

GAS SERVICE SOLUTIONS

# PERFORMANCE FOR A LIFETIME

GAS TURBINE RECONDITIONING



POWER |

*We are shaping the future* |

**ALSTOM**

# Welcome to Alstom Power

Alstom is a global leader in power generation with a portfolio of products covering all fuel types. From fossil and biomass to nuclear and renewables, close to 25 per cent of the world's power production capacity depends on Alstom Power technology and services.

Whether in design, manufacturing, procurement or servicing, Alstom Power is setting the benchmark for innovative technologies that provide clean, efficient, flexible and integrated power solutions. Alstom can supply anything from single components to complete turnkey power plants. Our Plant Integrator™ approach and power automation and control solutions ensure the optimisation of all elements to derive the maximum lifetime value from all our customer's investments.

Alstom Power has more than 100 years of experience in the engineering, procurement and construction (EPC) of new power plants. But our engineers are also experts in retrofitting, modernising and servicing existing plants. With operations in 70 countries, Alstom Power is close to customers all over the world, ensuring rapid responses and service excellence at all times.



close to **25**  
per cent of the world's  
power production  
capacity depends on  
Alstom technology

**52,000**  
employees in  
70 countries  
around the world

**100**  
years of industry  
expertise

**With our recognised expertise all over the power generation market, we are able to find solutions to the challenges of today.**

## **CLEAN POWER TODAY!®**

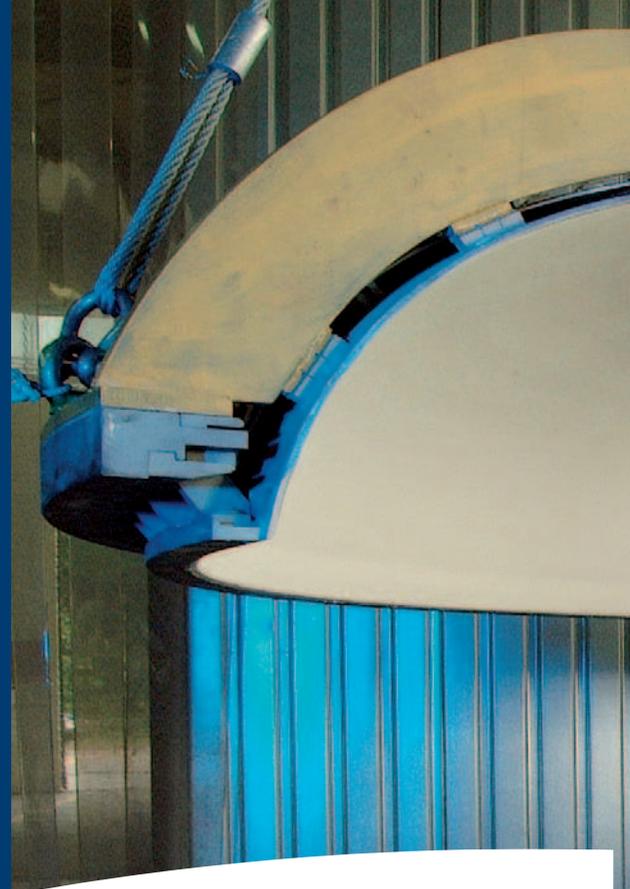
We recognise the need to improve the environmental balance of legacy plants while increasing the realisation of new clean energy solutions.

## **PLANT INTEGRATOR™**

Our solutions maximise performance by optimising the complex interactions between sub-systems from design to operation.

## **LIFECYCLE MANAGEMENT**

At all stages of the lifecycle we support owners to maximise their return on investment, while minimising negative environmental effects.



EXTENSIVE SERVICE  
SOLUTIONS IN POWER  
GENERATION:

NEW AND IMPROVED PARTS

**RECONDITIONING SERVICES**

ADVICE AND  
OPERATIONAL SUPPORT

FIELD SERVICES

PERFORMANCE  
IMPROVEMENTS

SERVICE CONTRACTS

SERVICES ON OTHER OEM



In today's tough markets, plant owners need **inventive and reliable reconditioning solutions** to optimise and enhance their return on assets.

# Reconditioning to **reduce lifecycle costs**

**In a dynamic market and regulatory context, utilities, independent power producers and merchant power generators are all looking to maximise their return on investment by optimising plant lifecycle economics through reconditioning.**

**At Alstom, we combine OEM insights and fleet experience to establish a unique perspective that allows us to offer the most efficient reconditioning solutions.**

Whatever suits your business needs best, we recondition or further upgrade components to the latest technological advantages to maximise the performance of reconditioned parts.

