Induction Heating Equipment

Innovation Technology in Pipeline Construction
Since the early 1980’s, TESI has been providing Induction Heating Equipment for the pipeline construction industry onshore, offshore and for spool base activities.

Today, after 30 years of experience, TESI can provide turnkey solutions for Field Joint processes.

Principles adopted by TESI are to ensure the highest quality and most reliable equipment, to achieve the long-term performance and integrity of the field joint coating.

Fully and semi-automated, field joint coating equipment offers highly repeatable installation processes, capable of achieving high coating production rates, allowing for faster commissioning and reduced pipeline construction costs.

Equipment and processes are designed to minimize any effects to the environment, while assuring the health and safety of operators.

Designed and manufactured in compliance with international and HSE regulations, TESI equipment is approved and certified by worldwide Oil & Gas companies.

TESI Pipeline Engineering is a division in the group, composed of highly skilled engineers, technicians and field operators with in-depth knowledge acquired through continuous in-house training and field management experience supported by the use of innovative software and thermodynamic simulators.
Demagnetization & Welding Pre-Heating

Weldings are the biggest unknown in steel assembled products. In order to increase the reliability of welded structures, the American Welding Society (AWS) issued the Welding Procedure Specifications (WPS). According to WPS, welding pre-heat is one of the most important processes influencing the quality and reliability of weldings. Cold welding or joints welded without uniform temperature through the wall thickness create weak and porous structures, with high internal tensions.

TESI provides a series of Welding Pre-Heat equipment for any kind of application:
- internal and external ring coils
- external clamp coils
- flexible and semi-rigid coils.

TESI equipment guarantees uniform heat not only on the surface but completely penetrating through the steel, with extremely limited tolerance range. Welding pre-heating equipment is designed to contain the heat within the areas to be welded, with high efficiency, extremely short heating time and perfectly clean and dry surfaces. Conventional systems, such as open flame or electrical resistances, cannot guarantee any of these advantages.

High frequency induction systems, although effective, can only generate "SKIN EFFECT". By using these, they are not able to completely match welding pre-heat requirements.

TS DEMAG®, designed, developed and perfected by TESI, is an integrated system detecting and removing irregular residual magnetism by the use of the same coil performing welding pre-heat.

Surface Preparation: blasting

In the field residual magnetism on pipes can be a serious problem. It can cause arc deflection during welding and in some cases inhibits welding process completely. Traditional demag systems on the market can only remove homogeneous and superficial residual magnetisms. These systems are based on alternating currents that don’t penetrate deep into the wall thickness.

Residual magnetism is the result of different pipe manufacturing processes such as cold forging, hardness checks, beveling and magnetic pipe handling. Even pipelines already in operation and buried underground can be magnetized from roaming currents coming from close grounding systems.

In compliance with technical specification and customer requirements, high quality sand-blasting equipment for onshore and offshore projects can be categorized in two different configurations:
- semi automatic series for offshore S-Lay & J-Lay projects
- manual machines

A sand-blasting system is composed of a frame with two spray blasting heads. These guns disperse a high pressure spray of abrasive material directly on to the pipe surface by rotating around it.

This synchronized motion creates a uniformly blasted surface throughout the outer pipe. The system works in a pressurized mode, based on Venturi pipe concept, to provide a safe uncontaminated area for operators and reduce material consumption. Blasting frames can be adjusted to work on a wide range of pipes. All the specifications such as heads trajectories, moving and rotating speed and pressure can be set on the built-in PLC.

In the manual version all the operations described are performed by operators.

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Field Joint Coating OFFSHORE

Offshore projects in the last decade have increased significantly. Contractors typically require high-tech and reliable equipment complying with safety regulations. TESI OFFSHORE EQUIPMENT are designed and manufactured to match the most severe FJC duty cycles required by main Offshore Contractors both for shallow water projects (S-Lay) and deepwater projects (J-Lay).

Once on board, TESI equipment becomes an integral part of the offshore pipe-lay activity, providing a highly recurring process with excellent heating patterns.

FJC systems for OFFSHORE applications include:

- Induction Heating Motor Generator CHG (120-150-180-350 kW)
- Containerized mobile induction heating systems
- Manual, Semi/Full-Automatic Induction Heat clamp coils
- Motorized FBE powder application clamp coils (under development)
- Fluidization Bed (under development)

TESI work closely with their customers providing training for the efficient installation of the field joint coating systems during the construction of the pipeline.

