

INNOTRANS 2016

BERLIN: CENTRE OF THE INTERNATIONAL RAILWAY INDUSTRY

The sector's most important biennial fair gathers more than 50 Spanish companies that will expose their latest technology.



DESTINATION: THE NORDIC COUNTRIES

Denmark, Sweden, Norway and Finland improve their railway networks



IN DEPTH: ERTMS ADVANCES

It is the key system for railway interoperability



INTERVIEW: MARTINA WERNER

Member of the Committee on Industry, Research and Energy of the European Parliament



COMPREHENSIVE
RAIL SOLUTIONS

ROLLING STOCK
SIGNALLING
SERVICES
EQUIPMENT & COMPONENTS
TRANSPORT SYSTEMS



MAFEX

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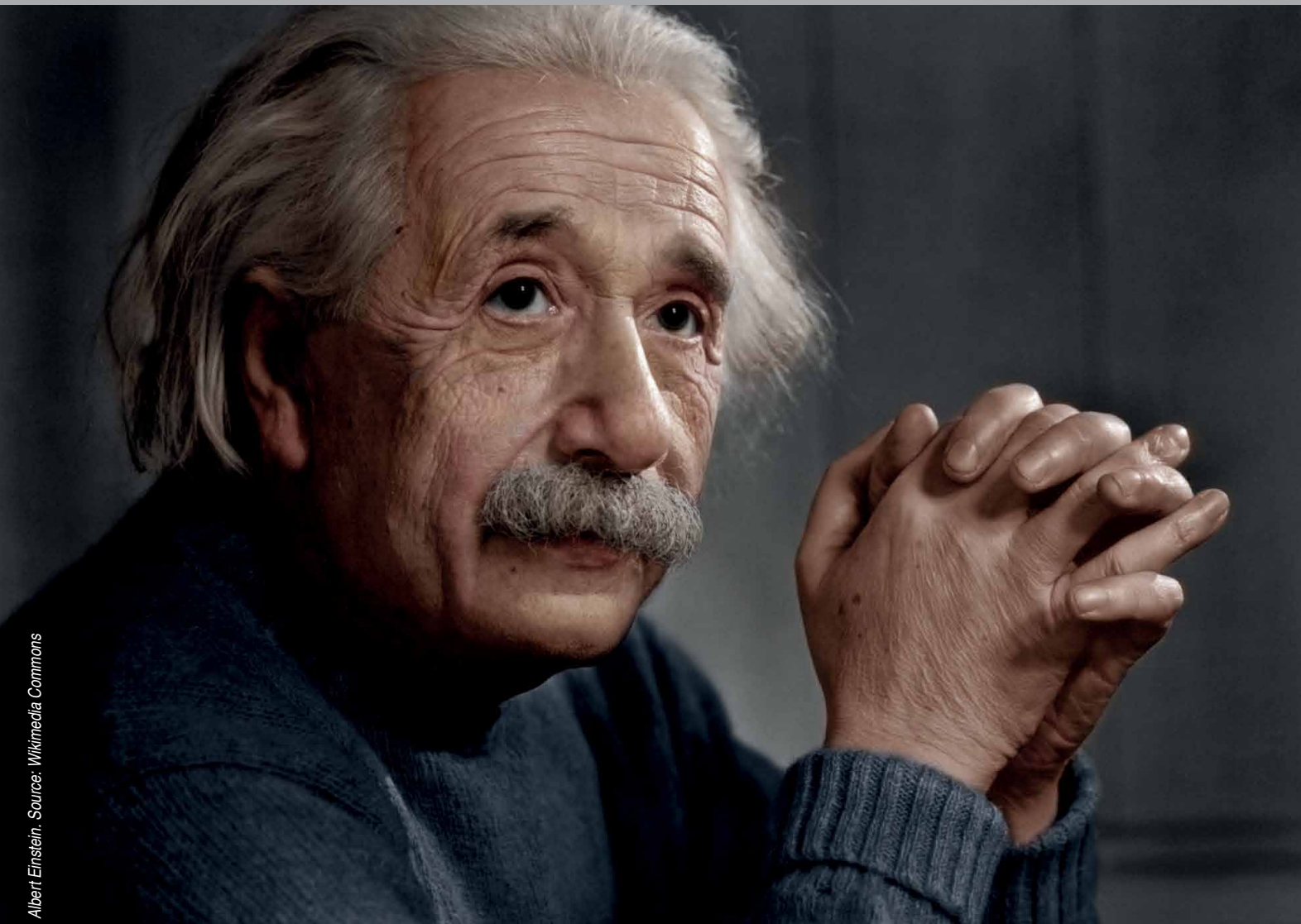
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The international railway industry gathers in Innotrans

Dear friends,

We present you our September issue which this time, how could it be otherwise, it incorporates a special mention to the participation of Spain in the fair Innotrans 2016, with information on the news that Spanish railway companies will present at the fair in the 2,300 square meters coordinated by Mafex.

On the other hand, Martina Werner, member of the Committee on Industry, Research and Energy of the European Parliament, is the main character of this issue, who has led the recent approval of the European Parliament's resolution for the Competitiveness of the European Railway Industry. Under this European framework, the section In Depth is dedicated to the European rail traffic management system and the key role of Spanish companies in the development of ERTMS, who have implanted over 5,000 kilometres in service around the world.

The section Destination is focused on northern European markets, particularly in the Nordic countries: Norway, Sweden, Finland and Denmark. Four countries with a high level of railway development whose national transport plans prioritize both urban and interurban railway investments.

In addition, we share an update on the activities that Mafex has been carrying out in recent months. In this sense, the celebration of the XIV General Meeting of the Association deserves special attention since the new additions to the association were presented: Turnkey Caf & Engineering, Comsa Corporation, Newtek Sólidos and Pretensados del Norte. Also, we must highlight the conference on urban public transport systems that hosted 12 major urban systems in the world and more than 70 Spanish professionals.

As in every issue, the section Members News includes up to 17 news and contracts awarded in recent months to Spanish companies, such as the provision of self-service machines for two lines of the Metro de Santiago de Chile, quality and safety audit services in the construction of the eastern corridor of India, the technical and legal "due diligence" of the tram of Almaty or the design, construction and commissioning of the new High Speed line from London to Birmingham, among others.

Finally, we hope that this issue will be of interest and that we see each other at Innotrans.

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by our booth!
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MANAGEMENT: MAFEX.

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Mafex celebrates its XIV general meeting

THE GENERAL MEETING OF MAFEX GATHERED ON JUNE 30 MAJOR COMPANIES OF THE SPANISH RAILWAY SECTOR

The Spanish Railway Association held on June 30th, 2016, its fourteenth General Meeting, which gathered a large group of member companies from the association.

During the ceremony held in Madrid, the activities of the Association in the previous year and the actions planned for the second half of the year were well received, including the participation at InnoTrans presented -where the participation of over 50 companies is coordinated by Mafex, occupying a space of 2,304 m²- and trade delegations to countries like Sweden, Denmark, Chile and Peru.

Moreover, in the framework of this meeting, new companies joining Mafex since the General Meeting of the previous year were presented: CAF TURKEY & ENGINEERING,



Assistants of the XIV Annual General Meeting of Mafex

COMSA CORPORATION, PRETENSADOS DEL NORTE and NEWTEK SOLIDOS, all companies based or with implantation in Spain and which have a significant rail exports.

Currently the association has 72 members, whose railway turnover in 2015 amounted to more than 4,800 million -of which 65% is made outside Spain- and employ more than 22,000 people.

25th General Assembly of UNIFE in Amsterdam

Two representatives of Mafex attended the General Assembly of UNIFE, the European Rail Association, held in Amsterdam from June 23rd to 24th, where more than 180 leaders of the European railway industry assisted.

Also, several major CEOs of European industry and heads of major local operators as well as senior officials from the European Commission, the European Parliament, the European Investment Bank, the Dutch Ministry of Infrastructure and Environment and Shift2Rail program were present. We must highlight the statement made by Martina Werner, Member of the European Parliament and presenter for the recently adopted resolution on the Competitiveness of the European Rail Industry. This resolution will help strengthen the sector with coordinated policy measures from the EU against the growing challenges and global competition to which the European rail industry is facing, especially large Asian manufacturers. For more information see the interview realized to Ms. Werner in this issue.

The venue chosen by the members of the European association to hold its next General Assembly 2017 will be Madrid, Spain. 📍



Opening of the XXV General Assembly of UNIFE



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Conference for rolling stock suppliers

MANUFACTURERS, MAINTAINERS AND INTEGRATORS OF ROLLING STOCK FROM GERMANY, CROATIA, FRANCE, HUNGARY, CZECH REPUBLIC, ROMANIA AND SWITZERLAND MET IN BILBAO

Under the heading "Business Opportunities in the Sector of Rolling Stock Rail Supply for Manufacturers, Maintainers and Integrators" Mafex, in collaboration with ICEX Spain Export and Investment, organized between May 23rd and 27th, a conference whose aim was to bring the technology of the Spanish railway industry to the major European manufacturers of rolling stock for metros, trams, commuter lines and high speed as well as operators of European public rail transport. Manufacturers of rolling stock as Alstom (France), Bombardier (Spain and Switzerland), Siemens



Technical visit of the delegation of rolling stock manufacturers

(Czech Republic), Softronic (Romania), TZV Gredjel (Croatia) and operators from public transport systems in Budapest and Berlin, BKV and BVG respectively, met with 24 Spanish companies, who showed them the latest developments in rail systems and equipment, advances in automation, telematics, technology design, inspection, onboard equipment,

filming and rails, among other technologies. For Mafex, days like these represent "an opportunity for administrations and companies in the sector to have a mutual understanding and therefore work together in pursuit of a modern transport, providing high quality services to users and adapted to the needs of each network."

Mafex and ANPTrilhos collaborate in a conference on railway innovation

NEW OPPORTUNITIES FOR SPANISH COMPANIES IN BRAZIL THANKS TO THE COLLABORATION OF MAFEX AND ANPTRLIHOS

The National Railway Passenger Transport Association of Brazil - ANPTrilhos organized in Sao Paulo during June 1st and 2nd with Mafex a day of "Spanish Technological Innovation in Rail Passenger Transport" based on three main topics: Energy Efficiency, Maintenance Systems and Telecommunications.

The Technical Seminar allowed to directly display the heads of department from operators associated with ANPTrilhos such as Metro Rio de Janeiro, the subway of Sao Paulo or the operator of urban rail



Conference in the facilities of ViaQuatro, private operator of Line 4 of Sao Paulo.

systems of Rio de Janeiro, the best solutions that the Spanish railway industry is able to offer in order to

support them and collaborate with the challenges facing the Brazilian operators.

New mafex members: Cafte and Pretenorte

TRANSPORT ENGINEERING CAF TURNKEY & ENGINEERING AND PRETENSADOS DEL NORTE, COMPANY SPECIALIZED IN PRESTRESSING STEEL, HAVE RECENTLY INCORPORATED THE ASSOCIATION

CAF Turnkey & Engineering, member of CAF Group company, provides global engineering services in the field of transport systems. Thus, in the catalog of railway solutions offered, it develops engineering activities specializing in prescribing all kinds of

studies and projects of transport systems, construction management, integration systems (infrastructure, superstructure, vehicles, etc ...) and commissioning, operation and maintenance. Pretensados del Norte is a company with over 30 years of experience specializing in prestressing

CAF
Turnkey &
Engineering

PRETENORTE
Pretensados del Norte, S.L.

steel and its various applications. These applications include mono-block railway sleepers, where the prestressing steel is the most important component. For more information on both companies, consult their respective websites: www.cafte.com and www.pretenorte.com





Rail

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

<p>España Spain</p> <p>Portugal Portugal</p> <p>Francia France</p> <p>Inglaterra England</p> <p>Grecia Greece</p> <p>Suiza Switzerland</p> <p>Italia Italy</p> <p>Turquía Turkey</p> <p>Arabia Saudita Saudi Arabia</p> <p>Egipto Egypt</p> <p>Túnez Tunisia</p>	<p>Argelia Algeria</p> <p>Marruecos Morocco</p> <p>Mauritania Mauritania</p> <p>Rep. Dominicana Dominican Rep.</p> <p>Cuba Cuba</p> <p>México Mexico</p> <p>Venezuela Venezuela</p> <p>Colombia Colombia</p> <p>Argentina Argentina</p> <p>Chile Chile</p>
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Mafex representatives and members with Malaysian authorities from SPAD, Rapid Rail and KTMB

Malaysia and Singapore: two recent destinations for the association



Talgo and Caf booth at the Fair Rail Solutions Asia

THE SPANISH INDUSTRY AWAKENED GREAT INTEREST FOR RAILWAY AUTHORITIES FROM MALAYSIA AND SINGAPORE IN THE FRAMEWORK OF THE FAIR RAIL SOLUTION ASIA AND THE MEETING WITH THE LAND TRANSPORT AUTHORITY (LTA)



Meeting of the Spanish delegation with the Land Transport Authority

The Spanish Railway Association attended, for the fourth consecutive year, the fair Rail Solutions Asia held from the 11th to the 13th of May in Kuala Lumpur with the main Spanish manufacturers of rolling stock. The seventeenth edition of the fair brought together more than 1,900 professionals and representatives of major railway companies in Asia. Personalities of the railway sector in Malaysia such as the CEO of Rapid Rail, the CDO

of SPAD and the General Director of the railway operator KTMB, are interested in the Spanish rail technology and the innovative projects that Spanish companies are implementing worldwide. In addition, the day before the fair, Mafex organized a meeting with the Land Transport Authority (LTA) in Singapore, which was attended, as well as by the directors of the main technical departments of the LTA, by a large group of Spanish railway companies. 🚆

Conference on urban public transport systems: metros, trams and commuter lines

DURING 5 DAYS, 28 TECHNICAL VISITS AND 214 MEETINGS WERE CARRIED OUT AMONG THE 12 FOREIGNERS INVITED AND THE 39 SPANISH COMPANIES PARTICIPATING IN THE CONGRESS

International experts analyzed in Barcelona, between the 20th and 25th of June, the future of urban rail public transport under the coordination of Mafex. The main operators of urban rail public transport of Colombia, Ecuador, Iran, Ireland, Finland, Kazakhstan, Mexico, Panama, United Kingdom, Czech Republic and Thailand were gathered at the Conference on "Urban Public Transport Systems: metros, tramways and commuter lines" which the Spanish Railway Association organized with the support of ICEX Spain Export and Investments.

The conference was attended by over 70 professionals and managers of the Spanish railway sector who had the opportunity to meet -214 bilateral meeting were coordinated- with representatives of 12 major urban systems in the world, including the metros of the Latin American cities Quito, Mexico City, Medellin and Panama, the light rail of Turku (Finland), the metro of the Iranian city of Mashhad, metros from Almaty, Prague and London, in addition to the company Transport Infrastructure of Ireland and the Metropolitan Rapid Transit of Bangkok.

"A multidisciplinary forum with a very practical working dynamic, which includes direct and actual knowledge of high capacity railway undertakings and enhanc-

es the interaction of the most important professionals in this field," according to Nahum Leal, deputy director of operations of the Collective Transport System of Mexico City's metro. 🚆



Opening of the conference on urban public transport systems in Barcelona



Bilateral meetings between foreign guests and Spanish companies



Visit to Barcelona's metro line number 9

GMV provides Santiago de Chile Metro's ticketing system

GMV

Santiago de Chile Metro's new lines 3 and 6 are now under construction, due to increase the total metro network to 41 kilometers with 31 stations plus 45 new trains. Line 6, with 10 new stations, will serve the comunas (Chile's smallest administrative districts) of Cerrillos, Pedro Aguirre Cerda, Santiago, San Miguel, San Joaquín, Ñuñoa and Providencia. Line 3, for its part, with 21 stations, will serve the comunas of Quilicura, Huechuraba, Conchalí, Independencia, Santiago, Ñuñoa and La Reina.

SICE, priming the contract for the supply of the fare-collection system of the new lines 3 and 6, has turned to GMV as supplier of the ticket vending/recharging machines.

SICE and GMV, both plumbing their wealth of experience in electronic fare collection systems, will design, develop and supply the vending/recharging machines and compact vending/recharging machines for the system's fare-



cards (called tarjetas bip!) plus the single-journey tickets for the new Metro lines.

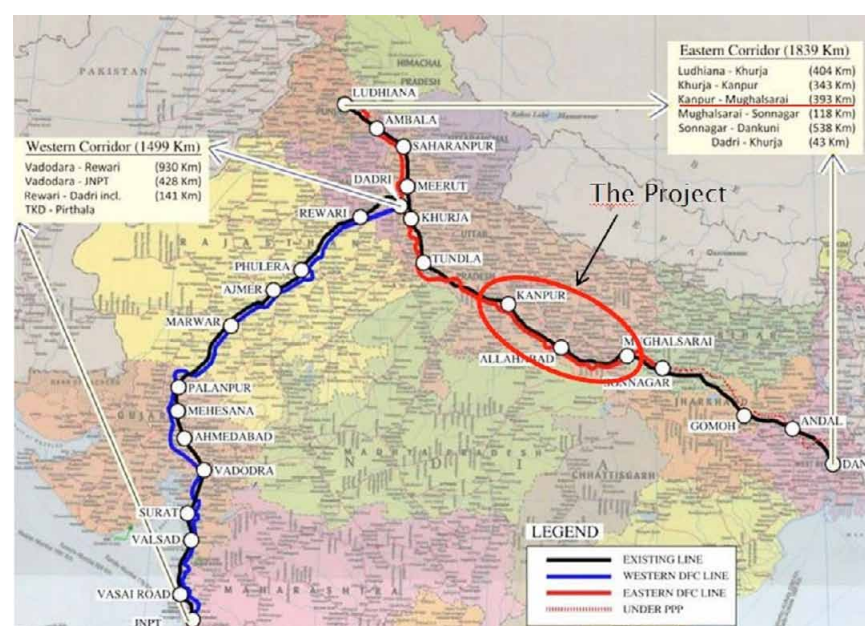
The newly designed vending/recharging machine will be a customized development of GMV's Ticket Vending Machine (TVM) family, specially adapted to meet the specific requirements of the Santiago Metro and also integrated with the rest of the systems to be supplied by SICE.

The project takes in 75 vending/recharging machines and 151 compact vending/recharging machines. During the first phase of the project, moreover, 3 prototypes of each machine will be supplied. After the client's in-factory test and approval of these prototypes, work will then go ahead on the manufacture of the complete supply, to be phased in in three batches during 2016 and 2017.

Getinsa-Payma is providing the quality and safety audit services during the construction of 400km of the New Eastern Dedicated Freight railway Corridor, in India

Getinsa-Payma

Getinsa-Payma has started the consultancy services for the "Quality and Safety Assurance Audit Consultancy (QSAC) for Mughalsarai – New Bhaupur section of Eastern Dedicated Freight railway Corridor in India". The consultancy services involve the implementation of audit and inspections of quality and safety matters of 400 km of construction of new railway line, checking that international standards as ISO 9001:2008 and OHSAS 18001:2007 are being



observed by the related parties of the project, progress monitoring, risk analysis and proposing solu-

tions, as well as assistance to the World Bank, which is financing the Project.

CAF is securing foothold in the uk market with the award of new contracts for the First Group Operator

CAF

CAF has signed contracts with the First Group Operator and the finance companies Eversholt Rail Group and

Beacon Rail which include the supply and maintenance of 66 passenger cars and 12 electrical units of 5 cars of the CIVITY UK platform. This company operates the TransPennine franchise that runs through the Northern Region of England.

These new contracts add to those signed by the company also in

the UK for €740 million in January, with the Arriva Rail North Limited operator and the Eversholt Rail Group finance company, for the manufacture of two fleets of 43 electric trains and 55 diesel trains, also of the CIVITY platform, which are meant for the Northern region (north of England).



Ingeteam is to supply equipment for the High-Speed Train in Uzbekistan

Ingeteam

Ingeteam has signed a contract with Talgo for the supply of equipment for four high-speed tractor units for Uzbekistan, thereby helping to extend the country's fleet of electric traction vehicles.

The Ingeteam supply comprises the engineering of the electric system, traction chain equipment, battery chargers, control systems and high voltage switchgear. Ingeteam will also be responsible for the control electronics, to be adapted to comply with the country's signalling and communication regulations. Ingeteam already has maintenance teams in this country, who will also provide coverage for these vehicles, once the commissioning process has been completed. The first tractor unit is expected to be started up at the beginning of next year. Ingeteam's participation in the



Talgo project dates back to 2011, with the supply of equipment for the High-Speed trains for the Tashkent-Samarkanda line in Uzbekistan. Two of the new tractor units will be running on this same line, whilst the other two are for the new Tashkent-Bukhara HS line.

The trains comprise 11 cars, set to run at a maximum speed of 250 km/h. With this project, Ingeteam confirms its commitment to Talgo and continues to develop and build on its capacity as a technology leader in Railway Traction Systems.

Assignia will maintain the infrastructure and railway track of the High Speed line between Antequera and Granada

Assignia Infraestructuras

Assignia Infraestructuras, in partnership with Iberovías, will be charge of the maintenance and pre-mainte-

nance of infrastructure, railroad and rail equipment for the High Speed Line between Antequera and Granada. The line has a length of 124 km, 82 km of single way and 42 two-way. The scope of action corresponds to the Maintenance Base in Antequera. The budget of the contract is approximately 40,000,000 euros



and has an execution period of 48 months, which may be extended by 24 additional months. The works are oriented to ensure the traffic safety of the infrastructure system, railways and the rail turnouts. In addition, the actions are designed to achieve the highest possible degree of comfort for travelers and to keep the regularity rates that the trains that transit on the High Speed Line have. Likewise, other works will be carried out to ensure the proper functioning of the elements of the superstructure of the railway. Also, to assist trains that have any incidents, establishing monitoring mechanisms and preventive measures in case of alert temporary or other causes, prevention fires, waste management, and control of stocks and several materials owned by ADIF, intended for use as replacements for road and track equipment located in the maintenance bases

Siemens will undertake the renovation of the catenary between Santa María de la Alameda and La Cañada in the line Madrid-Hendaya

Siemens España

Siemens has been awarded by ADIF the contract for the reformation of the overhead contact line between Santa María de la Alameda and La Cañada, both

localities from Ávila, in Madrid-Hendaya conventional line, for an amount of 9,3 ME (VAT included).

The double track section with standard gauge and a length of 25 kilometers has a catenary without mechanical compensation that Siemens will replace by a new modernized and tensioned catenary by ADIF.

The main interventions by Sie-

mens will include carrying out new foundations, raising masts, pylons and cantilevers, laying new catenary conductors, compensating and isolating catenaries and replacing protections and selectors' remote control. The broad experience of Siemens in this type of projects, which was acquired from electrification works both in conventional and high speed lines, and the availability of a large fleet of track-side vehicles allow the company to deploy this project ensuring its success both in delivery terms and execution.

Siemens designed, together with different machinery manufacturers, a catenary stringing train, which is capable to simultaneously mount the supporting trestle and the contact wire with the total mechanical stress of the system. As a result of the high level of automation of this process, exceptional quality and performance standards are kept.



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Ecocomputer S.L. extends its Passenger Information System for mobile devices

Ecocomputer

Renfe has launched some measures to improve the service on the Passenger Information System in place in its narrow gauge network by implementing RailMan® DSS Mobile, system where hardware are labels with QR and NFC technology installed on railway stations.

With this solution, even in unstaffed stations or without any other passenger information system, users have on their smartphone real time information about available railway services.

Traveller does not need any app. After reading a QR code or closing the mobile to the NFC tags, a web is popped up with the railway services, stop scheduled time, de-



lays or cancelled services. Furthermore, from each train service a list of stops and timetables is showed. More than 1.200 labels have been

installed in 332 stations and halts. Backoffice allows management to count on some valuable information about users and geolocation.

Indra will deploy its innovative ASFA Digital beacons in Spain

Indra

Indra is to equip more than 2,600 generic and fixed speed limit beacons with ASFA Digital technology for the Valladolid Railroad Technology Center in the northern region of the country, under a contract awarded by Adif.

The company will deploy an innovative proprietary solution, InVI-TALRAIL ASFA-WAY, which it developed to enhance and drive the evolution of wayside signaling and control for trains.



This groundbreaking wayside ATP system (automatic train protection) was made possible by the company's huge R&D commitment. It has been awarded top-level SIL 4 safety certification - the highest in the railroad sector. This wayside system is deployed in conjunction with the onboard ASFA Digital component fitted on trains. It provides continuous speed supervision, and will enact automatic braking should trains exceed signal limits at any given time.

The Spanish ASFA system is used on most conventional railroads, and is a backup system on high speed lines, ensuring automatic protection for

trains up to top speeds of 200 km/h. ASFA Digital beacons include new features, double-checking signals and ensuring constant supervision of trains at all times. A train will therefore automatically come to a halt should the driver fail to comply with a given signal or speed limit. Furthermore, ASFA Digital is able to work independently or as a backup for more advanced train control systems that allow faster speeds, such as the European ERTMS system.

This Indra solution is part of InVI-TALRAIL, a groundbreaking technology platform for critical railroad safety systems, also developed by the company. This comprehensive railroad signaling platform harnesses technology developed entirely in Spain and meets the most stringent quality, reliability and safety standards - each system has secured SIL 4 security certification, the highest available in the railroad industry. It is a generic platform and guarantees interoperability with any system from any supplier. It has already been tested and certified, and is being deployed on a number of projects in Spain and internationally.

DF Rail invests in a new foundry facility

Duro Felguera Rail

DF Rail has recently concluded a € 12 million investment at the construction and equipments of a new foundry facility for the manufacturing of Manganese steel crossings.

This new foundry occupies a total surface of 6.000 m2 at DF Rail's plant in Mieres (Asturias), and has been constructed over 18 working months.

The plant is environmentally friendly, as at its design all the exigent environmental restrictions have been considered referring to atmosphere emissions, noises, suspended particles, etc, ..., being equipped with sand mechanical and thermic regeneration systems.



The production capacity is approximately 1.000 crossings per year, having the possibility of treating crossings up to 12 meters long. This new facility will let DF Rail be

much more effective and efficient from the production point of view, transmitting those improvements to the final quality of the product as well as to its cost.

The Neoballast R&D project receives more than €1.5M from the European Commission for its commercialisation

Comsa

The European Commission, through the 'Fast Track to Innovation' (FTI) programme, has allocated €1.59M for the commercialisation of the Neoballast R&D project.

Led by the technical and R&D area of COMSA and with the participation of Spanish, Belgian and Italian companies, the project aims to improve the properties of railway ballast to reduce the level of degradation and attenuate the noise and vibrations caused by the trains running on the tracks. The pilot tests have so far shown significant improvements in prolonging the life of the ballast.

The progressive wear of the ballast, which is used as track layer support, generates numerous and expensive maintenance operations which, in general, must be carried out during the night. In this context, Neoballast reduces the level of degradation of the aggregate, thus reducing maintenance costs and the resulting

environmental impact. According to data provided by the research, this development may mean a saving of 40% of the total cost of the track, including construction and maintenance.

The European 'Fast Track to Innovation' programme finances the launching of innovative and cut-

ting-edge products that have already been successfully tested, so that they can be marketed quickly. The third call for proposals, which received more than one hundred applications, has led to the funding of fifteen R&D projects in various sectors and involves a total of €30.5M.





Alstom joins the Spanish Chamber of Commerce

Alstom España

Alstom has become part of the plenum of the Spanish Chamber of Commerce, a body in which are represented the 28 largest companies in Spain in their respective sectors (El Corte Ingles, Grupo Santander, ACS, Airbus, Inditex, Telefonica ...),

as well as representatives of various Ministries and Chambers of Commerce.

Joining the Spanish Chamber of Commerce supposes that Alstom is recognized for its innovative capacity. It gives us the opportunity to contribute through knowledge and experience to the digital transformation of the Spanish industry with the aim of turning it into a world-

wide reference.

The Spanish Chamber of Commerce is the institution in charge of representing the regional Chambers of Commerce towards national and international bodies and of organising networking between them. Internationalization, competitiveness, innovation, training, employment, mediation and arbitration are the basic axes of action.

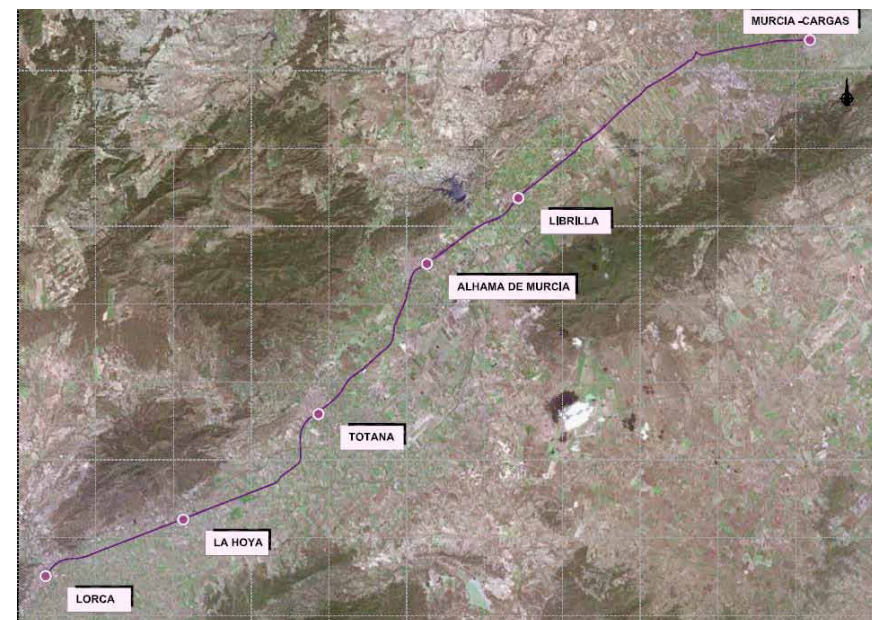
Awarding to the Joint Venture ENYSE-SICE of the Project "Drafting, final project, constructive project, works and maintenance of signalling and communications in the section Murcia Cargas-Lorca"

SICE

ADIF awarded this new project of signalling and communications with a timeframe of 7 months and maintenance for 20 years.