With over 100 years of turbine design and manufacturing and more than 30 years of reconditioning experience, Alstom provides high-quality reconditioning solutions to reduce lifecycle costs, while at the same time keeping your risk at a minimum.

Parts reconditioned by Alstom will fit perfectly – so there are no unexpected surprises during reassembly. Alstom delivers full sets with seamless fallout replacement and assembly material. In operation, reconditioned parts will perform indistinguishably alongside new parts.

The decision to recondition is best taken based on customer-specific and condition-based criteria. That is why we offer on-site inspection, metallurgical analysis and lifetime evaluation. Reconditioning with Alstom is a powerful step towards enhancing your total lifecycle management.

# A complete reconditioning

## Reconditioning, upgrades, spares, full service

**Our innovative reconditioning services and portfolio of upgrades cater to the needs and concerns of all plant owners who want to increase availability, reliability and performance.**

Extending the operating life of the hot gas path components and boosting performance is our speciality.

Building on over 100 years of turbine manufacturing, operations and maintenance experience, we know how

to design, build and recondition in a manner that will achieve the best return on investment from any engine.

Our reconditioning service covers the full range of noble parts for Alstom and other OEM equipment:

- Turbine components: vanes, blades and heat shield segments
- Compressor components: blades and vanes
- Structural parts: vane carriers, liners and hot gas casings
- Combustor components: lances, burners, swirlers, etc.

## Systematic steps for quality reconditioning results

### 1. Assess

We use an array of assessment tools to define the reconditioning scope and to monitor the process steps.

From the incoming inspection where we check the component version serial number and component condition, throughout the complete reconditioning cycle, we ensure full traceability of every step.

### 2. Strip/Clean

Surface contamination and old coatings need to be removed, before detail inspections and subsequent repairs can take place.

Besides classic mechanical and chemical methods of cleaning, we also employ advanced thermo-chemical cleaning techniques like fluor ion cleaning to remove oxides from the finest tip of a crack in preparation for crack brazing.

### 3. Repair

Increasingly advanced materials and technologies are being employed in the quest for higher power output and efficiency. This adds complexity to the repair job.

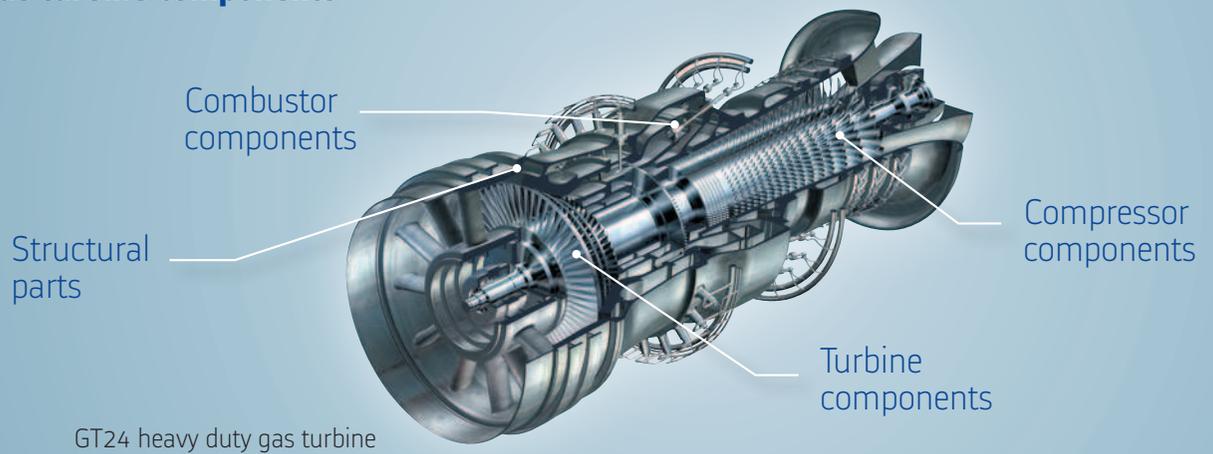
Alstom's substantial investment in people and technology means we can efficiently handle manual and automated repair processes including welding, brazing, machining and laser-based processes.



# portfolio

## Reliability through expertise

### Reconditioning gas turbine components



#### 4. Coating

Superior coatings play an important role in allowing higher operating temperatures and optimising total lifecycle costs. For better protection against corrosion, oxidation and heat damage, Alstom has a full range of advanced coatings.

