

ALSTOM TRANSPORT

2010-2011



GENERATING
SUSTAINABLE MOBILITY

We are shaping the future

ALSTOM



**SUSTAINABLE MOBILITY,
CLEAN AND ECONOMICALLY
EFFICIENT RAIL SYSTEMS**

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**DESIGNING
EFFICIENT AND SUSTAINABLE MOBILITY**

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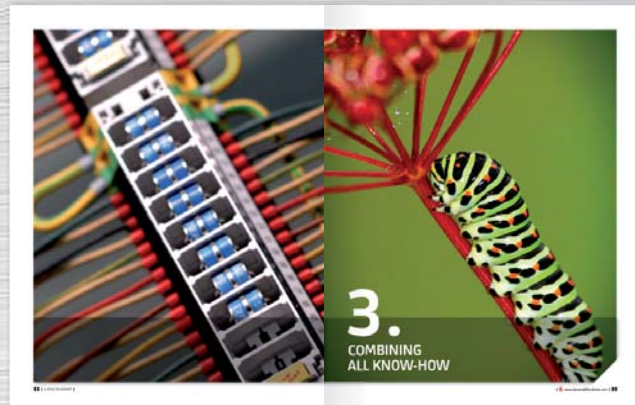
*More pictures and videos available on
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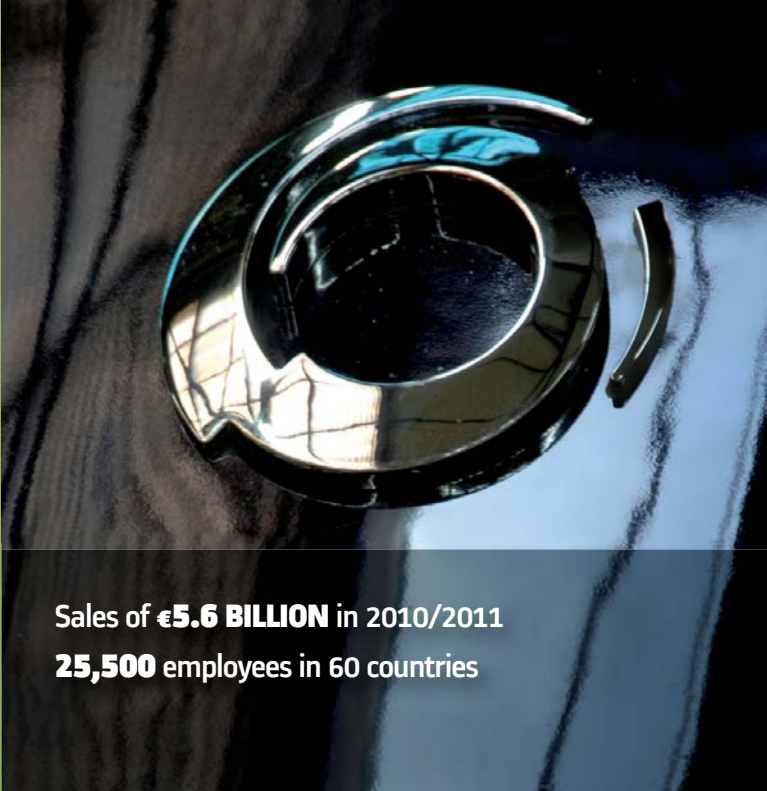
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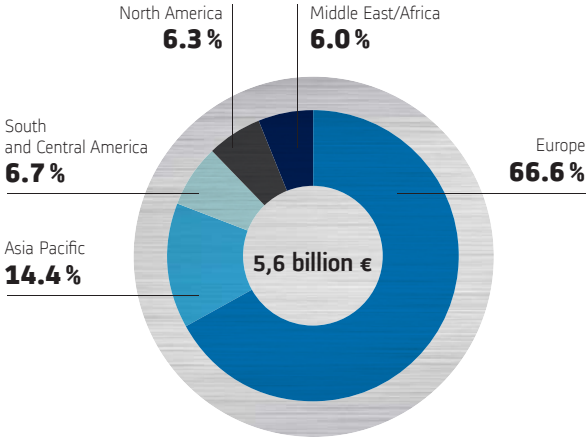
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EVERY TYPE OF KNOW-HOW**

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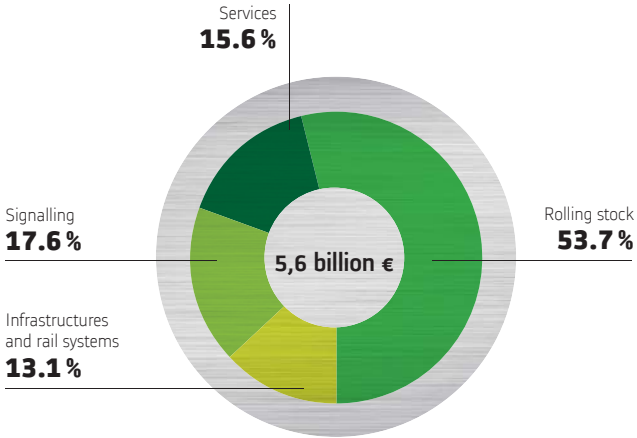


Sales of **€5.6 BILLION** in 2010/2011
25,500 employees in 60 countries

**SALES
 PER REGION**



**SALES
 PER TYPE OF PRODUCT**



SUSTAINABLE MOBILITY, CLEAN AND ECONOMICALLY EFFICIENT RAIL SYSTEMS



Alstom Transport is present in over 60 countries and employs 25,500 people worldwide.

This proximity is the main advantage it offers its customers. With regional hubs in every continent, the company can keep abreast of local issues and requirements. Each geographical implantation is a long-term commitment, contributing to the local economy and supporting local skills through recruitment.

Alstom Transport manages transport systems across the board, including rolling stock, signalling and infrastructure, offering its customers turnkey solutions. The only manufacturer in the world to master every business in the rail sector, Alstom aims to meet the profitability, comfort and safety targets of its customers. The company focuses on providing both ecological and economical solutions. To take advantage of future opportunities while remaining competitive, Alstom continues to invest regularly in R&D to innovate and modernise its production facilities.

As a partner in more sustainable mobility, and guided by its values – team spirit, trust and action – Alstom makes a daily contribution to rail transport.

Henri Poupart-Lafarge

Chairman of Alstom Transport







1.

DESIGNING EFFICIENT AND SUSTAINABLE MOBILITY

DESIGNING EFFICIENT AND SUSTAINABLE MOBILITY



ALSTOM, WORLD LEADER ON THE RAIL MARKET, HAS FOR 20 YEARS PLACED ENVIRONMENTAL PRESERVATION AT THE HEART OF ITS DEVELOPMENT STRATEGY AND IS CREATING THE CONDITIONS NECESSARY FOR THE EMERGENCE OF REAL SUSTAINABLE MOBILITY.



By 2015, the number of cities in the world with a population over of one million could reach 540⁽¹⁾. Nearly 350 million people will live in megapoles of over 10 million inhabitants⁽²⁾. Passenger and freight rail traffic will accompany this growth. Transport's share in world CO₂ emissions is 23%⁽³⁾. Rail transport is rightly seen as the most environment-friendly because it only accounts for 0.5%⁽³⁾ of emissions generated by transport. It therefore becomes a strategic tool to transport more people and more goods further and faster, whilst reducing road congestion and urban pollution.

Alstom's offer combines economic performance and technological innovation to serve passengers and meet the challenges of sustainable development. This strategy expresses the group's desire to prepare the future by preserving the planet.



AN "ECO-PROTECTIVE" LIFECYCLE

Rail infrastructure shapes territories, influences ways of life and affects economic development. Alstom integrates environmental parameters at the design stage to achieve sustainable mobility. This process, called eco-design, consists of controlling and reducing the impact that products have on the environment at every stage of their lifecycle, from manufacture to recycling. Alstom first began an in depth reflection on this issue in the mid-90s, and research continues at the "Eco-design" Centre

established in 2003 at Valenciennes (France). What is more, the company participates in several international competitiveness centres, such as I-Trans in the North of France, where engineers and academics work together on problems related to the environment.

Alstom anticipates energy performance and material recovery at the different stages of a product's lifetime. The environmental impact of most products on air, water and ground pollution, the consumption of raw materials, the production of greenhouse gases, the destruction of the ozone layer and the production of hazardous waste are assessed, even before the product is designed, by the Environmental Information and Management Explorer (EIME) software. Alstom has been helping the French Environment and Energy Management Agency (Ademe) to develop this software since 1987. This type of assessment is currently being carried out on projects such as the Rouen Citadis tram, the Citadis-Dualis tram-train in France and the DT5 metro train in Germany. Regular maintenance by Alstom Transport services ensures environmental preservation throughout the operational cycle of the product.

A product's end-of-life is factored into the equation from the outset. By anticipating regulatory changes, Alstom progressively eliminates certain hazardous substances and materials, such as hexavalent chromium. Alstom also works on the REACH⁽⁴⁾ programme and continues to be proactive in eliminating SVHCs⁽⁵⁾. It favours easily-recyclable materials such as aluminium,

(1) Source: the D+C Development and Cooperation journal.

