

Integrated Global Services



Global Repair

Ansaldo Energia Group

Ansaldo Energia is a leading provider of services and equipment for power plants, offering expertise at all levels of complexity for our own and third party machinery for heavy-duty Steam and Gas turbines, Generators, Nuclear, Micro turbines and Shaft Line. We provide global services including Repairs and Spare Parts, Field Service work including overhauls and upgrades, Plant Support with Remote Monitoring and Diagnostics, with transactional as well as comprehensive Long Term Service Agreements.

We are a global supplier of turn-key power plants, with a broad offering of the most reliable and best performing solutions available today, backed up by a dedicated Research and Development group and a global Service organization that assists customers with continuous product improvements, combined with the traditional reliability and robustness of Ansaldo Energia products.

The result is a unique and balanced value package based on innovation and reliability. Ansaldo Energia's solutions combine the company's proven designs, manufacturing capabilities and commissioning skills with its well-known flexibility in matching customer needs with tailored solutions.

At Ansaldo Energia, we recognize that the power market continues to be dynamic and challenging to our Customers. To remain profitable, operators expect global service organizations to offer solutions that improve the efficiency, operational flexibility, emissions, reliability and life-cycle maintenance costs of their power production assets.

Today, 160 years of Ansaldo Energia history are combined with a strategic assemblage of complementary service acquisitions. Not only can our Team provide advanced technology service solutions for your installed Ansaldo equipment, but our uniquely positioned Multi-OEM Platform technologies enable value-based offerings for any large frame GE, Siemens and Mitsubishi gas turbine, steam turbine or generator. This industry-first combination result? A flexible, multi-platform, full-scope service provider that can deliver competitive and proven answers to improve your equipment's life cycle maintenance costs.

With major operations in Genoa, Italy; Rheden, Netherlands; Jupiter, Florida, USA; Abu Dhabi, UAE; and field offices throughout Europe, Asia/Pacific, the Middle East, South and Central America, and the US, Ansaldo Energia offers customers localized service and global capacity to bring the highest level of value and capability to your plant.

We look forward to working with you as we create Power Together!





Global Repair Service Network

In today's highly competitive energy market, power producers need to achieve peak performance while minimizing life cycle costs.

Ansaldo Energia can help with a full spectrum of parts repair services - all backed by our engineering and advanced technology. These state-of-the-art repair services can extend the life of your components and optimize your maintenance budget.



Global Network, Local Repairs

From our headquarters in Genoa, Italy, and with local execution centres in China, Europe, the Middle East, and the US, we offer expertise at all levels of complexity for our own and third party machinery, for heavy-duty gas and steam turbines and generators.

We provide global Repair services that are key to supporting our Long Term Service Agreements and Field Service activities, with a dedicated R&D organization that offers quick solutions and long term improvements thanks to research that has produced over 200 patents.

We develop our own high-technology parts and service solutions to significantly reduce maintenance life-cycle costs by making plant owners' gas turbines more reliable, flexible and efficient. Our Reconditioning capabilities can outperform the Original Equipment Manufacturer (OEM) on life extension and repair yields.

Multi-OEM Platform SP Technology Portfolio



Broad offering leveraging know how and technical capabilities

Global Repair Network Footprint



Power Systems Mfg., LLC
Product Center 60Hz & E & F Class
Workshop
Jupiter, Florida/US

Repair Services Backed by Engineers

In our state of the art Global Repair Network, design engineers work hand in hand with process specialists to assess engine run components from across our product portfolio. Our combined OEM and Multi - OEM Platform portfolio enables us to establish a unique perspective that drives innovation and value for all customers - worldwide.

We utilize state-of-the-art inspection techniques such as digital x-ray, Coordinate Measuring Machines, Non-Destructive Testing, and fully

equipped materials and testing labs in order to accurately inspect and analyze our customers' assets. We determine the best method of repair, and use the most advanced equipment to perform every operation - from laser welding, (HVOF) coating and our F.I.C. cleaning and subsequent brazing processes.

Unlike any other reconditioning facility in the world, we allow you to take advantage of our patented new part design upgrades during repair - a unique combination that adds value to your parts and reduces your cost of operation. Our reconditioning services cover a full range of performance-critical equipment and



Ansaldo Thomassen
Product Center 50Hz
B, E Class
Workshop
Rheden, Netherlands



Ansaldo Energia
Product Center 50Hz E,
F-Class
Workshop
Genova, Italy



Ansaldo Gas Turbine
Workshop
Shanghai, China



Ansaldo Thomassen Gulf
Workshop
Abu Dhabi, UAE

components ranging from gas turbine hot gas path components including blades, vanes and heat shields, to combustion components, rotors, fuel nozzles, generators and steam turbines, all with the reassurance of quality standards that a customer would expect from a Global OEM.

Gas Turbine Hot Section Parts Repair

Ansaldo Energia's wide scope for component repair is fully backed by advanced technology and back office engineering know-how and know-why. Our state-of-the-art repair facilities work hand in

hand with design engineers to develop processes that ensure fit, form and function for further turbine operation. In addition, the unique cross platform design knowledge lends itself to cross platform repair synergies, therefore optimizing our offering to the customer, and allowing us to provide repair service for all OEM equipment.