Works include installation of new electronical interlockings and controllers for objects "EIS23", of ENYSE technology at the stations: Librilla, Alhama de Murcia, Totana, La Hoya and Lorca Sutullena and the blockade interface in "Murcia Cargas".

The interlockings will be integrated in the CTC of Valencia "Fuente San



Luis" replacing the current telephonic blockade via BLAU with axle counters in entry signals. A centralized maintenance post in Murcia will be installed.

The SDH equipments will be replaced by new telephony of exploitation system and new field elements: Signals, point machines, track circuits, axle counters, ASFA.

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Bombardier's 'Day of the Client'

Bombardier España

On May 23rd, various FGC representatives visited Bombardier's facilities in San Sebastián de los Reyes, where the Showroom and the Centre of Rail Excellence are located, and in the Pinto workshop, as part of the 'Day of the Client.' The 'Day of the Client' is a monthly gathering which consists of a bilateral meeting between Bombardier and one of its clients (a different one each month), which seeks the best understanding of the client's needs. Firstly, the situation is analysed from the client's point of view, taking into account their needs and forecasts, etc. After that, based on this analysis, Bombardier makes an ad-hoc presentation of the ways to cover those needs.

Lastly, the final part to this gathering is a brainstorming session about



how trains and transportation of the future will be, an activity which was carried out this year with the help

of interactive boards. These types of days serve to encourage teamwork between Bombardier and its clients.



DANOBATGROUP has been given the Award for Innovation in Advanced Manufacturing Technologies at the Spanish Machine Tool Biennial BIEMH 2016

DanobatGroup

DANOBATGROUP was awarded the Prize for Innovation in the discipline integration of Industry 4.0 concepts in advanced manufacturing systems at the BIEMH 2016 trade fair. The group presented the following developments in the digital field under this 4.0 concept:

HMI - Human-machine interface, to improve the interrelationship man machine, through an environment that simplifies machine operation, includes support for programming and specialised machining cycles, facilitates the maintenance reducing down-times, and provides information on how to reduce power consumption.

Data system, a set of services based on machine monitoring and Big Data to analyse the machining process and machine behaviour. A tablet or mobile phone can be used

to check the status of the machine and, if necessary, optimise the process or anticipate possible failures. Intelligent components, devices integrated in the machine that, based on the information received from multiple sensors, act to improve the performance and precision of machines, optimise the process times, increase the lifespan of tools, etc. Control system, a computer application for full management of production lines. This system is independent of the manufacturer of the equipment, and can be fitted on different types of machines; all information necessary to perform the given task is managed by the system: CNC programs, tools and tooling, etc. It can be included in other data management programs used on-site such as PLM, MES, ERP, etc.

The innovations were valued by a jury of 11 people representing Beaz, Bic Berrilan, Cdti Eide, Ergogroup, IHOBE, Mondragon Unibertsitatea, Osalan, SPRI, Tecnun-Universidad of Navarra and the University of the Basque Country (UPV/EHU).

Cetren, as expert on the railway sector

has over 35 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.

Cetren is also the first private center expert in railway staff training, as approved by the Ministry of Public Works since year 2007.

CERTIFICATION / INSPECTION



Cetren is a certification and inspection body acting by order of third parties in an independent, impartial and technically competent way within every rail sector field. We certify, evaluate, verify, and approve railways.

NOTIFIED AND DESIGNATED BODY by the Spanish State to certify interoperability in accordance with European Standards.

CERTIFICATION BODY to validate the fulfillment of the Technical Specifications for Approval (ETH).

CERTIFICATION ENTITY of rail products, processes and services (EN 17065). Recognized by the Ministry of Public Works as certification body within the frame of Standard EN 15085: welding of railway vehicles and constituents.

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SENER consortium is awarded the HS2 Engineering Delivery Partner contract in the UK

Senier

High Speed Two (HS2) Limited, the governmental company responsible for developing the UK's new high speed rail network, has awarded the joint venture formed by CH2M, Atkins and SENER the Engineering Delivery Partner for High Speed 2 - Phase 1 - contract.

SENER will work with CH2M and Atkins for the next 10 years to provide qualified engineering and construction management support to HS2 in the development of the 230 km London - Birmingham high speed line. The contract comprises supporting preparation for the procurement



of the main civil contracts and subsequent work packages, including stations and rail systems; managing support of the design stage and

constructions stages of the works; providing project engineering and construction management; and providing technical assurance of design.

The Tramway of Almaty: recovering a golden age

Idom

While the capital of Kazakhstan was moved from Almaty to Astana in 1997, the city is still considered to be the southern capital of the country. The city is the largest city in the country in terms of population and is the economic centre of the Republic. The tramway system powered by electricity had been extended greatly since its introduction in

1937 reaching its maximum extension in 1990 with ten different lines in operation. From the early nineties, this mode of transport has suffered a decline and in 2010 there were just two lines in operation. However, this tendency is about to be reversed with the recent signing of an agreement between the European Bank for Reconstruction and Development and the City of Almaty to finance a new Light Rail Transport (LRT) system.

As a result of this agreement, the City has appointed Idom to carry out the technical and legal due diligence of the LRT. This project involves, among other aspects, the revision of existing relevant studies, the preparation of the structure of the Public-private partnership scheme required to implement the project, the concept design, as well as the provision of technical assistance during the bidding phase and signing of the contract.



"Spain Builds": new recognition for Spanish engineering

Ineco

Ineco has collaborated in the "Spain Builds" (España Construye) ceremony, held in recognition of Spanish infrastructure companies' special role in the world. Organised by Brand Spain (Marca España), the event brought together the main representatives of the Spanish companies leading the most symbolic projects in the world. Ineco's president Jesús Silva praised the leadership of Spanish engineering in five continents during a round table he participated in with top construction and engineering companies. "Ineco has been part of this prestige, with particularly important projects such as the Makkah-Madinah high speed line and the British HS2 high speed line," he emphasised.

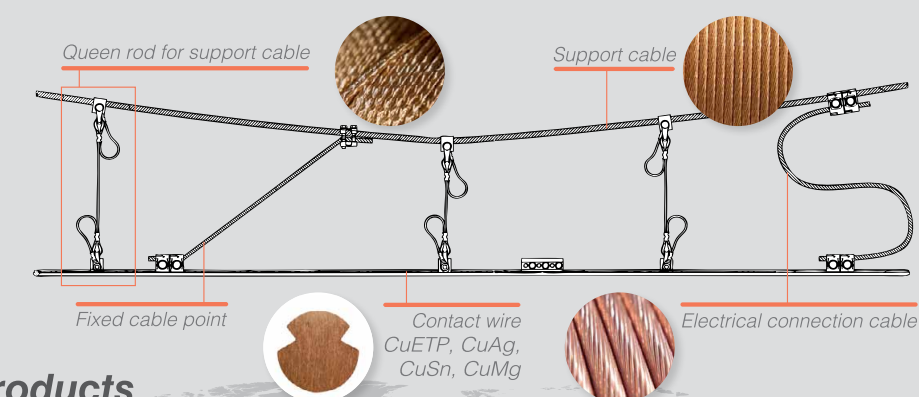
The ceremony, inaugurated by the acting Minister for Public Works Ana Pastor, and closed by the acting Minister of Foreign Affairs and Cooperation José Manuel García-

Margallo, gave special recognition to the Panama Canal project, Brand Spain's emblematic project in the world, due to be inaugurated this year.



Electrifying the future

La Farga offers an entire range of alloys and copper products for overhead lines in the rail transport sector. We use an integrated process based on pure, mined copper (cathodes).



Major Projects with La Farga Products

High speed

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LGV Est Metz - Strasbourg France
Ankara - Istanbul Turkey
Mecca - Medina Saudi Arabia
LGV Maroc Morocco
Barcelona - Figueres Spain
Madrid - Valencia Spain

Conventional lines / metro / trams

CL Kayas-Centikaya Turkey
CL Lisboa - Oporto Portugal
CL Athens - Tithorea Greece
MT Metro Paris France
TW Dublin Ireland
TW Firenze Italy
CL Xianxiang - Rizhao China
TW Ryad Saudi Arabia
TW Melbourne Australia
MT Quito Ecuador
MT L12 Mexico DF Mexico
MT Alger Algeria

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Come and see us at **Innotrans**, from 20 to 23 September
Pavillion 22b, Stand 311



InnoTrans Special Innotrans 2016

OVER 50 SPANISH COMPANIES WILL EXPOSE IN BERLIN THEIR LATEST TECHNOLOGIES.

BERLIN.GERMANY
INNOTRANS 2016

Mafex has organized, for the seventh consecutive year, the group participation of 51 Spanish railway companies, occupying a space of more than 2,300 square meters in InnoTrans, the most important fair for the railway industry worldwide. During September 20th and 23rd, more than 130,000 professionals from the railway sector around the world and over 2,700 exhibitors from 55 countries will be present in Berlin.

InnoTrans has become an international meeting point for professionals and decision-makers in economy, politics and transportation. With expert groups and roundtables on different subjects, it is the ideal platform for an exchange of ideas at the highest level. All coordinated by the Dialog Forum under the leader-

ship of the German Forum Transport (DVF, for its acronym in German), the Association of German Transport Companies (VDV), the Association of European Railway Industries (UNIFE) and the German Association Railway Industry (VDB).

Spanish technological developments

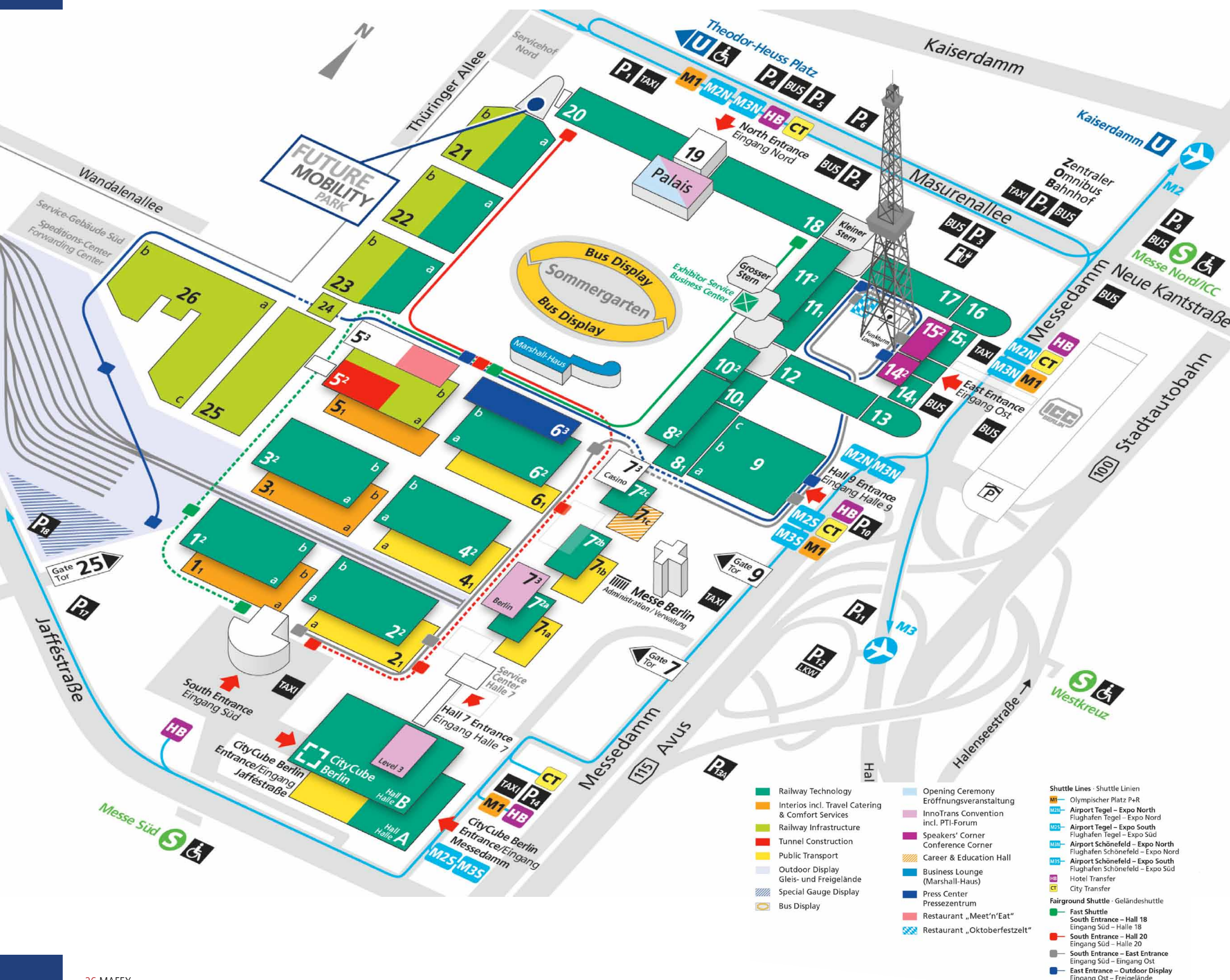
The Spanish railway industry will be present, as in every edition, presenting their technological developments in different segments of the exhibition, including rail technology, infrastructure, public transport, interior design and construction of tunnels. All this in an exhibition area of more than 140,000 m², including the display of vehicles in the 3,500 metres outdoor railway located within the space of the fair itself. The Spanish Railway Association, Mafex, is organizing again, as it has

done since 2004, the participation of more than fifty Spanish companies. On the following pages you can view details of railway innovations of some of the Spanish companies present at the event. For example, the first application of automatic train operation (ATO) combined with ETCS Level 2, which is currently being implemented for the first time in the intercity rail Mexico-Toluca. Also, assistants will be able to know and see the latest developments for High Speed turnouts, as well as learning about new solutions for maintenance workshops or the latest advances in manufacturing trains, among other technologies. All this developed by Mafex members who have spent decades working in more than 90 countries around the world and whose turnover in 2015 exceeded 4,800 million euros and employed more than 22,000 people. **Continue ►**



Map of the Fair

CHECK THE LOCATION OF SPANISH COMPANIES IN INNOTRANS. MAFEX MAFEX IS COORDINATING THE PARTICIPATION OF 51 EXHIBITORS IN AN AREA OF MORE THAN 2,300 M²



	Hall	Stand
AL-KO	9	701
ALSTOM TRANSPORTE S.A.	3.2	308
AMURRIO FERROCARRIL Y EQUIPOS S.A.*	26	209
AQUAFRISCH, S.L.	7.2C	201
ARCELORMITTAL ESPAÑA, S.A. *	26	209
AZIMUT e-MOTION*	4.1	205
BOMBARDIER ESPAÑA	2.2b	101
CAF*	3.2	401
CAF Miira	20	202
CAF POWER & AUTOMATION	3.2	401
CAF SIGNALLING, S.L.*	3.2	401
CAF TURNKEY & ENGINEERING	3.2	401
CEIT-CENTROS DE ESTUDIO E INVESTIGACIONES TÉCNICAS	22A	703
CETEST	7.2C	203
COLWAY FERROVIARIA, S.L.	1.1	502
DANOBA, S.COOP.*	22A	601
DF RAIL, S.A.U.	26	209
ECOCOMPUTER S.L.	22A	704
ELECTRANS*	25	215
ELECTROTÉCNICA ARTECHE SMARTGRID, S.L.	17	106
FAIVELEY TRANSPORT IBERICA	1.2	102
FORGING PRODUCT	22A	704
FUNOR, S.A.	22A	703
GAMARRA, S.A.	1.2	212
GMV SISTEMAS S.A.U.	2.1	412
GOAL SYSTEMS*	2.1	219
GORATU MAQUINAS HERRAMIENTA*	22A	701
GORGY TIMING SPAIN, S.L.*	22A	704
HAWKE TRANSIT SYSTEM	22A	704
IKUSI ELECTRONICS	22A	704
IKUSI, S.L.U.	4.1	308
INDRA SISTEMAS, S.A.*	4.1	403
INDUSTRIAL DE TRANSFORMADOS, S.A.*	3.1	234
INECO*	5.2	410
INGETEA POWER TECHNOLOGY, S.A. (TRACTION DIVISION)	17	201
INTERNATIONAL HISPACOLD S.A	3.1	406
JEZ SISTEMAS FERROVIARIOS, S.L.*	21	205
KELOX S.A	1.1	208
LA FARGA LACAMBRA, SAU	22B	311
LANDER SIMULATION & TRAINING	3.2	401
MAFEX	22A	704
MASATS*	3.1	405
MB SISTEMAS S. COOP *	22A	703
METALOCAUCHO S.L.	1.2	103
MGN, S.A. *	9	602
NEM SOLUTIONS	21	509
NEWTEK SOLIDOS S.L.*	22A	704
OLIVA TORRAS	3.1	336
PATENTES TALGO, S.L.	4.2	105
PREMIUM, S.A.	11.1	304
RELATS S.A.*	15.1	201
SEPSA (ALBATROS S.L)	2.2	102
SIEMENS RAIL AUTOMATION	4.2/F1	203/20
SICE*	4.1	402
STADLER RAIL VALENCIA S.A.U.*	2.2/0	103/238 Tracts 4,8 y 9
TALLERES ALEGRIA, S.A.	26	209
TALLERES CORRAL	22A	703
TECNOESTPUMA	22A	704
THALES ESPAÑA GRP, S.A.U.	22A	704
UROMAC-MAQUINARIA DEL EO, S.A.*	FGSUED	0/309
VIRLAB*	22A	704
XUBI ENGRANAJES, S.L.	22A	704

* More information about their products on the following pages



Hall 26. Stand 209

ARCELORMITTAL, AT THE VANGUARD OF THE SECTOR

The need for fast and reliable transport has encouraged R&D in this sector, making it possible to overcome challenges unimaginable a few years ago. ArcelorMittal, in its continuous development, has reinforced this permanent evolution in the rail sector with improvements of its product range, through the research and development of new types of rails and welding techniques.

ArcelorMittal has a dedicated R&D Rail Unit based in Spain with different prototyping facilities and a new welding pilot plant to develop and test new welding techniques, both for rail grades currently in use and for new grades under development. Rail welding is a critical process for ArcelorMittal's customers, and ArcelorMittal is capable of providing recommendations on the most suitable welding techniques in every case.

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

Hall 4.1. Stand 402

SICE PRESENTS ITS NEW AUTO-SALE MACHINE CALLED BIGBOX-S1.

SICE is proud to announce a new TVM product called BIGBOX-S1. BIGBOX-S1 accepts payment with coins, notes and all kind of credit and debit cards.

It also allows reporting of card balances and movements. Its main characteristics are:

- Ready to accept EMV L2 cards and NFC payments
- Adequate sizing and easy to move
- Rear door for cash management and dedicated access for maintenance
- Reliable mechanics avoiding coin stuck
- Fraud control due to a special counting system of coins and

notes

► In stations without ticket office allows to do change, verification and collection operations

► Specially designed for the use of persons with mobility reduced



Hall 4.1. Stand 403

INDRA BRINGS WI-FI CONTENT TO TRAINS

Indra will be at Innotrans showcasing a pioneering transport solution that provides passengers with wireless access to a digital content platform via mobile devices, without requiring an Internet connection.

This cutting edge service is made possible by the versatility and capabilities of Indra's Nauta onboard unit, which acts as a smart server for this content streaming solution. Passengers can connect to the system via Wi-Fi. Entering their username and password will bring up the menu of content offered by the operator directly on their device. Users can then choose and instantly open any item that interests them, without having to download the same. The system will also remember each user. For example, on a round trip, users can begin a movie or a book on the outbound journey and pick up where they left off on the return trip.

Indra will also be exhibiting its safe-



ty technology for wayside ATP systems, including its RBC solution for level 2 ERTMS signaling, part of IN-VITALRAIL, a revolutionary generic technology platform for top-level railroad safety systems, which was also developed by the company. Thus, continuing its development of open and integration-ready ERTMS, Indra will present in Innotrans the first open security protocol be-

tween the interlocking and RBC systems, based on the RaSTA (Rail Safe Transport Application) standard. This solution will help drive the globalization of the interoperability concept, extending the scope of standardized integration between signaling systems and train control systems, acting as a technological driver based on infrastructure scalability and optimization.



Hall 3.2. Stand 401

CAF IS TODAY ONE OF THE INTERNATIONAL LEADERS IN THE DESIGN AND IMPLEMENTATION OF COMPREHENSIVE RAIL TRANSPORT SYSTEMS.

CAF will participate in a new edition in Innotrans. CAF has a wide range of rail vehicles with a presence in over 30 countries worldwide. Its most recent contracts include the supply of Oaris high

speed trains for Flytoget in Norway and Civity regional trains for Arriva UK and First Group operators in the UK. In the urban segment, CAF is manufacturing new fully automated metros for the cities of Istanbul and Santiago de Chile and Urbos tramways for cities such as Luxembourg, Utrecht and Canberra in Australia, among others.

The company does not only supply rolling stock. CAF Group has extensive capabilities to offer its customers comprehensive rail solutions with high added value. These include civil works, signalling systems, traction and communication equipment, electromechanical systems, driving simulators, operation and maintenance of the system.

Hall 2.2/0 Stand 103/238 Tracks 4,8 y 9

STADLER SHOWS A WIDE RANGE OF PRODUCTS AND SERVICES AT INNOTRANS SUCH AS THE HIGH SPEED TRAIN FOR SBB, THE NEW FLIRT FOR THE NETHERLANDS, DUAL LOCOMOTIVES OR ITS LATEST TRAMS AND TRAIN-TRAMS

Stadler exhibits a wide range of products and services at InnoTrans, like the high speed train for SBB, the new FLIRT for the Netherlands, dual-mode locomotives or their last tramways and tram-trains. You can find us in Hall 2.2, stand 103 and outside stand O/238.

Stadler Rail Valencia presents two innovative examples of hybrid technologies:

► On track 8/43, the new EURODU-AL locomotive for UK (Class88): a lot more than a "last mile" locomotive. It provides operational flexibility, high performance and reduced transport costs since it can run on all kind of lines, electrified or not.

► On track 4/29, the new Citylink for VMS Chemnitz: a low floor tram-train that can run in the tram



network in electric mode and in regional railway lines in diesel mode (max. 100km/h) offering a high

degree of comfort and safety. It has got the German certificates BOStrab and EBO.

Hall 26 Stand 307

AMURRIO PRESENTS CRBM, A LOCKING DEVICE WHICH IS COMPACT AND EASY TO INSTALL, MAINTENANCE-FREE THANKS TO THE LEAK PROTECTION MECHANISM AND SEALED AGAINST WATER OR DIRT.

It can be installed by one person, and does not require holes in the rail. It is adaptable to all track widths and blocks both the closed tongue as the open one. Amurrio is one of the international leaders in the manufacture of manganese steel crossings (Hadfield steel, Mn 12/14%). They are manufactured in one piece, without any bolted connections, and cast and machined in our facilities. Each crossing is heat treated in a gas furnace and quenching pool. The result are pieces of great versatility with very low maintenance requirements.



The design of the new AFE fastening facilitates the installation of

turnouts, and achieves significant savings in time and materials.

Hall 22A Stand 601

DANOBAT EXHIBITS ITS DEPOT EQUIPMENT AT INNOTRANS: PREVENTIVE AND CORRECTIVE MAINTENANCE SOLUTIONS, WITH A WIDE RANGE TO ADAPT TO THE TYPE OF VEHICLE IN QUESTION: HIGH SPEED, LOCOMOTIVE, COMMUTER TRAIN, TRAM OR METRO.

At hall 22, stand 601, DANOBAT exhibits its depot equipment at INNOTRANS: preventive and corrective maintenance solutions, with a wide range to adapt to the type of vehicle in question: high speed, locomotive, commuter train, tram or metro.

The company will showcase its integral solutions for maintenance of rolling stock components. The new solution consists of a wheel profile measuring system + rolling stock wheelset optimization software + a brand new range of underfloor wheel



lathes. This integral solution has been designed and developed to extend wheelset life by some 25% and to save on maintenance costs. At the stand more information will be given on DANOBAT's com-

prehensive solutions for all manufacturing processes of rolling stock parts: from axles or wheels, through wheelsets to bogies, offering stand-alone machines as well as complete automated turnkey lines.

Hall 21 Stand 205

JEZ PRESENTS ITS LATEST DEVELOPMENTS FOR HIGH SPEED TURNOUTS

JEZ Sistemas Ferroviarios is a leading producer of turnouts and crossovers and an associate of the VAE Group, the international leader in this sector.

JEZ has implemented projects all around the world, in countries as diverse as Australia, Mexico, Finland and South Africa. Our offices in capital cities around the globe and capacity to undertake detailed studies in situ are key competitive advantages.

The experience and capacity of the technical experts in our R&D+i department allows us to develop and manufacture complete sets of railway layouts (turnouts, crossovers, etc.) along with all of their individual components such as manganese steel crossings, isolating joints, expansion joints, plates, slide chairs, guard rails etc. Our projects include rail equipment standardization, installation of layouts in stations or depots, and the development of patented Taylor-made solutions.

At the 2016 edition of Innotrans JEZ

will present its latest developments for high-speed turnouts, such as:

► New generation of elastic rail plates for high-speed turnouts on concrete plinth and ballast track, with stiffness ranging from 33 KN/mm to 45 KN/mm.

► High-performance vertical clamp lock, integrated hollow sleepers for high-speed turnouts.

With regard to urban rail systems, JEZ has developed track layouts for vehicles with central guide boxes, and holds two European patents for this technology. These vehicles are used by urban transport authorities in France and Latin America, and projects are also under way in China and Italy.

The main characteristics of these devices, which are currently at the manufacture and testing stage, are as follows:

► Incorporated into a setting, detection and interlocking unit for the Unistar HR drive.

► Mobile panel for main and divergent tracks.

► Panel rotation using cams, synchronized with the drive locking, setting and detection unit.

► The cams lock the mechanism in the final positions.

► Slide surface fitted with an Ecogloss system to prevent the need for maintenance and greasing.

► Hard steel system components and friction bushes.

One of the priorities of JEZ Sistemas Ferroviarios is to achieve excellence in the quality of its after-sales customer service. Excellence includes the immediate presence of technical personnel to:

- Solve any problem concerning the assembly process for the equipment supplied.

- Cater to customers' requests, contributions and suggestions to improve the product.

- Manage their technical complaints.

- Ensure full availability when faced with any other request.

The implementation of projects to improve environmental management (ISO 14001), total quality (ISO 9001) and occupational health and safety (OSHAS 18001) guarantee the excellence of our product with regard to the environment and a commitment to risk prevention.

Hall 3.2 Stand 401

CAF SIGNALLING PRESENTS THE FIRST APPLICATION OF ATO OVER ETCS LEVEL 2 ACCORDING TO INTEROPERABLE EUROPEAN DRAFT SPECIFICATIONS

The company CAF Signalling shows at Innotrans 2016 a DEMO of the first automatic train operation (ATO) in conjunction with ETCS Level 2 following the draft interoperable specifications which are being developed by the railway sector for future use in Europe. This technology is being implemented for the first time in Mexico-Toluca interurban line. This new line has 58 kilome-

tres of double track electrified at 25kV AC, with five new stations. The most significant conclusion is that a standard and interoperable approach to GoA2 Automation is feasible applying ETCS as the standard ATP to guarantee Safety. The ATO developed by CAF and ETCS are put together with a high degree on functional independency between them. This first implementation is part of the Mexico-Toluca works awarded to a consortium led by CAF, in which the Spanish group provides 30 trainsets, the ETCS on-board equipment, the full ATO system -including both



onboard and trackside equipment- and the integrated Control Centre. The ETCS specification is for Level 2 Baseline 2.3.0d with semi-automatic train operation, GoA-2.

Hall 22A Stand 704

NEWTEK FACILITIES FOR LOADING SAND

Founded in 1987, NEWTEK is a company dedicated to installations for the handling of bulk materials - dust and granule size solids - for different sectors of industry, such as, foundry, metalworking, ceramic, food, railway and so on.

It specializes in the design, manufacturing, assembly and maintenance of installations for the sand loading in trams, trains and locomotives, for the use into traction bogies.

It supplies complete facilities mainly composed by a storage silo, fixed or mobile sand feeding systems, and a dust suction system thus facilitating a safe loading and environmentally friendly way.

NEWTEK carries out specific designs adapted to each client to offer the best solution and it has a wide and varied catalogue, proven at facilities worldwide.



