



**WE TRAVEL
AROUND THE**

WORLD

In 2016 the Spanish railway industry
will be present at the main
international events
and railway projects



IN DEPTH: UAE AND QATAR
The metro and tram are positioned
as the most sustainable options



DESTINATION: COLOMBIA
The country is committed to improve
its railway system



INTERVIEW: MERCEDES VIDAL
The President of Alamy analyses
the railway situation in Latin America



transforming tomorrow



ArcelorMittal is the world's leading steel and mining company, with rail production facilities in Spain, Poland and United States that offer a wide portfolio of products covering rails for subways, trams, trains, light rails, crane rails, crossings, rail accessories and other special products such as cathode bars and track shoes.

Steel is a vital part of the world we live in, and it has an important role to play in helping us forge a more sustainable future. The modern world relies on steel, as for example, for its rail infrastructure. Steel is an essential part of the fabric of life.

Customer satisfaction, market expansion and R&D focus, are ArcelorMittal Europe – Long Products, rail strategic basis. Following these axes, the new investments and developments were launched: Head Hardened rail at Gijón Mill and 120 length rail, at Dabrowa mill.



ArcelorMittal es el principal productor siderúrgico y minero a escala mundial, con instalaciones dedicadas a la producción de carril en España, Polonia y Estados Unidos; ofreciendo una amplia gama de productos, tanto carriles para el metro, tranvías, trenes, trenes ligeros, los carriles de la grúa, desvíos, accesorios de vía y otros productos especiales como cátodos y zapatas de pruga.

Estamos convencidos de que el acero desempeña un papel fundamental en el mundo: gran parte del tejido de la vida está hecho de acero, como en el caso de las vías del ferrocarril.

Satisfacción del cliente, expansión de mercado y apuesta por la I+D son la base estratégica de ArcelorMittal Europe – Long Products – Carril. De acuerdo con estos ejes principales se lanzaron las nuevas inversiones y desarrollos: carril de cabeza endurecida en la fábrica de Veriña y 120 m. en la fábrica de Dabrowa.

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MAFEX AND ALAMYS SIGN A COLLABORATION AGREEMENT



The Latin American Association metros and underground (Alamys) and the Spanish Railway Association (Mafex) signed an agreement cooperation within the framework of the 29th Alamys General Assembly.

MAFEX TRAVELS TO SOUTH AFRICA AND MOZAMBIQUE

Mafex Mafex travelled, along with a delegation of companies, to Johannesburg and Maputo during October 19-23

SAUDI ARABIA, A PRIORITY DESTINATION FOR MAFEX

The Spanish Railway Association and several of its members met with railway authorities from Riyadh, Damman, Jeddah, Bahrain and Kuwait.

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Good prospects for the railway sector in Spain for 2016

Dear friends,

We begin this year with the sixth issue of our magazine, which is filled with news of our members and the association itself. Ahead presents a year with many events and rail meetings where Mafex and our members will be present, with special mention to InnoTrans, where during September 20th to the 23rd we will present the world the technological railway offer of more than 40 Spanish companies. In addition, we will also be representing our industry in the Middle East Rail Fair held in Dubai and Rail Solution Asia in Kuala Lumpur, two regions of particular interest to our companies.

This issue also includes the renewal of the agreement with the Latin American Association of Metros and Subways, ALAMYS, who's President, Mercedes Vidal, has given us an interesting interview highlighting the great weight of the Spanish railway industry in the supply of equipment in railway systems of Latin American cities. Vidal finishes the interview sharing her conclusions of the 29th General Assembly that the Association held in Lima in November last year.

Also, as usual, you will find the latest news concerning important contracts to Spanish companies throughout the world, from India's High Speed to the video surveillance system of the rail network in Sydney, the consultancy works for

the expansion of line 1 of the light rail Metro of Manila or High Speed in Sweden, among others. The section Destination of this issue is dedicated to Colombia and the relaunch of its rail system, a country that is making great efforts to have a rail structure capable of improving the lives of its inhabitants. The section In Depth covers a selection of urban systems in the Middle East, particularly in the cities of Doha, Abu Dhabi, Dubai, which complements the previous issue of our magazine, which was focused on Saudi Arabia.

The next three numbers of the year will be focused on different topics. Thus, May's issue will cover destinations such as Malaysia, Singapore and Australia; September's issue, the Scandinavian countries and December's will include information about Chile, Morocco and Iran. The section In Depth will be focused in the European rail industry, High Speed and ERTMS in UK or California.

Finally, we would like to welcome two new members, COMSA EMTE and NEWTEK, two major companies that bet for the railway sector and Mafex. Thank you very much to them and all our partners for trusting us once again.

And you, readers, we hope to count on your support in this second year of operation and we wish you a very successful 2016.

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Mafex and AlamyS sign a cooperation agreement

THE LATIN AMERICAN ASSOCIATION OF METROS AND UNDERGROUNDS (ALAMYS) AND THE SPANISH RAILWAY ASSOCIATION (MAFEX) SIGNED A COOPERATION AGREEMENT UNDER THE 29TH GENERAL ASSEMBLY OF ALAMYS

During November 8th and 11th, the 29th General Assembly of AlamyS, the Latin American Association of Metros and Underground, took place in Lima (Peru), which was attended, as it has done for several years, by a representative of Mafex.

This time, as part of the event, the signing of the cooperation agreement between the two associations took place. This agreement aims to establish a collaborative framework to encourage and expedite the actions that both associations jointly organize. These include the promotion and participation in events in the railway sector, the organization of training actions and the coordination of trade delegations that benefit members of both organizations.

AlamyS counts among its core members, with the most important metros and undergrounds of

Latin America, Portugal and Spain; as well as adherent members with railway companies leading urban rail transport systems. Mafex and AlamyS currently have 17 common partners: Alstom Transport,

Ardanuy Engineering, Bombardier Transportation, CAF, Cetren, Faiveley, Idom, Inabensa Abengoa, Indra, Ineco, Ingeteam, Sener, Sice, Siemens, Thales and Vossloh Spain. 🚆



The Director of Mafex, Pedro Fortea, and the President of the Latin American Association of Metros and Subways (AlamyS) and Transports Metropolitans de Barcelona (TMB), Mercedes Vidal, along with Roland Zamora, Secretary General of ALAMYS and Corporate Manager for Planning and International Relations of Metro de Santiago, signing the cooperation agreement.

Mafex travels to South Africa and Mozambique

MAFEX TRAVELLED WITH A DELEGATION OF COMPANIES TO JOHANNESBURG AND MAPUTO DURING OCTOBER 19TH TO 23RD 2015 TO MEET WITH KEY LOCAL COMPANIES AND RAILWAY AUTHORITIES.



The Spanish delegation, the Chief Operating Officer of Gautrain Management Agency and his team.

The Delegation of Mafex, consisting of infrastructure and engineering companies, manufacturers of stationary equipment and rolling stock components, met with key players in the railway sector in South Africa and Mozambique, as well as local companies interested in the capabilities of the Spanish railway industry.

In Johannesburg, meetings were held with passenger rail operator (Prasa), the freight operator (Transnet Freight Rail) and the Railway Department of the Ministry of Transport of South Africa, among others. In Maputo the team responsible for various departments of CFM, Portos e Caminhos de Ferro de Moçambique, welcomed the Spanish delegation.

South Africa is currently in full renewal of its transport infrastructure. The Ministry of Transport has developed the "2012-2030 Investment Plan in the Railway Sector" which aims to acquire rolling stock for more than 40,000 million eu-

ros, as well as remarkable works covering signalling and infrastructure.

In Mozambique, one of the Government's priorities is to improve transportation connections, especially freight transport. In this sense, one of the most prominent projects is the Nacala rail link, a strategic corridor with neighbouring countries such as Malawi and

Zambia. Also, the country aims to carry out the "Beira Railway Project" with the objective of rehabilitating the network of central Mozambique. Mozambique also plans to connect by rail the north of the country with the south, the expansion of the branches to the port of Maputo, the rehabilitation of existing infrastructure and the acquisition of locomotives. 🚆



Meeting with the representatives of Portos e Caminhos de Ferro de Moçambique (CFM)

Saudi Arabia, a priority destination for Mafex

THE SPANISH RAILWAY ASSOCIATION AND SEVERAL OF ITS PARTNERS MET WITH THE RAILWAY AUTHORITIES OF RIYADH, DAMMAM, JEDDAH, SAUDI ARABIA, KUWAIT CITY, SAUDI ARABIA, UAE, SAUDI ARABIA, QATAR AND OMAN.

During November 21st and 24th, Mafex coordinated the visit of a trade delegation of Spanish companies to the cities of Riyadh, Jeddah, Dammam, Bahrain and Kuwait City. The purpose of the meetings between Mafex members and railway authorities of these cities was to strengthen cooperation on rail facing the new infrastructure projects which are expected to be developed in the region, including the Gulf Railway, which will connect Saudi Arabia, UAE, Bahrain, Qatar and Oman.

During the visit to Saudi Arabia, members of the Spanish delegation had the opportunity to hold meetings with the Saudi railway company Saudi Railway Organization (SRO), with the Cooperation Council of Arab Gulf States and the Ministry of Transport of Saudi Arabia. Referring to local entities, the Spanish companies held meetings with Metro Jeddah Company and Makkah Mass Rail Transit Company, authorities responsible for the management and administration of the metros in the cities of Jeddah and Mecca or King Fahd Causeway Authority, among others. In addition, they had the opportunity to hold meetings with the leaders of Al Shoula consortia and FAST, responsible for the works of the High Speed line between Mecca and Medina and lines 4,5 and 6 of the Riyadh Metro respectively.

15th Gulf Industrialists Conference

The business delegation continued its route in Kuwait City dur



The Spanish delegation with authorities from KFCA, King Fahd Causeway Authority in Bahrain.

ing the 25th and 26th November to attend the 15th Gulf Industrialists Conference, a traveling event among member countries of the Gulf Cooperation Council (GCC). The event featured a series of conferences and meetings in which public-private investment is encouraged in different strategic sectors of the GCC for the development of infrastructure. Among the organizers of the Conference, are the Ministry of Trade and Industry, the Kuwait Chamber of Commerce and the General Secretariat of the GCC.



Spanish delegation meeting with representatives of Metro Jeddah

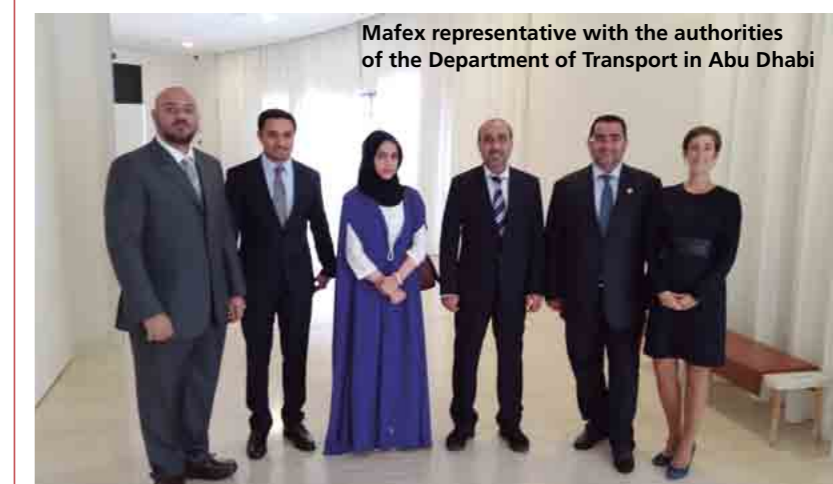


15th Gulf Industrialists Conference

SENIOR MANAGERS OF THE DEPARTMENT OF TRANSPORT IN ABU DHABI VISIT SPAIN

In early October 2015, a delegation of officials and experts from the Department of Transport of Abu Dhabi visited Spain in order to see in first-hand the characteristics and potential of the different technological solutions that the Spanish industry has to offer in the railway field taking into account the implementation of a metro and tram system in this city. The delegation also visited several sites of interest in the field of urban transport, such as the facilities and maintenance workshops of the Metro and Tram of Seville or flagship stations and other landmarks in Madrid.

On the occasion of this visit, the Spanish Railway Association, Mafex, organized a breakfast meeting in which the authorities of the United Arab Emirates - including the Director of the Division of Public Transport, the responsible for planning and the Minister of Transport - presented the current status of projects and railway investments in Abu Dhabi, facilitating the exchange of views on the experience of Spanish companies with which they cooperate. The section In Depth of this issue includes these and other projects and railway investments.



Mafex representative with the authorities of the Department of Transport in Abu Dhabi

Seminar on business opportunities in the rail freight sector and logistics

Visit to the facilities of Mafex's member Vossloh Spain.



BRAZIL AND TURKEY WERE GUESTS AT A CONFERENCE WHERE TECHNOLOGIES APPLIED TO FREIGHT TRANSPORT WERE THE PROTAGONISTS.

The Spanish Railway Association, Mafex, organized in Valencia during November 16th and 20th the seminar on "Business Opportunities in rail Freight Transport and Logistics" which had the participation of two of the countries with further development on freight railway transport in the world.

Participating Spanish companies had the opportunity to hear in first-hand the investment plans and projects of major corporations and freight operators that Brazil and Turkey currently have in their portfolio. The seminar was attended by the team responsible for purchasing rolling stock and fixed material of MRS Logistics and the Director of the Brazilian Association of Operators Rail Freight (ANTF), as well as the head of R & D Tulomsas, one of the most important manufacturers of locomotives and wagons in Turkey, among others. In addition, participating companies were able



Roundtable with representatives from MRS Logistics, ANTF and Tulomsas



Some of the participants in the conference of Freight and Logistics

to maintain individual meetings with foreign guests and meet them on their facilities.

This way, the delegation of foreign guests visited the Railroad Terminal

of the Port of Valencia, the largest of Spain as far as number of containers handled concerns and Vossloh Spain's factory in Albuixech and the BCN Rail fair held in Barcelona. 📍

OTHER SEMINARS ON INTRAPRENEURSHIP, SUSTAINABILITY AND MULTILATERAL FINANCIAL INSTITUTIONS

The month of november was full of conferences on various topics of interest to the railway sector. Mafex, in collaboration with the public company in charge of environmental management (Ihobe) and the cluster of environmental industries (Aclima), both entities of the Basque Country, held in Bilbao on November 12 the **"1st Conference on Sustainability in the railway sector: The environment as a factor of competitiveness"**.

Throughout the conference and with the participation of agencies and companies like UNIFE, Tecnalia, IK Engineering, Alstom Spain, Bombardier, CAF or Talgo, topics such as the environment and competitiveness in the railway sector were addressed; The life cycle and eco-design in the rail sector; the end of life and recyclability; and sustainability as the key factor in the supply chain were addressed through the presentation of the initiative Railsponsible.

Also, in collaboration with the University of Deusto, Mafex organized on November 16th a conference about the **"Intrapreneurship as a strategic solution to the expansive policy of emerging countries in the rail sector"**, which was attended by thirty participants.

The conference, whose purpose was to discuss the corporate entrepreneurship as a lever for business and economic development of the railway companies, had the intervention of the MEP and member of the Transportation Committee of the European Parliament, Izaskun Bilbao, who presented European policies regarding innovation affecting the railway sector. A professor from the Faculty of Engineering of the University of Deusto and business representatives from CAF Ventures and Aernnova also participated.

Finally, on November 24th, as part of the seminar INTERGUNE+ on globalization organized every year in Bilbao by the Basque Business Development Agency, SPRI, MAFEX collaborated in the conference **"Opportunities in multilateral markets for companies in the rail sector"**, which also had the participation of a representative of the International Directorate of the Basque Government,



Seminar on Intrapreneurship in the railway sector

who announced the Interlehan program to support public participation in international competitions and tenders; the Director General of the consulting Development Finance International, who explained how to win tenders and contracts financed by Multilateral Banks; and the responsible for trams from the engineering IDOM, who presented a case of best practices in contracting with Multilateral

Agencies.

Thanks to these three presentations, the railway companies that attended the seminar could learn in detail the business opportunities that the World Bank, the Inter-American Development Bank and the European Bank for Reconstruction and Development offer, having already spent more than 6.5 billion dollars to finance projects in the railway sector.



Representatives of Unife, Mafex, Ihobe and Aclima



IV Mafex open day

MAFEX BROUGHT TOGETHER TEN COMPANIES INTERESTED IN THE SERVICES OFFERED

Last December 2nd, Mafex organized its IV Mafex Open Day in Barcelona with the aim of publicizing the services of the association to a dozen interested companies.

Representatives of Mafex member companies, Alstom Spain, Colway Ferroviaria and La Forga Lacambra, shared their experience as Mafex members and explained how the association supports its competitive improvement and internationalization. Also, the Director of Mafex, Pedro Fortea, explained in detail the objectives of the association and the services it offers to its more than 70 members.

Mafex has supported the internationalization of railway companies since 2004. For more than a decade, the association has organized about 50 sales offices in over 40 countries in which 430 companies

have participated. In addition, Mafex has coordinated the visit to Spain of more than 175 companies and railway agencies from around the world and has made another series of activities whose primary objective is to promote the presence of the Spanish railway industry in international markets.

New additions

The companies COMSA EMTE and NEWTEK SOLIDOS S.L. have recently joined the Association.



COMSA

COMSA EMTE is the second largest unlisted Spanish group in the sector of infrastructure and engineering. With over a century of experience, it focuses on the areas of infrastructure and engineering, technology services, concessions and renewable energies.

One of the pillars of COMSA EMTE is its progress in international activity. Currently, the company is present in 25 countries, amounting to a turnover of 644 million euros in this area.

COMSA EMTE, which ranks as the Spanish eighth company in the sector, has a turnover of over 1,300 million euros and manages a superior workforce to 8,000 people, being a reference in the railway sector.



NEWTEK SOLIDOS SL is specialized in the manufacture of systems for loading sand on trains, sand pumps, silo reception and sand storage, complete pneumatic conveyors, dust extraction equipment and maintenance.

For more information on both companies, visit their respective websites: www.comsaemte.com and www.newteksolidos.com



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Mafex present in the main railway events of 2016



Mafex stand in
Innotrans 2014

INNOTRANS REAWAKENS A GREAT INTEREST AMONG THE 40 SPANISH COMPANIES THAT HAVE ALREADY CONFIRMED THEIR PARTICIPATION COORDINATED BY MAFEX

such as infrastructure, interior design, public transport or tunnelling. In its previous edition in 2014 it gathered over 135,000 visitors from 146 countries and had a total of 2,800 exhibitors from 40 countries. All of them occupied more

than 110,000 square meters of exhibition area, including the display of vehicles in the railway of 3,500 meters located in the exposition area of the fair.

Mafex and Spanish companies

Mafex organizes once again, for the sixth consecutive year, the Spanish group participating at the world's leading fair for the railway industry which takes place during September 20th to 23rd in Berlin. The Spanish Railway Association has already confirmed more than 40 companies occupying nearly 2,200 m².

The fair, held every two years, is the perfect meeting point for railway companies around the world to show their developments and technological progress in different areas



Visit of the Spanish Minister of Public Works and other authorities to the stand of Mafex at Innotrans 2014

will also be present at Exporail Fair (Acapulco), Middle East Rail (Dubai) and Rail Solution Asia (Kuala Lumpur)

During the first half of the year Mafex will participate together with twenty member companies at fairs and congresses to be held in three major markets of interest to the Spanish rail industry: Mexico, United Arab Emirates and Malaysia

The most important railway congress in Mexico, Exporail, will be held during February 10th -12th; the Middle East Rail will take place in Dubai during March 8th - 9th, and in the most important rail event in Southeast Asia, Rail Solution Asia, will be held in Kuala Lumpur during May 11th - 13th.



