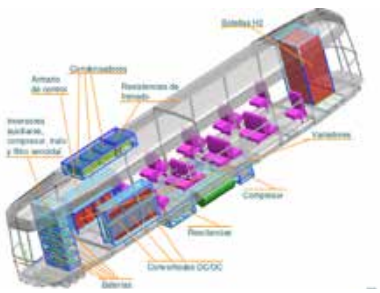
MAFEX
Mafex corporate magazine
Spanish Railway Association
Issue 10. February 2017

25th ANNIVERSARY OF THE SPANISH HIGH SPEED

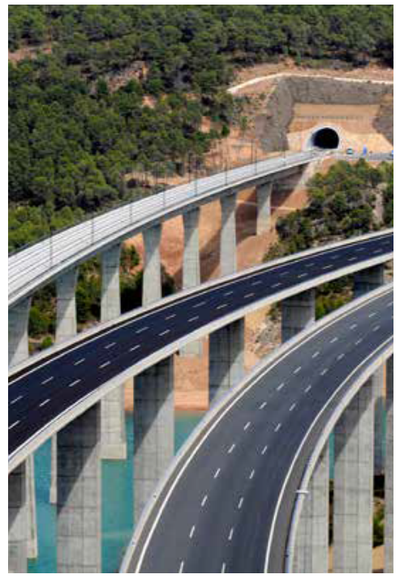
The industry's joint effort in implementing this network has created a reference model exported in the entire world

DESTINATION: US AND CANADA
Impetus into the long distance railway lines in the North America

MAFEX REPORTS
Excellent reception of the Association's "V Open Doors Day"



R&D: LATEST DEVELOPMENTS
Mafex's partners present the latest technological breakthroughs in the railway field



“Intelligence is the ability to adapt to changes”

Stephen Hawking

Representation of a black hole emitting the radiation discovered by Stephen Hawking in 1976 that bears his name. Until then it was believed that a black hole did not emit any kind of energy.

www.goodfreephotos.com

A great quote from someone who knows a lot about change.
And about intelligence, understood as the ability to take an alternative track, a new point of view.

This is the focus of our work at Amurrio: creating smoother, safer and more efficient turnouts. For all types of railway paths.
We have been doing it since 1880, adapting to all changes.

We like to belive that we contribute to intelligence in our railway system. And we would also like to thank you, Dr. Hawking, for being a permanent inspiration to us all.

25th anniversary of the spanish high-speed: a model of international reference

Dear friends,

This year we commemorate the 25th anniversary of the Spanish high-speed. A landmark date that highlights the steps that the railway industry has taken in terms of innovation, technological challenges and successful achievement of major infrastructure works. Since the first line thus characterized between Madrid and Seville, has been commissioned, developments, pioneering systems, latest generation rolling stock, as well as highly qualified consultancy, engineering services and turnkey projects have been delivered. Not forgetting the fact of having generated over the course of these years highly qualified human resources, also capable of facing the most demanding and advanced railway projects anywhere in the world.
As outcome, this Spanish high-speed model has become an international reference. All these are detailed in Section “Background”, where, the Mafex’s partners also explain the important role they had in implementing this network, which is already the second biggest in the world, with 3.200 km, just behind China.

The Section “Destination”, in this number focuses on the large connection lines between the United States and Canada. A review including the most significant corridors, the projects for boosting rail freight traffic, as well as the improvement of passenger lines and the most relevant high-speed projects, such as “California High Speed”.
To this is added the Association’s contemporaneousness, on which we will provide more details in the Section “Mafex informs”. Among the most pointed out news, the incorporation of two new partners, Tecnivial and Icon Multimedia, whom we warmly welcome.
Moreover, the awarded contracts and recent news from 15 partner companies, as well as the eight major technological innovations that we present in the Section “Innovation” deserve a special attention. A proof of the Spanish railway sector commitment towards the I+D and its contribution in developing international projects.
Again, we hope that the all contents will be of your interest and will help you taking the pulse of a very dynamic sector, with major projects and future plans.

MANAGEMENT: MAFEX.
MAFEX STRATEGY AND COMMUNICATION COMMITTEE: Albatros, Alstom Transporte, ArcelorMittal, Bombardier España, CAF Signalling, Idom, Indra Sistemas, Ingeteam, La Farga Lacambra , Patentes Talgo, Siemens España, Thales España and Stadler Rail Valencia S.A.U.. **ADMINISTRATION:** comunicacion@mafex.es. **ADVERTISING:** comunicacion@mafex.es. **SUBSCRIPTIONS:** comunicacion@mafex.es **.** Mafex magazine is not responsible for the opinions, images, texts and works of authors and readers that will be legally responsible for their content. It is understood that the signing authors have given their consent to be included, for which he or she will be responsible. Also, the magazine is not responsible for typographical errors contained in the original documents submitted by the authors.

New acquisitions for the Association: Icon Multimedia and Tecnivial

MAFEX'S ACQUISITION OF ICON MULTIMEDIA AIMS TO REINFORCE THE COMPANY'S WORK IN THE RAILWAY SECTOR AND TO STRENGTHEN ITS PRESENCE ON THE FOREIGN MARKET, WHERE OVER THE LAST YEARS.

ICON Multimedia, S.L. becomes Mafex's new partner. The Company that specializes in information and communication technologies was founded in 1993, within the EUROFORM project belonging to the European Community for the purpose of creating new companies.
With more than 20 years of experience, its technological solutions and innovations have been successfully implemented in the most of the national railway network. In addition, the Company has increased its internalization program during the last years, with a very satisfactory outcome. At present, it operates in many countries from America (USA, LATAM), Europe, Africa and the region of the Middle East. According to ICON Multimedia's Manager, Enrique Hornos, the incorporation to Mafex aims to "reinforce the Company's work in the railway sector and to strengthen its presence in the foreign market, where over the last years, Icon Multimedia' technological developments have been registering an increased demand."
The Company has a great number of references on the end-to-end communication solutions market intended for the public with its "DENEVA Solution", particularly in high availability environments, such as the high-speed railway lines or the visual marketing solutions, among others. This traveler information system is one of the Company's major contributions to the railway market. "DENEVA.transIT" brings together into a single Web Platform all communication requirements of a terminal, starting with the on-screen displays or LED panels and up to the multi-language public address system, via touch totems, Smartphones and Internet.

V OPEN DOORS DAY

Last December 14th, Mafex organized the V Open Doors Day Mafex at Bilbao, with the purpose of making the Association's services known to a dozen of interested companies. Representatives of Mafex's member companies, IDOM, IK4 Research Alliance and INGETEAM Power Technology shared their experience as Mafex partners and explained how the Association supports them in different environments and issues. The Mafex Director, Pedro Fortea, also gave details about the Association's objective and the services provided to its more than 70 partners.
In addition, Mafex works in other two important strategic lines through particular plans aiming, on one hand, to improve the companies' competitiveness, and on the other hand, to improve the Spanish railway sector's representation and image on the international markets.

TECNIVIAL HAS JOINED THE SPANISH RAILWAY ASSOCIATION (MAFEX). ITS MAIN PURPOSE IS TO SECURE ITS RANGE OF SERVICES AND TO REINFORCE ITS INTERNATIONAL PRESENCE WITHIN THE RAILWAY ENVIRONMENT.

The Tecnivial Company, with more than 40 years of experience in road, railway and airport beaconing and signaling, has joined the Spanish Railway Association (Mafex). The main objective is to secure its range of services and to reinforce its international presence within the railway environment, introducing its innovations in this field.
Tecnivial has always been committed to the I+D+i, which has allowed it to be a reference in the fixed railway signaling, high-speed and conventional network, while being present in the most relevant projects at the national level; this is the case of the Madrid-Figueras or Olmedo-Orense sections, and internationally, Ave Medina-La Meca.
As pointed out by the Managing Director, Arancha Lauffer "given the vast experience in signaling that backs us up, we are convinced that our presence within the Association will be more than obvious, while entering into possible collaborations and making successful projects".
This is one of the companies certified by the Railway Infrastructure Administrator (ADIF). Moreover, they have successfully performed the railway stations' signaling by carefully following the corporate identity manuals' provisions, developing an end-to-end and customized signage, starting with the design and manufacture and up to the assembly thereof.

Tecnivial has more than 40 years of experience in beaconing and signaling.

MAFEX ATTENDS TO THE MAIN TRADE FAIRS OF 2017

Mafex's international activity will continue during the following months with the participation in the main trade fairs of the sector. In March, the Association will coordinate the Spanish Pavilion in the "Middle East Rail", in Dubai (United Arab Emirates). It will also attend the "Iran Rail Expo", in May, managing the joint Spanish participation in Teheran (Iran) and in the UITP urban public transport trade fair, at Montreal (Canada). With this calendar of trade fairs, the Association aims to carry on with the international support and promotion works for the companies within the sector, as well as to drive its presence in those emerging markets where important transport infrastructure projects are planned.
A complete calendar which particularly highlights the organization of the "VI International Railway Convention", which will take place at Valencia (Spain), in June. This meeting became a key meeting point between the Spanish industry and representatives of the operating companies, infrastructure administrators, metros of the main cities and railway services providers of the five continents.

Tecnivial Company's signaling.

Ingeteam is to install more of its regenerative braking system units in the Barcelona Metro

Ingeteam

The Barcelona metro has yet again placed its trust in Ingeteam, and is set to install the regenerative braking system developed by the company in its lines 3 and 4. At the end of last year, Transportes Metropolitanos de Barcelona (TMB) already installed this system in suburban line 9, so that this new contract confirms the validity and effectiveness of Ingeteam's solution.

This technology makes it possible to recover up to 30% of the braking energy of the train, in order to reduce CO_2 emissions, and to lower the operator's energy bill (TMB). The Ingeteam contract covers the installation of two units; one for line 3, one of the oldest lines in Barcelona, comprising 26 stations over an 18.4 km route, and the other for line 4 comprising 22 stations over a 17.3 km route. TMB uses the energy recovered at its own facilities, for indoor station lighting, escalators, etc.

After a four year development phase and a 3 million euro investment in R&D&I, Ingeteam's Traction Division has developed this regenerative braking system that is ideally suited to LRVs, trains and tramways, due to their frequent stopping requirements, which is precisely when the system recovers energy.

This system has already proven its effectiveness and results in metro and railway systems in a number of cities around the world, such as Vienna, Brussels, Río de Janeiro, Bielefeld, Bilbao and Malaga.

NEM Solutions USA Inc new office

Nem Solutions

NEM Solutions has announced the opening of their new office in Philadelphia, USA. For the last 5 years NEM Solutions has been very active in the North American market and as a consequence of that its installed base has grown significantly.

The North American market potential is very high, both in the Railway and Wind Industry and the demand for NEM Solutions involvement is growing at a steady pace.

It is the right time for NEM Solutions to open its US branch: current customers are demanding a closer relationship with us and market expectations are high. Working side by side with our customers is the only way to deliver unique, revolutionary and memorable products, technologies and services: NEM Solutions trademarks.

NEM Solutions will continue to share its expertise in Operation & Maintenance, helping to take the Railway and Wind Industries to the next level in terms of efficiency, productivity and life cycle cost management. We are looking to better understand the needs and priorities of the North American market to provide the ideal solution to each customer.

COMSA Corporacion strengthens in Poland with new contracts

COMSA

COMSA Corporación reinforces its strategy of exporting its high specialization in railway infrastructures and civil works to international markets such as Eastern Europe, where it has recently increased its portfolio of projects. On this occasion, the subsidiary of the group in Poland, Trakcja PRKiI, has been awarded various contracts for railway modernization valued at more than 30 million Euros.

Specifically, the company will carry out the track remodelling of 28 kilometres of the Nowa Wies Wielka - Maksymilianowo line, located in the north of the country, with the aim of increasing the speed of freight trains. In addition, two stops and 15 kilometres of catenary will be rebuilt and new traffic control, electrical energy and telecommunications equipment will be installed. In the south of the country, the subsidiary will carry out the modernization of the station Wloszczowa Pólnoc, which will include the execution of a new platform and a pedestrian crossing and the reconstruction of 8 kilometres of catenary. Moreover, Trakcja PRKiI will also take over the maintenance of the Zwierzyniec - Stalowa Wola line, located in the southeast, to improve the safety and fluidity of the rail network in this section. The contract will cover substructure and superstructure works along 63 kilometres of track and the renovation of level crossings.

Bombardier has been awarded with the Euskal Makila award

Bombardier Spain

Bombardier has been awarded on 7th November in Basque Country (Spain) with the Euskal Makila award. The event, attended by Alvaro Rengifo (President of Bombardier) was organized by the Basque Company and Society Foundation, Empresa XXI and SabadellGuipuzcoano, and took place at the Guggenheim Museum, Bilbao. Bombardier received the Euskal Makila award for its works and efforts during 15 years in Trápaga's Factory.

The production of the factory in these 15 years has gone from mainly directed to the interior of the market (90% in 2007) to do almost everything abroad. As a reference, forecasts for 2016 indicate that 100% of its production will be exported. Of the equipment manufactured, 79% is installed in vehicles of the multinational and 21% in vehicles of other railway builders. The Trápaga's factory stands out for its role as HPP World Center of Excellence and Production (high power traction converters) and for the production of traction converters in all power ranges: low, medium and high.

CETEST in Haramain project

CETEST

Last November, CETEST signed an agreement for the provision and installation of the train instrumentation for track examination service through dynamic testing with the Al SHOULA GROUP consortium´s Spanish companies responsible for the track maintenance.

The project consists of the train instrumentation for a first track test campaign with the aim of validating the track and, once the track is on service, the performance of continuous measurements focused on track maintenance.

IDOM will design the new rail link project Port of A Coruña

IDOM

The Port of A Coruña is the sixth most important in Spain in terms of cargo traffic by rail; therefore, having a rail link is one of the main priorities of the Port Authority within the objective of positioning the Outer Port as a logistics node of international reference and fostering the competitiveness of the port operators.

IDOM will design a rail link project single-track, which will be electrified in the future. It consists on a main line of 5.58 km (including the connection in the direction of A Coruña) and a 0.96 km branch in the direction of Santiago. Regarding the environmental impact, the design incorporates preventive and corrective measures in accordance with the corresponding declaration. Finally, IDOM will support the Port Authority in obtaining European funding, developing the required economic and financial studies.

Tecnatom Group to supply ultrasonic inspection equipment for railway wheels in China

Grupo Tecnatom

Grupo Tecnatom will supply Masteel with two automated ultrasonic inspection systems for the quality control of railway wheels.

Masteel (www.masteel.com.cn) owns the world's largest wheel production line, covering 90% of the Chinese market and exporting to more than 20 countries. It has world record for the manufacture of the largest train wheel in diameter and the maximum load in freight transport. It is the supplier of CRH (China Railway High Speed) for its high-speed trains.

The tender of MA Steel, open to any bidder, had technical requirements for the inspection system well above the usual standards in this type of equipment. In fact, only two companies met the imposed criteria, being Grupo Tecnatom's offer the most competitive in price."

This contract strengthens Grupo Tecnatom's position as a reference in the market for Automated Inspection Systems in the rail sector, as it is already in the nuclear or aeronautical fields, where Tecnatom is internationally recognized as a first level company.

CAF Signalling is the successful bidder for the signalling and communication facilities for the Hernani- Irún section

CAF Signalling

Adif has awarded the consortium made up of CAF Signalling and Siemens Rail Automation with the contract for the completion of work, and upkeep and maintenance of the facilities in the construction project for the modification of the signalling and communications facilities for the implementation of standard gauge track on the Hernani-Irún section amounting to a total of €16.01 million. The performance scope for this project comprises the section between the stations of Andoain and Irún, on the 100 Madrid Chamartín-Hendaye line, running along a section of approximately 30.4 Km. and the stations on the Hernani-Irún section and the Hernani collateral station (Andoain).

The works to be peformed include but are not limited to the following: The replacement of the electronic interlocking of Hernani for another electronic interlocking with higher operating capacity for the implementation of 750 metre sidings and a higher number of switches; extension of the interlockings at San Sebastián, Pasajes and Lezo-Rentería to accommodate the operation of the standard gauge third rail on the main line; command and control of switches of mixed gauge installed at station entries to pool the routes and the general tracks on both gauges; replacement of the Hernani local video control station and modification of the San Sebastián, Pasajes and Lezo-Rentería video control stations. The current track circuits will be replaced with axle counting devices on mixed gauge tracks between Hernani and Irún and the Hernani track circuits will also be modified due to the new configuration of the station and the new sectioning of the Andoin route.

Faiveley supplies the passenger access doors of Lima Metro Line 1 trains

Faiveley Transport Ibérica

Alstom has designated Faiveley Transport Ibérica, S.A. (A WABTEC Company) as supplier of the passenger access doors of the trains that are part of the extension of the Lima Metro Line 1 fleet.

This extension consists of the supply of 19 intermediate cars - to increment up to 6 cars the current units - and 20 new trains of 6 cars.

The engineering and manufacturing of a total of 1,112 doors will be carried out at the Faiveley Transport plant located in La Selva del Camp (Tarragona), very close to the Alstom factory in Santa Perpetua de la Mogoda (Barcelona) where it will take the manufacture of the vehicles.

Ineco to develop the new regulatory framework for railways in Malaysia

Ineco

An international consortium formed by Ineco, Adif and the Malaysian companies HSS Integrated and Wong & Partners (Baker & McKenzie International) has been awarded the contract to develop Malaysia's train operation and infrastructure management regulatory framework.

The aim of the contract is to provide support for the implementation of a vertical separation model, where the companies commissioned for infrastructure and for train operation will coexist, and also includes the preparation of a legal framework and a range of regulatory policies, to cover freight and passenger transport.

The project, commissioned by the Land Public Transport Comission (SPAD, for its Malay initials), is part of the country's National Land Public Transport Master Plan. The objectives of the Plan, passed in 2013, include improving railway connectivity, accessibility, quality of service, reliability, security and sustainability.

With this contract, Ineco is positioning itself in a region which is in continuous growth and has great commercial opportunities, where it has already developed projects including the traffic demand study for the future high speed line connecting Malaysia and Singapore.

Class 88 revolution arrives to the UK

Stadler Rail Valencia S.A.U.

The first UKDUAL locomotives, called also Class 88, are arriving to the UK and after a short testing phase on the Network Rail tracks, it is expected the beginning of the commercial services by March 2017.

Class 88 locomotive is a further development of Class 68 platform, both developed and manufactured by Stadler Rail Valencia.

34 diesel-electric locomotives type Class68 have been sold in several batches to Beacon Rail Leasing Limited to be used for Direct Rail Services in the transport of passengers and goods, which demonstrates the excellent collaboration created among the 3 companies.

Fruit of this collaboration, DRS, via BRLL, ordered ten dual-powered Class88 locomotives to be used in passenger and freight transport services in the UK, at speeds up to 160km/h, combining both 25kV electric and diesel operating modes.

Class 88 is a true dual-mode 4-axle locomotive adapted to UK gauge, with AC/ AC transmission and low axle load representing the new generation of rolling stock for European market. It offers excellent operational flexibility, high performance and reduced transport costs, running with only one locomotive on main lines as well as on secondary lines.

New order from Bombardier Transportation for the installation of an underfloor wheel lathe

Danobat

The division specialised in railways of DANOBATGROUP continues to expand its market share with a major order from Bombardier Transportation. The Canadian company has awarded the cooperative a contract for the delivery of a DANOBAT underfloor wheel lathe for the re-profiling of train wheels.

The DLR model (DANOBAT Light Rail) is capable of machining train wheels and brake discs. The machine features an option to work both with the axles still attached to the vehicle or with removed wheelsets and bogies. The many different configurations offer several machining capacities: wheel profile, inside and outside surface of the wheel, brake disks located on the inside or end of the axles as well as on the wheel, etc.

One of the key features of this machine is the standard fitted unique measurement system, capable of continuous high-precision monitoring of the railway wheel. This system is fully integrated on the underfloor wheel lathe and protected during the machining process to prevent damage.

This technology in conjunction with the smart user-friendly software DANOBAT SMART MACHINING drastically reduces cycle times while yielding an optimised machining process, increased reliability and safety of the process and a substantially prolonged lifespan of the wheels.

This project provides DANOBATGROUP the opportunity to continue working together with Bombardier Transportation, one of the largest manufacturers of rolling stock for the railway industry.

Alstom Spain joins the AEDIVE Association to promote the electric vehicle

Alstom Spain

Alstom Spain has become a full member of the Asociación Empresarial para el Desarrollo e Impulso del Vehículo Eléctrico [Business Association for Development and Promotion of the Electric Vehicle] (AEDIVE), from where it will promote the implementation of electric charging projects for the ground transportation of freight and passengers.

The promotion of efficient, collective systems of electric mobility is a priority in the development of sustainable urban transport, insofar as it represents a reduction of vehicle traffic and the elimination of gaseous pollutants, particles and nitrogen oxides that degrade air quality.

In the interurban scope, electrification in heavy freight transport by road is another challenge of mobility, which requires solutions that overcome the barriers with respect to conventional engines, such as autonomy, weight and load capacity.

For years, Alstom has been working on transferring its experience in railway electric mobility to other modes of transport. Highlights of the innovations developed by Alstom in this field include SRS technology, a fast charging system at stations for electric buses, or a project with Volvo for the development of electric highways. In both cases, Alstom uses APS technology (ground-level power supply technology), which it has been implementing on various tram systems for over a decade to offer new formulas for charging and electric power supply.

Siemens and Bombardier awarded rail control upgrade on the R2 Line on Barcelona's commuter network

Siemens/Bombardier Spain

ADIF has awarded a consortium of Siemens and Bombardier Transportation the contract for the installation of signalling technologies and 20 years of maintenance on the R2 Line, one of the busiest lines on Barcelona's commuter network.

The contract, which will upgrade the existing equipment to the latest-generation computer-based and electronic systems, has a total value for the consortium of approximately 15 million euros (VAT included). Scope of the future-proofing contract includes the replacement of existing interlockings at the Gavà and Castelldefels Stations with the latest, electronic BOMBARDIER EBI Lock 950 computer-based interlocking (CBI) Release 4 (R4) system and installation of a new, electronic, bi-directional Automatic Block (BAB) system and Siemens ASFA balises on the Garraf - El Prat route.

The local control centres at the two stations and new interlockings will be integrated into the existing Barcelona França operational control centre.

The current conventional track circuits will be replaced with Siemens audio-frequency, jointless track circuits TCM 100 between El Prat and Garraf and Bombardier's EBI Track 400 between El Prat and Barcelona Airport. New wayside equipment including signals and point machines will also be installed and the Automatic Train Protection (EBI Cab 900) will be adapted to the new configuration.

The upgrade will carried out on the Garraf - El Prat route, part of the line between Madrid Chamartín and Barcelona Sants, at the Barcelona França Station and on Line 254 from El Prat de Llobregat Station to Barcelona's El Prat Airport.

CAF is awarded a contract to supply and maintain LRVs to Zweckverband Schönbuchbahn, in Germany

CAF

Zweckverband Schönbuchbahn (ZVS), public transport authority in Germany, has awarded CAF a contract which comprises the supply of 9 three-car Light Rail Vehicle units for the Schönbuchbahn and the integral maintenance over 19 year.

The new electrical LRVs will be operated on the network of ZVS between Böblingen – Holzgerlingen – Dettenhausen. The trains will be delivered in 2020 with start of operation end of 2020.

Each three-car unit will provide a capacity to transport a large number of passengers and will also be fitted out with spacious gangways, as well as areas allotted specifically for persons with reduced mobility. The vehicles are easily accessible

in its entirety from one end to the other, making it easy to move between modules during the journey. In terms of their external visual appearance, the vehicle will follow the corporate design concept, dynamic shaped and featuring fluid lines.

UNITED STATES

Long distances in the United States: Growth potential

THE RAILWAY CONNECTIONS GAIN IN IMPORTANCE IN THE UNITED STATES. THE AIM IS TO MANAGE THE AIR TRAFFIC CONGESTION AND THE FREIGHT NETWORK'S OVERLOAD. THE FEDERAL ADMINISTRATION, THE STATE GOVERNMENTS AND THE PRIVATE SECTOR PROMOTE MORE COMPETITIVE ROUTES BY MODERNIZING THE INTERCITY AND THE ARRIVAL OF HIGH-SPEED SERVICES.

The United States' railway network is the longest and the most dynamic of the world with 140.000 miles (225.308 kilometers) of operational routes. The freight transport lines represent almost 80%, while the passenger line extends on 35.000 kilometers. The raw material and goods transport is considered as the best of the world in terms of safety, reliability and price. Approximately five million tons are shipped every day to harbors, distribution centers and businesses. Moreover, it is estimated that a third of the exports to international markets is made by railway.

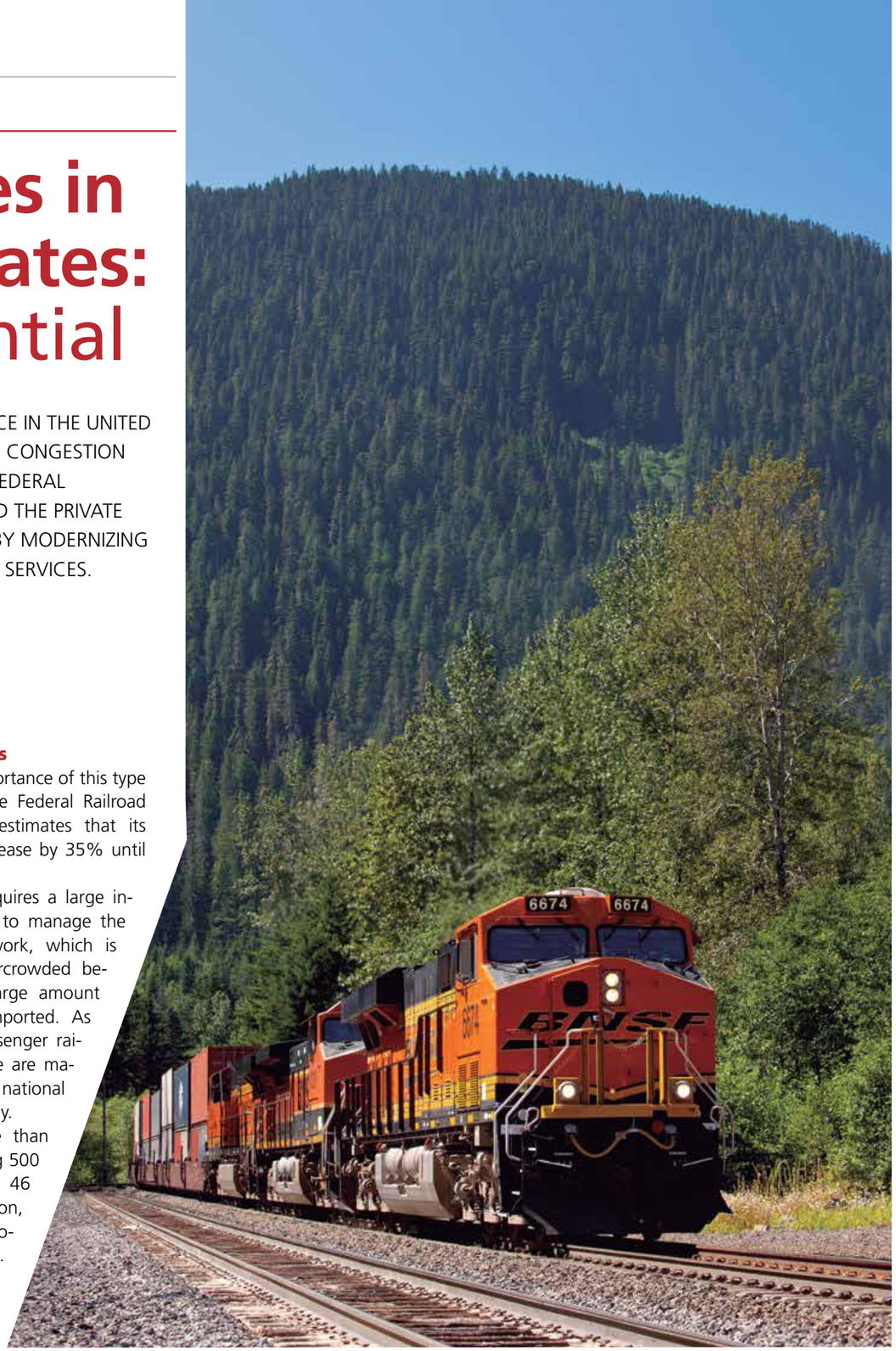
These lines are property of many private companies. In total, there are 538 routes, seven of them being I Class, which means that they have made a profit exceeding 453 million dollars (425 million Euros). Union Pacific Railroad and BNSF Railway are the largest. Alongside, the Canadian National Railway, the Canadian Pacific Railway, the CSX Transport, the Kansas City South Railway and Norfolk South Railway are also outlined.