Hall 5.2 Stand 410

INECO OFFERS COMPREHENSIVE AND INNOVATIVE SOLUTIONS IN ALL PHASES OF THE DEVELOPMENT OF RAILWAY PROJECTS, FROM FEASIBILITY STUDIES UP TO COMMISSIONING

Ineco is a global leader in infrastructure engineering and consultancy. With a presence in more than 50

countries, it has an expert team of more than 2,500 professionals and has for more than 45 years contributed to the development of projects in all areas of transport: planning, airports, air navigation, railways, roads, urban transport and ports. Its activities extend to the environmental sector, architecture and construction.

Ineco offers comprehensive solutions in all phases of railways projects, from preliminary feasibility studies to commissioning, including making improvements to management, operation and maintenance processes. Our Company has cooperated in every single phase of all the projects of the development of the Spanish railway system.



VIRLAB

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- 800mm/s speed max.,
- 6g acceleration max. and
- 0-200Hz frequency range.

Accredited by ENAC

Spanish accreditation body, under
UNE-EN ISO/IEC 17025: 2005





Hall 22A Stand 703

MB SISTEMAS PRESENTS AT INNOTRANS ITS MOST RECENT PROGRESS IN THE AUTOMATED MANUFACTURE OF RAILWAY BODYWORK

MB SISTEMAS will unveil in Innotrans 2016 the latest advances made by the Company in terms of the integration of automated solutions in the train coach manufacturing sector.

For the manufacture of railway passenger cars, MB SISTEMAS has developed specific lines for the different parts that make up the vehicles: roof body side lines etc. A company that boasts installations fitted with

the most advanced equipment and systems in the sphere of engineering, simulation and quality control.

Since 2008 the Company has developed complex automated railway projects, and which have been awarded to MB Sistemas thanks to its technological reliability and its highly-skilled experts. An example of this is the installation of welding systems for CAF and the implementation of new tools for its work for the Sao Paulo and Recife Metropolitan Railways (Brazil), the Saudi Railways or for the intercity state rail network in the United States, Amtrak, amongst others. A highly ef-

ficient line for welding systems of corrugated metal sheets for the company Kawasaki in Lincoln (Nebraska).

The company MB Sistemas is presenting a pioneering innovation at Innotrans: Seam Welder Machine. It is a specific development to welding roof and body side sheets with long seam in a reliable manner.

Successful projects:

► Seam Welder Machine in Elmira (New York-USA) with welding gun and roller in the same machine, an hybrid system in the cutting edge technology.

► Seam Welder Machine 2nd generation in Lincoln (Nebraska-USA) automatic position of sheets managed by PLC.

As well as performing in-house developments of new systems and assembly techniques, MB Sistemas participates with technological centres such as IKA4-LORTEK, which has on hand the very highest level of specialisation in advanced joining technology with different metallic and non-metallic materials. The work undertaken on different projects allows for us to develop and implement industrially new binding and assembly systems.

Hall 9 Stand 602

MGN INNOVATES AND IMPROVES IN EVERY TECHNOLOGICAL ASPECT CONCERNING TO THE MANUFACTURING OF A HIGH QUALITY PRODUCT

MGN (www.mgncaucho.com) is a SME with more than 50 years experience, which designs and manufactures rubber and rubber to metal pieces for the general industry, with a high specialization in the railway sector.

As a core of its strategy, MGN invests every year nearly the 10% of its invoicing, as a key towards the continuous improvement.

MGN innovates and improves in every technological aspect concerning to the manufacturing of a high quality product, from design to final control:

► Design: FEM simulation tools to speed up the process of new products development.

► Manufacturing: productive processes optimization through automation and moulds design.

► Materials: use of rubber formulations developed to withstand extreme conditions, both mechanical and environmental conditions (temperatures, chemical agents) and the use of aluminum is introduced to make lighter pieces and contribute to reduce the rolling stock weigh, what will have less train fuel consumption and less rail wear as a consequence.

► Quality: the most advanced means are incorporated to the MGN laboratories for the quality control, both for the raw materials and the final product.

This way, the components manufactured in MGN offer a high performance guarantee, improving essential demands such as mechanical and dimensional stability, low creep and good fatigue behavior.



Hall FGSUED Stand 0/309

UROMAC PRESENTS ITS LATEST SERVICE VEHICLES FOR TRAMWAYS AT INNOTRANS

Uromac presents at Innotrans the world's biggest railway trade fair, which takes place from 20-23 September in Berlin, the new T-Rail series of road-rail service vehicles for tramway lines. These

vehicles are equipped with new rail-wheel set specially designed for tram lines with tight curves (<25 m. radius) that ensure excellent traction over the track. The new T-Rail Tramway series offers the customer a wide variety of configuration for different applications such as overhead line maintenance, shunting trams in

depot yards and emergency towing of broken-down trams and cleaning vehicles for rail groove maintenance, using one unique chassis with eases the maintenance operation. Moreover Uromac has presented the latest evolution of its T-Rail Rescue Vehicle designed for minimizing possible rail traffic disruptions.

Hall 22A Stand 704

VIRLAB: MORE THAN THIRTY-FIVE YEARS OLD PERFORMING VIBRATIONS AND SHOCK TESTS, REGARDING ALL KIND OF ELECTRICAL AND MECHANICAL EQUIPMENT AND COMPONENTS OF ANY ECONOMIC SECTOR

VIRLAB, an URBAR Ingenieros Group company, is more than thirty-five years old performing vibrations and shock tests, regarding all kind of electrical and mechanical equipment and components of any economic sector: Railways Transport, Energy, Defense, Aeronautical, Space and Automotive.

In their Asteasu facilities, between the cities of San Sebastian and Tolosa, in the Northern of Spain, more than 2,400 tests have been made until the end of 2015.

Virlab is accredited by the Spanish Accreditation Body (ENAC) according to the criteria listed in the UNE-EN ISO / IEC 17025:2005, regarding the Standards CEI/IEC



61373, IEC 60068-2-27 and IEC 60068-2-64

VIRLAB's largest independent bi-axial platform features:

- 2500x2500mm of usable surface,
- Max. power, 2x150kN,
- Max. displacement, ±125mm
- 800 mm/s max. speed,
- 6g max. acceleration and

► 0-200 Hz range of frequencies. VIRLAB's RAILWAYS Transport References:

CAF Group, Carbuers, Bombardier Transportation, Siemens Rail Automation, Ingeteam, Merak, Knorr-Bremse, Hispacold, KKK Electromateriales, Sepsa, Accento Acústica y Vibraciones, Kelox, Oasys Group...



Hall 22A Stand 701

GORATU PRESENTS THE NEW GEMINIS GT7/R FOR MACHINING WHEELSET AT THE INNO TRANS 2016

Goratu presents the latest generation of GEMINIS lathes at its stand at the Inno Trans exhibition in 2016, where the new GT7/R model, the

latest innovation in the range of GEMINIS lathes for machining wheelset, will be exhibited. Geminis has horizontal and vertical lathes, multiprocess machines and a new line specialized on solutions for railways to enable manufacture and maintenance of rolling stock

undercarriage parts, including axles, wheels and wheelsets. Goratu occupies 120 meters in Hall 22 – stand 701. Geminis GT7-R for machining of wheels set. Horizontal lathe for high power cutting.

Hall 22A Stand 704

GORGY TIMING: TIME SERVERS, PRECISION CLOCKS & DISPLAYS

GORGY TIMING is a French 40-year experienced manufacturer that designs, produces and sells time distribution and synchronization systems, as well LED communication displays and public address system. GORGY TIMING SPAIN and GORGY TIMING GmbH are the two subsidiaries of GORGY TIMING.

GORGY TIMING time servers are well known for their security and reliability: hot-plug, redundancy, power backup, and modularity. The digital clocks LED called LEDI® and LEDICA® consist of a matt anodized aluminum casing, a front anti-reflective and bi-colored emitting diodes to display the time in red, green, amber, blue or white depending on the version chosen. HANDI® analogue clock range is

GORGY  TIMING
LA MARQUE DU TEMPS



composed of a flat aluminum case, a white dial with black Arabic numerals and hands, ensuring easy visibility. In 2014 GORGY TIMING was

named leader of a consortium assembling all of the French experts in Time and Frequency around an innovative and ambitious concept: SCPTIME®.

Hall 2.1 Stand 219

GOAL SYSTEMS: SOLUTIONS FOR OPTIMIZED PLANNING, SCHEDULING, AND MANAGEMENT OF TIMETABLES, TRAINS, AND OPERATOR SHIFTS

GOAL SYSTEMS offers sector-specific planning and monitoring solutions, world-class technology to cover all the needs of a company's processes:

- ▶ Generation of frequency-based network timetables and track assignments
- ▶ Train equipment scheduling
- ▶ Shift assignments for all personnel
- ▶ Communication with the company's monitoring and control systems for an integrated management
- ▶ Day-to-day incidents tracking and monitoring
- ▶ Data acquisition for payroll calculation support
- ▶ Generation of reports and KPIs
- ▶ Simulation of new scenarios



▶ Integration with the current company's computer systems
References:
Bombela RapidLink, Casa Tram, Métro d'Alger, FGC, FGV, Lithua-

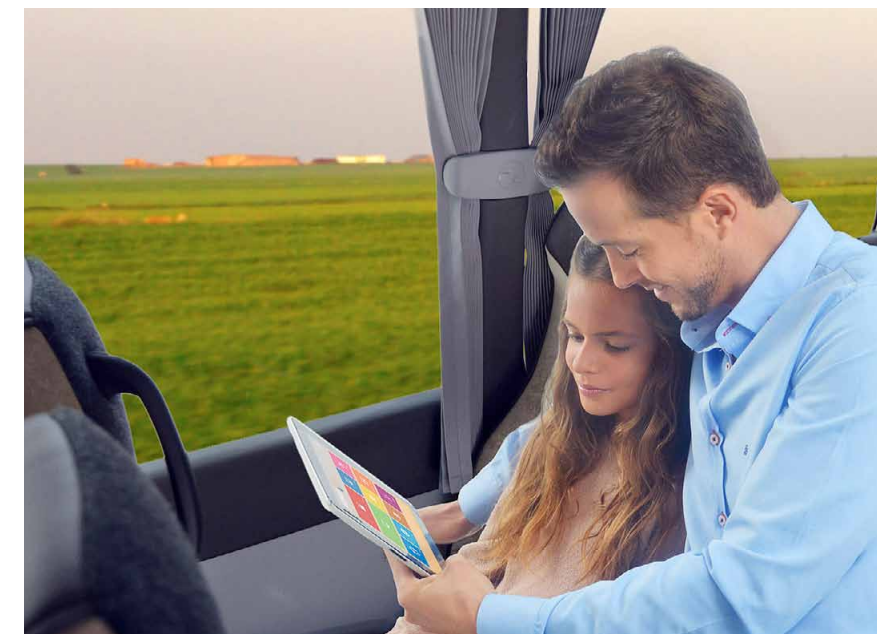
nian Railways, Metro de Medellín, Metrolink, MetrôRio, ONCF, Ratp RER, RATP Dev, RENFE, Saudi Railways, SNCF, Trambaix, Trenord, Turkish Railways.

Hall 4.1 Stand 205

AZIMUT EMOTION, LEADER IN ENTERTAINMENT WITH AZIMUT OPERATIVE DEVICE

Azimut eMotion presents an individual entertainment system for passengers, offering them the ability to access all kind of multimedia content wirelessly from their own device (smartphone, tablets and personal laptops) or from loaded screens; enabling passengers to enjoy a unique experience.

Aimed at high demand areas with a capacity to store more than 1,000 hours of content, and manage audio-visual material, movies, series and documentaries as well as other entertainment contents such as Wi-Fi for passengers (bearing one unique Wi-Fi network for entertainment and web browsing), music, videos, games, news, journals, book audios, tourist guides and other services such as surveys, publicity, access payments and corporate content. Its technology architecture and in-



novative design offers train operators the ability to stream content to their clients, with no added data costs. All content is inserted in the server and the remote loading is performed by the AOD cloud platform in real time. Azimut Operative Device, with its wide offer of secure contents, is a

low cost system and is easy to install, improving the train operator's image and increasing the customer loyalty. Providing entertainment for all the family and finally allowing our clients bidirectional communication. Azimut eMotion completes your installation with the new 10" and 12" Azimut screens.

Hall 15.1 Stand 201

**RELATS: FIRE PROTECTION
SLEEVING FOR WIRE HARNESSES**

Relats will present, during the Innotrans, its improved version of its sleeving Revitex VSCTF.

This sleeving is aimed to protect cables and wire harnesses used in trains in service in harsh conditions. It contains a special treated additive silicone rubber coating on top of a glass fiber braid characterizing the new sleeve with high temperature and fire protection properties. When in contact with direct flame, the sleeve creates a foam through an intumescent effect which protects the inside electrical cable and guarantees full service at least 30 minutes after ignition.

Main product features:

- ▶ Resistant to direct flame
- ▶ Self-extinguishing
- ▶ Very resilient to sand abrasion
- ▶ Fully operational within a large range of temperatures (-70°C up to +265 °C in continuous and peaks @ +300°C)
- ▶ EN 45545-2 certified.



Hall 25 Stand 215

**ELECTRAN-ELECTROSISTEMAS BACH,
S.A.:NEW SIL-4 AXLE COUNTER
GENERATION**

Electrans, with its headquarters in Barcelona, is a leading signalling company which designs, manufactures, installs and maintains safety equipment. This year the company is proud to announce the world debut of the new SIL-4 Axle Counter generation in Innotrans exhibition 2016. Among many others, its main features are:

Consistent with the new CENELEC regulation EN50617-2:2013.

- ▶ Digital communication between the track unit and the interlocking with Power Line circuit, including redundant communication for high availability applications.
- ▶ Selective wheel detection and GDS (Grouping Detection System) by a new signal processing system.
- ▶ Predictive maintenance of field devices.
- ▶ Automatic adjustment for installing and commissioning.



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Movies & Series



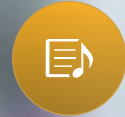
Music & Video



Live Satellite TV



Newspapers & Magazines



Live Satellite Radio



Tourist info guide



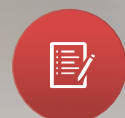
Wi-Fi for passengers



Corporate content



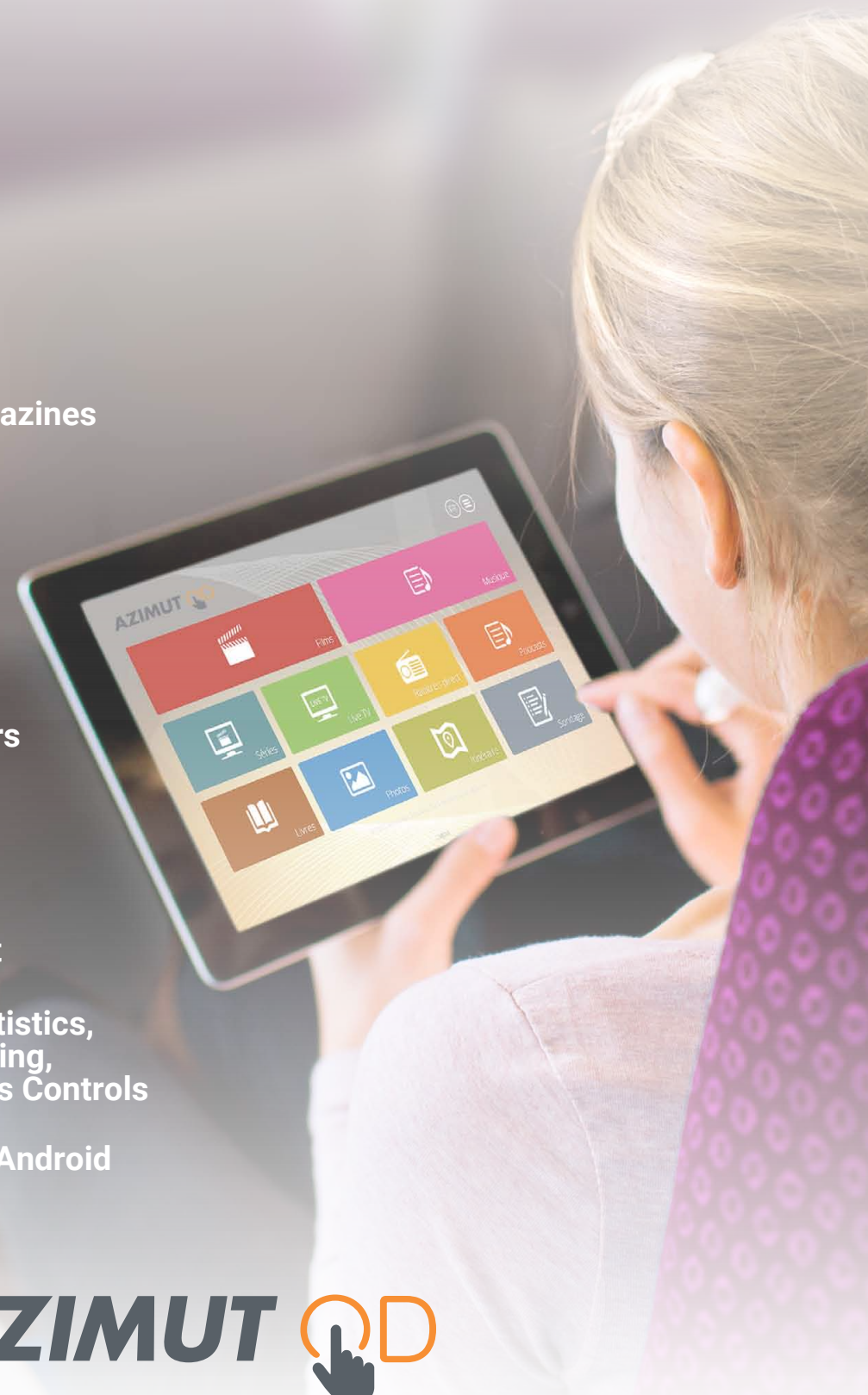
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Hall 3.1 Stand 336

MASATS LAUNCHES IN INNOTRANS A NEW RANGE OF PRODUCT

Masats will be launching in Innotrans the Passenger Screen Doors PSD: The Masats's Platform Accessibility System is a Platform Screen Doors system (PSD) that consists of a barrier installed at the edge of the platform that it is synchronized with the on-board door of the train.

PSD are an important safety device preventing accidental falls in the track and at the same time improving the climate control of the station reducing the noise and enhancing the quality of the air in the platform.

Masats offer a customized and modular PSD system to adapt to different platforms. The door design offers the maximum safety level (SIL) taking into consideration the highest requirements for availability and reliability (RAMS). The vanguard door design offers many possibilities for customization options and it can accommodate several utilities such as advertising signs, CCTV circuit, first-aid kits and others.



Masats will exhibit in Innotrans as well:

- ▶ Electric sliding doors for trams and trains
 - ▶ Evacuation system, including ramp and frontal door.
- Masats has 50 year experience in

the Public transport sector, including doors and accessibility systems. In their premises the products are designed in Catia V5, and they are tested in a huge prototyping department, where the most demanding tests are fulfilled.



Hall 3.1 Stand 234

ITSA: PROJECTS FOR INTERIOR SUBSYSTEMS

ITSA is a Spanish company specialized in the design and manufac-

turing of turnkey Railway Interior Components such as sidewall paneling, door entrance paneling, seats and ceiling.

We offer innovative solutions for

all the railway industry (high speed trains, metro and tram) that optimize costs, weights and subcomponents through the in-house engineering, along with ensuring they comply with the international quality requirements.

When transforming different raw materials and creating products, ITSA uses a wide range of in house processes: FRP SMC, SMC + PIMC, RTM, and PLASTIC INJECTION.

Additionally ITSA undertakes pultrusion, hand lamination, thermoforming, metal transformation and subcomponents processes through an expert panel of suppliers.

We manage all phases of the project:

- ▶ Tool & Product design
- ▶ Manufacturing
- ▶ Finishing & assembly
- ▶ Packaging & delivery

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- More than 50 years of experience in railway infrastructures
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OPERATIONS & MAINTENANCE

Martina Werner, member of the Committee on Industry, Research and Energy of the European Parliament

“If we want to bring change to the use of the railway, it is crucial to create a single European railway area that deserves its name”



THE COMMITTEE ON INDUSTRY, RESEARCH AND ENERGY OF THE EUROPEAN PARLIAMENT, WANTS TO MAINTAIN A STRONG INDUSTRIAL BASE TO HELP THE RAILWAY INDUSTRY. MARTINA WERNER SHARES WITH US THE MAIN ACTIONS THAT WILL BE IMPLEMENTED.

BRUSSELS. SPAIN

You are currently a member of the Industry, Research and Energy Committee of the European Parliament (ITRE). Which are the main areas of activity and objectives of this Committee?

I am the spokeswoman for industrial and energy policy for the German social democrats in the EU Parliament. My main focus in industrial policy is on how to keep a strong industrial base in Europe. That includes for instance working on measures to support the digital transformation of manufacturing industry and generally stimulating industrial growth and securing jobs in the EU. With regard to energy policy my main objective is to ensure a successful transformation to renewable energy and the design and implementation of a functioning Energy Union.

As you know, the European railway sector accounts for 46% of the global rail market, which proves to be a key sector for the growth of the European industry. What is this Committee currently working on in relation to our sector?

The ITRE Committee was the body in the European Union which put a spotlight on the rail supply industry by deciding to take up the work to draft a resolution on the competitiveness of the sector. In addition to that there are of course many other areas we are working on that have

an effect on the rail supply industry – from research and digitalisation to the setting up of the European Funds for Strategic Investment. The latter is a guarantee facility, which already enabled the funding of a transport project in Spain that dealt with rail and road access investments in state-owned ports.

In April, the draft motion for resolution proposed to improve the competitiveness of the European Rail Supply Industry, presented by you and your team in this Committee was approved. Could you please share with us more details regarding this resolution and explain how it will help European railway companies?

The resolution is a strong political signal that the European Parliament wants the Commission and the Member States to be more active in supporting the rail supply industry. It proposes concrete actions in nine chapters in support of the sector – from innovation and skills development to the EU's trade instruments, public procurement and the boosting of investments. Maybe most importantly we expect from the Commission to install a permanent high level dialogue for the rail supply industry. Such a forum would enable a continuous discussion on the challenges of the sector and possible solutions. This way the follow-up to the resolution is institutionalised. In addition to that we ask the Commission to develop a long-term in-



Martina Werner during a conference of UNIFE.

dustrial strategy for the rail industry and to include it in the general EU industrial policy strategy that is announced for 2017.

“We ask the Commission to extend its support for the internationalization of SMEs. Industry groups within the framework of the Enterprise Europe Network could be valuable in this regard.”

In some cases, we see with a certain distance the measures and actions presented and implemented by the EU, and especially those regarding small and medium enterprises. In this sense, how is the ITRE Committee going to support SMEs in the railway sector with such resolution?

Supporting SMEs was one of the

central goals of the resolution. We decided to include a dedicated SME chapter. SMEs in the rail supply industry tend to depend on one dominant national system integrator. We ask the Commission to upscale its support to SME internationalisation. Sector groups on rail in the framework of the Enterprise Europe Network could be valuable in this regard. We also highlight the problems that exist with regard to access to finance. The SME instrument in the EU's research programme “Horizon2020” makes it easier also for SMEs to apply for research funding. However, we need more instruments like that which don't put a huge bureaucratic burden on small companies. The SME participation in the dedicated rail research joint undertaking “Shift2Rail” is unfortunately low. I doubt that many SMEs will profit from the 920 Million Euro available. Therefore, we pressure the Commission to adjust the programme to fit the needs of SMEs.

The European rail sector invests around 2.7% of its annual turnover in R&D, which is one of its strengths in terms of global leadership. How do you think the European institutions should support the industry so that this percentage is similar or even higher in the future and maintain the current global leadership of the European rail industry?

First and foremost it is in the companies' own interest to keep on investing in research and innovation. Asian manufacturers have turned away from mere mass production. By now, there is high-tech made in China, too. The first fuel cell tram in operation might very well come from Changchun in China. The EU has limited resources at hand to support investments in rail R&D. Therefore, concentrating on areas where there is a clear added-value is essential. This is the case for investments in interoperability, digitalisation, reliability and noise reduction as they contribute to making rail transport more attractive. A second focus should be the support of rail innovation clusters such as the Spanish ‘Railgrup’. Supporting clusters is also a strategy with a special benefit for SMEs. We are calling for an increased engagement of the Commission in this regard. Thirdly, the rail supply industry is a very diverse sector. Therefore, different financial sources at EU level are available. The Connecting Europe Facility with a budget of 26 billion, the Structural Funds, the research programme “Horizon 2020” with Shift2Rail and the new European Fund for Strategic Investment all come to mind. The EU is working on ways that make it easier to combine several funds for one project, but this has to be sped up.



“The EU has limited resources available to support investments in rail R&D. Therefore, concentrating on areas where there is clear added value is essential.”

Finally, homework for the rail supply industry itself: the sector should start thinking outside the box. I suggest to reach out to the ICT world and the financial sector.

The railway is known to be one of the most sustainable and respectful with the environment transport means, as well as a key element of competitiveness for our industry. In your opinion, which measures should be implemented in order to support the objectives of modal shift to railway included in the Transport White Paper of 2011?

Two thoughts on this question. Firstly, we still have a highly fragmented market in Europe. Travelling by car or plane across borders still tends to be easier for customers than to take the train. If we want to achieve a shift to sustainable mobility - and that means a shift to rail - it is crucial to create a Single European Rail Area that deserves its name. Therefore we support our colleagues in the Transport Committee by endorsing the swift implementation of the fourth railway package. In my view a leading role of ERA, but also the thorough involvement of CEN/ CENELEC is important. Secondly, there has to be a fair competition of the different modes. This is currently not the case. Due to track access charges and other factors rail transport has a competitive disadvantage towards road transport. This is especially a call to action for member states.

The European Union is open to competition from companies from developing countries. However, access for European companies to other markets does not offer the same or similar reciprocity in many cases. The industry demands to gradually correct this inequality. What do you think should be done or is being done by the European institutions in this regard?

Indeed this is a particularly impor-

tant issue. The European Parliament has been pushing for a reform of the trade defence instruments for a long time. It is blocked by member states in the Council. Don't get me wrong. We do certainly not want to start trade wars, but reciprocity has to be the guiding principle of our trade policy. It is about creating a level playing field. Companies from third countries especially from China and Japan are entering the European market, but at the same time they increase the obstacles for European competitors. This is not acceptable. The Commission has to address this imbalance in all negotiations on trade and investment agreements. Finally, the new EU public procurement directives allow authorities to choose the most economically advantageous tender (MEAT) which includes criteria such as life-cycle costs. Many companies from third countries still compete merely on the basis of the lowest price. Therefore, European companies still possess a competitive advantage. We need to push member states to implement this framework thoroughly.

And finally, recently you have maintained an intensive contact with European railway associations. What is your opinion about the work they do? What would you recommend them?

I have indeed met with a lot of representatives from the industry in the last months. I met highly innovative and healthy companies. I spoke to motivated and very skilled employees. In my view, the industry could try to collaborate on more projects than they currently do. CRRC is more than double the size of all three major European players combined. This is probably going to be the competitive setting of the future. Europe should join its forces especially in research and development. My conviction is that this will contribute to industrial growth in Europe and secure jobs and long-term global competitiveness.

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The railway in the Nordic countries

SWEDEN, DENMARK, NORWAY AND FINLAND WANT TO IMPROVE THEIR RAILWAY NETWORK.

NORWAY

Despite the high degree of development of Norway, its transport infrastructure needs to be adapted to a growing population and adverse geographical conditions. The Government has launched an ambitious modernization program that offers multiple opportunities for international companies.

The Norwegian rail network consists of 4,114 kilometres of standard gauge lines, of which 242 km is double track and 64 kilometres are High Speed (210 km / h).

The entire network is owned by the Norwegian National Rail Administration, while all passenger trains on domestic routes, except the Airport Express Train, are operated by the company Norges Statsbaner (NSB). Investment in new infrastructure and maintenance is financed by the state budget, and subsidies are provided for passenger train operations. NSB operates long-distance trains, including night trains, regional services and four commuter train systems, around Oslo, Trondheim, Bergen and Stavanger.

Despite the high degree of development of Norway, its network of transport infrastructure needs to be adapted to a growing population and adverse geographical conditions. The Government has launched an ambitious modernization program that offers multiple opportunities for international companies who want to participate.

With almost 400,000 km², a geography riddled with lakes and fjords and an extreme climate, the development of the Norwegian infrastructure has been a need that has been constantly postponed due to its, but has been



widely demanded by the population as a means to articulate the country. We must highlight the poor development of the railway and, especially, roads, while airport infrastructure, with the aircraft as the transport mean preferred by the Norwegians, and shipping, in a country with a strong fishing

and offshore industry, are in much better conditions, being in line with one of the most prosperous economies in the world.