Stand shared by Mafex, Typsa and LKS in Middle East Rail 2015



Representatives from RapidKL, SPAD, CAF, the Spanish Embassy and Mafex in Rail Solution Asia in 2015





Soluciones en diseño y fabricación para aparatos de vía y cruzamientos de acero al Manganeso

Design and manufacturing solutions for turnout systems and Manganese steel crossings

España Spain	Argelia Algeria
Portugal Portugal	Marruecos Morocco
Francia France	Mauritania Mauritania
Inglaterra England	Rep. Dominicana Dominican Rep.
Grecia Greece	Cuba Cuba
Suiza Switzerland	México Mexico
Italia Italy	Venezuela Venezuela
Turquía Turkey	Colombia Colombia
Arabia Saudita	Argentina Argentina
Saudi Arabia	Chile Chile
Egipto Egypt	
Túnez Tunisia	



Indra deploys its smart video surveillance technology in the Sydney rail network

Indra

Sydney Trains, the entity offering railway services in the city of Sydney and its area of influence, has awarded Indra a contract for 69,9 million Australian dollars to modernize the railway network video surveillance system, using state-of-the-art technology, in Australia's largest, most populated urban center. The project, awarded to Indra through an international tender in which over 30 companies from around the world participated, has a 5-year ex-

ecution period and includes 3 years of maintenance.

Indra will implement its technology in the two control centers for managing the entire video surveillance system using closed-circuit television (CCTV) in a network of over 150 commuter stations, and will install state-of-the-art software for its operations and control. The multinational will replace the current 11,400 analog cameras with IP cameras that will be connected to the existing trunk communications network through a new network to be deployed in the stations. Indra will also supply the servers and storage devices for recording images

during the period stipulated by the client.

The new video surveillance system will include all of the advantages of IP (Internet Protocol) technology, given that by connecting directly to the cameras of the Sydney Trains computer network, any user station may operate as a control console for visualizing the images of any camera in real time and for recovering video recordings. Mobile devices connected to the network may also access video. Likewise, any tablet or cellphone may become a mobile console with which patrolling security employees may view images, thereby increasing their effectiveness.

The software that Indra will deploy in the project will include algorithms that continuously analyze the station camera images to automatically detect situations implying a potential risk, like a traveler falling onto the rails or the entry of unauthorized persons in tunnels, amongst others. The system also automatically generates alarms, allowing for the immediate implementation of appropriate measures, and thereby reducing response times.



CETEST, the partner for the European freight wagons manufacturers for the dynamic homologation

Cetest

Among the testing and homologation activities that CETEST performs for rolling stock, the on-track dynamic homologation for freight wagons is becoming an important task placing CETEST as a reference for

this process in Europe.

The on-track homologation is a complex process in which CETEST acts as the sole point of contact for the rolling stock manufacturer taking the responsibility not only of the test but also of the track slots management and operation of the test train (including the instrumented wagon). In 2016, CETEST will be performing the dynamic homologation of

a freight wagon for the French rolling stock manufacturer Titagarth Wagons AFR. The test will be performed in Spain over ADIF infrastructure and according to EN14363 European standard. As relevant aspect it is to say that the instrumentation will include the design, manufacturing, calibration and use of four instrumented wheelsets for wheel-rail force measurement on-real time.

Ingeteam and Istem are to recover 30% of the braking energy generated in the Barcelona metro

Ingeteam

Ingeteam and Istem are to install an advanced energy recovery system in the Barcelona Metro. Trains not only consume energy, but also produce it during braking. The technology developed by Ingeteam puts this train braking energy to good use, making it possible to recover between 10 to 30% of railway traction energy.

The system is to be installed in a traction substation of the Barcelona Metro, specifically in L9. In 2014 the Barcelona metro network served more than 415 million passengers.

This system that has already been installed in the Bilbao metro, in the metro of the German city of Bielefeld as well as in the suburban line in Malaga, whilst installation and commissioning work is also underway in the Brussels metro.

With regard to the Bilbao metro, particular mention should be made of the fact that 30% of the total energy recovered using this technology is intended for own consumption such as lighting, escalators, etc., whilst the remaining 70% is returned to the grid. Thanks to this technology, the metro returns to the grid the equivalent of the annual power consumed by 1,500 families.



Thales gets on board Sydney Metro

Thales

The company has been selected to provide the Central Control System and Communication System for the first fully-automated metro rail system in Australia, which opens in the first half of 2019 with a train every four minutes in the peak. Thales will deliver both systems to the Northwest Rapid Transit consortium (NRT) as a key supplier to NRT's Systems Joint Venture.

With an approximate value of €5.5 billion (AUD 8.3 billion), Sydney Metro Northwest is the first stage of Sydney Metro. The objective is to deliver a new standalone 36 km

metro rail system for Sydney, including eight new railway stations, five existing stations upgraded and 4,000 commuter car parking spaces. The NSW Government has announced metro rail will be extended from the end of Sydney Metro Northwest, under Sydney Harbour, through new underground stations in the CBD and southwest to Bankstown.

As a world leader in transport solutions, Thales is bringing to Australia expertise gained from projects in some of the world's most high-profile cities: London, Paris, Dubai and Hong Kong. The Central Control System will ensure seamless rail operations, including real-time control

mechanisms and data for various diverse systems, while providing a 'big picture' holistic view of the entire network. The Communication System will connect the public address, the passenger information systems, the CCTV and digital information boards, to a centralized system allowing a fully integrated approach to information management.

Thales helps urban transport operators increase capacity and offer new services that enhance the passenger experience and make public transport more attractive. Thales provides supervision to over 100 metro lines in 46 cities around the world.



Inauguration of Spanish High Speed Line AVE Valladolid-Venta de Baños-Palencia-León with Siemens electrification

Siemens Rail Automation
Last 29th of September it took place the official opening of the new High Speed Line Valladolid-Venta de Baños-Palencia-León in an act presided over by the Head of Spanish Government, Mariano Rajoy, and the Minister of Development, Ana Pastor.
This new section is 163 kilometers long and it is the extension of the HSL Madrid-Segovia-Valladolid Corridor; therefore, this will improve the railway connections towards Asturias, Cantabria and País Vasco and it will consolidate the Spanish railway network as the longest in Europe and the second one all over the world, with a length exceeding 3,000 kilometers.
The Minister of Development awarded the project for the electrification of the new line in Temporary Consortium (UTE) between Siemens and Telice in 2014, through ADIF Alta Velocidad (HS) Management



Board. This UTE is also responsible for the electrification of the section Venta de Baños-Burgos, 72 kilometers long.
The project includes the installation of the overhead contact line in sections Valladolid-Venta de Baños-Palencia-León, the switch track heating, tunnel lighting and power connections from the catenary to technical buildings and communications huts.
Siemens and Telice were also contract awardees in the development of the

project for executing the works and carrying out the maintenance of the electrical traction substations and their associated self-transformation centers, remote power control and high-voltage lines at 400 kilovolts of both sections.
For this installation, Siemens has used a track laying train with its own technology, able to mount 5 kilometers of catenary per day, which allows the electrification of 25000 AC volts, necessary for trains to reach a speed of 350 km/h.

IDOM wins a contract for the High-Speed line in Sweden

Idom
The East Link (Ostlänken) is planned as a new double-track high-speed railway in the eastern part of Central Sweden. Ostlänken shall be part of the future high-speed railway running between Sweden's metropolitan centres and the Scandinavian capital regions. The line will have stations at Vagnhärad, Nyköping, Skavsta Airport, Norrköping and Linköping. The Eastern Link will create opportunities for:
•Faster travel between the city regions.
•More straightforward commuting – enlargement of the region.
•Increased rail freight when the fast passenger trains move over to East Link. There will be more capacity for transport on goods trains on the Southern and Western Main Lines, which today carry passenger trains.
•Improved reliability in the rail system.



tem.
The government has referred to Ostlänken as being the largest investment in the national plan for

the transport system for the period 2014-2025. The entire Ostlänken – East Link – shall be fully operational for traffic in 2028.



Ecocomputer S.L. enters the polish market through a partnership with SSK S.A

Ecocomputer
Last September, ECOCOMPUTER

S.L. and Surfland Systemy Komputerowe S.A (SSK S.A.) signed a partnership agreement. The aim of the agreement is the commercialization of RailMan software in

Poland.
The official presentation of the agreement, as well as the RailMan software, took place in the framework of Trako2015 fair [Gdansk (Poland) on September 22-25]. There, at the stand of SSK S.A., RailMan software was presented to the different agents of the polish rail sector, who had also the opportunity to interact with a demo of RailMan Ticketing, developed specifically for the occasion.
SSK SA is a Polish technology and consulting firm. Together with its partners, and through years of projects, SSK has acquired a deep knowledge of the polish rail sector. As a result, SSK has today a broad portfolio of solutions for the operation of the railway transport (now including RailMan).

Danobat signs new contracts in Luxembourg and Sydney

Danobat
The Business Railway Unit of DANO-BATGROUP keeps growing its market share after obtaining two new orders in Luxembourg and Sydney (Australia)
The Company was awarded two contracts for two DANO-BAT underfloor wheel lathes for reprofiling wheels of trams that will be running in those cities.
The DANO-BAT underfloor wheel lathes are machines specifically designed for corrective maintenance of wheels and brakes. This operation, performed without disassembling the train wheelset, regenerates wheel profiles subjected to wear and deformation caused by the wheel-rail contact.
In the particular case of the Luxembourg project, the Company sees

this project as a major strategic opportunity to consolidate its presence on the Luxembourg market as this is the second machine installed in the country.

With this new contract, DANO-BATGROUP opens a new market niche in Australia, the stand-alone machine, apart from the already existing two major projects for the installation of maintenance workshops for freight wagons.



Alstom acquires the industrial facilities of the Santa Perpètua de Mogoda plant, in Barcelona

Alstom España

Alstom has acquired the industrial facilities of Santa Perpètua factory previously under leasing. Alstom thus exercises its purchase option over the 356,403-m2 site, owned up to now by Inbisa. The facilities are located 20 km from Barcelona (Spain) within the municipalities of Santa Perpètua de Mogoda and Mollet.

The Santa Perpètua plant, opened in 1994, is one the group's most modern plants and is one of the few Alstom plants that are capable of manufacturing high-speed trains, regional trains, trams and metros, all in the same facilities. Currently, 90% of its production is exported.

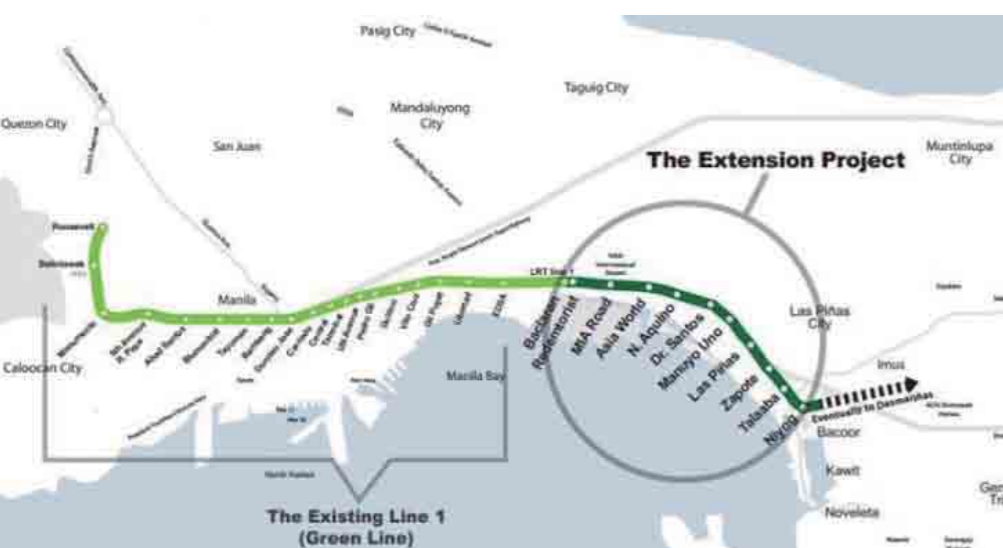
"This acquisition demonstrates our long-term industrial commitment and our vow to turn the Santa Perpètua plant into a benchmark centre within the group", highlights Antonio Moreno, President of Alstom Spain.

Over 67,000 m2 of manufacturing shops are located on the 36-hec-



tare site now being acquired. The centre also has 3000 m2 of testing workshops and a 1.2-km track for dynamic testing, which is connected to the external railway network.

Moreover, the industrial facility has an engineering centre and a technology laboratory that is engaged in research on ergonomics and overall passenger comfort.



Getinsa-Payma, Independent Consultant for the extension works of Manila Light Rail Line 1, The

Philippines

Getinsa Payma

Getinsa-Payma, in consortium with EGIS Group, will act as Independent

Consultant for the extension works of Manila Light Rail Line 1. The project is framed within a concession agreement for the maintenance and operating of the extended metro line during a 32-year period. As counterpart, the concessionaire must carry out the necessary works to extend 11.7 km the existing line, in addition to 8 stations that will be complemented in the future with 2 new ones. When the works are finished the total length of the line will reach 32.4 km, with 28 metro stations. to the line will be managed by a single concessionary company. With this project, Getinsa-Payma has obtained its first urban rail contract in Southeast Asia and reinforces its presence in Philippines.

Bombardier and the Carlos III University organise the second edition of the Railway Engineering Master's Degree

Bombardier Transportation

After the success of the first edition, 22 students are attending this year to the Second Edition of the Railway Engineering Master's Degree at the Carlos III University in collaboration with Bombardier Transportation. The program of the course, led by the Professor of the Carlos III University, Vicente Díaz Lopez, and Alvaro Rengifo, President of Bombardier Transportation Spain, includes internships in companies of the sector for the students.

A staff of mixed teachers will impart the degree. Twelve of them belong to Bombardier and

will teach the courses of signalisation, signalling and traction safety and maintenance. 90% of the students who completed the master's degree last year -50% of them unemployed at the beginning of the course- found work in the railway sector. And twelve of them are working directly or indirectly in Bombardier Transportation.

The Master's Degree, which has 60 credits, meets the need of professionals for an increasingly demanding and specialized market, and is taught on the campus of the Carlos III University in Leganés, Madrid.



BOMBARDIER
la evolución de la movilidad



India puts its faith in Ineco to develop high speed train

Ineco

The committee, led by Ineco and composed of Typsa and the Indian consultancy firm ICT, will assess the viability of a high speed train line between the capital New Delhi and Kolkata.

The line will measure approximately 1,500 km in length, and will pass through many cities of significant commercial, social and touristic interest, such as New Delhi, Agra, Aligarh, Kanpur, Lucknow, Allahabad, Mughal Benares, Sarai, Patna, Gaya, Dhanbad, Asansoi, Durgapur and Kolkata.

This project is part of the Diamond Quadrilateral Programme, driven by the Indian government, and aims to use high speed trains to connect the cities of New Delhi, Kolkata, Mumbai and Chennai.

This programme, which spans fourteen states, was established to address the Indian government's need to rejuvenate the country's current railway network. This net-

work is the largest in the world, totalling over 64,000 km in length, and each day it is used by over

18,000 trains to transport around 23 million passengers and approximately 2.6MT of goods.



Mercedes Vidal, President of Transports Metropolitans de Barcelona (TMB) and Alamys (Latin American Association of Metros and Subways)

“The Spanish railway industry has great power in the provision of equipment to rail systems in the cities of Latin America”



THE PRESIDENT OF THE LATIN AMERICAN ASSOCIATION OF METROS AND SUBWAYS HAS SHARED WITH US HER VISION OF THE SPANISH RAILWAY INDUSTRY IN THE LATIN AMERICAN MARKET.



The President of Alamys, Mercedes Vidal, during the official opening ceremony of the Annual Congress and 29th General Assembly of Alamys, held in November 2015 in Lima.

“It is necessary to achieve a transport system that provides adequate modal integration, without neglecting the crucial issue: the fare integration, a key proposal that will enable the citizen to access to this basic service and the right price to encourage its use.”

BARCELONA. SPAIN

The President of the Latin American Association of Metros and Subways (Alamys) and Transports Metropolitans de Barcelona (TMB) explains the Spanish railway situation at an international level.

Recently, during the last General Assembly of the Latin American Association of Metros and Subways held in Lima, you took over as President of this Association. Could you please share with us your objectives as the new President and the projects that will begin during your tenure at the head of the association?

Yes, of course I can share it with you. My aim is to streamline the

tasks of Alamys, an association which due to its objectives and the scope of action in Latin America, has a great future ahead. We have a great community, with great knowledge and I want to implement a work plan for the exchange of experiences, which will indeed be helpful for its members. We are preparing our next meeting which will be held in Santiago de Chile in 2016. It is likely that our 2017 assembly will take place in Barcelona.

The 29th General Assembly of the Association and the Annual Congress, held on November 8th in Lima, brought together more than 200 executives of the largest operators of urban systems in Latin America, Spain

and Portugal. What were the most relevant conclusions after the Congress?

The Annual Congress of Alamys was focused under the topic "Metro Systems development axes for the cities of Latin America."

As always, the goal is to share the experience of all the members of the association, to help operators and administrations find effective solutions and their implementation in systems and public transport networks with an excellent result.

We had the opportunity to hear the experiences of railway projects in the cities of Lima, Panama, Guadalajara (Mexico) and Rio de Janeiro and corroborate that their projects search the ultimate purpose of increasing social development of the cities, creating a positive impact on

the environment. This results in an improvement of the quality of life of people. Since not always the rail solution is best suited to ensure the mobility of citizens, administrations should evaluate it with an approach that takes into account economic, social and environmental outcomes simultaneously.

We all agree on the need for a transportation system that offers adequate modal integration, without neglecting the crucial issue that is the fare integration, a key proposal for the citizen access to this basic service and the right price that impels its use. Improving intermodal systems, with no competition between modes of transport, with a transportation system adapted to the needs of each city will undoubtedly result in the effi-

cient use of public resources. An important question, and in which there is always and agreements during our congresses, is the need for a single transportation authority. It is a basic instrument that combines the roles of authorities responsible for transport, each one in its level of competence, which allows us to sort the existing transportation system and plan its future. In most Latin American cities there is not yet a competent authority that brings together these functions and simplifies the decision making process. Therefore, from Alamys, where we count with members that are transport authorities and private and public operators that operate under the supervision of those authorities, we intend to analyse in the **Continue ▶**



From left to right, Manuel Wu, General Manager for Line 1 of Metro de Lima; Mercedes Vidal, President of TMB; Jose Gallardo Ku, Minister of Transport of Peru; Roland Zamora, Secretary General of Alamys during the opening ceremony of the last congress of Alamys.

The responsables for the transport of Latin American cities are very satisfied with the systems provided by the Spanish industry

“The public transport operators must be prepared to become global mobile operators in their city. This is the future.”

coming months how we can communicate public administrations of Latin American cities such information that is necessary to support the creation of transport authorities to an integrated transport system.

One of the many events that took place during the last Annual Congress was the signing of the renewal of the collaboration agreement between Alamys and Mafex. Could you please detail the purpose and main activities of the agreement?

Taking advantage of the meeting held in Lima, MAFEX and Alamys renewed their collaboration agree-

ment that focuses on the promotion and participation of events that each of the entities organize, as well as a commitment of cooperation in training tasks when organized in Spain. Also, the collaboration includes facilitating Mafex access collaboration offers with the industry sector initiated by Alamys members.