Future prospects

Despite the importance of this type of transport, the Federal Railroad Administration estimates that its volume will increase by 35% until 2050.

Therefore, it requires a large investment so as to manage the congested network, which is also highly overcrowded because of the large amount of oil being imported. As regards the passenger railway lines, these are managed by the national Amtrak Company.

There are more than 30 routes linking 500 destinations, in 46 states of the Union, as well as the Columbia district. They also reach to Toronto and Montreal, in Canada. The investments of two major freight companies aim to give a way out of the current saturation of this transport type in the country, as detailed below.



The railway has been gaining again in importance in the United States for eight years. The Obama Administration, endorsed by the Congress, approved the "American

BNFS

In 2016, an investment program in the amount of 4,300 million dollars (4031 M€) has been approved. Of this amount, 2,800 (2,625 M€) are intended for maintaining the network in the best conditions, as emphasized by the Company's President, Carl Ice, aiming to increase the transport capacity and safety. More than 300 million (281 M€) will go to the program intended for improving the control systems.

On its turn, 600 million dollars (562 M€) will be used to procure motor rolling stock (new locomotives) and towing equipment (wagons), as well as railway equipment. The network expansion is also critical, therefore, the BNSF has assigned more than 500 million (469 M€) for this plan, regarding the track duplication works on various sections. In the State of Washington, 220 million (226 M€) are awarded for infrastructure and superstructure works on more than 1,260 miles of track (2,027 kilometers), in addition to the signaling and control modernization. Additional programs are also carried out in the State, as well as in New Mexico and Minnesota.

UNION PACIFIC

Union Pacific will also make a private investment that will increase its lines' efficiency and safety. The Company holds 51,000 kilometers of railways in 23 US states equivalent to two thirds of the Western side of the country. In addition, it has business partnerships with almost 200 railways, as well as with road transport companies in the United States, Mexico and Canada.

Among the initiatives included in its competitive growth strategy, 513 million dollars (481 M€) are intended for improving the infrastructure, 429 million (402 M€) for maintaining the track, and other 79 (74.05 M€) for rebuilding bridges. In addition, an amount was assigned for the Pinehurst-Navasota line, in the Southeastern Texas in order to replace tracks. Some 22 million dollars (20.62 M€) will go to the San Antonio-Rockdale line. They are all part of its improvement plan to reinforce its position on the freight transport market and to count on a state network under the best conditions. The purpose was to increase the multimodal and interconnected transport system.

Above, one of the freight trains that belong to the BNSF fleet. The Company announced the procurement of new rolling stock and towing equipment so as to improve its services. On the right, one of the Union Pacific's locomotives, the other major operator from the United States.

UNITED STATES

The intercity passenger network and the first high-speed sections are among the improvement projects

Recovery and Reinvestment Act of 2009". The aim was to redouble the commitment towards the passenger railway transport. The long distance, intercity services, high-speed and new high-speed projects are the most supported. All this with the aim to manage the forecasts regarding the population growth until 2050 and to relieve the air space. The idea is to find a road solution so as to manage the demand of new and better means of mobility in a country with long distances between cities. This law is endowed with an amount of 10,100 million dollars (9,445 M€) to provide railway access to new cores and to improve the speed and frequency of the existing lines. It involves a historical and strategic investment to reinforce a transport network that would be faster, safer and more efficient.

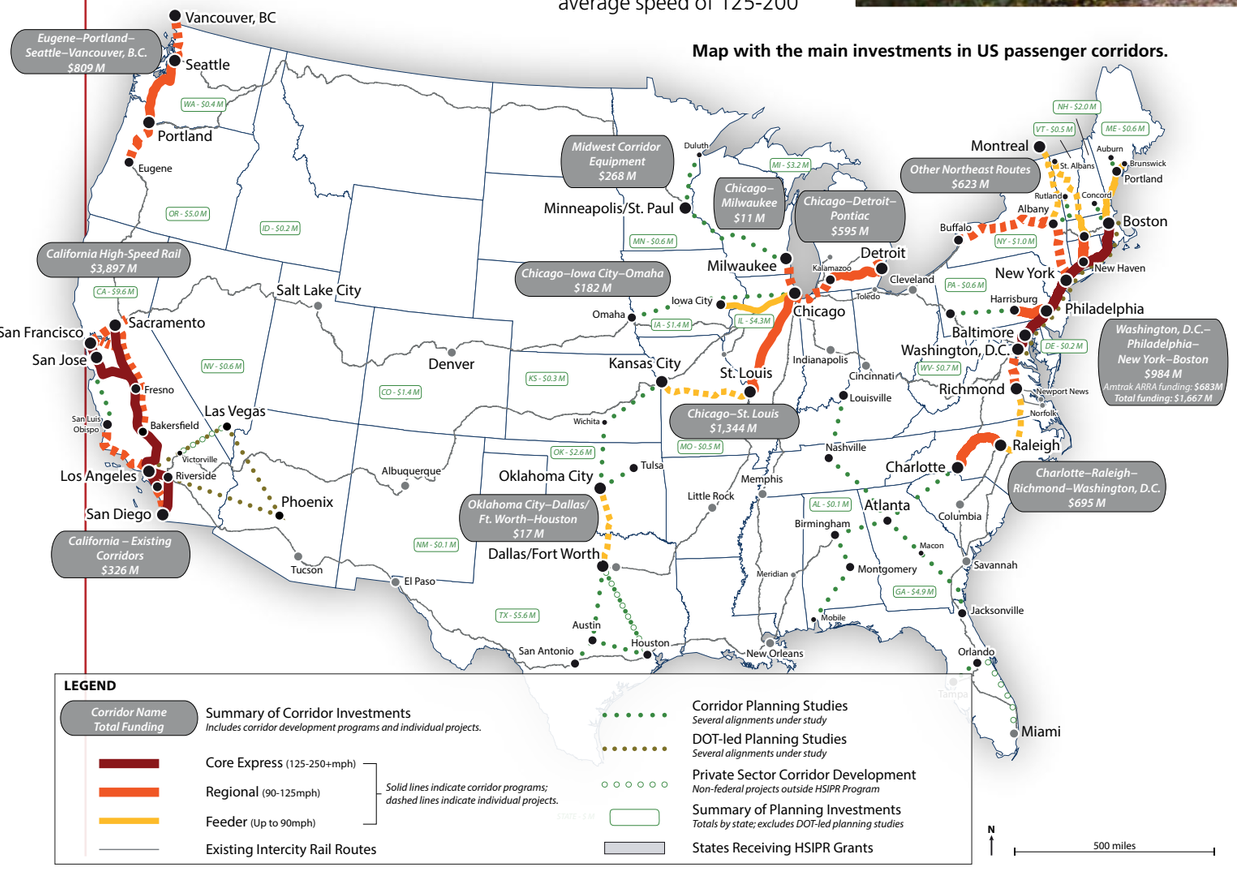
Passenger lines are reborn

More than 135 million Americans, 44% of the population, live in a community linked to a corridor that will benefit from the approved investments.

These funds will be allotted to three types of networks. On one hand, for the express services called "Core Express Service", which operate in the most populated and dense areas of the country, at an average speed of 125-200

The connections of both coastlines include high passenger traffic.

Map with the main investments in US passenger corridors.



miles per hour (201-402 kilometers/hour). On the other hand, the regional lines between big and average cities, as well as the branches linking small communities with the main passenger railway networks are improved.

A relevant datum is that 85% of the federal investments are focused on six key corridors. Together with the first high-speed line, between Los Angeles and San Francisco and the improvements in the high-speed corridor, "Northeast High-Speed Corridor (NEC)", other four are worth stressing: Seattle-Portland, Chicago-Saint Louis, Chicago-Detroit and from Charlotte to Washington. Various private initiatives are linked to them.

High-speed makes progress

In the passenger transport, the high-speed has been strengthened over the last years in the United States. At present there is a plan, divided into four phases, regarding the construction of 27,000 kilometers until 2030.In addition to being the first line of this nature, California High-Speed Rail; there are various ongoing projects: "Midwest High-Speed Rail Line" between Chicago and Indianapolis or St. Louis and "Texas High-Speed Rail", between Dallas and Houston. Within this federal funding, in July 2016, an amount of 25 million dollars (23,2 M€) has also been approved for the implementation of 11 projects, in six different states, regarding new control systems under the program called "Positive Train Control Implementation". With all these, the United States intends to meet the new mobility requirements within its long distance network and to promote the railway.

UNITED STATES

NORTHEAST CORRIDOR: WASHINGTON NEW YORK

The Northeast Corridor (NEC) line has almost 730 kilometers. This network covers the route between Boston and New York in 2.45 hours and between this city and Washington in 3.15 hours. During the last years, the number of passengers increased from 2.4 million in 2002 to 3.5 million in 2014. According to the International Railway Union; this figure triples the trips by plane of all companies between New York and Washington.

For this reason, the Amtrak Company has a multi-annual investment program implemented so as to improve its infrastructure, superstructure and stations that will adjust the growing levels of the high-speed railway service and the rolling stock. The main works include those carried out at the Washington Union Station, and the Moynihan Station from New York. One of the great novelties, in the middle of 2016, was the procurement of new trains for the Acela Express passenger network to replace the current fleet, which has been commercially operating since 2000.

The service liks the big cities

At present, this is the only service that can be equipped with high-speed in this country. It links the big cities located in the Northeast corridor: Washington DC, Baltimore, Wilmington, Philadelphia, Newark, New York, New Haven, Providence and Boston. Amtrak has supplied Alstom with 28 new high-speed trains, Avelia Liberty, in the amount of 1,800 million Euros (2,000 million dollars). One of its great novelties is that includes the proactive tilting technology, which allows the train to run through bends at high-speed, with greater safety and comfort. Thus, they become the first units of this type that enter into commercial operations in America.

With this rolling stock, the travelling times will be minimized and the current capacity will increase, since it will transport up to 33% more passengers. In addition, the operational costs and the power consumption will improve. Its articulated architecture will also help achieving comfort and safety. The train can reach speeds up to 300 km/h (186 mph). Although, at first, it will operate at a maximum speed of 257 km/h (160 mph) in order to comply with the speed limits set out for this Northeast Corridor.

Avelia Liberty high-speed train, belonging to Siemens, which will be incorporated to the Northeast Corridor.

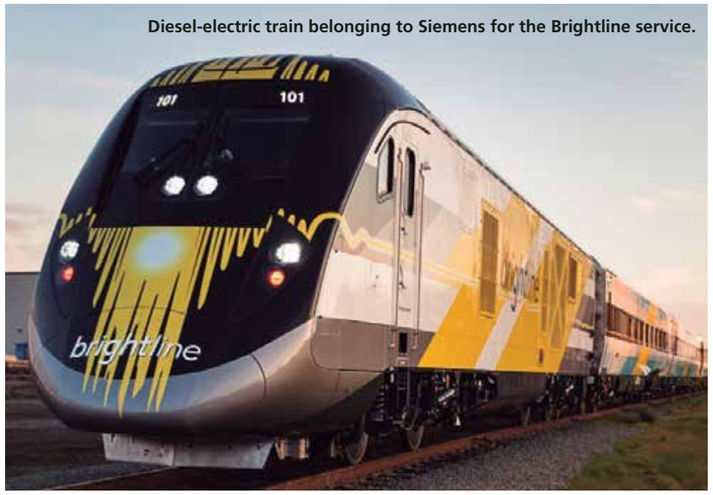
BRIGHTLINE: EXPRESS SERVICE BETWEEN MIAMI AND ORLANDO

The new fast train branch or shuttle called "Brightline" will cover in just three hours the distance existing between the cities of Miami and Orlando, having 385 kilometers.

It is expected to be commissioned during the summer of 2017, becoming the first private railway service regarding the passenger transport within the country. The five diesel-electric hybrid trains are manufactured by Siemens and will they reach a maximum speed of 200 km/h. They will have stops at Fort Lauderdale and West Palm Beach. Within a first phase, it will link Miami to West Palm Beach in the middle of 2017. The full line up to Orlando will be covered throughout this year. An alternative for relieving the traffic congestion by highway is searched. For this, the existing corridor will be used, property of the Florida East Coast Railway Company, between Miami.

In addition, some 64 kilometers of a new platform were built between Cocoa and Orlando. The service consists of four new stations that will be located in Miami, Fort Lauderdale, West Palm Beach and Orlando.

On the other side, the high-speed connection between Tampa and Orlando is still in a study phase. A section that is actually included in the federal plans for the passenger corridors of the country.



Diesel-electric train belonging to Siemens for the Brightline service.

UNITED STATES

Reconstruction of one of the trains intended for the California high-speed line.

FIRST US HIGH-SPEED LINE. LOS ANGELES-SAN FRANCISCO (CALIFORNIA)

The project started materializing in January 2015, when the works on the first 48 kilometers started. For this, a ceremony was organized where the Fresno Station, belonging to this network, will be located. It involves a line of 1,100 kilometers which will link the cities of Los Angeles and San Francisco in 2019, according to the planned schedule. All these, within a travel time of less than three hours. The network will be extended to Sacramento and San Diego, covering 800 miles (1,287 kilometers) and having 24 stations. California High-Speed Authority (CHSRA) is the promoting body of the railway corridor. In addition, this body is responsible for the planning, design, construction and operation.

Alongside, CHSRA works with regional partners regarding the implementation of a railway network modernization plan throughout the state. With this program, billions of dollars will be invested in local and regional railway lines to meet the transport needs throughout California. The Spanish seal is very present in this network. Ferrovial was awarded in March 2016 with the section's design and construction of 22 miles (some 35 kilometers) between the cities of Wasco and Shafter for an amount of 442 million dollars (around 407 M€). This is one of the four sections where the project has been structured and it crosses the Central Valley. It is anticipated that the construction phase will be concluded in 2018.

Ferrovial joins the U.T.E. Dragados y Flatiron, belonging to the ACS Group, and Shimmick that, in 2004, was awarded with the second section of tendered works of 105 kilometers, in the amount of some 900 million Euros. The route starts from Fresno up to the Northern Bakersfield, also in the area of Central Valley, and includes 36 level crossings, which require the construction of viaducts, tunnels and bridges. The project is called CP 2-3.

DALLAS-FORT CORE: EXPRESS SERVICE

The Texas Department of Transport (TxDOT) and the Federal Railway Administration (FRA) analyze a proposal for a high-speed passenger train between Fort Worth and Dallas, the region in the Northern Texas. The initial project focuses on studying the potential routes, as well as the stations' location. Both federal and state governments co-operate in the environmental study and in the project's feasibility. For this, the possible private funding formulas are analyzed, through which this line of such express services is carried forward.

Dallas-Fort Core is part of the long distance transport plan "Mobility 2035", alongside other regional connection improvement initiatives and the Texas-Oklahoma passenger branch study.

HIGH-SPEED DALLAS AND HOUSTON (TEXAS)

Texas Central Partners (TCP) is the developer of this future railway connection. This is a completely private initiative intended to carry forward the high-speed line between Dallas and Houston, in Texas. The Spanish industry will bring its solid experience to shape this "seed project", which depends on the capacity to close the funding required for its commissioning, in addition to the construction and environmental permits. The consortium led by Ferrovial Agroman, Dallas Houston Constructors (DHC), will be in charge of the pre-construction works, for an amount of 130 million dollars (121 M€). This U.T.E. also includes the Archer Western Construction Company. The design and construction value exceeds 10,000 million dollars (9,350 M€).

CANADA

Canada is searching for a more competitive and modern railway

THE RAILWAY NETWORK HAS 48,000 KILOMETERS. THE VAST MAJORITY OF THE LONG DISTANCE CONNECTIONS ARE USED FOR THE HEAVY FREIGHT TRANSPORT, ALTHOUGH THE INVESTMENTS IN PASSENGER LINES ARE INCREASING.

The long distance connections are essential for the freight transport.

Canada, the tenth world power, is a country covering a large area divided into 10 provinces, besides three autonomous territories. The railway network has 48,000 kilometers. The vast majority of the long distance connections have a standard track gauge (1,435 mm).There are small isolated branches that are used for the forest and mining industry, with narrow track gauges (between 610 mm and 1,067 mm).The railway system also includes 19 intermodal terminals and 27 border crossings with the United States.

Improvements plans

The long distances networks are mainly used for the heavy freight transport, in bulk and in containerized traffic. Many of them have reached the limits of their capacities, mainly in the Western area. For this reason, during the last years, the investments in infrastructure have been increased at a great pace.

In addition, the private public cooperation has increased in a joint effort to reinforce the railway prominence in the trade flows. In order of importance, Ontario, Quebec, Alberta and British Columbia are the provinces that have the longest tracks.

Conection from North to South

Likewise, the most important distribution channels are those that go from North to South towards US. However, the Northern territories are very small. As regards the passenger lines, the service of these corridors is in charge of the public VIA Rail Company. It provides services to some 450 communities and consists of 14,000 kilometers of network. The improvement plans intended for these lines search for a greater competitiveness against other transport means, such as the airplane. For this reason, the debate on high-speed has been tackled during the last years and it can bring new opportunities for the companies specialized in the field. In Canada, there are more than 40 companies, under federal regulation, although there are two major companies that account for the railway freight market. Canadian National Railway (CN), holding 49.1% (22,205 kilometers) and Canadian Pacific (CP), with 25.7% (11,600 kilometers). The other 25.2% (11,295 kilometers) are in the hands of American carriers, such as RAILAMERICA, BNSF and CSX Transportation Inc. Quebec North Shore and Labrador Railway (QNS & L), a subsidiary belonging to Iron Core Co. from Canada also operates. It provides services between Labrador City, Emeril Junction and Sept-Îles. In total, they all count on almost 3,000 locomotives and more than 51,000 wagons. The latest official data indicate that the railway freight transport has reached 300 million tons. A national transit that focuses on five corridors of a special importance. The "West Coast", which is a key area for the intermodal transport and the "Western Corridor", is the most occupied and represents a hub in Vancouver. The "Continental" and the "Atlantic" Corridor and the "Central" are linked to them with the most demanded routes between Ontario and Quebec.

> The Federal Government has made a great effort in terms of transport over the last years

Federal funding on the rise

The Federal Government has made a great effort in terms of transport over the last years. The aim was to respond to the infrastructure deficiency that drags the country, both in terms of freight and passenger services. In 2014, the "Building Canada Plan" was implemented; a program aimed to reinforce the economy and to improve the competitiveness where the railway started to have a greater presence. Until this date, the highway and freeway subsectors have been the main engine of growth.

At present, "Investing Canada" is implemented with different amounts and stages to „revive" a more modern, efficient, environmentally-friendly and a safer transport that would meet the Canadian society's needs. It is expected to be an essential part of the country's economy. For this, in 2016, the Federal Government approved a historical investment in infrastructures of 186,000 million Canadian dollars (131,200 M€). This amount is intended to fund various federal and provincial initiatives for the next 10 years during which the railway will have a leading role. The first phase of the program is awarded 120,000 million Canadian dollars (84,200 M€). The investment will be focused on the achievement, among other aspects, of the "Transportation 2030" federal program. The main objectives are the development of infrastructures related to the environment and the improvement of public transport.

CANADA

"INVESTING CANADA" FEDERAL BUDGET	AMOUNT
Sustainable infrastructures. Inter-provincial lines	21, 900 millon Canadian dollars (15,400 M€)
Railway safety	143 millon Canadian dollars (100 M€)
Multimodal Commercial and Transport corridors	10,100 millon Canadian dollars (7,156 M€)

Main initiatives

The most important projects will be in the field of mining and crude oil extraction. The provinces of Quebec, Ontario, Alberta and British Columbia, due to their large populations and wealth, benefit from the most amounts.

The "Fall Economic Statement" proposes an additional investment of 81,000 million Canadian dollars (57,153 M€) for the next 11 years. The funding includes 21,900 million Canadian dollars (15,400 M€) for the green infrastructure as inter-provincial transmission lines. Moreover, 10,100 million dollars (7,156 M€) are awarded for a goodwill and transport for the most efficient corridors of the international markets.

Safety and impetus into trade

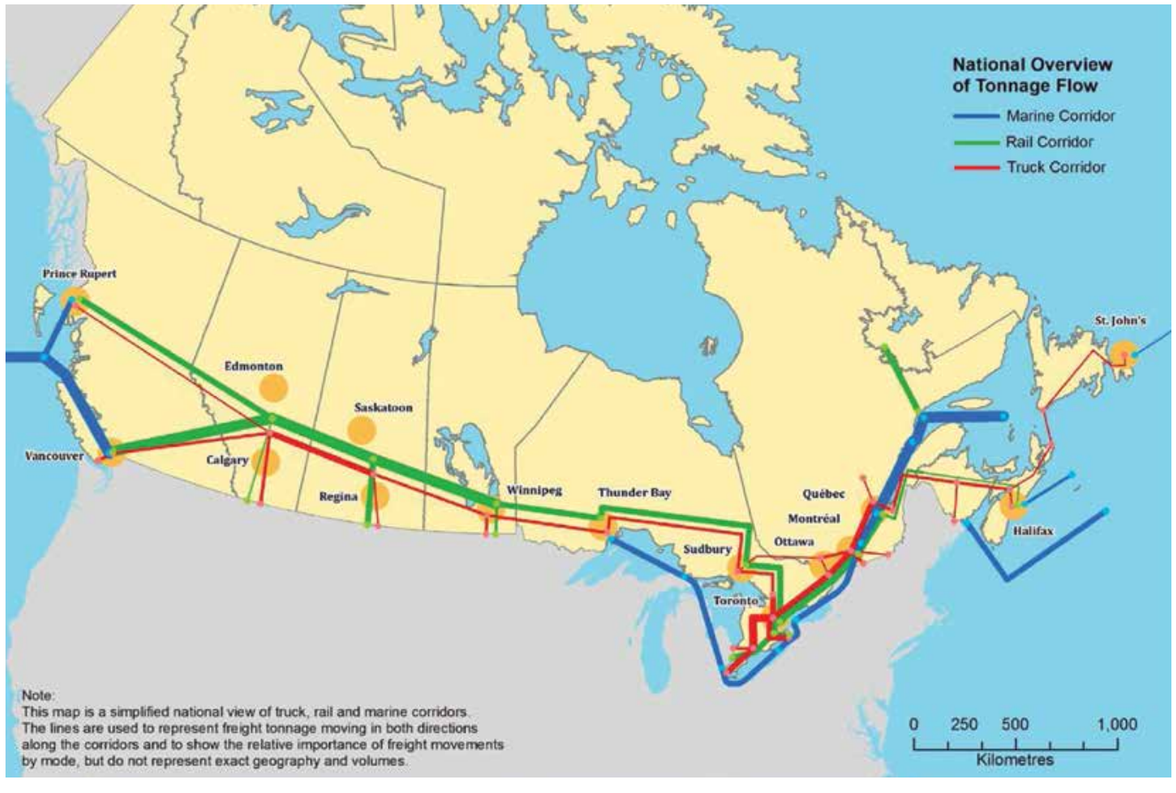
The Federal Government has also committed to improve the railway safety. The Transport Department (Transports Canada) has awarded from the 2016 budget an investment in the amount of 143 million Canadian dollars (100 M€) so that the Canadian railway operations and the dangerous freight transport may be the most efficient and as safe as possible.

Capacity increase

The actions include increasing the track inspection capacity, providing better management tools and strengthening the investigation. In order to reduce the accidents, mainly at the crossings' level, a "Rail Safety Improvement Program" is being implemented.

A detailed analysis has also been conducted to identify the transport projects with greater commercial benefits.

The Government endorses the investments in improving railway safety and capacity



Freight network:
Investments into key corridors

ALBERTA

Alberta includes some of the most relevant freight traffic-related projects. The railway is a key means, mainly for the oil, wood, forest and agricultural products transport performed by the CN and CP companies. Among them, the construction of a railway hub with the State of Alaska (US).

Moreover, the CN Company announced in April 2016, a multi-annual program to invest 500 million Canadian dollars (353 M€), so as to improve the infrastructure in railway lines in Alberta, Manitoba and Saskatchewan. Some amounts aimed to provide a better service to the increase of more than 50% of the transport volume in the Western Canada, during the last five years.

QUEBEC

The mining sector can be a good ally of the railway infrastructure construction companies. In Quebec, there are various examples, starting with the Cartier railway line, belonging to Arcelor Mittal, and up to the branches developed by Labrador Iron Mines or Consolidated Thompson. At present, the transport improvement is sustained within the Plan Nord of Quebec.

The State Government has approved an investment of 914.2 million Canadian dollars (645 M€) for infrastructures. Among them, the capacity and efficiency improvement of the railway services between the Labrador Channel and the Sept-Îles Harbor, one of the major iron deposits.

Project
Plan Nord of Quebec project for infrastructures

Location	Labrador Channel and Sept-Îles Harbor
Railway Company	Quebec North Shore and Labrador (QNSL)
Construction period	2015-2020

ONTARIO

Ontario has approved an investment of 3,500 million Canadian dollars (3,264 M€) for transport infrastructures in the next 10 years (highway, freeways and railway).

The "BuildON: Ontario's Infrastructure Plan" program, together with the impetus to the urban transport, also anticipates a new freight corridor. For its construction, which benefits from the federal support, an agreement has been signed with the CN Company. The idea was to find an alternative route for this type of transport between Milton and Brampton and thus avoiding crossing Guelph via a bypass. Thus the regional passenger connection would be improved after the track duplication and electrification works planned for this section up to Kitchener.

Project New freight bypass in Ontario (Missing Link)

Location	Ontario
Railway Company	Agreement between Metrolinx and CN
Commissioning	2024

BRITISH COLUMBIA

British Columbia is a strategic region on the Pacific coastline. The commercial reference point of the North America's West coast. In order to channel the Canadian and American trade flows with Asia, different supply chains (harbors, airports, railways and highways) are going to be integrated. Among the planned investments, of a private public nature, it is intended to increase the current infrastructure capacity so as to eliminate congestions and accelerate the intermodal transport operations. The aim is to respond to the substantial increase in the containerized and bulk traffic, respectively between Asia and North America via the Canadian corridors. During the 2016 fiscal year, 100 million dollars (70.5 M€) have already been awarded for the modernization of infrastructures, safety, new ballast and sleepers in the Region of Peace River, as indicated by its President, Claude Mongeau.

Project Modernization of infrastructures and safety systems

Location	Region of Peace River (British Columbia)
Railway Company	CN
Investment	100 million dollars (70.5 M€)
Construction period	2018

CANADA

Modern passenger lines:
Impetus to speed and frequencies

THE RAILWAY FITS IN AS THE MOST EFFICIENT TRANSPORT MEANS IN THE GOVERNMENT'S SUSTAINABILITY POLICY. THEREFORE, THE AMOUNTS INTENDED FOR THE IMPROVEMENT OF LONG DISTANCE ROUTES HAVE INCREASED.

The improvements in the railway connections gain in importance in Canada. A way of responding to the planned demographic and economical growth, mainly in the areas where the vast majority of the population is concentrated. Likewise, the impetus to the large touristic routes aims to also optimize these services.The major passenger company is VIA Rail Canada, which operates on 12,500 kilometers and provides services to 400 communities. With four million passengers, this public company was created in 1977.

Long distance routes

The busiest corridor is Quebec-Windsor. Among the long distance services, the touristic lines are the most extended. There are six major routes. First, "The Canadian", between Toronto and Vancouver, a four days train travel on a distance of 4,466 kilometers. The second corridor is the "Quebec- Windsor" Corridor, of 1,765 kilometers, consisting of 45 stations. The third route is Montreal-Halifax, known as "The Ocean" of 1,346 kilometers. Another famous long distance touristic journey is Jasper-Prince Rupert, of 1,160 kilometers. In the Region of Northern Manitoba, the Winnipeg Churchill route, of 1,697 kilometers. They all complement each other with the Montreal-Senneterre connections, of 717 kilometers, and Montreal- Jonquiere, of 510 kilometers. Although Via Rail is the main operator, the vast majority of the tracks where its services are provided belong to CN Rail. Likewise, there are a great number of passenger companies, both public and private, which have regional connections and short routes.