Onshore pipeline construction projects often involve installation of large diameter pipes, spanning many hundreds of miles across varying terrains and diverse climatic conditions. The Right of Way (ROW) Environmental Permits and project scheduling require pipelines to be built and commissioned within strict timelines.

Our experienced technicians and project managers are known around the world for their expertise in the application of a wide range of field joint coating systems in accordance with the parameters of the project specifications and schedule.

FJC systems for ONSHORE applications include:

- Induction Heating Diesel Generator IHG (120-150-180-350 kW)
- Ring & Clamp Coils for Demag, welding Pre-Heating & PWHT
- Manual, Semi/Full-Automatic Induction Heat clamp coils for FJC Pre-Heating

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A spoolbase is a shore-based facility used to facilitate continuous pipe laying for offshore oil and gas production. The facility allows the welding of single joints of pipe, predominantly steel pipe of 4" to 18" diameter, into predetermined lengths for spooling onto a pipe-laying vessel.

TESI equipment and processes have been adopted to deliver rapid cycle times and recurring high quality.

Induction heating compared to conventional radiation methods such as electrical resistances and furnaces, offers several key advantages:

- **Ease of usage**
- **Low maintenance**
- **Quick heating:** development of heat within the workpiece by induction provides much higher rates than the convection and radiation processes that occur in furnaces;

A primary benefit of TESI equipment is to control and limit the heat process just around the area to be treated, improving steel strength and fatigue resistance.

- **Fast start-up:** furnaces contain large amount of refractory materials that must be heated during start-up, resulting in large thermal inertia. The internal heating of induction processes eliminates this problem and allows much quicker start-up;
- **Limited space requirements**
- **Safe and clean working conditions**

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Continuity of work over many years has enabled close working relationships to develop between TESI and spool base operators around the world.

**Applications & Products**

**Post Weld Heat Treatment**

- **Energy savings:** when not in use the induction power supply can be turned off because restarting is so quick. With furnaces, energy must be supplied continuously to maintain temperatures and avoid long start-ups;
- **High production rates:** short heating times lead to an increase in production rates and a decrease in employment costs;
Engineering, Training, Commissioning

TESI has production & service facilities in Italy and USA, provided with first-class handling and quality control systems.

The technical Department is composed by electrical, mechanical and software engineers, assisted by technicians with excellent field experience.

TesISOFT®, a thermodynamic software developed in collaboration with Politecnico di Milano University, allows to simulate the required temperature profile for a perfect tuning of coils and machines.

TESI equipment has automatic setting routines for a perfect adjustment of the parameters. This guarantees optimum equipment performance in any type of climate condition.

IHG 150 MV, the NEW generation of Tesi induction heating equipment (under development), has a Multi-Voltage control that detects which is the best output voltage for the coil in use and automatically switches to the most suitable voltage. It is capable to self adjust all the related parameters such as PF, temperatures of alternator and contact, optimizing the performance of the machine.

Built-in modern communication technologies allow Tesi operators to download or upload firmware and datafiles to and from the CPU. Control panels, PLC and SYNOPTIC screens have user friendly operator interface, networking and USB hardware, and can also communicate with smartphones, tablets or laptops.

Service & Support

While big pipeline projects can have long planning stages, smaller projects usually require short delivery time and high delivery flexibility.

Even more rapidity and promptness is required for Pre-Qualification Tests (PQT), aimed at assuring that the output of the process will meet the desired level of performance.

In order to help and support customers to handle this kind of situations, TESI has a fleet of Generators and Coils at its disposal, capable of managing any kind of requirement for any kind of pipe size.

PQT is composed of a full package of equipment:
- Adjustable Welding Pre-heat coils
- Adjustable coil for coating Pre-Heating
- Shrink-sleeves equipment
- NDT temperature records

Training centers based in Italy and USA offer the following services:
- Basic and complete training courses
- Welding and Coating Pre-qualification tests (PQT), complete with NDT
- Equipment maintenance
- Equipment rental

Customer service is available 24/7 for emergency and technical support but also for commissioning, start-up, assistance and on site maintenance.
Offshore coil closed

Offshore coil open