Alamys counts among its core members, with the most important metros and underground systems in Latin America, Portugal and Spain; and among adherent members there are railway companies leading ur-

ban rail transport systems, many of which are also members of Mafex. How do you think this partnership will benefit members of both associations?

Mafex, as the association of the Spanish railway industry, can benefit from the contacts provided by the network of Alamys, as well as Alamys can benefit from constant innovations produced by the Spanish railway industry, one of the most dynamic in the world.

Focusing now on the Spanish rail industry, over 35% of metros and underground systems in the main cities of Latin America have Spanish technology. How do you value the contribution of our businesses to the development of urban systems in cities such as Santiago de Chile, Lima, Mexico City, Monterrey, Sao Paulo, Medellin or Panama?

As I indicated before, the thrust of the Spanish railway industry is very important and has great power in the provision of equipment in the railway systems of Latin American cities. For all I know, those responsible for public transport in these cities are very satisfied with the systems provided by the Spanish industry.

Public administrations of the large Latin American cities have committed for years to the development and modernization of their railway systems as a way to improve the urban environment at social, environmental, cultural and economic levels. Looking ahead to 2016, could you tell us what are the most important projects to be undertaken in this year?

It will be endless to share the complete list, so I will focus on those that my home city, Barcelona, will start in 2016. In the second half of February Barcelona will open a branch in line 9, 19.7 km long and destined to an automatic metro, which will mean an increase of 20% of its Metro network. The branch joins Barcelona Airport, with stations at both



terminals, T1 and T2, with line 3's station Zona Universitaria (located in the neighbourhood of Pedralbes). During the journey there will be connections with metro lines 1, 5, 8 (FGC) and RENFE's station in Prat de Llobregat. After opening the service of this branch, Barcelona will be the city with the largest fully automated metro network in Europe. As President I am very proud of it.

Finally, could you please tell us the challenges to which metro operators of Latin America, Spain and Portugal are facing? And what will be the role of Alamys?

The challenges of metro systems are always the same: to win passage (here is the objective of the UITP of doubling the number of passengers in 2025), improving service quality and increasing system productivity. Furthermore, public transport operators must go prepared to become global mobile operators in their city. This is the future..

“Mafex and Alamys renewed their collaboration agreement that focuses on the promotion and participation of events that each of the entities organize, as well as a commitment of cooperation in training tasks when organized in Spain. Also, the collaboration includes facilitating Mafex access collaboration offers with the industry sector initiated by Alamys members.”



Colombia relaunches its railway system

MEDELLIN

In 2004 the process that gave rise to the current Master Plan 2006-2020 entitled "Confidence in the future" began, given that the Metro system is the hub of structuring mobility.

The Medellín Metro system supports sustainable technologies that use cleaner fuels, using the privileged conditions of production in the country and innovating in the implementation of clean energy.

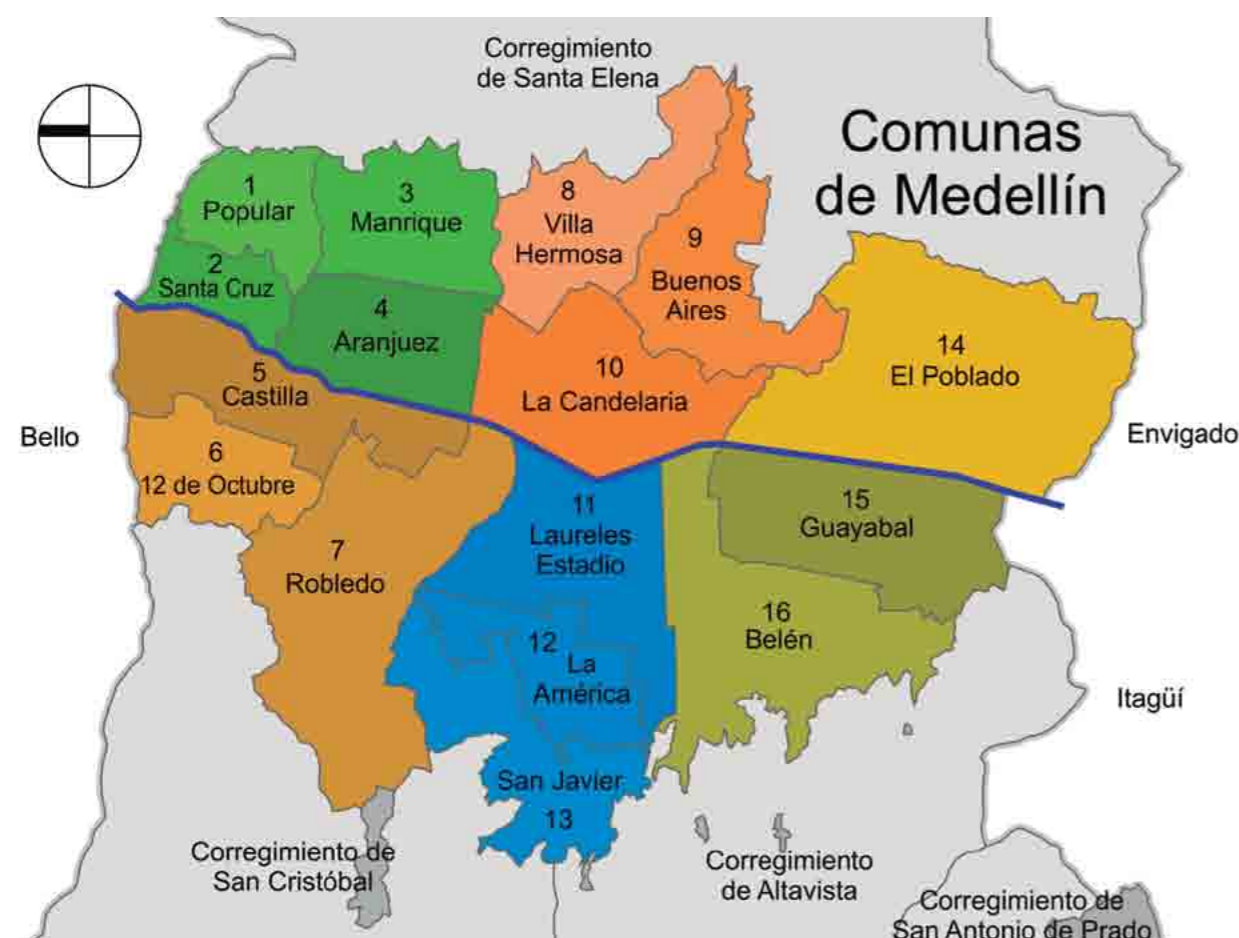
In 2004 the process that gave rise to the current Master Plan 2006-2020 entitled "Confidence in the future" began, given that the Metro system is the structural axis of mobility. Land Management Plans of the municipalities of Aburrá Valley,

THE COUNTRY IS MAKING GREAT EFFORTS TO HAVE A TRANSPORT STRUCTURE ABLE TO IMPROVE THE LIVES OF THE PEOPLE AND FREIGHT TRANSPORT. MAJOR PASSENGER PROJECTS ARE FOCUSED ON MEDELLIN AND BOGOTA, WHILE FREIGHT INFRASTRUCTURE EXPANDS AT A NATIONAL LEVEL.

Metropolitan Land Use Guidelines, the BIO 2030 Master Plan, the Management Plan and Management Aburrá River Basin, the Integral Plan of Solid Waste Management, Plan for Sustainable Tourism Development and the Urban Master

Plan, were studied among others. To complement this work, the challenge of building the Metropolitan Mobility Master Plan, including cargo terminals, bus and air emerged. This general scheme, which became the support for network

growth of mass transit and was built under a look at prospective, allows the company Metro de Medellín visualize the future and, therefore, conduct a scenario planning to prepare and anticipate any developments, with the aim of ensuring



the successful implementation of their Master Plan.

With a defined strategic direction and policies and methodologies designed consistently, the ETMVA (Mass Transit Company of Aburrá Valley) outlined in the Master Plan a road map to guide the growth and development of the Metro de Medellín in the coming years, based on six dimensions covered by their Master Plans: Administrative and Operational Infrastructure, internal organization, Business Partners, Information Technologies and Communications Technology and Operations System Expansion. Each of these Master Plans runs during periods of five years, through the strategic plan. There, specific actions for each time interval are established. Annually, it conducts an assessment of compliance with the goals and monitoring methodology. Having executed the 5 year period, and by recognizing that global trends in mobility are raised for a longer period, in 2010 the ETMVA proposed the Metropolitan Area to adjust the projections to 2030, as a result of prospective visibility regarding the development of mobility in the re-

gion. Thus, the Master Plan extended its temporal spectrum: 2006-2030. This vision for the future includes both mobility of Aburrá Valley and the Near East as the comprehensive and sustainable development of the region, without neglecting the great social benefits they generate. With its planning under prospective, the ETMVA achieved not only the growth and expansion of the mobility network, but transcends positively in the social, environmental and economic spheres of Aburrá Valley. This work is reflected not only in maintaining indicators, compared to metros in Latin America, such as Argentina, Chile, Venezuela, Peru, Mexico and Spain, but the recognitions it has won, such as being eight consecutive years the best public company and admired by medellinenses by its management, according to the study of public perception "Medellín Como Vamos" (study led by Prooantioquia, El Tiempo, El Colombiano, Fundación Corona, Comfama, Comfenalco, the Trade Chamber in Medellín and Bogotá's Chamber of Commerce).

26 ideas for the future are those which

are slowly approaching the population of the Valley of Aburrá, and that even include the possibility to expand beyond a network of public transport that connects the entire region, surpassing steep slopes to reach populated areas and distant populations, which place the Metro of Medellín as a leader in public transport. They are proposals for possible mass transit corridors for both medium and high capacity.

By developing profile studies, prefeasibility, feasibility and detailed design, among others, these transport corridors connecting the inhabitants of the metropolitan region, in their different origins and destinations, are connected from the city of Caldas, in the south, to Barbosa, in the north, passing by Sabaneta, Envigado, Rionegro, Barbosa, Copacabana and some districts of Medellín, among others. Overhead wires, trains, articulated buses and trams form an integrated mobility system operating at a tariff and administrative level, infrastructure, and they all reflect the same attributes to generate a sense of continuity: security, speed, accessibility, presentation, and information service.

Master Plan

Regarding the Master Plan, currently works are culminating Ayacucho's Tramway. In the west of the city there are plans to develop Avenue 80's Corridor, where they are conducting a review of the technology to be used. Articulated with the project "Parques del Río", there are studies regarding the development of a railway line connecting the stations and Industriales and Caribe, which would parallel the Medellín River all the way and would be different to the line that currently exists. This section is part of the project "Multi System Railway" that connects Amagá with La Pradera, and has three objectives: transport people as a suburban rail system, freight transport and finally to transport solid wastes to the area of the Prairie (Pradera) in northern Aburrá Valley.

The long-term Master Plan had proposed several levels, although the company is conducting a review of the Expansion Rector Plan, thus extending line A to the North, Avenue 34's Corridor, Corridor San Antonio de Prado - La Estrella, the new station between Envigado and Itagüí and the new station between Madera and Acevedo are being reviewed and will be prioritized according to the impact on mobility and territorial development.

Projects for the next five years (2016-2020)

► **Extension of Line A to the North (Navarra).** With the aim of creating a transportation solution for massively underserved areas in the north of Aburrá Valley, an extension section of the railway line has been developed from the station Niquía to the area of Copacabana. Estimated travel projected by 2020:

88,713 passengers/day

- **Length:** 4.2 km Stations: 1

- **Planned Technology:** Metro

► **Avenue 80's Corridor** is waiting for co financing by the Nation while it is also in a review process to determine the most appropriate technology to develop (tram or monorail). If developed with tram technology, it is estimated at 1.8 billion pesos in 2012 (600 million dollars). This project aims to implement a broker tram transport along Avenue 80,

one of the main longitudinal road corridors in the city of Medellín, forming a perimeter ring that will give structure to the main road grid of the western part of the city and will generate urban and metropolitan connections.

The scope of the project will be:

- Construction of a tram corridor 13.5 km long, four connection stations and fifteen stops integrating the western part of the city with the metro transport network connecting the stations of Caribe (north) and Aguacatala (south).

- Supply 26 trams to improve mobility in the area and generate environmental balance.

- Urban improvement of the influence areas in the project.

► **Avenue 34's Corridor** between the stations of Aguacatala and Palos Verdes To the east of Aburrá Valley, there are plans for implementing a 10,5 kilometres corridor from the station of Aguacatala, in Metro line A, to the station Palos Verdes, line 1 of the Bus network. According to the analysis that are available to the company in its profile stage, it is anticipated that the technology imple-

mented could be BRT (Bus Rapid Transit) and LRT (Light Rail Transit). This line aims to achieve by 2020 an average of 56,769 users a day, although this demand tends to increase due to the planned housing development in the sector and the adequate physical spatial integration scheme, which will include areas of easy access to shopping and parking areas close to the system.

- **Length:** 10.5 km

- **Area of influence:** south-eastern, north-eastern and east-central Aburrá Valley

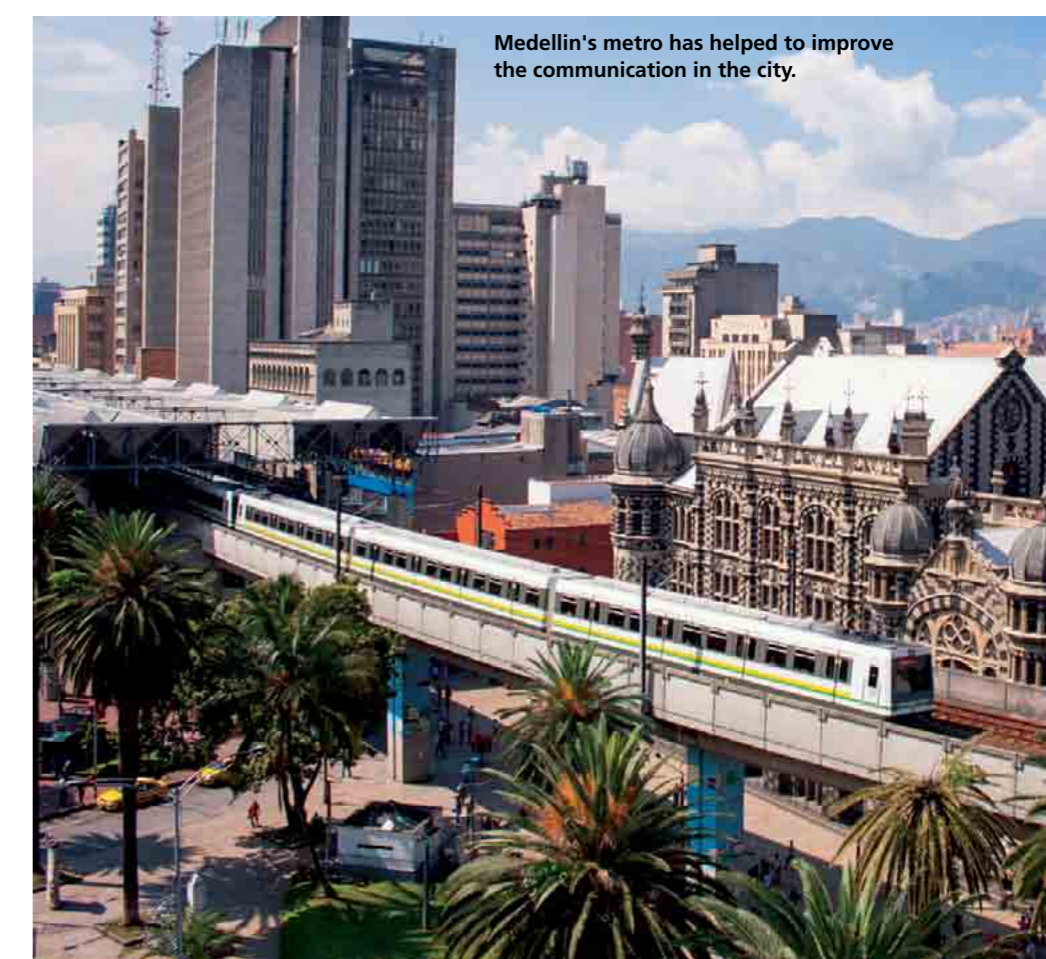
- **Planned Technology:** guided tram or trolley bus

► Corridor San Antonio de Prado – La Estrella

Approximately 29,269 passengers/day are estimated for this corridor to transport in 2020. A guided tram or trolley bus system are the technologies planned for this project, which has a budgeted investment of 950,000 million pesos.

- **Estimated travel projected by 2020:** 29,629 passengers/day

- **Length:** 7.2 km



Medellín's metro has helped to improve the communication in the city.



- **Investment:** 950.000 (million COP)
- **Planned Technology:** guided tram or trolley bus.

► **New station between Envigado and Itagüí.** Recognizing the productive, commercial and complementary services in the territory located between Avenida Las Vegas and the South Highway, the construction of a new station between Envigado and Itagüí is projected, and will transport more than 1,800 passengers per day.

- **Estimated travel:** 1,870 passengers/day.

- **Distance between Envigado and Itagüí Station:** 2.6 km

- **Investment:** 20.000 (million COP)

- **Planned Technology:** Metro.

► **New station between Madera and Acevedo.** The project is in its review stage. This area is an opportunity to plan a productive corridor, something that will be reinforced by the development of the metropolitan strategic project East Logistics Centre. To serve a demand of approximately 5,010 passengers daily, the construction of a new station between Madera and Acevedo, which will contribute in a relevant way to the mobility of this populated area

- **Distance between Madera station and Acevedo:** 1.98 km

- **Estimated travels projected:** 5,010 passengers / day

- **Investment:** 20.000 (million COP)

- **Planned Technology:** Metro

Proyectos 2021-2030

► **Multipurpose Rail Corridor System stages I, II and III.** It aims to become a solution for the mobility of the extreme areas northern and southern of Aburrá Valley, as an alternative to cargo and solid waste transport for the region. The network has a total length (stages I, II and III) of about 84 km from the station of Botero (municipality of Santo Domingo, in the north) to Primavera station (municipality of Caldas, in the south). The line involves, from north to south, the municipalities of Barbosa, Barbosa, Copacabana, Bello, Medellín, Envigado, La Estrella, Itagüí and Caldas.

- **Stage I** involves the rehabilitation of a first tranche of 51 km of existing railway corridor.

- **Estimated travel:** 56,437 passengers/day

- **Length:** 40 km

- **Stations:** 6

- **Investment:** 200,000 (million COP)

Phase I Phase II: Pre-design between a future transfer station for solid waste in the sector of Caribe (municipality of Medellín) and the station of Botero (municipality of Santo Domingo). It includes the

construction of sidings and crossings at major stations in the existing rail system. The aim at this stage I is to enable the corridor mentioned for the transport of solid waste in Aburrá Valley for disposal in the area of La Pradera, located about 1 km before the station of Botero.

Stage II consists of building 32 km of double track north of Aburrá Valley, between the station Niquía (municipality of Bello) and Barbosa station. The purpose of this stage would be to allow passenger transport in the north of the Valley of Aburrá with a suburban or commuter train system.

Stage III involves the construction of approximately 36 km of double railway south of the Aburrá Valley, between Niquía (municipality of Bello) and Spring Station (municipality of Caldas) station. The purpose of this stage is to enable multiple use of the complete system (84 km in total), facilitating the transport of solid waste, passengers and goods along the entire Aburrá Valley.

