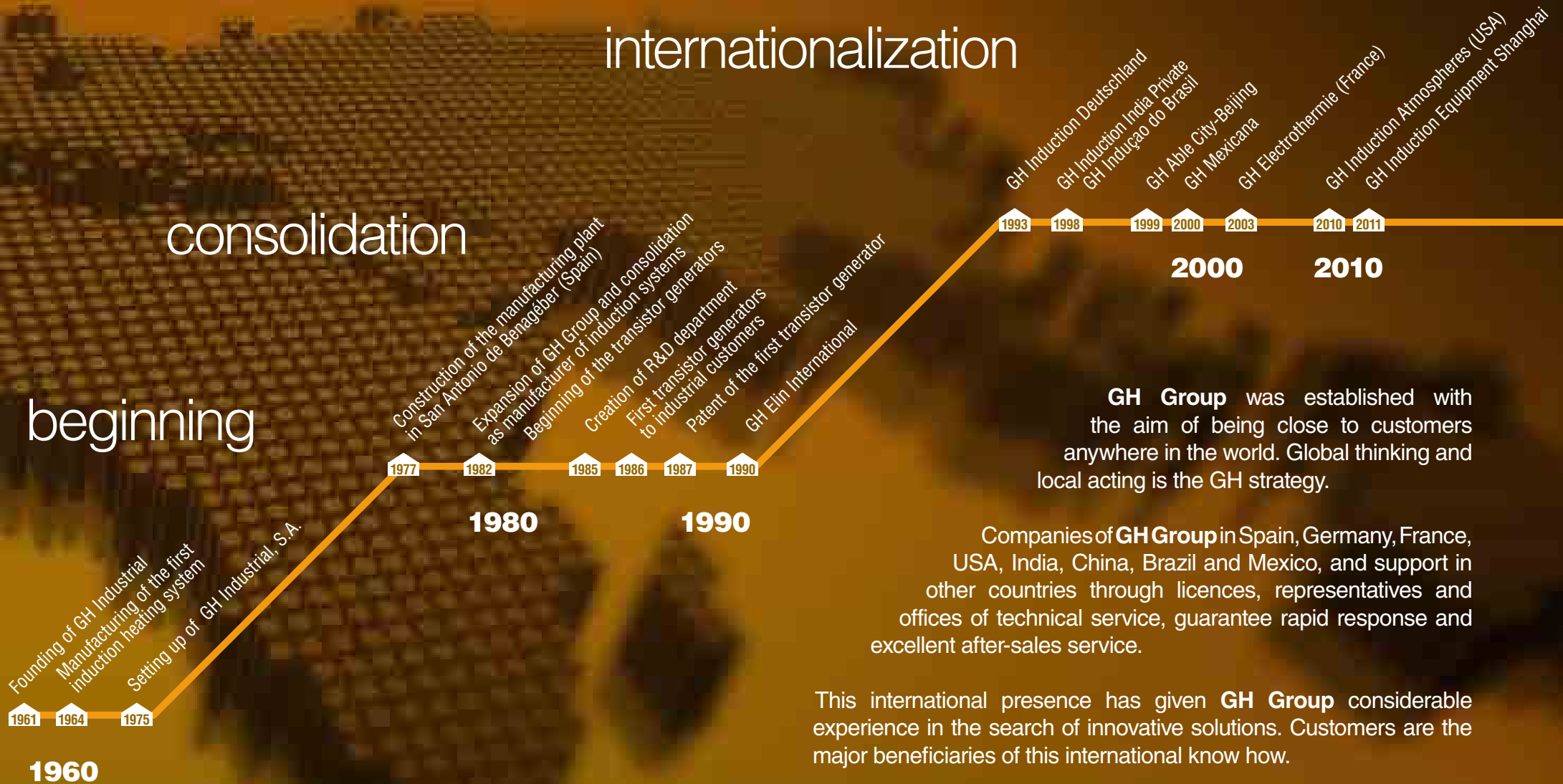
ABB **Aceralia** AEI Cables **AESA** Airbus **Aleppo Cable** Alessio Tubi **Condesa** Arcelor Mittal **Avon Appliances**  
 AUDI **Babcock Wilcox Española** Bamesol **Beijing Automobile Damper Factory** Belgo Mineira **Bellota**  
**Herramientas** Benteler **Bharat Earth Movers** Bill Forge **Blackmer & Mouvex** BMW **Bodycote** Boeing **Bonfiglioli**  
 BSH Fabricación **Cables de Comunicaciones** Camusso Tubo **Cascade Corporation** Chanchung First Auto Air-  
 Compress **Chinchurreta** CIE Automotive **Cigüeñales Sanz** Citizen **Comau** Comforsa **Conductores Monterrey**  
 Condumex **DAE Kyung Industries** DAE Myong Industries **DAE Sung Industries** DAE Won Industries **Daewoo**  
 Daewoo Plastics **Daimler Chrysler** Dana Albarus **Dana Heavy Axle** Dana Industrial **Dana Nakata** Danargen  
 S.A.I.C. **DCNS** Deacero **Defontaine** Delphi **Derbi Nacional Motor** Dong Kang Electronics **Duro Felguera** Eaton  
**EDF** Electro Cable **Embraer** Empresa Nacional Aluminio **Exiros** Fagor Famur Fasur **Faw Chan Chung** Faw  
 Tokico **Ferrosider** Fiat **Fimek** Firestone Hispania Fondalmec **Ford** Forja Industrial Lara **Forjas Atlas** Fujikura  
**GE Aviation** GE Healthcare **General Cable** Gestamp **Gevelot** GKN **GM** Hangzhou Universal Joint Fact **Hebei**  
**Lucky Ocean** Hispainox **Hispanomotor** Honda **Idem** IFA **INA Rodamientos** Inasmet **Inauxa** Indar **Induction**  
**de L'ouest** Induction Tooling **Industrias Alga** International Engines **Inoxcrom** Iveco **John Deere** Kablo Elektro  
**Kiepurex** Koenig **Kolbenschmitt** Kuka **Kyung Hi** Kyung Sung Electric **Land Rover** Lufthansa Technik **Magna**  
 Mahle **Mando Machinery Corp.** Marcegaglia **Moto Diesel Mexicana** Megatherm **Mercedes Benz** Metaldyne  
 Mitti Cables **Nestlé** Nexans **Nextrom** Nokia **Ningbo** Ningbo Haitian **Nissan** NKT **Nothelfer** Norstar **Opel** Piaggio  
 Porcelanosa **Porsche** Precitubo **Prysmian** **Powerlink** PSA **Renault** Renfe **Robert Bosch** Rothe Erde **Sachs**  
**Mannesmann** Saint Gobain **Sandvik Coromant Gimo** Sandvik Española **Scania** Seat **Shanchuan Machinery**  
**Factory** Shanghai Automotive Gear **Shenyang Huicheng** Siemens **Silec Cable** Sipma **SKF** Skoda **SNCB**  
 Snecma **Spicer Ayra Cardan** Sprimag **Ssang Yong** Stalprodukt **Steremat Elektrowarme** Steyr Daimler Puch  
 Sturm **Südkabel** Suzuki **Tata Cummins** Tata Steel **Tech Auto** Techtube **Teka** Tenaris Confab **Tenaris Dalmine**  
**Tenaris NKK** Tenaris Tamsa **Thyssen Boetticher** Thyssenkrupp **Treat. Térmicos Riza** Troester **TRW** TTT Ejes  
**TTT Goiko** Tube Products **Tumesa** Valeo **VB Autobaterías** Visteon **Voestalpine** Voith **Volvo** VW **Westinghouse**  
 Wildfang Automotive **WMF** Wuxi Cable **Yu Chang Industries** ZF Lemförder ...