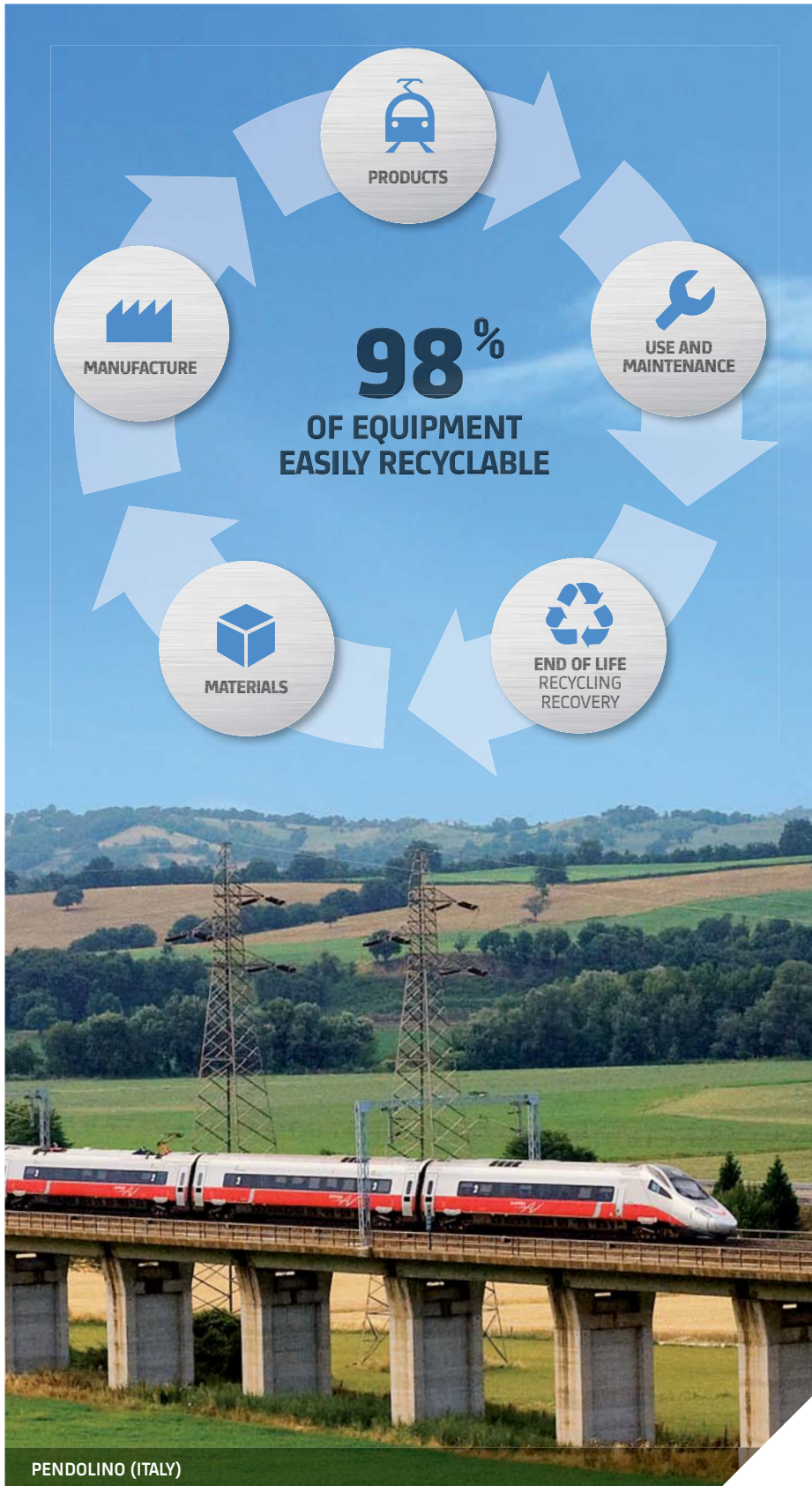
(2) Source: UNFPA, the United Nations Population Fund.

(3) Source: International Energy Agency.

(4) REACH: Registration, Evaluation, Authorization and Restriction of Chemical Substances

(5) SVHC: Substance of Very High Concern

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98%
OF EQUIPMENT EASILY RECYCLABLE

MANUFACTURE

PRODUCTS

USE AND MAINTENANCE

MATERIALS

END OF LIFE RECYCLING RECOVERY

PENDOLINO (ITALY)

steel and copper. Riveting and bolting are preferred for parts assembly to facilitate end-of-life recycling. Metropolis metros and Citadis tramways are now at least 85% recyclable and this can rise to as high as 98% for the Coradia Nordic regional train in Stockholm. Alstom is also carrying out research on using biomaterials from renewable resources such as wood, hemp and sheep's wool as thermal and/or sound insulation in trains. Moreover, all oils used in our trains are biodegradable.

 **TRAINS WHICH SUSTAINABLY PRESERVE THEIR SURROUNDINGS**

Concerns about preserving heritage such as landscape and nature in the long term have been fully assimilated by Alstom, which is committed to preserving the areas through which its trains run. One of the company's priorities is for instance to reduce its footprint as much as possible and not harm the surroundings.

In terms of capacity, very high-speed rail generally has the advantage of an extremely small footprint: a Duplex train line has the passenger flow of a three-lane highway. This represents a footprint of 14 metres for a very high-speed line, against 40 metres for a three-lane highway.



CO₂ PRORAIL ALSTOM LEADS THE WAY IN THE NETHERLANDS

ProRail is a Dutch public body that manages national rail infrastructure, excluding metros and tramways. Its CO₂ certificate rewards companies in the rail sector that reduce their carbon footprint with measures including cutting business trips, car-sharing, waste sorting and cutting paper and power consumption. It also assesses their transparency in terms of internal and external communication and the establishment of shared CO₂ reduction programmes with co- and subcontractors. Alstom – which aims to reduce its power consumption and gas emissions by 20%, cut its water consumption by 12% on 2008/2009 levels and recycle 80% of its waste – was the first rail transport manufacturer in the Netherlands to achieve level 4 on the CO₂ ProRail performance scale, from a possible 5.

→ With its Citadis tramways, Alstom offers a range of “wireless” solutions enabling tramways to harmoniously integrate urban environments. APS is a revolutionary electricity supply system exclusive to Alstom, that supplies power to the tramway using a third rail embedded in the tracks (see p.29). Used for the first time for the Bordeaux tramway, APS has also been chosen by the French cities of Angers, Orleans and Reims as well as Dubai (United Arab Emirates). Furthermore, batteries are an on-board autonomy solution that gives tramways increased range and enables them to cross certain protected urban areas. The technology - a world first - was developed for the Nice tramway (France).



OPTIMAL USE OF ENERGY FOR LOWER CONSUMPTION

Pressure relating to energy costs is forcing a dramatic reduction in the consumption of energy. Trains are the most competitive means of motorised transport in this field. Lighter trains through composite materials, more efficient traction systems, and articulated train set architectures, all enable reduced energy consumption. Thanks to continual investments in R&D, Alstom has reduced the weight and energy consumption of its high-speed trains, metros and regional trains by 10 to 15%.

For example, the AGV consumes the equivalent of only 0.4 litre of fuel per 100 km per passenger, or three times less than a bus (1.2 litre per 100 km), eight times less than a car (2-3 litres per 100 km), and fifteen times less than a plane (5-7 litres per 100 km). Likewise, Alstom’s MF2000 metro train, which is replacing the Paris metro fleet, consumes 30% less electricity than the train sets currently in use.

The Citadis Dualis tram-train, which was put into service between Nantes and Clisson



CORADIA POLYVALENT

(France) in June 2011, consumes 4 times less than a bus and 10 times less than a car in kWh per seated passenger.



CONSUMING LESS, CONSUMING BETTER

Alstom is also seeking to minimise energy loss. Progress being made in traction enables most Alstom trains to recover energy during braking. The energy generated by engines during braking phases and not consumed by the train can be fed back to the electrical power grid. For the AGV, up to 8 MW can be fed back to the grid, equivalent to the power produced by four windmills. The electronic



driving command on Coradia trains allows the driver to use just what is needed in terms of power and therefore to control the train's energy consumption. The M109 trains, which will enter into service on the regional express network (RER) in the Ile-de-France region in the autumn of 2011, will be equipped with a very high-performance traction motor that will reduce energy consumption through increased use of electric braking. Lastly, the permanent magnet engines, which equip Citadis, Coradia Polyvalent and AGV, are highly efficient (98%).

Alstom's objective is to continually optimize its trains' energy consumption throughout their lifecycle. To keep its competitive advantage with respect to the environment, research at its Engineering System centre

at Saint-Ouen (France), has notably led to the development of the Hesop reversible sub-station (see p.29), which enables almost all the energy recoverable from trains with regenerative braking systems to be fed back to the grid.

CORADIA POLYVALENT ORDERS CONTINUE

In 2009, SNCF and the French regions awarded Alstom the contract for the design and manufacture of the Coradia Polyvalent, christened Régiolis, the new generation of single-decker regional trains.

This is an exceptional market, since it could eventually include 1,000 trains. 166 are already on order. Designed with eco-sustainable materials, the Coradia Polyvalent consumes about 15% less energy than its competitors and is therefore a real partner of eco-sustainability. The first complete train was officially unveiled at the Reichshoffen site (France) on 14 June 2011.



AGV.italo



**HYBRID,
BI-MODE SOLUTIONS**

Alstom is also carrying out series of validations on hybrid mode rail solutions (combined use of a heat engine and a battery to provide energy) or bi-mode (use of different sources of energy). According to the results of current tests and market demand, it is likely that some of these solutions—particularly hybrid shunting locomotives, will reduce energy consumption by up to 40% compared to a conventional solution. DB Schenker Rail, Mitteldeutsche Eisenbahngesellschaft (MEG) and Alstom have agreed to perform long-term testing on these hybrid locomotives. The prototype unveiled at Innotrans 2010 has undergone endurance tests, which will be carried out on four other locomotives by the end of 2011.

Alstom engineers are also studying combinations of different power technologies. Combining APS with other technologies such as supercapacitor power supplies will enable tramways to run autonomously between two stations and to recharge this equipment in stations. This combination is currently being tested in partnership with the RATP (STEEM project) on one of the 21 Citadis train sets that run on the T3 line in Paris (France). The long-term objective of this project is to allow tramways to run autonomously, with a 15% reduction in energy consumption and optimisation of the tramway electric sub-station network.