In-House Parts Repair

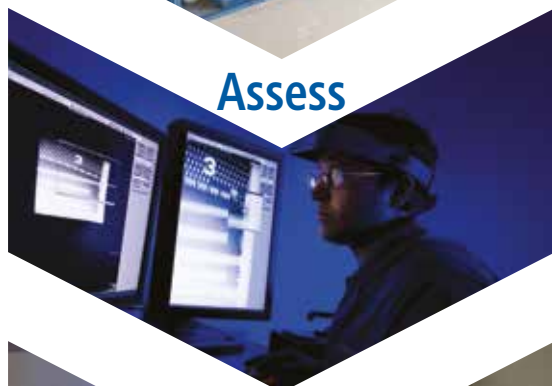
Ansaldo Energia has a philosophy of providing all required processing in-house. This ensures that even the most advanced F-class components can be reconditioned as per our customer needs.

The Repair Process



Stripping Cleaning & Preparation

- Grit Blasting
- Chemical stripping
- Ultrasonic cleaning
- Detail parts removal



Assessment

- Visual
- Fluoresant Penetrant
- Red Dye
- Eddy Current
- Ultrasonic thickness measurement
- CMM
- Metallurgical
- Airflow
- Digital X-Ray



Repair

- Manual TIG welding
- Laser Cladding
- Flouride Ion Cleaning (FIC)
- Brazing - narrow gap
- Brazing - Overlay
- Belting / Blending
- CNC Grinding
- CNC Milling
- EDM
- Single Point EDM - Cooling hole drilling
- Laser Drilling
- Honeycomb replacement
- Coupon Replacement
- Vacuum Heat Treatment



Coating

- HVOF
- APS
- Slurry Aluminide
- CVD Aluminide
- Dual wire arc



Quality Control & Final Inspection

- Metallographic Lab
- SEM
- Visual
- Moment Weigh & Sequencing
- Frequency analysis
- Dimensional - Fixturing
- Dimensional - CMM
- ISO 9001:2008 Certified



Gas Turbine - Rotor

Ansaldo Energia has a long history of Gas Turbine Rotor overhaul, repair and upgrade. Our services have always acknowledged that our customers' needs go beyond singular service requirements to that of a total care package for their assets. We provide multi-platform service at strategic locations worldwide:

- Standard rotor overhaul - including compressor re-blading when required
- Rotor component repair
- Rotor component replacement
- Upgrades
- Residual life assessment

All of our customers' requirements can be complemented by site-to-site shipping and logistics and re-commissioning service if required. As needed, critical rotor features undergo proprietary repair processes such as robotic welding of journal areas in order to restore dimensions to the original design intent. Alternatively, components such as compressor or turbine disks can be manufactured and supplied.

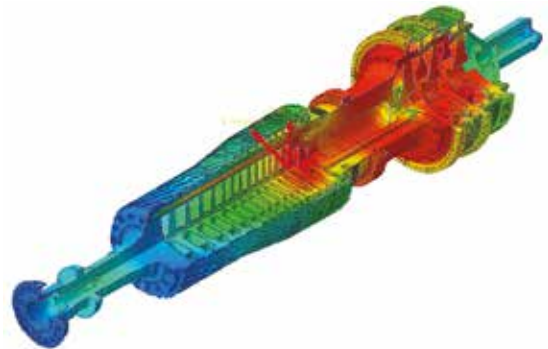


Rotor Residual Life Assessment

Ansaldo Energia's Rotor Residual Life Assessment (RLA) can extend the useful lifetime of your rotor. With the advancements in computing power, material properties, fracture mechanic methodologies, and inspection techniques, it is now possible to assess the potential to run rotors beyond their original published limits. Rotor RLA is enabled by:

- Advanced non-destructive inspection techniques, utilized to detect surface and volume flaws
- Full rotor material characterization
- Full 3D Finite Element Analysis (FEA) models for thermal & structural analysis
- Inspection results and operational history fed back to the FEA Model

Any problematic flaws identified are analyzed, and a report detailing the predicted remaining rotor capability is generated, empowering owners to make informed decisions about their rotor assets. Optional rotor modifications can be applied called LifeMod's, that are designed to extend rotor lifetime in known life limiting locations.





Fuel Nozzle Repair

The Global Repair Service Network is the industry choice's one-stop-shop for tuning, testing, repair and refurbishment of fuel nozzle components for all major models of industrial gas turbines. We understand the complexity of Gas Turbine Fuel Systems and excel in collaboration and tuning to deliver optimal performance. Our staff of experienced OEM and Ansaldo Energia trained technicians and engineers have implemented flow tolerances that are 50% lower than the OEM published allowable for nozzle-to-nozzle flow variation. The attention to detail yields reduced temperature spreads, fewer hot-spots in the combustion system, and a reduction in combustion dynamics.



Shaft Line

Shaft Line offers a total plant solution which utilizes Ansaldo Energia's engineering and field service resources partnered with external service providers.

Shaft Line offers:

- Integrated total plant solutions which utilize our global network of technology, experience and resources
- Multiple product lines, services and commercial teams, working together in unison with Ansaldo Energia as your single point of contact
- Competitive product and service offerings driven by customer demand – working on the solutions needed most by our customers
- Demonstrated performance, flexibility, and on-time execution

For more information and to reach our sales Team, please go to www.ansaldoenergia.com

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