National Transport Plan

Aware of the challenge for economic and social structure, and pressure from

population growth experienced in recent years, the Norwegian Government has made infrastructure developments in the centre of the agenda through the fourth National Transport Plan, corresponding to the period 2014-2023. This public investment is 50% higher than the previous, reaching a budget

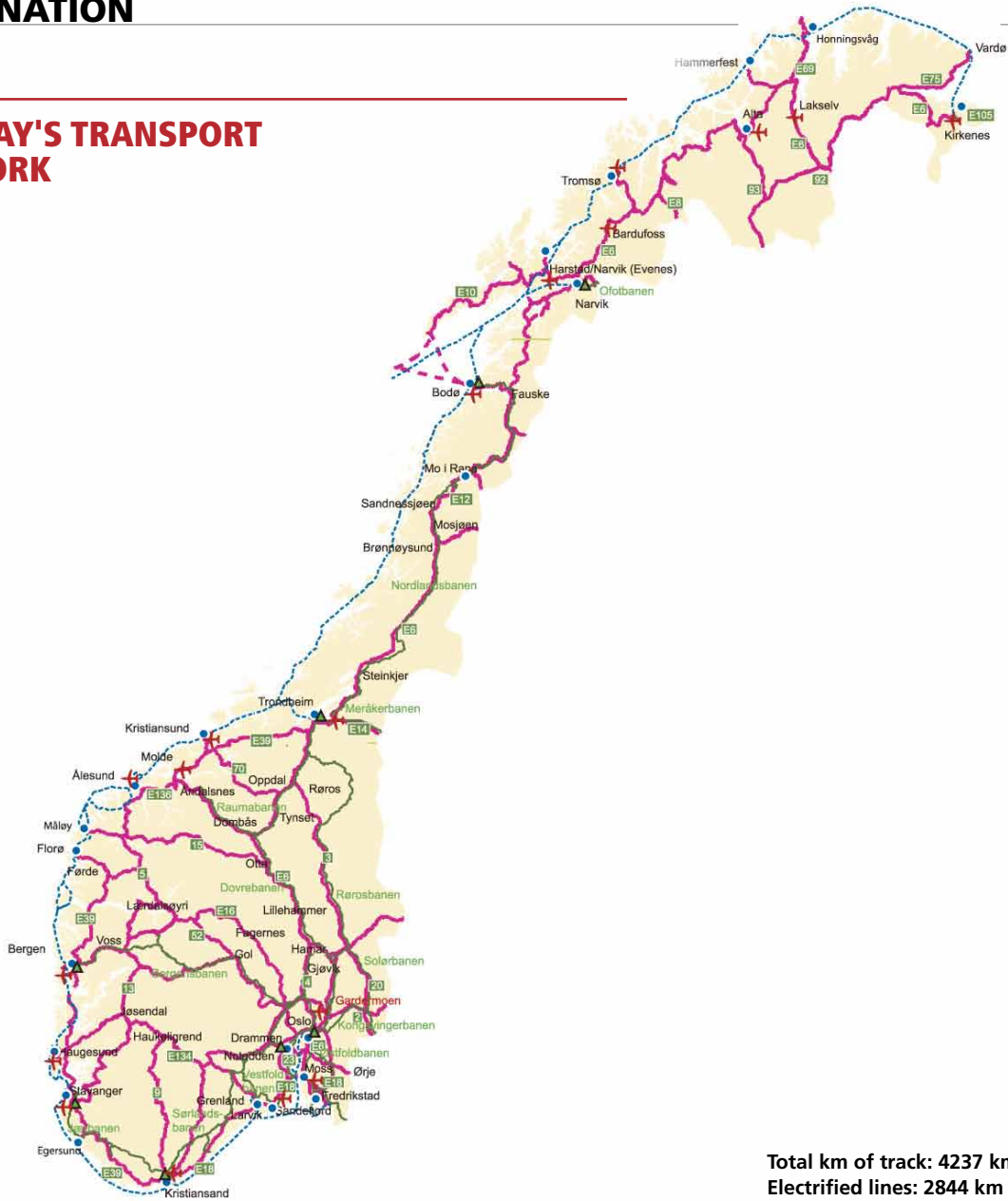
of 58,800 million euros allocated to rail and roads. To this should be added 11,350 million obtained through the installation of tolls.

The program includes 71 projects, of which 31 will be launched during the first four years, with which it is expected to modernize the system, making it

simpler, faster and safer.

The aim is to improve the competitiveness of the industry and articulate urban -especially in the most populated area of Oslo- and regional development. In addition to expanding the existing network, the construction of major projects is also expected, as

NORWAY'S TRANSPORT NETWORK



the north-south road corridors or the first tunnel for ships in the world. The Spanish OHL Group obtained an award worth 265 million euros for the reconstruction and adaptation of the railway station Ski to High Speed. This project is part of the Follo Line, the largest rail initiative in the history of the Nordic country. The Government aims to develop a modern transport system that will make traffic flow easier, faster and safer. This will increase competitiveness of the industry, improve urban environments and promote regional development. A robust high-level infrastructure will also improve traffic safety and make the transportation system accessible to the largest possible number of people. Moreover, the

Government will develop the transport system to limit its environmental impact and help the transition from Norway to a low-carbon society. The guidelines established by the Government for the development of a transport system are included in the white paper Norwegian Climate Policy MELD. St. 21 (2011-2012). This document is the foundation for a comprehensive political agreement on the problem of climate change - known as the Climate Agreement. The basis of the government is a long-term strategy which will include how to develop the transport system. This strategy is based on exploiting the advantages of each mode of transport and strengthening the interaction between them to facilitate the efficient

use of resources. Regarding rail transport, the Government gives high priority to the development of routes Inter-City (IC). At the end of 2024 there will be double track lines adjacent to Tonsberg, Fredrikstad and Hamar, which will enable the establishment of train services with a frequency of half hour throughout the day. In late 2026, double track will extend to Sarpsborg. The Government expects that future planning will be aimed at the completion of the entire IC system in 2030. Construction of the Oslo-Ski Follo line will start at the beginning of the National Transport Plan period. E6 via Sør and Nord-Trøndelag will have significant improvements. The Government will also give priority to the modernization and electrification of the lines Meråker

and Trønder during the period. The increased level of average investment for railways in more than 50 percent compared with the final 2013 budget, NOK 6.1 (0.8 million euros) to NOK 9.2 billion (1,2 million euros) a year. Allocations for investments rep-

resent almost double its investment in large projects. This will enable the development and modernization of the railway in the central area of eastern Norway, in the region of Bergen and Trøndelag. In addition, measures to increase the capacity of the line Ofoten

have high priority during the plan's period. Strong growth in rail investment will be used to strengthen the infrastructure around larger cities so that rail can play a key role in restructuring the public transport system.



THE FOLLO LINE PROJECT

The Follo Line project is currently the largest transport project in Norway and includes the longest railway tunnel in the country. The Follo Line will form the central part of InterCity, south of Oslo. The project will consist of a tunnel of 20 km long and will be the first railway tunnel with double long track in Norway. In addition, extensive works in Oslo Central Station and the construction of a new station in Ski are included. The necessary restructuring of avenues for

Østfold line is also planned. Another action included in the project is the construction of about 64 km of new railway lines. Works on the tunnel, the longest currently in the Nordic countries, will be carried out with tunnel boring machines (TBM) and will provide greater traffic capacity to and from Oslo. It will allow a 50% reduction in travel time between Oslo and Ski. The trains are designed for speeds up to 250 kmh.

Phases of the project
Preparatory works began in 2013 and were completed in 2015. The EPC contracts began last year and will continue throughout this year. The construction of the main phase has already begun and is scheduled to become operational in late 2021. Norway's National Rail Administration has awarded Baneservice and Società Italiana per Condotte d'Acqua S.p.A. two new contracts in connection with the Follo Line Project, subproject of Oslo's Central Station.

DESTINATION

NORWAY

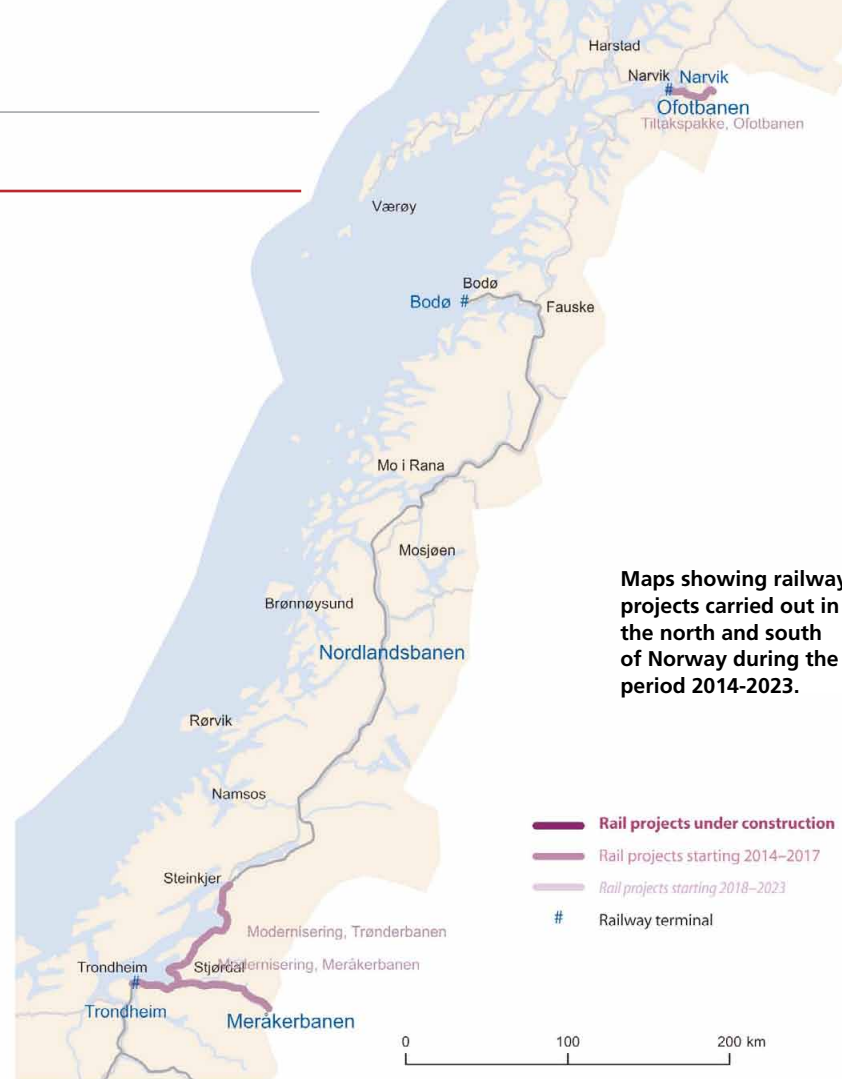
ERTMS IMPLEMENTATION

Norway's National Rail Administration (Jernbaneverket) is committed to carrying out the ERTMS implementation in the Norwegian railway network. According to the National ERTMS Implementation Plan of Jernbaneverket, in 2030 a description of high-level signalling renewal program and implementation of ERTMS Level 2 baseline 3 will be completed.

The planned sequence and timing for implementation are aligned with several factors:

- The age of the existing signalling systems
- The need to eliminate railway sections without interlocks
- The need to avoid "islands" with class B systems
- A desire for the initial deployment of the new TMS

The total cost of implementing the ERTMS program in Norway is estimated approximately in 1.7 billion and 2.2 billion euros.



Maps showing railway projects carried out in the north and south of Norway during the period 2014-2023.

Railway projects Northern Norway 2014-2023



EUROPEAN JOINT PROJECT LINE 6-DOVRE

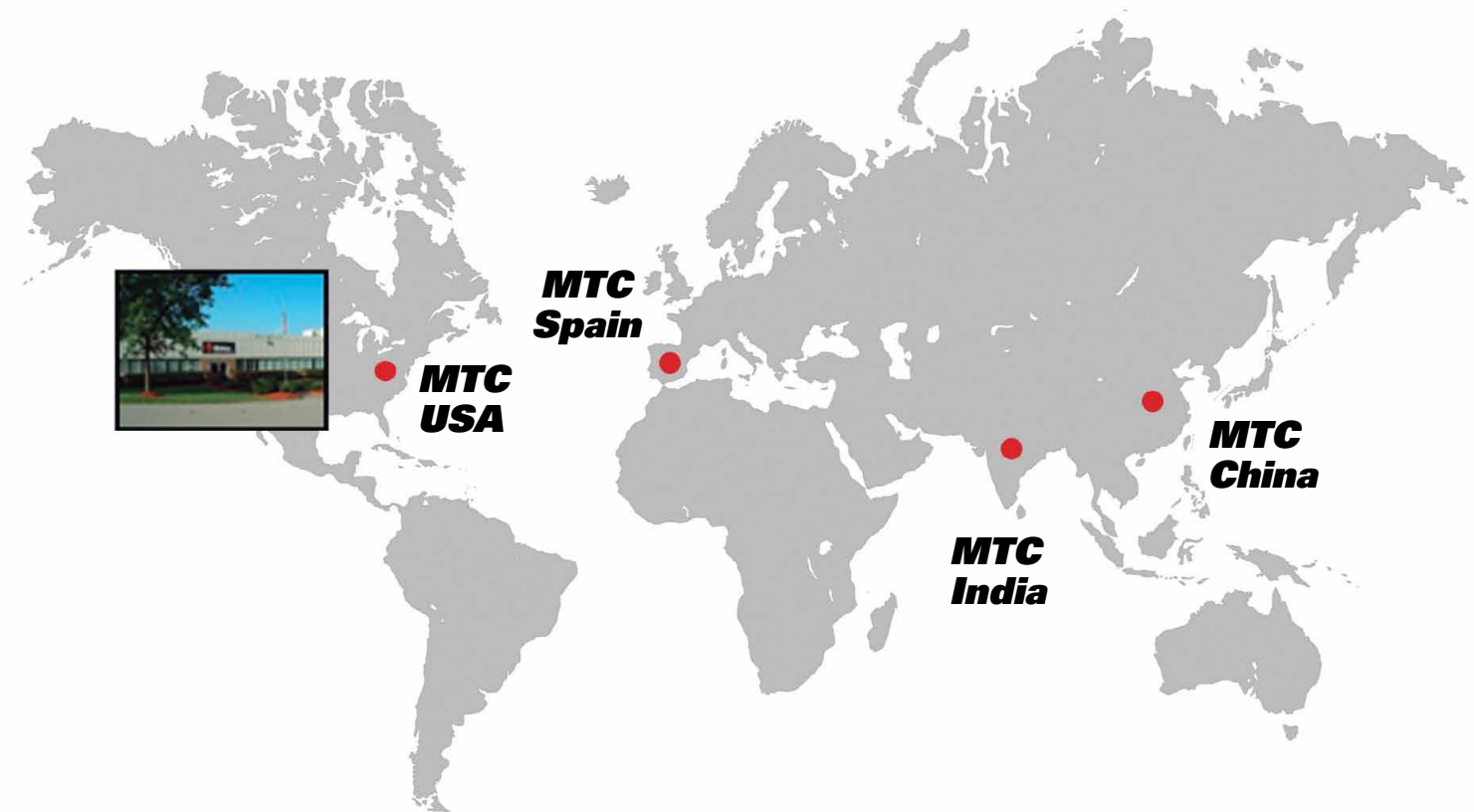
Norway's National Rail Administration is working with Norwegian Roads on the stretch of the line between Minnesund and Kleverud. This collaboration has been formalized in the European Road 6-Dovre. The agencies are currently formulating zoning plans and the construction of a double track, as well as the European road 6. Both the European railway line and the road will be developed simultaneously along this section. The reason for establishing a joint project is to agree on the overall planning of the transport corridor along the Vorma River and Lake Mjøsa.



MTC

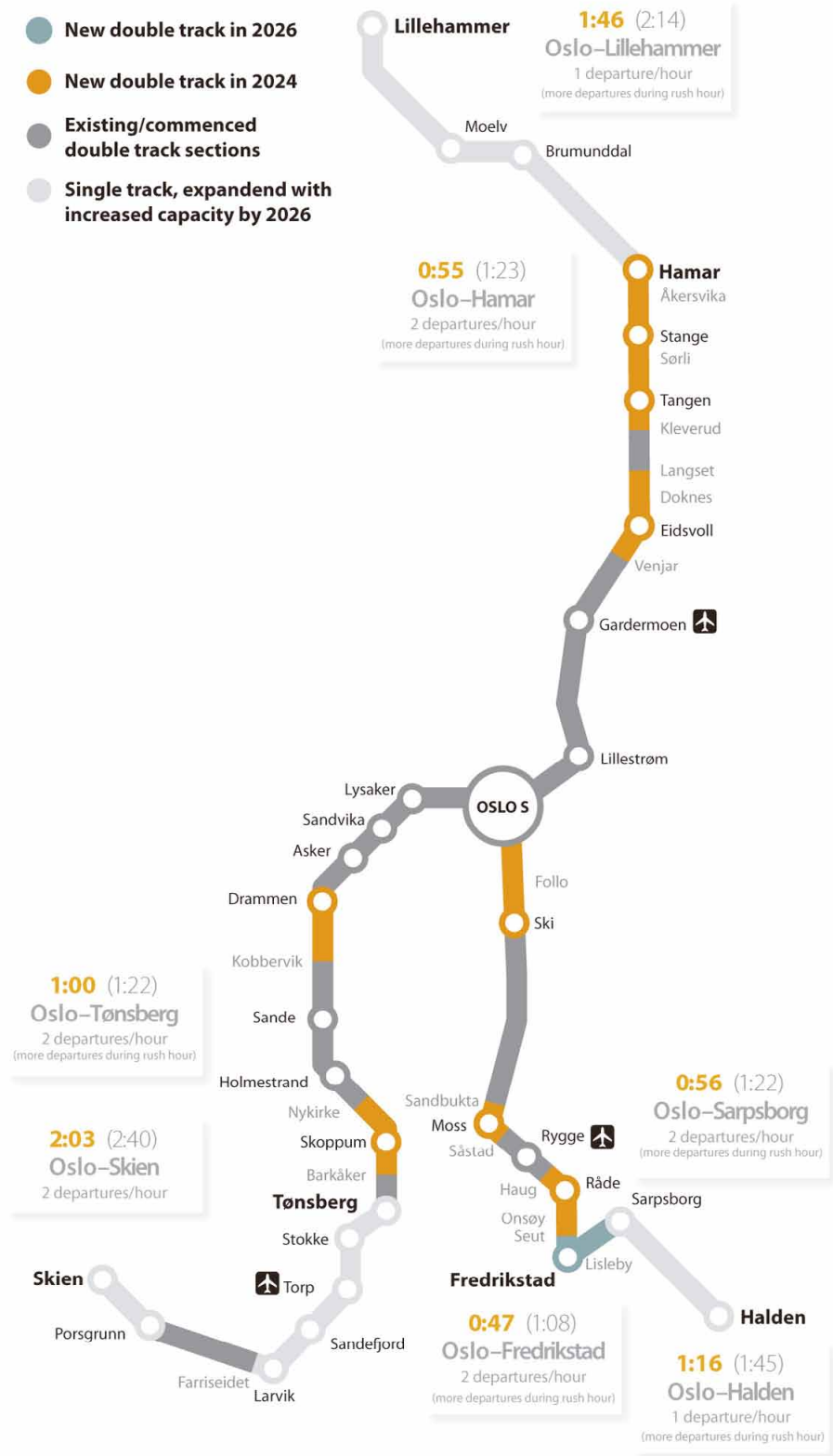
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30 KM OF DOUBLE TRACK

According to the National Transport Plan 2010-2019, 30 km of double track will be built between Minnesund and Steinsrud. This will provide saving travel times about 10 minutes for passenger trains. The line capacity will also increase, but not enough to be able to run more trains on the entire section. It will only be

possible to double the number of train departures when the entire section between Eidsvoll and Hamar is completed. This section of the line includes the following sections:

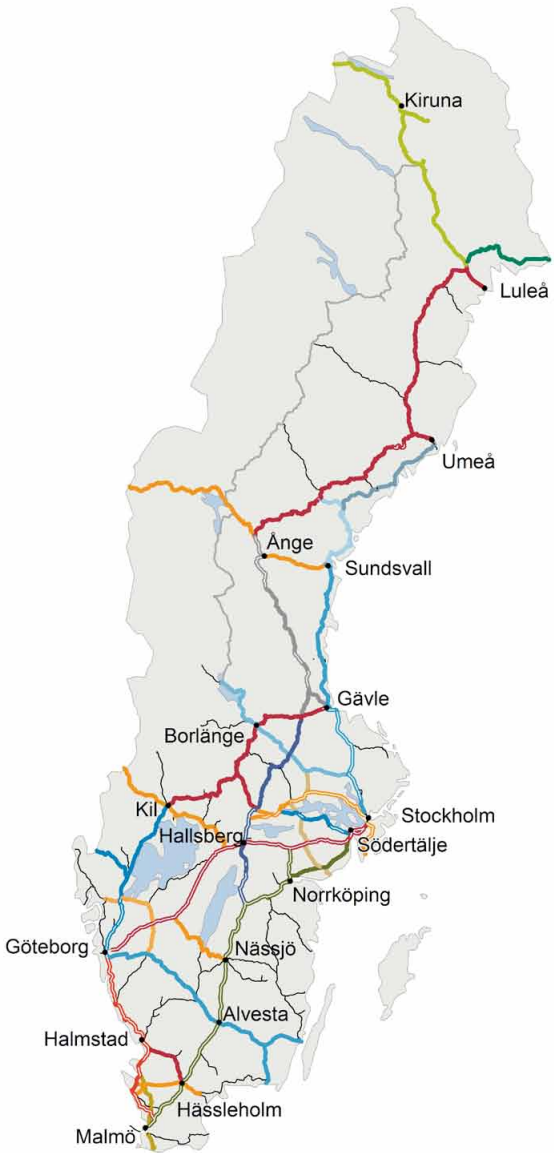
- Eidsvoll-Minnesund, about 7 km
- Minnesund-Kleverud, about 17 km
- Kleverud-Steinsrud, about 13 km
- Steinsrud-Sørli, about 3 km
- Sørli-Hamar, about 20 km

It is one of the busiest sections of single track in Norway. With a double-track line along the entire route, travel time of passenger trains between Oslo and Hamar will be reduced to one hour. It has been estimated a budget of around 10 billion Norwegian kroner for the whole section and the double-track line is expected to arrive in Hamar for 2024.

With a large area that ranks as the third largest country in the European Union, it has one of the lowest population densities in Europe. This involves great challenges in connecting the various, widely scattered population centres throughout the geography of the country.

Its population is highly concentrated in the south of the country, especially in the three major cities: Stockholm, Gothenburg and Malmö, where 51% of the Swedish population is accumulated. Furthermore, the trend in recent years shows a clear increase in population in the regions of these cities, which shows the need to incorporate a greater amount of infrastructure to improve the mobility problems caused by a growing population. The various Swedish public administrations, with Trafikverket (Swedish Transport Administration) as head of the operation and management of transport infrastructure, jointly plan different projects. However, having different levels of decision involved, the first part of the planning process and obtaining permits can be very complicated and spread over time for several years. The total supply has been increasing in recent years, with increased investments in infrastructure they have exceeded expectations and objectives of the administrations themselves. However, the number of proposals received by Trafikverket has descended on the number of projects tendered in recent years, both in the rail sector and in infrastructure projects in road transport. During the next few years, different projects with their corresponding bids will be carried out. The prospects offered by the sector show a clear need to incorporate new technologies, especially in the field of High Speed, where the country has little experience (not exceeding 250 km/h) and to which the country is devoting large amount of state investments. The first two projects of the future network that will connect the 3 main urban centres of

the country, Stockholm, Gothenburg and Malmö, are already planned to take place in the coming years. To the east, the section between Stockholm and Linköping will be executed, while works in the west of the line between Gothenburg and Borås will begin. These first two lines represent two of the major investments of the new infrastructure plan. However, these are only the first two sections of the future Swedish network. High speed is starting to being developed in Sweden and the necessary works to completion are expected to extend over several decades. The arrival of High Speed to the airports of Landvetter and Skavsta require adapting existing facilities and building intermodal stations to improve accessibility for travellers. The connection of the major Swedish airports by rail is one of the main commitments of the central administration, which has shown interest in incorporating foreign companies that can provide technical expertise and practical experience, to promote air transport and the accessibility of their facilities, located several kilometres away from the urban centres. Another investment item will go to ERTMS signaling systems. The Parliament has decided that all new infrastructure to be built and those in which investments are expected must follow the standards of ERTMS, entrusting the task of introducing this system to Trafikverket. The ERTMS project is one of the most important priorities of the Swedish Ministry of Enterprise and Innovation and represents one of the largest investments of this Infrastructure Plan. Other projects like The E4 Stockholm Bypass, The West Link or The Mälaren Line include the construction of major infrastructure that will require the participation of foreign companies. The large number of bridges and tunnels planned in different government projects show an interesting field of action for international companies. The railway network has a total length of 12,821 km of railways, of which 7,963 km are electrified lines and there are



General railway map of the different lines.

nearly 600 train stations throughout the country. Trafikverket owns and operates about 90% of the network since April 1, 2010, date until which was managed by its predecessor Banverket, the Swedish Railway Agency. Rail transport, both passenger and freight, is liberalized, although the 2 main companies operating on the SJ, (passengers) and Green Cargo Network (freight) are public companies. Rail traffic in Sweden has increased considerably over the last 20 years and is a very common transport mean among Swedes, who do about 500,000 trips daily.

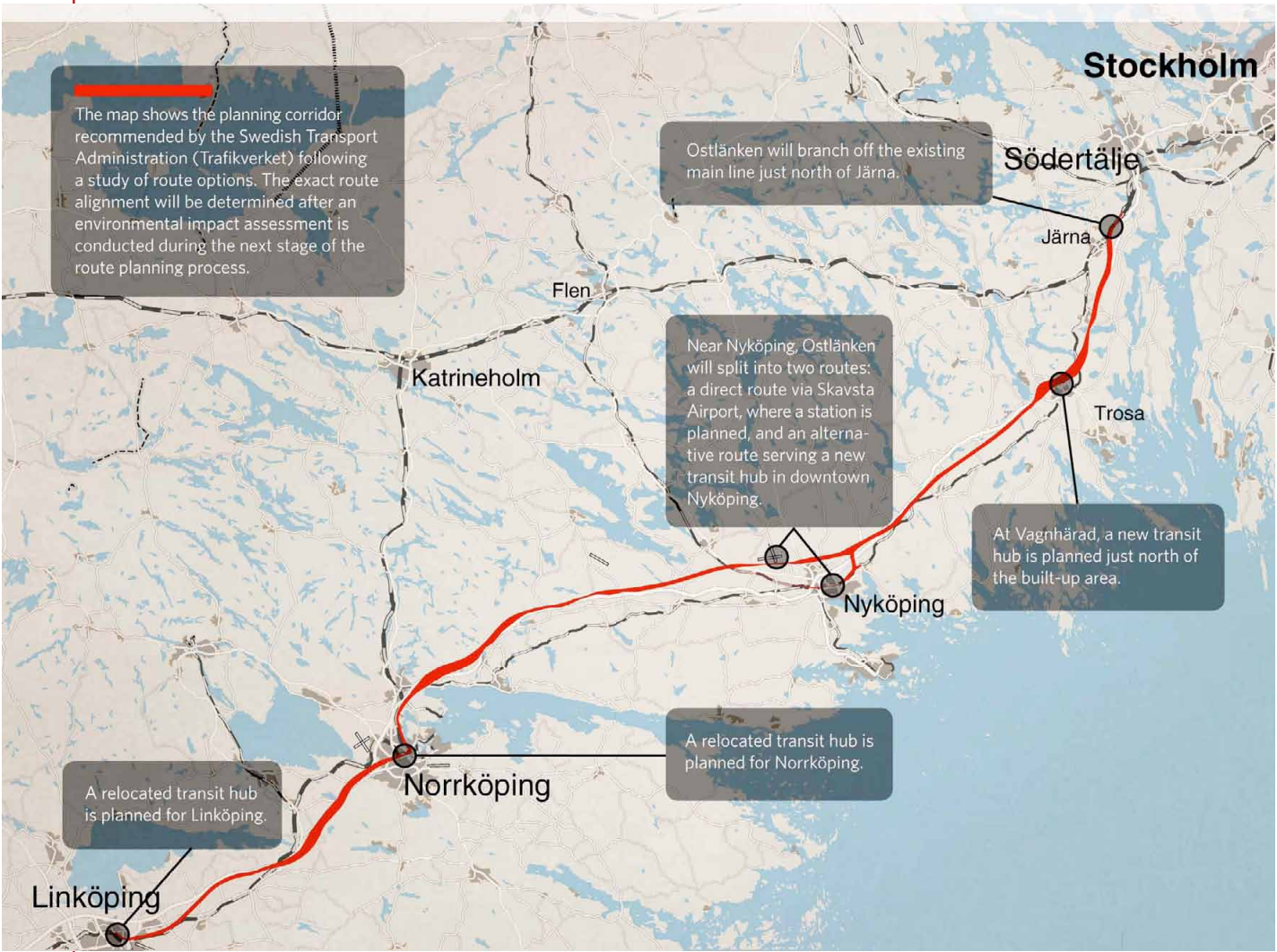
SWEDEN

HIGH SPEED

The extensive network of trains is individually managed by each of the regions and especially in the most populated, traffic is very high and generates numerous political debates on development. But undoubtedly the star project of the plan, which has generated great interest in the country, is the first high-speed line linking the two largest cities, Stockholm and Gothenburg, at a speed of 320 km/h. After several years of debate and various proposals, the project is beginning to take shape with the development of the first two sections between Stockholm and Linköping (Eastern section) and between Gothenburg and Borås

(Western section). However, it remains unclear when the stretch Linköping-Jönköping-Borås will be approved, for budgetary reasons, despite the increased investments in the rail sector, due to the great emphasis on infrastructure maintenance that leaves other projects without funds. However, thanks to the great political and social support that the new line has and to the fact that it is expected to connect with the third largest city, Malmö, forming a Y-shaped network, the project will decrease travel times and the use of vehicles and flights. In addition, agreements with various municipalities and provinces favour the development of metropolitan

transport networks, especially in the three major urban centres. Investments also included 3.5 billion kronor destined to infrastructure that will facilitate mining activities for the industry to continue to contribute to employment and growth, especially in the central regions and the north. Government investments represent a great stimulus for operation and maintenance works with the main aim of increasing the reliability of the railway system. Investments in this sector have been increased by more than 20 billion kronor compared to the previous plan. The biggest challenge presented in this sector is to solve the bottleneck of Stockholm's central station.



