Services for industrial power plants

Alstom is dedicated to keeping industrial power plants competitive. Thanks to our experience on Alstom OEM turbines as well as equipment from other OEMs, and our involvement in around 25% of the world’s power production capacity, we operate from a position of proven expertise. With 15,000 power industry professionals spread across 200 worldwide locations, Alstom Thermal Services supports customers by providing extensive service solutions; for daily operations and maintenance and for lifecycle management challenges.

In a changing competitive and regulatory environment, flexibility and expertise are key. Building on our global fleet and project execution experience, we partner with owners of Alstom and other OEM equipment to help maximise performance and lifetime profitability while keeping safety, reliability and environmental compatibility as top priorities.

Alstom is a global organisation that cultivates cutting-edge expertise at the product/technology level while maintaining a strong local presence to meet site-specific needs and to efficiently deliver tailored solutions in both established and emerging markets. Whether you require support in the areas of skills or systems, we have the technology, solutions and presence to meet all your needs.
Building on a broad heritage Alstom offers a dedicated team of engineers and service technicians to address the needs of operators of all makes of industrial turbines across the whole lifecycle.

In today’s dynamic and competitive markets industrial plant operators are under pressure to enhance the performance and lower the lifecycle costs of their equipment.

With more than 100 years of turbine design experience, Alstom is a global leader in power generation technology and services. Alstom’s industrial steam turbine service organisation combines the expertise of an original equipment manufacturer with the flexibility of an independent service provider.

With advanced technology, service facilities and solutions we can provide fast responses, optimised outage times, highest technical standards and strict EHS practices.

**Technological expertise**
Do you need spare parts or repairs during inspections or unplanned outages? We have a vast portfolio of solutions developed for our own fleet and advanced reverse engineering capabilities and spare parts packages to cover major fleets of steam turbines from other manufacturers.

**Full shaftline solutions**
Alstom package solutions allow you to focus on your core business while we provide the team, know-how and facilities to keep your shaftline productive and profitable.

**Better than the original: upgrades and retrofits**
Using Alstom parts with advanced designs and materials you can improve operations, maintenance and life expectancy. Our retrofits fundamentally improve turbines to meet today’s operational challenges.
Presence

Alstom Thermal Services has a powerful and effective global supply chain and the largest global field service organisation in the power industry. This world-wide presence ensures high quality and timely responses from dedicated, trained and experienced service managers, engineers and technicians.

The Industrial Steam Turbine Services organisation can draw on the whole Alstom network to support customers with powerful technology, expert engineering and quick access to the solutions that they need.

- 1 global product centre dedicated to industrial steam turbines
- 32 R&D engineering sites with > 2300 engineers
- 62 local service centres
- 33 field service hubs
  with > 5000 field service experts
- 17 service workshops
- several mobile workshops

Local Service Centres (LSCs) and workshops in over 60 countries worldwide

Industrial Steam Turbine product and execution centres
capacity

Technology
Thanks to our OEM expertise and service-focused R&D, Alstom has a range of technology-driven solutions to improve operations and maintenance for any industrial steam turbine. We can also optimise the performance and output of all types of design and all stages of the steam path thanks to a wide range of technological expertise.

Solutions
Alstom offers a one-stop shop with a portfolio of solutions covering the whole life of the industrial steam turbine (IST). From optimising operations, inspections and overhauls to lifetime extension or upgrades for power and flexibility, we have the expertise and the implementation capabilities that only a globally-active OEM and field service provider can deliver.

Alstom solutions cover the whole steam turbine lifecycle:

• Field service, parts and repairs
• Life extension and performance improvement
• Technical expertise and operational support

>1,000 own industrial steam turbines in operation
>100 years of experience in steam turbine design and maintenance
>100 services for industrial turbines of other makes

>30 years retrofitting steam turbines of other manufacturers
References for ALL major makes of steam turbines

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Ability to boost performance, reliability and flexibility of your industrial steam turbine of any make:

• Design and configuration
• Reverse engineering
• Condition assessments
• Component analysis
• Flow path aerodynamics and thermodynamics expertise
• Surface coatings and material substitution
• Instrumentation & control systems
• Diagnostics, system reliability improvements
• Hydraulics upgrades
• Failure analysis
Parts

With Alstom’s in depth expertise in reverse engineering we are able to support standard and complex industrial steam turbine parts during the ongoing overhaul. With the application of the latest validated tools and our over 100 years long design experience we can provide spare parts with improved design features and materials for better part performance. Our pre-defined spare parts catalogues for standard spares and the Alstom rapid reverse engineering process ensure that necessary parts are delivered to site whenever they are needed.