► **Corridor El Salado-Ayurá.**

It is projected for the long term. With a length of 5 km, this corridor starts from the station Ayurá to the ecological park El Salado, at the top of Envigado. This initiative still has not defined the technology that will be implemented as it is currently at the stage of identification and profile.

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The tram Ayacucho will enter commercial service throughout this year.

► **Sabaneta Corridor.** It is projected for the long term. This is an initiative that provides an internal route in the town of Sabaneta, integrated with the station Itagüí, near the station La Estrella and Sabaneta. It is a corridor whose planned technology is that of a tram, but due to the stage where it is now, the particular characteristics have not yet been defined.

► **The Eastern Transport System is under study.** Many inhabitants of the Valley of Aburrá have started their march towards the east of the region. This situation is being considered to have a mean of clean transport, connecting several municipalities. The technology contemplated for this project is the tram.

► **New station between El Poblado and Aguacatala is being reviewed.** This area has undergone a transformation in land use, from productive activities to multiple areas, acting as a metropolitan corridor with the possibility of high

population densities. Therefore, there are plans to build a new railway between El Poblado and Aguacatala, which has an estimated demand of 1,260 passengers per day.

TRAM OF AYACUCHO

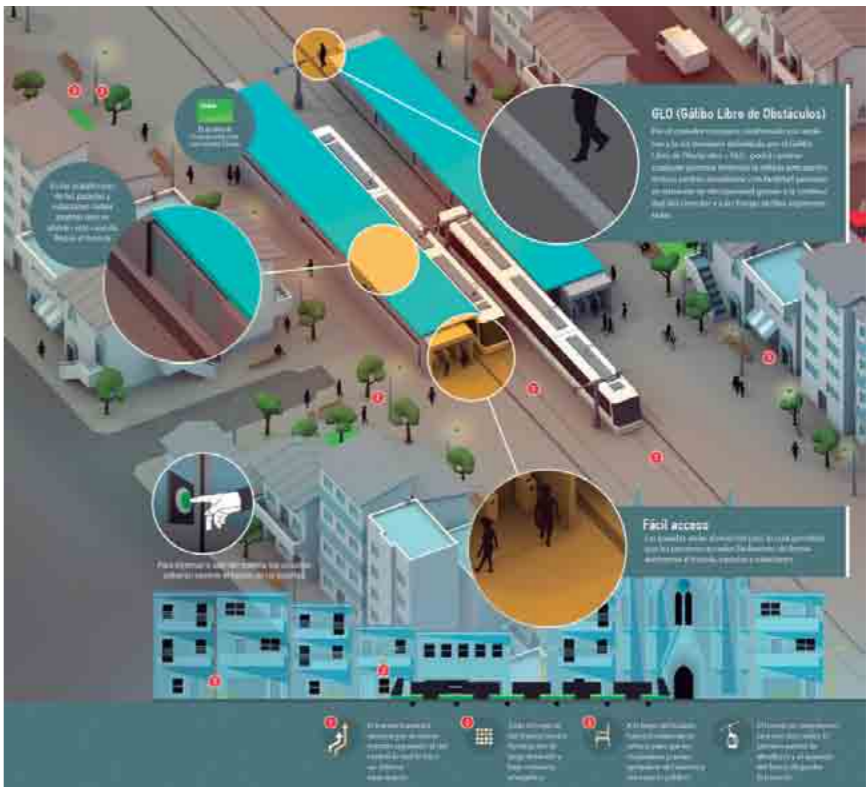
The tram of Ayacucho, with two complementary wires, will enter commercial service in 2016. The tram of Ayacucho had an investment of approximately 670 billion pesos (224 million dollars). A total of 4.3 kilometres of tram over 2459 meters of overhead cable, delimit the path of what will be the tram of Ayacucho and two integrated Metro cables, a project which is located in the municipalities 8, 9 and 10 in Medellín. The coordination and integration of the tram system with various transport systems and the environment responds to the situation of segments of the population which are deficient in providing this service, which in many cases is necessary and a priority. Similarly, it aims to

contribute to the reduction of motorized vehicular congestion and encourage and promote new travel patterns by the developments proposed in the Integral Urban Project (IUP) in the central-eastern area of the city of Medellín, where the integration of parks and green areas is contemplated. This proposal for urban transformation and to generate new dynamic sectors, whose route begins at the San Antonio station, provides an initial demand of 81,700 passengers a day, which translates into a better and greater mobility for the inhabitants of the areas of influence. This is the project for the integral intervention to Ayacucho. An initiative of the company Metro, supported by the Mayor of Medellín, which seeks to unite efforts of the community and various institutions to achieve not only painting the walls surrounding the project, but filling them with urban and conceptual art that stimulate a cultural and touristic

proposal, as well as the renewal of the area. With the arrival of the Tram of Ayacucho and the two connections to communes 8, 9 and 10 of Medellín, the community shall have the following environmental benefits:

- About 1400 trees will be planted along the Tram and two cables.
- The three new lines are powered and therefore avoid the emission of pollutants.
- Near 7,356 tons of CO2 will be reduced annually.
- 113,174 m2 of new public spaces and green areas will be created.

This project of the Mayor of Medellín, managed by the Metro, will benefit 350,000 people in the Eastern Central area of Medellín. The work involves the implementation of three new subway lines fully integrated: a Tram 4.3 km from the station San Antonio on Line A to the district of Alejandro Echavarría. The tram corridor will consist of 3 con-



Detailed infographic showing the distribution and characteristics of each tram station in the tram of Ayacucho.

nection stations (San Antonio, Miraflores and Oriente) and 6 stations: San Jose, CEFA, Bicentenario, Buenos Aires, Loyola and Alejandro Echavarría. Along its route, it will provide the ability to transfer to two aerial cable car transport systems. The first Metrocable corresponds to Line M, which begins its journey in the sector Unidad Deportiva in Miraflores and arrives to the district of Trece de Noviembre, with an intermediate station in the El Pinal. The second Metrocable, Line H, is deployed from the terminus of the tram heading towards the districts of Villa Turbay and La Sierra, which also includes an intermediate station in the neighbourhood of San Antonio, in the sector of Las Torres.

Connection Stations

San Antonio station: located in the street of Maturín with Bolívar -in the basement of the subway station of the same name, hence this is the starting point of the tram. The station will be open and will be connected with the subway to complete integration.

- San Jose Station: Located strategically between Avenida Oriental and Ayacucho.

- Pabellón del Agua EPM Station: before it was known as the station Mon y Velarde, now it will connect with the Cooperative University of Colombia, the Training Centre of Antioquia CEFA and Fine Arts. In addition, there is the Museo del Agua will be here.
- Bicentenario Station: close to park Bicentenario, the museum Museo Casa de la Memoria and the district of Boston, Las Palmas and El Salvador. La Placita de Flórez will be within walking distance.
- Buenos Aires Station: it will reach the heart of the neighbourhood of Buenos Aires and will be close to the hospital Unidad Hospitalaria of Buenos Aires.
- **Miraflores Station:** the second integration station and the tram will be located here. This will be the starting point of Metrocable Line M.
- Loyola Station: this station will be serving the traditional residential unit that bears its name.
- Alejandro Echavarría Station: located in the district of the same name, originally built for the workers of the company Coltejer, that was located where today is the urbanization Villas del Telar.
- **Oriente Station:** the last station of the Tram, and will be the transfer station to the second Metrocable, Line H.

BOGOTA

The city currently has paralyzed the realization of the metro, though it is projecting commuter trains to link different areas of the city.

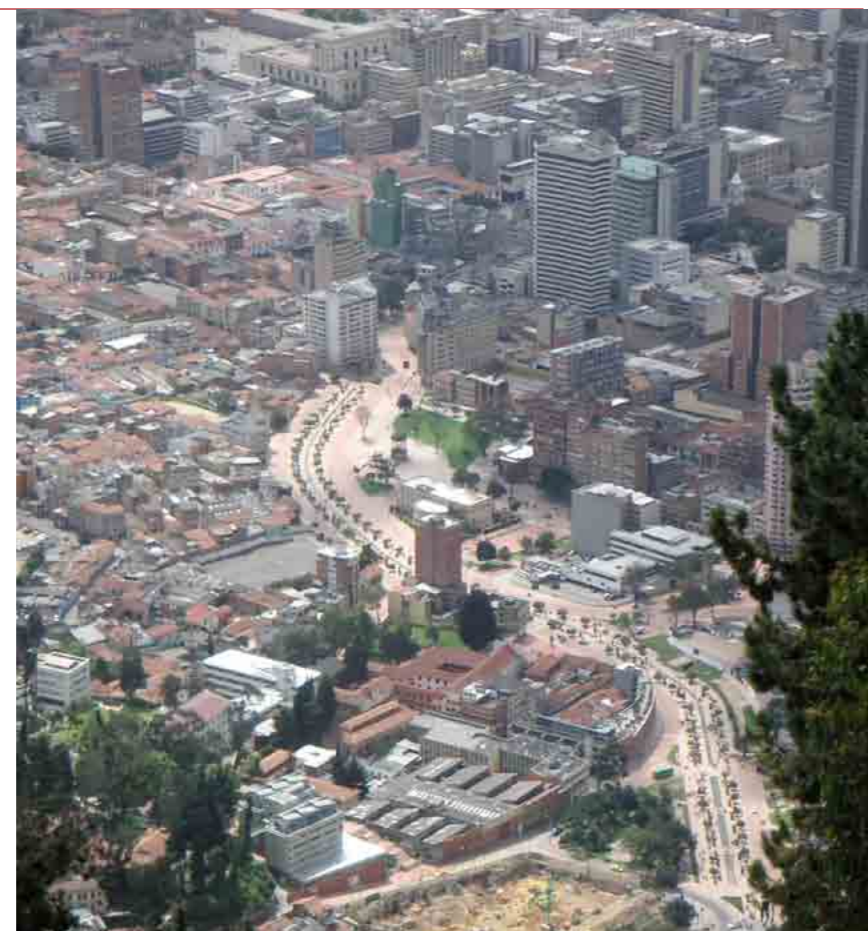
Bogota, unlike Medellin, is in time of uncertainty regarding an urban rail transport system. In late 2015, the National Development Finance organization announced the intention to suspend the bidding process for the Metro at the same time as they finish realizing the revisions proposed by Enrique Peñalosa, mayor of Bogota. The project already was postponed at least until February 2016, year in which the decision will be taken as to which branch is constructed, as well as the starting dates. It is an underground line of 27 km long, between the station Portal de las Americas and the station Calle 127, with a total of 27 stations and workshops at the beginning of the line with an investment of 5,000 M USD. It will have an initial fleet of 47 vehicles of 6 cars, 142-145m wide and 3.2m long, with a capacity for 2,000 people. It will also count with a driverless automatic system CBTC, and initial frequencies of 2.5 minutes, expected to decrease to 1.5 min, and an initial capacity of 48,000 passengers/hour, expandable to 80,000 passengers/hour. The commercial speed is 35m/h.

Commuter rail projects

Last December were presented designs for the commuter train that will connect Bogotá with the surrounding municipalities of Facatativa and Soacha. In the first case, travel times will be reduced to only 40 minutes.

The commuter train of the Sabana (RegioTram) is a rail system that uses a lightweight electric vehicle with dual functionality: in intercity sections it acts as a commuter train with speeds up to 100 km/h. In the city it works as a tram, achieving a perfect urban integration and very competitive times to avoid modal interchanges.

The RegioTram consists of two lines, one to the west and another to the south, drawing in part of the old railway infrastructure, which includes some stations that are considered of Cultural Interest. The West line will go through the route



of the old Sabana Train. From the station Sabana, it will travel along its 40 km, the town of Fontibon, the municipalities of Funza, Mosquera, Madrid, El Corzo and ends its journey in Facatativá. This line will also incorporate in its route a connection from the station Fontibon to El Dorado International Airport.

The other proposal, the South Corridor, departs also from the station Sabana, reaching the town of Soacha. With 18 km in length, its layout largely coincides with the old Southern Railway.

Both corridors will have a fleet of approximately 50 trains peaking frequencies of 4 and 5 minutes respectively to serve 160 million passengers a year.

It will have stations located 500 metres away in the urban areas up to 5 km in intercity sections, which have a system of high security doors with automatic synchronized with the arrival of trains. All of it controlled by a central command centre, complemented with parking and maintenance workshops.

In addition to reducing travel times, this transport will allow a reduction of 180,000 tons per year in carbon dioxide

emissions, helping to improve the energy efficiency of public transport.

This ferrous system is designed for its integration with transport modes in the city of Bogotá such as feeder roads and subway lines, in case the project is finally carried out.

It is expected that the rate is similar to the SITP in urban and intercity differential zone sections.

For financing, it is planned that the originator of the project covers 80 percent of the investment. Meanwhile, 20 percent will be distributed as follows: 70 percent will remain in the hands of the nation and the remaining 30 percent, by Cundinamarca. An investment of \$ 1,000 million will be required.

Finally, the commuter train between Bogotá and Zipaquirá (BZ) will transport about 60,000 inhabitants. It is a public-private partnership (PPP) and contemplates stations in La Caro (Chia), Cajicá and Zipaquirá and a connection with TransMilenio. The project has feasibility studies which are being tested by ANI - Regional Railway Company and Transmilenio SA since last February 25th.

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FREIGHT AND TOURISTIC TRANSPORT



Freight rail has an important place in Colombia given its wealth of mineral to transport. There are currently four major corridors planned or recently completed: Pacific Railway Corridor, Cerrejón Railway, La Dorada-Chiriguana-Santa Marta Railway Corridor, and Facatativá-La Caro-Belencito Railway Corridor.

Freight rail is considered the second mode of transport in Colombia and in the case of coal, the first. However, freight has not interconnected networks for operation although there are different lines which allow communication throughout the country. Currently, the stretch Chiriguana-Santa Marta de FENOCO (Ferrocarriles del Norte de Colombia) is operating with a length of 245 kilometres and transporting 38 million tons of coal a year. A total of \$ 400 million were invested for its rehabilitation.

The stretch Puerto de Buenaventura-Cali- La Tebaida del FDP-Ferrocarril del Pacifico is also operating. It is a line of 498 kilometres long and had an investment of \$300 million. Annually, 450,000 tons

of container and non-perishable elements are transported in such tracks. Finally, CERREJÓN-Ferrocarril de Mina al Puerto, carries 42 M ton/year of coal along its 250 km. The section: La Mina La Guajira a Puerto Bolívar has already been launched and \$600 M were invested for its renewal.

Projects that have not yet enter operation

Today, there are 3 freight railways that have been rehabilitated but have not yet entered into service.

The ferrous corridor La Dorada-Chiriguana, which has a length of 700 kilometres. The company Tren Colombia has asked the National Infrastructure Agency (ANI) the beginning of an early operation in this corridor to be used also for passenger transport.

Corridor El Caro-Belencito, also called Northeast railroad, has a length of 228 kilometres. A total of \$208 M were invested for its renewal. The company SOFCA presented the ANI an APP offer whose response is expected in the second half of 2016. This is a railroad that will serve freight industries in the region: cement, steel, mining and drinks

of approx . 7,000 tons/day and operation with 4 trains/day.

Spanish participation

The Spanish industry is very present on the improvements being carried out in the Colombian railroad. The UT Ferroviaria Central, with a budget of \$50 M, was in charge of the civil works in the Railway Corridor Chiriguana-La Dorada and the branch Puerto Capulco, which carried out the repair of critical points to give transition to a next operation for both freight and passengers. Moreover, in the Corridor Facatativá-La Caro-Belencito the civil works have been awarded to the Consortium Dracol-Vias for \$50 M.

Touristic train of the Sabana

Turistren, as it is known, is a train that runs 70 kilometres from La Sabana de Colombia. This is a pioneer project in Colombia for tourism and recreational passenger transport between Bogota and Zipaquirá-Nemocon, whose appeal is a visit to the salt mines of the region. It uses very old steam locomotives that arouse memories of the oldest and fantasies and illusion of the smallest.



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KEYNOTE SPEAKERS:



Chua Chong Keng
Deputy Chief Executive,
Infrastructure and
Development
Land Transport
Authority



**Mohd Azharuddin
Mat Sah**
Chief Executive Officer
Land Public Transport
Commission (SPAD)



Dr. Jacob Kam
Operations Director
MTR Corporation
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George Clark
Engineering Director,
Capital Programmes
London Underground

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MAFEX MEMBERS PRESENTS IN PROJECT IN COLOMBIA

ALSTOM ESPAÑA

Alstom Spain, as leader of the consortium UT Alstom-Sytecsa, has provided the power system of the new Ayacucho Tram, in Medellín, Colombia.

Alstom's scope includes the project management, engineering, sourcing of traction equipment (medium voltage transformers, DC equipment and control), a centre for distribution and three traction substations with rectification, as well as the testing and control of the substations, which will provide electric power to the trams. These activities will be managed by Alstom Spain with the support of the company's local team. Alstom's consortium partner Sytecsa has been in charge of the installation on the site. The 4.3 km-long line - which has



been inaugurated on October the 20th - includes 9 stations and is expected to transport 85,000 passengers per day. In April 2012, the city of Medellín ordered 12 Translohr STE5 trams (each 39 metres long) from NTL (51% held by Alstom). The NTL trams are highly efficient and offer ex-

ceptional benefits in terms of their insertion into the urban landscape, including a clearance gauge of 5.18 metres and a turning radius of 10.5 meters. The trams can easily run on gradients of up to 13%, particularly relevant for the Ayacucho line which includes slopes with gradients of 12%.



IDOM

The office of IDOM in Medellín, Colombia began its activity in 2010. However, prior to its inauguration, IDOM had already completed many reference projects in the country with the collaboration of numerous Colombian professionals working in

the Idom offices in Spain.

IDOM has participated in the most important infrastructure projects undertaken in the last decade, such as the Ayacucho tramway in Medellín (inaugurated in late 2015), Line 1 of the metro of Bogotá, the Carrera 80 tramway, and the future Bogotram train-tram line that will link Bogotá with the airport. The 4.4 km Avenida Ayacucho tramway in the city of Medellín, which Idom developed in 2010 was the first tramway in the country, and one of the first in Latin America. From 2011 onwards, Idom has been developing the engineering and architectural detailed design of the Carrera 80 tramway with a length of 17.2 km, and the prelimi-

nary design for Line 1 of the Bogotá Metro, with an approximate length of 27 km and which is currently under revision. In 2013, Idom opened an office in Bogotá, mainly for consultancy projects, with the objective of being closer to the clients located in the central region of the country, such as the National Planning Department, Findeter, and the Chamber of Commerce, among others.

In addition, Idom, with the support of the professionals from the offices of Medellín and Bogotá, is working with other important clients in Colombia such as EPM (Empresas Públicas de Medellín) on urban infrastructure and water projects.

tinational company will be in all means of transport operated by Metro de Medellín. Contactless technology allows having implemented the latest technology in terms of performance, scalability, versatility and adaptability, as it is ready to incorporate new payment technologies quickly, easily and transparently. Having a centralized global platform provides also full control over the pricing transactions, allowing customers to explore new models of development and operation of the system. As a result of previous contracts, Indra implemented in 2008 the DaVinci system for railway traffic management in Medellín and in 2010 began the development of the Metro's current collection

system. In a subsequent project, this system joined the fleet of public buses BRT (Bus Rapid Transit) of Metroplus, which also counts with Indra's Aid for Exploitation System. The integration of this system with DaVinci has led to an intermodal public transport platform, a pioneer in Colombia, which facilitates the combined use of different means of transport.