STOCKHOLM LINKÖPING
The 154 km High Speed railway line between Stockholm and Linköping will connect to the airport of Skavsta. The two-way network is intended as a

future connection to the major cities of Scandinavia, joining the Swedish capital with Gothenburg and Malmö. The project includes 20 km of tunnels and 155 bridges, totalling 10 km over the bridge. This

is the largest investment of the national infrastructure plan 2014 - 2025 and is scheduled to start operation in 2028. **Budget: SEK 35,500 million (2013 price)**



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It corresponds to a stretch of 60 kilometres of the future line connecting Stockholm and Gothenburg. Over the next two years, dialoguing with suppliers, making the necessary arrangements between 2017 and 2018 and begin construction in 2020 is expected.

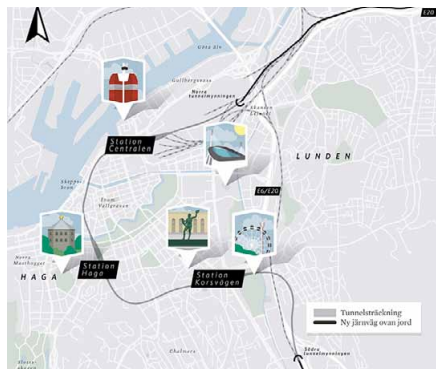
The map illustrates the proposed coastal road route from Gothenburg to Borås. Key locations marked include Kungälv, Alingsås, Lerum, Gothenburg, Mölndal, Landvetter, Molnlycke, Bollebygd, Borås, Viskafors, Kungälv, and Kinna. The 'COAST-TO-COAST LINE' is shown as a dashed line. The proposed road route is indicated by a green line with '40' markers. A grey shaded area represents the 'Inquiry area'. An inset map shows the location of the study area within Sweden, with an arrow pointing 'Towards Stockholm'.

Project for the expansion of the railway network between Malmö and Lund, from 2 to 4 tracks. Among the most important issues that motivate their construction is the excessive noise that occurs with current lines and the inter-

section with the E6 motorway connecting with the rest of Europe. In addition, 5 km of temporary roads will be built to keep excess line traffic during construction works. The planning stage is expected to continue until 2016, while contacts with suppliers will be held un-

til 2017, the same year in which construction will begin and completed in 2022. Although the project is divided into several sections, there will only be one tender for the contract of the entire project (design and construction).

Budget: SEK 3,800 million



8km railway line, of which 6 km will run through tunnel and will cross the centre of Gothenburg, which is the largest project of transportation infrastructure west of the country and will double the current capacity and create three new stations in the centre of the city. The project is divided into several contracts (design and construction) of

around 300 to 400 million Euros. The pre-qualification for some of them was carried out during the first quarter of 2015, while for others it is scheduled for autumn this year. Construction will begin in 2017/2018 and its commissioning is expected for 2026.

Budget: SEK 20,000 million

Expansion of the capacity of the commuter line between Tomtebodavägen and Kallhäll, from two to four tracks, in a section of 20 km, as well as the construction of 3 more stations. The project is divided into 3 sections. The first has already begun works while the other 2 are still in various stages of planning and during the next year meetings with potential suppliers will be coordinated.

Railway project under planning phase. A 7.5 km, double track tunnel in the centre of Varberg to increase capacity between Malmo and Lund. It includes the construction of a new station and a logistics zone for goods. The design process will take place between 2016 and 2018 and its construction between 2019 and 2024.

The project is still under development and includes a new infrastructure for signalling in several thousand kilometres of roads. The first project will take place in the main southern line between Stockholm and Malmö, which is scheduled for 2017. The next priority is the line that connects Luleå and Narvik, Norway. Implementation will begin in 2018 and end in 2030.

Budget: SEK 10,800 million



Between 2016 and 2025, the Stockholm metro network will be extended by approximately 19 km with the construction of 4 new sections between Kungsträdgården and

Nacka (7.7 km), Sofia and Gullmarsplan/Söderort (3.3 km), Odenplan and Arenastaden (4.6 km) and Akalla and Barkarby (3.4 km). In addition to the extension of the network, at least 9 new stations are included in the

plan. The start of construction of the new sections are planned between 2016 and 2018 and operation of the various lines between 2020 and 2025.

Budget: SEK 19,500 million





In April the Finnish government presented its investment plan for the period 2017-2020. Apart from the light rail Raide-Jokeri (€275 M), it will also participate, in other important projects.

The government decided to improve the rail link Luumäki-Imatra in the vicinity of the Russian border to expedite the crossing of goods and people across the border between Finland and the town of Svetogorsk. It is estimated that the total cost of the project is € 165 M and is scheduled to begin construction works in 2018. Apart from this information on the projects, note that it is expected that during 2016 the conditions for the opening to competition of rail transport services for passengers will be defined.

Baltic Route

"Rail Baltica" Warsaw-Kaunas-Riga-Tallinn-Helsinki is one of the 30 priority projects of the Trans-European Transport Network (TEN-T) of the European Union and its main objective is the economic integration of the Baltic countries and Poland with eastern Europe. The provisional length of the railway line will be 728 kilometres, including 264 kilometres in Lithuania, 235 in Latvia and 229 in Estonia.

The network's development is conditioned by the widths of the existing track. On the one Poland and Germany (1435 mm), the Baltic countries (1520 mm) and

Finland (1524 mm). Preliminary studies conducted in 2011, estimated a cost of 1,500 million euros for the implementation of the first option and 2,400 for the second, although more recent estimates put the total cost at 3.600 million. The project will be implemented following the European standards and the trains will run on rails of 1435 mm.

One aspect of greater complexity is connecting the cities of Helsinki and Tallinn, separated by the Gulf of Finland and a distance of 80 km. The construction of a tunnel from Helsinki to Tallinn, which would provide a rail link between the two cities, is debated in the Nordic country. According to a preliminary study published in early 2015, the estimated cost of the project would be between 9,000 and 13,000 million Euros, of which approximately 4,000 million correspond to the construction of the tunnel.

At the end of 2015, the Rail Baltica project took a major step forward with the signing of three agreements with EU subsidy. The decision to support the planning and development of three rail projects in the three Baltic countries and Poland with 734 million Euro destined to the project Rail Baltica through the mechanism "Connecting Europe" (Connecting Europe Facility, CEF) was approved. In addition, to ensure the EU co-financing for other stages of the project's development, Estonia, Latvia and Lithuania submitted applications for the second call for proposals and finally 202 million Euro will be allocated to the three Baltic countries to develop rail connections

under the Rail Baltica project.

Arctic route

Currently, transport connections in Finland and the EU to the northern regions of Norway, northwest Russia and the western end of the North sea route are limited to road connections. During recent years in Finland, interest in developing a competitive, fast and environmentally sustainable transport system in the area to improve connectivity and competitiveness especially in the north has raised great interest. However, the rail connection to the Arctic Ocean is not considered an immediate need for the current government, but an interesting possibility for the future.

Initially, plans to build a broad-gauge railway starting from a deep water port located on the Norwegian coast of the Arctic Ocean were developed. The aim would be to use the corridors and existing transport means as a basis for identifying the different alternatives for the railway route: the total length of a possible path, the main option would happen in the town of Kirkenes (Norway) to Rovaniemi (Finland) and it would also provide significant improvements for the industry. We analyzed the possibility of implementing the railway in two phases of development. According to preliminary plans submitted by the Arctic Corridor project, the first phase would be completed by 2020, to the city of Sodankylä in northern Finland and during the second phase of the rail-

way construction the Arctic Ocean would be reached and that stretch would be completed no later than 2030.

"Raide-Jokeri" light Rail

The new light rail line will connect the Finnish capital city of Helsinki with the second largest city in Finland, Espoo, which is also located in the metropolitan area of Helsinki. Chances are that the bids for planning and construction works related to Raide-Jokeri will be launched in summer/autumn 2016, once the final decision on the project's implementation has been taken.

The development of the Raide-Jokeri plan, the fast tram line in the Helsinki's metropolitan area, has been completed. It is estimated its total construction will cost 275 million Euros.

Contrary to perceptions exposed earlier, the Finnish government has approved a proposal to finance a third of the investment, and offers a stake of 84 million Euros to be allocated to the project between 2017 to 2019, with the aim of promoting the construction of new homes in the metropolitan area. The city of Helsinki will cover an investment of 129 million Euros and Espoo the 63 remaining millions. The initial budget submitted with the development plan of the new line that

would link the town of Keilaniemi in Espoo with Itäkeskus in western Helsinki, included, despite the total cost of the construction of the railway of the new tram, an estimate of other costs such as: 64 million Euros allocated to the construction of garages, 85-95 million euros to the acquisition of equipment, cars, etc. and 1.6-2 million allocated annually for maintenance. According to the latest data released, construction works are scheduled to begin in 2018.

Tampere City Light Rail

No later than during the month of October, the council will share the final decision on the execution of the project. As for the bidding, the city of Tampere reinitiated in April the process of acquisition of rolling stock.

Turku City Light Rail

The project has not progressed much since the initial planning process began in early 2013.

Helsinki Metro. Länsimetro

The extension of Helsinki's Metro will take place towards the city of Espoo and west of the metropolitan area. The new metro units supplied by the Spanish CAF, will begin operations in the section of

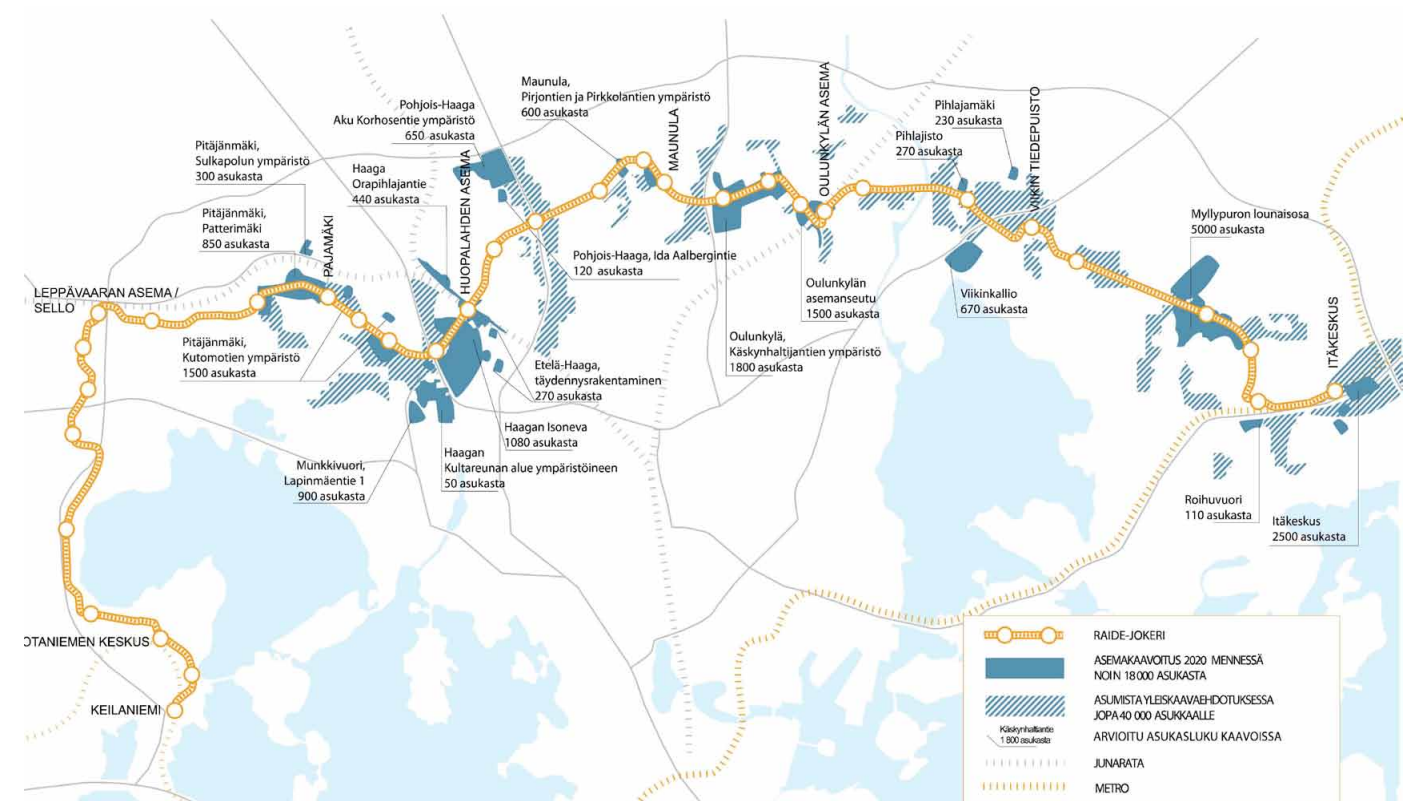
Länsimetro soon.

The metro in Helsinki's metropolitan area will continue from Ruoholahti, Lauttasaari through and ending in Espoo. In the first phase, a 14 kilometres long railway line between Matinkylä and Ruoholahti will be completed, including eight new stations. Koivusaari and Lauttasaari stations will be located in Helsinki, and those of Keilaniemi, Aalto University, Tapiola, Urheilupuisto Niittykumpu, and Matinkylä will be located in Espoo.

The section Matinkylä-Kivenlahti in the west will be the next phase of construction consisting of seven kilometres. The new stations will be Finnoo, Kaitaa, Soukka, Espoonlahti and Kivenlahti.

The construction of the first phase of the metro to the west was completed in late 2015, and operation is expected to begin by early 2017. The entire line from Matinkylä to Kivenlahti will be completed no earlier than 2020. The extension of the metro to the west will add 13 new stations to the network.

In addition, a deposit of underground metro will be built in Sammalvuori. Each new metro station will have its own identity so that passengers can easily recognize them. Each station will have the same design platform and signalling, as well as similar access.





A full replacement of Banedanmark's signalling to ERTMS is planned for the end of 2021, as well as other projects among which we must highlight the railway that will connect with Europe.

The structure and railway equipment sector in Denmark has boomed in recent years due to attempts by public authorities to revive the economy through increased public spending. The sector is highly dependent on the European legislation, namely the Directive of the European Parliament and of the Council establishing a single European railway area, since November 21st 2012, and the implementation of the fourth railway package set, which aims to promote interoperability at European level (trans-European transport network) as well as the liberalization of the provision of passenger transport services by rail. To achieve these objectives, it is necessary to harmonize the

signalling system on all road networks in Europe through ERTMS and therefore promote safety, punctuality and allow not having to make transfers when changing rail system.

Moreover, regarding the opening of the service to private operators, keep in mind that the sector is fully liberalized, both freight and passenger transport, from January 1st 1999 in the first case and from January 1st 2000 in the case of passenger transport. Regarding infrastructure, the network of the country was obsolete and in need of renovation. This need, combined with the decision of maintaining the high level of public sector spending has generated a large number of new projects in the rail transport sector which have resulted so far in the following actions:

- Electrification of large sections of the rail network.
- Expansion of Copenhagen's metro.
- Construction of the tram in Odense.

- Construction of the tram in Aarhus.
- Extension of the light rail network in Copenhagen's "Ring 3" area.
- High Speed lines "Copenhagen-Ringsted" and "Ringsted-Femern".
- Construction of Femern's fixed connection..

Electrification program

Banedanmark will conduct a process of electrification of the Danish railway network to upgrade most of the network. Currently, the network has 1,756 km of electrified catenaries between conventional lanes and roads near the Copenhagen area (S-Train). The project involves an investment of up to DKK 8,700 million (EUR 1,167 million) to be financed with resources from the Royal Fund. In total, the program involves the electrification of 1,362 km, which would lead to have 3,118 km of electrified railway.

Copenhagen-Ringsten Line

The construction of the first High Speed track in Denmark. It is expected to reach speeds up to 250 kilometres per hour for passenger in a shared rail with freight services. It is part of an ambitious project that aims to unite the four major Danish cities (Copenhagen, Odense, Aarhus and Aalborg) in one hour. The budget for this project is DKK 10,400 million (EUR 1.396 million) and would be co-financed by the European Union. The project requires the construction of a new station in Køge. It is expected that this new route allows doubling the number of travellers by 2020.

Ringsted- Femern Line

The route will link Copenhagen with Germany directly through the tunnel Femern. It is the continuation of the Copenhagen-Ringsted line and will allow trains to reach speeds of 200 km/h for passenger transport. The budget of this route is EUR 1,200 million, and it is co-financed by the European Union. The first package for bridges of the contract was assigned in March 2014 to Arkil A/S. Packets number 2, 3 and 4 have been allocated to MT Højgaard a/s in March 2016. The contract for

the new broker Masnedø has been assigned to Rohde Nielsen A/S, Denmark. The contract for the construction of 29 stations is now being announced and there are several more contracts with pre-qualified companies.

Copenhagen Metro

The expansion of the Copenhagen metro is being managed by the company Metroselskabet. It involves the construction of two subway lines, lines 3 and 4, which will complement the two existing. Line 3 is a circular line that will connect the city centre with residential neighbourhoods, while Line 4 will unite the northern port of the city (area of greatest expansion of the current city) with the centre and later with the south port on the Sydhavn branch. The subway expansion will mean the addition of 15 kilometres of track to the 21 km existing today. It is expected to be completed by 2019 and the circular line will complete one full revolution every 24 minutes. A total of 34 vehicles, consisting of 3 cars each, with no access barriers between, be added. The two new subway lines will involve the construction of 17 new stations in the city, to be added to the existing 22 (of which only 9 are underground). The branch of Sydhavn is still pending assignment contracts for the construction of 4.2 kilometres of lines. It is expected to be divided into 4 contracts, of which 3 of them have a deadline for submission of proposals in November 2016, while the last one is expected to be able to submit proposals until February 2017. A meeting of potential suppliers will be coordinated during the summer of this year and the signing of contracts is expected to take place in mid-2017, at the latest.

Copenhagen metropolitan light rail "Ring 3"

In order to complete the mobility system in the metropolitan area of Copenhagen, the third ring, known as the city's light rail, is under construction. This is not a subway, although its operating system is relatively similar. The construction of the third railway ring around the city of Copenhagen

involves expanding 27 kilometres the current rail network and adding 27 new stations to the S-Train rail system. The rolling stock will have the same characteristics as that they both use metro and commuter trains: 2.65 meters wide, 3.5 meters high and about 35 meters long, with a capacity of about 230 passengers per vehicle. The frequency of trains passing through each of the different stations will be about 5 minutes on weekdays and 10 minutes on weekends in the busiest stations. Different municipalities are involved in this project: Lyngby, Gladsaxe, Herlev, Albertslund, Rødovre, Glostrup, Brøndby, Hvidovre, Vallensbæk, Ishøj, Høje-Taastrup and the capital. It is estimated that this new transport system will absorb 43,000 passengers/day, of which about 4,000 would be former car users. In addition, improved mobility will allow setting population in these municipalities, reducing the pressure on property prices in the centre of Copenhagen. In total, it is estimated to carry about 14 million passengers annually, reaching up to 18,000,000 passengers, depending on the evolution of the population in the affected areas. The budget of the construction works amounts to about DKK 3,931 million (€527 M). To finance it, the various municipalities provide 34% of the funds, 40% will be financed by the Danish state, and the remaining 26% will be provided by the Copenhagen region. The development schedule of work is divided into 4 phases: a first phase including the study of the construction program. The second phase includes the call and the preparatory work. The third phase will consist of the construction and safety checks and finally the fourth and final phase, which would be the normal operation of passenger transport.

Femern tunnel

It is the largest public works project in the history of Denmark and possibly one of the most ambitious in its category within the EU. It is a project initiated by the Nordic country and supported by successive governments, but Germany

has always seen it with reticence. Although the European Union itself has been favourable to the idea to the point of including it among the initiatives the EU is co-financing with up to 50% of the total investment, the fact is that the project has suffered successive delays, being subject to great uncertainty. Its opening is set today for 2028. The project budget amounts to EUR 7100 million. The fixed link of Femern is not just a rail link, but includes step for trucks and cars, and is estimated to have a very positive impact on the country's economy as well as on other Nordic countries (mainly Sweden) because it would enable the exit by road for goods to improve their competitiveness. The project involves the construction of an immersed tunnel consisting of a four-lane highway and an electrified double railway line. The total length of the tunnel will be 18 kilometres; its width will be about 40 meters and height 15 meters. The project design and financing correspond to Denmark, while Germany will be in charge of any connections within its territory. Once the tunnel is built, railway traffic will reach 200 kilometres per hour, taking about 7 minutes through the tunnel, while road vehicles are limited to 110 kilometres per hour. Currently, the Danish Government has given authority to the company Femern A / S to sign contracts with companies that have been selected to perform different jobs. These contracts are valid until 2019, subject to renegotiation if necessary. In february 2016, major contracts involving approximately 80% of the total project were assigned, although a series of minor contracts, which will complete the remaining 20%, are still pending. The main contracts are: the construction of the northern part of the tunnel, the construction of the southern part of the tunnel and ramps in infrastructure, all three of them assigned to the consortium Femern Link Contractors (FLC); and dredging and jobs to gain land to sea, awarded to the consortium Femern Belt Contractors (FBC). The remaining contracts are expected to be allocated in 2017.

Information obtained by ICEX

MAFEX MEMBERS WITH PROJECTS IN THE NORDIC COUNTRIES



ALSTOM ESPAÑA

Alstom Spain and Indra are tendering for the largest civil engineering project currently planned in Europe.

They compete in consortium for the electromechanical installations of Fehmarnbelt tunnel, linking by road and rail Europe and Scandinavia.

The consortium formed by Alstom and Indra has been pre-qualified to tender for the implementation of electrical and mechanical installations in the Femern tunnel, one of the largest civil engineering projects currently planned in Europe. With 18 km, it will link Denmark and Germany and it will be the largest undersea and combined rail-road in the world.

The consortium formed by Alstom and Indra is now opting for a contract that includes design, project planning, supply of materials, implementation of the installation and 3 years maintenance.

The project foresees the implementation of an integrated solution that allows you to monitor and centrally manage different intelligent systems that must be installed in the tunnels, in order to ensure maximum safety and operability. The project scope includes electrical and mechanical installations for power distribution, cabling, connections to the substation, uninterrupted power supply,

lighting, drainage, ventilation, air conditioning systems, access and emergency doors, fire detection and fire fighting systems, elevation, video surveillance and communications systems.

This contract is part of one of the largest civil engineering projects in Europe: an 18 km tunnel under the sea, linking the cities of Fehmarn (Germany) and Lolland (Denmark). When opened in 2021, it will significantly reduce travel times between Scandinavia and Continental Europe, with a direct link by rail and road.

Along with the Spanish consortium, two other consortiums have also been short-listed for this tender: Stragbag Bravida Consortium (composed of Starbag from Austria and Bravida from Denmark) and Femern Electrical and Mechanical Contractors (formed by Cegelec from France and the German engineering company Vinci).

Indra and Alstom Spain consortium is the result of the large experience of both companies in the installation and maintenance of security systems in the tunnels of the Spanish high-speed network. Specifically, infrastructures equipments of both companies have been responsible for equipping and maintaining electromechanical installations in the 32 tunnels associated with the Ourense-

Santiago High-Speed line, and the tunnels on the Madrid-Valladolid-Leon line, including the Guadarrama Tunnel, the longest in Spain with a length of 28.8 km. In addition, Alstom Spain-Indra consortium is currently participating in the construction and maintenance of the Antequera-Granada tunnels and Pajares tunnels.

Alstom Spain has large experience in international tenders and is currently working with large Spanish firms in their venture on internationalisation, in which Alstom contributes with its technological knowledge, industrial capacity and international structure throughout the world (Metro of Panama with FCC, Guadalajara Metro with OHL, the Light train in Ottawa with ACS, the trams in Algeria with Isolux and the Riyadh Metro, also with FCC).



DANOBATGROUP

DANOBAT received a major order from Bergen Light Rail for the delivery of a train shunt measuring system.

The Bergen Light Rail between Bergen central station and Bergen Airport comprises a 20 km double track line between Bergen city centre in the north and Bergen Airport, Flesland in the south.

The project is part of the Bergen program for transportation, and the urban development and environmental plan, which is a joint effort to coordinate and prioritise public transport, environmental issues, construction

of road, pedestrian and cycle paths over the twenty year period 2005 to 2025.

The workshop and depot at Kokstad shall be operational both for the Bergen – Flesland section and also for future extensions to the north and west of Bergen central station.

When fully built, the facility shall be capable of serving all trams, estimated to be over 50 trams of 42 metres. The contract consists of a condition based maintenance system. DANOBAT train shunt measuring system has been specifically designed and manufactured for the measuring of the electrical resistance between two wheels of each axle of the train. The train shunt measuring system is installed on an isolated track, but without the need to replace the existing track, thus ensuring normal uninterrupted operation of the train. This system can be installed in both locational cases, indoor and outdoor. Some of the benefits of the DANOBAT solutions

are reduced installation requirements, automatic data collection analysis, extreme weather conditions work environment, traceability of fleet, connectivity to other peripheral equipment, ...

Moreover, the client has developed a specific Health, Safety, and Environment (HSE) Plan. This plan has been devised to ensure that the client's obligations with regard to safeguarding health and safety and the working environment on the building site and Bergen Light Rail's own requirements for the building project are fulfilled. The client has also prepared an environmental follow-up programme to safeguard environmental issues. DANOBAT has a great range of condition based maintenance systems, such as the On-Track Wheel Profile Inspection System, Underfloor wheel lathe or Bogie Rotary Parts and Bearings Test Rig.



CAF

STOCKHOLM TRAM: In 2010, through the company SL AB (company responsible for the transport network in the city of Stockholm), this city awarded CAF a contract for the supply of 15 model A35 trams of the Urbos platform. This model consists of a bidirectional low-floor unit made up of 3 modules, which provides capacity for 275 passengers. Subsequently the client has contracted seven A36 model units which include an additional intermediate car.

These trams are fitted with state-of-the-art comfort and safety equipment and have been particularly adapted for the extreme weather conditions in this Nordic country.

METRO HELSINKI: Helsinki is added to the extensive list of cities in which CAF's metro units are in operation. In 2013, the company was awarded the contract to supply 20 new metro units for the capital city of Finland. These trains are made up of 4 modules and have been designed such that minimal changes can provide for a

safe and comfortable service in the various existing grades of automation (GoA1, GoA3 and GoA4). Taking account that the Helsinki Metro operates both outdoors and inside tunnels, the M300 series vehicle has been designed for commercial operation in extreme temperatures ranging from -40 °C to +35 °C. CAF has experience in the Finnish market, as this is not the first Project to develop in Finland. Éste no es el primer proyecto de CAF en Finlandia. The company supplied commuter trains for the Finnish railways (Valtion Rautatiet) in 1999. OARIS FLYTOGET: This is the most recent contract that CAF has been awarded with in the Scandinavian countries. The trains will run on the Airport Express line that connects the city center of Oslo with its airport, operated by Flytoget. CAF is to supply the new high-speed Oaris trains. The trains are 4-car units with a design focused on energy efficiency and environmental protection. These units feature proprietary technology with maximum reliability and cutting edge design, safety, comfort and passenger accessibility. Oaris complies with the PRM TSI. The train has 2 specific areas for wheel-chairs including one PRM toilet. In addition, a manual ramp is available for ease of boarding by PRM passengers.

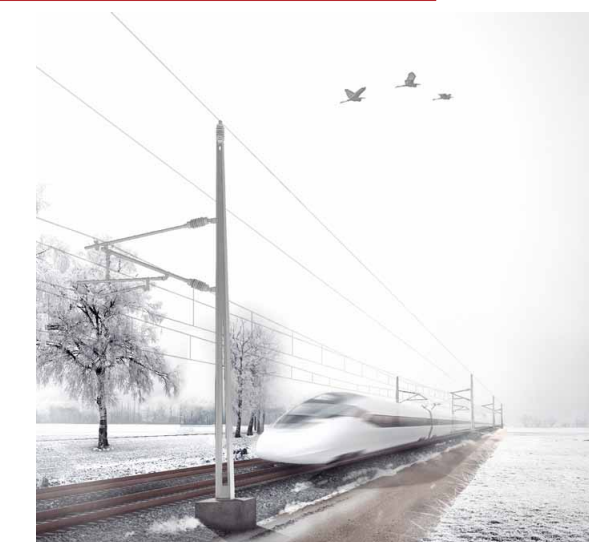
IDOM

Idom as an engineering, architectural and consulting firm is strengthening its position in the international arena. As part of this strategy, Idom is consolidating existing markets and entering new ones. Railway is an important business area of the firm and it is precisely in this field that, in recent years, Idom has been making inroads into the Scandinavian market.

