ROLLING STOCK MODERNIZATION
ENGINEER A NEW LIFE FOR YOUR FLEET
OUR ROLLING STOCK MODERNIZATION CAN IMPROVE THE DESIGN AND PERFORMANCE OF YOUR TRAINS, BOOSTING YOUR RESULTS WHILE ENHANCING THE CITY YOU SERVE.

THE TIME HAS COME
You’ve made your decision: it’s time to modernize your fleet. Your service may have been performing well but to meet new customer requirements, more stringent regulations and environmental challenges, not to mention heavier operational and maintenance costs, you’re going to have to make some significant improvements. Modernizing your rolling stock is a positive, pragmatic choice. It requires less investment and shorter lead times for delivery than new trains, and causes fewer disruptions to operations. You end up with a much-improved fleet providing better operational and maintenance performance while boosting your image. Your costs are lower, your passengers are more comfortable and you can count on additional decades of high-quality service life.

THE LOGICAL ANSWER
Our modernization services are the logical extension of our experience as train manufacturers. We understand where the rail industry is heading and what operators’ needs are likely to be, today and tomorrow. We have the experience and the know-how to propose innovative solutions. Our technologically advanced engineering and industrial capabilities are at your disposal for modernization operations. Possessing dedicated Centers of Excellence, we have the means to work on all types of rolling stock worldwide. Among the possibilities: a dynamic new look inside and out, a highly performing traction system to improve reliability and energy savings, and the latest passenger amenities for greater comfort.
The more complex the modernization, the more important the prototype demonstration needs

We offer two types of modernization to give operators of every kind and situation the widest range of engineering and industrial options.

**Design/prototype & kitting**

For the operator or local partner with the desire and industrial capacity to keep the work in-house, we provide the design and deliver equipment and parts to the company carrying out the work. This facilitates industrialization and assures quality control over speed and cost. Alstom engineers work up the technical solutions that will enhance fleet performance while meeting your industrialization requirements. A prototype serves to validate the design. When the local workforce is to carry out the modernization work, Alstom delivers high quality kits on a precision schedule, thanks to a well developed supply chain, along with full technical and industrial support.

**Full Modernization**

In addition to the design/prototype & kitting commitments noted above, Alstom acts as the project integrator, carrying out the industrial part of modernization operations, which include series tests and the delivery program.

**GUARANTEED RESULTS**

We guarantee that all rolling stock modernized by Alstom delivers on projected performance expectations. We have extensive experience with every type of rolling stock. Bringing the product to a team of engineering experts guarantees optimum efficiency: good design from the start saves time, money and avoids trouble-shooting further down the line.

**OUR COMMITMENTS TO YOU**

Alstom products and services will:

- Improve your fleet in terms of capacity, reliability, energy consumption and operational performance
- Increase your passengers’ comfort and enjoyment
- Extend the life of your rolling stock
- Improve your fleet’s maintenance performance
- Boost your image and passenger service

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**Environmental preservation**

Environmental respect is a key driver in every phase of our modernization process, from energy-efficient design through end-of-life recycling. Responsible toxic waste removal and disposal, regenerative braking usage for energy savings of up to 30%, and lower noise are just a few examples of our environmental policy at work. On diesel-electric shunting locomotives, our newly developed hybrid traction package sets new standards in terms of environmental friendliness and profitability, with fuel consumption reduced up to 30%.

**Alstom Centers of Excellence**

Our engineers are dedicated to modernization operations, concentrated in seven Alstom Centers of Excellence, each with its own specialization:

- Reichshoffen, France; Hornell, USA; and Lapa, Brazil: integration of rolling stock solutions
- Neuhausen, Switzerland: bogies
- Preston, UK; and Ridderkerk, the Netherlands: traction, auxiliaries and motors
- Villeurbanne, France: electronics

Our modernization teams have expertise on every type of rolling stock.
Our modernization of the Spanish very high speed AVE fleet had the benefit of our unparalleled technical understanding as its manufacturer and maintainer.

Beating Obsolescence

Modern rolling stock integrates an ever-increasing amount of electronics. Limited volumes, reduced inventories for such parts and changing standards have turned obsolescence from a risk to a near-certainty over the 30-40 year life of rolling stock. Combating this, our Electronics Center of Excellence is responsible for the global process: entering all the components to be monitored in a database (of 80,000 items today), collecting “last availability” information, analyzing technical solutions offered by original equipment manufacturers and defining optimized treatments. Our strategy is to provide efficient support to our customers’ maintainers and our maintenance teams.