All our reverse engineering parts are designed, manufactured and tested according to Alstom’s OEM quality process to ensure the highest reliability for our customers.

Alstom not only provides for its many legacy machines but can also re-engineer non-Alstom designs and even improve upon them. We provide the full range of industrial steam turbine parts, from generic fasteners to large strategic spares, and are constantly pursuing an efficient supply chain with increasing local content.

- Bladed / unbladed rotors
- Casings, gland housings
- Blades, diaphragms, gland segments
- Bearings
- Valve internals and actuators
- Control system modular spares
- Fasteners
- Gaskets and seals
- Filters
- Consumables
Alstom offers a complete portfolio of products and services for the industrial steam turbine, regardless of original manufacturer, type or application. To optimise the lifetime performance of your turbine we offer:

- Field service
- Parts
- Repairs
- Technical expertise and operational support
- Performance improvements
- Service contracts
- Services on all OEM turbines

**Field services**

With best practices and time-saving proprietary advanced tools for disassembly and assembly, Alstom plans carefully to reduce downtime and ensure on-time completion with the highest quality results.

Our first commitment is to the environment, health and safety. And thanks to standardised training and processes you enjoy the same Alstom quality irrespective of your plant location. Thus, our highly qualified supervisors and site engineers are equipped with state of the art tools and conduct rigorous quality checks at every stage of the job.

We offer:

- Maintenance services, e.g. minor & major overhauls
- Erection & commissioning
- Blade removal and installation
- Valve & actuator overhauls
- Condition assessment and non destructive testing
- Site repairs

**Repairs**

Alstom has developed an array of proven repair techniques for all parts of the industrial steam turbine. These include many specialist repairs for parts such as blades, diaphragms, glands and valve components. To reduce outage time, many tasks can be done in-situ. Alstom offers repair services for all industrial steam turbine components.

- ROTORS: Straightening, balancing, weld repairs, disc head repairs, disassembly and rebuild
- CASINGS: Re-rounding, erosion and corrosion repair, welding
- BLADING: Control Stage repair or replacements, fixed and moving blades, last stage blades
- SEALING: realignment and partial/full exchange of gland seals

**Mobile workshops**

Alstom’s mobile workshops allow us to respond to planned or unplanned outages on industrial turbines, generators and other related equipment – anywhere, anytime.

- Full shaft-line machining of rotors
- Balancing of rotors
- On-site machining for turbine and generator components, including casings, shafts and valves
- Specialised mechanical and electrical testing for generators
- Generator rewinds on-site
Alstom supports all major types and makes of steam turbines in all industries. From simple advice, to inspections and overhauls, up to major upgrades and retrofits.
Technical expertise and operational support

We assist customers in maximising their machine’s operation, reliability and availability with:

**Operational support**
- Emergency response planning
- Outage compression techniques
- Remote operations support

**Assessments & analyses**
- Performance & lifetime assessments
- Condition assessments
- Monitoring and diagnostics
- Operational analysis
- Design studies

**Outage planning**
With Alstom’s Outage Time Reduction initiative we optimise every last detail of the outage through careful planning. From materials and parts requirements to logistics, lay-down areas and crew communications, every detail is considered for the fastest return to availability.

Service contracts

Alstom service contracts are win-win arrangements to increase operative efficiency and eliminate parts or resources availability risks in the face of both planned or unplanned outages.

Alstom’s Long-Term Service Agreements and Emergency Response Plans can be tailored to perfectly fit your scope, duration and risk-sharing requirements.

**Long-Term Service Agreements**
An LTSA is one umbrella agreement for partial or complete industrial power plants covering on site advisors, engineering support and planned maintenance/parts support. This helps you to maximise generation and minimise downtime over the whole lifetime.

**Fleet wide maintenance agreements**
We can offer international fleet wide maintenance agreements to cover all your plant service, parts, stock management and emergency response needs. Agreeing on the commercial conditions only once, rather than for each site, cuts your costs and saves time for everyone.
Performance improvements

Many steam turbines have unexploited capacity and capabilities due to the conservative nature of their original design. To unleash latent potential, Alstom has developed a unique set of solutions that improve efficiency and output or boost operational flexibility and reliability of individual parts or whole systems.

**Upgrades**

Inefficiency, parts obsolescence, performance deterioration and reliability issues can all be addressed with Alstom upgrades. Upgrades do not require a new rotor, but can give your turbine a new lease of life, boost reliability and efficiency and even reduce CO₂ emissions by replacing individual parts with improved design and features.