Idom has already worked on various projects in Scandinavian countries: electrification studies in Denmark, the tramway of Lund, or the East link high-speed line, both in Sweden. The firm is also participating in a framework project in the Swedish city of Gothenburg.

In the case of Lund, apart from the necessary previous studies, Idom developed the basic design of the 5 km tramway line, including urban intersections, energy supply, OCL, and the signalling and communications systems. An important element of this project involved integrating this new tramline into the urban setting through the use of modern safety systems and lighting to give structure to the city.

The East Link high-speed project involves the basic design of a 42 km section of a total of approximately 150 km. This ambitious project will be a bi-directional



high-speed line connecting east central Sweden with the rest of the country's rail network. The East Link will reduce travel times between major cities and regions and permit freight traffic to increase on the existing network as passengers move to the new line.

Idom has also provided technical assistance to Odense Letbane on their tramway project. As an independent firm, Idom develops all its work, designs, supervision of works, commissioning from a position of complete impartiality.

Idom is currently participating in several bidding processes for rail projects in Scandinavia.

MAFEX MEMBERS WITH PROJECTS IN THE NORDIC COUNTRIES

► TYP SA

Stockholm Metro. Extension to Nacka and Gullmarsplan/Soderort. At present, Stockholm Metro has approximately 110 km length with 100 stations. Currently the metro system is being extended to meet future demand. TYP SA is working on the design of the southern extension of the Blue Line from Kungsträdgården station, currently the end of the line, toward the municipality of Nacka. The line includes a branch to Gullmarsplan intermodal station, connecting to the existing Green Line at Sockenplan station. The branch that is currently part of the Green Line between Sockenplan station and Hagsåtra will be operated by the Blue Line. The design is 11 km long and has 7 stations. Worthy of note is the extension that runs under the Saltsjön (Salt Sea). The construction budget is estimated at approximately € 1 350 million. Construction is expected to commence in 2018, and the section is scheduled to come into service in 2025.

- Feasibility Study for the new High Speed Railway Line Jönköping – Malmö (Sweden). TYP SA participates in this study which



comprises the definition of the works needed for the completion of the civil works, superstructure and systems for the new high speed line section from Jönköping to Malmö. The new line is 350 km length and will take part of the future High Speed Line between Stockholm and Copenhagen. The study comprises the definition of various corridors and their comparison, analyzing technical, economic and railway operation factors. TYP SA is applying its solid experience in HSR design and construction, both in Spain and worldwide.

- Design of the new High Speed Line Ostlänken. Section: Bäckeby – Tallboda (Sweden). Railway Plan and Environmental Impact Study. The aim of the contract is to define the rail layout and draw up the Environmental Impact Study for the new

section between Bäckeby and Tallboda, near the city of Linköping, of the new High Speed Line Ostlänken in eastern Sweden. The section is 17 km long and its design speed is 320 km/h. The new high speed line will be integrated into the current rail network, using the appropriate interchanges, so that their benefits can be extended to the largest possible number of trains and services, thus achieving faster, safer and more sustainable journeys throughout the network.

- Design of the new interurban conventional line Drammen - Kobbervikdalen (Norway). TYP SA collaborates with a Norwegian engineering consulting firm in the preparation of the Feasibility Study and definition of all the works needed for the construction of a new double-track line between Drammen and Kobbervikdalen. The new line, which is 9 km long —most of which runs through a tunnel— will improve regional rail communications and will provide a complete double track line between the cities Oslo and Tønsberg by 2024. TYP SA's work focuses on the design of the tunnel.



► STADLER RAIL VALENCIA S.A.U.

Stadler disposes of a strong expertise in customizing railway vehicles for operating under harsh weather conditions, e.g. Nordic countries. 8 EURO4000 locomotives are operating successfully in Norway and Sweden since 2009. This 6-axle locomotive family, which has been sold about 140 units in 7 different countries, is used mainly for freight transport thanks to its high hauling capacity

and power, its reliability and the operative flexibility that offers. The Scandinavian units are adapted to harsh weather conditions (-40°) and to the snow. The winterization package includes winterized brake and ventilation systems, Xenon lights, elk collision protection, aggressive snow plough, primary air filtration system optimized for winter operation, increased cab heating by additional electric heaters...



► SIEMENS ESPAÑA

Siemens is executing the project for implementing its signaling and traffic control technologies at the depot of the Swedish mining company Bergbaugesellschaft Luossavaara-Kiirunavaara Aktiebolag (LKAB) in Narvik, at the North of Norway. Siemens Spain is implementing its interlocking technology Trackguard Westrace Mk II and it is responsible for the system integration engineering and the installation and commissioning coordination.



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NORDIC COUNTRIES, MIXTURE OF ART AND NATURE.

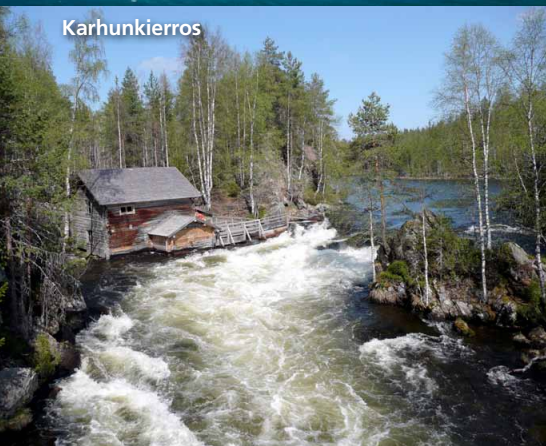
THE SCANDINAVIAN COUNTRIES PROVIDE A WIDE RANGE OF VIEWS. FOR MOVING FROM ONE CITY TO ANOTHER YOU CAN OPT FOR TRAIN, BOAT, CAR, PLANE OR BUS.



The Hermitage Museum



Gothenburg



Karhunkierros



Skagen



Lofoten Islands

Excursions through the national parks covering a big part of the Nordic countries are inescapable, such as **Karhunkierros** in north-eastern Finland, **Jotunheimen** in Norway, **Abisko**, in the Arctic Circle in Sweden or the route from **Porsmork** to **Landmannalaugar** in Iceland.

Another must stop is the **Norwegian fjords**: **Nærøfjorden** (part of **Sognefjorden**), **Lysefjord** and **Geirangerfjord**, the king of all of them, are probably the most beautiful corners of Scandinavia.

The Hermitage, St. Petersburg, has one of the largest art collections in the world, so you should not leave without seeing it.

Another possible visit are the **Lofoten Islands in Norway**, known for the fishing villages that you can visit biking. In Norway, don't forget to visit beautiful Svalbard.

The old town of Tallin, from the fourteenth and fifteenth centuries, protected by Unesco and

full of alleys, courtyards and cosy bars and cafés to stop on this busy trip.

As for gastronomy, you should certainly try the new Nordic cuisine, as served in many restaurants in Copenhagen that have modernized the Scandinavian cuisine and are now on trend. Now, all the capitals of the area have great restaurants.

Skagen, Denmark, a breathtaking location on the northern tip of Jutland, where the **Baltic meets the North Sea**. You can also visit the bodies of peat bogs: millenary bodies exhumed from Danish peat bogs amazingly preserved. Quite a mystery worthy of a murder novel.

Going out: Reykjavik, Helsinki or Stockholm have short summers and long and very cold winters, so they have developed an almost legendary nightlife.

And be sure to discover the historical **cities of wood**. Rauna, Bergen and Gothenburg preserve great cities with neighbourhoods in perfect conditions for walking.

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ERTMS: unity is strength

THE EUROPEAN SYSTEM OF RAILWAY TRAFFIC MANAGEMENT IS AN INITIATIVE OF THE EUROPEAN UNION TO ENSURE INTEROPERABILITY OF RAIL NETWORKS BY CREATING A SINGLE WORLDWIDE STANDARD. RECENT DEVELOPMENTS AND THE INVOLVEMENT OF EUROPEAN INSTITUTIONS BRING THE GOAL CLOSER.

The ultimate goal is that all European lines form a single network and that a train can circulate freely throughout the different countries of the European Union. Currently, this railway communication is not possible due to differences in width, gauge, electrification and technological systems that exist between the networks of each of the EU countries. The existence of more than 20 signalling systems in Europe, inherited from the past, is seen as a critical factor. In fact, each train used by a national railway company must be equipped with at least one traffic management system but sometimes even more and just to move safely within the same country. This is costly

and significantly increases the technical and operational complexity of train systems. Removing these barriers through ERTMS will help increase rail transport performance and level conditions between road and rail transport. This single European train control system has been designed to gradually replace the existing incompatible systems across Europe. This implementation will provide significant benefits for the railway sector as it will raise the international transport of goods and passengers. ERTMS is certainly the most powerful train control system in the world and provides significant advantages in terms of saving maintenance costs, safety, reliability, punctuality and traf-

fic capacity. This explains why ERTMS is increasingly successful outside Europe and is becoming the train control system of choice for countries like China, India, Taiwan, South Korea and Saudi Arabia. Although it is a complex system, ERTMS has become essential to ensure traffic safety and rail traffic management. As for the freight rail system, the factors that are and obstacle for commercial transport and competitiveness are increasing by making even more complex and difficult to handle cross-border traffic. Among the drawbacks are, for example, the differences in terms of indicators, the various electrification systems or different administrative procedures in Europe, which in many cases can be overcome. The fact that it is a system compatible with Europe, ERTMS gives the European Union a unique opportunity to create a strong railway system, where trains can run from Barcelona to Warsaw without facing technical problems or other issues related to the signalling system. Nevertheless, interoperability is far from being the only advantage of ERTMS. In fact,

ERTMS is also designed to be the most powerful train control system in the world. The main engine of ERTMS in the context of the European railway network, is achieving full cross-border interoperability: the implementation of a common signalling system will remove barriers for trade and passenger and freight rail services.

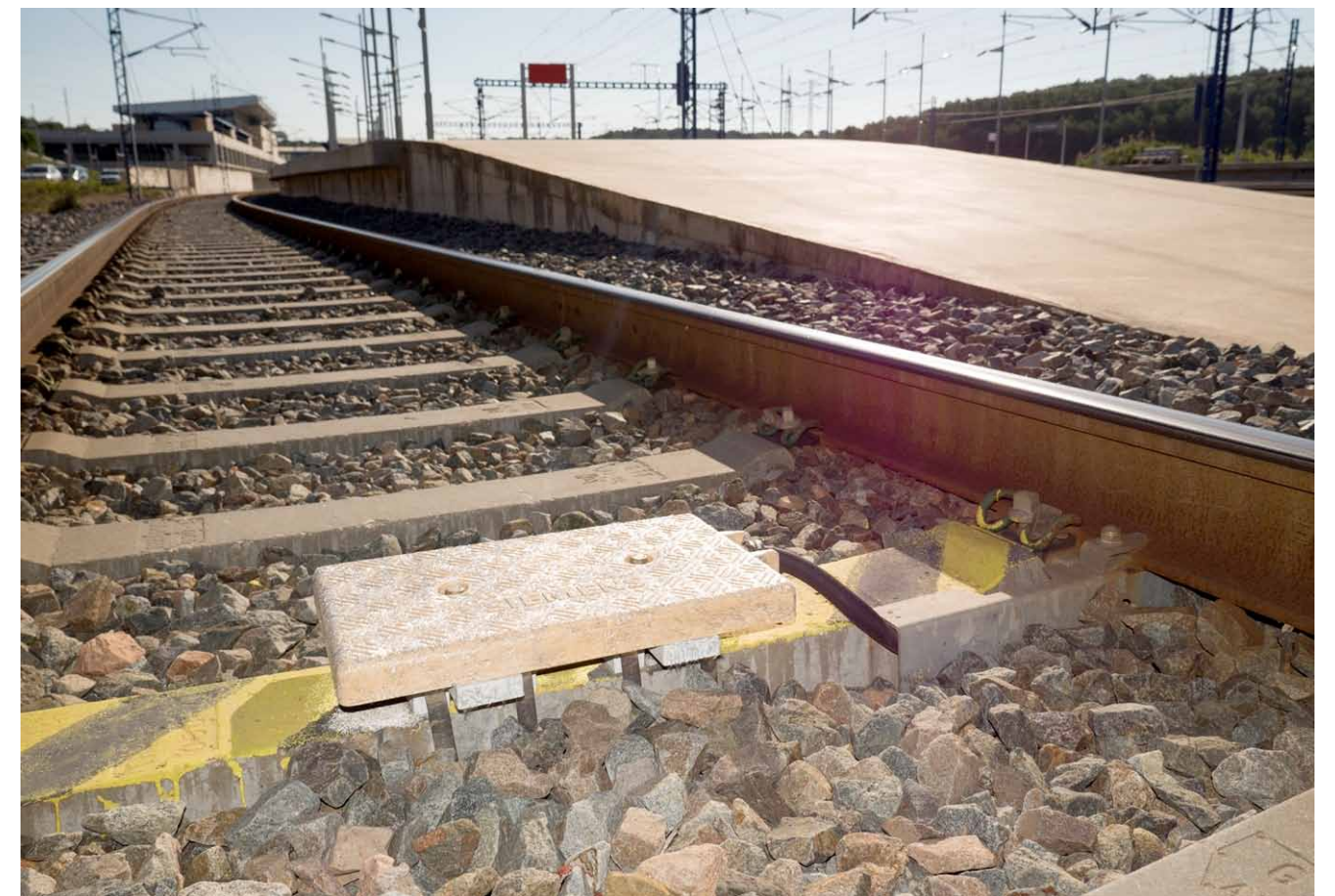
Advantages of ERTMS

- Increased capacity on existing lines and responding to the growing demands of transportation. Being a signalling system based on continuous communication, ERTMS reduces the progression between trains that allow up to 40% more capacity of existing infrastructure today.
- Faster: ERTMS enables a top speed of 500 km/h;
- Increased reliability: ERTMS can significantly increase the reliability and punctuality, which are crucial for both passenger and freight transport;
- Reduced production costs: a unified system is easier to install, maintain and make more competitive rail systems.

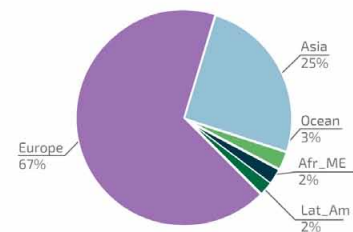
- Reduced maintenance costs: With ERTMS Level 2 signalling on land is no longer needed, significantly reducing maintenance costs.
- An open supply market will allow customers to purchase anywhere in Europe and all suppliers will make an offer.
- The period of performance of the contract is reduced due to the significant reduction in process engineering.
- Increased safety for both passengers and vehicles.

Baseline 3

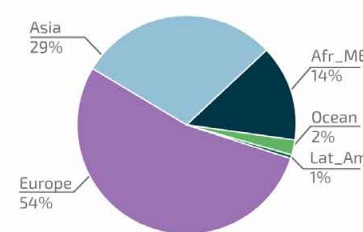
In December 2015, the European Union Agency for Railways (formerly ERA) successfully delivered together with UNISIG (an industry consortium created to develop the ERTMS/ETCS technical specifications) the second release of the Baseline 3 specifications. The hard work deployed by the UNISIG experts confirmed, once again, the full commitment of manufacturers to ERTMS. This new milestone in maintaining the ERTMS/ETCS specifications is distinguished by the following reasons:



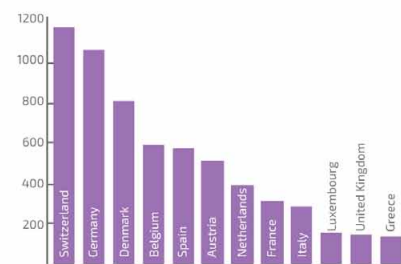
Global (ETCS L1 &/or L2) contracted vehicles in the World



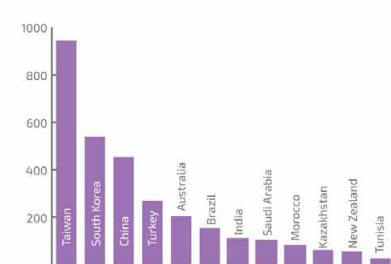
Global (ETCS L1 &/or L2) contracted tracks (km) in the World



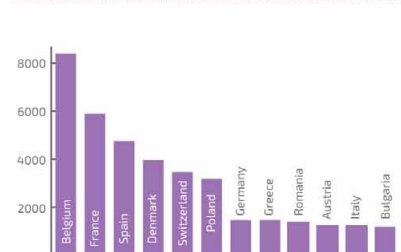
Global (ETCS L1 &/or L2) contracted vehicles in Europe



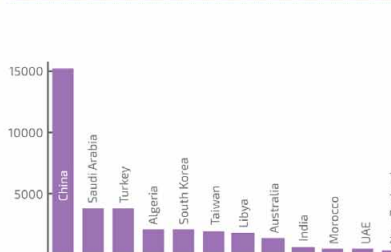
Global (ETCS L1 &/or L2) contracted vehicles in non-European countries



Global (ETCS L1 &/or L2) contracted tracks (km) in Europe



Global (ETCS L1 &/or L2) contracted tracks (km) in non-European countries



Graphics on the European and global implementation, number of vehicles and kilometers of ERTMS by region. *

*Source: Unife. Annual Report 2015

► This new version includes error corrections "compatible" with the latest legal regulation of the specifications (formally adopted by the European Commission in January 2015).

► Enter GPRS (General Packet Radio Service), an evolution of telecommunications in the side of the ERTMS/ETCS specifications required in some European countries to further enhance system performance.

► The ERA (European Union Agency for Railway) also submitted to the European Commission a document summarizing the "long-term perspective" for ERTMS/ETCS. The main objectives were to identify and analyze the different strategic challenges for medium and long term related to the development of ERTMS/ETCS

specifications. One of the main challenges is to find the optimal balance between the stability of the specifications and the development of ERTMS, while ensuring interoperability and preservation of investments.

ERTMS Advancement Program

Karel Vinck, Coordinator of ERTMS in Europe, with the support of the European Commission, has demonstrated its full commitment to ERTMS and created the "ERTMS Breakthrough Programme" in order to help accelerate the deployment of ERTMS in Europe.

The key principles of this program are focused on the following:

► "Users first" and not "designers first". Users are defined from the economic point of view. Con-

sidering that the railway undertakings (RU) are in a competitive situation with national monopoly, their needs must be taken into account.

► Running throughout Europe. On the basis of the principles at the heart of ERTMS, a vehicle equipped with a interoperable and complete on board equipment compatible with the ETCS Baseline 3 System should be able to be implemented throughout Europe.

► Focus on implementation. The focus of all stakeholders should include from specifications and development to implementation, operation and maintenance of the ERTMS specifications.

► ERTMS cost reduction. ERTMS must be sought in products and solutions as well as maintenance, and also for the European system as a whole.

► Review of the European Deployment Plan.

These 5 objectives should be achieved by the end of 2016. As already announced in the provisional Work Plan, the Coordinator presented a proposal for the revision of the European Deployment Plan approved in 2009. Member States should ensure that the main parts of the implementation of ERTMS in the corridors will be completed in 2027, using the financial opportunities provided by the current period (2014-2020) and the programming period for the future (2020-2027).

A series of complete, stable and mature specifications are the perfect condition for the functioning of a software-based system such as ERTMS. An interoperable and compatible infrastructure adapted to Baseline 3 is essential for a competitive rail network in Europe.

With the establishment of the nine multi-modal corridors of the Core Network (CNC), the Commission has taken an important step towards the realization of

a sustainable transport network in Europe. With this coordinated application, the European Commission has provided a strategic and political framework for the implementation of the single European railway area: as a first step, corridors will be operating, and then the remaining parts of the Core Network corridor will be completed in 2030.

The European ERTMS coordinator has always shown that, in order to get the construction of an operational rail corridor fulfilled, three conditions are needed: the elimination of bottlenecks in infrastructure, harmonization of national operating rules in Europe and the introduction of ERTMS. On this last point, Europe has achieved significant results over the last 10 years. The technology itself has matured and has reached a point of no return: ERTMS is an interoperable signalling system in Europe, accepted by all Member States.

A strategy for planning

When preparing the proposal for the new European Deployment Plan, the Coordinator analyzed all the documents presented to the Commission and the results of studies of the core network corridor. This deployment plan covers the Core Network Corridor (CNC), but Member States have the obligation to apply the entire Core network in 2030.

In recent years, the European Coordinator has revealed that the corridor approach is the most appropriate way to achieve an interoperable network. A coordinated implementation through brokers facilitates not only the management of the application, but provides an added economic value: ERTMS costs are linearly growing, while its benefits in terms of interoperability will grow exponentially.

ERTMS progress in Europe is already a tangible fact. More and more countries have decided to

ERTMS financing is a priority for the European Commission and the EIB

change their national signalling system to ERTMS. The Coordinator identified two major areas in which the implementation of ERTMS is progressing significantly: Benelux and Central Europe (Austria, Slovenia, Slovakia, the Czech Republic, Hungary and parts of north-eastern Italy). The Coordinator has always emphasized the central role of cross-border sections regarding ERTMS. In order to achieve the highest possible value, a significant cross-border section must be first identified and then apply it in a well organized way, involving not only infrastructure managers, but also to security authorities and the ERA (European Union Agency for Railway).

The role of UNIFE and ERA

On the other hand, UNIFE, the Association of the European Railway Industry, has also been one of the major contributors and will continue to support the Commission in 2016.

On December 15th, 2015, the ERA, the European Union Agency for Railway, held the meeting for the launch "ERTMS Stakeholders' Platform", which will facilitate a harmonized approach to the development and deployment of ERTMS in Europe.

During that meeting, all aspects of ERTMS specifications and authorization issues were discussed. It was agreed to create a first subgroup that will ensure monitoring of the objectives included in the 2012 MoU ERTMS system and the progress of the program; address other issues related to testing, certification and authorization. The work of the subgroups will start this year along with the full participation

of UNISIG and UNIFE.

Among the plans that are expected to be carried out in 2016, the main deployment programs in several Member States of the EU and the limited EU funding available until 2020 remain as an important priority for the sector. The European Commission and the European Investment Bank (EIB) are waiting for member states, infrastructure managers, railway companies and rail manufacturers to agree to implement projects immediately. UNIFE will in 2016 to continue to facilitate the dialogue at European level between the different actors involved

Obstacles for full implementation

However, the implementation of the ERTMS system is not progressing as quickly as planned and expected by all stakeholders. The most common arguments are that the financial means are not enough (in particular due to the financial crisis), the price of ERTMS products is not always adequate when compared to their added value (especially onboard equipment), the lack of ERTMS has hampered the implementation, maintenance of specifications have been delayed, etc. Moreover, some European Member States have invested in maintaining / updating their national systems regularly and use the argument that the existing signalling system has not reached the end of its life cycle.

ERTMS in Spain

Spain decided the implementation of the ERTMS system in the construction of all new High Speed lines following the Euro-



Source: www.ertms.net

Map illustrating the sections in Spain with ERTMS. To the right, a table including the specifications of each of the Spanish lines with ERTMS, as well as their provider. * The interactive map is available at magazine.mafex.es

pean directive and clearly betting on this new interoperable system. The role of Spain has been instrumental in the deployment, development and success of ERTMS, being one of the international leaders of the proper functioning of the system. To give some numerical examples, more than 5,000 km in service have been hired by Mafex members worldwide (more than 2,900 outside Spain); the first and only ETCS in America has been installed by Spanish companies as Bombardier España; and the first and only ETCS systems in the world in suburban lines (commuter)

has been installed by Spanish companies. Spain has shown the rest of Europe how technical interoperability between all suppliers is possible, as the implemented system, with high levels of punctuality and reliability, in all high-speed lines of Adif, except the first line Madrid-Seville. The longest interoperable section in Europe is the journey between Barcelona and Malaga, in which a train equipped with ERTMS by Siemens runs equipped by Thales, Ansaldo, LZB and Dimetronic lines (now Siemens Rail Automation). In Europe, Adif (Railway Infra-

structure Administrator of Spain) is actively involved in the development of the trans-European rail network, promoting the coordination of high-speed connections with France and Portugal, participating in the development of international regulation for safety and interoperability and promoting the installation of ERTMS on Corridor D. Currently, about 2,150 kilometres in Spain have installed the ERTMS system, of which 607 correspond to level 2. This fact makes Spain have, right now, the highest level of deployment of the European signalling system.

PROJECT	USER	SUPPLIER	LEVEL	TYPE	ORDER	IN SERVICE	KM	Nº
Albacete-Villar de Chinchilla - La Encina	RENFE	Bombardier	Level 1/2		2010		180	45
Antequera - Granada	ADIF	Siemens/ Thales	Level 1/2	HSL	2014	2015	252	
Atocha By-Pass North to South HS Link	ADIF	Ansaldo STS	Level 1/2		2007		12	
AVE S100	RENFE	Alstom	Level 1/2		2005			24
AVE Valladolid-Venta de Baños-Burgos-Leon	ADIF	Alstom/ Bombardier	Level 2	ML	2014		359	
Barcelona - Figueres	ADIF	Thales / Siemens	Level 1/2		2009		300	
Bombardier Transportation	ADIF	Siemens	Level 1/2		2009			2
BT "Talgo"	ADIF	Ansaldo STS	Level 1/2		2001			2
BT/TALGO S102 "Pato"	RENFE	Siemens	Level 1/2		2002	2006		16
BT/TALGO S112 "Patito"	RENFE	Siemens	Level 1/2		2006	2009		30
C58 Locos	Continental Rail	Siemens	Level 1/2		2009			2
CAF OARIS	RENFE	Ansaldo STS	Level 1/2		2007			1
CAF S120 "Alvia" ATPRD	RENFE STS	Ansaldo	Level 1/2		2003			12
CAF S120-050 "Alvia" AVGL	RENFE STS	Ansaldo	Level 1/2		2007			15
CAF S121 "Avant" - AVR	RENFE STS	Ansaldo	Level 1/2		2008			29
Castellbisbal-Can Tunis	ADIF	Alstom	Level 1		2010		40	
Civia (462, 463, 464 & 465 series)	RENFE	Alstom	Level 1/2		2007	2012		123
Cordoba - Malaga HSL	ADIF	Siemens / Thales	Level 1/2		2004		310	4
Figueres-Perpignan	TP Ferro	Ansaldo STS	Level 1/2		2006		40	
Girona - Figueres	ADIF	Alstom	Level 1	ML	2009		82	
La Robla – Pola de Lena	ADIF	Ansaldo STS	Level 2	VHSL	2014		102	
Lerida - Barcelona HSL	ADIF	Siemens / Thales	Level 1/2		2003	2007	380	12
Olmedo – Ourense	ADIF	Siemens / Thales	Level 1	HSL	2014	2020	590	
Loc 252+ALARIS	RENFE	Siemens	Level 1		2000			5
Madrid - Lerida HSL	ADIF	Ansaldo STS	Level 1/2		2000	2011	920	
Madrid - Segovia HSL	ADIF	Siemens / Thales	Level 1/2		2006		146	
Madrid - Toledo HSL	ADIF	Siemens / Thales	Level 1/2		2003		42	12
Madrid - Valencia HSL	ADIF	Siemens / Thales	Level 1/2		2008		872	
Madrid Commuter Trains	ADIF	Siemens	Level 2		2008			94
Madrid Suburban Cercanias (Chamartin-Atocha)	ADIF	Thales / Siemens	Level 1/2		2006	2012	320	
Orense-Santiago Compostela	ADIF	Siemens / Thales	Level 1/2		2010		175	
Plasencia-Cáceres/Badajoz	ADIF	Bombardier/Alstom/Indra	Level 2	HSL	2015		328	
PPP/Albacete La Encina - Alicante	ADIF	Alstom	Level 2	VHSL	2011		330	
S104 - Part I "Lanzaderas"	RENFE	Alstom	Level 1/2		2001			20
S114 - Part II "Lanzaderas"	RENFE	Alstom	Level 1/2		2005			13
S130	RENFE/BOMBARDIER TRANSPORTATION	Siemens	Level 1		2008		6	
S130 ALVIA	RENFE	Bombardier	Level 1/2		2004			39
S252 Locomotives	RENFE	Siemens	Level 2		2012			10
S400 Alaris	ADIF	Siemens	Level 1/2		2005			10
Segovia - Valladolid HSL	ADIF	Thales / Siemens	Level 1/2		2003		220	12
Sevilla-Cádiz HSL (Utrera Jerez de la Frontera)	ADIF	Siemens / Thales	Level 2	HSL	2010		216	
Talgo A330 Séneca	ADIF	Ansaldo STS	Level 1/2		2005		1	
TALGO VHST AVRIL	TALGO	Alstom	Level 1/2		2010			1
Valencia - Vandellos	ADIF	Bombardier / Thales	Level 1		2014	220		
Velaro S103	RENFE	Siemens	Level 1/2		2002/6	2006		26
Vendellós - Tarragona	ADIF	CAF	Level 1/2		2014		130	
Zaragoza - Huesca	ADIF	Alstom	Level 1		2003		160	

Source: www.ertms.net

HISTORY AND EVOLUTION OF ERTMS

ERTMS basically harmonizes two types of technologies: on one hand ETCS (European Train Control System), with regard to signalling (in infrastructure and trains), providing data on the maximum speed at each point or distance to the next mark, as well as the calculation and supervision of the train's speed; and secondly GSM-R (Global System for Mobile Communications-Railways), which regulates aspects relating to communications between the train and operators in the Control Traffic Centre (CTC). In order to have compatibility between ETCS and signalling systems of each country, modules called STM (Specific Transmission Module) that allow operation with both systems are defined.