15% REDUCTION IN ENERGY CONSUMPTION TO BE ACHIEVED BY STEEM PROJECT

95% REDUCTION IN CORADIA LINT SOOT PARTICULATE EMISSIONS

0.4 LITRES PER 100 KM PER PASSENGER AGV FUEL EQUIVALENT CONSUMPTION, OR 15 TIMES LESS THAN A PLANE

**REDUCING
THE IMPACT OF TRAINS
ON THE ENVIRONMENT**

Alstom has developed the first diesel particulate filter for trains. The Coradia Lint regional train, in use in the Frankfurt area (Germany), has a fine particulate emission rate of under 0.025 g/kWh, and is the first diesel train in the world to be fitted with a filter reducing soot particulate emissions by 95%.

Alstom has a head start with respect to the application of the EU Directive on particulate emissions (1999/30/EU) in force since 1 January 2005. The directive sets future European standards for soot particulate emissions in all Member States by 2012.

ALSTOM STRENGTHENS ITS LEADERSHIP ON THE FRENCH TRAMWAY MARKET

Many successes this year have confirmed Alstom's competitive position on the French tramway market, with also 1,500 Citadis trams ordered worldwide.

RATP and the Ile-de-France regional authorities chose Citadis to serve the T7 and T8 lines that will link Villejuif to Athis-Mons and Saint-Denis to Epinay and Villetaneuse.

The first two tranches are for 39 trams. Alstom will provide 10 large capacity Citadis trams to SYTRAL (Syndicat des Transports de l'Agglomération Lyonnaise). These trams, which can carry up to 400 passengers, will run on the T3 line linking Part-Dieu and Meyzieu. The Rouen urban agglomeration has ordered 27 new trams to modernize its network, which will mean an additional 40,000 passengers transported from 2012.

In Valenciennes, 7 new Citadis trams will be delivered in 2012 to the Syndicat Intercommunal des Transports Urbains. And Citadis trams have been serving 9 stations between Toulouse, Blagnac and Beauzelle since 11 December 2010. With 20 French cities as customers and 80% of the French tramway market, Alstom has consolidated its leadership position.



TRAINS ACCESSIBLE TO ALL

Alstom is incorporating sociological parameters into its product designs to suit the needs of current and future generations, aiming for accessibility for all.

In 1987, the Grenoble tramway (France) – designed in conjunction with associations for the disabled and the authorities – was the first vehicle to feature low flooring over 70% of its length.

Alstom was also one of the first signatories of France's National Accessibility Charter in December 2003.

Conforming to the Alstom philosophy of sustainability, its engineers are working on interiors to suit the users of Alstom trains 30 years from now. To accomplish this, they have factored in changes in the morphology of passengers and on-board personnel, such as the increased height of users and their growing demand for comfort. The AGV bodies have been widened, enabling the fitting of more comfortable seats.



ALSTOM IMPROVES THE ACOUSTIC COMFORT OF TRAINS

The reduction of noise pollution is another environmental aspect in which Alstom engineers have taken a particular interest. They use aeroacoustic modelling to reduce the level of noise made by trains. These digital models make it possible to define the ideal compromise between aerodynamics and acoustic impact: the easier it is for a train to penetrate the air, the less turbulence and noise pollution there will be.

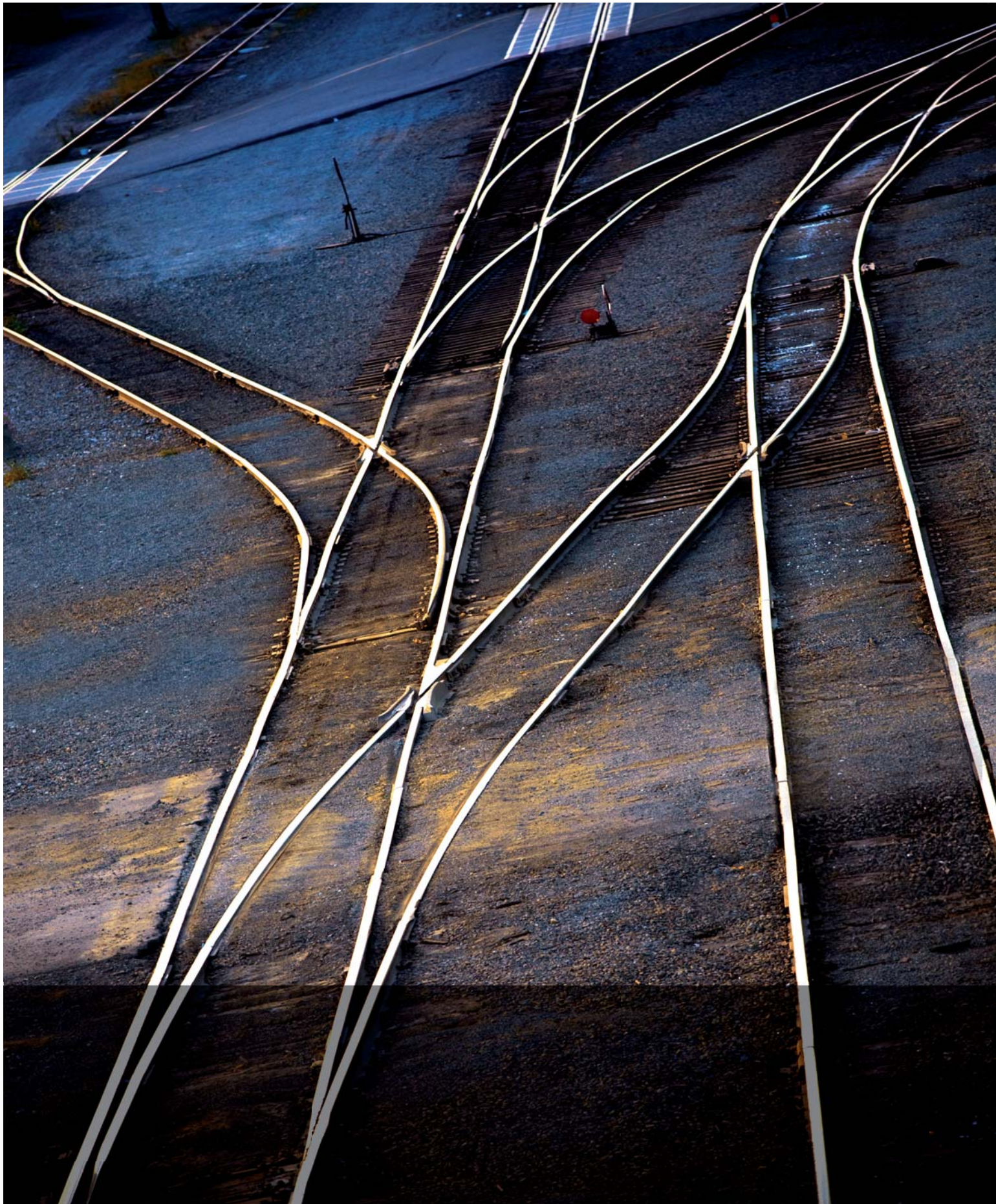
In the field of very high-speed, acoustic comfort has been substantially improved. The sound level between the first and current (fourth) generation of stock has been reduced by 10 decibels. This performance has been achieved by using models, but also through work carried out on the frontal aspect of the train set to improve its penetration through the air and by streamlining the leading bogies. This work is not limited to high-speed. The noise level of the Citadis tramway is 5 decibels less than that generated by motor traffic.

Apart from noise, research is being carried out to reduce vibration levels. Work is focusing on ballast, which reduces the vibrations thanks to its "rheological" properties, that is to say its effects on the dissipation of vibratory energy. Elastomer base plates have already been placed under the crossties of the new line built by Alstom between Paris and London to diminish vibrations due to train movement.





CITADIS TRAM IN REIMS (FRANCE)





2.

CONTRIBUTING TO CUSTOMER COMPETITIVENESS

CONTRIBUTING TO CUSTOMER COMPETITIVENESS



BECAUSE ALSTOM TEAMS MASTER EVERY TYPE OF RAIL KNOW-HOW, THE COMPANY IS ABLE TO RESPOND TO CUSTOMER NEEDS WITH OPTIMAL, INNOVATIVE AND ECONOMICALLY EFFICIENT QUALITY SOLUTIONS.

ALSTOM/TRANSMASHHOLDING A WINNING PARTNERSHIP IN RUSSIA AND KAZAKHSTAN

In June 2010, Russian Railways (RZD) awarded Alstom and its partner, TMH, a contract to build 200 EP20 electric locomotives. The parts and the traction motors in particular will be developed and produced at TMH's Novotcherkassk site, with technological support from Alstom. The EP20 is a 7,200-kW locomotive with speeds of up to 200 km/h, designed to operate at temperatures as low as -50°C. This regional penetration was confirmed in October 2010 in Kazakhstan, where the national railway (KTZ) ordered 295 electric locomotives from Kamkor, Alstom and TMH, operating through a joint venture. These include 200 Pima freight locomotives with towing capacity of 9,000 t at 120 km/h, and 95 Prima passenger locomotives with a top speed of 200 km/h. The first deliveries will be made by Alstom's Belfort site, with the plant built at Astana (Kazakhstan) and equipped by Alstom and TMH subsequently taking over production.

The economic crisis has accelerated profound changes that are redefining the rail sector throughout the world. Markets are taking on new forms. The most traditional markets have considerably opened up or fragmented. Some, closed until now, have seen restrictions eased, particularly in Europe. Others are coming into being or emerging. A combination of competition and tight operator budgets has noticeably affected this context. Alstom is adapting its growth model to this new situation, developing strategic partnerships and reinforcing the pillars of its organisation: "One face to the Customer", industrial platforming and sourcing management. Despite the economic crisis, the group continues to regularly invest in research, modernising and rationalising its production tools and reinforcing its presence in the world. Alstom therefore has the resources to fulfill its commitments to its customers and to supply quality, reliability, and controlled costs and deadlines.