# history of GH Group

## internationalization

## consolidation

## beginning



**GH Group** was established with the aim of being close to customers anywhere in the world. Global thinking and local acting is the GH strategy.

Companies of **GH Group** in Spain, Germany, France, USA, India, China, Brazil and Mexico, and support in other countries through licences, representatives and offices of technical service, guarantee rapid response and excellent after-sales service.

This international presence has given **GH Group** considerable experience in the search of innovative solutions. Customers are the major beneficiaries of this international know how.

## some successful cases

### tools



### heat treatment of tool holding system

**Engineering of precision and microfusion inductors**  
**Improvement of customer services and reduction of costs**

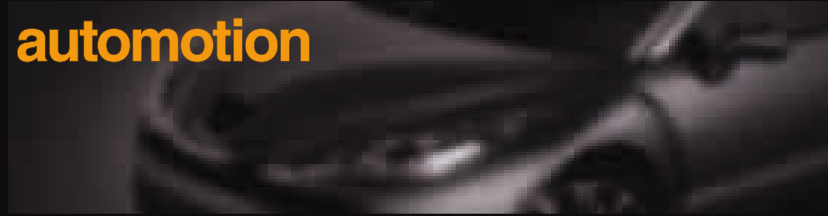
Originally the customer had located machines for different hardening and tempering processes in several countries. GH Group has achieved the unification of these processes and methods in a single cell of robotic manufacturing, reducing the finishing time of parts and reducing the management expenses due to previous processing in several locations.

Furthermore, the new installation included a system of specific manipulators that positioned the parts in the inductors with

high precision. Also, using inductor manufactured through microfusion (exclusive technology of GH) allows for hardening profiles impossible to realize with the traditional copper inductors.

Therefore, the customer was able to surpass the expectations of its requirements shortening delivery time and increasing the lifespan of its products.

### automation



### rotational hardening of big parts

**Rotating inductor and controlled gas consumption**  
**Increased profitability of investment**

The parts were steering housings up to 700mm in length. GH Group developed a system for induction hardening without the need for rotating the parts by turning the inductor instead.

This way the mechanic design of the system was simplified greatly reducing the incidences of vibration due to large imbalances in the rotation system, and allowed the hardening of parts of any length.

In addition the atmospheric gas chamber was replaced by a controlled flow for each

individual part.

The main benefits were: flexibility of the part treatment, reduction and control of the gas consumption by part, increased lifespan of the mechanism and reduction of power consumption by 20%.

The final result for the customer was an investment with greater profit than expected and an innovative project reference within its group.



Inductor manufactured through microfusion (Patent of GH Group)



## petroleum and gas

### stress relieving of pipes

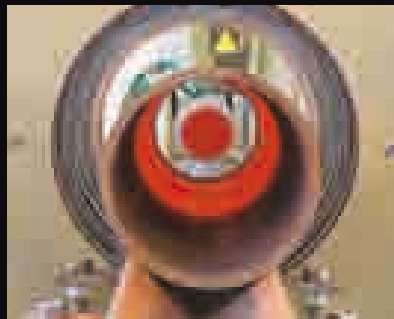
**Adaptation to the requirements of the customer, control of the process  
Increase in the quality of the product**

The pipes used in petroleum fields undergo very severe mechanical conditions at great depths. The customer needed to improve the process of heating pipe ends for elimination of stress.

They looked for an induction solution that heated from 450°C to 650°C depending on the material used for the manufacturing, and a temperature differential in the heated zone of +/- 20°C with a precise control of the cycle times. GH Group designed a temperature regulation system with several parameters

for the control and regulation of the heated zone. Depending on the information of the parameters, the control acted on the generator modifying the power allocation and thus having total control over the treated zone.

The customer was able to increase the quality of the pipe and reduce the operation costs. From the year 2000 GH Group has continued the worldwide supply of systems to this group.



## wind generators

### hardening of large bearings and gears

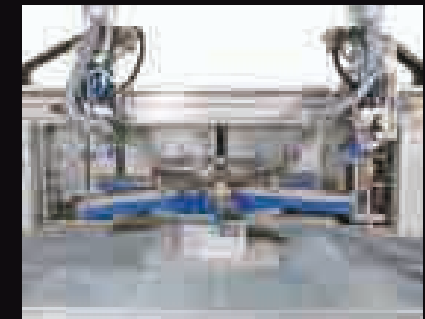
**Automatic adjustment and optimization of the power system  
Greater production and flexibility in resources**

At the beginning of this project, the efficiency of the systems available in the market was inefficient due to the high requirements of adjustment and preparation in the loading of each bearing and during heating. Therefore, the machines needed constant supervision of an expert operator in all the phases of its operation.