The European Commission published on July 4th 2005 a Communication on the deployment of the European system for rail signalling ERTMS/ETCS. On this basis, the Commission defends the gradual adoption of a common system for all EU Member States with the European Rail Traffic Management System (ERTMS).

The equipment necessary for the operation of the systems is divided into two parts, on

one hand there is the on-board equipment and on the other the external equipment.

On-board equipment

The on-board equipment consists of:

- ▶ An antenna installed on the underside of the train and that is responsible for the communication between the on-board and trackside systems.

- ▶ An antenna installed on the roof of the train (optional, only if radio communication is used) for voice and data communications between on-board and trackside systems

- ▶ EURORADIO: receives ERTMS voice and data from the antenna.

- ▶ BTM (Balise Transmission Module) device that allows the reading of the track installed balises. Its function is to receive the underside-antenna messages and make them easy to handle for EURO-CAB; EURO-CAB: core of the system. It processes all the information proceeding from the antennas, supervising train movements and controlling the information shown to drivers in the DMI (Driver-Machine Interface) and the information sent to the JRU (Juridical Recording Unit), taking action on brakes if necessary. EURO-CAB continuously calculates the train's position by means of its own odometer based on Doppler radar sensors and wheel sensors; DMI: it presents all relevant data to drivers, such as current speed, speed limit, speed restrictions, breaking distance and text messages.

Trackside equipment

Trackside equipment is composed of:

- ▶ Blocking elements: electronic devices that control each station. They are used to

determine routes, signalling aspects and position of switches.

- ▶ Track circuits: detection of the train's position, transferring it to the blocking elements.

- ▶ LEU (Line-Side Electronic Unit): they convert the information received from the blocking of the station in ERTMS telegrams which they then send to the balises.

EUROBALISES: they transmit telegrams with information relative to train control and traffic operation that are transferred from the LEU to the train.

RBC (Radio Block Centre): it's connected to the blocking elements when data communication via radio is used to transmit ERTMS telegrams to the train.

GSM-R: transmission system for voice and data via radio used by the ERTMS.

ERTMS levels

Level 1. The operation of the system as a Level 1 is based primarily on the interlocks, providing information on the status of the needles, signals and routes to the LEU (standard electronic units), encoding information and forwarded to the eurobalises located in the rail.

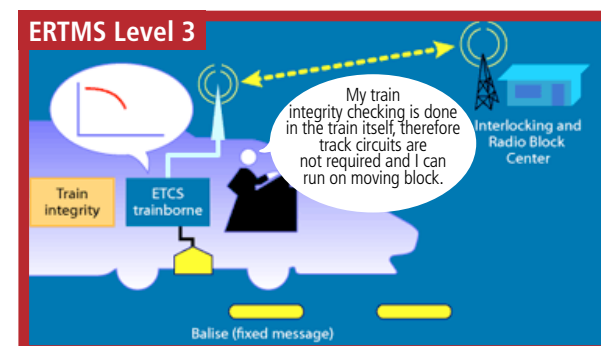
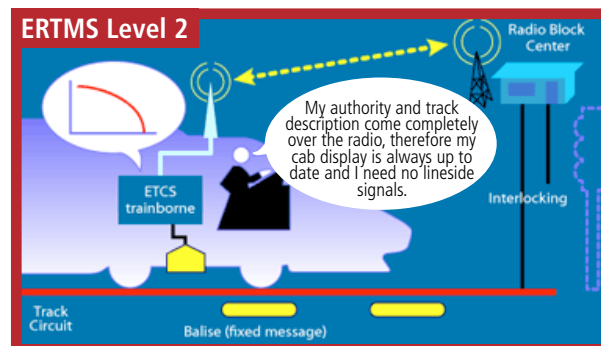
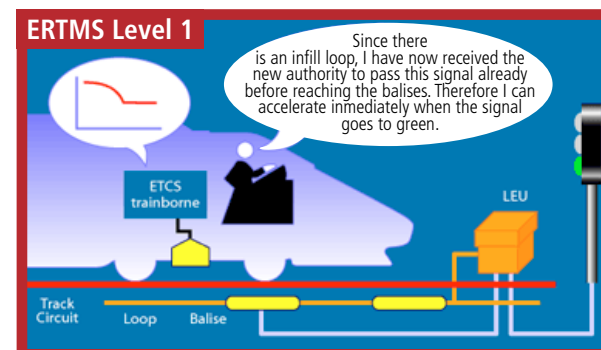
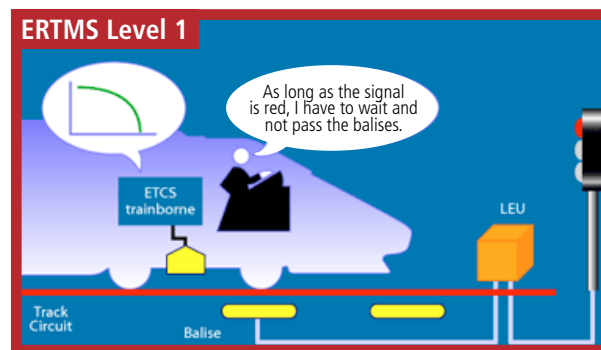
At level 2 ERTMS, the blocking of trains is done from a Radio Block Centre (RBC), which receives the information, on one hand from the interlocks and on the other hand it transmits the information to trains through the GSMR system.

At Level 3, the train integrity data are sent via a separate system on the composition, therefore track circuits are not required, as in the previous level. This allows the cantons to be mobile. 🚂

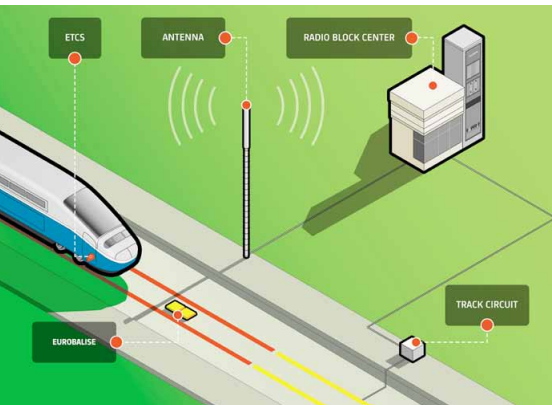
What can't be seen, also matters

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MAFEX MEMBERS WITH ERTMS PROJECTS



ALSTOM ESPAÑA

In Spain, following the success of the installation of ERTMS level 2 in the Albacete-Alicante line (first exclusive system level 2, without Level 1), Alstom has led the adjudication of new ERTMS systems for the Spanish rail network.

At European level, 3 out of 4 trains using the system ERTMS do it with the Atlas solution developed by Alstom.

With more than 10 years of experience in the installation of ERTMS solutions, Alstom is one of the worldwide pioneers in the development and implementation of this technology, with projects in 23 countries giving service to 1,200 km of rail and more than 5,200 on-board equipments.

In Spain, after the success of the installation of ERTMS level 2 in Albacete-Alicante line (the first exclusive level 2 system, without level 1), Alstom has led the adjudications of new ERTMS systems for the Spanish railway network. Thereby, Alstom has installed or is installing ERTMS technology in the Atlantic corridor (A Coruña-Santiago and Santiago-Vigo), in the Levante corridor (Albacete-Alicante), in the Mediterranean corridor (connection with French border), in the Zaragoza-Huesca connection, in the Norwest corridor (Valladolid-Leon-Burgos), in the Extremadura corridor (Plasencia-Caceres-Badajoz) and in the Barcelona commuter network (L'Hospitalet de Llobregat and Mataro).

Alstom Spain was also the first manufacturer to incorporate ERTMS to a commuter network, installing on-board equipments in 112 trains Civia in Madrid.

The signalling and safety division of Alstom Spain has more than 400 technicians and engineers dedicated to develop

and implement signalling solutions for all kind of railway infrastructures. Moreover, we are the worldwide Competence Center of light rail signalling and safety solutions.

First line in Europe

Ten years ago, in December 2005, Alstom has driven innovation in the field of signalling and railway safety by being the first to put into service its ERTMS Level 2 radio-based system, the latest in the market. Alstom ERTMS level 2 (Atlas 200) started to operate on the Rome-Napoles high-speed line in Italy, the first route to have a signalling system based in GSMR, and freeing the train control system from the constraints and cost of trackside signal lights.

Since the first line implemented in Italy, Alstom has maintained its position as a market leader for interoperable ERTMS level 2 systems in operation. The Atlas solution equipped the first high density line in Switzerland (2006), the first freight line in The Netherlands (2007) and the first cross border operation (2009). Also, Alstom has supplied the on-board equipments operating under ERTMS level 2 in Germany. It is also participating in the putting into service of ERTMS level 2 lines in UAE and in Saudi Arabia.

ERTMS main projects Alstom Spain

Finished projects.

- Trains with on-board equipment: S100, TAV S104, S114, AVRIL G3, TALGO MECA-MEDINA, CIVIAS.
- ERTMS Zaragoza-Huesca – third rail.
- ERTMS Girona-Figueres – third rail.
- ERTMS Castellbisbal-Can Tunis – third rail.
- ERTMS Castellbisbal/Papiol-Mollet San Fost – third rail.
- ERTMS for the Albacete-Alicante high-speed line.
- Madrid-Levante high-speed line (Alpera variant).

Ongoing projects.

- ERTMS for the Valladolid-Leon-Venta de Baños-Burgos high-speed line.
- ERTMS for the Plasencia-Caceres-Badajoz high-speed line.
- ERTMS for the Barcelona commuter network.



INDRA

Indra has developed revolutionary solutions for level 2 interoperable ERTMS signaling. These include a proprietary RBC system, the required wayside component and cornerstone of the system, which has been granted interoperability certification and top-level SIL4 security certification, as well as the onboard equipment (Eurocabin), also SIL 4 certified. The solution is part of InVitalRail, an innovative technology platform for highly scalable and adaptable top-level safety systems. It is a fully generic system that guarantees interoperability with any system from any supplier. It complies with the most stringent quality and security standards (SIL4). Having already undergone testing and certification, the platform is being deployed on a number of projects in Spain and internationally.

Thus, continuing its development of open and integration-ready ERTMS, Indra has developed the first open security protocol between the interlocking and RBC systems, based on the RaSTA (Rail Safe Transport Application) standard. This solution will help drive the globalization of the interoperability concept, extending the scope of standardized integration between signaling systems and train control systems, acting as a technological driver based on infrastructure scalability and optimization.



SIEMENS ESPAÑA

In 1989, Siemens, as leader of the Hispanic-German consortium, was entrusted to lay the foundation stone in High Speed Lines construction in Spain after the

BOMBARDIER ESPAÑA

The level 2 ERTMS of Bombardier, present in various sections of Spain, as well as in Europe and Asia.

Since Bombardier's implementation of the world's first ERTMS Level 2 line in full commercial operation in April 2002 with outstanding performance levels of 99.6% on-time performance, we have rapidly become a world leader in this field. Bombardier built an invaluable foundation of know-how and trained specialists to continue implementing ERTMS technology on rail routes worldwide.

The INTERFLO 250 solution receives information from the EBI Link lineside electronic unit (LEU), which transmits it to the train via balises, and can easily be upgraded to INTERFLO 450 ERTMS Level 2. This enables the onboard equipment to use radio-based signalling on ERTMS Level 2 and regional ERTMS lines.

The INTERFLO 450 ERTMS Level 2 solution is characterised by the wayside system providing continuously updated information to the train to ensure safe operation.

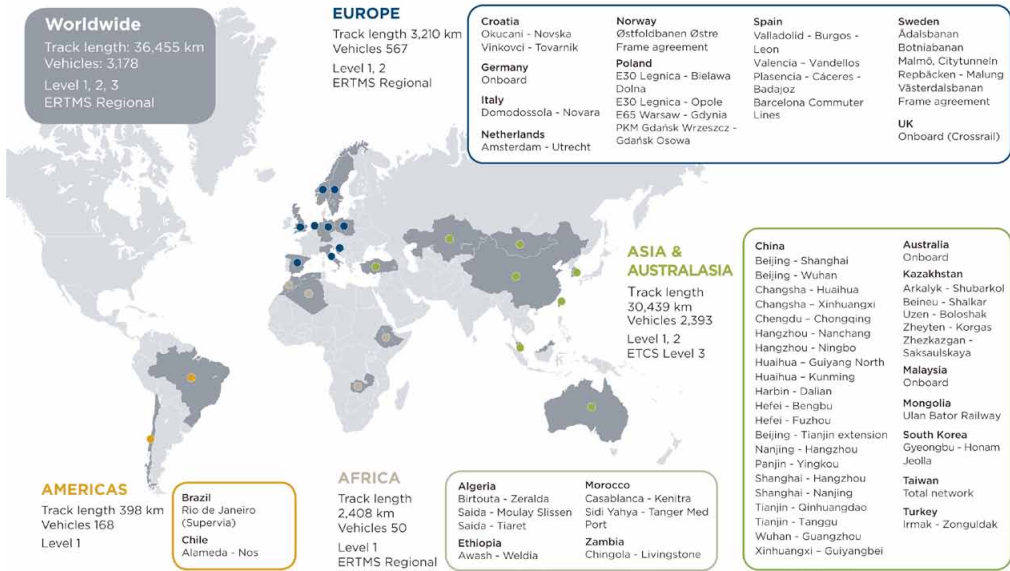
INTERFLO 450 supports very high levels of operational safety and removes the need for the installation and maintenance of wayside equipment, particularly light signals and their support systems and similarly reduces civil works and cabling supply and works. Having signals displayed in the cab presents the

awarding of Madrid-Seville High Speed Line, opened in 1992, coinciding with the Universal Exhibition in Seville. Since that date, this company has become a reference within the railway sector in Spain and worldwide, and nowadays it can be said that Siemens has participated almost in all the High Speed Lines currently operating or under construction in Spain: Madrid-Seville, Madrid-Toledo, Madrid-Segovia-Valladolid, Valladolid-Leon, Madrid-Barcelona, Lleida-Barcelona, Barcelona-French border, Madrid-Valencia, Córdoba-Málaga, Antequera-Granada and Olmedo-Orense-Santiago.

Another historical fact took place in

2007 with the commissioning of the first one of the 26 AVE S103 units, the first one in getting the authorization for the commercial operation service under ERTMS Level 2 in Spain. Siemens was also responsible for equipping, for Renfe, Siemens AVE S103 fleet as well as both Talgo-Bombardier AVE S102 and S112 fleets with the on-board equipment Trainguard 200, specific for Level 2. Regarding international projects, it is worth mentioning the Meca-Medina High Speed Line (within the Haramain project), Ankara-Konya High Speed Line (in Turkey) and the Marmaray project (also in Turkey).

BOMBARDIER ERTMS/ETCS PROJECTS WORLDWIDE



opportunity for higher line speeds and increased capacity.

The INTERFLO 550 solution is a digital radio-based signalling system for low density regional lines which significantly reduces the cost of rail operations (OPEX). Cost-intensive manual operations can therefore be replaced by the INTERFLO 550 solution, improving economy, capacity and safety. INTERFLO 550 utilises the Class 1 ERTMS/ETCS specifications providing full interoperability for ERTMS fitted trains.

In Spain, Bombardier, in partnership

with other companies, has supplied the ERTMS Level 2 for various railway sections such as the Plasencia-Burgos (correspondent to the railway corridor Valladolid-León-Burgos), the corridor of Plasencia-Cáceres-Badajoz and the section between Hospitalet de Llobregat-Mataró, of Rodalies. The ERTMS Level 2 has also on board in the AVE 130.

On an international level, it's presence in China stands out. In Europe, it is present in the section between Amsterdam and Utrecht, besides being implemented in Polonia and at a pilot line in Sweden.

MAFEX MEMBERS WITH ERTMS PROJECTS

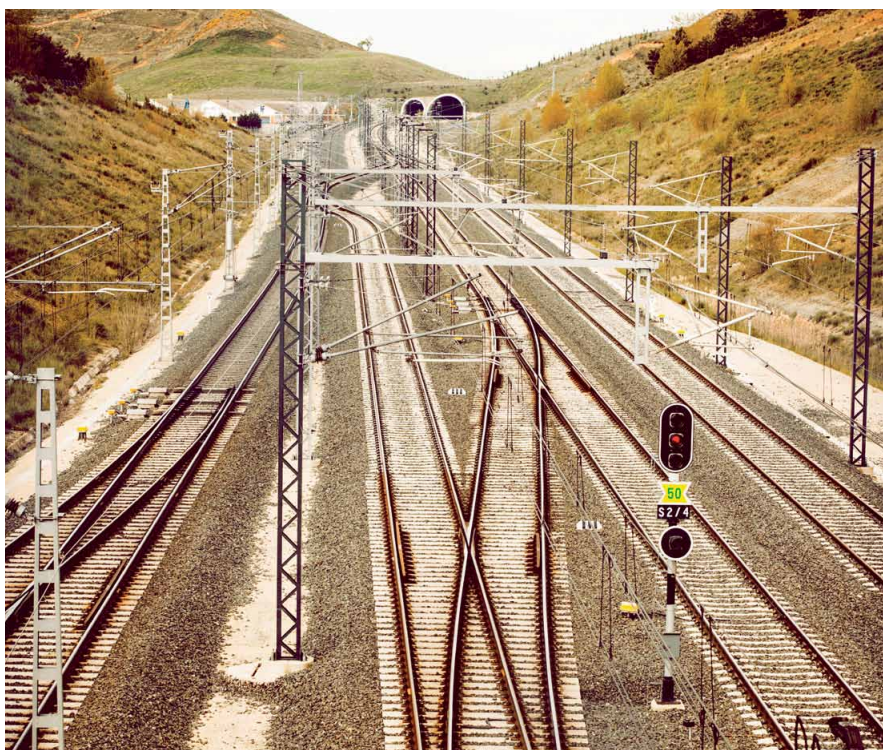
IDOM

One of the first ERTMS implementation projects of IDOM was for the Spanish Railway Infrastructure Administrator (ADIF). The firm carried out the role of project manager of the contract which included Design, Build and Maintenance of the Signalling system, Train Protection systems, Telecommunications systems, GSM-R Radio system and related systems for the last section of the Barcelona-French border High Speed Line. The Scope of Works included ERTMS Level 1 and 2 for a section of 186 km. The Lleida-Barcelona section included the following railway facilities: crossing posts (Les Borges Blanques, Camp de Tarragona Station, La Pobla de Montornés, Gelida), passing loops (L'Espluga de Francolí, L'Arboç, Vilafranca del Penedés, Sant Vicenç dels Horts, El Prat de Llobregat station, Barcelona Sants station),

The Signalling works commenced in April, 2004. By December, 2006, the 91 km length section (Lleida-Roda de Barà) started commercial operation, extending the Madrid-Zaragoza-Lleida high-speed line. An ERTMS Level 1 system adopting SRS UNISIG specifications were tested and commissioned, allowing a maximum speed of 300 km/h for the Lleida-Tarragona section.

Since these beginnings, Idom has continued to design and implement ETCS solutions.

At present, IDOM is working in Croatia



preparing studies, designs and obtaining the necessary permits for the implementation of the Upgrade and Construction of a 43 km Second Track (Križevci-Koprivnica-state border section). This project is being developed for HŽ Infrastruktura with funding from the EU. The engineers of Idom have been designing an ERTMS Level 1 system with speeds of up to 160 km/h (Lepavina - state border). This system is based on the national PZB system with ETCS 3.0.0 UNISIG centralized for the stations of Lepavina, Koprivnica and the future station of Novo Drnje. The de-

sign includes entry/exiting areas for the ETCS Territory (Osijek-Varaždin connection). The signalling design includes road level crossings which will not be interrupted by the civil works. The design has contemplated that the ETCS balises will be compliant with ERTMS Level 2, allowing for speeds of up to 200 km/h. Idom is also working on a high-speed project in Sweden, East Link Branch. Once the preliminary design of the track alignment has been concluded, Idom will begin designing the ERTMS system for the new line.

INECO

Ineco supervises the deployment of ERTMS in European corridors. Ineco's experience and knowledge in ERTMS have led the ERA to rely on the Spanish engineering company for the sixth consecutive year for technical assistance and supervision of ERTMS/ETCS interoperability in more than 40 European projects.

The projects include, for example, implementing ERTMS in the Swedish, Belgian and Austrian network, or equipping vehicles with ERTMS in Germany, Czech Republic and The Netherlands.



GETINSA-PAYMA

Getinsa-Payma has developed the ETCS/ERTMS level 2 pilot railway signaling Project in Romania

Between 2011 and 2014, Getinsa-Payma carried out the technical assistance for the supervision of the design and installation up to commissioning of the ETCS/ERTMS level 2 pilot railway signaling project, in Romania. This pilot project covers a railway stretch of 45 km and includes the installation of the on board equipment, interlocking systems, GSM-R and data transmission systems. The design speed of the railway line is 160 km/h.

THALES

Thales Spain has been present in the Spanish High Speed networks since its beginning in the line Madrid-Seville and, since then, in a relevant part of the new lines and in the development and implementation of the ERTMS system in Spain.

Today, Thales Spain is present in more than 1,000km of the high speed network with ERTMS systems Level 1 and Level 2, in high performance lines as in the Mediterranean Corridor in the Villarrela-Vandellos section and in the first implementation of the system in a commuter network in Madrid.

The knowledge and experience in Spain, allowed Thales Spain to develop its international presence implementing ERTMS solutions in Turkey, Nigeria, Algeria, Greece and Mexico where is pioneer in the installation of ERTMS in America and pioneer in the installation in suburban lines.

The suburban line Cuautitlan-Buenavista (System 1) was the first in America with ERTMS (Level 1) and today Thales Spain is working on the installation of ERTMS Level 2 in the suburban line México DF – Toluca.

This section runs over 57km between the city of Mexico and Toluca, connect-



ing the capital city with the West of the country.

The project is being developed with double track allowing 600,000 travellers per day to Mexico City at a 160km/h speed.

Thales Spain is providing an interlocking based system, ETCE Level 2 as ATP system, field elements (axle counters, point machines, signals, eurobalises) and auxiliary detectors.

Added to the signalling systems, Thales is installing that putting into service the telecommunication systems based on optical fiber. Multiservice network, GSM-R, broadband radio, CCTV system, passenger information system and the integrated platform of telecommunication systems..

CAF SIGNALING

CAF Signalling has been implementing ERTMS level 1 and level 2 solutions both trackside and onboard in several countries like in Spain, Bulgaria, Mexico or Turkey, and more recently received contracts in the Netherlands and the UK.





Management systems to improve conservation of transport infrastructure

THE TECHNICAL BUSINESS AREA OF COMSA HAS BEEN AWARDED THE CONTRACTS FOR FOUR R&D PROJECTS INVOLVING THE DEVELOPMENT OF NEW MATERIALS AND MANAGEMENT SYSTEMS THAT WILL ALLOW LONGER LASTING AND MORE EFFICIENT MAINTENANCE OF RAILWAY INFRASTRUCTURE.

The MAPMIT (multifunctional materials designed for strengthening and monitoring of transport infrastructure) project will develop a new method for the repair, rehabilitation and reinforcement of tunnels, embankments and bridges by the projecting of mortars and multifunctional concretes. In this way, both the properties of the materials used and also their resistance and adhesion will be improved. SISGES (smart, sustainable and integrated management system for structures) aims to provide a new tool for the integrated management of infrastructures that facilitates decision-making relating to their conservation based on the real-time evaluation of their condition. Meanwhile, RECOVER (comprehensive sustainable anti-pollution

treatment for the creation of green railway corridors) seeks to create green railway corridors by means of systems for removing contaminants associated with the operation of the infrastructure, especially in relation to ballast. Finally, the FINLAY (reduction of traffic accidents through sustainable fine and ultra-fine layered road surfaces with an extended life cycle) initiative seeks to develop a new generation of high performance mixtures for asphalt to improve the safety, durability and sustainability of road surfaces and reduce the cost of their life cycle. These projects involve total funding of 4.3 million euros from the 2015 Challenges-Collaboration call for proposals from the Ministry of Economy and Competitiveness of the Spanish Government.

ETCS solutions

Everywhere it matters, we deliver

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Provide up to 40% gain without any further investment in infrastructure

INTEROPERABILITY
Enable non-stop rail operations at national frontiers

SYSTEMS INTEGRATION
Design and deliver seamless signalling and communication solutions

LIFECYCLE COST
Optimise trackside efficiency, running costs and maintenance

ENERGY SAVINGS
Reduce power consumption by more than 10%

Millions of critical decisions are made every day in rail network operations. Thales is at the heart of this. A world-leading supplier of ETCS technology, we have been making rail networks safer, more efficient and greener for 70 years. We pioneered ETCS deployment and our customer-focused integrated smart technologies deliver unrivalled signalling and control solutions. Helping decision makers to make more effective responses in critical environments. Everywhere, together with our customers, we are making a difference.



THALES
Together • Safer • Everywhere



The V300ZEFIRO, equipped with the CBM system to support maintenance activities

MANUFACTURED BY BOMBARDIER IN COLLABORATION WITH HITACHI, IT IS EQUIPPED WITH CONDITION BASED MAINTENANCE (CBM) SYSTEM, WHICH HAS SEVERAL CONTROL DEVICES BOTH INSIDE AND OUTSIDE THE VEHICLE.

The CBM functionality applied to high voltage and propulsion systems observes the operation of various sub-systems, which is used in order to determine the need for inspection and/or maintenance of the vehicle. This assists in predicting imminent component failures such that they can be addressed before the functioning of the train is affected.

At the same time, CBM aim is to reduce maintenance costs significantly as the preventive maintenance activities will be performed based on components or sub-systems monitored actual status, not on a pure and simple predefined time base, avoiding substitution of components that are still in good enough operative conditions.

The propulsion and high voltage components that are monitored via CBM in the mentioned train are listed below:

- ▶ AC and DC line circuit breakers
- ▶ AC and DC switches
- ▶ Bearings of fans and pumps included in cooling systems
- ▶ Heat exchangers and cooling air filters
- ▶ Charging circuits components (contactors, inductors and capacitors) of the propulsion converter

- ▶ Traction motor
 - ▶ Gear box
- The magnitudes monitored to determine need for inspection and/or maintenance are mainly:
- ▶ Number of operation for breakers, switches and contactors, and number of operating hours for motors.
 - ▶ Opening and closing times of breakers and contactors.
 - ▶ In case of the DC breaker, number of openings due to overcurrents.
 - ▶ Charging time of filters, to detect degradations of filter components.
 - ▶ Vibrations produced by degraded bearings of traction motors, gear boxes, and motors of fans and pumps.
 - ▶ Clogging condition of the air filters and so proper air flow in forced ventilated cooling systems.

COMPREHENSIVE MANAGEMENT OF INFRASTRUCTURE

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A sole interlocutor, well-equipped to successfully manage the whole cycle of the project, with 42 offices representing the Group around the world.

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- ▶ Water
- ▶ Environment



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Trackguard Westrace Urban: state-of-the-art control technology for trams

SIEMENS, IN ITS COMMITMENT TO MAKE INTELLIGENT MOBILITY A REALITY IN CITIES, IS WORKING ON THE CREATION OF CUTTING-EDGE SOLUTIONS THAT HELP OPERATORS MANAGE METROPOLITAN DEMANDS EFFICIENTLY, SUSTAINABLE AND SAFELY.



The first installation of TrackGuard Westrace Urban was held in the tank of TUSSAM located in Seville

In its commitment to make real a smart mobility in the cities, Siemens is working on creating state-of-the-art solutions to help the metropolitan operators to manage the travelers' requests in an efficient, sustainable and safe way. Facing these challenges, Siemens offers a safe and innovative solution specially aimed to the tramway sector customer: the electronic interlocking Trackguard Westrace Urban, the latest development from the interlocking family Sicas S7. Siemens carried out the installation of Trackguard Westrace

Urban at the TUSSAM depot in Seville, entering into commercial operation service last Summer. This interlocking can not only be managed from the control center equipped with Controlguide Vicos, but also from a local control panel which receives the signal coming from a control panel installed on the route. The Chinese market was also interested in the Siemens solution for the first tramway project in the West of the country, the Xinjin Line in Chengdu, of which commercial operation service is foreseen to start in the middle of this year.

Other European countries such as Belgium, Luxembourg or Denmark were also concerned with this new solution.

Reliable, flexible and cost effective modular hardware

The automation technology of Trackguard Westrace Urban has a compact design and it is scalable, thus it is ideal for limited operation budgets as it stands out for its low cost of life cycle. In addition, thanks to the simplicity of its architecture, it offers short implementation deadlines, which allow configuring it without excessive costs.