This platform has enabled to integrate the operation of trains with the bus system and now with the tram, so that vehicles are treated in a unified way, with special emphasis on networking stations or linking lines. The solution allows managing in a more efficient way the trans-

CAF

In June 2015, CAF signed a new contract with Medellín Metro for the supply of 20 metro units. These new trains meet the needs of a larger transport capacity in the urban transport system of the city of Medellín. These new metro units are made up of 3 cars each and are able to run on single or double consists. They will reach a maximum operating speed of 80 km/h and offer a capacity of more than 1,100 passengers.

SENER

SENER carried out the conceptual design, operational design and legal and financial scope of the first subway line in the city of Bogotá. SENER, as leader of the winning group, performed the project management and technical development: demand study, study of alternatives and conceptual design of the first subway line.

The work is structured in various stages, covering the economic, urban and transport diagnosis of Bogotá; the transport modeling for different venues in the city until 2038; as well as regulatory and financial analysis.

These analysis determined, along with the previous study of alternatives and evaluation, the mass transport network for the SITP, with underground corridors, the Transmilenio and the commuter train. The first selected line has a total of

At present, Empresa de Transporte Masivo Valle de Aburrá (Medellín Metro) already operates CAF metros of the same features on its metro lines. Currently the Medellín Metro has two main lines in operation, A and B, extending for a total of 35.5 km in a network of 27 stations. Medellín, located in the natural region called Aburrá Valley, in the Andes Central Mountain Range, is the second largest city in Colombia and has 2.5 million inhabitants. With this new

34.5 km, 18 of them in the tunnel, 6 km half-buried, 10.5 in surface and a total of 33 stations.

The first metro line in Bogotá (PLMB) has a length of about 27 km and will include 27 stations. All of it will be underground and it will be equipped with the most modern automatic train driving systems (UTO). The project was carried out under the aegis of the Institute of Urban Development (IDU), the official organism under the Capital District of Bogotá. The estimated total investment (including trains, workshops and garages) amounts to about USD 6,900 million.

SENER developed between March and May 2015, a Value Engineering Study on this project for the National Development Finance Company (NDF) with the Government of Colombia, as co-financier of the project. The work has consisted in developing an analysis of the different as-

pects of the draft prepared by a consortium of engineering, in order to optimize its value. Using standardized methodologies (SAVE) and techniques developed by SENER, a team of experts identified a number of (non-binding) opportunities on the project, allowing a significant reduction in investment, operating and financial costs, as well as the commissioning period of the line. To achieve this goal SENER has sought to maintain a balance between the benefits provided, such as improving the efficiency of railway operation and the level of service passengers, employees and resources.

SENER has carried out this analysis from a life cycle perspective and addressing aspects of design, construction per phases, schedule and risk, thereby improving the socio-economic return on this high investment is fulfilling customer expectations.

INDRA

It has implemented in Medellín a new intermodal public transport system that has recently been joined by the new tram of Ayacucho, to which the company will provide a full collection system. With Indra's platform, which enables the combined use of different transport systems and new ticketing, travellers can access the tram of Ayacucho with the same card without contact and enables them to use the metro, BRT buses (bus Rapid Transit), the metro feeder bus routes and three aerial transport lines. Following the renewal of contactless access control systems of the two metro lines of the city, the access control technology of the mul-

port service, providing the highest quality and information to travellers, as well as promoting the use of public transport. Indra is a technological partner of Metro de Medellín and the technology leader for the control of traffic and transport in this city of Colombia. Besides the transportation solution, Indra has also implemented in Medellín intelligent traffic systems (ITS) and a new integrated traffic control system for the city. The new traffic control centre is the largest of Colombia by number of integrated systems under a single platform because it receives, integrates, operates and analyses information from different subsystems of traffic and six independent control

centres: Collective Public Transport; Incidents Centre; Police Fleet Management; Police Logistics and Mobility Planning; Violations Control, and Traffic Light Control Centre.

Medellín is recognized internationally for its commitment to a sustainable mobility with awards as those awarded in 2013 by the Wall Street Journal and Citigroup as the "most innovative city in the world", the "International Sustainable Transport Award 2012" or the recognition given that same year by the Inter-American Development Bank (IDB) as the "Latin American city model in implementation of Intelligent Transport Systems (ITS)".





Botero Museum



Cartagena de Indias

COLOMBIA SEA, MOUNTAIN AND ART

Bogotá offers cultural havens you should not miss. Therefore, we recommend the **Botero Museum**. The art collection donated by the Colombian master consists of 123 works of authorship made with the techniques of drawing, watercolour, oil, pastel and sculpture, mainly, and displayed in the halls of the old Hemeroteca Luis Lopez de Mesa, later known as the Exhibitions House and now permanent headquarters of the Botero Museum. In **Medellin** you should go to the **Botanical Garden**. It has various types of living collections and conservation collections, comprising plants that are in some category of extinction risk.

Cartagena de Indias is one of the places that, if you have time, you should visit. Along with Gethsemane, San Diego and Matuna they form the oldest part of the city. El Centro and San Diego, are walled. Right from the door of the clock and the square of the cars one is transported back in time to periods of pirates and privateers who tried to conquer the rich Spanish plaza. It is highly recommended the **Inquisition Museum**, the **Cathedral**, the sweets street and you can go see the sunset at Café del Mar.

For lovers of tranquility and wild landscapes, is the **Tayrona National Park**, located in the Caribbean Region. The foothills of Sierra Nevada de Santa Marta, the highest coastal mountain in the world,



Rosario Islands

sink into the sea like the fingers of a giant hand among the bays and inlets of singular beauty: Chengue, Gayraca, Cinto, Neguanje, Concha, Guachaquita, with its white sand beaches bordered by mangrove thickets or forests, all bathed by the crystalline waters of the Caribbean Sea, are part of the many attractions of this park. For those looking for contemplation and relaxation, we recommend the magnificent beaches and relaxing panorama of the deep blue seas. For those who are attracted by more exciting activities we recommend hiking and scuba diving. It also has also archaeological remains of the ancient city of Tayrona.

Finally, to enjoy a relaxing time and idyllic landscape, are the **Rosario Islands**: it is an archipelago of 27 islands, some of them very small. This is an important coral formation. The archipelago is located 35 km. of Cartagena in the Caribbean Sea. The journey itself is already lovely and you can see in all its splendour



Botanical Garden of Medellín



Tayrona National Park

the beautiful Bay of Cartagena, Cartagena seen from the hill of La Popa, the walls, etc. The oldest and with higher infrastructure island is Baru-Playa Blanca, where you can eat fresh lobster. The visit to the Aquarium is interesting, you can see the various species of marine life in the Caribbean and, in addition, there are pools where you can see manta rays, turtles and large specimens. Not to miss the show of the dolphins and sharks. 🐬



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The way to see the future

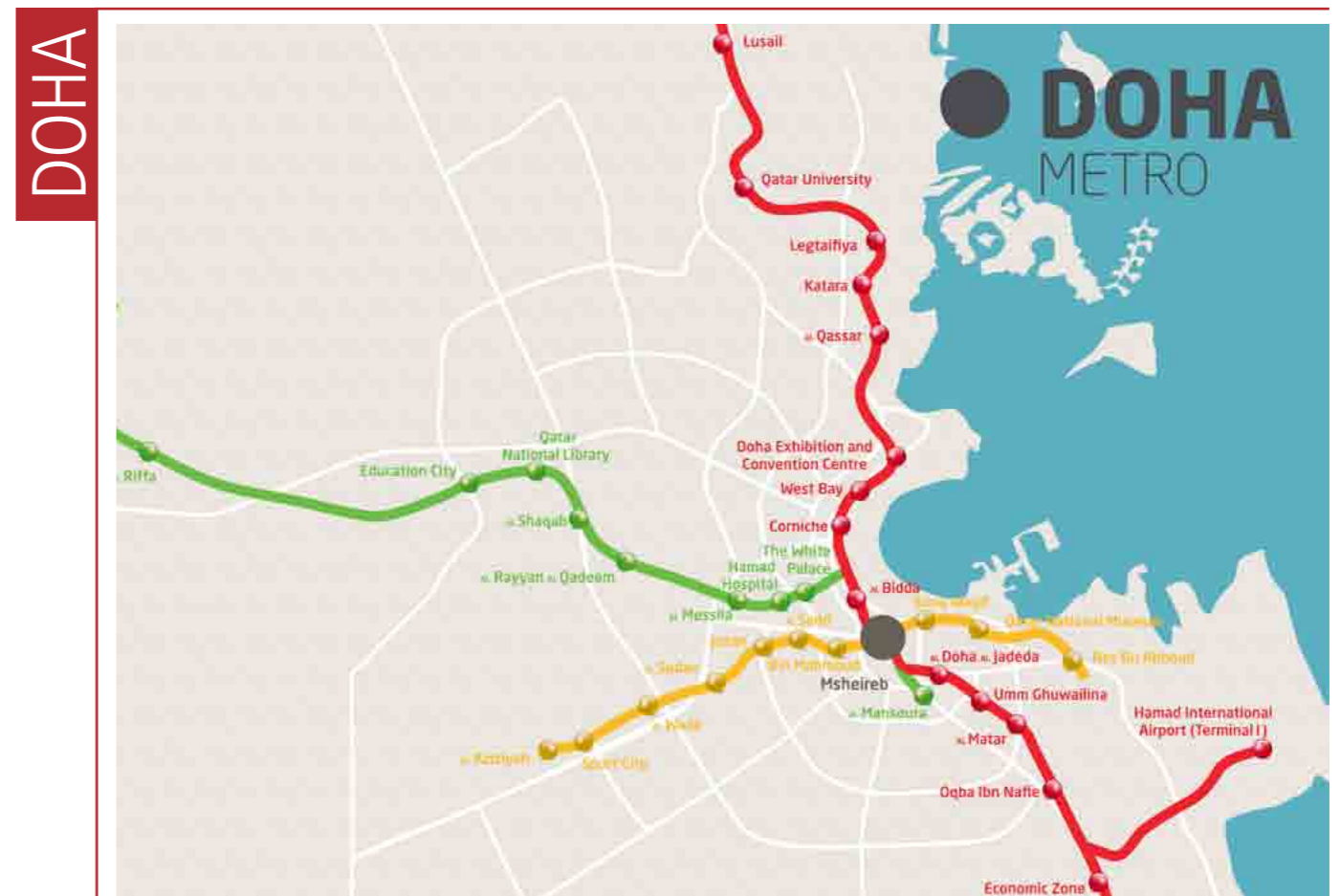


Metro and tram, the best bet in the cities of UAE and Qatar

RAILWAY SYSTEMS ARE IMPLANTED IN SEVERAL COUNTRIES AS THE MOST OPTIMAL TRANSPORT MEAN FOR CITIES. AMONG THE MOST ACTIVE LOCATIONS IN TERMS OF INVESTMENT ARE DOHA, ABU DHABI AND DUBAI, WHILE OMAN IS EMERGING IN A TIME HIGH INVESTMENT IN INFRASTRUCTURE. WE DETAIL BELOW THE DIFFERENT PROJECTS THAT ARE BEING IMPLEMENTED.

Obtaining a faster, cheaper and environmentally sustainable transport are the premises on which the majority of governments of large cities in the Middle East are focused. An example is the program developed by the city of Qatar, where the tram Lusail, along with the Doha Metro, the long-distance passenger network and the freight one, with an investment of M \$30,000, will create an integrated transport system. The Doha Metro, with a total budget that will exceed €20,000 M, will revolutionize the way people move around Doha and its suburbs. When it is launched for the first time in 2019, most of the places in the capital will be conveniently nearby, without the trouble of traffic. For example, a trip from Msheireb to the University of Qatar currently takes 28 minutes. With the Doha Metro it will be 10 minutes faster and will save 1.9

kg of greenhouse gas. The Doha Metro will be built in two phases: the first phase will consist of the Red, gold and green line in 2019, with 37 stations and 75 kilometres. Future phases involve the introduction of an additional line (blue) and the expansion of existing ones, with 60 additional stations and more than 130 kilometres. The Msheireb station will serve as the heart of the first phase, with connections to the Red, Gold and Green lines. With most of Doha's Metro stations being underground, TBM are being implemented to excavate below the capital, since for the most part, it will be invisible to the population of the city. The TBMs are the most efficient and environmentally friendly way to tunnel. Comfort, reliability and sustainable transport are the foundations of a project that meets the ambitions of Qatar's National Vision 2030.



The map of the future metro of Doha shows the three lines that are planned today.

DOHA

CHARACTERISTICS OF THE RED LINE

Also known as the coastline, the Red line has a length of 39 kilometres from Al Wakra in the south to Lusail, in the north. The line also connects Hamad International Airport with the city centre. It has 18 stations, such as West Bay, Katara, and Qatar University. The station Legtaifiya will also give passengers the opportunity to connect with the Lusail Light Rail Transit (tramway Lusail), plus another interchange station between the metro and tram called Lusail Central. The line offers a very suitable alternative against driving in the heart of the capital today: the route between the airport and Lusail is nearly half an hour in rush hour traffic while it takes 36 minutes by metro.

- Length: 39 km from north to south.
- Number of stations: 18
- Passengers per day in 2021: 280,000



STATE-OF-THE-ART STATIONS

Stations allow a unique opportunity to add some local flavour and personality to the Doha Metro. Therefore, all stations will be designed in a contemporary 'vaulted space' concept; a concept that reflects on the heritage of the region by introducing open spaces that mimic traditional Bedouin tents. The design also has ornamental panel work that have a function beyond aesthetics as they form the backbone of a dynamic lighting and ventilation system. Through the use of traditional elements of Islamic and local art, each station is a unique tribute to Qatari heritage with the dhow-inspired exteriors and the 'pearl-effect' interiors.

CHARACTERISTICS OF THE GREEN LINE

It runs from the east of Al Mansoura to Al Riffa, in the west. It passes through the Education City, name by which the metro line is also known. It has 11 stations, highlighting Hospital Hamad, AlShaqab, and the upcoming Qatar National Library.

- Length: 22 km from east to west
- Number of stations: 11
- Passengers per day in 2021: 140,000



CHARACTERISTICS OF THE GOLD LINE

The (Historical) Gold Line extends from Ras Abu Abboud to Al Aziziyah. It consists of ten stations along with a Msheirbeb interconnection, and will have stations at the National Museum of Qatar, Souq Waqif, and Al Waab.

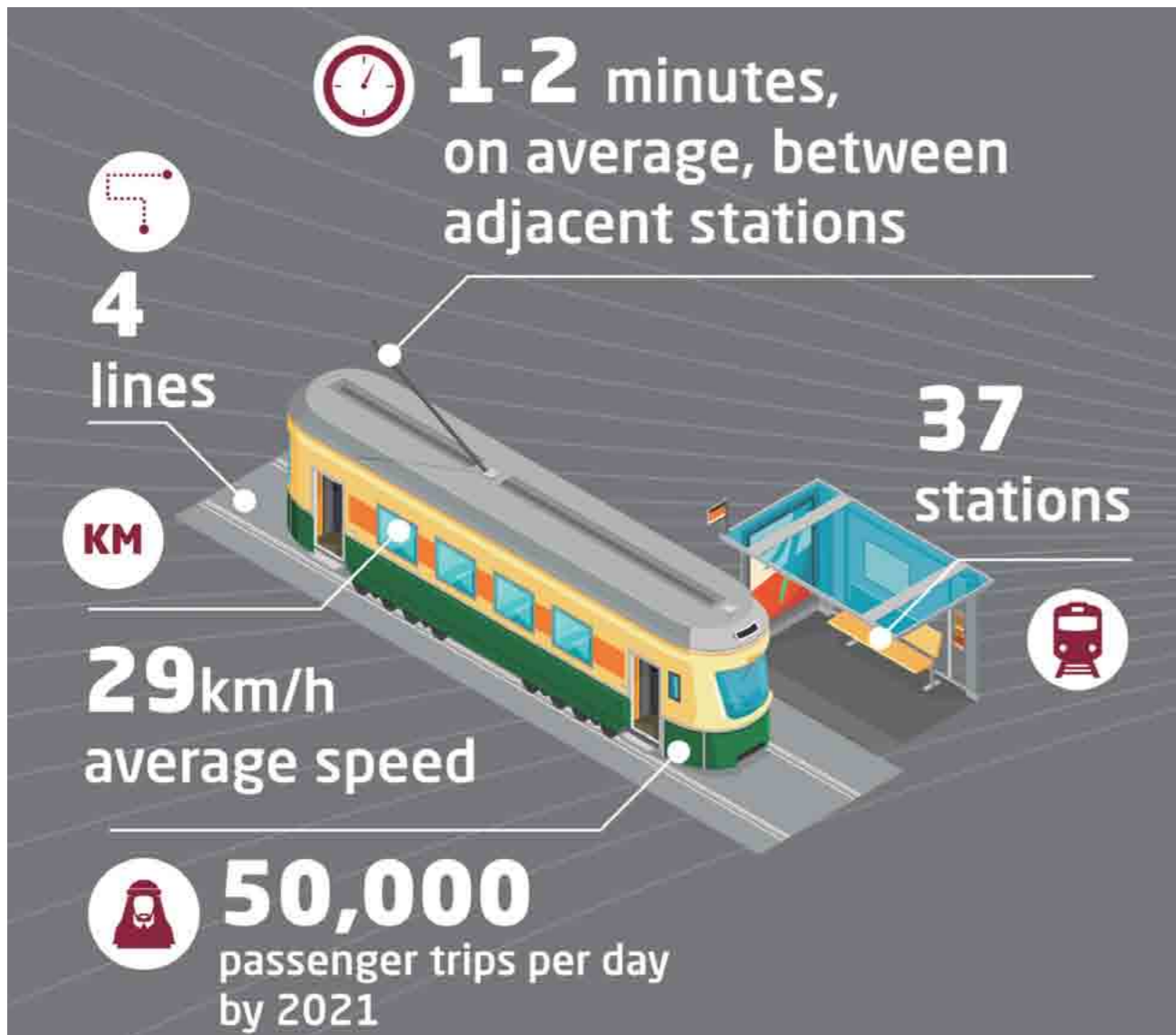
- Length: 14 km from east to west.
- Number of stations: 11.
- Passengers per day in 2021: 180,000



CHARACTERISTICS OF MSHEIREB STATION

It is the largest station in Doha and is located in the development zone where the

streets of Wadi Msheireb and Al Diwan meet. Msheireb station serves the junction of three metro lines: the Red and Green lines which run parallel and beneath the Gold Line



LUSAIL TRAM

Lusail is an ambitious project to build a new city on the north coast of Doha. The idea is to create an integrated transport system in Lusail (called LRT). The project and the works being developed by QDVC, a consortium formed by the investment company Qatari Diar and the constructor Vinci Construction. The project consists of 4 tram lines without catenary, 17.8 km of double track surface and 9.9 km single track surface. It also includes 6.6 km of underground layout made with the technique "cut and cover", 22 exterior stations with different settings (lateral platforms, central platform, side platforms), 7 underground stations, a viaduct and an area of workshops, maintenance and garages. At the request of QDVC, Sener is conducting the Engineering Review of the project regardless of

any agent involved (ICE), to verify the conception and design and ensure that the objectives set by the promoter are achieved, in everything related to soundness of structures, enforceability, safety, durability, maintenance, operability, and expandability and/or future update.