The GH solution was compact and free of adjustments. It was based on a lightweight induction system (inductor and transformer) and a set of sensors that provided a data flow allowing recalculation of the pro-

cess parameters and providing precise location automatically. Thus the GH machine regulated itself automatically without the need of supervision from loading through the end of the hardening cycle, obtaining a faster and more accurate process than previous solutions.

The benefits for the customer were a reduction of the production time and reduction of specialized manpower, generating greater flexibility in the production resources.



## some successful cases

### aerospace



### heat treating & brazing turbine engine parts

**Lean manufacturing, small foot print vacuum furnace system  
Work in progress reduction and high quality control**

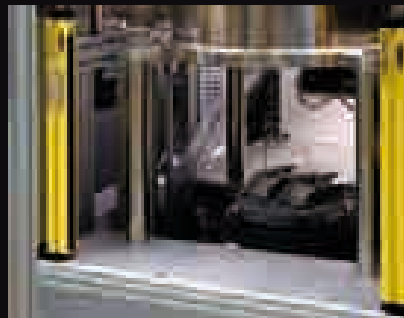
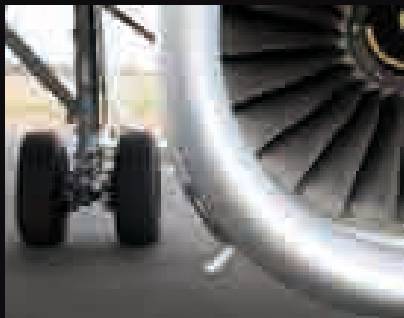
The customer is a leading global producer of jet engines for civil and military aircraft highly focused on lean manufacturing. However they were using batch furnaces for heating so they searched a better option to meet lean and continuous flow manufacturing requirements.

GH Group provided several vacuum furnaces to convert the production cells to small batch flow resulting in a 96% reduction in turn around time.

GH provides their systems with advanced induction heating technology that can reach operating temperature in minutes

instead of hours and individual or small batches of engine parts can be heated with accuracy and consistency. The compact 5'x5' footprint of GH system allows the customer to install the units in work cells on the manufacturing floor, further improving production flow. The new furnaces have the flexibility to heat a variety of part sizes and shapes, including "orphans" from other heating processes. Additionally the GH furnace is over 85% energy efficient vs. about 50% for standard industrial vacuum furnaces.

The customer is currently leveraging this technology throughout their supply chain.



### railway



### high-speed switch blade head hardening and normalizing

**Application expertise and versatile design  
New market and production increase**

Since the high-speed service is being deployed worldwide, the technical requirements in tracks are becoming more and more stringent. A new European Standard on forged rail transitions is being prepared. The switch blade manufacturing customer needed to upgrade its production facility in order to offer the new high-speed product. Initially the new product volume was small making the initial investment an economically unfeasible project.

GH Group offered a flexible installation that allowed head hardening of the high-speed switch blades and normalizing for all forged

blades. The key components in the solution were: changing oscillator depending on the process and the application engineers that were able to meet the railway standard requirements.

Finally the installation became a less than one year payback project and the customer could compete in a new market.



## cable

### post-heating of energy cable

**Application innovation and solution integration know-how  
Competitive advantage to keep market share**

The customer sells complete cable production lines to final cable manufacturers at a global level. As energy cable sector is an intensive competitive industry, our customer was looking for an improvement in its offer to provide added value to its clients. They wanted to increase the output cable production rate (m/min) reducing bottlenecks in the underground energy cable characterized by a large rubber insulator.

Using a teamwork approach, the customer and GH Group engineers improved the vulcanization process by the replacing resistance heaters with induction heating. The challenge was to integrate the GH solution in the rigid and narrow cable line structure

in an aggressive environment with toxic and corrosive fumes.