MAJOR STRATEGIC PARTNERSHIPS

Alstom is multiplying its partnerships, which are the key to development on major growth markets. The agreements forged in 2009 with Transmashholding in Russia have been ramped up in 2010/2011. The alliance has already won two large-scale contracts in Russia and Kazakhstan (see box). Alstom has also begun strategic discussions with China Northern Railways (CNR) and the Chinese Transport Ministry to look

at all possible options for cooperation. The agreement is one of the results of Alstom's 50-year presence in China. Alstom currently has a record 15 alliances, in Europe, Asia and the CIS. By covering a broad spectrum of activities (rolling stock, signalling, service, parts, engineering), they satisfy customer demand for competitive products that are locally manufactured and also enable more rapid development of simpler products adapted for market requirements.



THE LIFECYCLE COST, STRATEGIC EPICENTRE

Operators require maximum availability for their equipment and infrastructures. This leads them to think in terms of lifecycle costs and integrated logistics support. Accounting for system lifecycles has never been more essential on a market that requires ever more competitiveness and reliability. The lifecycle cost of rolling stock is divided equally between the cost of acquisition, the cost of maintenance and the cost of circulation—mainly energy and operations teams. This is an average, as these ratios can vary between a tramway and a high-speed train and, even more so, in the case of signalling systems or infrastructure equipment. Equipment designed to be easy and inexpensive to operate and maintain therefore has an ever more decisive competitive advantage. Alstom offers its customers a global approach that includes supplying the train and responsibility

for its lifecycle: maintenance, repairs, treating obsolescence and modernisation. The company commits to the lifecycle cost of trains, whether it carries out the maintenance itself or not. The objective is to offer operators maximum equipment availability by limiting maintenance interventions to what is strictly necessary while of course taking no safety risks. Although controlling the lifecycle cost involves, during the design phase, work on lightening trains and optimising their energy consumption, it then depends on the aptitude of rail equipment to fulfil its mission over time. It is therefore crucial to facilitate component access, disassembly and equipment maintenance plans in general. This is why at Alstom, the teams who design equipment and those carrying out maintenance work closely together to ensure that maintenance is taken into account when weighing design choices.

RENOVATING TO LAST LONGER

Another major aspect of estimating the lifecycle cost of rail equipment is its aptitude for renovation. Most operators wish to update their trains in midlife, after about fifteen or twenty years. Alstom therefore conceives designs suitable for easy low cost renovation.

These renovations can be implemented through sub-systems - car interiors, air conditioning, passenger information systems, traction, and so on, to provide the best response to customers' needs and take advantage of changes in technology. For instance, replacing a traction system equipped with a direct current motor that requires costly maintenance, by an alternative current system, makes it possible to improve the train's lifecycle cost. In this respect, Alstom was asked by Sistema de Transporte Colectivo in Mexico



A TRAMWAY FOR EVERY CITY

Many cities worldwide have adopted tram systems and their popularity continues to grow. Are tramways the preserve of the biggest or wealthiest cities? Not necessarily. If they are properly adapted for their specific requirements, tram systems are suitable for medium-sized agglomerations. Alstom has the advantage of its technological expertise and experience gained from providing 1,500 Citadis tramways across the world since the range was launched in 1997. Alstom's teams are currently working on a more compact, innovative tramway, available within a shorter timeframe and financially optimised. This compact tram is an opportunity for many agglomerations that want to install a high-performance public transport system in a delimited zone.



ASSEMBLY LINE FOR A TRACTION BOX

→ to update and then provide maintenance for a fleet of 25 MP82 metro trains that had been in service for 25 years. The complete renovation of the traction system from the old sub-systems to modules using the very latest technology enabled the fleet to not only improve the reliability and availability of train sets but also to achieve 35% lower energy consumption.

MÉTRO : CHENNAI CHOOSES ALSTOM TECHNOLOGY

Chennai Metro Rail Limited has signed a contract with Alstom for 168 carriages for the Chennai metro in India, with an option for another 16. The first deliveries are scheduled for the end of 2012. The new trains, built in stainless steel, are fitted with air conditioning systems and automatic electric sliding doors, offering passengers greater comfort and easier access to the carriages. They will be equipped with automatic protection and command systems. For the purposes of economy and sustainable development, they will also be fitted with a braking and energy recovery system.

A WORLDWIDE LOCAL COMPANY

Alstom Transport's 25,5000 employees work close to the company's customers in more than 60 countries. As well as listening to the specific needs of each operator, they also offer a high-quality long-term follow-up service. This strategy is based on a spirit of partnership and exchange, to serve the customer and local development. Alstom is opening new plants: in India, for metro trains, in Kazakhstan, for locomotives, and in Algeria, for tramway maintenance.



Ying Sheng

• Sales Manager
Major Lines



I graduated in electrical engineering from the Polytechnic University of Shenyang in 1989. I then joined Harbin Electric Machinery Works, the biggest supplier of generators in China, where I spent five years as a Product Engineer. After that, I went to Canada to take an MBA at Concordia University in Montreal, subsequently joining the Energy division of ABB as an Applications Marketing Engineer. After 9 years in Canada, ABB made me a Product Manager in China.

In July 2006, Alstom Transport offered me the job of Marketing Director attached to the Sales Manager Major Lines. I completed various missions, including the negotiation of contracts for 500 CoCo locomotives, the electrification of Shi-Tai and day-to-day support for MOR projects. I then became a Site Director, then General Manager of SATEE, a joint venture that produces traction systems, in which Alstom has a majority stake.

In December 2010, I was promoted to Sales Manager Major Lines, which is a complex role but one that I enjoy enormously, and for which I have the support of a skilled, hard-working team prepared to tackle any challenge.





INTEGRATED CONTROL CENTRE, CIRCLE LINE, SINGAPORE METRO



Galice Suarez

- Mainline Signalling
Marketing Manager

- Member of the association
"Women on the Move"
("Elles bougent")



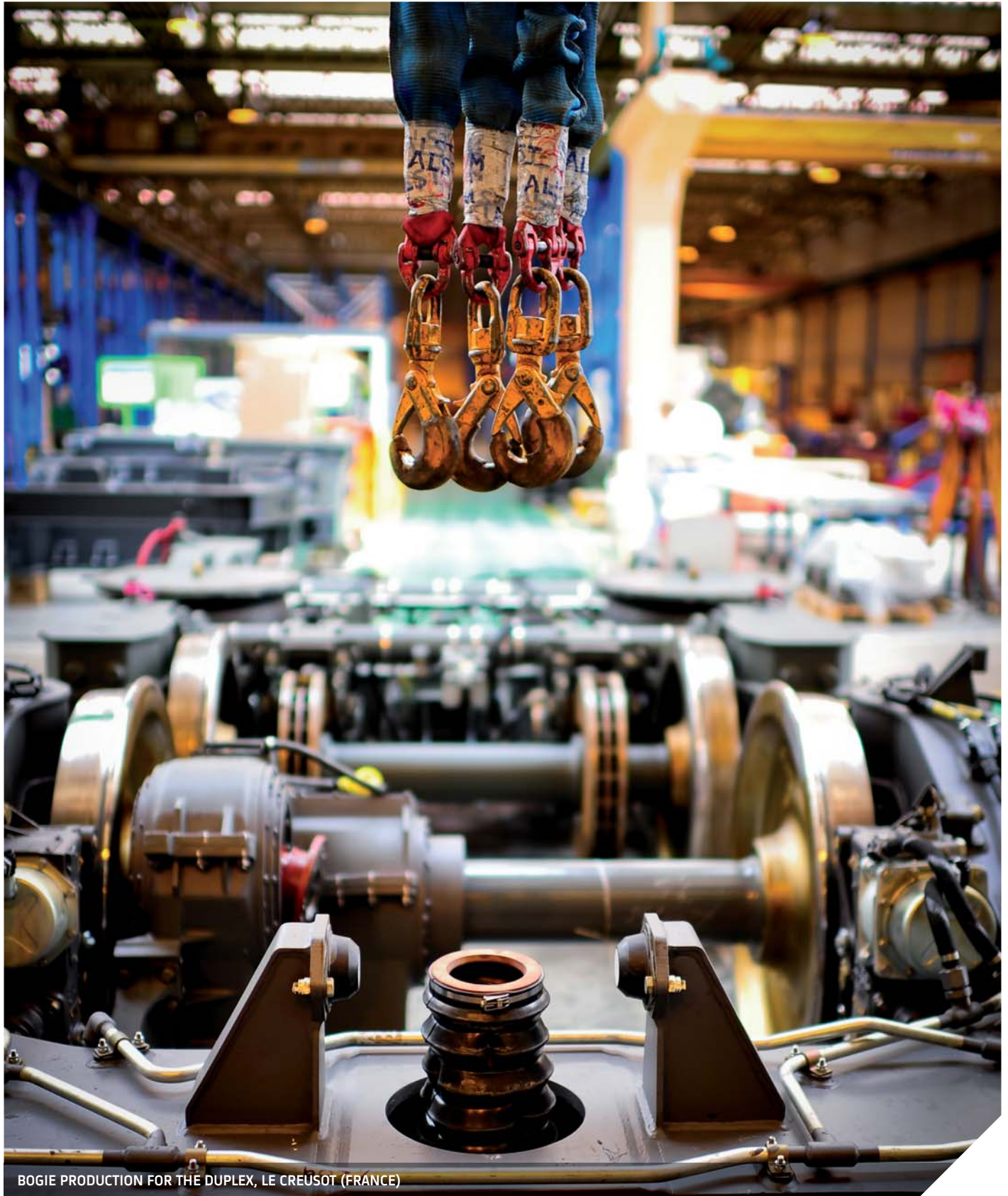
In 2001, after my double training in engineering at the Ecole Centrale de Lyon and in marketing at Politecnico di Torino, I joined the Sourcing Department and then the Strategy Department of a French company in the car industry.