#### 5. Quality

With our wide range of assessment methods and thorough documentation, we are able to present firm evidence that the reconditioned parts are according to specifications.

Thanks to Alstom's cutting-edge reconditioning technologies, many parts that would otherwise be replaced can now be reconditioned.



# Technology and quality leaders

Extending lifetimes, enhancing

## Alstom's global technology

Technology leadership is the key to reconditioning that enhances performance and extends component lifetimes and inspection intervals.

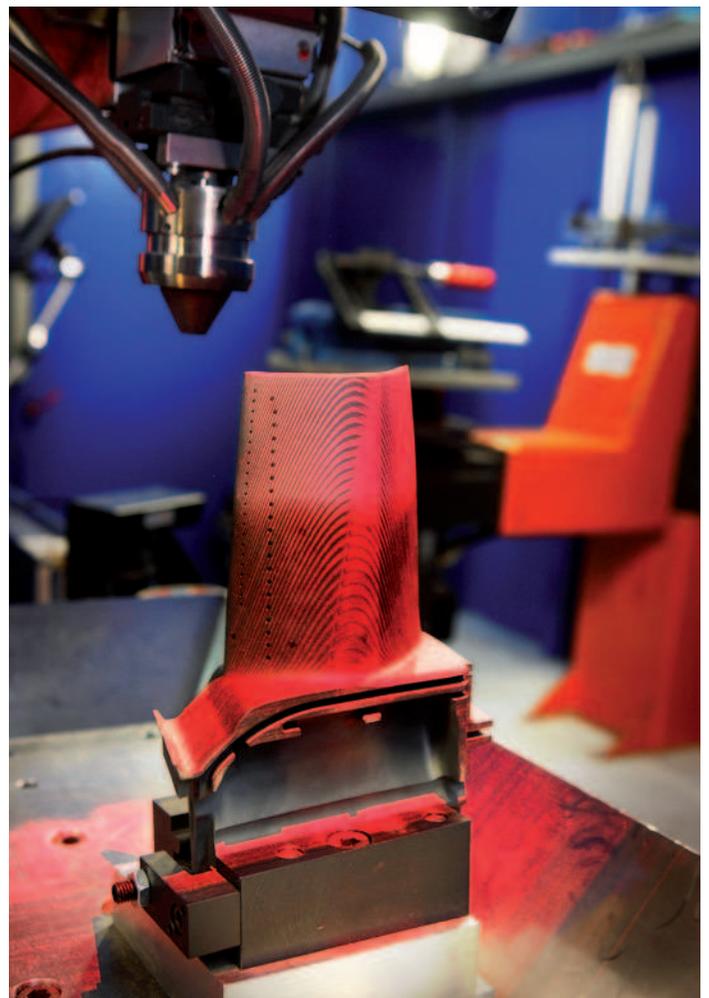
Reconditioning with Alstom is not just about getting your unit back online. We seek every opportunity to reduce emissions and boost performance by taking advantage of modern design insights to propose modifications that deliver added value. With this we bridge the technology gap between the time you bought the turbine and our current capabilities.

### Expertise in reconditioning and latest design evolutions

Alstom's reconditioning network has a strong link to the turbine development centre, which gives us first-hand knowledge of emerging technologies and the latest design improvements. Our experienced reconditioning and repair engineers have access to full-sized gas turbine test rigs and are supported by Alstom's coating and material research laboratories.

Thanks to our investment in cutting-edge technologies:

- New super-strong materials are revolutionising our reconditioning methods
- New techniques and automation technologies are reducing scrap rates
- Improvements can be made to whole sets of components cost-effectively





# hip performance

## Putting **quality first**

A modern, traceable quality assurance system is integral to Alstom's reconditioning process. From the incoming controls, to the final checks, every step of the reconditioning process is carefully monitored and documented.

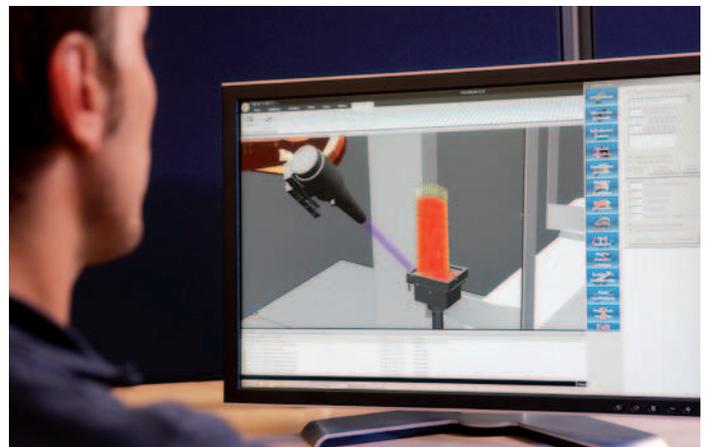
Quality assurance for reconditioned parts is particularly important, because a correct form-fit is essential to avoid any unexpected surprises during reassembly. Furthermore, for reconditioning to be an attractive alternative, the reliability of reconditioned parts has to match that of new parts.