**Control, monitoring and diagnostics**

By upgrading your automation and control to Alstom’s ALSPA platform, you benefit from more governing functions, SIL-3 protection and the possibility for easy integration of modular monitoring and diagnostics systems.

We offer:
- Full or partial steam path upgrades
  - Blading, last stage blading, inlets and exhaust
  - Steam chest replacement
  - Valve internals upgrades
  - Auxiliary systems or components modernisations
  - I&C upgrades

**Retrofits**

Alstom retrofits are modifications where major internals are replaced (e.g. rotor, blading, stator). This can be required when changed operating conditions lead to different output requirements, in the case of poor efficiency or when the risk of age-related failure is on the rise.

**One name fits all**

Since the 1980’s, Alstom has been pioneering steam turbine retrofits across brand boundaries. Thanks to significant ongoing R&D investments, we can implement latest turbine know how and developments into existing steam turbines whatever their origins.

We offer:
- Partial retrofits – a new inner cylinder and partial blading and layout changes
- Full retrofits – a completely new steam path covering one or more cylinders

**Benefits:**
- Increased lifetime
- Efficiency improvement
- Capacity adjustment
- Rapid installation
- Heat rate improvement
- Power increase

Whatever your service needs are, we have the means to satisfy them.

Our work is not finished until your service needs are met.
Service focused R&D

Alstom’s commitment to R&D for service solutions is unique in the power industry. Through R&D we are developing technology to maintain plant productivity and meet evolving environmental requirements. And we are leveraging our fleet perspective to make the most of every service opportunity.

R&D advantages

Alstom has a track record of leading steam turbine technology developments in the areas of steam path, frame architecture, component design and material development. We focus on constant improvement to give our customers the technology advantage of a leading Original Equipment Manufacturer.

In order to make existing plants more competitive over a lifetime, we are developing a broad range of innovative capabilities covering product upgrades, component and system modernisations, repairs, and improved parts, outage optimisation, consultancy tools and remote monitoring services.

Fleet management insights

With our fleet management approach we constantly analyse the performance of Alstom and other OEM fleets. Using insights gained, we proactively support customers. Our goal is to address potential product/system issues before they affect performance, availability and reliability.

- Predict service needs e.g. parts, inspections and upgrades
- Recommend scope of work/procedures for outages
- Provide technical input for Research & Development
- Providing solutions for generic fleet issues
Engineering expertise and advise

On the foundation of solid product and solution developments and the understanding of technical requirements during the lifecycle, Alstom provides the following areas of expertise.

**Design and configuration**
- New design of parts from the valves through to the last stage blading
- Reverse engineering of all steam turbine components
- Mechanical design configuration for thermal performance
- Customised design solution

**Mechanical Integrity**
- Finite Element Method (FEM) used for calculations
- Frequency & vibration analysis
- Creep/FEM analysis of components
- Low Cycle Fatigue (LCF) and High Cycle Fatigue (HCF) analysis
- Lifetime calculation
- Critical crack growth assessment
- Failure analysis

**Performance**
- Flow path optimisation through aerodynamic improvements
- Thermodynamical calculation of steam path
- Heat Balance Calculations

**Materials**
- Surface treatments
- Coatings of valve parts and blades
- Chemical composition
- Material substitution

**Instrumentation & Control**
- I&C upgrades and retrofits
- Monitoring & Diagnostics
- System reliability improvements
- Hydraulics upgrade
Last Stage Blade replacement

NDT findings revealed blades with cracks in the location of the damping wire. The longest crack was 12 mm.

Scope
Alstom performed reverse engineering of the blades and production of the instructions for manufacturing and assembly, as well as the planning the installation and testing work. Raw materials were delivered from an Alstom warehouse and we were also responsible for the rotor assembly and testing.

Results
Alstom performed the necessary reverse engineering for sixty blades in five days. The production of the blades was successfully completed over the Christmas and New Year period. All NDT, reverse engineering, production and installation work was performed in 6 weeks to the client’s fullest satisfaction.

Specifications
- Waste to Energy plant, Belgium
- Unit: ABB Nürnberg V50A 19NW

Retrofit for power output boost

To support an increase in the production of ammonia, the customer had to increase the steam turbine capacity that powers the process. On the strength of the extensive experience and references, Alstom was awarded the steam path retrofit job.

Scope
Alstom converted the units from impulse to reaction type blading supplying a new rotor and inner parts with the latest Alstom blading technology.