Finally GH Group managed a system that improved, up to 10%, the production line performance as main benefit. The higher production in new and existing cable lines became the competitive advantage to keep the customer's market share.

Currently, GH Group still keeps a continuous improvement commitment with the customer. The original solution has been improved mainly in the O&M part, adding benefits for the customer's client as low-maintenance design for extended service life.



## shipbuilding

### steel plate induction heating for straightening

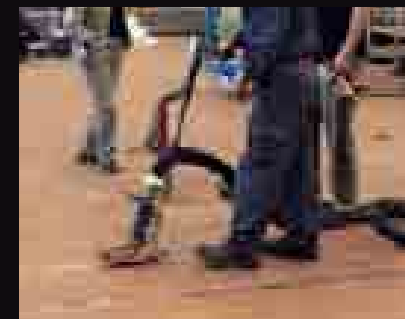
**Induction application and user-friendly design  
Time-process optimization and cost reduction**

The shipyard company used flame torches for distortion straightening on decks and bulkheads that result from the previous welding plate process. Customer searched to avoid the drawbacks of this traditional method (toxic fumes, high skilled operators, time-consuming, etc) and to increase the quality results.

GH Group developed a portable system for both deck and bulkhead plates from 4mm to 20mm thickness in 1 sec/mm and not exceeding 730°C (Curie temperature). The operation did not require skilled operators

because in few hours any operator could work with the equipment getting even better results than previously. Besides the working environment improving dramatically, the health hazards were virtually eliminated and other tasks, in close proximity, were able to be performed.

The process heating time was reduced 80% and the quality of the heating pattern was improved by the customer. Today they are deploying this technology as standard practice throughout their corporation.





# GH solution components

100% GH technology, design and manufacturing



## Pre-sale Services

- Investment Analysis
- Application Development Service (AOS)
- Application Optimization Service (ADS)
- Part test laboratory
- Pre-series production service



## Customer Care Services

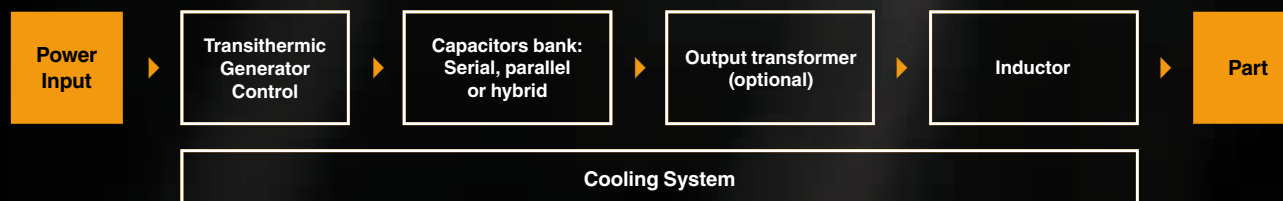
- Start-up Service
- On-site production assistance
- Inductor Shop
- Preventive Maintenance
- Corrective Maintenance:
  - On-site technical assistance
  - Remote assistance
  - 24x7 technical support
- Repair & Spare Parts
- Retrofitting Service
- Generator Swapping Service
- Learning Services



## Power Supply Systems

- Transithermic generators up to 2400 kW and 450 kHz
- Traditional manufactured inductors
- Microfusion manufactured inductors (GH patent)
- Optimized systems for concrete industries as cable and tube

### Standard configuration elements:



# **Machines Installations**

## Customized machines

Ad-hoc projects for specific customer requirements or new applications.

Main parameters to design the installation:

- Type of application
- Production rate
- Part type and range
- Technical part requirement
- Handling system
- Integration with other processes

## Standard base machines\*

Ready-made designed and proven machines/ systems that are used as final configuration by the customer or as a base configuration with adaptation.