### **A mindset and a system**

Quality control at Alstom is not a department: it is the mind-set of all our highly trained employees whose skills are continuously honed to global standards. All our reconditioning workshops are ISO 9001:2000 certified. Furthermore, our Reconditioning Diagnostics and Statistics platform (R-DAS) enables us to have full traceability for each component and manufacturing and quality assurance step.

### **High standardisation**

Standard reconditioning processes are developed, tested and audited in one of our technology centres before being implemented and certified for each reconditioning workshop in our network. Close communication between workshops and our technology centres ensures the continuous growth of our practical knowledge and experience.



# Closer to you and your needs

## Global reconditioning

We operate six fully equipped reconditioning workshops close to our main markets. They are staffed by reconditioning specialists who are committed to providing top quality services through advanced technology and professionalism.

Our global reconditioning network, product lines, field service and sales organisations collaborate closely to ensure for you the very best support. Our global organisations derive insights and added value by systematically managing the knowledge accumulated within our global fleet. At the local level, we cooperate closely with you to determine solutions that suit your exact needs.

### Partnering for speed

This combination of global reach and local partnership means everything happens faster when it needs to:

- We can conduct on-site assessments rapidly or arrange the full-service approach where Alstom is responsible for all the logistics and work from disassembly to reassembly and everything in between.
- Besides shorter lead times, our customer proximity is the basis for better condition-based or customer-specific reconditioning strategies.
- The identical procedures, equipment and training levels throughout our global network allow us to balance loading in our workshops and ensure timely delivery to our customers.

On average, we process well above 50,000 components per year in our global reconditioning network.

### Reconditioning workshops around the world

Switzerland, Birr



Blading, Combustor parts

Croatia, Karlovac



Structural parts

UAE, Dubai



Blading, Combustor parts

USA, Richmond



Blading, Combustor parts

USA, Jupiter



Blading, Combustor parts

USA, Danville



Structural parts





capabilities

## Reconditioning **unlimited**

The Alstom Company PSM (Power Systems Mfg, LLC) located in Jupiter FL, USA, provides a wide range of technologically-advanced aftermarket gas turbine capital components, parts reconditioning services, field services, monitoring and Long-Term Agreements (LTAs) focused on non-Alstom equipment worldwide.

PSM is fully integrated into the Alstom organisation and works to the same high Alstom standards, completing overhauls in a timely, safe and high-quality manner worldwide.

As a full service provider, the PSM team supports a wide range of power equipment, including gas and steam turbines, generators and auxiliary equipment.



### **Our PSM offering portfolio**

Our reconditioning product portfolio for the 50 Hz and 60 Hz markets includes blades and vanes, low-emission combustion systems, compressor components and other capital parts including:

- Hot gas path and combustion component reconditioning for other OEM's, including Siemens, GE and Mitsubishi.
- An entire range of re-engineered and fully compatible compressor, combustion and hot gas path components for the GE 7FA and Siemens-Westinghouse 501F engines designed to improve lifecycle costs.
- Performance upgrade packages for the 7FA and 501F engines that increase efficiency, power output and inspection intervals.
- An ultra-low emissions LEC-III® combustion system for GE's B, D and E class engines, including drop-in combustion and hot gas path replacement components for the 6B, 7E and 9E.
- LTAs that are structured to meet the specific needs of each individual plant and account for changing market conditions. Our flexible agreements incorporate state-of-the-art PSM parts, reconditioning, field services, "24/7" plant monitoring and engineering support to optimise maintenance budgets, and lower costs over the life of the agreement.

# Service contracts

Alstom's service contracts are tailored to meet all your operational, maintenance and support requirements. Whether you prefer a Long Term Agreement (LTA) or an Operation & Maintenance (O&M) contract with Alstom's comprehensive, yet flexible agreements, you can be sure of a win-win situation.

## Partnerships for performance

Long-term agreements are based on framework contracts that define prices and conditions in advance. Besides offering preferential conditions for high-quality parts and services, the LTA reduces administrative efforts and simplifies planning. The scope of services and equipment covered, as well as the contract duration and risk sharing, can be adapted perfectly to your needs.