Results
The overall efficiency was improved as the turbine power output was boosted to 34 MW. This represents a 4% output increase, with 3% less steam consumption. The conversion also eliminated a last stage blade failure problem and provided a strong basis for future performance and reliability.

Specifications
- Ammonia chemical plant, Russia and Ukraine
- Units: MHI 103JT 27 MW
Adaptation to process parameters

Steam turbine design and mass flow mismatches have been known issues for over a decade at a corn processing plant in Illinois, US. Alstom was asked to design and implement a retrofit solution.

Scope
The rotor was retrofitted with Alstom high performance blading and the number of reaction stages was reduced to 30. Integral welded-on impulse wheels were installed in the HP, IP and LP-sections. An asymmetric rotor groove for the first row, longer LSB blades, and shrouds for improved sealing of the LP blades were all part of the improved design.

Results
The outcome was in accordance with expectations thanks to the careful studies of the thermodynamics and shaft dynamics along with 3D modelling during the design phase. With better efficiency and more LP flow, power output was up +3.5 MW.

Specifications
- Food processing, Decatur, Illinois, US
- Units: Alstom, BBC DEEK-026, 64 MW

A major reverse engineered repair

Due to extensive erosion of the inner parts, Alstom was asked to do a major repair on a Siemens Schuckart single-casing reaction turbine. The strength of our reverse engineering capabilities, a competitive offer and the fast delivery were important in the customer choosing Alstom.

Scope
Alstom’s work included the following: Detailed condition assessment of the turbine casing, rotor, bearings, emergency stop valve, HP and LP control valves. Then major repairs and supply of a completely new set of LP rotating and stationary blading, including a clean cut, rebabbitting all shaft-line bearings, new LP nozzle ring, complete new ESV and control valve internals, bolting the upgraded split line and finally renewing all sealing strips on the LP rotor and stator parts.

Results
The turbine was successfully re-assembled, re-commissioned and handed over to a satisfied customer. The benefits were life extension and enhanced efficiency.

Specifications
- Chemical process utility, Germany
- Unit: Siemens Schuckart 32 MW
A comprehensive legacy

Thanks to the depth and diversity of our manufacturing heritage and operational feedback from one of the largest installed bases in power generation, Alstom’s capabilities cover the full range of steam turbine and related technologies on the market today.

A fresh impulse for industrial steam turbines

In 2008, Alstom returned to the industrial steam turbine (IST) business with renewed vigour. A new industrial turbine design group was formed to combine the best of our OEM heritage with the agility of a small and focused organisation dedicated to new industrial turbine projects. And in 2010, we formed our new IST services group to offer a superior one-stop solution for all your IST operations, maintenance and lifecycle needs.
With Alstom as your industrial steam turbine servicing partner, you can rest assured of speed and expertise.
Environment, health and safety

At Alstom, the safety of our employees and contractors is paramount. We also strive to take care of our environment and to continually reduce the environmental impact of Alstom’s operations throughout the world.

Zero deviation plan

Our long-term safety initiative, the “Alstom Zero Deviation Plan” has been reducing the accident rate since 2011.

Having learnt from the analysis of past incidents Alstom has implemented nine Safety Directives which we audit and have improved the control of our contractors.

In the spirit of trust, team and action, every employee and contractor must know and practice the Alstom Life-Saving Rules in their daily work. They are accountable for challenging others when they see Directives and Rules being broken.

Dedicated to excellence (d2e)

d2e is a strategic programme that represents our commitment to operational excellence with five key pillars:

- Quality
- Lead time reduction
- Cost competitiveness
- Standardisation and modularisation
- People and safety
Alstom is a global leader in the world of power generation, power transmission and rail infrastructure and sets the benchmark for innovative and environmentally friendly technologies.

Alstom builds the fastest train and the highest capacity automated metro in the world. It also provides turnkey integrated power plant solutions and associated services for a wide variety of energy sources, including hydro, nuclear, gas, coal, wind, solar thermal, geothermal and ocean energies. Alstom offers a wide range of solutions for power transmission, with a focus on smart grids.

Alstom Power offers solutions which allow our customers to generate reliable, competitive and eco-friendly power.

Alstom has the industry’s most comprehensive portfolio of thermal technologies – coal, gas, oil and nuclear. With leading positions in turnkey power plants, power generation services and air quality control systems, Alstom is pioneering developments in carbon capture technologies.

Alstom offers the most comprehensive range of renewable power generation solutions. Today we offer hydro power, wind power, geothermal, biomass and solar. And with ocean energies, we are developing solutions for tomorrow.

Alstom is one of the world leaders in hydro power, the largest source of renewable energy on the planet.