It is worth noting that certain freight transport railway groups also count on passenger services. Among them, Tshiuetin Rail Transportation, Chemin de Fer from Charle-Voix, Algoma Central Railway or British Columbia Railway. On its turn, there is the Rocky Mountaineer Company, with its headquarters at Vancouver, linking this city and Calgary with the touristic destinations like Banff, Jasper and Whistler. As a matter of fact, there are investment plans for this legendary corridor.

The Business Development Vice-President for CAnARAil Consultants, Guillaume Genin, has revealed that they are working in a forward-looking project that takes into account rolling stock improvements. This consultancy study includes the bi-level car reform.

Investment for new stages

The current aim is to drive these connections, since the railway fits in as the most efficient means in the Government's sustainability policy. Therefore, the manner in which the travel times can be reduced and the most important routes of the country can be made more attractive and commercially viable is thoroughly examined.

At present is being studied how the most important routes can be made more attractive and viable

CANADA

WINDSOR-QUEBEC CORRIDOR

One of the major ongoing projects is the commissioning of a high-frequency passenger only railway connection between Windsor and Quebec. This is the well-known "Dedicated track project". The number of freight trains and commuter trains is constantly increasing; therefore, it is difficult to improve travel times for the passenger transport in the current busiest corridors.

With this project's impetus it is aimed to achieve a modern, safe and efficient railway transport, so as to compete with the individuals' road travel. The traffic is expected to be relieved and the greenhouse emissions to be reduced, being one of the "Transport 2030" federal plan's objectives. The "exclusive" track project for passengers would allow redesigning the current frequencies that operate within the shared environment so as to better meet the regional needs of greater service. The economical development will be also encouraged throughout the railway corridor.

On one hand, Transport Canada has approved within the 2016- 2017 fiscal year for this corridor an amount of 34.4 million Canadian dollars (24.4 M€).

Some resources are intended for the improvement of stations and maintenance centers. The budget is part of the 444.9 million (316.3 M€) of the annual funds intended for VIA Rail's capital needs.

But the co-operation with the private sector is also sought in order to carry forward this great initiative. Within the "The Canadian Council for Public-Private Partnerships" forum, in 2015, the Via Rail's Manager, explained this PPP proposal and the need for a joint effort so as to culminate this ambitious project.

TORONTO-OTTAWA-MONTREAL

The Federal Government announced in March 2016 a new funding package for the next three years for Via Rail. 3,000 million Canadian dollars (2,133 M€) will improve the frequency of services between Toronto-Ottawa and Montreal. Another 7,700 million Canadian dollars (5,475 M€) for the procurement of new rolling stock, the plan for improving level crossings and safety within stations.

Likewise, there is an amount of 34 million dollars (31.6 M€) for the improvement of stations and maintenance of installations. The VIA Rail Canada's President, Yves Desjardins-Siciliano, has mentioned that based on these funds, a safer and more comfortable service will be provided, with modern infrastructures in the Ottawa station. In addition, four frequencies will be added between the two cities in 2017.

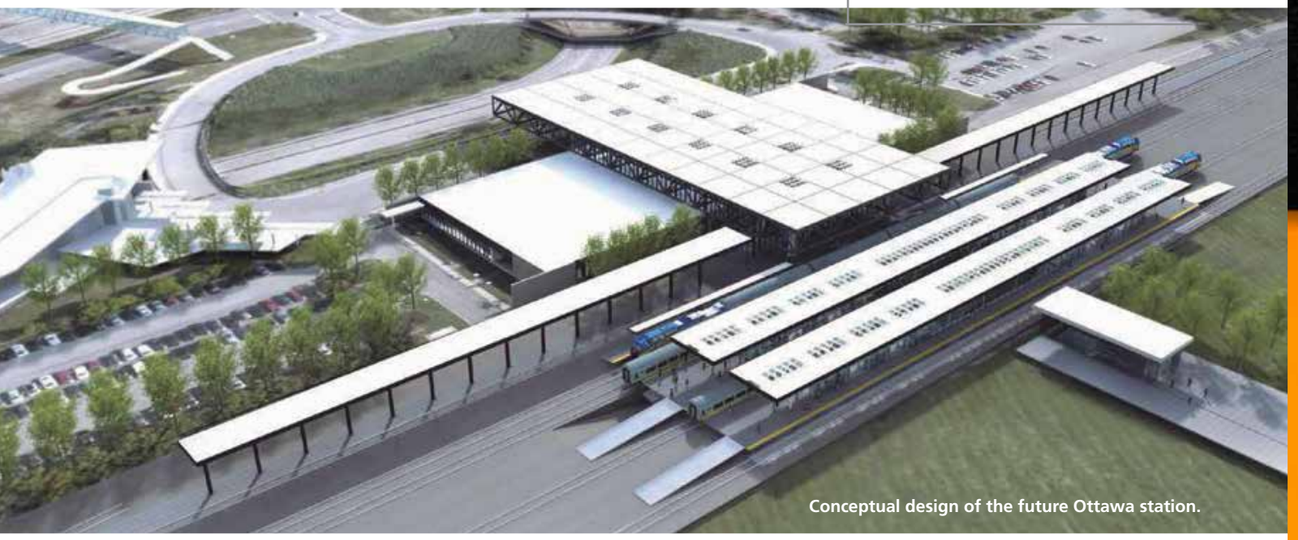
KINGSTON STATION

Another planned improvement within this branch is the Kingston station modernization. For this, the federal transport funds have awarded an additional amount of two million Euros. Kingston is a strategic center of heavy traffic between the connections of the three big cities of Montreal, Ottawa and Toronto.

FLEET RENEWAL

Within this impetus given to one of the busiest corridors, a special emphasis is placed on the Via Rail program for the rolling stock renewal. The "Train fleet renewal program in the Quebec city-Windsor corridor" aims to incorporate a new fleet of electrical hybrid trains until 2020.

It is estimated that the exchange with new units costs between a billion Canadian dollars (707 M€) if they are diesel and 1.3 billion (920 M€) if they are diesel-electrical.



Conceptual design of the future Ottawa station.

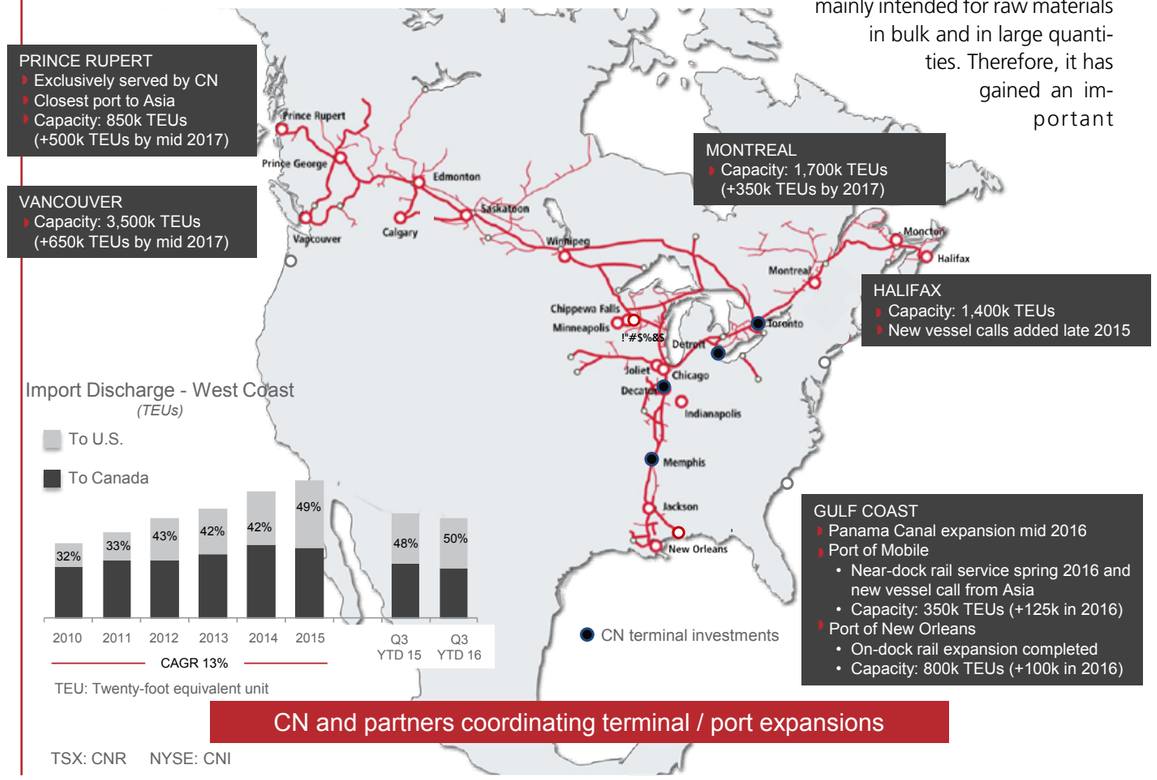
UNITED STATES AND CANADA

North America: Railway plans crossing borders

THE CONNECTION OF THE UNITED STATES WITH CANADA VIA RAILWAY WILL BENEFIT DURING THE NEXT YEARS FROM IMPROVEMENT PLANS BOTH IN THE COASTLINE AREAS AND FROM WEST TO EAST. IT AIMS TO PROMOTE TOURISTIC PASSENGER ROUTES AND THE FREIGHT TRANSPORT.

The coastline connections are of heavy traffic between both countries.

With almost 9,000 kilometers, the border shared by the Unites States and Canada is the largest of the world. The railway connections have the same track gauge 1.435 mm (4 feet 81/2).The connections between the North and the South Canada, up to the routes of its neighboring country, have been increased after having signed the Canada-US Free Trade Agreement and subsequently, the North American Free Trade Agreement (NAFTA). With the intercity freight road traffic growth in the 70's, the railway companies operating in both countries had to develop a long distance intermodal transport, mainly intended for raw materials in bulk and in large quantities. Therefore, it has gained an important role in terms of mobility. Among the most important, the one which starts from the Northeast Canada, from Prince Rupert and which crosses the central axis, by passing through Winnipeg and up to the Gulf's coastline. The international passenger connections of both coastlines are linked to them, as the well-known Pacific corridors (The Pacific Northwest Corridor) and also those belonging to the Atlantic.



PACIFIC NORTHWEST RAIL CORRIDOR

The Pacific Northwest Rail Corridor (PNWRC) is one of the eleven high-speed projects that the Federal Government of the Unites States aim to improve. It involves a line of 466 miles (750 kilometers) running from Eugene, in the United States to Vancouver, in Canada.
This line includes the famous "Amtrak Cascades" service. This is considered as one of the most successful long distance railway transport revival in the North America. For 20 years now, the Company has been able to make the most of this route, taking into consideration that this is one of the most exceptional routes due to its landscapes and the Spanish technology commitment.

Talgo trains

Within an infrastructure that has barely been renewed since its inception, during the last decades of the XIX century, there was a decision to incorporate tilting trains for a mountainous route and a modern, comfortable, efficient rolling stock with the best guarantees pronounced, where necessary. The Talgo technology was the winning option. During the 90's, Amtrack procured five 6 series train sets, which are being prepared to reach the speed of 200 km/h. In 2009, a new demand added to this route a 8 series rolling stock.
At present, work is constantly being done in the route's improvement. For this, the Transport Department of the Unites States co-operates with BNSF Railway
and Sound Transit. Within the two-year period 2015-2017, ten projects are expected. One of the most outstanding, a third track to the City of Kelso, the procurement of new locomotives, superstructure works for the installation of new rails near the Seattle station, the bypass in Point Defiance and an internal route between Tacoma and Nisqual. In 2023, the improvement works will make the trains run at a maximum speed of 110 miles per hours (180 km/h).Thus, the route between Portland and Seattle will be covered in 2 hours and a half. The route from Seattle to Vancouver will last for two hours and 37 minutes.

APGCI: ASIAN PACIFIC

The APGCI consists of a series of transport infrastructure projects, which include improvements in the main railway connections and highways starting from the West Canada and up to the Southern United States, the main border crossings and the largest harbors of Canada. This is an initiative where the private public cooperation is essential.
So far, the Federal Government of Canada has invested 1,400 million Canadian dollars (991 M€) in this initiative. It involves a consortium of transport administrations of provinces, municipalities and the private sector that seeks to improve the international trade via an efficient multimodal system with joint terminals and resource improvement. The total investments are in the amount of 3,500 million Canadian dollars (2,477 M€).

UNITED STATES AND CANADA

STUDY REGARDING THE RAILWAY CONNECTION BETWEEN ALASKA AND CANADA

The railway link between Alaska and Canada has been analyzed for various years. Since it involves a route that is very close to natural protected areas, the feasibility studies are focused on the most recommended route. In 2016, the Van Horne Institute (Alberta) proposed an alternative that would start from Fort McMurraya Delta Junction, in Alaska. A route particularly intended for oil derivatives transport.

The studied connections include a section from Alaska to Canada.

HIGH-SPEED, POSSIBLE ROUTES IN ANALYSIS PHASE

Although the United States have actually taken steps to implement high-speed networks, Canada is the only country of the G8 that has no line of this nature. Even so, during the last years, the national debate regarding the development of sections considered to be essential has increased. Among them, the vast majority from North to South. The objective was to connect the main Canadian cities between them (Quebec-Windsor, Calgary- Edmonton) and also with the closest ones to the U.S. (Vancouver-Seattle, Toronto-Chicago and Montreal-Boston and New York). Currently, these are only in a study phase, without a firm progress or a private public funding.

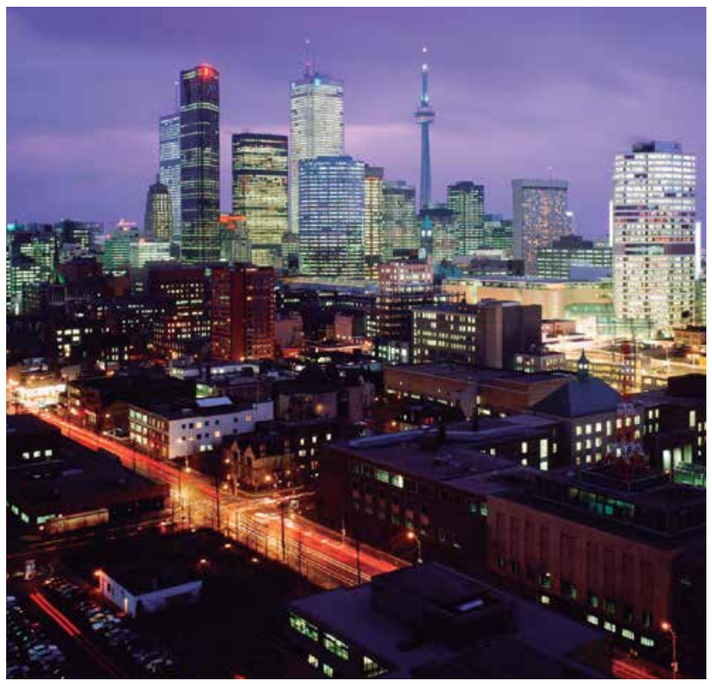
Possible studied routes

There are four possible routes in Ontario: Windsor-Quebec, Windsor-Chicago Toronto-Cleveland and Toronto-New York. The most densely populated and industrialized region from Canada is precisely located between the cities of Quebec and Windsor. Half of the country's population and three of the four most important metropolitan areas are concentrated here. Currently, various feasibility studies have been undertaken, but no date has been specified.

In addition, two more routes are studied in Quebec: Montreal-Boston and Montreal-New York. In the second case, the passenger traffic service is highly limited between New York and Montreal. For this reason, the Transport Department of the New York State and the Ministry of Transport of Quebec started the feasibility studies for a high-speed connection between New York and Montreal. The corridor will be divided into three sections: New York-Albany-Rouses Point and Montreal.

As for Alberta, the Edmonton-Calgary line is being discussed. Three options are assessed for this region as regards the railway infrastructure routes. The first of them is to improve an existing freight section belonging to Canadian Pacific. An amount of 1,800 million Canadian dollars (1,279 million Euros) is estimated. The second option would be to create a new track for the passenger traffic, called "Green Field". This would cost 2,200 million Canadian dollars (1,564 million Euros).

Thirdly, an electrified version of the "Green Field" is planned, which would be the most expensive option of these three, exceeding the amount of 3,700 million Canadian dollars (2,631 million Euros).


Toronto is one of the cities included in the debates on high-speed.

SOME MAFEX MEMBERS WITH PROJECTS IN UNITED STATES AND CANADA

SICE

SICE is in charge of the integrated controls and communication equipment in the expanded wilson yard and new wilson yard substation north in Toronto.

The Toronto-York Spadina Subway Extension Project is undertaking an extension of the existing Spadina Subway Line from Downsview Station, in the City of Toronto, to the Vaughan Corporate Centre.

To accommodate the extra trains required by the subway extension, extra storage tracks are required to store the trains in Wilson Yard.

SICE' s Scope includes the supply, installation, testing and commissioning of communication equipment:

- 26 Harsh Environment Telephone.
- 21 Emergency Trip Switchs.
- Emergency Trip Control Cabinet.
- Fiber optic cable and Fiber Optic Cabinets.
- RF radiant and non-radiant coaxial cable.
- Station Control System Cabinet.

CETEST

CETEST has developed plenty of tests for projects in North America.

Structural tests for the car shells of the Vacuum cleaner train for NYCT are being performed these days; this vehicle will be used for New York Metro maintenance and cleaning.

The environmental test campaign for PRIIA vehicle for CALTRANS- IDOT project will be performed soon for NIPPON SHARYO, with whom CETEST has already collaborated in the past for this project, as well as in Metrolinx DMUs in Toronto.

Moreover, dynamics and comfort test campaigns have been developed for AMTRAK (Viewliner I and II) and loco manufacturer BROOKVILLE, as well as complete homologation test campaigns for CAF tramways in Houston, Cincinnati and Kansas, amongst others.

CAF

CAF, present in the US for almost 20 years, has currently several projects in the country:

- Passenger coaches for AMTRAK: The production of 130 cars for AMTRAK long distance services. The order includes 25 sleepers, 25 dining cars, 55 baggage cars and 25 bedroom cars (which combine bed and baggage).
- LRVs for Massachusetts Bay Transportation Authority: The supply of new LRVs which will run on Boston city's Green Line.
- LRV Maryland: This is a Private Public Partnership (P3) Project to design, build, finance, operate and maintain the Purple Line. CAF will suppy 26 LRVs, together with capital spares, special tools and test equipment.

Recently, CAF has supplied state-of-the-art tramways to cities such as Houston, Cincinnati and Kansas City, becoming one of the leading urban vehicle suppliers in the US.

These projects are manufactured at the CAF production facility in Elmira, New York.

SIEMENS SPAIN

Siemens Rail Automation has developed a version of his Trackguard Westrace electronic interlocking for the United States market. The new interlocking is installed in the New York Metro, at Dyre Avenue station. The North American market is especially exigent in terms of accomplishment of own regulations as AREMA (American Railway Engineering and Maintenance-of-Way Association). The Trackguard Westrace interlocking -the most-installed-worldwide electronic interlocking with more than 2,200 references- had to be adapted for this purpose to these requirements at the same time that the new security modules have been developed.

New York Metro is one of the most exigent clients in the world and has chosen the Trackguard Westrace interlocking due to its high security, availability and flexibility levels. This last one has allowed the adaptation to the requirements from the New York Metro in a record time, less than one year, a new milestone in the expansion plan of the Siemens Railway Signalling and Control portfolio to the new markets

MB SISTEMAS S.COOP.

During the year 2016 MB SISTEMAS S. Coop. has developed and installed a new line of spot seam welding for corrugated panels of passenger rail coaches for KAWASAKI company in Lincoln (Nebraska-USA).

This new machine includes the latest technologies of artificial vision, air cooling system, automatic panel positioning, welding parameters online control and automatic polishing of the welding seam.

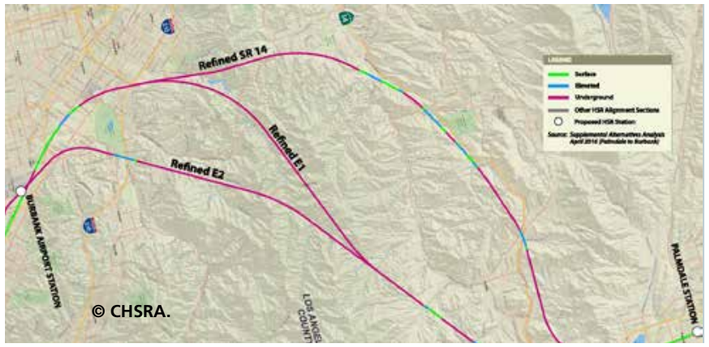
KELOX

Kelox IRT USA, -an affiliate of Kelox S.A., a Spanish subsidiary of the Flores Valles Group-, signed a contract to supply catering onboard equipment for 21 cars manufactured by Nippon Sharyo Manufacturing, -a US-owned subsidiary of Japan's NIppon Sharyo, which is part of Nippon Sharyo USA-, at its plant in Rochelle, Illinois. These cars are double-decker and have been purchased by a consortium of 5 states (California, Illinois, Missouri, Iowa and Michigan) for which they have federal funding.

Kelox USA won the competition by offering quality equipment, design and technology being the first company to supply this material with the new specifications developed by the Next Generation of Equipment Committee (NGEC) created in the framework of the Passenger Rail Investment and Improvement ACT (PRIIA) and led by Amtrak, which placed Kelox in an unbeatable position for future tenders in the United States. Since railroad equipment is funded in part by federal funds, an essential point for Kelox was to comply with the Buy America requirements and, to that end, a subsidiary company of Kelox S.A. is established jointly with a US industrial group, which is the main supplier for manufacturing and assembly in its plant in Chambersburg, PA. However, all aspects related to engineering, design, know-how and project management are the responsibility of Kelox España.

This project is currently being completed, and as a result of this good positioning, the year 2016 Kelox IRT USA has been awarded by Siemens USA of two other orders in the United States, both for the new Brightline rolling stock awaiting intercity commercial service in mid-2017 connecting Miami, Fort Lauderdale and West Palm Beach. The first 10 Brightline trains are being manufactured from the Siemens hub in Sacramento, CA.

SOME MAFEX MEMBERS WITH PROJECTS IN UNITED STATES AND CANADA



SENER

The public agency CHSRA (the California High Speed Rail Authority) awarded SENER the contract for delivering engineering and environmental services for the Palmdale to Burbank section of Los Angeles line of California's high-speed rail system. This is a critical section of the line due to the complexity of crossing through the Los Angeles National Forest with its complicated orography and various tunnels, some of which will of a considerable length. It will furthermore pass through various cities where integrating the railway will be extremely problematic, including the Palmdale and Burbank stations.

STADLER RAIL VALENCIA

Southern California commuter operator Metrolink is launch customer of the Tier IV-compliant passenger locomotive F125 developed by Stadler Rail Valencia in cooperation with EMD/Progress Rail. First units of an order of 40 diesel-electric locomotives have been already delivered.

Stadler has designed the locomotive and manufactures the carbodies and the bogies. Final assembly is made in EMD/Progress Rail´s plant in Muncie who also supplies the traction and control systems.

This state-of-the-art F125, so named because it reaches a speed of 125 mph (200 km/h), is an innovative locomotive designed to meet strict environmental requirements Tier IV and optimize the performance of the operator.

INDRA

Since 2006, Indra has been the reference technology provider for St. Louis's MetroLink system, for which it has implemented advanced contactless ticketing technology in its bus and light rail network.

The entity that manages the regional public transportation system of the metropolitan area of St. Louis, which also operates in the states of Missouri and Illinois, entrusted to Indra the design and implementation of a contactless ticketing system for its MetroLink network, made up of 37 stations, and for the almost 70 lines that form the region's bus system. All the systems are integrated at the control center installed by Indra, enabling the agile processing of the network's operating and management information and the simplification of the maintenance of its systems.

St. Louis was one of the first cities to use the innovative fare system developed by Indra, which is capable of automatically charging passengers the best available price for their journeys without their having to worry about selecting the most suitable ticket. Another innovation implemented by Indra is a back-office system that works as a regional compensation system with other operators in the region, enabling the use of both individual transport tickets for each operator and unified tickets that allow passengers to make multimodal and multi-operator journeys. Indra has also implemented its ticketing systems in the MetroRail service in the Texan city of Austin. The company provided Capital Metro, Austin's transport authority, with a full automatic ticket issuance system and ticket validation systems located both at stations and on trains and in the portable devices used by inspectors. Indra's technology received an 'Honorable Mention' in Austin City Council's Access Awards due to the full accessibility of its ticket issuance machines, which offer visual and audible information in English and Spanish, as well as in Braille, and can be easily used by people in wheelchairs.

Indra has also been a recipient of the Best Industry Solution Award for the Travel and Transportation market, one of the prestigious awards issued by IBM in the United States, for its DaVinci system.

TALGO

The Series 8 trains are the latest Talgo development for the North American market.

They are specifically designed to operate in this region and are compliant with all FRA standards including more demanding requirements for universal accessibility and structural resistance in the event of collisions. All have been manufactured by Talgo at a factory in Milwaukee and are currently serving the Oregon-Washington route, along with other Talgo trains in revenue since the late 90's in the Cascades route connecting Portland with Seattle (USA) and Vancouver (Canada).

Its ongoing diversification strategy has led Talgo to new market segments and new business activities in the railway sector. With 60 years' experience in long-distance rolling stock maintenance, Talgo will now overhaul up to 74 A650 rail vehicles of the Los Angeles metro fleet (USA), as part of the Los Angeles County Metropolitan Transportation Authority (LACMTA) long-term plans to develop a non-stop, sustainable mobility offer in the area.

GETINSA-PAYMA

Euroestudios, company of TPF group associated to Gentisa-Payma, is involved in the development of one of the most significant high speed projects currently undertaken in the USA. We are providing consulting services in the design of a section of the California High Speed Corridor under a design-and-build contract.

The California HSR Corridor covers a total length of approximately 800 miles. It will connect the major metropolitan areas of California, from San Francisco and Sacramento in the north to Los Angeles and San Diego in the south, with a design speed of 250 mph.

Euroestudios is responsible for the design of the Fresno-Bakersfield section, which is located in the Central Valley and is included in Package 4.

UNITED STATES AND CANADA:
NATURE AND MODERNISM CONNECTED


Moraine Lake, a proof of Canada's natural beauty.

NORTH AMERICA OFFERS THE BEST URBAN EXPERIENCES, FASCINATING LANDSCAPES AND NATURE IN A PURE STATE.

CANADA

This is one of the largest countries of the world, outlining the combination between big cities and an impressive natural beauty. On one hand, the East has a lot to offer. In the City of Quebec, the capital of this region, the ancient world's warmth comes together with a cosmopolitan life. At Montreal, there is a clear fusion of ancient ages, a diversity of cultures, languages and gastronomy. The region of Ontario has renowned national parks and the **"Great Lakes"**. The Canadian urban life epicenter, Toronto, is also known as the 6ix, astonishing with its colorful neighborhoods. It is also interesting visiting the **Niagara waterfalls**. The country capital, Ottawa, famous for landscapes such as the **Rideau Canal**, its gastronomic offer and natural beauty links to them.The magic of the Western area is obvious throughout the coastline and its known natural tracks. Lakes, large woods, glaciers, rocky mountains and reserves are its hallmarks. Its fame also comes from its most touristic urban destinations, such as Vancouver, where the glass towers horizon reflects the surrounding ocean's beauty and the "Coastal Mountains" on the background. Travelling in the states of British Columbia and Alberta is highly recommended. A tour that includes **Jasper** and **Banff**, through whose surroundings and the famous Icefields Parkway motorway, parks such as the **Yoho, Glacier** and **Mt. Revelstoke** or **Kootenay** can be visited. Besides the **Maligne Lake**, it is also worth visiting **Lake Louis**. And, of course, the Athabasca Glacier.

UNITED STATES

The United States is another comprehensive destination. Its territorial extension makes it a cradle of a great variety of cultures, traditions and customs. The country is particularly famous for its big cities and its natural diversity as a touristic attraction. New York is the most cosmopolitan and visited city. One of its greatest symbols is the **Statue of Liberty**, built between 1875 and 1884, on the **Liberty Island**.