The network construction is being carried out in phases and the design phase began in August 2007. In June 2014, all excavation works and more than seven kilometres of tunnels, plus the viaduct access, was completed across the road from Al Khor. The main civil works of seven metro stations and four stations were also completed at that time.

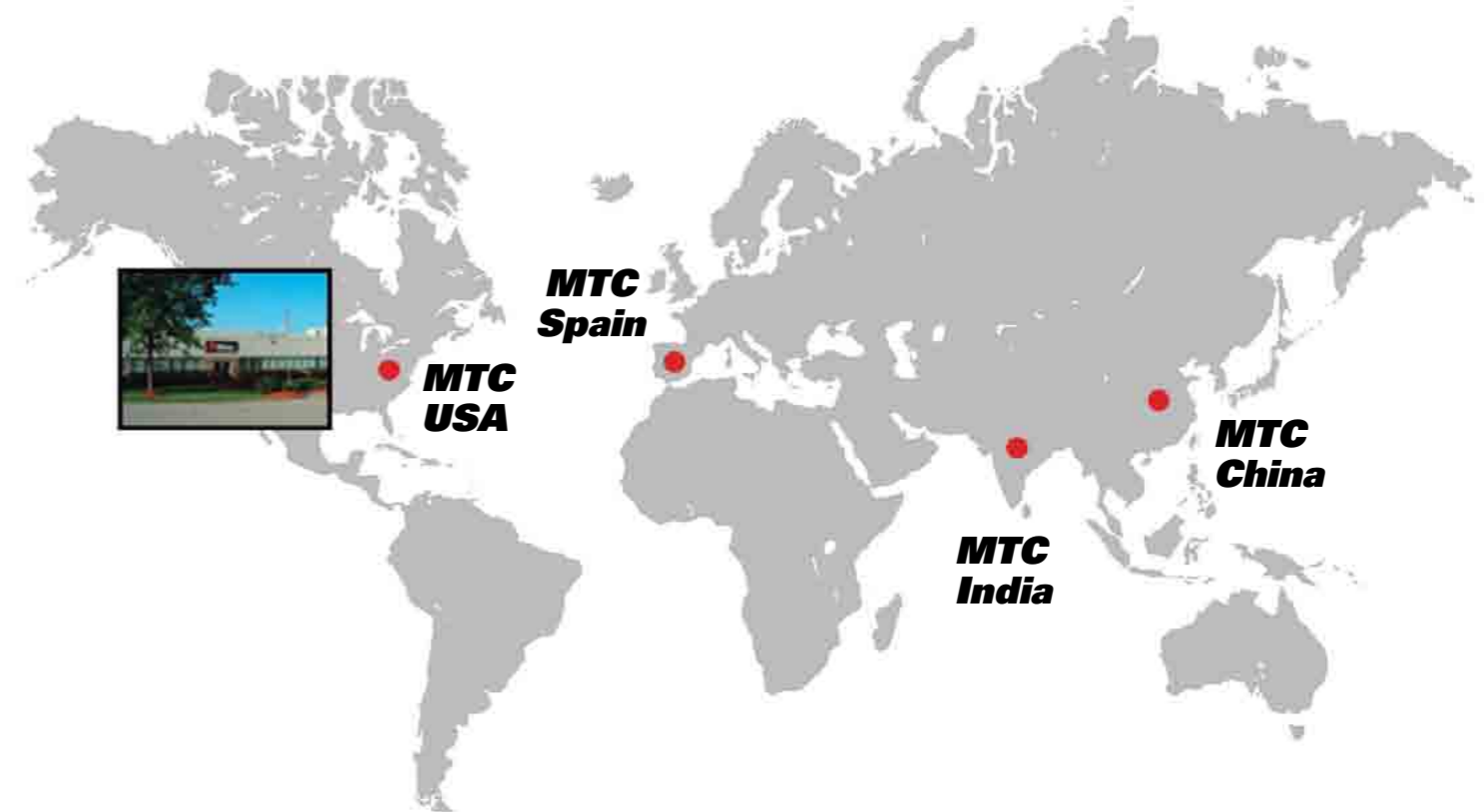
Lusail's tram will operate a fleet of 35 Alstom Citadis trams. The trams consist of a length 32 meters, and have a low floor to ensure easy access to

passengers. They will run on the catenary electrification system except inside the tunnels, where dual power connection with catenary system will be installed. The Alimentation Par le sol technology (APS) installed on trams allows a power source at ground level of a third lane, avoiding the need for overhead wires. The northern sector of the city of Lusail will count with stations at ground level with central and side platforms. These stations will connect to the district of Fox Hills, the residential Northern suburb, doctors and school districts, the Golf district and Lusail City Square district.

In the southern part of the city, 8km of underground tracks will link various residential districts and serve underground stations in the Marina district, Energy City, Qatar Entertainment City, Qatar Petroleum District and the Pearl.



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The Surface Master Transport Plan (SMTP), an important initiative taken by the Department of Transportation (DOT) in Abu Dhabi to develop a comprehensive plan for surface transport - including different modes for passengers and goods, such as roads, metro and light rail transit (LRT) - indicates the need for a high quality and capacity in a metro system in Abu

Dhabi. With the support of tram and bus services in approximately 131 Km, the 'Abu Dhabi Metro' railway system is designed to achieve a decrease in traffic congestion on the road network, as well as providing optimal connectivity between Abu Dhabi Island and its suburbs and nearby communities such as Saadiyat, Yas Islands and Al Raha Beach.



TRAM

The planned tram network is valued at \$ 3,000m. The study was awarded to a Spanish consortium formed by Sener and TYPESA and is actually in its design phase. It is a tram line with a length of 48 km and 82 stations, designed for a

maximum speed of 80 km/h. The study of Spanish companies aimed to design and develop a sustainable transport system to meet the growing demand for mobility in the city, improving the quality of life and maximizing social benefits

METRO

The metro network of Abu Dhabi, still in the design phase, is estimated to have an investment of about \$ 1.900m.

DoT is in the process of preparing a detailed coordination with international consultant leaders to ensure the implementation of the project "Metro Abu Dhabi" according to its schedule and technical specifications study.

The study will have 3 different stages distributed as follows:

- Stage 1: Feasibility Study
- Stage 2: Preliminary Design
- Stage 3: Final Contract Documentation and Tender Award

Under the main stages of 'Abu Dhabi Metro Study', the main tasks will include:

- The determination of parameters of the metro line covering its alignment, track rail systems and station locations.
- The selection of the optimal project urban insertion.
- The provision of capital, operation and maintenance cost estimates of the metro line.
- The project implementation schedule.
- The revision of alternative options for design, construction, procurement and operations.
- The specification of optimal functional/output characteristics of the project to maximize its patronage and financial viability.

The "Metro Abu Dhabi Studio" will aim to carry out the planning of metro operations with the level of detail necessary to specify train technologies, track geometry, rail size, number of units of cars, maintenance and storage facilities, power stations, frequency of service, fare collection and ticketing systems. Finally, the study will focus on the development of a detailed timetable for implementing the project based on financial, technical, economic and updated feasibility studies.

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DUBAI



METRO
Currently the tender for the extension of the Metro Red Line connecting Dubai with the Expo 2020 is running, with an approximate value of \$1,000M. The construction of the project "Route 2020" is set to the strategic vision of the Government of Dubai for achieving sustainable development, and the development of infrastructure and world-class services. It also comes as a practical application of the Director Plan of RTA plan to provide multiple integrated mass transit options such as subways, trams, buses and water transport towards RTA's vision of a safe and smooth transport for all. As for other projects related to the Dubai Metro (expansion of existing lines and construction of 3 new subway lines), these are valued at about \$5,700M. It covers the extension of the Metro Red Line of Dubai Nakheel Harbour and the subway station tower on the site of Expo 2020. The expansion of the metro line extends 15 kilometres. Metro Station Nakheel Harbour & Tower begins and extends 15 km (11 km ground level and four kilometres underground), and includes seven stations (5 ground level and 2 underground stations). These communities are inhabited by about 240,000 people and the trip from Dubai Marina to the Expo site will take 16 minutes.



Map showing Dubai's metro line

United Arab Emirates was the first Middle Eastern country to develop rail transport as a means of public transport. In Dubai, in 2009 its first metro line was opened, and in 2014 the city of Dubai already had a tram line. Currently the metro has two lines with a total of 69.7 kilometres and is the world's longest automatic metro network. In case of the tram, the UAE were the first in the world to have the entire journey without catenary. Its uniqueness lies in adapting to extreme weather conditions in the area, with temperatures exceeding 50 °C, high humidity and continuous appearance. Alstom Spain participated in the development of this tram. From its hub Solutions Information Technology, located in Madrid, it has supported the implementation of CBTC signalling system, as well

as the design, execution and operation of the control equipment for the passenger information systems, safety of people, facilities and video surveillance of the entire network. The tram of Dubai is 44 meters long and can carry up to 408 travellers distributed in "Gold" and "Silver" classes, and another on reserved for women and children. It offers a high level of comfort, entertainment solutions, communications systems and improved security, both inside the stations and on the trams. Dubai's tram design is highlighted by a diamond-shaped face and image abroad that evokes the typical sand dunes in the Emirates. It is also the first tram that moves exclusively with catenary-free APS system and the first new-generation equipment adapted to the extreme weather conditions in the Gulf.



MAFEX MEMBERS PRESENT IN PROJECTS IN UAE AND QATAR

► **ALSTOM ESPAÑA**

Dubái: The first tramway in the Gulf region, developed by Alstom. On Novem-

ber 2014, Dubai Roads and Transport Authority (RTA) inaugurated the Dubai Tram. Alstom has been responsible for the design, integration and supply of this turnkey tramway project, which includes: the supply of Citadis trams, track laying, signalling (using Alstom's Urbalis CBTC1), communications systems, integrated operation control centre, platform screen doors and ticketing system. Alstom will also be responsible for the maintenance of the transport system for a period of 13 years.

Alstom's engineering centre and technology laboratory in Madrid has supported the signalling system (CBTC) development and has designed and commissioned the central system that will manage video surveillance, public address systems and passenger information screens in stations and on trains.

The new 10-km line includes 11 air-conditioned stations and connects destinations such as the Burj Al Arab Hotel

area, Dubai Media City, the Marina and the metro. In a second project phase, the line is planned to be extended up to 14.7 km. This first Tramway in the entire Gulf region is expected to serve about 27,000 passengers per day and is anticipated to hit about 66 000 by 2020. The Dubai Citadis tram is 44 metres long and can carry up to 408 passengers in "Gold", "Silver", and "Women & Children" classes. It offers high-end comfort, "infotainment" solutions, enhanced communications and security systems both within the stations and on-board the trams. The main features of the tram's fine design are its diamond-shaped front nose, and its external livery which evokes the sand dunes of the Emirate. Dubai's tram is the first tram to run exclusively on APS3 and also the first with tropicalised next-generation equipment adapted to the extreme weather conditions of the Gulf, including temperatures above 50° C, high humidity and sand.

► **BOMBARDIER ESPAÑA**

Bombardier has launched the Dubai APM project, which includes the delivery of 18 cars INNOVIA 300 APM DC-AC platform to configure a total fleet of 3 vehicles (5 cars each), plus 3 car parts.

This fleet is designed to transport 200,000 passengers daily along the 1.5 kilometres between the Terminal 1 and the new Concourse 4 of King Abdulaziz International Airport in Jeddah. The project includes the design, supply and installation of all electrical

and mechanical equipment, as well as project management, engineering and integration systems, testing and commissioning of the fleet.

The factory Trápaga in Vizcaya, was the Lead Site of PPC for the APM project in Dubai. This means that such facilities have led the design and manufacture of the propulsion equipment in the project. The car propulsion equipment includes: converter, transformer, three-phase filter, line choke, braking resistor, traction motors and TCMS.

The INNOVIA 300 Monorail system is

an important solution for the future of urban mobility and it has been chosen as the main mode of transport for King Abdullah Financial District in Riyadh. Moreover, the BOMBARDIER CITYFLO 650 train control technology will allow transportation without drivers for the new INNOVIA 300 system in Dubai.

This driverless transportation system is specifically designed for flexible operation in both urban transport and the airport itself, with high passenger capacity and providing exceptional energy efficiency, thereby reducing costs.

► **IDOM**

IDOM is an architectural, engineering and consultancy firm that is very active in Arab countries and is presently developing important infrastructure projects. Idom has an office in Abu Dhabi and since 2013 has been collaborating with the Department of Transport, designing and implementing new applications based on GIS. Idom also has offices in Riyadh where

an extensive multidisciplinary team is based. This team is participating in the Line 3 of the Riyadh Metro project, assuming the responsibility for the complete design of the line: route, tunnel, viaducts and level sections, the stations (underground and aboveground including the transfer station with Line 6), workshops, depots, and the road and landscaping civil works necessary for its urban integration.



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MAFEX MEMBERS PRESENT IN PROJECTS IN UAE AND QATAR

► GETINSA PAYMA

Getinsa-Payma takes part in the PM contract for the modernization of the railway network of Oman. The contract includes: design and

operational plan review, technical support to the commissioning and operation of the railway system, implement quality control procedures during the construction works, and

provide assistance in the tendering of the rolling stock and in the selection of the railway operator for different design and build packages with a total length of 2.245 km..



► SENER

Project: Railway networks in United Arab Emirates (Etihad Rail) and Oman (Oman Rail)

Descripción (145 caracteres):
SENER has supported contractors in the tender processes for the railway networks of Etihad Rail in the United Arab Emirates and Oman Rail in Oman.
Project: Abu Dhabi LRT/Tram Study
Descripción (145 caracteres):
SENER is responsible for the concept and preliminary design for the Abu Dhabi LRT/Tram. With 48 km long and 82 stations, it is designed for max. circulation speed of 80 km/h.
Project: Light rail transportation system in Lusail

Descripción (145 caracteres):
SENER has been providing review services as an independent checker consulting engineer (ICE) and supervising the construction for the new LRT system in Lusail (Qatar).
Project: Doha Metro Red Line South elevated section
Descripción (145 caracteres):
SENER is working on the design of the civil works, electromechanical systems and architectural station finishes on the elevated section of Red line South of Doha metro.

► TYPESA

In 2010 TYPESA was selected by the Government of Abu Dhabi (UAE), in consortium with other engineering companies, to develop the LRT/Tram Study in Abu Dhabi. This study was aimed to design and develop a sustainable and high quality transport system to respond to the growing mobility demand in the city, improving its quality of life and maximizing the social benefits. The engineering works were to be carried out in different stages, of which, up-to-date, the first three of them

have already been developed:
• Phase I: Feasibility Study for a network of 340 km of LRT which had been proposed by the Surface Transport Master Plan 2030. This first phase was concluded with the selection of the Initial Operating Segment, which comprised 2 LRT Lines (27,5 km and 45 stops) and 1 BRT Line (13,8 km and 25 stops)
• Phases II and III: Preliminary Engineering Design and Tender Documents preparation. During these two phases the Initial Operating Segment was modified after

several Value Engineering Sessions held with the Client. The IOS, developed to a Preliminary Engineering Design level, included 3 LRT Lines (50 km and 78 stops); two depots with stabling capacity for the complete fleet of Light Rail Vehicles needed to operate the three lines, heavy maintenance workshops, Operation Control Centre, etc. and one transport hub with a small stabling area where, additionally, light maintenance could be carried out; one underpass including one underground station; five bridges and two viaducts.



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Eco-Cement, a new method that generates a cheaper cement and ecological

THE ESSENTIUM GROUP IS THE MANAGER OF THE ECO-CEMENT PROJECT, ONE OF THE MOST DECIDED BETS BY THE R+D+I OF THIS BUSINESS GROUP.

Eco-Cement stands out in the field of the sustainable development, the energetic efficiency and the innovation because of the high pollution that the industry of the cement causes in the manufacture of this material. The European Commission under the seventh Framework Programme -in its Environment Meeting- funds the project. It has a total budget of 2,209,746 euros and his complete denomination is "New microbial carbonate precipitation technology for the production of high strength, economical an ecologic cement".

The project began in 2012 and will culminate in a short time. Selected by his industrial and environmental interest, Eco-Cement is focused on research into the uses of industrial waste from cement – specifically solid alkaline- as a raw material for production. The project has a back use in the industrial projects and of infrastructures of Essentium Group. For Assignia Infrastructures, the the Eco-Cement Project has potential uses in most of projects that the company realises, especially in the railways infrastructures.

The Ecological cement of Essentium Group presents the following advantages for a greater energetic efficiency and sustainable development with regard to the conventional cement:

- Reduction of greenhouse gas emissions of the cement producers (until 11%).
- Decrease of the costs of production of cement in comparison with the conventional systems (until 27%).
- Revaluation of the waste produced by the cement industry for the production.



AridLap Project "A Journey through the Desert"

BEING THE FIRST TIME THAT A PROJECT WITH THESE CHARACTERISTICS HAD BEEN CARRIED OUT, ABENGOA, TOGETHER WITH ADIF, DEIMOS, INECO, OHL, WIN INERTIA AND NERVADOS, FACED THIS CHALLENGE BY FORMING THE PROJECT ARIDLAP, CONSISTING IN MINIMIZING THE EFFECTS CAUSED BY EXTREME CLIMATES ON HIGH PERFORMANCE RAIL INFRASTRUCTURE LOCATED IN ARID AREAS.

Writer: Luis Turmo Durán

According to the study 'High Speed Rail. Fast track to sustainable mobility' (UIC), greater activity within the railway world is predicted and many countries may modernize their railway by renovating existing infrastructures or constructing new ones.

This expansion process will have its greatest impact in the developing world, as showcased in the Middle East, in which countries such as Saudi Arabia, Qatar, United Arab Emirates and Iran are beginning to develop ambitious plans for their railway networks, some of which are currently non-existent. Moreover, the climatic conditions of these countries complicate the development of projects.

The sand swept up by the wind and hanging in the air (in the form of dust), has been identified as the principle problem for the operation of railway lines in these countries.

This is due to the abrasive effect of the sand and the fact that the build-up of deposit might be a critical issue for the circulation of trains which travel at a velocity of over 200km/h. Another important problem derives from the high temperatures and, above all, from the significant temperature difference between day and night, in some cases resulting in a difference between -5°C y 50°C in the same day.

As a result, it is necessary to turn to new technology that can perfect the railway transport system in these countries. New technology will facilitate speeds of 350km/h in a range of adverse conditions including snow, desert

climate, wind, sand, and high temperatures. This would allow better transport systems in areas such as the Arabian Desert, which experiences constant dune movement, or Dubai city, which experiences very high temperatures. The wind, sand and high temperatures are normal occurrences that accom-

pany these particular trains on all their journeys, but with the application of technology to the railway systems, the expectation is that the only problem with flying across the sand would be a lost camel crossing the track. Seeing as this is the first time a project with these characteristics has been carried out Abengoa, along with Adif, Deimos, Ineco, OHL, Win Inertia, and Nervados, have united to confront the challenge, forming the project AridLap. The project focusses on minimizing the effects of extreme weather on high delivery railway infrastructures located in arid areas. This project has been developed entirely in Andalucía and financed through funding from the Ministry of Economy and Competitiveness, via the Centre for Industrial Technological Development (CDTI). The technology developed for the AridLap project is applicable to other areas with similar characteristics, therefore expanding the business. The leaders of this newly formed group work within technological development in Abengoa's department of Railway Engineering, located in Málaga's Centre of Railway Technology building. The team has carried out a study on electronic isolation distances (dynamic and static) with high contents of sand/dust in the

air. They later developed methods of sensorisation to monitor and supervise in real time, the state of the rails and contact wire, which are essential elements for the electrification of the overhead lines, against these types of adversities. Additionally, Abengoa has carried out a study of requirements, assessments and responses to consider for the switchgear in the presence of adverse environmental conditions in desert climates. They have created different designs for the protection of articulated parts, which are elements that need lubrication in the line area of contact, and for the protection of elements of the compensation system, which include pulleys and counterweights, similar to the design of new methods of train compensation. During the course of the AridLap project, other studies and developments have been carried out, an example of this is focusing on; the viability of the application of aerospace technology with images made by satellites and drone flights in order to plot the railway route using auscultation in these types of climate, and the detection of the degree of sleeper contamination by means of GPR. Furthermore, there have been many developments in areas such as; creating a system for monitoring and predicting meteorological phenomena on the railway line, and creating artificial barriers of varying distances on the route in order to minimize the introduction of sand on the route in adverse climate conditions, in intense wind and the transport of particles in the air.