Summary of Standard Base portfolios:

- Heat Treatment scanners
- Forging heater
- Tube and pipe welder
- Vacuum furnaces
- Brazing machines
- Automotive parts heat treatment machines (Shaft, CVJs, Crankshaft, Camshaft, Valves)
- Large Rings heat treatment machines

\* Ask to GH Group for the product catalogues



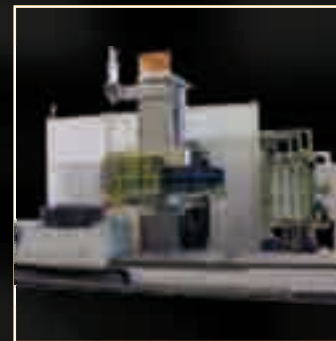
Vacuum Furnace for controlled atmosphere brazing



Vertical scanner installation for hardening and tempering with manual load



Versatile hardening single-shot installation for CVJs, tulips and outer race. Cycle time: 15sec/part

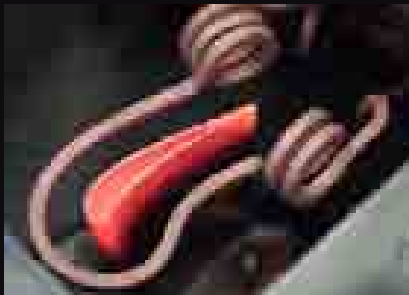


Universal vertical and horizontal scanner installation for large parts



Large rings raceway vertical hardening scanning installation with special tracking system. Up to 4000mm part diameter; teeth and raceways

# examples of applications per sector



Blade heating



Installation for the hardening of tulips  
with two stations (inner and outer)



Aerospace vacuum chamber



Forging heating

## Renewable energies

### Wind • Solar

Heat treatment of large rings and bearings  
Heat treatment of gears  
Soldering of photovoltaic and thermal panels

## Automotive

### Transmission • Suspension • Steering Engine block • Car body

Hardening and tempering of components such as:

- Transmission: shafts, wheel hubs, tulips, fixed outer race
- Suspension: shock absorber spindles and pistons
- Gearbox: gearshift fork, differential case
- Engine block: crankshafts, camshafts, valves
- Steering: ball joint, pinions, racks

Car body component bonding

Heating for shrink fitting

## Railway

### Rolling Stock • Infrastructure • Maintenance

Heat treatment of parts

Heating of rail Infrastructure (rail, fasteners, switches)

Shrink fitting of wheel tire

Brazing of short circuit rings of electrical motors

Straightening of car body panels

## Aerospace

### Engine • Landing gear • Structures • Maintenance

Composite and polymer bonding

Heat treatment of turbine engine blades

Brazing of turbine blades

Forging and repairing turbine components

Heating for assembly/disassembly

## Shipbuilding

### Structure • Engine • Maintenance

Heat treatment of engine parts  
Straightening of decks and bulkhead  
Paint removal  
Preheating for welding

## Petroleum and Gas

Pipe straightening  
Preheat for pipe forming  
Seam annealing  
Heating the ends of sucker rods  
Forming pipe ends for bottles and cylinders.

## Cable

### Energy • Wire

Cable pre and post heating  
Cable degassing  
Sealing of aluminum cover  
Wire pre and post-heating

## Medicine

Annealing inconel tubing in a protective atmosphere  
Brazing Steel Orthodontic Parts  
Metal to plastic insertion

## Food industry

Seal of packages  
Cap sealing  
Mold release

## Tube & Pipe

### Structure • Automobile • Industrial use

Continuous steel pipe welding  
Continuous pipe hardening and tempering  
Continuous pipe annealing and normalizing

## Chains

### Offshore • Industrial • others

Heating of links  
Heating of bars  
Continuous hardening of chains

## Industrial applications

### Offshore • General use • others

Heat treatment of metal frames and platforms  
Heat treatment for agricultural machinery  
Heat treatment for civil works machinery  
Heat treatment for mining machinery

## Forging

Vertical or horizontal heating of bar ends  
Heating of steel bars and billets  
Heating of non-ferrous materials

## Household • Tools

Heat treatment and brazing of tools, drills, cutting equipment  
Heat treatment of large gears, pulleys and wheels  
Soldiering and brazing of tips of batteries, terminals and contacts  
Brazing of pan bottoms  
Welding of miscellaneous parts



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