Other most demanded destinations are Boston, Chicago, Las Vegas, Los Angeles, San Francisco and Washington DC. The most visited natural places are the **National Parks of the Great Smoky Mountains**, the **Grand Canyon**, as well as the **National Park of Yellowstone, Redwood, Mammoth Cave** or **Everglades**.


The National Park of the Grand Canyon from Arizona.

The Spanish high-speed network consists of tunnels and viaducts of particular importance.

Above, the Contreras viaduct, with the largest concrete railway arch from Europe (261 m of light). It is located in the LAV Madrid-Valencia. On the right, the Sant Boi viaduct.

High Speed in Spain:
Global forefront on technologies and know

THE SPANISH HIGH-SPEED IS 25 YEARS OLD. AN ANNIVERSARY THAT HIGHLIGHTS THE GREAT POTENTIAL OF THE RAILWAY INDUSTRY AND ITS INNOVATIONS IN THE DEPLOYMENT OF THE SECOND NETWORK OF THIS NATURE FROM THE WORLD.

The Spanish high-speed network ranks first in Europe and second in the world ranking, just behind China. With more than 3,200 km in commercial operation, it is not only one of the largest, but it also stands out for the fact of being equipped with the most advanced breakthroughs in I+D. For the success of this pioneering development process, various factors were involved. For example, the cooperation between different Spanish manufacturers, SMEs and multinationals that have put together their knowledge and potential so as to achieve the most pioneering solutions of the market, with a high level of efficiency, quality and comfort. The network, under the Adif and Adif Alta Velocidad responsibility, consists of state-of-the-art safety and control technological solutions implemented on the track and its control centers. In addition, it has the most modern and best equipped train fleet from the entire Europe, which belongs to Renfe Operadora. This innovative, fast, clean and safe transport system has broken the records, as indicated by Renfe." All high-speed services from Spain have been used in 2016 by 35,214,000 passengers". This figure represents a growth by almost 1.8 million compared to 2015. These trains reach speeds of up to 350 kilometers per hour. Apart from the already operating sections, there are currently 1,300 kilometers in different performance phases. The high-speed lines are an example of the commitment to the railway as a transport mean in Spain, where they became a key element as regards the country's articulation improvement and the citizens' quality of life. All these are reflected in the guidelines drawing the Infrastructure, Transport and Housing Plan (PITVI 2012-2024).

A network with great benefits

Since 1992, the number of operational high-speed kilometers has been practically multiplied by seven. Thus, it started from 470 kilometers and reached to more than 3,200. Moreover, the benefits of this transport mean have extended from 10 to 47 cities. At present, 67.4% of the Spanish population has access to high-speed in their province. The high-speed success registered in Spain since the inauguration of the first line in 1992 is currently interpreted in its international projection. All these developments have placed the Spanish railway industry and all sub-sectors required in this type of projects as the leading international reference point. The added value chain of this industry includes a wide range of products and services, starting with the infrastructure's design, construction, management and maintenance stage, and up to the most advanced rolling stock. All these are able to meet any type of demand in any part of the world, with maximum quality, reliability and quality-price ratio guarantees. It is noteworthy that both big companies and the SMEs hold the top leadership positions in the world, in a sector where a great know-how and a high management capacity are required.

Modernity and innovation

El The fact that Spain has one of the best high-speed networks of the

67.4% of the Spanish population has access to high-speed in their province

SECTIONS IN OPERATION

1992
Madrid-Sevilla 471km

2003
Madrid-Lleida 468km
Zaragoza-Huesca 79 km

2005/06
Lleida-Tarragona 95 km
Córdoba-Antequera 100 km
Connection to Toledo 21 km

2007
Madrid-Lleida 468 km
Madrid-Valladolid 181 km
Antequera-Málaga 51 km

2008
Tarragona-Barcelona 88 km

2010
Madrid-Cuenca 183 km
Madrid-Albacete 315 km
Madrid-Valencia 391 km
Mollet-Girona 75 km
Connection with France 20 km

2011
Orense-La Coruña 150 km

2013
Barcelona-French Border 131 km
Albacete-Alicante 165 km

2015
Santiago-Vigo 94 km
Sevilla-Cádiz 71 km
Valladolid-León 166 km
Olmedo-Zamora 103 km

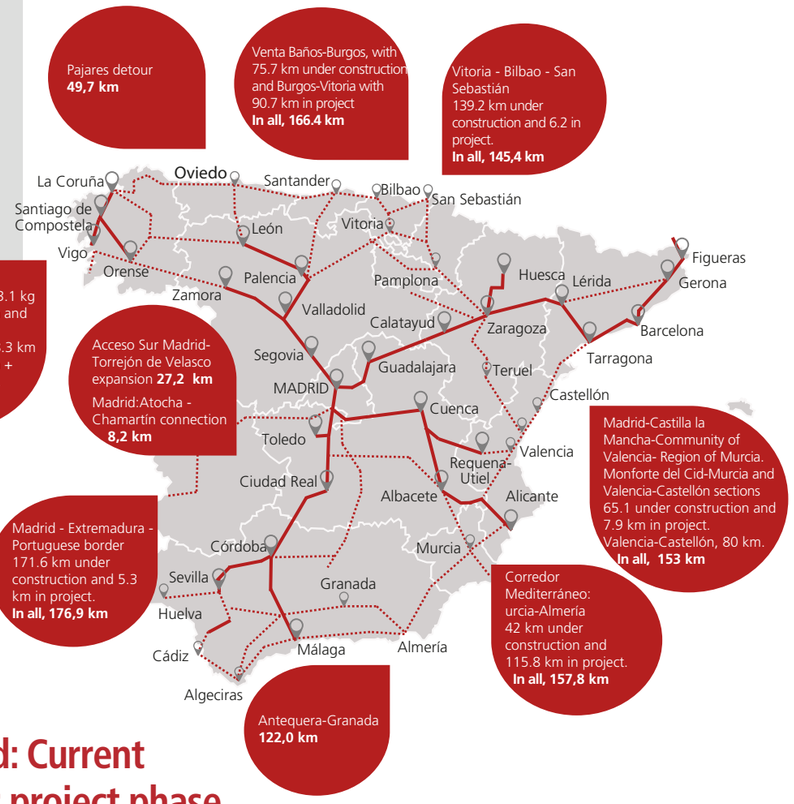
world is the result of more than 20 years of joint work and experience in a very compact, structured sector with great synergy. The high-speed history in Spain has a key date, April 21st, 1992. That day, an AVE (Spanish High-Speed) train performed the first commercial transport between Madrid and Seville. Since then, as the 25th anniversary is celebrated, it constantly increases the number of persons travelling on this line. Recent figures indicate that there are more than 3,100 km of tracks and 41 stations assigned to Adif Alta Velocidad. Due to this innovative infrastructure and the 16 gauge switches installed within the network, numerous Spanish cities benefit from this service.

Future plans: More than 3,800 Km

The works and projects planned by the Government will continue to be developed in the medium-term. Therefore, Adif Alta Velocidad makes progress as regards the works and projects entrusted with the aim to reduce the distances further more and to link various territories of the Spanish geography through the high performance network. New high-speed infrastructures such as the Mediterranean Corridor, the Antequera-Granada line, the Basque Y and the link to Murcia, are still performed within the scheduled action plans, among others. Approximately 3,800 kilometers are in a study or project phase. The development of the extended high-speed infrastructure has not been exempted from challenges and threats.

Works of particular complexity

The complicated Spanish orography had to be superseded on large



TOTAL INVESTMENT **45,120** M€

Spanish High-Speed: Current sections in study or project phase

Source: Adif.

Viaduct over the Almonte River, on the LAV Madrid-Extremadura-Portuguese border, with IDOM's participation.

sections, with civil works of particular technical complexity. For this, large tunnels that are already listed among the largest of the world, as well as viaducts of important dimensions, have been designed and built. Among the most relevant, due to its features, is the tunnel of Guadarrama of 28.4 km, which is one of the largest tunnels of the world. Another most complex tunnel is the one of Pajares of 24.9 km, which is one of the largest tunnels from Europe. These examples also include the works of great significance, such as the viaduct of Contreras, of 587 m, with one of the major concrete railway arches (261 meters of light) from the entire Europe. The viaduct over the Almonte River, located in the high-speed line Madrid-Extremadura-Portuguese border also stands out. It holds the world record in terms of viaducts-concrete railway arch. Its singularity resides in the construction of its central arch measuring 384 m. The Ardanuy, Idom, Ineco, Getinsa, Sener or Typsa engineering, among other highly specialized companies, were involved in these big successful projects. And also constructors having an extensive experience in this field, such as Comsa.

ERTMS: Signaling guides

The Spanish high-speed leading position is not only linked to the kilometers of operational lines. Spain is also a pioneer in terms of technological breakthroughs in the field of railway infrastructure signaling. It involves the country that has largely implemented the European ERTMS (European Traffic Management System) system, the most modern and advanced until present. There are already approximately 2,000 kilometers of network equipped with this system, out of which more than 1,000 are Level 2 equipped, which is being implemented on the new lines under construction. The commitment to this new interoperable technology has made Spain to play a particularly key role in its international deployment and development. In fact, "it has been demonstrated for the rest of Europe how the technical interoperability between all providers is possible, considering that the system is implemented with high levels of punctuality and reliability, within all high-speed lines, except for the first Madrid-Seville line", as indicated by Adif. The Spanish high-speed network consists of one of the largest interoperable routes from Europe, which passes through Barcelona and Malaga. On this section, the rolling stock equipped with ERTMS runs through an infrastructure equipped by four different manufacturers. The connection to 17 French cities, since its commissioning in 2013, the Madrid-Barcelona-Marseille and Barcelona-Paris, Lyon and Toulouse section, should also be added. CAF Signaling, Thales, Bombardier España and Siemens España have contributed to its progress.

The Spanish high-speed has one of the largest interoperable routes from Europe

Developments and own technology

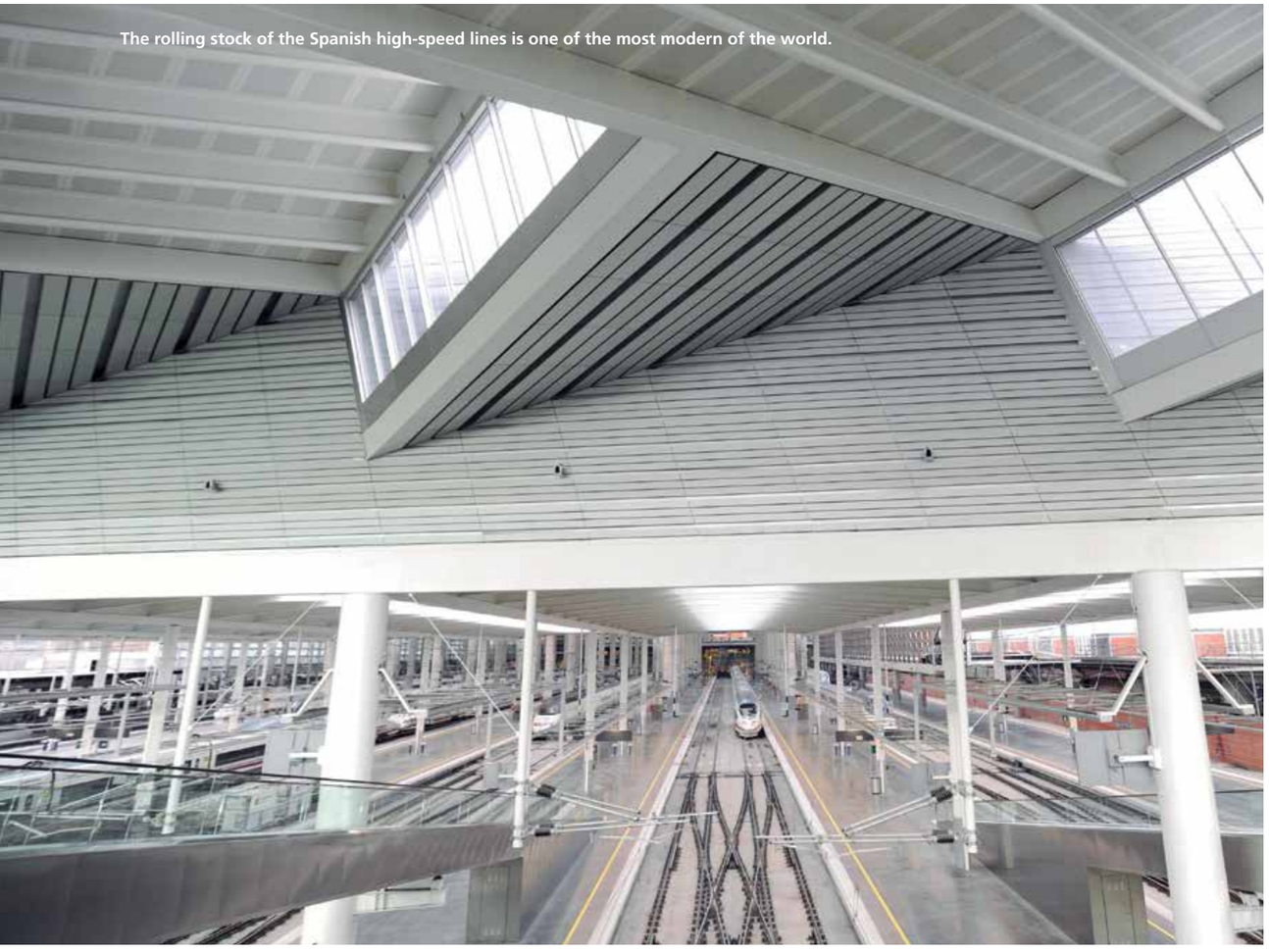
The network management is another environment in which Spain particularly stands out due to its technical training and the innovative breakthroughs that ensure a greater safety and efficiency. A clear example is the DaVinci system, one of the most advanced of the world. Property of Adif and developed by Indra, this is a reference tool for the railway traffic control in the Spanish high-speed. It adapts to the conventional networks and it is already implemented in different countries. This development has been able to integrate all systems consisting of the elements of a regulation and control center into a single application.

Electrification and superstructure

In the field of railway electrification, there is the Adif catenary, entirely Spanish, called C-350 and supplied by 2x25 KV CA. The SEMI Company played a special role. To this, new developments are added to the electronic level crossing protection technology, based on which their safety is increased. As regards the track superstructure, solutions have been created for the gauge switching, such as those belonging to CAF and Talgo. These systems have generated a great interest in countries, such as Russia, which also have another measurement than the standard one. Another breakthrough has been the "Telphe" technology, by Telice, applied on the Valladolid-Leon line. It prevents the switch points from freezing. The new generation of AV4 bypasses, developed by UTE Fabrides with Adif requirements also stands out.

25 YEARS OF TECHNOLOGICAL ACHIVEMENTS IN HIGH SPEED

Pioneers in signaling	The network with the highest level of implementation of the European ERTMS system. Approximately 2,000 kilometers equipped with ERTMS.
Interoperability references	One of the major interoperable routes from Europe is Barcelona-Malaga. The rolling stock equipped with ERTMS runs through an infrastructure equipped by four different manufacturers.
Mobile rolling systems	Technology based on the Brava (Self-Propelled Variable Gauge Rolling Bogie) bogies. Talgo RD system.
Railway electrification	Adif developed an entirely Spanish catenary called C-350.
DaVinci system	The most advanced traffic management system of the world.
Tunnels	Guadarrama tunnel: It is the fourth longest from Europe and the fifth from the entire world (28.4 km). Pajares tunnel: It hold the fifth place as the longest from Europe (24.9 km).
Viaducts	Contreras viaduct: One of the largest concrete railway arches from Europe (261 m of light).Ulla viaduct: The tallest from Spain. Record in terms of metallic lattice structural typology.1.620 m long and an opening wider than 240 m.
Aerodinamic sleeper	Air-sleeper: Reduction of the ballast lifting phenomenon.
High-speed bypasses	AV4 model bypasses: They allow speeds of up to 350 km/h on direct track and 170 km/h on bypassed track
Three-rail track technology	It allows running through an international and Iberian gauge on the same tracks.
Anti-freeze technology for tracks	Telphe: Improved track conditions against adverse environmental conditions.
High-speed platforms	Oaris (CAF)/ AVRIL (Talgo).



The rolling stock of the Spanish high-speed lines is one of the most modern of the world.

Rolling stock: State-of-the-art trains for a XXI century network

THE FIRST SPANISH HIGH-SPEED TRAIN WAS USED FOR THE FIRST TIME IN 1992. SINCE THEN, A ROLLING STOCK EQUIPPED WITH THE MOST TECHNOLOGICAL DEVELOPMENTS HAS BEEN INTEGRATED. ACCESIBILITY, COMFORT, PUNCTUALITY AND SAFETY ARE ITS MARKS OF IDENTITY.

On the Spanish network run high-speed trains belonging to different manufacturers, while all being equipped with state-of-the-art technology. This diversity has resulted in a train fleet that stands out for its comfort, convenience and punctuality, aspects that are highly appreciated by the users. The high-speed rolling stock belonging to Renfe Operadora was used for the first time in 1992, alongside with the Madrid-Sevilla line opening. The well-known AVE 100R Series started to operate on this section. After 15 years of activity, in 2009, it completed its technical remodeling so as to meet the passengers' new requirements. In 2001, the Talgo-Bombardier Consortium was awarded the construction and maintenance of 16 high-speed trains, the S102.In 2005, 30 more units were entrusted. In 2008, the first "Alvia" self-propelled train of the 120 Series enters into commercial operation for Madrid-Barcelona. One of its novelties is that it has been equipped with a mobile rolling system based on the Brava (Self-Propelled Variable Gauge Rolling Bogie) bogies developed by CAF. Since they adapt to any track gauge, and in only 3 seconds, they allow providing services on the high-speed lines. The 103 Series train appeared later for these networks. It involved a fleet of 26 units, with distributed traction, awarded to Siemens after two tenders. This fleet is completed with 130 Series trains. There are 45 compositions of 11 7 Series Talgo carriages and two tractor trucks manufactured by Talgo in terms of mechanics and by Bombardier in terms of electrics. It is able to run through the high-speed international gauge lines at 250 km/h and at 200 km/h on the conventional ones. In 2012, the first hybrid train, Alvia 730 Series, is integrated in the Madrid-Galicia service. With the traction technology, both diesel and electrical, the benefits of high-speed also reach the sections without the need to electrify. It consists of a mobile rolling system, through which they can run on UIC (AVE gauge) gauge tracks and on conventional gauges.

Spain also has the first rolling stock of the world designed and built particularly for providing services on high-speed medium distances. These are the S104 trains based on the Pendolino technology. Special mention is made to the recent rolling stock developments.On one hand, the Oaris platform belonging to the CAF Company. A very high-speed train family able to reach 350 kilometers per hour. It has been designed with own maximum reliability technology, as a result of the constant commitment of the Company towards I+D. Therefore, it includes the most modern breakthroughs in terms of design, accessibility, safety and comfort. On the other hand, the Talgo AVRIL also stands out, an advanced train designed for the operators with the most demanding capacity requirements.

The most modern fleet from Europe

Precisely, at the end of 2016, the Talgo Company was awarded the manufacture of 15 trains belonging to this family and their maintenance for a period of 30 years. A contract in the amount of 786.5 M€. In addition, another extra 15 trains are intended to be procured and the maintenance period will be extended for another 10 years. With this new demand, Spain will have the most modern high-speed train fleet from Europe. This rolling stock will be equipped with the most modern technology (including WiFi), of a great versatile capacity, while being accessible and reliable. Other advantages would be its design that aims to reduce the power consumption and to multiply efficiency.

Train	Route	Manufacturer
AVE Serie 100R	Madrid - Sevilla	Alstom/MTM, Meinfesa, Alcatel y Faiveley CAF/Sepsa y Stone Iberica
AVE Serie 102 /112	Madrid - C. Real - Córdoba-Málaga Madrid - Segovia - Valladolid Madrid - Zaragoza - Huesca Madrid - Valencia Madrid - Albacete Madrid - León Barcelona - Málaga Barcelona - Sevilla	Talgo/Bombardier
AVE Serie 103	Madrid - C.Real-Córdoba - Málaga Madrid - Córdoba - Sevilla Madrid - Barcelona	Siemens
Alvia Serie 120	Madrid - Guadalajara - Logroño Madrid - Bilbao Madrid - Irún - Hendaya	CAF
Alvia Serie 130	Santander - Alicante Madrid - Alicante Madrid - Valencia - Castellón Alicante - Gijón	Talgo/Bombardier
Alvia Serie 730 (Híbrido)	Madrid Chamartín - A Coruña Madrid - Ferrol Madrid - Pontevedra	Talgo/Bombardier
Avant S-104	Madrid - Ciudad Real - Puertollano Madrid - Toledo Málaga - Córdoba - Sevilla	Alstom/CAF
Avant S-114	Madrid - Segovia - Valladolid	Alstom/CAF
Avant Serie 121	Barcelona - Tarragona - Lleida A Coruña - Santiago - Ourense Zaragoza - Calatayud	Alstom/CAF

Source: Renfe Operadora.

Spanish leadership: A model of success exported throughout the world

The Talgo 350 model is the high-speed train exported to Saudi Arabia.

THE SPANISH RAILWAY INDUSTRY BUILDS, DESIGNS AND OPERATES HIGH-SPEED INFRASTRUCTURES THROUGHOUT THE WORLD. THE MAIN PROJECTS ON FIVE CONTINENTS, FROM THE MIDDLE EAST TO NORTH AMERICA AND THE ENTIRE EUROPE, AMONG OTHERS, RELY ON ITS TECHNOLOGICAL SEAL AND EXPERIENCE.

Spain is a case of international success in terms of high-speed, which is backed up with more than 20 years of experience and the determined effort regarding innovation. The impetus into these networks is the country's genuine commitment. The institutional investment exceeds 12,000 million Euros per year, a support for the Spanish railway I+D, which consists of 90,000 experts with a solid experience and good reputation in the design, construction, maintenance, exploitation and development of safety systems, as well as in the state-of-the-art rolling stock provision. For this reason, the national railway industry builds, designs and operates more and more infrastructures of this type throughout the world. The commissioning of this modern and extended network created a highly specialized, competitive, professional and integrated business fabric that exports its know-how and high qualification in the entire world. The Spanish railway sector has been and it is still reliable for many transport administrations that require providers with proven experience throughout the design, construction, commissioning, service and maintenance project cycle on the high-speed lines. They are looking for the best guarantees and

The first Turkish high-speed network consists of the rolling stock and signaling belonging to the Spanish CAF Company.

the most modern technology. The global interest in the Spanish high-speed is indicated by the many co-operation agreements signed. As results of these agreements, representatives of various countries, such as Brazil, Chile, Columbia, U.S., Morocco, Mexico, Poland, Russia, Turkey or Venezuela, came to Spain to become acquainted with this innovative model. We could also add the multiple visits of international delegations for the purpose of becoming acquainted with the Spanish railway system, such as Sweden, China, Bosnia-Herzegovina, Saudi Arabia, India, Tunisia, Algeria, United Kingdom, Bulgaria, Japan, Czech Republic, Hungary, Uzbekistan, Croatia, United Arab Emirates, Nigeria, Australia, Qatar, Vietnam, Korea, Indonesia and South Africa, among others.

PRESENCE IN THE MIDDLE EAST

In the Middle East, among the most highlighted projects, there is the high-speed line that will link the cities of Mecca and Medina, in the Saudi Arabia. The consortium of companies including Renfe, Adif, Ineco, Indra, OHL, Consultrans, Copasa, Imathia, Cobra, Dimetronic, Inabensa and Talgo performs this work, with a contract value up to an amount of 6,736 M€. Amurrio Ferrocarril y Equipos, S.A. is also in charge of the provision of high-speed bypasses, model AV4. It involves an entirely Spanish technology that has been designed and manufactured so as to allow reaching speeds of up to 350 km/h on direct track and 170 km/h on bypassed track

EUROPE

Many of the projects have the Spanish seal. Turkey also relied on the Spanish railway industry for the commissioning of the first network of this nature between Ankara and Istanbul. The first LAV from the Middle East is a project carried out by OHL and in which the CAF Company provides the most advanced rolling stock. In addition, CAF Signaling has been in charge of the ERTMS system implementation. Therefore, Adif and Renfe provided advices for its commissioning and the commissioning of the DaVinci traffic management system, an intellectual property of Adif. Among the most recent European projects, this industry's experience was transferred to the United Kingdom, which will carry out various phases of the largest high-speed line, known as the "HS2" (See number 9 of the Mafex Magazine). This network will link London to Birmingham. Sener, Idom and Ineco are three of the companies that perform these works. They are an example of great international weight of the engineering advisers in terms of design, construction and commissioning of these innovative high-speed networks. The Ferrovial Agroman subsidiary, which is part of the Fusion Consortium, in charge of the previous construction works regarding the central line section, joins them. In addition, as regards the civil engineering, various consortiums with Spanish presence are involved: ACS, Ferrovial, FCC and Acciona. In Norway, for example, CAF has been recently awarded with eight Oaris high-speed trains for an amount of 120 million Euros. The Spanish industry seal is very present in many other railway networks of this nature. Among them, there is the recently inaugurated high-speed train which links Moscow to Berlin, while being equipped with the Talgo technology. This system allows the axles to be changed so as to adapt to the different track gauges and to reduce the journey to 4 hours and a half.

AMERICA

America is another continent where the high-speed knowledge export steadily makes its way through.

The Spanish high-speed network created a highly specialized business fabric

Spain signed numerous international co-operation protocols as regards the high-speed

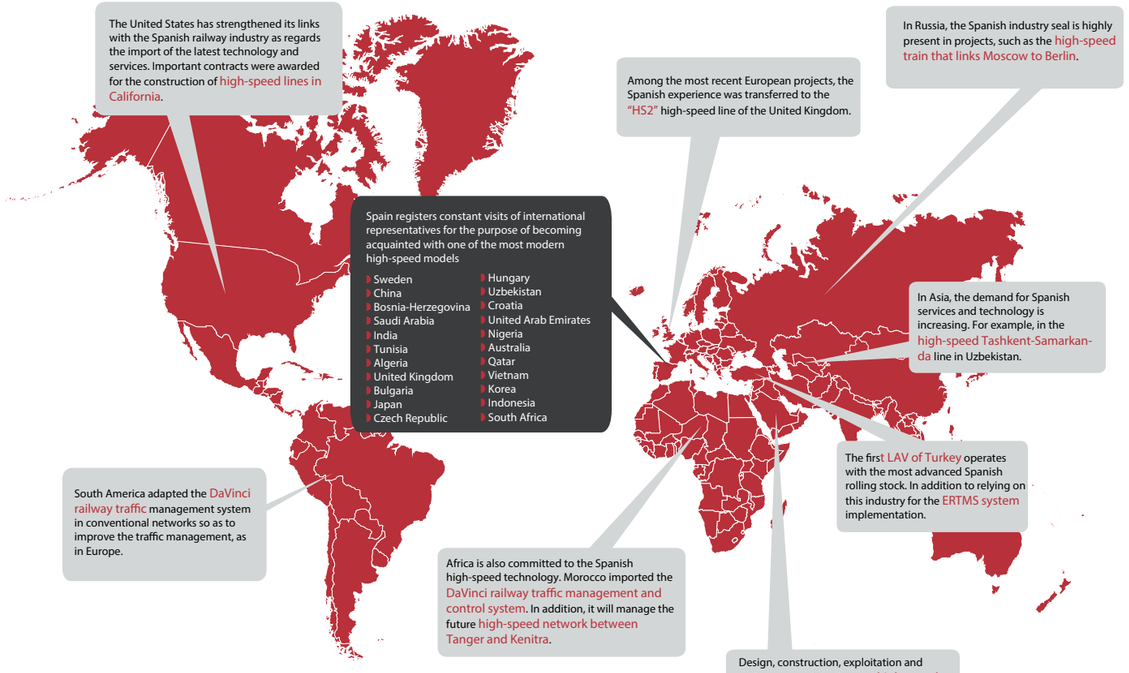
For example, ACS or Isolux Corsan, are successful bidders of important contracts for the construction of high-speed lines in California (United States). In this country, Adif has signed various agreements with North American entities in order to share its experience and know-how mainly in the field of construction, quality control, management and maintenance of the high-speed. In addition, during the last years, various official delegations of the United States have been visiting our country to become acquainted first-hand with the great breakthroughs in the high-speed and the modern railway infrastructure. Among them, the senior management of the Secretary of Transports, Congress, Senate, Federal Railway Administration. As result of these meetings, a work group was created so as to share information and promote the technological co-operation between both countries.