Installed in Gernika the railway gauge DWPM for Euskotren

EUSKOTREN ALREADY HAS THE PROFILE MEASURING EQUIPMENT FOR DANOBAT TRAIN WHEELS AT ITS FACILITIES IN GERNIKA.

The DANOBAT train wheel profile measuring unit has been installed at the facilities of Euskotren in Gernika. Thanks to this new measuring system, the Basque railway company has gained greater control over the condition of the wheels of their trains, thereby improving maintenance and safety in transport. The system is capable of measuring various parameters simultaneously:

- ▶ Flange Height
- ▶ Flange Width
- ▶ qR factor.
- ▶ Rim Thickness
- ▶ Full Wheel Profile
- ▶ Tread Hollow
- ▶ Back to back Measurement
- ▶ Wheel Diameter

The measuring device is equipped with cutting edge railway technology: high speed camera capable of taking 100 fps, the system is capable of providing the measuring result 120s after the last wheelset has passed, the measurements are reconstructed with a mathematical algorithm in 3 dimensions, ... Furthermore, given the adverse climate conditions of the Basque coast, the robustness of this DANOBAT railway measuring system

has been given the utmost importance. The unit is protected and isolated from the outside, and is capable of maintaining a constant temperature inside the triangulation unit in extreme weather conditions with temperatures below -20°C. In addition, the whole structure is designed in such a way that it does not deform, even in adverse weather conditions, and that vibrations generated when the train passes are reduced significantly. The straightforward and rapid installation of the DANOBAT machine took place in the month of October. There was no need for civil works or removing rails for installation in the railway maintenance complex.



Major Spanish participation in Shift2Rail

INDRA HAS MANAGED TO JOIN THE HIGHEST GOVERNING BODY OF THE LEADING EUROPEAN RESEARCH INITIATIVE IN THE RAIL SECTOR AND IS PART OF THE STEERING COMMITTEES OF THREE OF THE FIVE RESEARCH PROGRAMS.

Indra aspires to break the hegemony in the world of high-performance trains and spearhead its evolution. It has racked up major successes over recent years, completing state-of-the-art developments and projects in railroad traffic control and signaling platforms, payment systems and new solutions to enhance passenger services.

Following a long and demanding process, Indra's innovative developments, R&D accomplishments and commitment to innovation have positioned the company among the 17 major railroad firms comprising what is set to

become the Governing Board of the Shift2Rail joint undertaking. As part of the Horizon 2020 initiative, and armed with a budget of 920 million euros, this leading European research program for railroad transport is intended to focus combined R&D investment and develop the next generation of technologies to help create a genuine European railroad network.

Indra will be involved in the IP2 program to develop advanced railroad traffic management and control systems; on the IP4, dedicated to development of new ICT solutions for the provision of groundbreaking services in interoperability, ticketing, new payment methods and information systems; and the IP5, seeking to drive progress toward more efficient, sustainable and competitive goods transport.

As well as its technological capabilities and experience in railroad transport, Indra also brings to Shift2Rail its wide-ranging expertise in a number of industries, supporting synergy generation and the transfer of technology between fields, as well as driving more in-

tegrated and intermodal mobility management. The company will also contribute its long experience in the integration of technology and systems from a number of suppliers, and particularly in the development of proprietary innovative solutions to drive process automation and efficiency, as well as to cut operating costs.

As part of Shift2Rail, Indra will partner with the foremost European businesses, institutions, universities and research centers in the field, participating in multinational initiatives and fund raising, while also improving its range of solutions and enhancing its competitive position.

Joining the Shift2Rail initiative strengthens Indra's position as one of the leading operators in the railroad industry, while also representing acknowledgment of its commitment to innovation in the field. The latest technological solutions developed by the company have placed it at the forefront of the global industry, having successfully deployed systems all over the world, including in the USA, Mexico, Colombia, China, India and Malaysia.



Optimising the maintenance

WITH AV-RAMS, INECO HAS DEVELOPED A METHODOLOGY FOR CALCULATING THE MAINTENANCE OF HIGH SPEED, USING AS A BASE, FOR THE FIRST TIME, ACTUAL DATA FROM FAILURES OF INFRASTRUCTURE AND SUPERSTRUCTURE IN LINES IN OPERATION, SUCH AS THOSE LINKING MADRID WITH BARCELONA, VALENCIA AND VALLADOLID.

The aim of the AV-RAMS project is to detect the most frequent causes of track infrastructure and superstructure faults (not to be confused with

breakdowns) on high speed lines and to define the best solution to the most common incidents. This pioneering project is the first to eschew a purely theo-

retical basis in favour of a trove of empirical data taken from lines in active service. The project aims to optimise the design of maintenance plans to save time and resources, which is why this kind of study is increasingly demanded internationally. Ineco has developed this innovative initiative by applying its extensive experience with the Spanish high speed rail network to enhance both preventive and corrective maintenance.



The plant of Santa Perpetua, inaugurated in 1994, is the most modern in the Alstom group in Europe and one of the few Alstom plants able to manufacture, in the same facilities, High Speed and regional trains, trams, subways, etc.

Developed in Spain the first 4.0 factory of the railway sector

THE INDUSTRIAL CENTER OF ALSTOM IN SANTA PERPETUA DE MOGODA (BARCELONA) WILL BECOME THE FIRST FACTORY 4.0 OF THE RAILWAY SECTOR IN SPAIN, ACCORDING TO PLANS ANNOUNCED BY ALSTOM. THE COMPANY BET ON THE DIGITAL TRANSFORMATION, WITH A PLAN THAT INCLUDES BOTH THE INTEGRATION OF THE LATEST TECHNOLOGIES AND THE ENHANCEMENT OF ITS HUMAN CAPITAL.

"We are witnessing a great change called Industry 4.0 or the Fourth Industrial Revolution, driven by the confluence of new technologies that have matured in recent years, by new business models derived from those technologies and by the transformation of existing value chains. We are facing a great opportunity for companies, for people and for economies. As a company that has always been a pioneer, Alstom wants to be one of the architects of this new industrial era in Spain". The Alstom site in Santa Perpetua has already started to integrate intelligent systems into industrial processes, using big data, 3D te-

chnologies, robotics and augmented reality, among others. These new technologies will allow Alstom to improve its production chain and processes in order to be more competitive, to design and manufacture trains adapted to the future needs of passengers, drivers and operators. Santa Perpetua plant, inaugurated in 1994, is the most modern of the group in Europe and one of the few Alstom plants able to manufacture, in the same facilities, high-speed trains, regional, trams, metros, etc. Currently 90% of its production is dedicated to export projects in Australia, Europe, North Africa, Middle East and Latin America.



ArcelorMittal

At the forefront of Rails Solutions

ArcelorMittal is the world leading steel and mining company, is part of a small group of rail manufacturers with rail production facilities in Spain, Poland, Luxembourg and the United States. Our production has experienced significant developments in all rail markets: high speed, tram, metro, heavy loads, urban transport and port operations.

ArcelorMittal have the widest range of products, offering a wide portfolio covering all sizes and types of steel in the best conditions of quality and service. Proximity and customer satisfaction, Research and Development focus, a wide range of premium rails and our unmatched capacity, are ArcelorMittal Long Products Europe - Rail and Special Sections strategic bases. The next time you take a train anywhere in the world, you may be traveling in rails manufactured by ArcelorMittal.

rails.arcelormittal.com

AcelorMittal es el principal productor siderúrgico y minero a escala mundial, y forma parte de un reducido grupo de fabricantes de carril, con plantas productoras en España, Polonia, Luxemburgo y Estados Unidos. Nuestra producción ha experimentado un importante desarrollo en todos los mercados de carril: la alta velocidad, tranvía, metro, cargas pesadas, transporte urbano y operaciones portuarias.

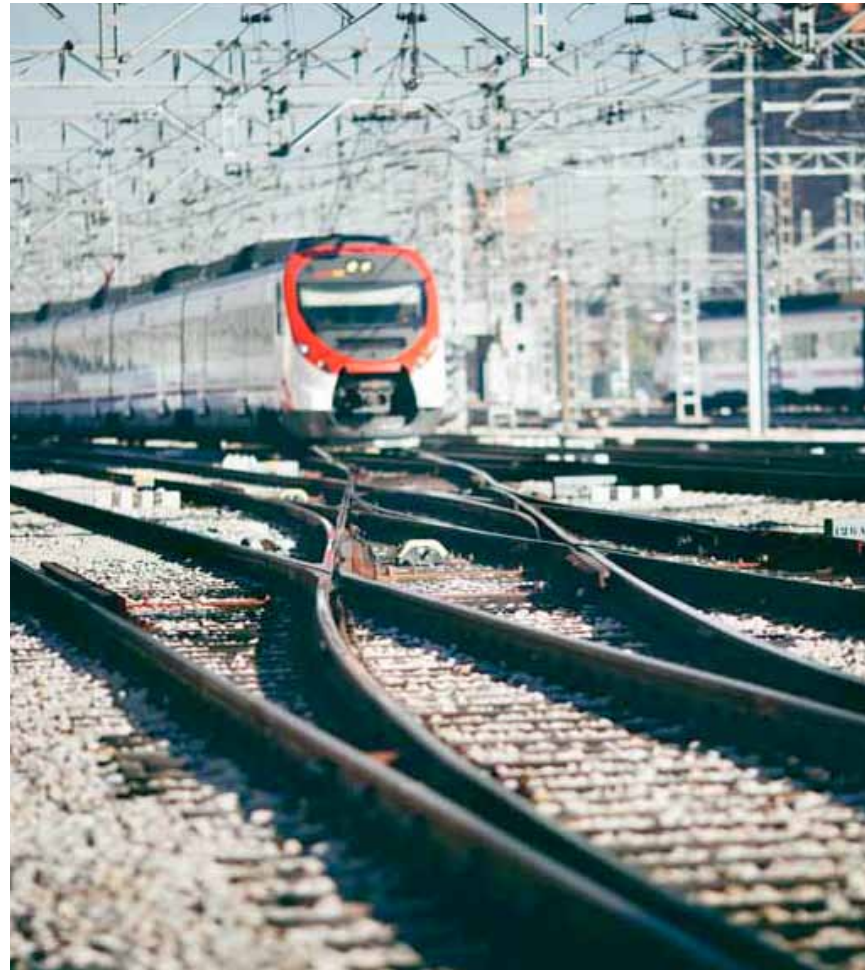
En ArcelorMittal contamos con la oferta más variada de productos, fabricando una amplia gama de dimensiones y tipos de acero en las mejores condiciones de calidad y servicio. Proximidad y la satisfacción de nuestros clientes, apuesta por la Investigación y el Desarrollo (I+D), una amplia gama de carriles premium y nuestra incomparable capacidad, son la base estratégica de ArcelorMittal Europe Long Products – Carril y Secciones Especiales. La próxima vez que coja un tren en cualquier parte del mundo, es posible que esté viajando en carriles fabricados por ArcelorMittal.

Improving rail safety: New simulator for training of railway traffic controllers

IDOM HAS DEVELOPED WITH TELVENT AND FOR THE RAILWAY INFRASTRUCTURE ADMINISTRATOR (ADIF) A SYSTEM SIMULATION TRAINING, PIONEER WORLDWIDE, TO PLAY DYNAMICALLY EXPLOITING SITUATIONS OF MAXIMUM COMPLEXITY.

The training and retraining of rail traffic controllers is a matter of priority to guarantee safety and ensure the efficient management of railway systems. With this in mind, IDOM, working alongside TELVENT, has developed a rail training simulator for the railway infrastructure administrator (ADIF). This world-class pioneering system can reproduce dynamic scenarios of highly complex situations involving many different actors and implementing Spanish regulations for rail systems. IDOM has conceived the development of the simulator as an automatic evaluation training process, able to develop all kinds of rail simulation exercises operating on highly complex infrastructure covering 800 km with 84 stations and all kinds of signage and trains blockages.

This project, which is innovative in the railway sector, has required the participation of a large multidisciplinary team comprising experts in rail operations, signalling, process analysts and system design, as well as the participation of specialists in psychological training. This tool was first used for the retraining of ADIF rail traffic controllers and is now being used to standardize and approve new rail traffic controllers.



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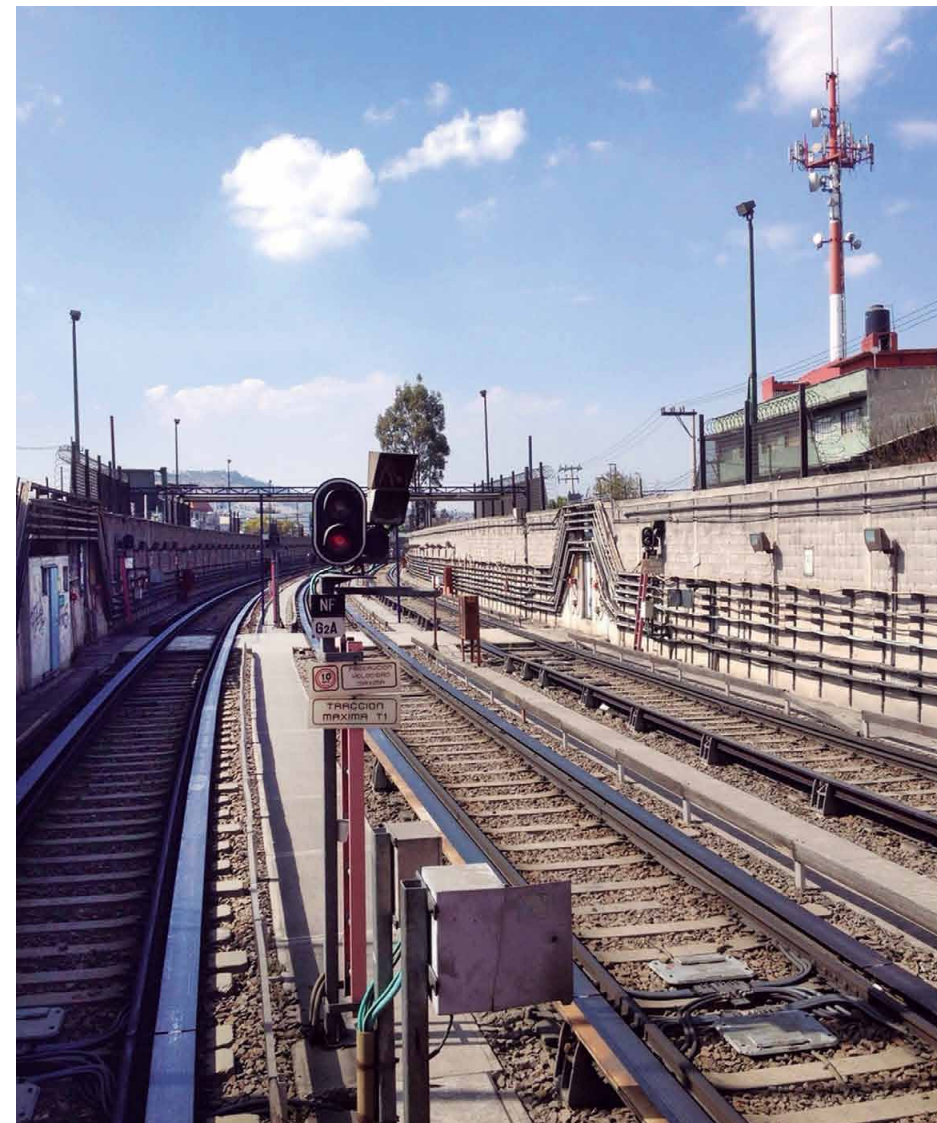
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Albatros Corporation is specialised in the design, manufacture, commercialization, and maintenance of equipment for the railway industry. Albatros is formed by various units of engineering and manufacture in Spain as other countries. We have a team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

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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.

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

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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 stock, signalling, maintenance and modernisation, infrastructure and integrated solutions.

In Spain, Alstom Transport employs around 2000 people in 19 working sites, has a manufacturing site in Barcelona and develops R&D programmes both for rolling stock and railway signalling and safety projects.

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

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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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from Europe through Asia to Oceania, America and Africa.

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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.

**ARTECHE (ELECTROTÉCNICA ARTECHE SMARTGRID, S.L.)**

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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.

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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 flexibil-

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**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.

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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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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.



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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.



CAF TURNKEY & ENGINEERING

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CAF Turnkey & Engineering was created in 2007 with its head office is in the Technological and Scientific Park of Biscay (Zamudio). It began its business in Integrated Engineering of Transport Services and in 2015, after merging with the company CMFS (Mexico), it increased its portfolio of services with the inclusion of EPC projects for both civil works and subsystems.

Following solid and constant growth, the company currently has a workforce of 200 with offices in Zamudio, Madrid and Mexico, providing service to both companies within the CAF Group and national and international private and public customers.



CALMELL GROUP

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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.

With a strong international presence through its network of representatives and distributors, the Calmell Group is able to satisfy your needs on a global level.



CETEST

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Cetren, as expert on the railway sector, has over 30 years experience in promoting and certifying the quality in this sector. Our experience and exclusive dedication to railways allows us to offer global solutions for certification, as the Spanish Notified Body according to European Interoperability Standards and also acting as Independent Safety Assessor and Certification Entity of rail products, processes and services.

Cetren is also the first private center expert in railway staff training, as approved by the Ministry of Public Works and Transport since 2007.



COLWAY FERROVIARIA, S.L.

► C/Botánica, 149-151
08908 L'Hospitalet (BARCELONA)
► P: +34 93 414 65 12
► F: +34 93 639 86 04
► 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

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► P: +34 913 532 120
► F: +34 913 504 954
► jensenat@comsa.com
► www.comsa.com

COMSA is the company of COMSA Corporation 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 qualification in the rendering of services such as engineering services, equipment integra-

tion, complex project management, and collaboration with the customer all along the life of the project. Danobat has a strong international presence and references in the most relevant customers.



DSAF – DINÁMICAS DE SEGURIDAD, S.L.

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

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

DF Rail is a Spanish company specialized at the design, manufacturing and supply of turnout systems and components for

Metro, Conventional, Heavy Haul or High Speed Lines. Turnouts, single and double crossovers, diamond crossings, single and double slip crossings, single and double junctions, switch expansion joints, ..., on wooden or concrete sleepers; for ballasted or unballasted tracks; for single or combined gauges; with monobloc Mn steel crossings or with swing nose crossings; insulated glued joints; transition rails.



ECOCOMPUTER S.L.

► C/ María Zambrano 5 - Bajo- 33401 Avilés (ASTURIAS)
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► 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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► P: +34 607 94 29 73
► 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

► Pol. Ind La Drecera – c/ Mecánica, 23 – 43470 La Selva del Camp (TARRAGONA). c/Antonio Cabezón s/n – 28034 Madrid (MADRID)
► T: +34 917282159
► 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.

► B° Munsaratz, 33 48220 Abadiano (BIZKAIA)
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► F: +34 94 681 73 86
► garbi@fundicionesgarbi.es
► 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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► P: +34 947 29 84 80
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► info@funorsa.es
► www.funorsa.es

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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► F: +34 945 27 49 48
► gamarra@gamarrasa.es
► www.gamarrasa.es

Gamarra, S.A. at a glance: Spanish steel foundry -located at Vitoria Gasteiz- annual production: 4,000 tons - customers: European State Railways, - producers of rolling stock and their subsuppliers - as foundry and supplier homologated by DB AG (HPQ), ÖBB, SBB, SNCF (AFQ) (extract) as well as according to DIN EN ISO 9001:

2000 + DIN 6700 - 2.

Products: brake discs, brake block shoe holders, buffers, spigots and essential steel castings for bogies.



GETINSA-PAYMA, S.L.

► C/ Ramón de Aguinaga, 8 28028 Madrid (MADRID)
► P: +34 91 456 09 82
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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 collec-

tion 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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► F: +34 985 26 09 05
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► www.hicasa.com

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.



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, Portugal, 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 socioeconomical analysis, basic and detailed design, operational and maintenance plans, works supervision, testing and commissioning.



IKUSI

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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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- T: +34 94 382 03 50
- otegi@ik4.es
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IK4 Research Alliance es una alianza de centros tecnológicos, privada e independiente, de referencia en el ámbito tecnológico europeo. Está integrada por 9 entidades del País Vasco: AZTERLAN, CEIT, CIDETEC, GAIKER, IDEKO, IKERLAN, LORTEK, TEKNIKER y VICOMTECH.

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

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



IMPLASER 99, S.L.L.

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- 50172 Alfajarin (ZARAGOZA)
- P: +34 902 18 20 22
- F: +34 902 18 20 22
- international@implaser.com
- www.implaser.com

Implaser is a Spanish company focused in developing innovative security signs for railway projects. Innovation and quality are our mainstays, as we were the first SME being certified in R+D+I in Spain. Implaser has all the range of products certified by AENOR with photoluminescent values of 150, 300, 580 and 720 mcd/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 prod-

ucts, such as photoluminescent systems combined with electroluminescent and guiding systems by LEDs.



INDRA

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- F: +34 91 626 88 68
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- www.indra.es

Indra is a world leader and pioneer in the supply of technological platforms for railway operations management, control and supervision, having specific solutions already tested on high speed and conventional lines and metropolitan operations. Indra is also a leader in ticketing systems for transport operators and has facilities and projects all over the world.

Furthermore, Indra develops high-precision safety and signalling systems. At this moment in time, Indra's solutions are completely unique because of their high level of integration and adaptation to the current and future necessities of the railway environment whatever may be the most state of the art technological and operative options. Indra has managed to open a competitive market for the first time based on technological and economical competitiveness.



INECO

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- international@ineco.com
- www.ineco.com

Global leader in transport engineering and consultancy, it has contributed to the development of transport infrastructures for over 45 years in more than 45 countries. Its high level technical specialisation allows its activity to diversify into new markets and reinforce its presence in

those where it is already established. Its participation in the whole railway system in Spain has led the company to develop important international projects like the Makkah-Madinah high speed in Saudi Arabia, the Ankara-Istanbul line in Turkey and the HS2 project in the United Kingdom.



INGETEAM POWER TECHNOLOGY, S.A.

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- 48160 Derio (BIZKAIA)
- P: +34 94 655 90 00
- F: +34 94 403 98 37
- 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 offering in-house/state-of-the-art developments for.



INSTALACIONES INABENSA, S.A.

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- F: +34 95 493 60 05
- inabensa@abengoa.com
- www.inabensa.com

In the railway sector, Inabensa is an international reference for overhead lines, traction substations, communications and ancillary installations: high voltage, low voltage, lighting and ventilation. Inabensa undertakes turn-key projects, ranging from designing, supplying and

installing to maintaining electrification system for both conventional and high-speed railways, freight, subways, trams and monorails.

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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- 41016 Sevilla (SEVILLA)
- p: +34 954 677 480
- F: +34 954 999 728
- hispacold@hispacold.es
- www.hispacold.es

Hispacold is a World leader company for climate systems specialized in comfort for people with more than 30 years' experience.

Hispacold designs and manufactures HVAC solutions for all rail vehicles: trams, metros, EMUs, DMUs, LRVs... with proven and reliable technology solutions.

In Hispacold each activity is based on a solid quality culture and on a real commitment with the environment. Quality certifications ISO 9001, ISO 14001, OHSAS 18001 are only the smallest part of this working way.

Hispacold is a company of Irizar Group SC, which employs more than 3.000 people in the five continents and has a global turnover of more than 550 Million €. This gives Hispacold the benefits from a multinational organization while maintaining an individual company spirit.

Hispacold's presence in the five continents guarantees the best technical assistance at any place of the world.



ITK INGENIERÍA, S.A.

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- 33203 Gijón (ASTURIAS)
- P: +34 985 35 50 00
- F: +34 985 35 70 50
- itk@itk-ingenieria.es
- www.itk-ingenieria.es

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

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

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



JEZ SISTEMAS FERROVIARIOS, S.L.

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- 01400 Llodio (ARABA)
- P: +34 94 672 12 00
- F: +34 94 672 00 92
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- www.jez.es

JEZ Sistemas Ferroviarios, S.L. is committed to designing, manufacturing, supplying and maintenance of all types of manganese steel switches and railway track systems, in addition to moulded cast steel parts for the general industry. Our Technical Department (Department of R&D) ensures we have the capability of designing and producing points and crossings (turnouts, crossovers, scissor crossovers and diamond crossings) or parts for them, such as hard steel manganese crossings or spare tongues.

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

**KELOX, S.A.**

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

Kelox launched its railway activity in 1977, manufacturing catering equipment for dining cars on longdistance lines.

The experience and knowledge acquired over the years have become Kelox specialist in the design and full supply of galleys and catering equipment for high-speed, shuttle and regional trains.

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

**LA FARGA LACAMBRA, S.A.U.**

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- F: +34 93 859 55 30
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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.

**LUZNOR**

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01015 Vitoria (ARABA)
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- 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: + 34 902 321 400
- P: +34 935 915 700
- F: +34 902 321 450
- F: +34 932 185 610
- manusa@manusa.com
- www.manusa.com

Manusa is the Spanish market leader in design, production, installation and maintenance of automatic door systems. Established in 1966, it has 12 delegations in Spain, branches in Portugal, Brazil, Singapore and India and international presence in more than 70 countries around the world. Manusa develops specific products for public transport, such as platform screen doors (PSD) and ticket gates for access control, as well as one-way corridors, onboard doors and tunnel partitioning doors, always with the Manusa technology support.

**MB SISTEMAS, S. COOP.**

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C/ Igeltzera, 8
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- F: + 34 94 403 06 27
- amacias@mbsistemas.es
- www.mbsistemas.es

MB SISTEMAS is part of MONDRAGON CORPORATION.

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

We give "ad hoc" solutions for the customer's needs; having implanted successfully our facilities around the world.

As engineering we develop both, robotic installations and special machines for any assembly process.

**METALOCAUCHO, S.L.**

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

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

The Company was established in 1982 and currently has three manufacturing sites, located in Spain (HQ), China and India. In 2009 the company was awarded IRIS Certification.

MTC, being among the leading companies in its sector, supplies to the main Rolling stock Constructors worldwide, including Alstom, Bombardier, CAF, CSR, CNR, Hyundai Rotem, Siemens, Talgo, Vossloh).

We also collaborate with Operators for the supply of spare components for their over-haul 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.**

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

MGN was established in 1957 and since then it has been developing its activity both designing and manufacturing rubber-metal components, mainly for the railway industry. MGN invests in research and innovation as a basis for the development of elements to be adapted in the new understanding of passenger and freight trains, taking the latest technological advances of the rubber world, vibration control and damping systems.

**NEWTEK SOLIDOS S.L.**

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- P: +34 943 835942
- F: +34 943 894441
- comercial@newteksolidos.com
- www.newteksolidos.com

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

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

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- F: +34 943 30 93 26
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- 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.**

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- 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.**

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13260 Bolaños de Calatrava (CIUDAD REAL)
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- 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.

**PRETENSADOS DEL NORTE S.L.**

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- F: +34 945 261 400
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- www.pretenorte.com

PRETENSADOS DEL NORTE produces the best prestressed wire for railway sleepers in the world.

More than 30 years' experience, PRETENORTE only uses the best raw materials and we can supply any need required by the client.

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

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

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

**PATENTES TALGO, S.L.**

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28290 Madrid (MADRID)
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- 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.

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► F: +34 91 359 12 46

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► 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

strech and convencional rail network.

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

■ Regeneration of used rails to make LBS.

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

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

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

■ Thermal aluminium welding kits distribution.



ROVER ALCISA, S.A.

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The Rover Alcisa Group came into being 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)

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► 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.

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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 manage-

ment services, supervision of works, value engineering or ICE services.



SICE TECNOLOGÍA Y SISTEMAS

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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).



STADLER RAIL VALENCIA S.A.U.

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► www.stadlerrail.com

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

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



Ingenio para la vida

SIEMENS RAIL AUTOMATION S.A.U.

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► 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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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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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

TEKNORAIL SYSTEMS, S.A.

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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

TECNOLOGÍA SOBRE EL TERRENO

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 Signalling, Optical Fiber, Industrial Automation and Electrical Installations.

Our extensive experience has made Telice a preferred partner for carrying out work and providing services for important railroad administrations and major construction and technology companies in the railroad industry.

THALES

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 signalling, train control, Telecommunication, Supervision, ticketing and critical infrastructures security.

TYPSA

INGENIEROS
CONSULTORES
Y ARQUITECTOS

TYPSA

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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.

VALDEPINTO, S.L.

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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.

When the railway Traction travels to the future, it's *i+c*

At Ingeteam, we apply the concept **i+c** to every project we undertake – innovation to find the best solution and commitment to provide the best service.

We strive towards on offering in-house/state-of-the-art developments for **rolling stock** (Traction & Control Systems) and **infrastructure** (Energy Recovery Systems) and we aim to become the preferred technological partner for our customers: cooperation goes from conception and business case to beyond implementation, and our innovation and commitment is shown from project definition, through the study, design and engineering phases to ensure a successful turn-key supply of the complete solution.

The formula of the new energy *i+c*

www.ingetteam.com

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Ingeteam

READY FOR YOUR CHALLENGES



Talgo Designer and Manufacturer of High Speed and Very High Speed Passenger Trains

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

Talgo

www.Talgo.com