After five years in this company, I had the opportunity to join the marketing team of the Alstom Signalling Department. This enabled me to discover and understand the rail market working closely with operational teams. I then integrated the team responsible for answering "Signalling mainlines" tenders. I worked on preparing responses to tenders, while developing the promotion of our signalling solutions, including our ERTMS offer, and conducting regular technology and competition watch.

Alstom then offered me a position in the transversal Market and Product Strategy department responsible for "Signalling mainlines" business. Strategic thinking, working with R&D and Communication, supporting project teams and bids... my missions, which are extremely varied, bring me into contact with a great many people of different horizons and cultures. I love this team work, with its international mix, and the human dynamic that characterises Alstom.



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BOGIE PRODUCTION FOR THE DUPLEX, LE CREUSOT (FRANCE)



EQUIPMENT WITH INTERNATIONAL STANDARDS, ADAPTED TO LOCAL NETWORKS

This great proximity to customers enables Alstom to conduct thorough analyses of local operating conditions and to provide the best customisation for trains, thereby making an important contribution to the economic and commercial performance of lines. Citadis trams are essentially products manufactured on an international platform and subsequently adapted to local networks. Most recently, in February 2011, Istanbul's urban transport operator put 14 Citadis trams into service on the Zeytinburnu-Kabatas and Zeytinburnu-Bagcilar lines. This very busy line, which serves the historic Golden Horn district, currently carries 250,000 passengers daily. Another example is winterisation and tropicalisation. Alstom is able to adapt its technologies to offer resistance to the most extreme temperatures. The Helsinki-Saint Petersburg Pendolino, put into service in December 2010, is adapted to extreme cold and heavy snowfall. The tropicalised APS system can withstand the great heat and high humidity level of Dubai.

The mobility and geographical adaptability of Alstom experts are also assets during train certification processes. For instance, several engineers from the company's various industrial sites succeeded each other in Italy on board the AGV to carry out a series of tests on the Italian network. These tests on site will enable the operator NTV to obtain the necessary certification for the commercial operation of its AGV fleet in Italy.



PROMOTING AND SHARING A CULTURE OF RESULTS

Alstom's foremost strength is the men and women who work throughout the world to offer the company's customers products and services of irreproachable quality. Several years ago, Alstom adopted a chart, "Care for people", which commits it to a certain number of essential principles in terms of ethics, equity, safety, health and the environment.

Equal opportunity and diversity, employing disabled people, respecting the balance between professional and private life... Goals are clearly underlined: recruit more women to the company including in technical professions, internationalise recruitment, fight against all forms of discrimination and re-balance the age pyramid. Alstom employees benefit throughout their career in the company from training programmes intended to maintain and reinforce their skills. Alstom has, for example, launched the GOAL programme in Asia, the objective of which is to prepare the next generation of local managers. Besides developing their leadership and managerial skills, as well as improving their financial and project management expertise, this programme aims to encourage their exchanges with Europe, increase their control of intercultural problems and foster sharing of the company's best practices.



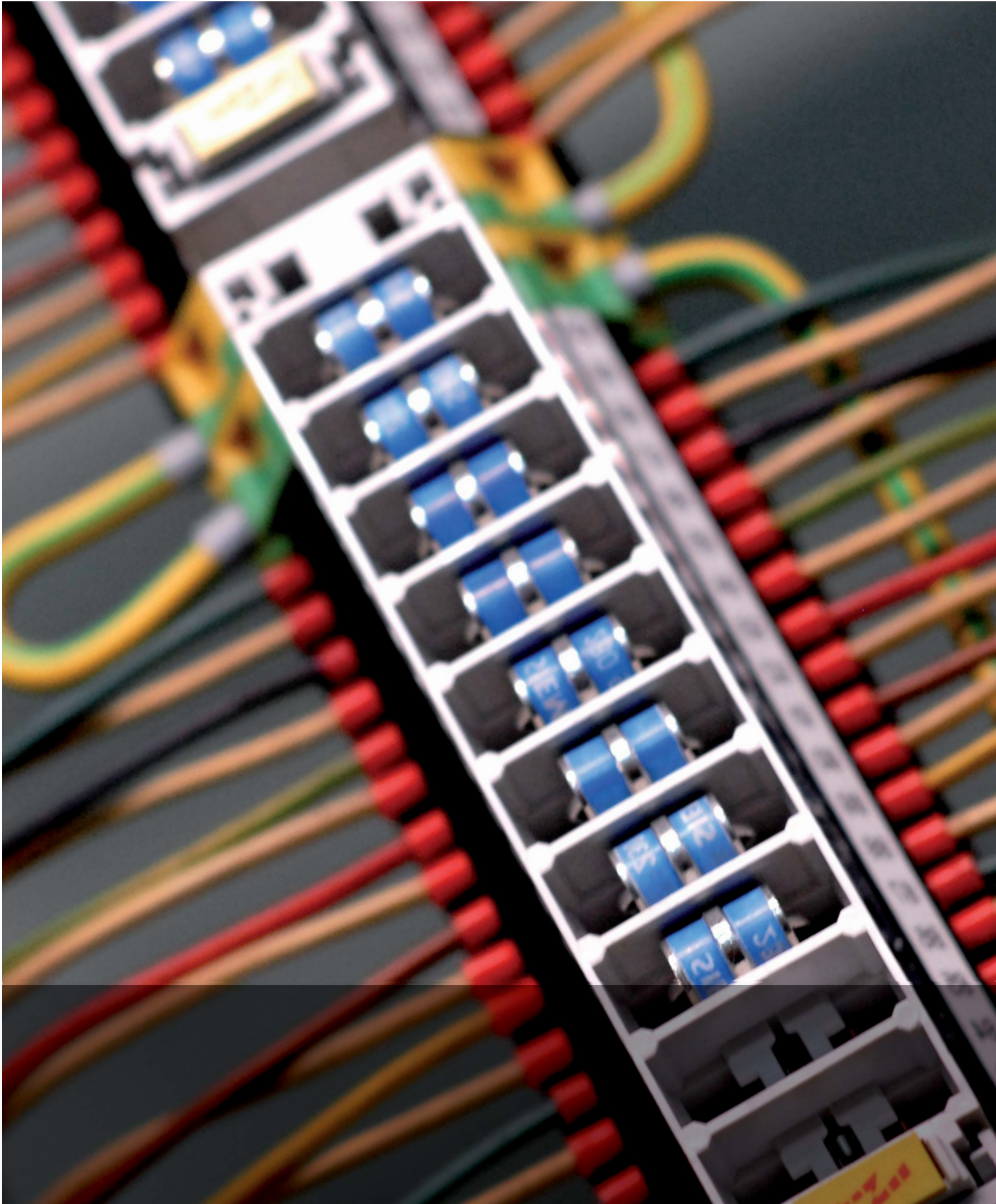
A SOURCING POLICY BUILT AROUND THE CUSTOMER

To meet customer expectations in terms of quality, innovation and cost, on an increasingly competitive world rail market, Alstom retains control of the manufacture of its train's key components. It is one of the only rail builders to do this. Furthermore, Alstom develops long-term partnerships with suppliers who have recognized know-how in the sector. Alstom's Leading Partners 150 (LP150) programme thus supports suppliers who have demonstrated over time that they supply quality products that are technically and economically efficient. In return for this commitment from its suppliers, Alstom offers them its support to develop components and products, guaranteeing a greater volume of potential business through access to new calls for tenders.

TANGIERS-CASABLANCA: DUPLEX LINE ON THE HORIZON

In December 2010, the Moroccan government signed a contract with Alstom for 14 very high-speed double-decker (Duplex) trains. The trains will run on the Tangier-Casablanca axis, which serves the north of the kingdom. Commercial entry to operation is scheduled for December 2015. The trains will operate at 320 km/h under 25 kV between Tangier and Kenitra, the first 200 km section of the Moroccan very-high speed network. Between Kenitra and Casablanca, the trains will rejoin the conventional network, where they will run at 160 km/h or at 220 km/h under 3 kV, according to the operating speed set by ONCF. This very high-speed link between Tangiers and Casablanca will reduce the current journey time from 4 h 45 to 2 h 10 and carry up to 10 million passengers.

 MORE PICTURES
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3.

COMBINING
ALL KNOW-HOW

COMBINING ALL KNOW-HOW



WITH ITS PHILOSOPHY OF SUSTAINABLE MOBILITY, ALSTOM TRANSPORT DEVELOPS AND PROPOSES THE MOST COMPLETE RANGE OF PRODUCTS AND SERVICES ON THE RAIL MARKET. BY DEVELOPING INFORMATION SYSTEMS, INFRASTRUCTURES, SERVICES, EFFICIENT AND PROVEN ROLLING STOCK, WITH UNIQUE DESIGNS FOCUSED ON COMFORT AND EASY ACCESS FOR PASSENGERS, ALSTOM COMBINES ALL TYPES OF RAIL KNOW-HOW.



ROLLING STOCK: THE COMBINATION OF PERFORMANCE, SAFETY AND COMFORT

METROPOLIS: FLEXIBLE TECHNOLOGY

With standard and proven components, Metropolis proposes an extremely wide range of options: size, speed, interior and exterior layouts are modular and can be adapted to all requirements. It can transport up to 100,000 passengers per hour in either direction in optimum safety conditions. Metropolis is fitted with the most efficient systems to make maintenance easy and optimise passenger safety and information. More than 4,000 Metropolis carriages have been sold worldwide, in cities including Barcelona, Warsaw, Singapore, Buenos Aires and Santiago.