AFRICA

It has also been committed to the Spanish high-speed technology. Morocco imported the DaVinci railway traffic management and control system. This is a strategic project, considering that it involves the first entire implementation of the DaVinci system in a foreign railway administration. In addition, it will manage the country's future high-speed network, whose first line started to be built between Tanger and Kenitra. This system opens up the borders also in many conventional networks that have adapted it, so as to improve the traffic management (Lithuania, Columbia, United Kingdom, among other many examples.).

ASIA

In Asia, the demand for Spanish services and technology is increasing. Talgo has built the units of the LAV Tashkent-Samarkanda in Uzbekistan. A project in co-operation with the traction division of Ingeteam, which has provided equipment for four tractor trucks from this fleet, as well as the control electronics. The Spanish companies have significantly increased their global presence during the last years. Their internationalization goes hand in hand with the increasing demand for technology and professionals from the transport and infrastructure administrations. The increased dynamism and investment in the I+D+i of the companies to Spain in leading positions.



Illustrative map with the international presence of the Spanish railway industry in the field of high-speed.

MAFEX MEMBERS WITH PROJECTS IN HIGH SPEED IN SPAIN

AMURRIO

Amurrio has manufactured 42 AV4 turnouts and supplied components for 100 turnouts more. He has also taken part in the development of this turnout, created for the Spanish High Speed.
AV4 is the fourth generation of the turnouts created by Fabrides UTE (in which Amurrio is integrated) according to ADIF requirements for High Speed.
One of the big improvements include a modular fastening system, more versatile for use in turnouts. It also has an optimized geometry that improves comfort and reduces maintenance. And the crossing has been equipped with a movable point on roller bearingsthat eases movement and reduces maintenance.
The AV4 turnouts manufactured by Amurrio have been installed in the Mediterranean corridor and the routes Olmedo-Zamora, Valladolid-Palencia-León and Antequera-Granada. They have also been approved for use in desert conditions on the Mecca-MedinaHigh Speed Line in Saudi Arabia.

ARCELORMITTAL

Rails for High-speed railways, with speeds over 350 km/h, are one of the most demanding steel products that must fulfil a multitude of technological requirements. ArcelorMittal has developed state-of-the-art systems for rails production and control that allow our rails to comply the most strictest requirements.
ArcelorMittal has been producing high speed rails since 1990, with more than 1.500.000 tonnes supplied of this product, in Spain (Palencia-Leon line, Madrid-Castilla La Mancha-Comunidad Valenciana-Región de Murcia, etc) and for large high-speed projects worlwide (Germany, Morocco, Turkey, Mexico). At present, it can supply individual bars up to 120 metres long with maximum reliability, geometrical precision, strict flatness and the highest quality on the market.

CAF

CAF has vast experience in the design, manufacture, supply and maintenance of high speed trains. In addition to playing an important role in the supply of the high-speed Spanish train (AVE) for the Madrid-Sevilla line, CAF has manufactured 120 and 121 series trains for RENFE.
These trains can reach a maximum speed of 250 km/h and they are fitted with BRAVA variable gauge system (Self-propelled Variable Gauge Bogie System), which allows the vehicle to adapt to different track gauges where it operates with no need to stop. The units are designed for complete railway interoperability since they can run on tracks supplied at different voltages (3,000 VDC to 25 kV AC) and with different signalling systems (from ASFA to ERTMS or LZB). Furthermore, CAF is testing its very high speed prototype Oaris in the Spanish railway network, which is at the final stage of homologation. With a maximum speed of 350 km/h, this train incorporates the latest dynamics, aerodynamics and noise technologies, in full compliance.

MAFEX MEMBERS WITH PROJECTS IN HIGH SPEED IN SPAIN

TALLERES ALEGRÍA

Talleres Alegría S.A. has actively participated in the development of the Spanish High Speed since 1999. The Company has brought its technical know-how to the design and construction of turnouts and expansion devices in a large number of lines of this network, the second largest and advanced in the world.

Talleres Alegría has been part of one of the most important technological developments in this field: The AV4 turnout. It is an advanced solution, according to Adif requirements, that has implemented numerous enhancements to improve comfort and security. AV4 new generation turnouts have been designed and made entirely in Spain. T.A. has also developed and patented high speed expansion devices, with elongations of up to 1000 mm, that have been installed in AVE lines.

The prominent role of the company in the spanish high speed network has also been exported to international projects of technical and strategic relevance such as the Mecca-Medina High Speed Line (Saudi Arabia). The Company offers complementary services that cover the entire project cycle, from the initial design stage to technical assistance (fixed track equipment).

TYPSA

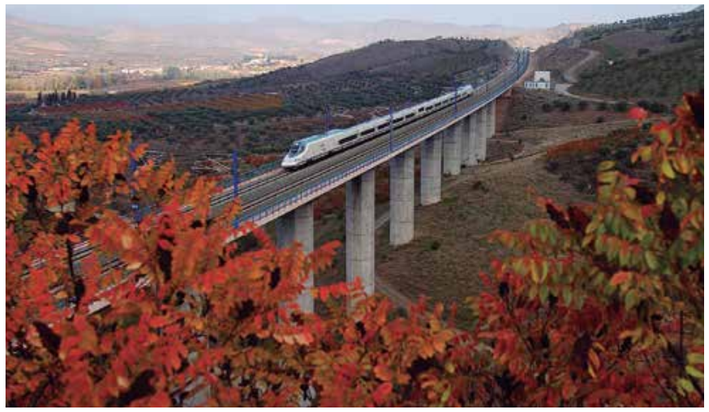
Founded in July 1966, last year TYPSA celebrated 50 years of activity, during which time the company has become one of the leading consulting companies in the railway field.

TYPSA has taken an active role in the growth of high speed rail in Spain from the start. The company took part in the first Madrid - Seville high-speed railway line works and then helped build every high-speed railway line in Spain: the Madrid - Zaragoza - Barcelona - French border line; the Córdoba - Málaga line; the Madrid - Segovia - Valladolid line plus links to northern and north-western Spain, such as the Basque 'Y' and the link to Galicia; the Madrid - Castile La Mancha - Valencian Community - Murcia Region line; the Navarre high-speed corridor; the Madrid - Badajoz line and the Galician Atlantic Axis. TYPSA carried out all kinds of tasks in these lines: informative studies, detailed designs, construction supervision, construction engineering services, etc.

TYPSA's business expanded across Spain as it spread internationally, taking its experience and knowledge of the railway sector to other countries. To a greater or lesser extent, TYPSA has participated in major international projects such as the Madrid - Lisbon high speed line (Poceirão-Caia section), the Figueres- Perpignan line (Spain-France), the São Paulo-Rio de Janeiro line (Brazil), the Lyon-Torino line (France-Italy), the Lahore - Rawalpindi line (Pakistan) and the Los Angeles-Las Vegas line (USA). Currently, TYPSA is involved in the design of high-speed networks in Sweden and the United Kingdom.

In all, TYPSA has participated in the planning, design, and supervision of more than 6 500 km of high-speed lines.

All of this is thanks to a great team of professionals: widely experienced and highly specialised teams working in every discipline of a railway engineering project to prepare prior studies and designs and carry out construction supervision and construction engineering services. Moreover, TYPSA is constantly evolving to implement the latest technical innovations and acquire new skills to help maintain its prominent position in this field.



BOMBARDIER SPAIN

Bombardier develops many signalling and propulsion projects for the Spanish High Speed. Bombardier signalling is present in more than 970 km of the Spanish high-speed network, including sections of the Mediterranean Corridor (more than 450 km), the Atlantic Corridor (20 km) and the Valladolid-Palencia-León (165 km), Venta de Baños-Burgos (87 km) and Plasencia-Cáceres-Badajoz (192 km) lines, as well as in the section between L'Hospitalet de Llobregat and Mataró, in the Barcelona commuter network (56 km).

The successful projects developed at Trápaga's factory includes the BOMBARDIER MITRAC propulsion systems for the 91 high-speed trains AVE S102, AVE S112 and AVE S130 from Renfe, the propulsion and control equipment for more than 300 Madrid Metro units, the propulsion systems for the FGC 213 series regional trains, or the propulsion and control equipment for Metro Bilbao. The propulsion of the 100 freight locomotives of the series 253 of Renfe (BOMBARDIER TRAXX F140 DC) is also developed in Trápaga, where it has been developed the propulsion system of the European fastest train (V300 Zefiro).

CETEST

CETEST has been in charge of the homologation tests for OARIS train, a high-speed vehicle developed by CAF for RENFE. Structural tests for the main components have been performed (car body, bogie, bolsters, axles and wheels, axleboxes, etc.), as well as running characteristics according to EN 14363, stationary and on track tests, EMC, acoustics and vibrations, and the rest of tests required, within the TSI 2008/108/CE framework.

MAFEX MEMBERS WITH PROJECTS IN HIGH SPEED IN SPAIN

SIEMENS SPAIN

In 1989, Siemens, as leader of the Hispanic-German consortium, was entrusted to lay the foundation stone in High Speed Lines construction in Spain after the awarding of Madrid-Seville High Speed Line, opened in 1992, coinciding with the Universal Exhibition in Seville. Since that date, this company has become a reference within the railway sector in Spain and worldwide, and nowadays it can be said that Siemens has participated almost in all the High Speed Lines currently operating or under construction in Spain: Madrid-Seville, Madrid - Toledo, Madrid - Segovia-Valladolid, Valladolid - Leon, Madrid - Barcelona, Lleida - Barcelona, Barcelona - French border, Madrid - Valencia, Córdoba - Málaga, Antequera - Granada and Olmedo - Orense - Santiago. Another historical fact took place in 2007 with the commissioning of the first one of the 26 AVE S103 units, the first one in getting the authorization for the commercial operation service under ERTMS Level 2 in Spain. Siemens was also responsible for equipping, for Renfe, Siemens AVE S103 fleet as well as both Talgo-Bombardier AVE S102 and S112 fleets with the on-board equipment Trainguard 200, specific for Level 2.

SEMI

To be highlighted is the relevant role of SEMI in the electrification between the Albacete and Alicante stations. The company has been responsible for the design, development and implementation, together with ADIF, of one of the most modern overhead lines: the 2x25 KV ac C-350 catenary. It is a rigid, inclined and simple catenary with mechanical stress regulation. The contact wire if 5,3 m tall, with a maximum deviation of 0,4 m with wind. This project has implemented the Energy Systems Interoperability Technical Specification standards, as well as the UIC and EN standards.

SEMI has also completed works in the traction substations of the Northwest High-Speed Line, in the Orense-Santiago section and the corrective maintenance of the repeaters network installed in the Madrid - Barcelona AVE tunnels.

CAF SIGNALLING

CAF Signalling is playing a significant role in the implementation of the high-speed network in Spain regarding signaling, control and telecommunications. An experience which has been exported to several countries. Among the most outstanding projects under implementation, the works and facilities of the ERTMS system are included in:

- The section of the Mediterranean Corridor with the High Speed Rail Line (HSRL) Madrid-Barcelona-French Border. Section Vandellós-Camp de Tarragona.
- High-Speed Railway Madrid-Levante. Section Monforte Del Cid-Murcia.
- ERTMS Level 1 in the Atlantic Axis, in its sections A Coruña-Santiago and Santiago-Vigo, in Company Joint Venture with Siemens Rail Automation and Alstom.

The company also concluded successfully the pilot project TAISE of implementation of their own solution ERTMS level 1 and level 2 in the section Olmedo-Medina. Another one of its outstanding works has been the development, manufacture, installation, setting-up and subsequent maintenance of the control post and the concentrator system of fail-safe detectors of the High-Speed Railway Albacete-Alicante.

COMSA

Thanks to the high specialization in the railway sector, the company took over the development of the first high speed line in Spain from Madrid to Seville at the end of the 80s. From then, COMSA has participated in every project of the High Speed Line (AVE) performing construction and maintenance works, catenary and substations' installations, security and communication systems, as well as network management and control centers.

The company has invested in developing the North and Northeast-corridor (AVE to Galicia, Asturias and Y Basque), the High Speed Line from Madrid to the French Border, the Levante Line, and the corridor to Portugal. The company has recently executed the new line between Valladolid and León and keeps developing new sections of the Antequera-Granada project.

MAFEX MEMBERS WITH PROJECTS IN HIGH SPEED IN SPAIN

IDOM

IDOM has developed more than 55 High Speed projects in Spain during the last 15 years, which covers a total of 2,300 km, both in the design and works supervision. Highlights the Basic Design and Works Supervision of the stretch Lalín - Santiago with 47 km in length; as well as the Detail Design and Works Supervision of the sub-section of Alcántara-Garrovillas Reservoir, which includes the Almonte viaduct, with a 384 m central arch, which is the world's longest span for a high-speed arch bridge.

Regarding the High Speed stations, IDOM has developed the Basic Design for the enlargement of the Atocha Station in Madrid and the Detailed Design and Works Supervision of the Joaquín Sorolla station in Valencia.

THALES SPAIN

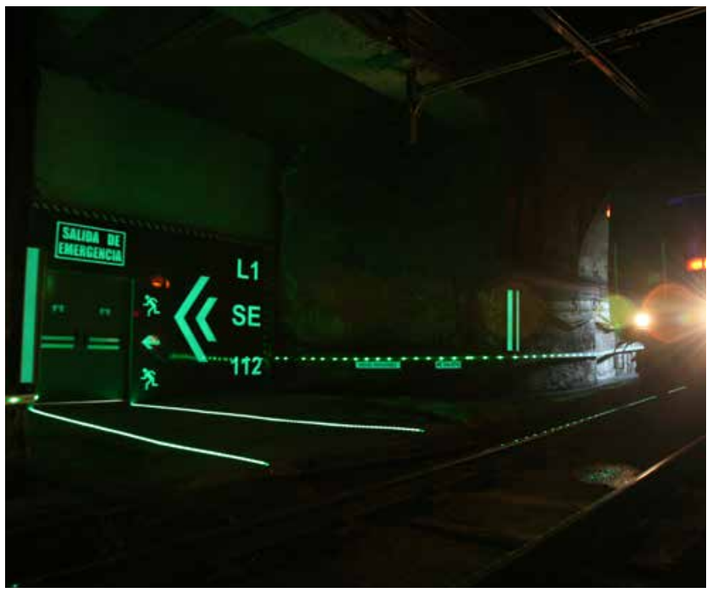
With more than 65 years of presence in Spain with railway solutions, Thales is part of the modern railway having participated in its evolution and being pioneer in the introduction of most of the technology advances. Thales is present in the Spanish High Speed network with signaling, communications and traffic control systems since its very beginning in 1992 with the Madrid-Seville line.

Today Thales is present in more than 2,700 km of high Speed network (Madrid-Seville, Madrid-Valladolid, Orense Santiago de Compostela, Madrid-Valencia/Albacete, Olmedo-Orense, etc.) with different solutions and technologies, including almost 1,000 km of ETCS, and providing maintenance services in around 1,900km.

IMPLASER

Implaser has performed the photoluminescent signalling in more than 50 Spanish tunnels, including evacuation signs, low location strips and exit door signs. Its most prominent references include the 30 tunnels of the Madrid-Valencia AVE train, with particular emphasis on "Cabrera", a tunnel of 7000 meters long and 17 evacuation galleries. The Company has also taken part in the tunnels that connect Barcelona with France, and Atocha with Chamartin.

Implaser photoluminescent signs are approved by ADIF and count on all necessary tests to guarantee their technical quality, performance towards corrosive agents and durability. Its focus on R+D has achieved new coatings that help the sign to last over time without losing its original qualities and improve its maintenance and conservation. The Company works in more than 20 countries to export its photoluminescent signalling for all kind of railway projects: IMPLASOL 580 and IMPLASOL 720. Both are certified as the higher luminance signs in the market, with higher levels than the ones indicated in the most demanding specifications.



ALSTOM SPAIN

The first AVE to travel at 300 kilometres per hour on Spanish railway lines was a model that was designed, built and maintained by Alstom Spain. On 14 April 1992, an Alstom train made the first trip on the Madrid-Seville high-speed line. That first unit was followed by another 23 trains, manufactured at Alstom's industrial centre in Barcelona.

Today, after comprehensive remodelling and modernisation, these pioneering trains run on the Madrid-Seville, Madrid-Málaga, Madrid-Barcelona and Madrid-Alicante corridors, and they are a benchmark regarding standards of safety, comfort and punctuality. 10 units of the 100 Series were also adapted to run on the Madrid-Barcelona-French border corridor, thereby becoming the first and only AVE that it is capable of running on the French railway network.

Renfe also incorporated new high-speed trains manufactured by Alstom in Spain for a new service that is unique in the world: the so-called Lanzadera (shuttle service) trains. Between 2004 and 2011, the fleet of Renfe Operadora was joined by two new generations of Pendolino, manufactured at the Santa Perpetua plant in Barcelona. These 33 trains, which run under the commercial name Avant, offer high-speed services for medium distances (Madrid - Valladolid, Madrid - Toledo, Madrid - Puertollano, Lérida - Barcelona, Málaga-Seville, etc.).

Alstom's presence in the Spanish high-speed network is furthermore completed by maintenance services, latest-generation ERTMS signalling systems, the installation of catenary lines and railway tunnel maintenance. On many of these projects, Alstom has been a pioneer in our country, with major milestones that have marked a turning point in the history of Spanish high speed.

TALGO

Spain is the most competitive and open market for rolling stock in the world. As opposed to other countries, where it is customary to purchase trains almost exclusively from the leading national company, Renfe has assembled its high-speed fleet through a series of extremely competitive tenders in which companies from all over the world have participated. Talgo 350 has the biggest share of Renfe's very high-speed fleet with 48 sets and soon up to 30 trains of its newest technological platform will follow: AVRIL. In the high-speed segment, Talgo 250 (45 units) is the world's most flexible and interoperable train: dual track-gauge, dual voltage (AC/DC) and even hybrid.

SENER

The SENER engineering and technology group is a leader in railway transport, with a track record of nearly 17,000 km of studies and projects for new high-speed rail lines all over the the world. In Spain, SENER pioneered the planning and design of the country's high-speed rail lines, taking part in the main national projects that are now on revenue operation. SENER also makes major developments in railway technology, such as a very-short-term cross-swind gust prediction system and a safety system that mitigates the risk of derailing, in addition to its innovative aerodynamic studies. It has also made developments for optimizing operations, such as IF-Zone and Blocksat.

MAFEX MEMBERS WITH PROJECTS IN HIGH SPEED IN SPAIN

GETINSA-PAYMA

With more than 50 years of experience, Getinsa-Payma is a leading company in the Spanish high speed sector. We have carried out studies and designs for more than 5,200 km of railway lines and supervised the works for more than 4,650 km. Furthermore, we have been involved in the development of all of the High Speed Railway Lines in Spain.

Among our most significant assignments, the following are worth mentioning:

- Feasibility study and preliminary design of the Teruel-Saragossa High Speed Railway Line. 180 km.
- Assembly, installation and commissioning of all the systems which are necessary for the operation of the Córdoba – Malaga High Speed Railway Line. 155 km. Design speed: 300 km/h.
- Madrid-Valencia-Albacete High Speed Railway Line. Modified designs 1 and 2. 955 km.
- Works management for the installation of the telecommunications system and GMS-R in the Madrid-Saragossa-Barcelona-French Border High Speed Railway Line. 450 km.
- Supervision of the works in the section between Orense and Lalín. 42 km. Design speed: 350 km/h.
- Supervision of the works in the section between Soto del Real and Segovia, including two parallel high speed tunnels with a total length of 28.4 km. Design speed: 350 km/h.
- Supervision of the works for the construction of Arroyo de las Piedras Viaduct. 1,220 m.

Our broad experience in Spain has enabled us to export our know-how to other countries and to win significant contracts in Turkey, Saudi Arabia and the United States.

INECO

From its beginnings, Ineco has been involved in the implementation of the Spanish high speed rail network, and was active in the planning, design, and technological development, to achieve a safer and more efficient railway system.

Over 20 years experience in design, construction, signalling, communications, maintenance and traffic management projects, for greater efficiency and safety.

Our excellent engineering skills have enabled us to overcome the challenges of Spain's difficult and rather complicated landscape, designing and building some of the longest tunnels in the world and constructing internationally renowned viaducts as Guadarrama Tunnel, with 28.4 km, Contreras Viaduct, the biggest concrete railway bridge in Europe. We have also participated in the extension, planning and construction of the main network stations linking Spanish cities.

We invest in the latest and most advanced high speed technology. This is reflected in the implementation of the ERTMS (European Rail Traffic Management System).

FAIVELEY

The history of the Spanish High Speed, is united to the one of Faiveley Transport. On the trains that inaugurated the Madrid-Sevilla line (S/100 of Alstom), Faiveley supplied the complete brake system, access doors, event recorder and signal control (ATESS), pantographs, antilocking system, Various electrical appliances and chemical WC. Since 1992 Faiveley has continued to supply equipment for the various train series that have been added to the park, such as the S/112 Talgo trains, S/103 Siemens, S/120 CAF or S/130 from Talgo / Bombardier.

Also Faiveley Transport is currently present in many international high speed projects in all countries of the world.

INDRA

Indra's DaVinci system controls the almost 3,000 kilometers of track that make up Spain's high-speed rail network. The flexibility, features and advanced technology that this solution offers make it the world's most advanced rail traffic management platform currently in operation, responding to public demand for faster, more efficient and more punctual transportation with maximum safety levels.

The DaVinci system enables the full integration of all the control and operation elements of the rail network and the integrated management of numerous railroads, in addition to facilitating the automation of the running of the network. The solution manages the rail traffic of all Spain's Regulation and Control Centers (CRCs), the operating centers created by Indra for Adif, Spain's railroad infrastructure management company, to control and regulate high-speed rail network traffic, including the Atocha CRC in Madrid, which is considered to be the 'brain' of Spanish high-speed rail. Indra is currently responsible for the provision of the support and maintenance service for the centralized management systems of Spain's four high-speed rail CRCs: Madrid (Atocha, Delicias and Villaverde), Antequera, Albacete and Zaragoza.

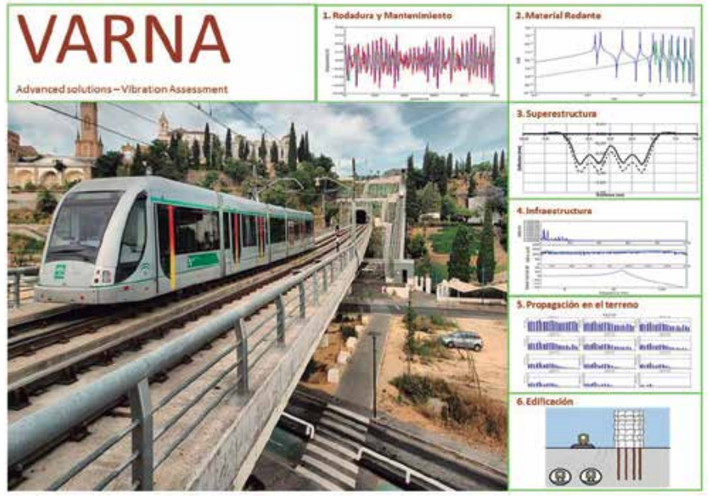
Indra has also applied its signaling and security technology to the various sections, lines and stations of the network and has implemented its ASFA digital on-board system in approximately one third of the trains currently running in Spain.

The company has implemented centralized traffic control, auxiliary sensor systems and safety sensor concentrators, based on its innovative Safety InVITALRAIL platform, on the high-speed line from Burgos to León. It has also installed its ASFA ATP security system, in addition to other telecommunications and security systems, including video surveillance and access control. In addition, the company has installed the ASFA system on the Plasencia-Cáceres-Badajoz section

of the high-speed line to Extremadura. In collaboration with Alstom Spain, Indra is responsible for the installation of civil protection and security systems in Spain's longest tunnel, the Guadarrama, and in the other three tunnels of the Madrid-Valladolid line, for which it is currently participating in the provision of maintenance services. Again with Alstom, it is installing these same systems in the tunnels of the Pajares variant between La Robla and Pola de Lena, and in the six tunnels on the high-speed line between Antequera and Granada.

VARNA (Vibration Analysis for Railway Network Assessment): software for the study of vibrations in rail lines

THE VARNA SOFTWARE HAS BEEN DEVELOPED BY IDOM SO AS TO STUDY THE VIBRATIONS IN RAILWAY LINES THROUGHOUT THE WORLD. IT CAN BE APPLIED IN NETWORKS OF ALL TYPES, STARTING WITH HIGH-SPEED PROJECTS ON CONVENTIONAL LINES AND METRO SYSTEMS.



VARNA (Vibration Analysis for Railway Network Assessment) is a specialized software, fully developed by the IDOM's rail team of I+D+i, for the study of vibrations in rail lines of all types, from High Speed or Conventional Railway Lines to Metro Lines.

This software allows us to characterize and forecast accurately the impact generated by a railway infrastructure on the closer buildings, taking into account all of the constraints due to the status of the track and maintenance conditions, type of rolling stock, type of track, type of infrastructure section, characteristics of the soil and the type of building which suffer such condition.

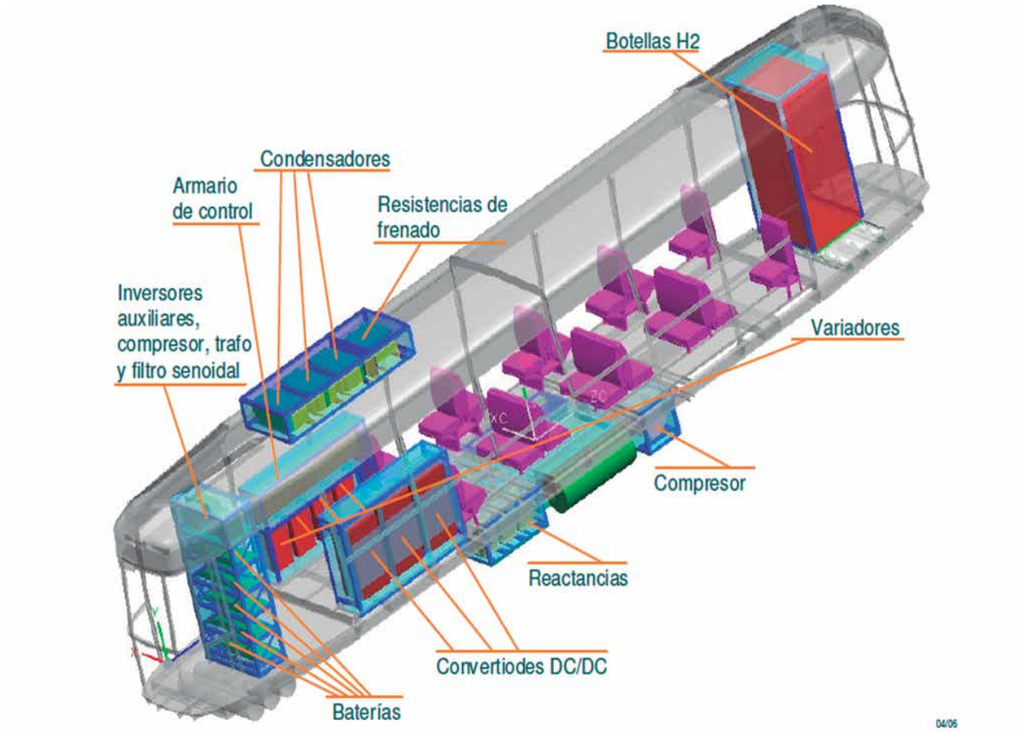
The main innovations given by this software over the current models of calculation of vibrations are:

1. The possibility of including in the analysis the quality status of the track due to the number of years of operation and maintenance conditions;
2. The advanced modeling of the structural behavior of the track and its interaction with the rolling stock, which have increased significantly the accuracy of the results, reducing the error between calculation and field measures;
3. It has allowed the assessment of special solutions which were difficult to analyze by traditional methods, providing to the technical team the ability to test the effectiveness of the vibration mitigation measures on the market and those on the research field;
4. The application of optimized algorithms, reducing the time of analysis, and making possible to analyze the whole infrastructure in a short time.

This tool allows for a more swift and detailed analysis of the vibrations

After two years of development, the implementation of this tool has enabled us to achieve a more agile and detailed analysis of the vibrations produced in the railway infrastructure projects; as well as the optimum mitigation solutions for each specific case.