Traction for Success

Underperforming or unreliable traction systems routinely lead to low availability or service delays. For EMUs, metros, trams and electric locomotives, Alstom proposes a complete range of solutions using the most up-to-date technology, with IGBT* modules and digital control either as inverters and new AC motors or as chopper if DC motor use can be extended for an additional 20 years. Both solutions guarantee improved reliability and availability, obsolescence-proofing, energy savings via regenerative braking, significant reductions in maintenance costs and a short-term return on investment.

Four Reasons to Always Consult Alstom

1. Proven engineering: from Day One of your project, time and costs are cut from standard modernization operations. Huge gains in efficiency are made by sending a train to one of our 7 engineering sites for due diligence and prototyping by dedicated engineering experts.

2. Experience and expertise: drawing on years of experience in modernizing all types of rolling stock, our engineering experts are available to work on a project basis with local partners.

3. Integrated design & styling: Alstom has an in-house dedicated team to create tailored interior and exterior designs.

4. Proactive, knowledgeable support: our manufacturer and service provider perspective allows us to help our customers optimize the scope of their modernization.

Prototype for Efficiency

The first step in the modernization process for Mexico City’s fleet of 25 metro trains was to send one of its motor cars to the Netherlands. At our Center of Excellence in Ridderkerk, our engineering experts used this car as a prototype to find the optimized solution: replacement of the DC chopper by one using IGBT technology, replacement of braking resistor and re-use of DC motors. With the power modules and traction control supplied by the Dutch site, the installation and commissioning of the fleet is being carried out in Mexico.

* Insulated Gate Bipolar Transistors
SOUTH AFRICA
TRANSNET: FULL MODERNIZATION OF 9E LOCOMOTIVES

South African freight operator Transnet has significantly increased its iron-ore hauling capacity, thanks to our modernization of its 31 locomotives, which had been in service for 20 years. The contract with Alstom, signed in 2000, guaranteed results: the objective of 40,000 mean km between failures was met by July 2007, well within the warranty period. The scope covered a new electronic control system, new gear cases, cab redesign, multiple-unit operation, and performance-related upgrades. New equipment was designed and manufactured in our Preston Center of Excellence. Integration was performed by our local partners.

THE NETHERLANDS
DUTCH RAILWAYS: EMU TRACTION MODERNIZATION

In 2003, Alstom began modernizing 60 three-car and 30 two-car EMU trains for Dutch Railways. The fleet, in regional service since 1975, had been incurring relatively high maintenance costs due to aging power control and auxiliary generator components. Along with the general overhaul, Alstom replaced the dated resistor-controlled DC drive by our advanced technology IGBT chopper and upgraded the auxiliary supply system. This chopper system greatly reduced the need for preventive maintenance. The new traction enabled the fleet to recuperate brake energy, decreasing energy costs by over 25%. By switchgear reduction, maintenance costs were also lowered. Modernized trains returned to service in 2005, their availability and reliability significantly improved. Other deliveries follow throughout 2009. Alstom is also guaranteeing repair and spare parts service for three years.

VENEZUELA
CARACAS METRO: REDESIGNING EQUIPMENT AND ELECTRONICS FOR RELIABILITY

Under this modernization contract for Caracas’ 378 metro cars built between 1973 and 1981, Alstom guaranteed from the outset that it would deliver a fleet with three times the overall reliability. A promise it kept. The work scope covered the renovation of traction equipment and motors, auxiliaries, HVAC*, pneumatic and brake equipment as well as the replacement of traction electronics, auxiliary converter control unit, and battery charger.

* Heating, Ventilation and Air-conditioning
A new livery for Spain’s high speed AVE fleet, part of its total modernization

**SPAIN**
**RENFE: MODERNIZATION OF VERY HIGH SPEED FLEET WITH RENOVATION OF INTERIORS**

After 15 years of successful service at 300 km/h, it was time for the AVE to re-polish its commercial image. Spanish operator Renfe chose Alstom, the fleet’s manufacturer and maintainer, to modernize its 18 AVE very high speed trains. The scope included a full renovation of the trains’ interiors, seats, passenger in-fainment, and mobility impaired access as well as exterior painting. The work started in 2006 at our maintenance depot in La Sagra, Spain, and is to be completed in 2009.