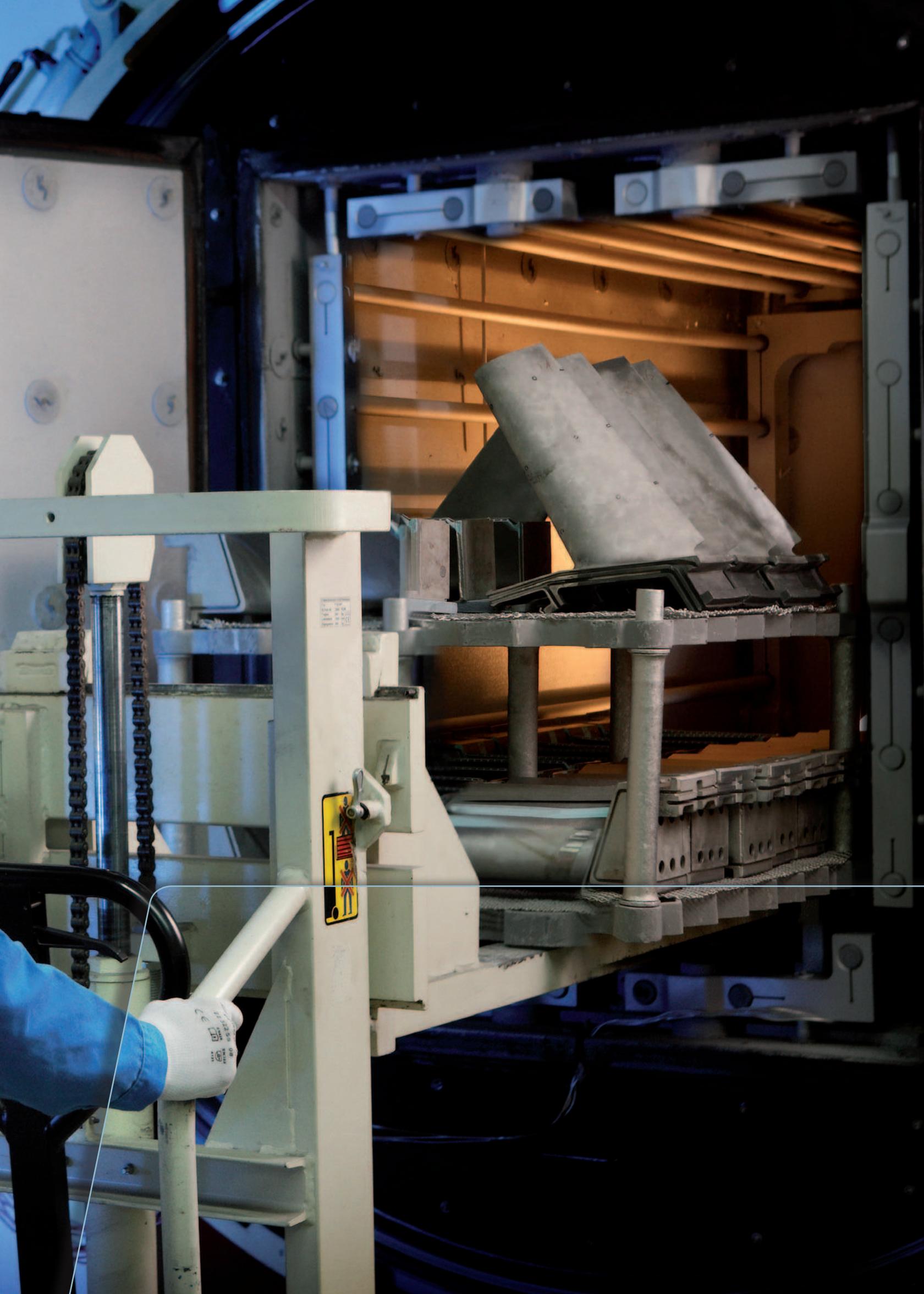
**LTAs** offer many immediate advantages:

- Fixed preferential prices for parts and services
- Flexible scope to suit operative strategy
- Extendable scope to include almost any aspect of plant operations

Alstom's operation and maintenance contracts let plant owners devise completely new management strategies by outsourcing risks and responsibilities. Take advantage of performance and availability guarantees through tailored agreements that perfectly suit your required service and equipment scope.

Alstom's **O&M contracts** are fee-based agreements that:

- Mitigate risks
- Leverage Alstom's extensive experience in plant asset management
- Can be adapted to suit your business strategy



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