VARNA provides numerous innovations for the current models



Hydrogen traction project for the European Union's LIFE programme

RENFE, IN CONJUNCTION WITH ALSTOM AND ENAGÁS, AS MAIN PARTNERS, PRESENTED A NEW RAILWAY TRACTION PROJECT BASED ON THE HYDROGEN FUEL CELL, BATTERIES AND SUPERCONDENSERS WITHIN THE AMBIENTAL LIFE FUNDING PROGRAM BELONGING TO THE EUROPEAN UNION.

Renfe, together with Alstom and Enagás as the principal partners, has submitted a new project to the European Union's environmental financing programme, LIFE. The project concerns railway traction based on a hydrogen fuel cell, batteries and super-capacitors. One of the most significant points of the project is the possibility of reducing a vehicle's direct emissions by 100% with respect to a vehicle powered by conventional fuels.

The objective of this R&D&i programme is to develop pilot testing using a laboratory train/vehicle and reach conclusions about the technical viability of railway traction using hydrogen on the Spanish railway network. For testing, a tram unit from the 1930s will be used. The tram is known as "Fabiolo", from the 3400 series, which was reformed in the 1950s. It was used as a tram in Asturias and Valencia in the 1980s and 1990s.

The project includes the development of a supply and refuelling system, adaptation of the tram vehicle as a test unit and regulations and procedures to monitor how the unit runs to compile data on features, performance, emissions, autonomy and noise for comparison with conventional traction systems. At the same time, financial studies on the life cycle of the complete system will be developed.

The programme is especially important with respect to the analysis of urban and interurban railway traffic, which in the case of Renfe refers to the Suburban, conventional Medium Distance and Metric Gauge services.

With a budget of EUR 2.6 million, the project is in line with the Spanish government's position at the past climate conference in Paris (COP 21) and with the commitment to a 26% reduction in greenhouse gas (GHG) emissions by 2030. Moreover, Renfe signed the 2015 Railway Climate Responsibility Pledge in Paris, sponsored by the UIC, which is focused on reducing specific energy consumption and CO2 emissions in 2030 by 50% with respect to 1990.

New Front Connection Spring Socket

THE BASES WITH SPRING FRONT CONNECTION, BELONGING TO ARTECHE, DO NOT REQUIRE MAINTENANCE, THEY ALLOW FOR THE USER A MORE SWIFT AND SIMPLE CONNECTION, THUS REDUCING THE WIRING AND REPLACEMENT TIMES, WHILE MAINTAINING ALL COMPONENTS' RELIABILITY.

Arteche launches onto the market the Front Connection Spring Sockets product line, a component in the product solution principally focused on the railway sector. This product was presented at InnoTrans, the world's leading trade fair for the sector.

This new product is the result of a year of hard work of development. It is the first element of a wider range of sockets specially designed for the railway sector on which Arteche is already working.

These new sockets developed by Arteche do not use screws to fix their wiring, they use pressure instead. This makes them ideal for its use in critical applications, such as railway, because they are smaller and more reliable.

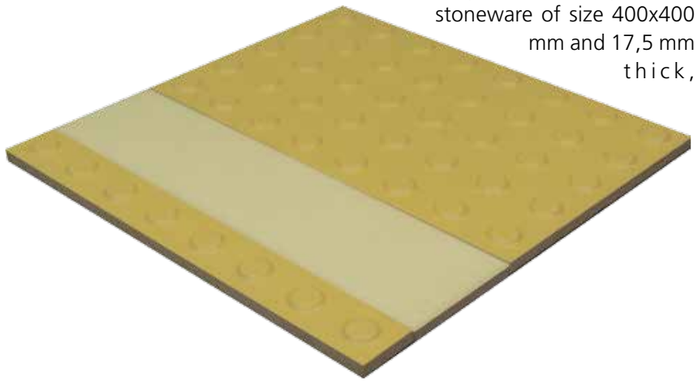
These new Sockets are a complement associated with auxiliary 4 contact relays in all of their ranges, the best accessories in terms of reliability and endurance. The range of sockets suitable for relays with a wider range of contacts will be soon increased.

The front connection spring sockets are maintenance free, quicker and simpler to connect. They reduce the wiring and replacement times, maintaining the reliability of every component.

This new Socket development, and those to come, is the result of the importance given to the R&D+i activities in Arteche, in which they invert around 3% of it incomes. It's the answer to the Arteche's Strategic Plan of increasing the range of products focused on the railway sector, a sector Arteche has already participated in some major projects, such as the high speed line between Medina and Meca.

Photoluminescent and tactile platform edge warning system/ accesibility

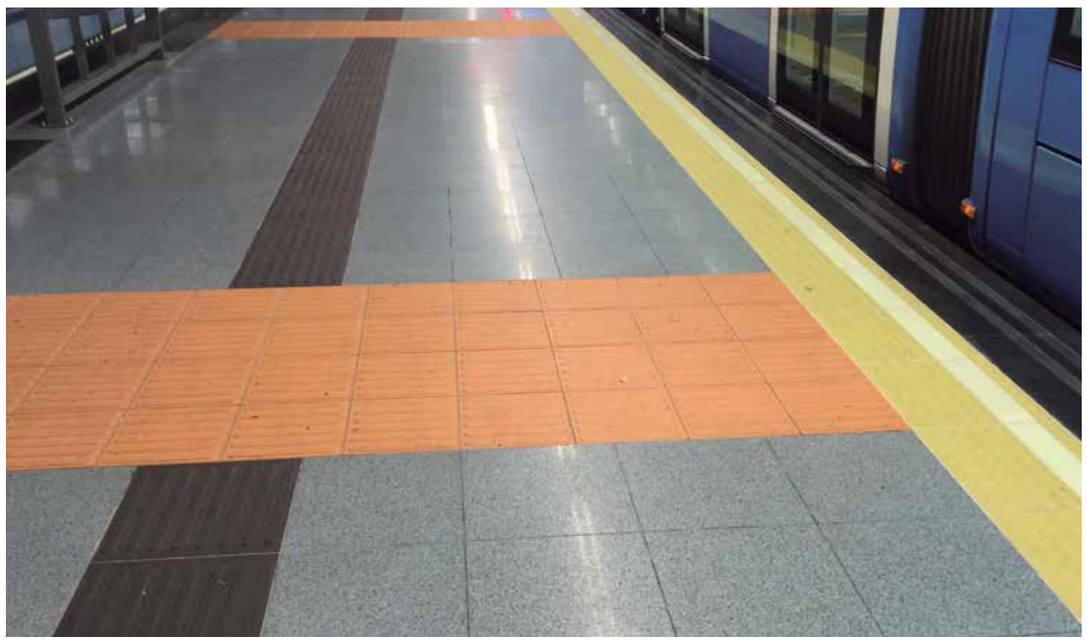
IMPLASER, THE FIRST SME CERTIFIED IN I+D+I, DEVELOPED A PODOTACTILE AND PHOTO-LUMINESCENT FLOOR TILE INTENDED TO BE USED ON PLATFORM EDGES IN RAILWAY STATIONS.

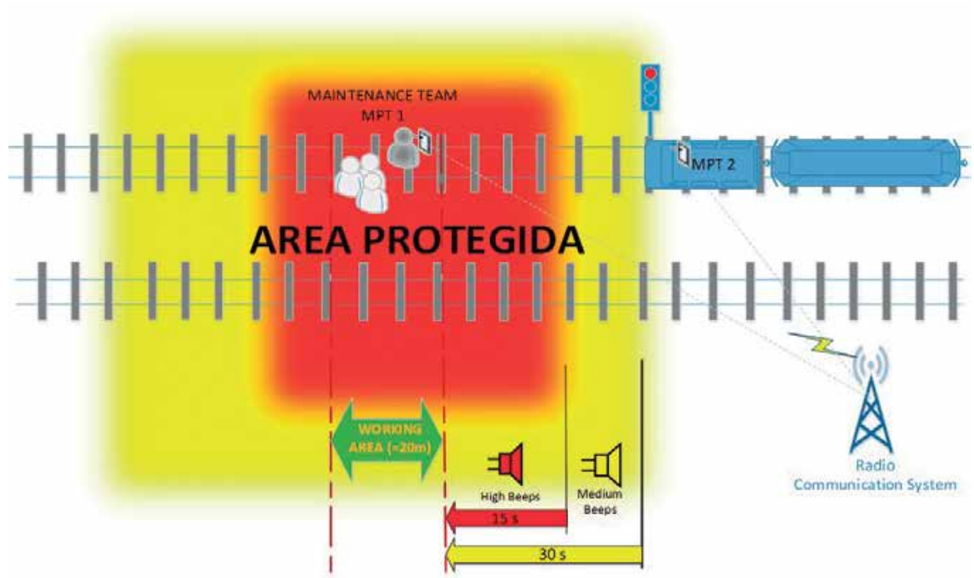


The Implaser R+D+i department in collaboration with innovative enterprises have developed this new product, which is specially designed to be installed in public areas, such as Metro and railway stations, etc. where it is necessary to advise people of the platform edge location to prevent from falling over both in normal and emergency situations with no light. This floor tile is composed of satin porcelain stoneware of size 400x400 mm and 17,5 mm thick, and photoluminescent pavement according to UNE 23035/4:2003 (ISO 17398 Class D) of size 100x400 mm, that when arranged in a linear way serves as a delimitation of the edge of railway platforms. Thanks to its anti-slip properties Class 3 according to UNE-ENV 12633, this product becomes a very slip resistant tile suitable for high traffic of people.

The luminance properties of the photoluminescent strip make this product visible during hours even in total darkness, as long as the product has been previously exposed to natural or artificial light. Its use does not entail any energetic cost, and thanks to its photoluminescent pigments from which it is manufactured, the product provides unlimited charge and discharge cycles.

These tiles have been already installed in Madrid's Metro/ Light Rail Tram with excellent results.





Research and development of access and safety management systems for on-track staff in the USA market

THE AUXITEC'S INVESTIGATION OBJECTIVE, COMPANY OF THE GETINSA-PAYMA GROUP, IS TO DEVELOP A SYSTEM THAT GUARANTEES SAFETY IN RAILWAY MAINTENANCE ACTIVITIES AND IT INCLUDES A MOBILE DEVICE FOR GEOLOCATION.

All railway facilities are provided with operating procedures to guarantee the existence of safe working areas for the different uses of the infrastructure. In this way, interlocking devices are essential to ensure safety and functionality, together with railway traffic management systems. However, most of these systems do not take into account one type of users: on-track staff.

For this reason, it is necessary to implement complementary and additional safety protocols in order to regulate safe access for on-track staff so that the different work teams can safely carry out maintenance activities. These protocols involve standing orders, regulations and double checking through communications with the control office, the establishment of temporary speed restrictions when there is staff working near the track, orders to run at sight or any other procedure that can be supported by the signaling and traffic management systems.

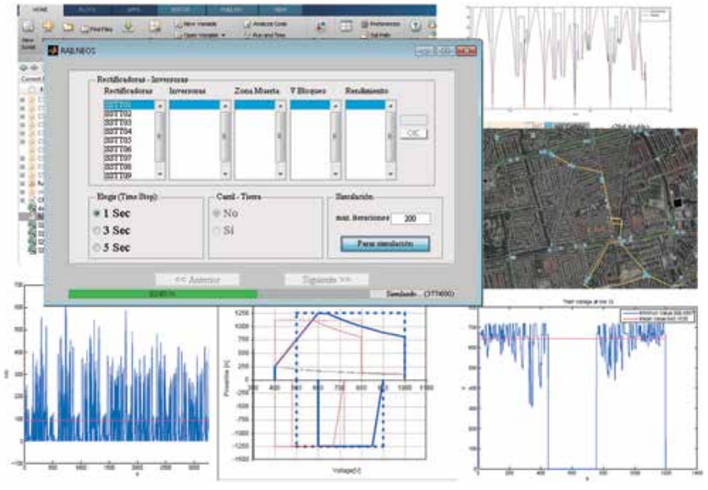
Nevertheless, these measures reduce but do not eliminate the risk of an accident. Accordingly, the main purpose of this research is to develop a system to ensure safe undertaking of railway maintenance activities, including a portable geolocation device to determine the position of on-site staff. High accuracy must be maintained when calculating the staff position in exterior areas (zones with GPS coverage and others) as well as in those areas without satellite positioning system coverage (tunnels, inside stations or buildings, etc.).

To this end, Auxitec, a company belonging to Getinsa-Payma Group, has decided to have the support of an American manufacturer and participate in the CDTI funding program for international R+D+i projects in the US market.

Furthermore, due to the goals set and to the interrelations between the different devices, this project will have a direct application in other railway safety systems, such as the Positive Train Control (PTC) or ERTMS Level 3.

Innovative software simulator for railway situations

CAF TURNKEY & ENGINEERING DEVELOPS A NEW SIMULATION TOOL FOR THE POWER TRACTION NETWORK DIMENSIONING.



The traditional concept of DC traction systems for light rail applications was based in a quite simple DC system fed by AC/DC non-controlled diode rectifier substations connected to the AC distribution network.
Low energy efficiency and controllability were not a problem. However, with the massive implementation of regenerative braking technologies in light trains and trams, the development of an effective way to manage the recovered energy became an important issue. The regenerated power injected in the system by a train in braking mode could only be used only in the case that other nearby train was in traction mode. Otherwise, the regenerated power was dissipated in the DC traction system or in the rheostatic braking equipment as well as the potential for increasing the overall System energy efficiency. The need of new solutions for using the regenerated energy and increasing the energy efficiency of the system was the driver of new technological developments.
There are two fundamental technologies included in these solutions; the return to the network of the surplus of energy, or its accumulation of.
The return of the excess of energy to the grid is made by means of reversible or bidirectional substations, capable of feeding the railway operation, and returning the remaining energy produced by the regenerative braking of the trains.
The accumulation of generated energy can be either installed on the rolling stock or installed in the railway infrastructure.
For the assessment of the most optimal energy recovery solution, CAF Turnkey & Engineering has developed a dedicated simulation tool which enables the dimensioning of the integral railway traction network, capable of simulating different scenarios and taking measures in all of them
For further information, read the article "Energy is on board", published in IEEE electrification Magazine in September 2016 (Vol. 4 Number 3).

New compact system for depuration / reuse of waste water in railway workshops

THE AQUAFRISCH SYSTEM FOR TERTIARY WASTEWATER TREATMENT WITH FLOW RATES OF UP TO 500 M3/DAY ALLOWS FOR REUSING 100 % OF THE EFFLUENT IN RAILWAY WORKSHOPS.

The new Compact MBR-UV.01 system developed by Aquafrisch for tertiary treatment of wastewater with flows up to 500 m3/day allows the reuse of 100% of the effluent in railway workshops.
Compliance with environmental regulations for both recycling and disposal of waste water is guaranteed.
The treatment effluents though the Compact MBR-UV.01 produces a water that complies with the most demanding regulations making it suitable for reuse in irrigation and/or discharge into public water, sewage or sea.
The equipment allows the production of high quality water without using chemical products, as well as the elimination of viruses and bacteria by sterilization with UV system (without by-products) and pH control.
The system has been designed as a compact equipment, with no need for civil works and minimal intervention by operator in both operation and maintenance.

Silicon carbide technology for more reliable efficient railways

THE ROLL2RAIL EUROPEAN PROJECT IS INCLUDED WITHIN THE SHIFT2RAIL INITIATIVE. NEW SOLUTIONS ARE SEARCHED FOR SO AS TO ALLOW REDUCING THE POWER CONSUMPTION, ROLLING STOCK, IMPROVING ITS EFFICIENCY AND INCREASING ITS RELIABILITY. THE PARTICIPATING COMPANIES, WITH CAF AS TECHNICAL LEADER, CO-OPERATE IN THE DEVELOPMENT OF ELECTRONIC TRACTION EQUIPMENT FOR TRAINS BASED ON SILICON CARBIDE SEMICONDUCTORS.

The industry railway, in the interests of a constant search of it innovation and improves of railway vehicles, develops new solutions that allow it to reduce its consumption energy, improve its efficiency and increase its reliability.

This context marks the development of the European project Roll2Rail, an initiative coordinated by UNIFE and technically led by CAF, rail vehicles manufacturer. The project, started 2015, is part of the Shift2Rail initiative for research and innovation in the European rail sector. In Roll2Rail, the IKERLAN technology centre cooperates with CAF P&A in the development of electric traction equipment for trains based on silicon carbide semiconductors.

Silicon carbide is a material characterised by superior performance compared to that of conventional devices. These properties make it possible to reduce the volume and weight of current traction systems, which are vital parameters for improving the efficiency of rail transport.

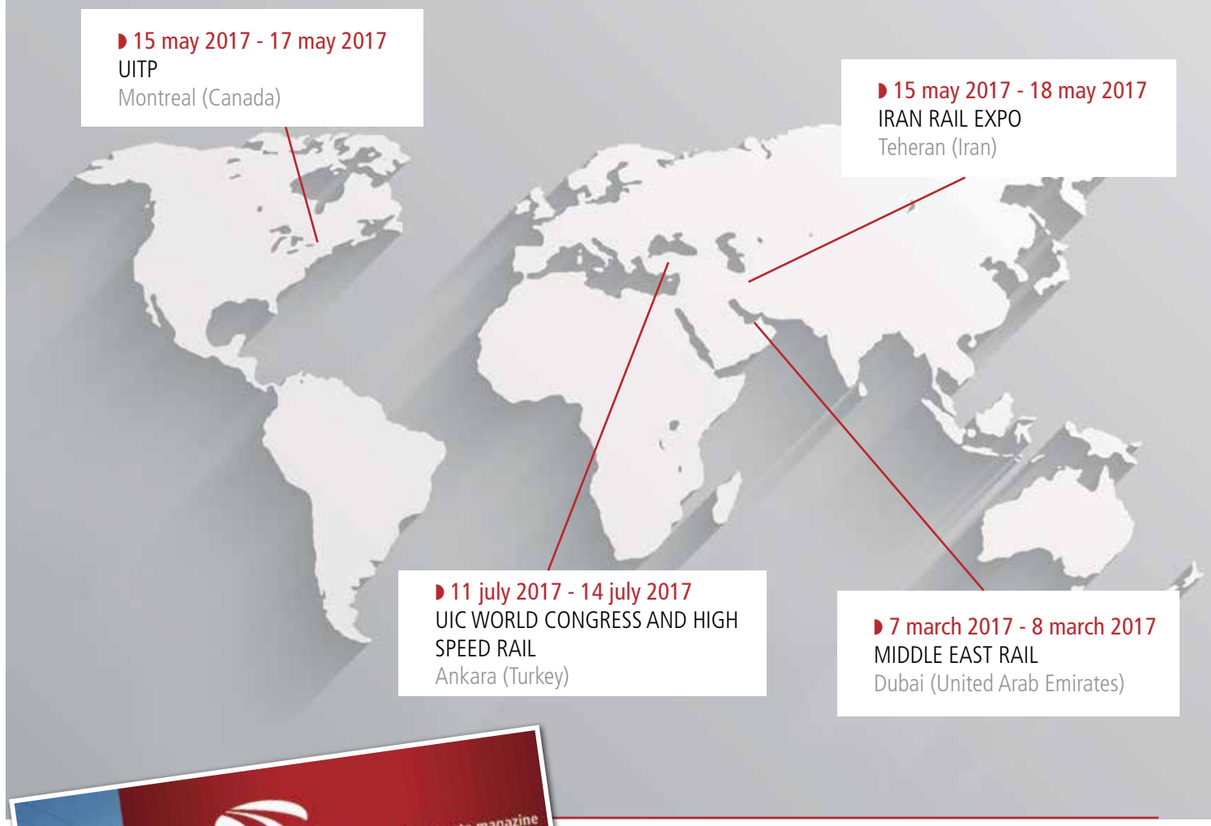
Roll2Rail, which has received 16 million euro in funds, through the European Union's Horizon 2020 research & innovation support programme, counts on the participation of the Basque manufacturer CAF Power & Automation and other renowned companies the rail transport sector.

The use of silicon carbide in the traction equipment developed in collaboration with CAF has allowed us to reduce the volume and weight of power cores by 30 % and that of the magnetic elements by 80 %. In addition, losses in the conversion system have been reduced by 50 %, a fact that has increased its efficiency in a remarkable way.

Project details

- Name: Roll2Rail
- Funding organisation: European Union
- Programme: Shift2Rail (Horizonte 2020)
- Contract: 636032
- Project coordinator: UNIFE
- Thecnical leader: CAF.

UPCOMING EVENTS THAT WILL BE ATTENTED BY MAFEX



- 15 may 2017 - 17 may 2017
  UITP
  Montreal (Canada)
- 15 may 2017 - 18 may 2017
  IRAN RAIL EXPO
  Teheran (Iran)
- 11 july 2017 - 14 july 2017
  UIC WORLD CONGRESS AND HIGH SPEED RAIL
  Ankara (Turkey)
- 7 march 2017 - 8 march 2017
  MIDDLE EAST RAIL
  Dubai (United Arab Emirates)

MEMBERS DIRECTORY

INFRASTRUCTURE

Engineering and consultancy
- Aquafrisch, S.L.
- Ardanuy Ingeniería, S.A.
- CAF Power & Automation
- CAF Turnkey & Engineering
- Colway Ferroviaria, S.L.
- Getinsa-Payma, S.L.
- Idom
- Instalaciones Inabensa
- Ineco
- ITK Ingeniería, S.A.
- MB Sistemas, S.Coop.
- NEM Solutions, S.L.
- Newtek Sólidos
- Sener Ingeniería y Sistemas, S.A.
- Tecnivial Infraestructuras
- Typsa

Civil engineering construction
- Assignia Infraestructuras, S.A.
- Azvi
- COMSA
- Instalaciones Inabensa, S.A.
- Parrós Obras, S.L.
- PRECON - Prefabricaciones y Contratas, S.A.U.
- Pretensados del Norte

Electrification
- Alstom Transporte, S.A.
- Ardanuy Ingeniería, S.A.
- Arteche
- Getinsa-Payma, S.L.
- Idom
- Ineco
- Ingeteam Power Technology, S.A.
- Instalaciones Inabensa, S.A.
- La Farga Lacambra, S.A.U.
- Luznor
- Parrós Obras, S.L.
- SEMI, S.A.
- Telice
- Typsa

Fixed material: components and equipment
- Alstom Transporte, S.A.
- Amurrio Ferrocarriles y Equipos, S.A.
- Aquafrisch, S.L.
- Arteche
- Duro Felguera Rail, S.A.U.
- Elektra - Grupo Elektra, S.A.
- Faiveley
- HICASA - Hierros y Carbones, S.A.
- Idom
- Ikusi
- Instalaciones Inabensa
- Ineco
- ITK Ingeniería, S.A.
- JEZ Sistemas Ferroviarios, S.L.
- Parrós Obras, S.L.
- Redalsa, S.A.
- Siemens Rail Automation, S.A.U.
- Talleres Alegría, S.A.
- Thales España GRP, S.A.U.
- Valdepinto, S.L.

Security
- Alstom Transporte, S.A.
- Ardanuy Ingeniería, S.A.
- DSAF. Dinámicas de Seguridad
- Ecocomputer S.L.
- Idom
- Ikusi
- Implaser 99, S.L.L.
- Ineco
- Manusa Door Systems
- SICE
- Siemens Rail Automation, S.A.U.
- Telice
- Tecnivial Infraestructuras
- Thales España GRP, S.A.U.

Signaling and traffic control
- Alstom Transporte, S.A.
- Ardanuy Ingeniería, S.A.
- Bombardier España
- Cables y Comunicaciones Zaragoza S.A.
- CAF Signalling
- DSAF. Dinámicas de Seguridad
- Getinsa-Payma, S.L.
- GMV Sistemas S.A.U.
- Idom
- Ikusi
- Implaser 99, S.L.L.
- Indra Sistemas, S.A.
- Ineco
- Luznor
- P4Q Electronics, S.L.
- SEMI, S.A.
- SICE
- Siemens Rail Automation, S.A.U.
- Telice
- Tecnivial Infraestructuras
- Thales España GRP, S.A.U.
- Typsa

Maintenance
- Alstom Transporte, S.A.
- Amurrio Ferrocarriles y Equipos, S.A.
- Azvi
- COMSA
- Danobat
- Duro Felguera Rail, S.A.U.
- Idom
- Ikusi
- Ineco
- Instalaciones Inabensa
- Parrós Obras, S.L.
- Siemens Rail Automation, S.A.U.
- Telice
- Thales España GRP, S.A.U.

Stations
- Alstom Transporte, S.A.
- Ardanuy Ingeniería, S.A.
- Idom
- Ikusi
- Ineco
- Luznor
- Manusa Door Systems
- Parrós Obras, S.L.
- Thales España GRP, S.A.U.
- Typsa

Quality control, inspection and certification
- Cetren

INFORMATION AND DATA SYSTEMS

Systems and equipment for collection and ticketing
- Alstom Transporte, S.A.
- Ardanuy Ingeniería, S.A.
- Calmell Group
- Ecocomputer
- Idom
- Ikusi
- Indra Sistemas, S.A.
- Manusa Door Systems
- SICE
- Thales España GRP, S.A.U.

Communications, Information systems and passenger information equipment
- Alstom Transporte, S.A.
- Ardanuy Ingeniería, S.A.
- Cables de comunicaciones Zaragoza, S.L.
- CAF Power & Automation
- Ecocomputer
- Getinsa-Payma, S.L.
- Icon Sistemas de Información y Datos
- Idom
- Ikusi
- Indra
- Ineco
- P4Q Electronics, S.L.
- SICE
- Siemens Rail Automation, S.A.U.
- Telice, S.A.
- Thales España GRP, S.A.U.
- Typsa

ROLLING STOCK

Passenger car manufacturers
- Alstom Transporte, S.A.
- Bombardier España
- CAF - Construcciones y Auxiliar de Ferrocarriles, S.A.
- Cetest
- Patentes Talgo, S.L.
- Stadler Rail Valencia S.A.U.

Manufacturers of freight wagons
- Alstom Transporte, S.A.
- Bombardier España
- CAF - Construcciones y Auxiliar de Ferrocarriles, S.A.
- ITK Ingeniería, S.A.
- Talleres Alegría, S.A.
- Stadler Rail Valencia S.A.U.

Locomotive manufacturers
- Alstom Transporte, S.A.
- Bombardier España
- CAF - Construcciones y Auxiliar de Ferrocarriles, S.A.
- Patentes Talgo, S.L.
- Stadler Rail Valencia S.A.U.

EQUIPMENT AND COMPONENTS ROLLING STOCK

Traction and control systems
- Alstom Transporte, S.A.
- CAF Power & Automation
- Cetest
- Ingeteam Power Technology, S.A.
- P4Q Electronics, S.L.
- Patentes Talgo, S.L.

Components
- Albatros, S.L.
- AL-KO Record
- Alstom Transporte, S.A.
- Arteche (Electrotécnica Arteche Smartgrid, S.L.)
- CAF Power & Automation
- Cetest
- Elektra
- Faiveley
- Fundiciones Garbi, S.A.
- Funor, S.A.
- Gamarra, S.A.
- Hispacold
- Ikusi
- Indra
- Ingeteam Power Technology, S.A.
- Metalocaucho, S.L.
- MGN Transformaciones del Caucho, S.A.
- P4Q Electronics, S.L.
- Siemens Rail Automation, S.A.U.
- Teknorail Systems, S.A.
- Valdepinto, S.L.

Equipment and machinery for the manufacture of rolling stock
- Aquafrisch, S.L.
- Cetest
- Danobat
- ITK Ingeniería, S.A.
- MB Sistemas, S.Coop.

Interior
- Alstom Transporte, S.A.
- Colway Ferroviaria, S.L.
- Idom
- Kelox, S.A.
- Teknorail Systems, S.A.
- Valdepinto, S.L.

Security
- Actia Systems, S.A.U.
- Albatros, S.L.
- Alstom Transporte, S.A.
- Ardanuy Ingeniería, S.A.
- Cetest
- DSAF. Dinámicas de Seguridad
- Idom
- Ikusi
- Implaser 99, S.L.L.
- Indra
- Luznor
- Siemens Rail Automation, S.A.U.
- Tecnatom
- Thales España GRP, S.A.U.