**REVIVING BRAND IDENTITY:**
**IMPROVING PASSENGER SERVICE AND COMFORT**

**FRANCE**
**RATP & SNCF: REJUVENATING PARISIAN COMMUTER TRAINS**

Alstom is modernizing the interior of 119 Paris region commuter trains manufactured by our company in 1979, giving them a “like-new” life extension of 20 years. For RER B operators RATP and SNCF, Alstom will first carry out studies and supply an upgrade kit (air-conditioning equipment, cabling and seats) for a pre-series trainset before delivering kits for the other 118 trainsets. The renovated trains will be more comfortable for passengers, with new seats, grab poles, ceilings, lighting and passenger information system. Certain access doors will be fitted for an automatic, retractable lift to help disabled people board. Under another contract, Alstom will also equip the entire fleet (476 cars) with a video surveillance system and an optional system for transmitting images to a control centre via Wi-Fi. Car interiors will be viewable in real time in the driver’s cab and images stored on digital recorders.

Inside the AVE’s new buffet car

A new livery for Spain’s high speed AVE fleet, part of its total modernization
EXTENDING THE LIFE OF ROLLING STOCK

SHUNTING LOCOMOTIVE MODERNIZATION CENTER

Our modernization center, located in Stendal, Germany, has a 125-year tradition of overhauling locomotives and other rolling stock. Today, it is a leader in creating revenue-enhancing, environmentally sound solutions for our customers. Our comprehensive modernization service for shunting locomotives relies on state-of-the-art technology to transform aging fleets into practical, high-performance units at affordable prices. Lifecycle assessments provide ecological comparative data such as energy consumption figures. Among the many options are: a new, high-performance diesel engine with accessory air intake and emissions system, self-cleaning particle filter, rebuilt dynaflo drive, new cooling system, state-of-the-art pressurized air brake system and electronic locomotive control and monitoring with optional radio remote control.

FREIGHT WAGON MODERNIZATION CENTER

Alstom has produced all types of new freight wagons over the years and this experience serves us well for modernization projects. In addition to manufacturing rolling stock, our state-of-the-art Salzgitter (Germany) facility also employs 200 people specialized in modernizing, overhauling and maintaining all kinds of freight wagons, coal hoppers and tankers for transporting gas, chemicals, oil and food. The highly trained staff offers a full range of services including updating braking equipment and other wheelset work to reduce noise and improve performance, sandblasting for anticorrosion tanks, painting cabin with drying, brake, bogie, buffer workshops, internal and external cleaning of tanks and wagons, nitrogen-gas cleaning for tankers.

PORTUGAL CP: MODERNIZATION OF COMMUTER TRAINS

After 30 years in service, the 57-train commuter fleet run by Portugal’s CP needed an image overhaul as well as a technical one to increase its attractiveness and reduce global operating costs. Alstom was chosen in December 2000 to modernize the three-car EMUs built in 1970 by another manufacturer. This modernization added 20 years to its service life. The scope of work included a full overhaul of the steel car bodies and couplers; and addition or replacement of the front end, seats and internal fittings, lighting, access doors, air-conditioning, passenger information system and digital driver’s desk, IGBT traction system, motor bogie and train control monitoring system.
ROLLING STOCK MODERNIZATION WITHIN OUR GLOBAL OFFER

Alstom is dedicated to accompanying your fleet throughout its lifespan.

Modernization is a logical continuation of our rolling stock activities, as leading manufacturers of all types of passenger and freight rolling stock. Our modernization teams draw directly from our continuously updated technological know-how and field experience.

Alstom’s rolling stock modernization activity is part of our global Train Life Service, which covers every aspect of fleet care. Our strategically located Centers of Excellence provide a full range of services for operators worldwide, including maintenance, product supply chain and technical support services for spare parts and repair, as well as crash repairs.

We also specialize in the modernization of rail infrastructure, including tracks, electrification and signalling, such as CBTC* upgrades.

* Communications Based Train Control

Through its know-how and the excellence of its products, Alstom is shaping the future of energy and transport infrastructure and contributing to improving the living and working conditions of people throughout the world. Today, more than 65,000 people in 70 countries are making an active contribution to the growth and sustainable development of its business.