Begitren, towards Rail Safety Assistive Systems

DEVELOPED BY VICOMTECH-
IK4 AND VISUAL LINE, IT IS A
TECHNOLOGICAL RESEARCH
PROJECT FOR MANAGEMENT,
SUPERVISION AND SUPPORT TO
DRIVING RAILWAY VEHICLES.

Begitren is a Technology Research Project for the railway sector, carried out by Vicomtech-IK4 and Visual Line and co-funded by the Basque Government (Gaitek Programme).

The project can be described as an initial prototype of a global solution based on image capture sensors and computer vision techniques, for the management, supervision and support of train driving. Begitren focuses on non-invasive and direct contactless technologies, responding to the current needs of the sector.

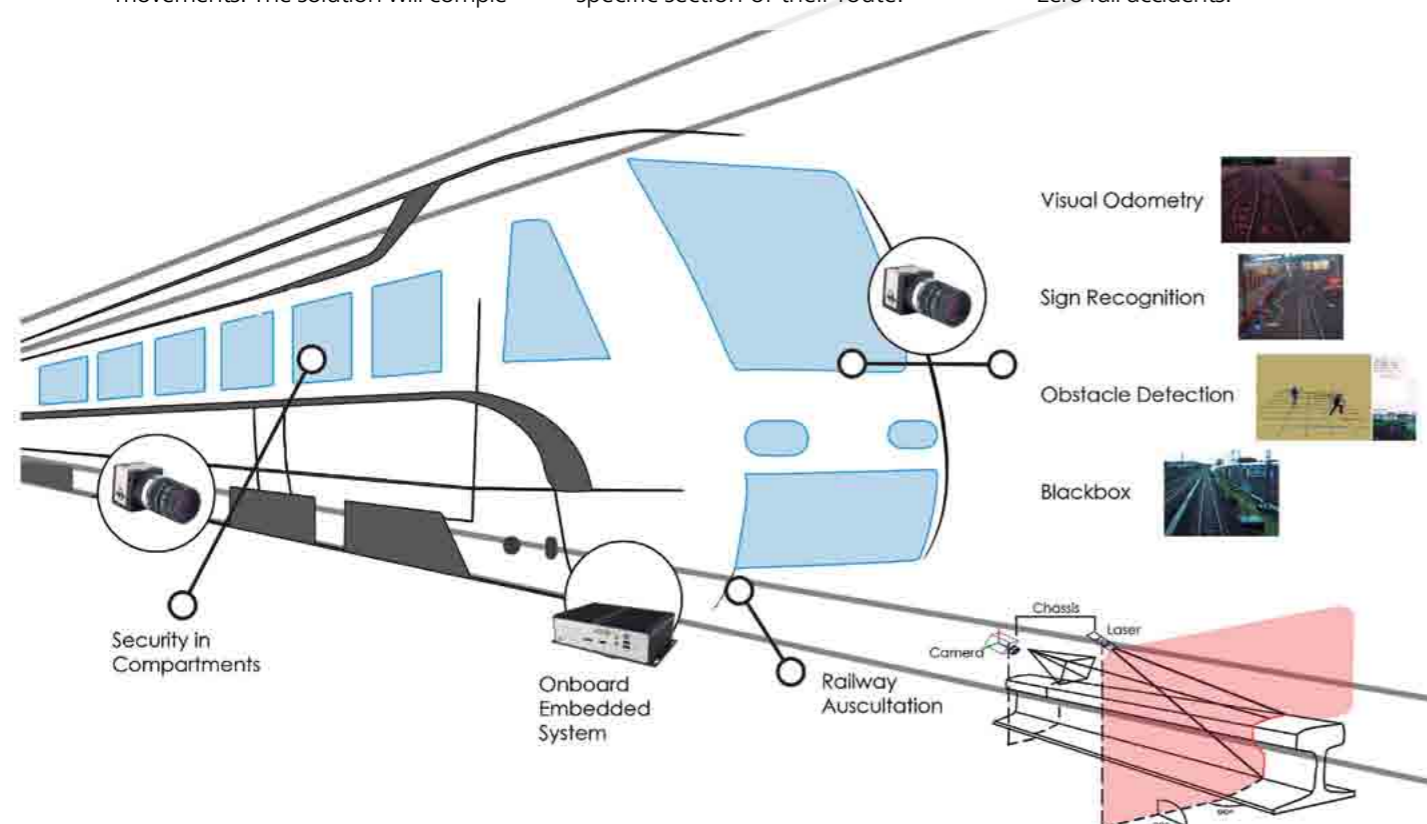
The research programme has been designed to combine numerous sources of information and provide a solution to aid train and rolling stock movements. The solution will comple-

ment information from geospatial sensors and railway cartographic data, providing users with a comparison between the current speed and the speed limit (giving a warning if the speed limit is exceeded), the distance to points of interest, trip data, etc.

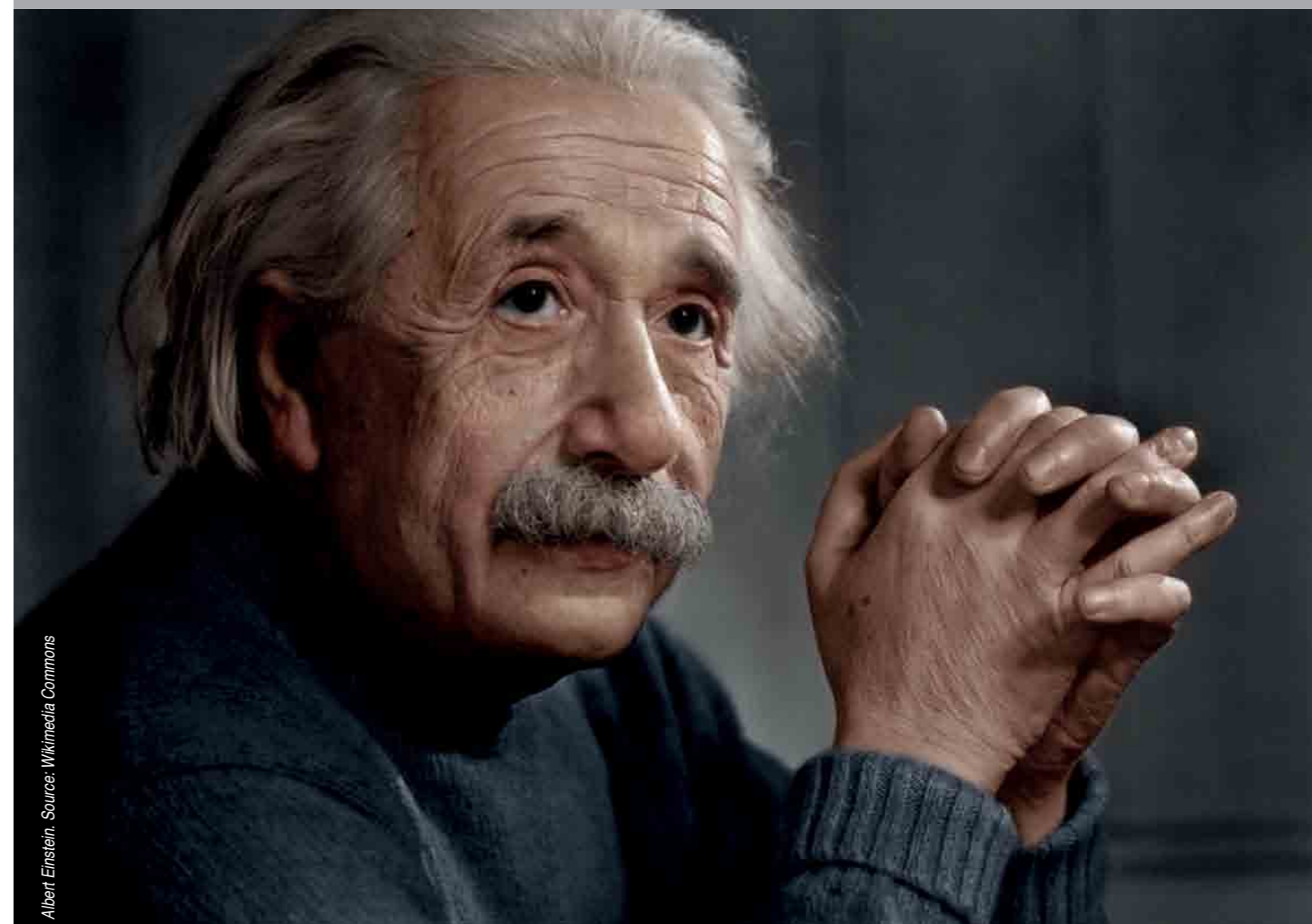
Several sensors are in development phases and have shown significance in the application to Rail Safety Assistive Systems. These aids will be created as systems which give support to the driver in avoiding hazardous situations, advising the driver about risk factors, and addressing the all-important human factor of excessive speed. Different types of assistive systems can be found in the market, many of which have been adopted from the automotive industry, where the technology is reaching maturity. However, the problems in these two sectors have fundamental differences and technologies addressed to road traffic must be adapted to the rail sector. Begitren will attempt to make significant progress in signal detection sensors to alert the driver to the prevailing limitations on a specific section of their route.

Begitren acquires images from a camera located in the train's tractor unit, facing ahead of the train. These images are sent through to an embedded processing unit. Here computer vision algorithms are applied to analyse and identify the signals. Finally, the operator is notified by an interface designed using Human Machine Interface techniques that minimise the changes to the train drivers normal behaviour, whilst also ensuring that the data arrives in a coherent and understandable manner.

Begitren does not directly intervene with the train's control systems. It maintains the Human in the Loop principal. However, one of the future aims of research in the field is to progressively increase the levels of automation and the technologies direct intervention in the control of the train. In the long term, through research in data analysis, event modelling and prediction, and a greater understanding of human factors, it is hoped that human factors in response to hazardous situations will be further minimised thus leading to an objective of zero rail accidents.



*"If you are looking for different results
don't always do the same things"*



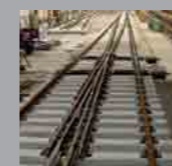
Albert Einstein. Source: Wikimedia Commons

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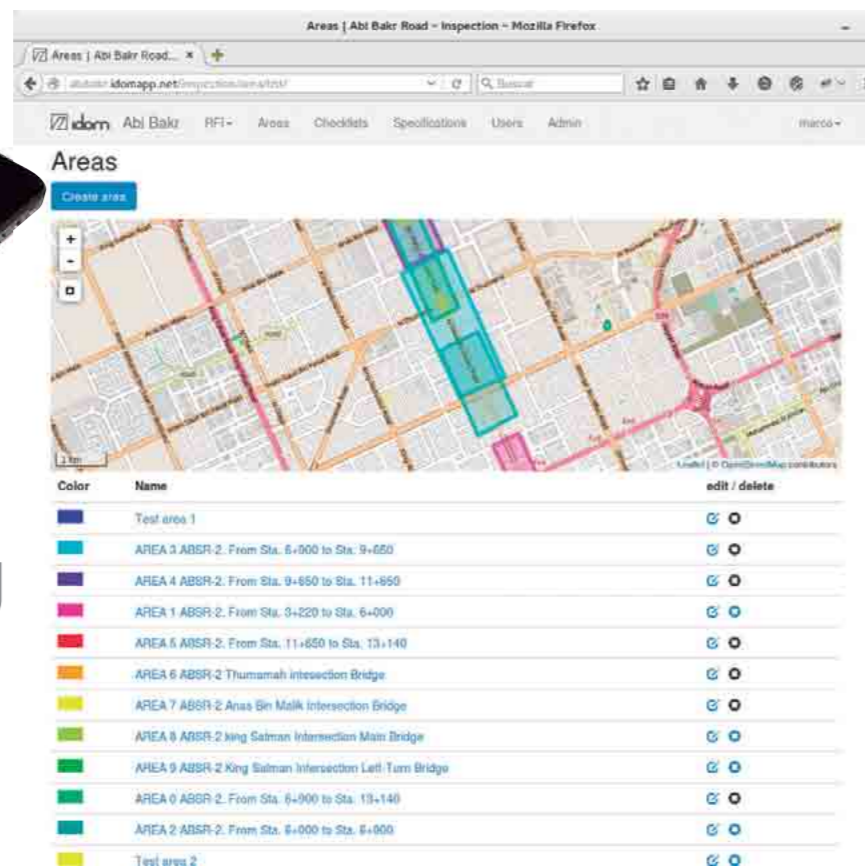
Online technology for managing linear projects

IDOM HAS DEVELOPED THIS TOOL TO FACILITATE THE COLLABORATION AND COORDINATION OF THE VARIOUS WORKING GROUPS WITHIN THE PROJECT AND ALLOW A CLOSE RELATIONSHIP BETWEEN ALL PEOPLE INVOLVED.

IDOM has developed a tool to facilitate the collaboration and coordination of the various working groups within a project, allowing for close collaboration between all involved. For example, field inspectors can enter in-situ information that the client can supervise in real-time to see the status of the works being undertaken.

This is an online system to manage the information related to the supervision and inspection of works or the installations of railway infrastructure, and it use can also be extended to other construction areas such as roads, buildings, etc.

The system consists of several elements that permit all information to be centralized and gives immediate access to all users. The



IDOM has developed this system consisting of several elements that allow the centralization of all the information and immediate access to all users.

core of the system is a web server connected to a database, which can be accessed from any internet-connected device (computer, smartphone, tablet, etc.).

These devices do not require the installation of native applications, since it is a web app that is tailored to each device using a just web browser. This allows immediate use from any platform (iOS, Android, Windows, Linux, etc.). Any device fitted with a camera or GPS can be used to attach geo-referenced graphical information (photos or videos), as well as localize the elements inspected precisely on a map.

An uninterrupted internet connection is not required as the application can work independently and synchronize data later. This capability mean that the application can be used in spaces or areas without network coverage, as is normally the case in tunnels.

One of the main advantages of

this system developed by IDOM, is that it can be personalized for each project, therefore, the application can be adapted to the way of work required for each project (workflow) and not vice versa, making its use comfortable for the user. In addition, all the information of the database is stored on the servers of IDOM.

The system can automatically generate statistics (progress, performance, KPI, etc.) graphically from the stored information and detect disruptions in the flow of information to ensure that all work is resolved correctly and within the time schedule stipulated.

Technically, the system uses open source tools for its operation, as well as web platforms that are flexible to allow for the necessary adjustments as required depending on the project. Some of the technology we use includes PostgreSQL, PostGIS, nginx/uwsgi, Python, Django, and javascript.

EMS helps reduce energy consumption and is already being implemented in several fleets of trains of Renfe.



EMS, the Energy Management System that will help Renfe to reduce the energy consumption of its trains in 2016

BOMBARDIER SPAIN HAS DEVELOPED A PROJECT TO IMPLEMENT THIS EMS SYSTEM IN SEVERAL RENFE TRAIN FLEETS THAT WILL OPTIMIZE THE MANAGEMENT AND CONTROL OF ONE OF THE MAJOR COSTS FOR THE RAILWAY OPERATOR.

Nowadays the energy consumption represents one of the major rail operator costs. With the aim of finding innovative ways to save energy and reduce costs for the operators, Bombardier Spain has developed an Energy Management System (EMS) that contributes to the reduction of energy consumption.

Currently, Bombardier is developing a project to implement this EMS system in several Renfe train fleet that will optimize the management and the control of the most important railway operator costs.

The project, developed to reduce energy consumption of the Renfe fleets 102, 112, 130 and 730, consists on the installation and integration of three systems in vehicles: power measuring equipment, Bombardier efficient driving system (SCEB) and consumption reduction system for stationary train.

The energy meter equipment allows Renfe to receive energy bills based on the kWh consumed. Meanwhile, the other two systems are directly aimed at achieving significant energy savings. To date, more than 30 measuring equipment have al-



ready been installed and they have been homologated with CETREN. Bombardier has also carried out the tests of the Efficient Driving System, obtaining savings of up to 15 % of total energy consumption. The efficient driving system is scheduled to start operating in 2016.

New Centralized Traffic Control Center for Commuter Lines in Barcelona

DEVELOPED AND INSTALLED BY SIEMENS, IT IS A FUNDAMENTAL ELEMENT SINCE IT WILL MANAGE SERVICES REALIZED IN CONVENTIONAL WIDTH IN THE PROVINCES OF BARCELONA AND GIRONA, AND PART OF TARRAGONA AND LLEIDA.



The technology Controlguide Rail 9000 has been adapted to the demands of ADIF.

The new Centralized Traffic Control (CTC) center for Commuter Lines in Barcelona, which will be developed and installed by Siemens, is a key element in Catalonia's transport since it manages standard gauge services in Barcelona and Girona provinces and part of Tarragona and Lerida ones.

Modernization of this CTC with Siemens Controlguide Rail 9000 technology will offer better technological features that will increase system flexibility and easiness to allow future extensions. In addition, from the operator point of view, it will provide a more optimal Human-Machine Interface (HMI).

Functionality of the Controlguide Rail 9000 technology has been adapted to ADIF requests in order to ensure that it meets the monitoring and control requirements for all the lines in its Commuter Lines network. Controlguide Rail 9000 is a flexible

system that allows integration of different functions, such as route automatization and regulation or interaction with other systems through a safe interface for information exchange with external systems.

Monitoring is organized at different levels (operation, system, communication and trackside objects), announcing possible incidents according to the settings requested by the customer. The aim is to ease the operator task as far as possible, allowing optimizing resources and operation.

In July, ADIF awarded the contract for writing up on the project and the new Centralized Traffic Control (CTC) installation in Barcelona's Commuter Lines to Siemens Rail Automation. This contract, awarded for an amount of 7.4 million euros (VAT included), also includes a 20-year maintenance.

Siemens has developed and installed

CTCs for ADIF Commuter Lines in Chamartín, Valencia-Fuente San Luis, Miranda de Ebro, Zaragoza-Portillo, Manzanares or Zaragoza, among others, as well as for ADIF High Speed Lines in Chamartín, Zaragoza-Delicias, Albacete or Antequera.

The company has a large experience in migrating control centers without service interruption and with no incident affecting line operation, a vital service for the city. For instance, it's worth pointing out migrations carried out in Metro de Madrid, also in Rubí CTC (Ferrocarrils de la Generalitat de Catalunya), in Valencia Sud CTC (Ferrocarrils de la Generalitat Valenciana) and in El Berrón CTC (Metric-gauge Network). Likewise, it also has a delegation in Catalonia made up of a team of professionals with large experience and skills in Engineering capable to develop any type of railway and mobility projects.