Maintenance
- Albatros, S.L.
- Alstom Transporte, S.A.
- Aquafrisch, S.L.
- CAF - Construcciones y Auxiliar de Ferrocarriles, S.A.
- Cetest
- Danobat
- Faiveley
- Ikusi
- Ingeteam Power Technology, S.A.
- Kelox, S.A.
- Luznor
- Metalocaucho, S.L.
- NEM Solutions, S.L.
- Patentes Talgo, S.L.
- Siemens Rail Automation, S.A.U.
- Talleres Alegría, S.A.
- Teknorail Systems, S.A.
- Stadler Rail Valencia S.A.U.

Quality control, inspection and certification
- Cetren
- Tecnatom

MEMBERS DIRECTORY PER SECTOR

ALBATROS, S.L.

- Ruiz de Alarcón, 13 - 3º
  28014 Madrid (MADRID)
- P: +34 91 495 70 00
- F: +34 91 495 70 06
- af@albatros-sl.es
- www.albatros-sl.es

Albatros Corporation is specialised in the design, manufacture, commercialization, and maintenance of equipment for the railway industry. Albatros is formed by various units of engineering and manufacture in Spain as other countries. We have a team of over 500 employees, selling over 100 million Euros a year, specially on export markets, with over 27,000 static converters, 35,000 passenger information systems, 6,000 HVAC systems, 10,000 WC modules and a variety of designs for the exterior as the interior of the trains, metros and tramways all over the world.

AL-KO

- Ctra. Durango-Elorrio, 25
  48220 Abadiano (BIZKAIA)
- P: +34 94 621 57 40
- F: +34 94 681 37 04
- erik.geluk@al-ko.es
- www.al-ko.com

AL-KO, a pioneer in the manufacture of shock absorbers in Spain, offers wide range of shock absorbers and suspension elements, backed by its engineering versatility that provides innovative technical solutions to meet the needs of its customers.

This fact has lead AL-KO, to carry out -in all its plants- major investments in research and testing facilities, as well as in expansions and refurbishments with the objective of implementing a flexible, efficient and profitable production, also in small series.

All this serves to make AL-KO a competent party in developing effective solutions in the field of suspension.

ALSTOM TRANSPORTE, S.A.

- C/ Martínez Villergas 49, edificio V
  28027 Madrid (MADRID)
- P: +34 91 334 58 00
- F: +34 91 334 58 01
- german.ruiz@transport.alstom.com
- www.alstom.com

As a promoter of sustainable mobility, Alstom Transport is the only railway manufacturer present in the full spectrum of transport systems, equipment and services. The company offers a complete range of high performance products: rolling stock, signalling, maintenance and modernisation, infrastructure and integrated solutions. In Spain, Alstom Transport employs around 2000 people in 19 working sites, has a manufacturing site in Barcelona and develops R&D programmes both for rolling stock and railway signalling and safety projects.

The technological laboratory located in Madrid has become a benchmark for signalling projects throughout the world.

AMURRIO FERROCARRIL Y EQUIPOS, S.A.

- Maskuribai, 10
  01471 Amurrio
  (ARABA)
- P: +34 945 89 16 00
- F: +34 945 89 24 80
- info@amufer.es
- www.amufer.es

Amurrio Ferrocarril y Equipos, S.A. is one of the international market leaders in the design, production and installation of railway materials. Our rolling stock interchanges and crossings are installed in high-speed rail lines, underground lines, tram lines, and conventional railways throughout Europe, Asia, America and Africa. In the area of metal foundry, we have the experience, the knowledge and the people to produce, process and mechanize machine tool parts and sets of great technical complexity in carbon steel manganese steel and other steel alloys.

AQUAFRISCH, S.L.

- C/ Ignacio Zuloaga, 10
  28522 Rivas Vaciamadrid
  (MADRID)
- P: +34 91 380 03 33
- F: +34 91 778 60 02
- aquafrisch@aquafrisch.com
- www.aquafrisch.com

Aquafrisch is a service oriented company. Our task is to provide our customers needs with reliable results. Aquafrisch provides a wide offer in equipment and services in both working fields for the company:

1. Aquafrisch Rail: solutions for railway equipment in depots and workshops.
2. Aquafrisch Agua: solutions for water treatment both in consumption and waste waters.

ARCELORMITTAL ESPAÑA, S.A.

- Apdo. 570.
  Edificio Energías, 2ª planta
  33691 Gijón
  (ASTURIAS)
- P: +34 985 18 77 50
- rails.specialsections@arcelormittal.com
- www.rails.arcelormittal.com

ArcelorMittal is the world's leading steel and mining company and it is part of a small group of rail manufactures whose production has developed notably in the specialized high-speed, heavy- haul, metro, conventional lines and other applications are light rail and tram in the different qualities of normal carbon steel, micro alloyed and head hardened rails.

ArcelorMittal quality has been recognized by customers around the world, from Europe through Asia to Oceania, America and Africa.

Next time you travel by train, no matter the continent where you are, you may be doing it on rails manufactured by ArcelorMittal.

ARDANUY INGENIERÍA, S.A.

- Avda. Europa, 34
  28023 Madrid (MADRID)
- P: +34 91 799 45 00
- F: +34 91 799 45 01
- madrid@ardanuy.com
- www.ardanuy.com

Ardanuy is a consultancy company that specializes in studies, designs, works management and technical consultancy pertaining to Rail, Metro, Tram and Cable Transport.

The company was founded in December 1992 and is made up of a team of over 100 Engineers and Architects. Other experts also act as consultants to Ardanuy staff on specific projects.

In Spain, Ardanuy carries out work from offices in Madrid, Barcelona, Valencia, Seville and Tenerife. It also has offices in Lithuania, Poland, India, Colombia, Algeria and USA. Ardanuy has always had a marked international vocation. Currently over 90% of new contracts are won on the international market, in Western Europe: United Kingdom, Ireland and France; Central and Eastern Europe: Poland, Bulgaria, Latvia, Lithuania; America: Bolivia, Chile, Colombia, Mexico, Peru, USA; Africa: Morocco, Mozambique, Algeria, Egypt, South Africa; and Asia: India, Vietnam, Kazakhstan.

ARTECHE (ELECTROTÉCNICA ARTECHE SMARTGRID, S.L.)

- Derio Bidea, 28
  48100 Mungia (BIZKAIA)
- P: +34 94 601 12 00
- F: +34 94 615 56 28
- nac@arteche.es
- www.arteche.com

Arteche Group's business is focused on providing equipment, applications and solutions for the electricity and railway sector worldwide. In power generation, transmission, distribution, industry, and railway technologies, the group has become a key player in the search for answers to new challenges. A position maintained by a deep knowledge of the different international electricity systems, efficient client-oriented organization and remarkable investment in research and development.

This is shown by over 50% increase in the brand references in the past five years. Arteche's decisions over the years made our group a symbol of reliability, quality and trust, both in solutions and in corporate relations. Corporate alliances have taken a key role in Arteches's history, becoming and asset which has contributed to our international growth and to the development of innovative solutions.

ASSIGNIA INFRAESTRUCTURAS, S.A.

- Avd. Quitapesares 11
  Pol. Emp. Villapark
  28670 Villaviciosa de Odón,
  (MADRID)
- P: +34 91 567 28 70
- F: +34 91 571 96 28
- info@assignia.com
- www.assignia.com

Assignia Infrastructures is a company that is part of the Essentium Group, which is based in Spain.

It has international experience in the development, execution, management and operations of large infrastructure projects of all kinds, including concessions and services.

Assignia has participated in all high-speed railway projects in Spain. Its experience is reflected in the various projects developed including infrastructures, superstructures, stations, new lines or renovations of lines in circulation that include: high-speed, conventional and sub-urban lines, trams and metros, the expertise in the sector is complemented by performing maintenance works thereof.

The in-house machinery park (available for widths 1,435 and 1,668 mm), the flexibility and international presence of the company in countries like Mexico, Venezuela, Turkey, Morocco, India, Algeria and Chile, gives Assignia an unquestionable distinction in the railway sector.

AZVI

- C/ Almendralejo, 5
  41019 SEVILLA (SEVILLA)
- P: +34 954 999 320
- F: +34 954 999 200
- azvi@azvi.es
- ww.azvi.es

Azvi is a hundred-year-old Company specialised in Civil Works whose origins are in railways, forming part of the history and evolution of the railways and its infrastructures in Spain and abroad.Throughout these years, Azvi has participated in numerous construction, rehabilitation, conservation and maintenance projects over more than 1,000 kilometres of track, of which almost 450 km have been High-Speed Rail built within the last 25 years.Azvi also has a large and modern machinery park which allows the company to carry out works with its own machines and a Logistics Centre equipped with modern facilities and state of the art resources in order to centralize a variety of support services to railway activity, such as MachineryPark, materials, maintenance, checking and repairing shops. Research and Development is also an important issue for Azvi. Through its own R&D department, Azvi invests in railway research and development, in collaboration with various public and private entities and investigation groups.

BOMBARDIER ESPAÑA

- Avda. Burgos, 17
  Complejo Triada-Torre A
  28036 Madrid (MADRID)
- P: +34 91 383 62 00
- F: +34 91 383 61 98
- susana.bargsten@es.transport.bombardier.com
- www.bombardier.com

Bombardier Transportation, a global leader in rail technology, offers the broadest portfolio in the rail industry.

Bombardier Transportation Spain is one of the leading exporters of the Spanish railway industry, employing more than

750 people in its plants and offices in Trápaga (Biscay), San Sebastian de los Reyes and Alcobendas (Madrid), Madrid and Barcelona, and taking part in some of the major railway projects in the country.
Its Propulsion Systems plant located in Trápaga (Biscay) and its Centre of Excellence in Rail Signalling Engineering located in San Sebastian de los Reyes (Madrid) are world top technological centres, leading the requests for Bombardier's propulsion and signalling systems for Spain and for the rest of the world. Exports represent already more than 85% of its activity.

CABLES DE COMUNICACIONES ZARAGOZA

- **Polígono de Malpica, Calle D, nº 83 50016 Zaragoza (ZARAGOZA)**
- **P: +34 976 72 99 00**
- **F: +34 976 72 99 72**
- **comercial@cablescom.com**
- **www.cablescom.com**

Founded in 1971, Cables de Comunicaciones has been steadily building its reputation as a respected business in the field of communications cables. Cables de Comunicaciones has cemented its position and its products are now used in over 50 countries around the world.
The company has a wide range of products that are certified according to the standards of the leading telecomm and railway operators in the majority of countries in Europe. It is dedicated to designing and developing excellent telecommunications, signalling, instrumentation, data and fibre optic cables.

CONSTRUCCIONES Y AUXILIAR DE FERROCARRILES, S.A.

- **Padilla, 71 - 6 28006 Madrid (MADRID)**
- **P: +34 91 436 60 00**
- **F: +34 91 436 60 11**
- **caf@caf.net**
- **www.caf.net**

CAF is a firm focused on investigation, development, design, production and maintenance of Rolling stocks for the railway industry. Our product range include from High Speed, to regional and suburban trains, articulated units, underground trains, LRVs, light underground trains and locomotives. Maintenance of the whole range.
It boasts production premises throughout Spain (Beasain, Irun, Zaragoza, Castejón and Linares), as well as in the USA (Elmira NY), France (Bagnères de Bigorre), Mexico (Mexico Df) and Brazil (Sao Paulo) and Rail Technological Centres in Beasain and Zaragoza. CAF's projects are distributed in over 25 countries around the world in the five continents.

CAF POWER & AUTOMATION

- **Parque Tecnológico de San Sebastián. Pso. de Mikeletegi, 58 -2º. 20009 San Sebastián (GIPUZKOA)**
- **P: +34 943 30 92 51**
- **F: +34 943 30 92 52**
- **info@cafpower.com**
- **www.cafpower.com**

CAF P&A is a global manufacturer of electric power solutions as well as information and communications systems for the rail industry. CAF P&A have equipped more than 5,000 vehicles world wide including, metros, light rail, locomotives and high-speed trains.
One of the main strategic lines is the development of its own technology. To do so, as a major asset, CAF P&A has a team of experienced, competent and dynamic specialists. CAF P&A develops, manufactures and deliver high reliability solutions adapted to each and every client's specific needs in compliance with railway standards.

CAF SIGNALLING

- **Avenida de la Industria, 50 28108 Alcobendas (MADRID)**
- **P: +34 91 798 27 50**
- **F: +34 91 661 37 51**
- **cafsignalling@cafsignalling.com**
- **www.cafsignalling.com**

CAF Signalling, the technological subsidiary of the CAF Group, provides rail traffic signalling, both in Spain and abroad.
As such, it offers railway signalling solutions and remote control for Railway infrastructures.
CAF Signalling, boats the Company's own in-house engineering and expertise to take on "turn-key" railway signalling projects with recognition from several Railway Administrations in Spain and other countries in Europe, America, Africa, Middle East and Asia.

CAF TURNKEY & ENGINEERING

- **Parque Científico y Tecnológico de Bizkaia, Laida Bidea, Edificio 205. 48170 Zamudio (BIZKAIA)**
- **P: +34 946 819 550**
- **F: +34 94 623 29 29**
- **comercial@cafte.com**
- **www.cafte.com**

CAF Turnkey & Engineering was created in 2007 with its head office is in the Technological and Scientific Park of Biscay (Zamudio). It began its business in Integrated Engineering of Transport Services and in 2015, after merging with the company CMFS (Mexico), it increased its portfolio of services with the inclusion of EPC projects for both civil works and subsystems.
Following solid and constant growth, the company currently has a workforce of 200 with offices in Zamudio, Madrid and Mexico, providing service to both companies within the CAF Group and national and international private and public customers.

CALMELL GROUP

- **Pol. Ind. Pla d'en Coll C/ Fresser, 12 C 08110 Montcada i Reixac (BARCELONA)**
- **P: +34 93 564 14 00**
- **F: +34 93 564 58 22**
- **calmell@calmell.net**
- **www.calmell.com**

The first company of the group, Calmell, S.A. was founded in 1970, focusing its activity on the manufacture or graphic products. Currently, the Calmell Group is the leader in access control and identification, through its companies Calmell S.A., Affix S.L., Idoneum S.A., which are respectively engaged in producing the supports (tickets, cards,…), developing specific software and hardware, personalization and security.
In the public transport sector it works for integrators and operators supplying any kind of support for ticketing and reader/writer systems.
With a strong international presence through its network of representatives and distributors, the Calmell Group is able to satisfy your needs on a global level.

CETEST

- **Lazkaibar, s/n 20200 Beasain (GIPUZKOA)**
- **P: +34 943 028 690**
- **cetest@cetestgroup.com**
- **www.cetestgroup.com**

Test and analysis services for:
- Design verification and validation.
- Full homologation of new products and vehicles.
- Failure analysis and optimization.

Fully accredited test lab with more than 40 years of experience in railway testing.
Test services cover the following areas:
- Structural components.
- Running gear.
- Suspension systems.
- Vehicle dynamics.
- Noise and vibrations.
- Aerodynamics.
- EMC and energy consumption.
- Mechatronics.
- Special instrumentation (Instrumented wheelsets, instrumented pantograph).

CETREN

- **Paseo de la Castellana, 91. Planta 10. 28046. (MADRID)**
- **T. Certificación/Inspección: +34 91 1264 83 30**
- **P. Formación: +34 91 264 85 35**
- **Certificación: cetren@cetren.es**
- **Formación: formacion@cetren.es**
- **www.cetren.es**

Cetren, as expert on the railway sector, has over 30 years experience in promoting and certifying the quality in this sector. Our experience and exclusive dedication to railways allows us to offer global solutions for certification, as the Spanish Notified Body according to European Interoperability Standards and also acting as Independent Safety Assessor and Certification Entity of rail products, processes and services.
Cetren is also the first private center expert in railway staff training, as approved by the Ministry of Public Works and Transport since 2007.

COLWAY FERROVIARIA, S.L.

- **C/Botánica, 149-151 08908 L'Hospitalet (BARCELONA)**
- **P: +34 93 414 65 12**
- **F: +34 936 39 8 610**
- **acolomerf@colway-08.com**
- **www.colway-08.com**

Colway Ferroviaria,S.L., company belonging to the COLWAY Group, specializes in the design, engineering, manufacture, supply, installation and commissioning of turnkey railway vehicle interiors. Through the integrated management of modular supplies, based on experience, knowledge, research and innovation, the company achieves the satisfaction of the needs and expectations of its customers: railway manufacturers and public administrations.
Colway capabilities include Modular System solutions for Rail Interiors as Toilet Modules, Front hoods, saloons, walls, Buffet, Restaurant areas, vestibules.

COMSA CORPORACIÓN

- **C/ Julián Camarillo 6A, 2ª planta 28037 (MADRID)**
- **T: +34 913 532 120**
- **F: +34 913 504 954**
- **jensenat@comsa.com**
- **www.comsa.com**

COMSA is the company of COMSA Corporación specialised in the construction of railway infrastructures. Founded in 1891, the company provides a comprehensive service in the field of railway construction and maintenance, electrification, and control and communication systems of high speed rails, conventional rails, metros and tramways. In this business activity, it is leader in Spain, where has been involved in the construction of all high speed lines, and has permanent operations in Argentina, Brazil, Lithuania, Mexico, Poland, Portugal and Turkey. It has also taken part in a large number of projects in other markets such as Italy, the Philippines, Taiwan, Malaysia, India, etc. This extensive experience has been the key for its consolidation in the railway sector and has enabled it to become the leader in the railway construction industry.

DANOBAT

- **Arriaga Kalea, 21 20870 Elgoibar (GIPUZKOA)**
- **T: +34 943 748 044**
- **F: +34 943 743 138**
- **danobat@danobat.com**
- **www.danobat.com**

Danobat Railways business unit focuses its activity in the supply of turnkey solutions for the manufacturing and maintenance of railways rolling stock, incorporating own products of leading technology, together with those manufactured by specialized companies.
It gathers extensive experience and qualification in the rendering of services such as engineering services, equipment integration, complex project management, and collaboration with the customer all along the life of the project.
Danobat has a strong international presence and references in the most relevant customers.

DSAF – DINÁMICAS DE SEGURIDAD, S.L.

- **Avda. de San Blas nº 13 - Polígono Industrial de Gojain 01170 Legutiano (ARABA)**
- **P: +34 945 466 314**
- **F: +34 945 466 314**

DURO FELGUERA RAIL, S.A.U.

- **Pol. Ind. Fábrica de Mieres s/n**
  33600 Mieres (ASTURIAS)
- **P: +34 985 45 63 31**
- **F: +34 985 45 61 64**
- **dfrail@durofelguera.com**
- **www.durofelguera.com**

DF Rail is a Spanish company specialized at the design, manufacturing and supply of turnout systems and components for Metro, Conventional, Heavy Haul or High Speed Lines. Turnouts, single and double crossovers, diamond crossings, single and double slip crossings, single and double junctions, switch expansion joints, ..., on wooden or concrete sleepers; for ballasted or unballasted tracks; for single or combined gauges; with monobloc Mn steel crossings or with swing nose crossings; insulated glued joints; transition rails.

ECOCOMPUTER S.L.

- **C/ María Zambrano 5 - Bajo · 33401 Avilés (ASTURIAS)**
- **P: +34 985 52 50 46**
- **F: 34 985 56 83 17**
- **sales@ecocomputer.com**
- **www.ecocomputer.com**

Ecocomputer S.L. es una firma tecnológica localizada en Asturias y Cantabria y especializada en el diseño, desarrollo e implementación de soluciones IT específicas para el sector ferroviario (ticketing, booking, información al viajero, etc.) y el control de accesos y presencia.Fundada en 1999, cuenta en dichos ámbitos con un amplio abanico de productos desarrollados con tecnología propia, resultado de años de evolución y adaptación a las necesidades de los clientes. Así mismo, Ecocomputer presta servicios tecnológicos en el mantenimiento de la operación e infraestructura ferroviaria (CTC, SIV, equipamiento IT de estaciones).

ELEKTRA-GRUPO ELEKTRA, S.A.

- **C/ Apostolado, 34**
  20014 San Sebastián (GIPUZKOA)
- **T: +34 607 94 29 73**
- **railway@elektra-sa.es**
- **www.grupoelektra.es**

Ecocomputer S.L. is a technology firm based on North Spain (Asturias and Cantabria) and focused on the design, development and implementation of IT solutions on the railways industry (ie: ticketing, booking, passenger information system) and access control and time&attendance business. Founded on 1999, it holds a wide portfolio of own products as a result of years of evolution and adaptation to customer needs. Ecocomputer provides as well onsite IT maintenance services for the railways operators and administrator infrastructure companies (Railway Control and Regulation Centres, security infrastructure, IT equipment).

FAIVELEY TRANSPORT IBERICA, S.A

- **Pol. Ind La Drecera – C/ Mecánica, 23 – 43470 La Selva del Camp (TARRAGONA)**
  C/Antonio Cabezón s/n (complejo Renfe) – 28034 Madrid (MADRID)
- **P: +34 917282159**
- **F: +34 917282157**
- **patricia.gil@faiveleytransport.com**
- **www.faiveleytransport.com**

Faiveley Transport Ibérica, S.A. is a firm focused on design, production, and maintenance of auxiliary equipments for railway industry (locomotives, rolling stocks, trams and metros). Our product range include also the design, production, installation and maintenance of Platform Screen Doors (PSD). FT Ibérica is the branch for Spain, Portugal and Mexico market of International Group Faiveley Transport. Our main facilities are in La Selva del Camp (Tarragona –Spain) and Commercial offices in Madrid.

FUNDICIONES GARBI, S.A.

- **Bº Munsaratz, 33**
  48220 Abadiano (BIZKAIA)
- **P: +34 94 621 54 80**
- **F: +34 94 681 73 86**
- **garbi@fundicionesgarbi.es**
- **www.fundicionesgarbi.es**

Founded back in 1972, Fundiciones Garbi has evolved from a traditional foundy to a Global Service Company for industry.
We offer a full catalogue of services starting from the casting or other materials till delivery of "ready to use" parts or assembly sets. With this aim, we have developed an organization oriented towards solid and competitive processes, ensuring quality from design phase using APQP tools. Well aware of customer satisfaction, we offer to our clients additional global services including a full range of heat treatments, machining, product inspection and testing (NDT's, etc), protection and finishing surface treatment (Painting, Metallization, Others...), including final assembly of different parts. For the Railway industry we are specialized on production of rolling stock material.

FUNOR, S.A.

- **Pol. Ind. de Villalonquejar**
  C/ Condado de Treviño, 41
  09001 Burgos (BURGOS)
- **P: +34 947 29 84 80**
- **F: +34 947 29 82 93**
- **info@funorsa. es**
- **www.funorsa.es**

Castings in carbon steel, alloy steel and stainles steel.
Our products:
- Steel casting.
- Raw castings or fully machined.

Examples:
- Bogie components.
- Pivots.
- Motor housings.
- Pressure rings.
- Axle boxes.
- Links.

GAMARRA, S.A.

- **Portal de Vergara, 6**
  01013 Vitoria (ARABA)
- **P: +34 945 25 16 77**
- **F: +34 945 27 49 48**
- **gamarra@gamarrasa.es**
- **www.gamarrasa.es**

Gamarra, S.A. at a glance: Spanish steel foundry -located at Vitoria Gasteiz- annual production: 4,000 tons - customers: European State Railways, - producers of rolling stock and their subsuppliers - as foundry and supplier homologated by DB AG (HPQ), ÖBB, SBB, SNCF (AFQ) (extract) as well as according to DIN EN ISO 9001: 2000 + DIN 6700 - 2.
Products: brake discs, brake block shoe holders, buffers, spigots and essential steel castings for bogies.

GETINSA-PAYMA, S.L.

- **C/ Ramón de Aguinaga, 8**
  28028 Madrid (MADRID)
- **P: +34 91 456 09 82**
- **F: +34 91 456 09 83**
- **internacional@getinsa.es**
- **www.getinsa.es**

With more than 40 years of experience in Transport Infrastructure Projects in Spain and all around the world, Getinsa-Payma, S.L. has grown into a top engineering firm in Spain and an international benchmark in the sector. In Spain, Getinsa-Payma has played a leading role both in the modernization of the conventional railway and in the development of the new high speed railway network. Our services include project management and engineering & consultancy services, involving all phases of the project, from feasibility studies up to commissioning and technical assistance for the operation and maintenance of railway infrastructure. Our experience covers civil works, track and platform, signaling and telecommunication systems, as well as electrification (electric substations, overhead lines, etc.). We are currently working on railway projects in Europe, Middle East, Africa, Asia, South America and USA.

GMV SISTEMAS, S.A.U.

- **Juan de Herrera, 17 - P.T.B. Boecillo**
  47151 Valladolid (VALLADOLID)
- **P: +34 983 54 65 54**
- **F: +34 983 54 65 53**
- **ahernandez@gmv.com**
- **aags@gmv.com**
- **www.gmv.com**

Since 1994 GMV provides Intelligent Transport Systems, offering turnkey solutions and specific products. GMV develops applications adapted to sector needs, including satellite navigation, mobile communications, passenger information, fare collection systems and monitoring-and-control centers.
GMV's railway portfolio includes fleet management system, SAE-R®, providing operators with an all-in system for planning and management, and other products like CCTV, PA-Intercomm and Passengers Video Information, as well as electronic fare collection systems for railway sector.

HICASA - HIERROS Y CARBONES, S.A.

- **Polígono de Asipo, P48**
  33428 Cayés-Llanera (ASTURIAS)
- **P: +34 985 26 04 73**
- **F: +34 985 26 09 05**
- **info@hicasa.com**
- **www.hicasa.com**

HICASA está especializada en el almacenamiento, transformación, distribución y comercialización de materiales de vía ferroviaria, carriles de todo tipo y accesorios ferroviarios siguiendo normativa tanto Europea (Normas UNE EN, DIN) como normativa Americana (ASTM, ASCE...) y otros tipos de Normas (AREMA, UIC etc).
HICASA pertenece al grupo privado de empresas (GEVIR) del que forman parte 4 empresas situadas en España, y tiene la particularidad de unir su condición de distribuidor a la de fabricante, ya que contamos con una fábrica propia especializada en la fabricación de carriles ligeros, lo cual nos confiere un perfil único en el mercado.
Cuenta con una superficie cubierta de más de 13.000 m^2, con modernas máquinas de corte y taladrado lo cual permite suministrar los pedidos en cualquier formato o medida, siguiendo los requisitos de sus clientes.
Exporta más del 50% de sus productos.

ICON SISTEMAS DE INFORMACIÓN Y DATOS

- **Avd. Santiago Amón, 3-52-**
  34005 Palencia (PALENCIA)
- **P: +34 979 70 29 06**
- **F: +34 979 70 20 21**
- **ehornos@iconmm.com**
- **www.iconmm.com**
- **www.denevads.com**

Software development company specialized in passenger information systems, digital signage and advertising schedules, covering all areas of transport, either rail/metro, airports, bus or port. ICON Multimedia also has a significant presence in the world of commerce/retail, menuboards, and the banking sector, with worlwide reference clients with more than 40.000 points deployed around the world.
It stands out for the wide degree of customization of your product to suit the needs or requirements of any client or that may be contained in a statement of technical conditions.

IDOM

- **Zarandoa 23**
  48015 Bilbao (VIZCAYA)

- **P: +34 94 479 76 40**
- **F: +34 94 475 93 64**
- **cortega@idom.com**
- **oscar.rico@idom.com**
- **www.idom.es**

Idom is one of the european leading companies in the field of professional services in engineering, architecture and consultancy. It is an independent company established in 1957 and it has participated in over 30.000 projects in five continents. In 25 countries with 42 offices throughout Angola, Arabia, Argelia, Belgium, Brazil, Canada, Chile, Colombia, Ecuador, France, Germany, India, Laos, UAE, Spain, U.S.A., Libya, Morocco, Mexico, Peru, Poland, Portugal, Rumania, Turkey and United Kingdom.

More than 2.500 staff posseses the expertise and experience to cover all the phases of a railway project (high speed, conventional, freight, metro, light rail, tramway, depot and workshops..), from conception to commissioning and beyond.

Idom will accompany the client by providing the correct technical assistance required for the decision-making process: technical specifications for design, alternatives studies, demand and traffic studies, financial and socioeconomical analysis,basic and detailed design, operational and maintenance plans,works supervision, testing and commissioning.

IKUSI

- **Paseo Miramón, 170**
  20014 San Sebastián
  (GIPUZKOA)
- **P: +34 943 44 88 00**
- **F: +34 943 44 88 20**
- **movilidad@ikusi.com**
- **www.ikusi.com**

Ikusi offers integral solutions for exploiting the diverse means of urban public transport (Bus/BRT/Tramway/Light Rail/ Metro/Suburban), as well as in intermodal transport hubs. One proposal, backed up with a track record reaching back more than 20 years in the sector, has the main goal of improving passenger experience, guaranteeing safety, increasing revenue from secondary sources independent from the main activity, and streamlining operational efficiency.