METROPOLIS

CITADIS: THE TRAMWAY IN THE IMAGE OF CITIES

By combining standardisation, modularity and personalised design, the Citadis range offers each city a transport solution. Access on board the Citadis is made easier by low flooring throughout, wide windows, spacious corridors, air conditioning, video surveillance and real time information, providing passengers with safety and comfort. Since its launch, more than 1,500 Citadis trams have been sold to 36 cities worldwide. The latest addition to the range, the compact tram (see box on page 17) is perfectly adapted to medium-sized cities.



CITADIS

REGIO CITADIS AND CITADIS DUALIS: THE POLYVALENT TRAM-TRAINS

Regio Citadis, the first bi-mode tram-train in the world, was introduced in Germany and in the Netherlands. The range has since been enriched by the Citadis Dualis model. Able to run on both urban networks and regional lines, Regio Citadis and Citadis Dualis provide cities and regions with an innovative and efficient transport solution that meets the growing demand of public transport services from the centre to the suburbs, without load transfer. By connecting a city centre tramway network to a suburban rail network, Alstom's tram-trains are able to penetrate to the heart of cities like a tramway and to run on a regional rail network thanks to innovations in power, safety and comfort.



CITADIS DUALIS



X'TRAPOLIS:
FLUID SUBURBAN SERVICES

A high capacity train, X'Trapolis proposes flexible suburban transport solutions, in particular from suburb to suburb. Modular, able to adapt to variations in passenger flows, X'Trapolis integrates the latest technologies developed by Alstom: bogie, Onix traction system...

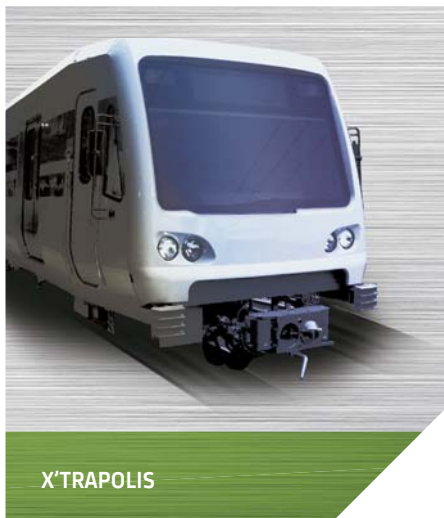
CORADIA:
AT THE HEART OF REGIONS

Coradia is designed to guarantee reliable and economic operation and is an essential link at the heart of regions. Highly recyclable, Coradia makes a contribution to regional dynamism and to people's quality of life. Coradia offers numerous options to enhance passenger comfort: articulated train sets, modular interior design, low flooring without steps or stairs for easy access and circulation on board the train. With over 30 years experience in regional transport, and more than 3000 regional trains sold in the world, Alstom is a reference on the market.

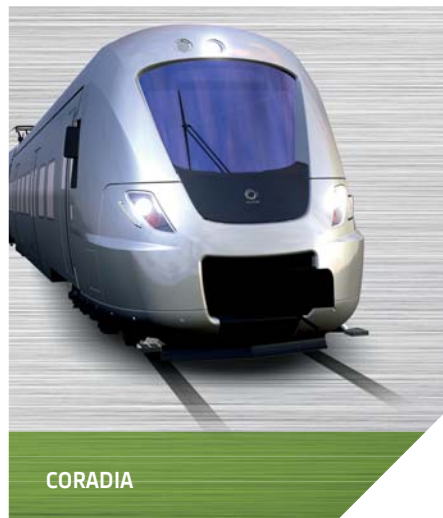
PRIMA:
EFFICIENCY WITHOUT FRONTIERS

The Prima range is characterised by its high degree of adaptability. The operator benefits from its flexible configuration and can manage his fleet according to his requirements (freight or passengers). Able to tow up to 20000 tons (in multiple units), Prima is the most powerful locomotive in the world. It also offers particularly flexible and easy maintenance through improved access to all the sub-systems. Lastly, Prima drivers benefit from optimum ergonomics with maximum comfort and safety.

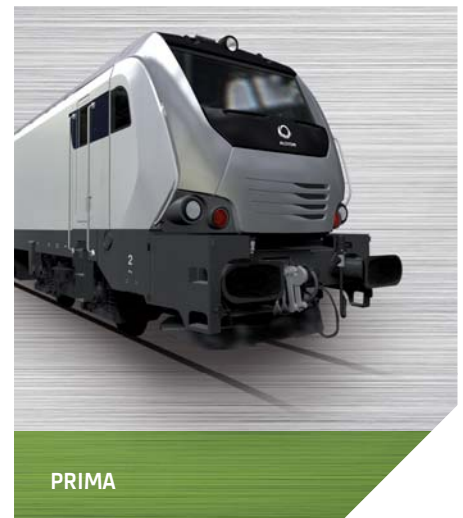
 MORE PICTURES
www.cleanmobility.alstom.com



X'TRAPOLIS



CORADIA



PRIMA



SPEED: THE WIDEST RANGE OF PROVEN EXPERTISE AVAILABLE ON THE MARKET

The high and very high-speed sector, which is booming in all continents, constitutes one of the most promising fields in the railway market. Operators' needs and technical constraints differ greatly from one country to another. To provide a response to this increasing demand and to this variety of requests, Alstom is the only manufacturer to offer the widest range of proven technical configurations on the market, including articulated and non-articulated trains, tilting technology, single and double-decker architecture and concentrated and distributed power. The range, designed to carry passengers at high speeds (up to 360 km/h) in the greatest comfort and safety, also offers operators all the modularity they require in terms of capacity.

For the past 30 years, Alstom has exported its technological expertise all over the world and in particular to Europe, Asia, and America. This unique know-how was showcased on April 3rd 2007 when Alstom, in cooperation with SNCF and RFF, broke the speed record on rail, reaching the amazing speed of 574.8 kph.

PENDOLINO: HIGH SPEED AND CONVENTIONAL NETWORKS

Pendolino is Alstom's non articulated high-speed platform. With its tilting Tilttronix technology, Pendolino can run on existing lines at speeds of up to 250 kph. Significantly reducing infrastructure investments and journey times, Pendolino improves the profitability of rail networks and passenger services. Pendolino is a versatile and interoperable (cross-border) train circulating in more than 10 countries. Its modular structure guarantees optimum cost-efficient maintenance. Its internal layout and on-board equipment, such as the individual information and entertainment system and WiFi access, provide a high level of passenger comfort.

360 kph
COMMERCIAL SPEED FOR AGV

500 million
KILOMETRES COVERED BY DUPLEX SINCE 1996

1.100
ALSTOM HIGH AND VERY HIGH-SPEED TRAINS SOLD THROUGHOUT THE WORLD

1.010
IN COMMERCIAL SERVICE





DUPLEX:
**VERY HIGH SPEED
AND VERY HIGH CAPACITY**

Duplex is the highest-capacity very high-speed train on the market. It is able to transport up to 1,050 passengers (in multiple units) at 320 kph. Duplex is accessible to all - including people with reduced mobility - thanks to its platforms, which are at station platform level. Its double decker structure offers operators the possibility to organise several types of interiors on-board: quiet environments on the lower deck, lively and panoramic spaces on the upper deck. Since its launch in 1996, Duplex has covered nearly 500 million kilometres. The new generation Duplex has improved comfort and performance. It will be put into service on the Rhin-Rhône (France) high-speed line at the end of 2011. The new, fully interoperable trains will circulate in France, Germany, Switzerland and Luxembourg. In Morocco, Duplex will enter into commercial service at the end of 2015, on the future high-speed line between Tangier and Casablanca.

SPEEDELIA:
HIGH SPEED AND FLEXIBILITY

Speedelia has been designed to respond to operators that want flexible and interoperable architecture. It is a train specifically adapted to networks with broader carriage templates; its non-articulated architecture enables the combination of high or very high speeds in configurations with higher or lower capacity.

AGV:
VERY HIGH SPEED AND MODULARITY

AGV was the first train developed after the launch of Europe's Technical Specifications for Interoperability, and can run on all West European networks. Designed to run at 360 kph in the greatest comfort and complete safety, AGV is the first in the world to combine an articulated architecture with distributed power. Thanks to the combination of these two technologies, AGV offers operators the best operating costs (energy, maintenance) available in the market. The optimised design of its shell means that its design can evolve throughout its lifecycle. Its internal architecture

is fully modular and enables each train to be customised according to the marketing and sales objectives of operators. Ordered by private operator NTV, which chose an internal layout specification to a standard unprecedented in the rail industry, AGV will soon be put into service on the Italian very high-speed network.

 **MORE PICTURES**
www.cleanmobility.alstom.com





TRACK LAYING, CITADIS ANGERS (FRANCE)



**INFRASTRUCTURE:
INNOVATION AT THE HEART
OF EXPERTISE**

Alstom offers a complete range of solutions for laying, electrifying and supplying electric power to tracks, supplying electromechanical equipment alongside track and in stations and depots. Its engineers use their consummate knowledge of rail systems to resolve problems arising from integration for the best possible cost. On site, Alstom supplies the workshops and equipment required as well as a qualified workforce. For example, Casa Transportes SA, the state-owned company that operates the Casablanca tramway, has tasked Alstom with researching, providing, installing and putting into service the signalling and power supply systems for the first line, which is currently under construction.

**APS:
OPEN-SKY CITIES**

APS is a proven ground-based power supply system for tramways via a third rail embedded in the ground. The driving segments are supplied with energy only when the tramway is passing, thus guaranteeing safety for pedestrians and other vehicles. This Alstom exclusive technology makes it possible to do away with overhead electric cables, limits visual pollution and in particular preserves the architectural integrity of sites crossed by the network.

**APPITRACK:
THE BEST WAY TO LAY TRACKS**

Appitrack is an innovative and efficient machine that makes it possible to lay tracks automatically (metro, tramway, mainlines...) four times faster than with conventional processes. This reduction in production time on sites guarantees a better quality/cost ratio, contributes to preserving the environment and reduces disturbance for neighbours.