MIMO, a new tool for maintenance of railway systems in tunnels

THIS SPANISH DEVELOPMENT TOOL CREATED BY ALSTOM SPAIN AND INDRA IS COMPATIBLE WITH ALL ADIF RAIL SYSTEMS, CAN REDUCE COSTS, ENSURE PROPER MAINTENANCE OF EACH EQUIPMENT, REDUCE TRAVEL TIMES AND ENSURE THE SAFETY OF OPERATORS AS WELL AS UNITING THE FOUNDATION OF KNOWLEDGE.



The application is available for Android and is compatible with tables and smartphones.

Alstom Spain and Indra have developed a unique software application in the market for the maintenance management of railway systems in tunnels. Available on Android and compatible with the tablets and smartphones currently on the market, this application simplifies, integrates and facilitates maintenance management.

The application, called MIMO (Intelligent Maintenance, Optimised Maintenance), incorporates new functionalities to the previously existing tools and interacts with Adif's current systems, thereby facilitating integrated and complete management of all equipment and systems.

The needs of the railway infrastructure manager, of maintenance managers and of subcontractor companies were considered during development of the application, which has resulted in a unique, simple and intuitive tool for all agents who take part in the process.

With respect to previous applications, MiMo allows, among other novelties, consulting data

off-line, managing the inventory of materials through QR codes, incorporating occupational safety standards (which all workers must read and accept before performing a specific task), entering data in real time, predicting incidents and subsequently analysing results.

The cost savings, the increased speed in managing incidents and more comprehensive control of inventory are consequently some of the main, immediate benefits of this tool, which is already being used in the main tunnels of the national railway system.

The alliance between Indra and Alstom Spain on this project is the result of the extensive experience that both companies have in in-

stalling and maintaining the safety systems in tunnels of the Spanish high-speed network. Specifically, the infrastructure teams of both companies have been in charge of equipping and maintaining the electro-mechanical installations of the 32 tunnels associated with the Ourense-Santiago line and the tunnels of the Pajares bypass, as well as maintaining the four tunnels of the Madrid-Valladolid line, which includes the Guadarrama tunnel, the longest in Spain at 28.8 km. Moreover, the INDRA-ALSTOM UTE [Temporary Joint Venture] is currently participating in the construction and maintenance of installations of the Antequera – Granada tunnels and of the Pajares tunnels.

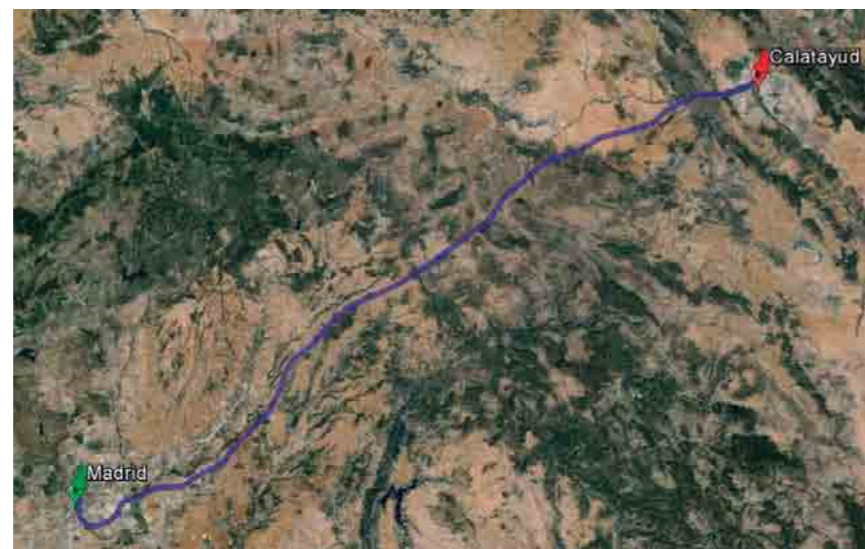
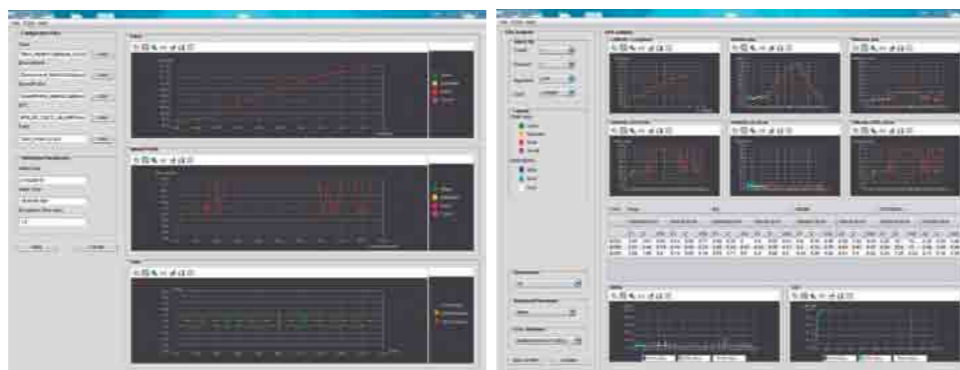
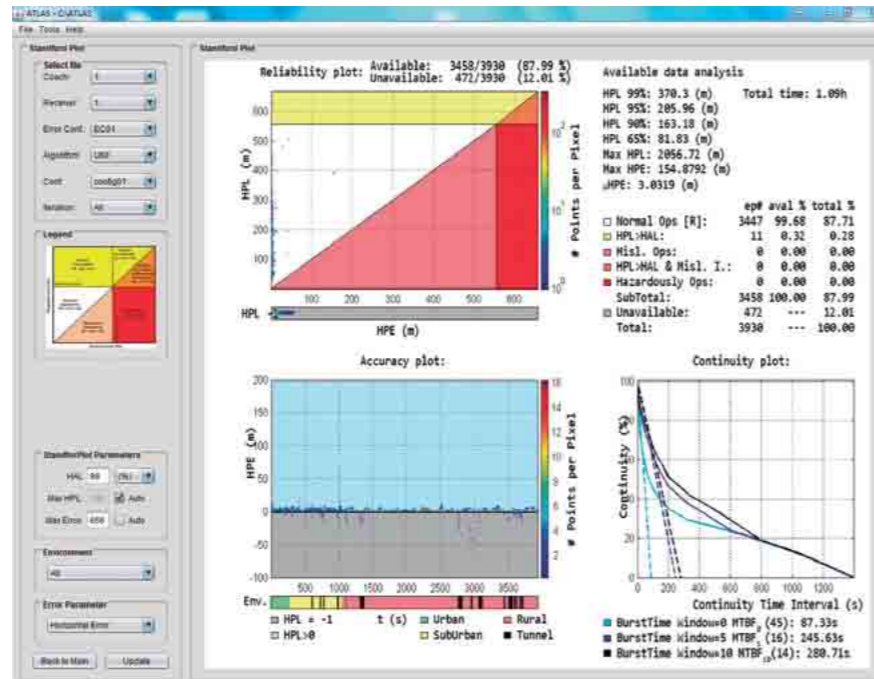
New platform for simulation and evaluation of board positioning systems in railways

CEIT-IK4 DEVELOPS A RAIL PLATFORM WITHIN THE EUROPEAN PROJECT EATS, WHICH WAS FUNDED BY THE EUROPEAN COMMISSION.

EATS (ETCS Advanced Testing and Smart Train Positioning System) European project co-ordinated by CEIT-IK4 has as one of the main objectives to develop new on-board location systems by combining GNSS, UMTS and GSM-R technologies and including multi-antenna configurations in the train. Two of the expected advances of ETCS signalling system are the implantation of safe on-board location systems based on satellite technologies and the migration from ETCS level 2 to level 3.

In order to design, implement and evaluate the new location systems, an innovative platform called ATLAS (Advanced Train Location Simulator) has been developed, which is characterized for being modular, extensible and highly configurable. It allows configuring the train to be analysed together with the on-board location systems and even the route to be studied. Moreover, it provides a powerful performance evaluation tool that allows visualizing the results of hundreds of simulations at a glance. The platform is currently used not only to evaluate the location systems that have been developed within the EATS project, but also to analyse the behaviour of (new or existing) location systems in new routes, to compare different location systems in the same route, to quantify the enhancement applied to existing location systems, etc.

More information: EATS European project web page: <http://www.eats-eu.org/> Paper about the ATLAS platform: <http://link.springer.com/article/10.1007/s12544-015-0173-5>



One of the objectives of the European project EATS is proposing new onboard location systems.

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Actia is a company based in Spain with a number of subsidiaries in more than 15 countries, devoted to the research, design and manufacturing of electronic platforms, on board and fixes systems, using the latest technologies for the railway industries, not just in security, information and entertainment but also in the communication and transferring of data. It's available with a wide range of electronic equipment and services which meets all needs for different means of public transport like High Speed train, InterCity, Regional train, Suburban train, Train-Tram, Tram and Underground.

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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.

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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.

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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

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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.



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Alte Transportation, S.L. main activities are design, sales, manufacturing and maintenance of Toilet Modules with vacuum systems, Air Conditioning systems and Modular Interiors. All these products are designed with our own technology and they are specifically designed for the railway sector.

Alte main facilities are in Lliçà de Vall (Barcelona, Spain) and Raimat (Lleida, Spain). The company has more than 100 staff and extended network of agents worldwide with annual turnover of 18 million Euro. Our knowhow is built on 25 years doing several interior projec



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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.

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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.

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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.



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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.

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Assignia Infraestructuras 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

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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

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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

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► 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.



CAF - CONSTRUCCIONES Y AUXILIAR DE FERROCARRILES, S.A.

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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

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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

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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, boasts 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.



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The first company of the group, Calmell, S.A. was founded in 1970, focusing its activity on the manufacture of 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.

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 ► 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.

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 08021 Barcelona (BARCELONA)
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 ► F: +34 93 414 16 64
 ► 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)
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 ► 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

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 ► 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 qualifi-

cation 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.

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 Polígono Industrial de Gojain 01170 Legutiano (ARABA)
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 ► F: +34 945 466 314
 ► info@dsaf.es
 ► www.dsaf.es

DSAF is a company structure devoted to People's Movement Safety. It is committed to providing new technologies applied to design and project implementation, as well as initiatives that guarantee an approved evacuation safety level in this generalized risk society.

Emergency signalling is DSAF's main application area; it develops photoluminescent, electroluminescent and LED signalling systems for people evacuation in risk situations and environments: tunnel evacuation safety, vessel evacuation safety, building evacuation safety...

DSAF safety applications are developed in three big areas: tunnel safety (road / railway), safety in vessels, and buildings.



DURO FELGUERA RAIL, S.A.U.

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 33600 Mieres (ASTURIAS)
 ► P: +34 985 45 63 31
 ► F: +34 985 45 61 64
 ► dfail@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. 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).



ELEKTRA-GRUPO ELEKTRA S.A.

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 ► railway@elektra-sa.es
 ► www.grupoelektra.es

Grupo Elektra is a market leader in the field of electrical and electronic equipment distribution for manufacturers of rolling stock, maintenance and railway equipment manufacturers.

Being the leading company in the railway sector in the supply of electrical equipment. Your solution provider in electrical products for railway, with specific technical support. Elektra Group is composed of an extensive Spanish national network and has companies in Romania, India and USA.



FAIVELEY TRANSPORT IBERICA, S.A

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(TARRAGONA). c/Antonio Cabezón
s/n – 28034 Madrid (MADRID)
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► F: +34 917282157
► jesus.delatorre@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.

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► www.fundicionesgarbi.es

Founded back in 1972, Fundiciones Garbi has evolved from a traditional foundry 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.

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Castings in carbon steel, alloy steel and stainless steel.

Our products:

- Steel casting.
 - Raw castings or fully machined.
- Examples:
- Bogie components.
 - Pivots.
 - Motor housings.
 - Pressure rings.
 - Axle boxes.
 - Links...



GAMARRA, S.A.

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► 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.

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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.

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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.

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HICASA specialises in the storage, transformation, distribution and commercialisation of railway materials, rails and railway accessories of all types in accordance with both European (UNE EN), as well as American (ASTM) Standards, not to mention others such as AREMA, etc. HICASA belongs to a private group of companies, GEVIR, which is made up of four enterprises in Spain, and is special in the sense that it combines its role of distributor with that of manufacturer, given that it possesses its own specialist light rail factory, a fact which endows it with a unique market profile. We can boast of a roofed surface area at our installations of over 13,000 m² where we dispose of modern cutting and drilling machines that enable us to transform iron and steel and to supply orders of any format and measurement, in accordance with the specifications requested by our clients. We export over 50% of our products abroad.



IBERTEST, S.A.E.

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Ibtest is a company that since 1970, designs and manufactures machines and complete laboratory installations "Turn Key" for high precision materials testing. Our equipment offers a global solution for R&D Investigation and Quality Control of all types of materials, englobing static and dynamic testing of the different elements in conventional and high speed railway, that includes: Tracks, Sleepers, Track Support Assembly, bogies & etc. Our solutions guarantee the high demanding safety requirements established by national and international standards.



IDOM

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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, Portu-

gal, Rumania, Turkey and United Kingdom.

More than 2.500 staff possesses 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 socio-economical analysis, basic and detailed design, operational and maintenance plans, works supervision, testing and commissioning.



IKUSI - ÁNGEL IGLESIAS, S.A.

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► 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

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K4 Research Alliance es una alianza de centros tecnológicos, privada e inde-

pendiente, 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.

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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/m². 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

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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.



INDUSTRIAS E. DÍAZ, S.A.

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► m.eugenia@industrias-ediaz.com
► www.industrias-diaz.com

Industrias E. Díaz, S.A. founded in 1968, manufactures side and cab WINDOWS for railways, metro and tram. It counts with highly qualified personnel as well as a technical staff able to make any kind of design. Its facilities of 11,000 m² of built, contains the most sophisticated technology and means of test and homologations.

It is certificated ISO 9001:2000. In order to respect the environment, it does not use hexavalent chrome in its modern installations of chemical treatments, decreasing toxic substances emissions.



INECO

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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.

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► traction@ingetteam.com
► www.ingetteam.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.

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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.

It also holds one of the most advanced pools of rail plants in the sector, highly sophisticated with the utmost functionality and approved for use in the EU. Inabensa has its own overhead line equipment technology, CAVE overhead line and TkMx overhead line, and it also has an R&D department focusing on energy storage systems, bidirectional substations, detection of broken rail and software development.



INTERNACIONAL HISPACOLD, S.A

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► 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 conti-

nents guarantees the best technical assistance at any place of the world.



ITK INGENIERÍA, S.A.

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► 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.

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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 man-

ganese crossings or spare tongues.

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



KELOX, S.A.

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► 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.



LA FARGA LACAMBRA, S.A.U.

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► 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.

**LKS INGENIERÍA, S. COOP**

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lksingenieria.com
► www.lks.es

Through more than 25 years of existence, LKS DIARADESIGN has experienced a progression toward its consolidation on areas such as transport design, engineering and transport infrastructure.

Rolling Stock Design: Design consultancy, Concept design, Exterior styling, Interior styling, Design engineering, Branding, colour & trim. Railway Infrastructure: Feasibility studies, Landscape architecture, Infrastructure design, Technical assistance, Program & Project Management, Environmental consulting.

**LUZNOR**

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► 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.

**MANUSA DOOR SYSTEMS**

► Avda. Via Augusta, 85-87 -
6ª planta.
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► P: +34 935 915 700
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► F: +34 932 185 610
► manusa@manusa.com
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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.

**MB SISTEMAS, S. COOP.**

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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, robot-

ic installations and special machines for any assembly process.

**METALOCAUCHO, S.L.**

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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.

**MGN TRANSFORMACIONES DEL CAUCHO, S.A.**

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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 freight trains, taking the latest technological advances of the rubber world, vibration control and damping systems.

**NEWTEK SOLIDOS S.L**

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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..

**NUEVAS ESTRATEGIAS DE MANTENIMIENTO, S.L.**

► Paseo Mikeletegi, 54 - 2º
20009 Donostia (GIPUZKOA)
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► F: +34 943 30 93 26
► gparada@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)
► P: +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

Family business with over 25 years experience in civil construction and iron and steel industry for the railway sector. Parros Group which is specialized in pile driving and catenary foundations, has implemented the 80% of the foundations of the entire Spanish High Speed Network.

Whether conventional railway network or Highspeed Railway (AVE), PARROS GROUP is distinguished by the versatility of our machines adapted "Ad hoc" for auxiliary civil works from the railway, with automatic switching to the three Spanish gauges. Also innovative is our implementing system of noise barriers from the railway track and its foundations. Generic activities of building and general construction.

**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 stretch and conventional rail network.

■ Engineering 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 metallic 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.

**ROVER ALCISA, S.A.**

► **C/ Ochandiano, 18 - Edificio A**
Parque Empresarial El Plantío
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► **P: +34 91 444 44 80**
 ► **F: +34 91 444 44 81**
 ► **aleon@roveralcisa.com**
 ► **www.roveralcisa.com**

The Rover Alcisa Group came into be-

ing in 1962, and brought together its corporate activities in Construction, Property Development, Engineering, Mining Extraction and New Technology, giving rise to a diversified corporate group ready to take on new investments.

The Rover Alcisa Group is present on all fronts and in all fields of civil works. Indeed, its position as leader is plain to see.

It has a wealth of experience in all kinds of overland infrastructures: highways, dual carriageways and motorways. In addition to its strong position in this sector, it also has a notable and unique presence in railway infrastructure: high-speed, metro and tram. Its involvement in one-of-a-kind projects as part of the Spanish rail network turned this corporate group into one of only a handful throughout Spain specializing in large-scale projects whose implementation is technically complex.

**SEMI, S.A. (GRUPO ACS)**

► **Manzanares, 4**
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 ► **P: +34 91 701 77 00**
 ► **F +34 91 521 85 97**
 ► **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)**
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 ► **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)
 ► **T: +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.



Talleres Alegría, s.a.

TALLERES ALEGRÍA, S.A.

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33192 Llanera (ASTURIAS)
 ► **P: +34 985 26 32 95**
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 ► **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**

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 ► **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

**TEKNORAIL SYSTEMS, S.A.**

► **Paseo de la Castellana, 91**
28046 Madrid
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 ► **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

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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 Signaling, 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.

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Thales is a World leader in Mission Critical Solutions for Land Transportation. Thales Spain, with more than 60 years of experience, has been pioneer and leader in the technological development of the Spanish railways, being 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 signaling, train control, Telecommunication, Supervision ticketing and critical infrastructures security.



TYPESA

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► F: +34 91 651 75 88

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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.

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► 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.



VOSSLOH ESPAÑA, S.A.

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► info@ve.vossloh.com

► www.vossloh-rail-vehicles.com

The Vossloh España Engineering Center has a commitment to innovation.

State-of-the-art technology and optimum quality are the characteristics of the whole range of products developed and produced in the Valencia plant.

As one of Europe's leading rail industry manufacturers, we design and build locomotives as well as passenger trains.

Closely linked with the industrial heritage of railways and with the benefit of more than a century of experience, our goal is to design and manufacture advanced-technology, high-performance locomotives for present and future public transport networks, to create new passenger vehicle concepts and to provide comprehensive maintenance services.



Very high speed train
Very high capacity
Best accessibility
Best-in-class energy consumption
Lightweight construction
Cutting edge technology
Maximum reliability



www.Talgo.com

Signalling is not what you see, but what you don't see.
Relax, this train is running on a CAF Signalling system.



www.cafsignalling.com