IK4 RESEARCH ALLIANCE

- **Pol. Azitain 3K, 2ºG**
  20600 Eibar (GIPUZKOA)
- **P: +34 94 382 03 50**
- **otegi@ik4.es**
- **www.ik4.es**

IK4 Research Alliance es una alianza de centros tecnológicos, privada e independiente, de referencia en el ámbito tecnológico europeo. Está integrada por 9 entidades del País Vasco: AZTERLAN, CEIT, CIDETEC, GAIKER, IDEKO, IKERLAN, LORTEK, TEKNIKER y VICOMTECH.

IK4 Research Alliance tiene por objeto la generación, captación y transferencia de conocimiento científico-tecnológico principalmente al tejido empresarial, con el fin de contribuir a la mejora de su competitividad y, en general, al progreso de la sociedad.

Actualmente reúne 1275 personas y en 2014 tuvo unos ingresos de 102 M€.

IMPLASER 99, S.L.L.

- **Pol. Ind. Borao Norte, Nave 5A**
  50172 Alfajarín (ZARAGOZA)
- **P: +34 902 18 20 22**
- **F: +34 902 18 20 22**
- **international@implaser.com**
- **www.implaser.com**

Implaser is a Spanish company focused in developing innovative security signs for railway projects. Innovation and quality are our mainstays, as we were the first SME being certified in R+D+I in Spain. Implaser has all the range of products certified by AENOR with photoluminescent values of 150, 300, 580 and 720 mcd/m^2. We are also specialized in the manufacturing of informative, security and accessibility stickers for coaches, to be used both indoor and outdoor.

Hard work and great concern for innovation has allowed us to develop new products, such as photoluminescent systems combined with electroluminescent and guiding systems by LEDs.

INDRA

- **Avda. de Bruselas, 35**
  28108 Alcobendas (MADRID)
- **P: +34 91 626 88 58**
- **F: +34 91 626 88 68**
- **dmeza@indra.es**
- **www.indra.es**

Indra is a world leader and pioneer in the supply of technological platforms for railway operations management, control and supervision, having specific solutions already tested on high speed and conventional lines and metropolitan operations. Indra is also a leader in ticketing systems for transport operators and has facilities and projects all over the world. Furthermore, Indra develops high-precision safety and signalling systems. At this moment in time, Indra's solutions are completely unique because of their high level of integration and adaptation to the current and future necessities of the railway environment whatever may be the most state of the art technological and operative options. Indra has managed to open a competitive market for the first time based on technological and economical competitiveness.

INECO

- **Paseo de la Habana, 138**
  28036 Madrid (MADRID)
- **P: + 34 91 452 12 00**
- **nacional@ineco.com**
- **international@ineco.com**
- **www.ineco.com**

Global leader in transport engineering and consultancy, it has contributed to the development of transport infrastructures for over 45 years in more than 45 countries. Its high level technical specialisation allows its activity to diversify into new markets and reinforce its presence in those where it is already established. Its participation in the whole railway system in Spain has led the company to develop important international projects like the Makkah-Madinah high speed in Saudi Arabia, the Ankara-Istanbul line in Turkey and the HS2 project in the United Kingdom.

INGETEAM POWER TECHNOLOGY, S.A.

- **Edificio 702.**
  Parque Tecnológico de Bizkaia
  48160 Derio (BIZKAIA)
- **P: +34 94 655 90 00**
- **F: +34 94 403 98 37**
- **traction@ingeteam.com**
- **www.ingeteam.com**

Ingeteam is an expert leader in the development of electrotechnical and power electronics systems providing involving energy exchanges at large.

Our capacities and the experience on the railways sector allow us to offer technological solutions that significantly contribute to reach our customers´ strategic objectives, leading to maximize operational efficiency.

We strive towards on offering in-house/ state-of-the-art developments for.

INSTALACIONES INABENSA, S.A.

- **Energía Solar, 1 -**
  Palmas Altas
  41014 (SEVILLA)
- **P: +34 95 493 60 00**
- **F: +34 95 493 60 05**
- **inabensa@abengoa.com**
- **www.inabensa.com**

In the railway sector, Inabensa is an international reference for overhead lines, traction substations, communications and ancillary installations: high voltage, low voltage, lighting and ventilation. Inabensa undertakes turn-key projects, ranging from designing, supplying and installing to maintaining electrification system for both conventional and high-speed railways, freight, subways, trams and monorails.

INTERNACIONAL HISPACOLD, S.A

- **Avda. Hacienda San Antonio,1**
  Pol. Ind. El Pino
  41016 Sevilla (SEVILLA)
- **P: +34 954 677 480**
- **F: +34 954 999 728**
- **hispacold@hispacold.es**
- **www.hispacold.es**

Hispacold is a World leader company for climate systems specialized in comfort for people with more than 30 years' experience.Hispacold designs and manufactures HVAC solutions for all rail vehicles: trams, metros, EMUs, DMUs, LRVs… with proven and reliable technology solutions.In Hispacold each activity is based on a solid quality culture and on a real commitment with the environment. Quality certifications ISO 9001, ISO 14001, OSHAS 18001 are only the smallest part of this working way.

Hispacold is a company of Irizar Group SC, which employees more than 3.000 people in the five continents and has a global turnover of more than 550 Million €. This gives Hispacold the benefits from a multinational organization while maintaining an individual company spirit. Hispacold's presence in the five continents guarantees the best technical assistance at any place of the world.

ITK INGENIERÍA, S.A.

- **Parque Científico Tecnológico de Gijón - Parcela 5 - Edificio ITK**
  33203 Gijón (ASTURIAS)
- **P: +34 985 35 50 00**
- **F: +34 985 35 70 50**
- **itk@itk-ingenieria.es**
- **www.itk-ingenieria.es**

One line of business in which ITK has become involved has been the development, supply and assembly of installations and equipment for the rail sector.

ITK's work takes in all aspects of a project, starting with the precise definition of the needs of the client to offer an integrated solution that brings together construction, production, environmental and personnel aspects via analysis, calculation and engineering.

Installations, vehicles and equipment are delivered in an operational state with their corresponding operating and maintenance manuals and even training courses for outside staff, integral maintenance for the life of said installations and a complete after-sales and repair service.

JEZ SISTEMAS FERROVIARIOS, S.L.

- **Arantzar, s/n**
  01400 Llodio (ARABA)
- **P: +34 94 672 12 00**
- **F: +34 94 672 00 92**
- **infor@jez.es**
- **www.jez.es**

JEZ Sistemas Ferroviarios, S.L. is committed to designing, manufacturing, supplying and maintenance of all types of manganese steel switches and railway track systems, in addition to moulded cast steel parts for the general industry.

Our Technical Department (Department of R&D) ensures we have the capability of designing and producing points and crossings (turnouts, crossovers, scissor crossovers and diamond crossings) or parts for them, such as hard steel manganese crossings or spare tongues.

At JEZ Sistemas Ferroviarios, S.L. we fit our developments to meet clients needs.

KELOX, S.A.

- Isla de Jamaica, 8
  28034 Madrid
  (MADRID)
- P: +34 91 334 15 90
- F: +34 91 358 05 64
- marketing@kelox.es
- www.kelox.es

Kelox launched its railway activity in 1977, manufacturing catering equipment for dining cars on longdistance lines. The experience and knowledge acquired over the years have become Kelox specialist in the design and full supply of galleys and catering equipment for high-speed, shuttle and regional trains.

Our style of design is characterised by harmony; it is beautiful, ergonomic and functional, always according to the customer specifications.

LUZNOR

- Paduleta, 47 01015 Vitoria
  (ARABA)
- P: 945 200 961
- F: 945 200 971
- iarbeloa@luznor.com
- www.luznor.com

Luznor Company is specialized in the design, manufacture and commercialization of professional torches (for railway industry), emergency lighting (for industry and architecture) and other Electronic devices.

Luznor offers you (in its factory in Vitoria) highly qualified technicians, a high standard of quality, an effective system development, manufacture and testing, and above all, a philosophy of commitment to our customers allowing us to offer innovative products equipped with advanced technology and recognized prestige.

MB SISTEMAS, S. COOP.

- Pol. Ind. Igeltzera - C/ Igeltzera, 8
  48610 Urduliz (BIZKAIA)
- P: + 34 94 403 06 26
- F: + 34 94 403 06 27
- amacias@mbsistemas.es
- www.mbsistemas.es

MB SISTEMAS is part of MONDRAGON CORPORATION. We develop turnkey "World Class" engineering projects, implementing automation solutions into the Assembly and welding phases of manufacture process for car body structures of railroad passenger cars.

We give "ad hoc" solutions for the customer's needs; having implanted successfully our facilities around the world. As engineering we develop both, robotic installations and special machines for any assembly process.

LA FARGA LACAMBRA, S.A.U.

- Ctra. C-17z - Km. 73,5 08508
  Les Masies de Voltregà
  (BARCELONA)
- P: +34 93 850 41 00
- F: +34 93 859 55 30
- gustau.castellana@lafarga.es
  jordi.valaro@lafarga.es
- www.lafarga.es

La Farga Lacambra is a model company in the railway sector, with more than 200 years' experience in the copper industry. A solid international presence and continuous innovation in the search for new alloys have enabled it to produce high-service materials.

La Farga Lacambra provides global solutions for copper materials and its alloys such as CuMg, CuSn or CuAg, integrating the whole productive process and ensuring the maximum technical qualities.

These products satisfy the needs of the market for all kind of lines and speeds around the world.

MANUSA DOOR SYSTEMS

- Avda. Via Augusta, 85-87 -
  6ª planta. 08174
  Sant Cugat del Vallès
  (BARCELONA)
- P: + 34 902 321 400
- T: +34 935 915 700
- F: +34 902 321 450
- F: +34 932 185 610
- manusa@manusa.com
- www.manusa.com

Manusa is the Spanish market leader in design, production, installation and maintenance of automatic door systems. Established in 1966, it has 12 delegations in Spain, branches in Portugal, Brazil, Singapore and India and international presence in more than 70 countries around the world.

Manusa develops specific products for public transport, such as platform screen doors (PSD) and ticket gates for access control, as well as one-way corridors, onboard doors and tunnel partitioning doors, always with the Manusa technology support.

METALOCAUCHO, S.L.

- Polígono Erratzu, 253
  20130 Urnieta (GIPUZKOA)
- T: +34 943 33 37 55
- F: +34 943 33 37 51
- info@metalocaucho.com
- www.metalocaucho.com

MGN was established in 1957 and since then it has been developing its activity both designing and manufacturing rubber-metal components, mainly for the railway industry.

MGN invests in research and innovation as a basis for the development of elements to be adapted in the new understanding of passenger and fright trains, taking the lastest technological advances of the rubber world, vibration control and damping systems.

MGN TRANSFORMACIONES DEL CAUCHO, S.A.

- C/ Candelaria, 9 - Pol. Ind.
  Camino del Calvario
  28864 Ajalvir (MADRID)
- T: +34 91 887 40 35
- F: +34 91 884 45 84
- enp@mgncaucho.com
- www.mgncaucho.com

MTC specialises in the design and manufacture of anti-vibration and suspension solutions for Rolling stock.

The Company was established in 1982 and currently has three manufacturing sites, located in Spain (HQ), China and India. In 2009 the company was awarded IRIS Certification. MTC, being among the leading companies in its sector, supplies to the main Rolling stock Constructors worldwide, including Alstom, Bombardier, CAF, CSR, CNR, Hyundai Rotem, Siemens, Talgo, Vossloh). We also collaborate with Operators for the supply of spare components for their overhaul projects. Our main products are rubber-metal primary and secondary suspensions, focusing on primary springs (conical or chevron type), guiding bushes, guiding links, secondary air springs and emergency springs, traction rods, elastic bushings, buffers, layer springs as well as a diverse range of associated rubber-metal solutions.

NEWTEK SOLIDOS S.L

- Pol. Abendaño. Urdaneta bidea, 3B.
  Zarautz - (GIPUZKOA)
- P: +34 943 835942
- F: +34 943 894441
- comercial@newteksolidos.com
- www.newteksolidos.com

NEWTEK SOLIDOS, S.L. manufactures sand filling systems for the railway equipment industry, sand feeders, storage silos, pneumatic transport, dust return systems, sand loading equipment and facilities maintenance.

NEM. NUEVAS ESTRATEGIAS DE MANTENIMIENTO, S.L.

- Paseo Mikeletegi, nº 54 - 1ª planta
  20009 Donostia (GIPUZKOA)
- P: +34 943 30 93 28
- F: +34 943 30 93 26
- info@nemsolutions.com
- www.nemsolutions.com

At NEM Solutions we offer total control of business operations and maintenances for the railway industry. Our products and services project the assets' future from data generated daily. The objective is to give our client the possibility to control his/her own business and to avoid surprises. Thanks to our expert knowledge we provide wheel life management, productivity improvement and O&M cost reduction.

P4Q ELECTRONICS, S.L.

- Ctra. Bilbao-Balmaseda, Km. 9
  48810 Alonsotegi (BIZKAIA)
- T: +34 94 498 20 28
- ialberdi@p4q.com
- www.p4q.com

At P4Q we are involved in the complete development of electronic devices and lean production services. We are structured as an integral supplier of electronics solutions, focused in flexibility and quick development. We design under customer specs and approval. Being a partner of our customers giving global support attending local production demands. Is the basis of our strategy. We have facilities in Albuquerque (NM), USA as well as in Spain.

PARRÓS OBRAS, S.L.

- Ctra. Virgen del Monte, 1
  13260 Bolaños de Calatrava
  (CIUDAD REAL)
- P: +34 926 88 47 05
- F: +34 926 88 47 06
- rocio@parros.es
- www.parros.es

At P4Q we are involved in the complete development of electronic devices and lean production services. We are structured as an integral supplier of electronics solutions, focused in flexibility and quick development. We design under customer specs and approval. Being a partner of our customers giving global support attending local production demands. Is the basis of our strategy. We have facilities in Albuquerque (NM), USA as well as in Spain.

PRETENSADOS DEL NORTE S.L.

- Miravalles, 4 (Zona Industrial de
  Betoño) 01013 Vitoria (ALAVA)
- P: +34 945 258 431
- F: +34 945 261 400
- pretenorte@pretenorte.com
- www.pretenorte.com

PRETENSADOS DEL NORTE produces the best prestressed wire for railway sleepers in the world. More than 30 years' experience, PRETENORTE only uses the best raw materials and we can supply any need required by the client.

We have supplied prestressed steel for several projects around the world and our material is considered the one with the best quality in prestressed WIRE world.

We have the best and most modern machinery and a highly qualified team of experts and engineers.

We also produce prestressed steel used in precast concrete parts and structures.

PATENTES TALGO, S.L.

- C/ Paseo del Tren Talgo, 2
  28290 Madrid
  (MADRID)
- P: +34 91 631 38 00
- F: +34 91 631 38 93
- marketing@talgo.com
- www.talgo.com

Talgo, leading High Speed rolling stock manufacturer in Spain, has over 70 years of experience manufacturing very high speed, high speed, intercity and regional trains, tilting passenger coaches and locomotives.

The company is also a pioneer in providing complete maintenance solutions to

railway operators worldwide, and is specialized in the design and manufacture of maintenance equipment for any type of rail vehicles.

PRECON; PREFABRICACIONES Y CONTRATAS, S.A.U.

- **C/ Espronceda, 38, local 3**
  28003 Madrid
  (MADRID)
- **P: +34 91 343 03 48**
- **F: +34 91 359 12 46**
- **fsanchez@precon.cemolins.es**
- **ferroviario@precon.cemolins.es**
- **www.cemolins.es**

PRECON is the Spanish leader in design and supply of precast concrete products for railway tracks, either ballasted and ballastless tracks.

PRECON has supplied solutions based on monoblock, twinblock, block, slabs and sleepers for switches and crossings. Either for high speed, conventional lines, heavy haul, subways and tramways. PRECON from its two Spanish factories has supplied more than 15 millions twinblock sleepers, 5 millions monoblock sleepers, 500,000 ml sleepers for switches and crossings and currently manufacture most of the slab track systems in use in Spain.

REDALSA, S.A.

- **General Solchaga, s/n**
  P. I. de Argales, Apdo. 719
  47008 Valladolid (VALLADOLID)
- **P: +34 983 27 13 16**
- **F: +34 983 27 37 68**
- **redalsa@redalsa.com**
- **www.redalsa.com**

■ Rail electrical welding LBS are arranged to form 288 meters for high-speed train strecht and convencional rail network.

■ Engeneering services and integral management for electrical welding factories and management of rail stockpiles.

■ Regeneration of used rails to make LBS.

■ Providing fastening complet systems. Manufacture of metalic elements for diferents fastening systems. Iron sheets J2.L1 or P50 for J2 and Elastic fastening clips SKL-1, SKL14, SKL12 and new variant to "Fast-Clip".

■ Rail ultrasonic inspection, using hand-held equipment and self-propelled movil equipment until 90 Km/h.

■ Maintenance and repair work of train coaches in our factory. Our facilities are equipped with 3 Km of railway and 3 railway access to RFIG. We have all the necessary traction resources of 1668 track width.

■ Thermal aluminium welding kits distribution.

SEMI, S.A. (GRUPO ACS)

- **Avda. de Manoteras, 6 2ª Planta**
  28050 Madrid (MADRID)
- **P: +34 91 308 93 35**
- **F: +34 915 218 597**
- **ferrocar@semi.es**
- **www.semi.es**
- **www.grupoacs.com**

A society in international expansion. With the adaptability of a small business, the infrastructure of a big company and the financial backing of a large group. SEMI is encompassed in the major companies of Industrial Services sector of the ACS group. Focused in the industrial field, SEMI build infrastructures for energy, transport, communication, environment and non-residential building. Activity in the railway area: Electrification and Traction Substations for AC and DC, Auxiliary Electrical Equipment, Engineering and Consulting, Maintenance of Catenary and Substations, Infrastructure for Railway Signaling and Communications.

SENER INGENIERÍA Y SISTEMAS, S.A.

- **Severo Ochoa, 4 (PTM)**
  28760 Tres Cantos (MADRID)
- **P: +34 91 807 70 68 / 71 74**
- **F:+34 91 807 87 32**
- **dep.infra@sener.es**
- **www.sener.es**

Sener is one of the leading engineering and technology groups in Europe with over one billion euros of annual turnover, more than 5,000 professionals and a continuously growing international presence with offices in more than 15 countries. In the field of railway engineering, Sener count on an extensive experience in metros, light rail trains systems and tramways, conventional railway line, freight transport and High Speed Lines. Sener's activities range from preliminary, conceptual and feasibility studies, basic and detailed engineering to project management services, supervision of works, value engineering or ICE services.

SICE TECNOLOGÍA Y SISTEMAS

- **C/ Sepúlveda, 6 -**
  Pol. Ind.Alcobendas
  28108 Alcobendas
  (MADRID)
- **P: +34 916232200**
- **F: +34 916232201**
- **sice@sice.com**
- **www.sice.com**

SICE Tecnología y Sistemas, (SICE TyS) is a multinational group of Companies, technology and systems integrators operating in the fields of traffic and transport, environment and energy, telecommunications and all types of industrial processes.

SICE TyS's transport activities are focused on meeting the needs of users, operators and transport operation concessionaires in the transport sector. As a systems integrators and systems suppliers, they offer unique technological solutions tailored to all kind of installations.

Design of the Centralized management of all services that complement any form of public or private transport and integrates different solutions and systems:

■ Security&Safety Systems for Metros and Railways

■ Telecommunications Systems for Metros and Railways

■ Signaling: (Interlocking, Level Crossing, CTC)

■ Electric BRTs

■ Ticketing

■ Public transport prioritization

■ Consulting Engineering (OFITECO): Railways lines, Tunnels, Load test (railways bridges).

SIEMENS RAIL AUTOMATION S.A.U.

- **Ronda de Europa, 5**
  28760 Tres Cantos.
  (MADRID)
- **P: +34 91 514 80 00**
- **www.siemens.es/railautomation**

Siemens Rail Automation is the resulting Company after the acquisition of the Invensys Rail Dimetronic group by Siemens. The new division offers integrated mobility solutions through the most advanced technologies for railway signalling and train control.

Our main purpose is the supply of "turn-key" projects, including all the phases of design, development, supply, manufacturing, installing, testing, commissioning and maintenance of railway signalling systems and automatic train control systems for either mass transit applications as main line and high speed lines.

The solutions and systems of Siemens Rail Automation allow railways and metropolitan networks to improve the safety of their railway application; increase the capacity of the lines; reduce operating costs; optimize maintenance works; obtain a better usage of its rolling stock, having at the same time lower energy consumptions rates and to decrease energy consumption.

STADLER RAIL VALENCIA S.A.U.

- **Pol. Ind. del Mediterráneo – C/**
  Mitjera, 6 – 46550 Albuixech
  (Valencia) – España
- **P: +34 96 141 50 00**
- **F: +34 96 141 50 02**
- **info@stadlerrail.es**
- **www.stadlerrail.com**

The new Spanish División of Stadler has a long history as rail vehicles provider. Stadler Rail Group completed the purchase from the Vossloh Group of its Spanish business unit of manufacture of locomotives and light rail vehicles at the end of 2015. This acquisition falls within the long term growth strategy of the Stadler and reinforces its position as one of the leading manufacturers of railway vehicles with new products and the access to new markets.

Technology and quality are the key points of the entire range of products developed and produced in the Valencia plant.

Closely linked with the industrial heritage of railways and with the benefit of more than a century of experience, Stadler Rail Valencia designs and manufactures state-of-the-art locomotives as well as passenger trains and provides a comprehensive range of services such as the maintenance of the vehicles, spare parts logistics, technical support or training.

TALLERES ALEGRÍA, S.A.

- **C/ Peña Santa, 7 - P.I. Silvota**
  33192 Llanera
  (ASTURIAS)
- **P +34 985 26 32 95**
- **F: +34 985 26 60 1**
- **talegria@talegria.com**
- **www.talegria.com**

Talleres Alegría with more than 100 years at the service of railway´s networks, offers to its customers a wide range of fixed track equipment with the best quality and service conditions. Following its own technical design or its customer's, Talleres Alegría manufactures among other turnouts for High Speed Lines, conventional Lines, subway and Tramway lines, as well as End Forged Switch Points and Track Vehicles.

Being aware of the relevance of comfort within the railway sector, Talleres Alegría has collaborated with leading companies developing and applying technical solutions for mitigating noise and vibrations during the crossing over the turnouts.

TECTATOM

- **Avda. Montes de Oca, 1 San**
  Sebastián de los Reyes
  28703 Madrid (MADRID)
- **P: +34 91 659 8600**
- **F: +34 91 659 8677**
- **correo@tecnatom.es**
- **www.tecnatom.es**

Tecnatom has more than 50 years of experience in the application of Non Destructive Testing (NDT) to the inspection of components. It also offers its high technological level in the development and application of inspection systems and techniques to the railway market, where security and quality control are increasing required. Tecnatom can provide its depth knowledge on materials currently used or tested in the railway sector (metals or new materials carbon-fiber based), taken advantage of its activities in the nuclear and aerospace sectors.

The main fields where it is carrying out activities in the railway sector are:

■ Inspection services for infrastructures and rolling stock

■ Development of inspection techniques and procedures

■ Development of inspection equipment and systems (ultrasonics, eddy currents) for rail transport components (track, axles, bogies, wheels)

■ Training of operators on Non-Destructive Testing (NDT) techniques

■ Development of training simulators for train drivers.

TECNIVIAL

- **C/ Livorno nº59 Marchamalo**
  CP 19004, Guadalajara
- **P: +34 949 32 50 00**
- **F:+34 949 25 20 80**
- **export@tecnivial.es**
- **www.tecnivial.es**

Created in 1973, Tecnivial is the Spanish reference in traffic safety. It contributes giving solutions regarding Airport, Railways, and Road Signaling and marking. The challenge for a permanent evolution, technological innovation, and customer´s satisfaction are our identity signs.

In Tecnivial we specialize in all types of fixed signalling for roads, both conventional and high speed lines; in this last section are one of the companies approved by the Railway Infrastructure Administrator (ADIF).

We have extensive experience in railway stations signalling, carefully following the specifications of the corporate identity manuals. We develop comprehensive and customised signage projects, from project design to final installation and maintenance service.

Tecnivial has always been committed to the I+D+i, which has allowed it to be a reference in the fixed railway signaling, high-speed and conventional network, while being present in the most relevant projects at the national level; this is the case of the Madrid-Figueras or Olmedo-Orense sections, and internationally, Ave Medina-La Meca.

TEKNORAIL SYSTEMS, S.A.

- **Paseo de la Castellana, 91**
  28046 Madrid
  (MADRID)
- **P: + 34 91 515 60 00**
- **F:+ 34 91 564 72 86**
- **info@teknorail.com**
- **www.teknorail.com**

Teknorail Systems, S.A. is a company belonging to the EUROFINSA Group, whose activity focuses on the development of railway interior projects, aimed both for the refurbishment of existing vehicles and also for new rolling stock, with a scope of supply that ranges from the design and engineering to the industrialization and material supply, including the technical assistance to the car commissioning. Teknorail's main goal is to provide its customers with high-quality solutions for railway interiors by means of innovation, global project management, modular supply and flexible solutions.

TELICE

- **Pol. Ind. Onzonilla, 2ª fase**
  24391 Ribaseca
  (LEÓN)
- **P: +34 987 22 10 04**
- **F: +34 987 26 44 07**
- **telice@telice.es**
- **www.telice.es**

Telice is a Spanish company with 39 years of experience in several fields of technology installation, especially for the railway sector.

Our activities cover design, installation and maintenance for Railway Electrification Systems, Railways Safety and Signalling, Optical Fiber, Industrial Automation and Electrical Installations Our extensive experience has made Telice a preferred partner for carrying out work and providing services for important railroad administrations and major construction and technology companies in the railroad industry.

THALES ESPAÑA GRP, S.A.U.

- **Serrano Galvache, 56 Edificio**
  Álamo 4º, Planta Sur.
  28033 Madrid
  (MADRID)
- **P: +34 91 273 76 80**
- **F: +34 91 273 78 67**
- **jose.villalpando@thalesgroup.com**
- **www.thalesgroup.com**

Thales is a World leader in Mission Critical Solutions for Land Transportation. Thales Spain, with more tha 60 years of experience, has been pioneer and leader in the technological development of the Spanish railways, beein one of the main suppliers of safety and telecommunication systems for the Spanish Railways Administrations and present in countries as Turkey, Mexico, Algeria, Malaysia, Egypt and Morocco. Its activity goes from the development, manufacturing installation, commissioning to the maintenance of equipments and systems for railway signalling, train control, Telecommunication, Supervision ticketing and critical infrastructures security.

TYPSA

- **C/ Gomera, 9. 28703**
  San Sebastián de los Reyes (MADRID)
- **P: +34 91 722 73 00**
- **F: +34 91 651 75 88**
- **madrid@typsa.es**
- **www.typsa.com**

Typsa Group is one of the most important European consulting groups and leader in the fields of civil engineering, architecture and the environment. Since its creation, in 1966, Typsa Group's ever-increasing activities, having focused both on preliminary assessment and on design, as well as supervision and/or management of construction projects in Europe, the Americas, Africa and the Middle East. Typsa is one of the most experienced Spanish consulting firms in the field of railways and metro systems. We have been involved in more than 4,700 km of High Speed lines (HSL), 2,600 km of conventional lines, 390 km of conventional metro and 450 km of tram and light-rail transits.

VALDEPINTO, S.L.

- **Calle Águilas, 9 - Nave 11**
  28320 Valdepinto
  (MADRID)
- **P: +34 91 691 42 68**
- **F: +34 91 691 57 03**
- **lauraparra@valdepinto.net**
- **www.valdepinto.com**

Valdepinto, S.L. was established in 1986 and focuses its activities in the Railway sector.

We have four main product lines:

- All types of machining (specialists in electrical insulation).
- Screen printing, Signs and Engraving low-relief.
- Metal transformation and welding.
- Design and fabrication of transformers and coils of high/low voltage. Our philosophy is to always offer all our clients an unbeatable value for Money, combined with an excellent service.