**HESOP:
RECOVERED POWER**

With direct current, a traditional sub-station only allows the current to move in one direction: when the vehicle brakes, its electrical energy is transmitted along the conversion chain and reinjected into the overhead line to supply other vehicles if they are nearby. Hesop is a sub-station that enables absorption and reinjection on the power distribution network of energy produced during braking phases, giving priority to the natural exchange of energy between vehicles. Hesop is designed to optimise the supply system, starting with complete control of the current and the energy consumed and then reinjected on the power network. The originality of the Hesop sub-station lies in the addition of an inverter, which optimises current quality in the traction phase and enables capture of at least 99% of recoverable energy, to reinject it into the upstream power network during the braking phase. On urban transport networks, the energy saving target is 15% of annual traction consumption. Hesop will be best suited to railways with frequent stops or on sloping sites for which braking is particularly needed. Currently available for networks supplied with 750 V, Hesop is being researched with a view to deployment on urban (metro) and sub-urban lines supplied with 1,500 V to 3kV. In September 2010, a reversible sub-station of this kind was installed on line 1 of the Paris tramway.

X4 APPITRACK MAKES IT POSSIBLE TO LAY TRACKS 4 TIMES FASTER

15% ENERGY SAVING ACCOMPLISHED THANKS TO HESOP



TURNKEY SYSTEMS: MASTERING ALL KNOW-HOW TO DESIGN UNIQUE SOLUTIONS

Faced with increasingly complex projects, operators often seek global answers to their needs. Alstom has been proposing complete solutions to its customers for 25 years, for rolling stock, signalling, infrastructures and services. Whatever the specific nature of the system, Alstom teams know how to mobilise the necessary resources to manage each phase of the project, with strict budget control and respect for delivery deadlines. The company benefits from internationally recognised experience in managing turnkey projects, carried out in collaboration with international operators. For example, the partnerships developed with the Bouygues Group (Bouygues Construction and Colas Rail), the main shareholder of the Alstom

Group, are a powerful lever for Alstom's development through turnkey systems. The construction under concession of the Reims tramway, which was inaugurated on 16 April 2011, testifies to this. Another success is the delivery by Alstom and ETRHB, its partner in the Mediterrail group, of the first section of the tramway line put into service on 8 May 2011 to Entreprise du Métro d'Alger at the end of 2010. This turnkey contract includes 41 Citadis trams, infrastructure, signalling and maintenance of the entire system for a 10-year period.

ALSTOM IN LATIN AMERICA

Alstom has won three major contracts, strengthening its position in the Antilles and Latin America. The SMP (Secretaría del Metro de Panamá), Panama's metro authority, awarded a contract to "Consortio Línea 1" to build the first metro line in the country. As part of this consortium, Alstom will be responsible for the engineering, integration and entry into operation of the electromechanical lot. Alstom will also supply 57 Metropolis carriages, traction sub-stations and the control system for CBTC (Urbalis) trains. In Santo Domingo, operator OPRET has awarded Alstom a contract to equip line 2 of the metro with 15 Metropolis trains and to maintain them. Entry into service is scheduled for early 2012. Finally, Alstom has won a contract to provide 19 Metropolis trains to the city of Lima in Peru. Entry into commercial service is scheduled for 2013.



SANTO DOMINGO METRO (DOMINICAN REPUBLIC)



DETAIL OF BALL BEARING SWIVEL

**SERVICES TO OPERATORS:
EFFICIENT FLEETS AVAILABLE
EACH DAY**

Available equipment and satisfied customers: all rail operators want maximum efficiency for their fleet. Alstom offers them a complete range of customised services. The objective is to guarantee global, safe and optimised management of their rolling stock and equipment throughout its operating lifecycle, whether it is manufactured by Alstom or not. The return on experience from teams in the field feeds engineering platforms whose mission is to develop the most competitive solutions for maintenance, integrated logistics support and the modernisation of rail systems. This dedicated organisation is responsible for Alstom's successful growth in the service field, and has made it capable of optimising the lifecycle cost of all types of rail equipment. Operators thus transport passengers and goods at the best levels of service and profitability.

**SPARE PARTS AND LOGISTICS:
DAILY SUPPORT FOR OPERATORS**

By offering operators logistics services for trains of all brands, Alstom has, over the years, acquired and perfected know-how recognised in more than 30 countries and developed a methodology based on systematic anticipation. By determining each customer's specific needs in terms of detached parts, then preparing a risk management plan, the company accompanies them in a philosophy of daily sustainable partnership.

ALSTOM ATTRACTS US OPERATORS

MARTA, the Atlanta transport authority, has awarded a contract to Alstom to overhaul its train and rail safety system control systems. The contract includes the establishment of an integrated platform, which will improve passenger service and operational efficiency. Another city, another success. Alstom will modernise the metros under the control of the Port Authority Transit Corporation (PATCO), which link Philadelphia with southern New Jersey. With new couplers, integrated propulsion, a modernised braking system, automatic control of trains, interior finishes and air conditioning, the 120 carriages will offer a high level of passenger comfort.

MAINTENANCE: OPTIMISING TRAIN PERFORMANCE

The increased use of predictive and preventive maintenance significantly increases the effective availability of fleets. Conditional preventive maintenance makes it possible to monitor the train's critical parameters and to intervene only when these have crossed a predetermined level. This technique minimises train unavailability due to interventions and maximises availability for commercial service. Alstom has developed a powerful preventive maintenance tool, TrainTracer, which radio transmits to the depot real-time data on the condition of each of the fleet's train while it is still in commercial service. Detecting eventual anomalies while the train is running, this system analyses them and is able to direct the train to the depot best equipped to intervene on the problem which has been diagnosed and to prepare the intervention in masked time, in order to reduce to a minimum the train's immobility time for the intervention. This system is in operation, for instance, on the West Coast Main Line (United Kingdom). Thanks to this system, train availability is optimal. In September 2010, Virgin and Alstom together unveiled a livery in the colours of both brands on one of the Pendolino trains used on this line, in a co-branding exercise that confirmed this operator's confidence in its supplier.

MODERNISATION: IMPROVED FLEET MANAGEMENT OVER TIME

The 30-40 year lifespan of rail equipment requires anticipating modernisation phases. Modernisation engineering is the core expertise of Alstom's Reichshoffen specialized centre (France). The quality of Alstom's offer is based on three main assets: sound knowledge of the profession of integrator, proven manufacturing processes and control of the logistics chain. With sound

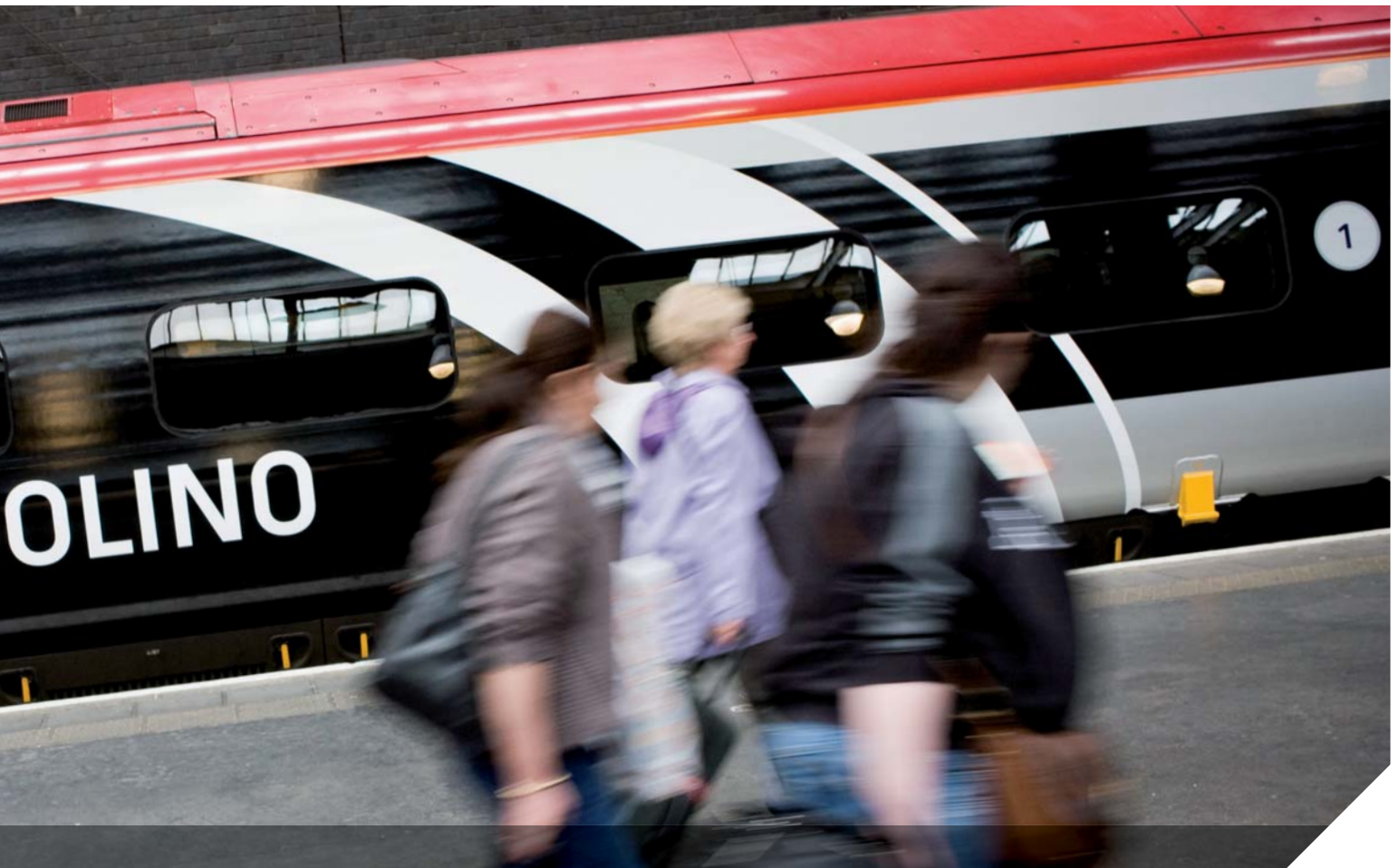


VIRGIN WEST COAST MAIN LINE PENDOLINO (UK)

return on experience to constantly improve processes, its teams propose a complete range of modernisation services for rolling stock. Their know-how guarantees the accurate translation of 3D digital interior layout designs into a reliable and sustainable industrial reality.

LOCLIFE SERVICES: SUPERIOR TRACTION VALUE FOR FREIGHT BY RAIL

In 2010, Alstom launched LoLife Services, a flexible maintenance offer for freight locomotives in Europe, associated to Prima II locomotives equipped with on board signalling systems. This new offer guarantees, through a performance contract, a long lasting, reliable and available traction. Wherever they are, operators are freed from their fleet maintenance constraints.



**SIGNALLING:
SAFE NETWORKS, OPTIMISED
AND PROFITABLE**

Safety and output, interoperability, passenger services... These are the pillars of the signalling offer. With its advanced solutions, Alstom enables operators to transport passengers or goods in complete safety with fluid services, optimising the operations and profitability of their networks.

**MORE FLUID NETWORKS:
FOR MAXIMISED OUTPUT
IN TOTAL SAFETY**

Infrastructure costs weigh heavily on the results of their managers. Automated control of train movements, safe traffic, optimised traffic flow rates, continual improvements to passenger safety, etc. By providing optimum network

fluidity, the various signalling solutions developed by Alstom – Urbalis for urban networks and Atlas for major line networks – boost rail transport competitiveness and therefore make an effective contribution to the modal shift towards rail, which has a smaller carbon footprint. Beijing MTR Construction Administration Corp. has chosen Urbalis for the signalling system on line 6 of the Beijing metro, which is the longest line under construction in the Chinese capital (42 km) and the first to operate 8-carriage trains at 100 km/h at 3-minute intervals. Shanghai Alstom Transport Electrical Equipment Co (SATEE) will supply a traction system equipped with Optonix technologies for the 512 metro carriages. Specifically designed for the Chinese market, Optonix reduces journey times and increases train frequency while reducing energy consumed by 30%. Alstom has also been chosen to design and provide signalling and switching

equipment on the Flushing Line metro line operated by New York City Transit (NYCT). The contract involves renovating and modifying signalling to enable operation with a CBTC system.

The company also offers a wide range of trackside equipment (Smartway, Smartlock): train detection, points and level crossing mechanisms, interlocking systems, signals and safety relays. Lastly, its integrated control centres (Iconis) also improve the quality of passenger information, schedule management, delays and connections...





In the United States, the Rail Safety Improvement Act of 2008 mandates a deadline of 2015 for implementation of PTC for all US rail operations. Alstom currently has the largest operational train control solution in the US, ACSES, implemented on the North East Corridor, utilised on over 5 000 vehicles and recognised by the Federal Railroad Administration (FRA) as a PTC solution. Alstom is also providing a family of PTC products for wayside applications, from switch point monitoring, broken rail detection to block signalling and full interlocking control. PTC deployment support is provided through existing extensive kitting, warehousing, logistics, and technical support capabilities, from Alstom's Chicago logistic centre. With these different solutions, Alstom works with its customers to maximise the commercial output of lines and in absolute safety.

**INTEROPERABILITY:
AVAILABILITY WITHOUT BORDERS**

The growing need for cross-border mobility is obliging infrastructure managers and train operators to provide the best possible interoperability between national rail networks. The technological differences between these networks generate major additional costs for operators. Alstom provides an answer to this problem with Atlas, its own ERTMS (European Rail Traffic Management System) solution. With 2,634 trains in total, including 1,135 trains already in commercial service, fitted on 45 types of different equipment, Atlas is positioned as the leader for on-board solutions. Alstom, which played a key role in the development of ERTMS levels 1 and 2, is presently developing the third generation.

**SAFETY AND INFORMATION:
TOWARDS REAL TIME**

Whether for urban transport, mainline networks or freight transport, the rail safety market is developing fast. Although it is impossible to eliminate all risk, anticipating and taking decisions in real time are essential. Whether for safety on board trains, in stations, on track, inside tunnels or for communicating data within a complete rail system, Alstom proposes integrated solutions designed to anticipate and provide the best response to all types of problems.

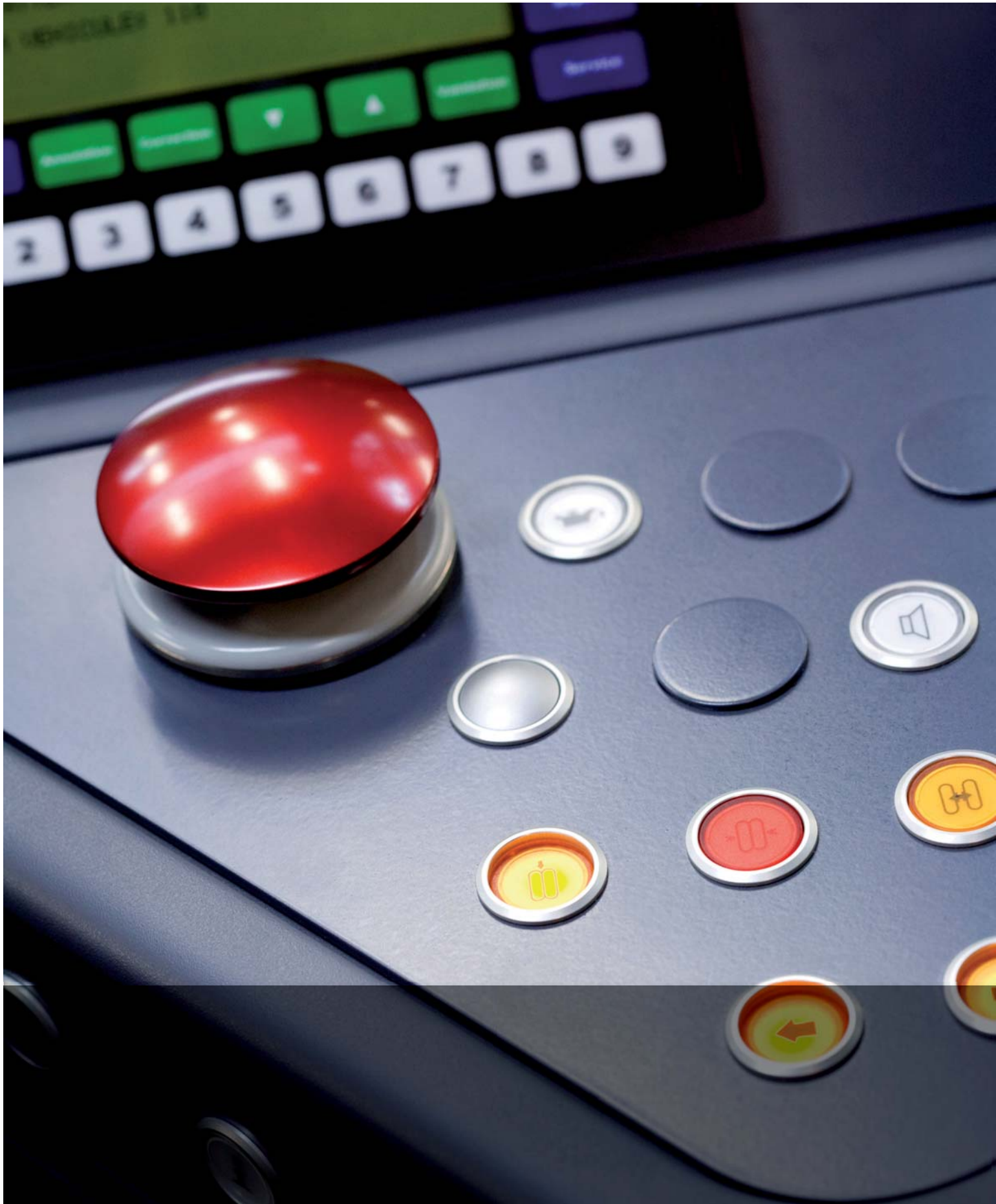
These solutions are modular and compatible with existing systems. Furthermore, to improve the level of service offered to passengers, operators are looking for the most efficient communication systems to transmit real-time safety announcements and information. This equipment must also be able to propose audiovisual programmes or on-board Internet access to offer passengers a more enjoyable journey. Alstom's solutions are built on know-how that has been enriched over many years by working closely with numerous operators throughout the world. Alstom's research and development programmes enable it to offer its customers shared platforms for data processing equipment and software for passenger safety and information. These two functions can be updated and thus ensure the optimisation and relevance of investments made.



LEVEL CROSSING, AURORA LED (USA)

DOUBLE SUCCESS FOR ATLAS

German operator Deutsche Bahn (DB) and Luxembourg operator Chemins de Fer Luxembourgeois (CFL) have both chosen Atlas, Alstom's ERTMS solution. Atlas will equip 121 trains in DB's high speed ICE fleet, which will circulate in Germany, Austria and Switzerland. The first trains will be put into service at the end of 2012. CFL has also decided to fit the third and final portion of its train fleet with Atlas. The contract involves 19 locomotives and 22 double-decker self-propelled trains. The entire CFL fleet (more than 100 trains) will therefore operate with Alstom's ERTMS solution. Entry into service is scheduled to take place from 2012 on the Luxembourg, French and Belgian networks.





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