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JUN | SEP 2014

ABU DHABI AIRPORT

**A new star in the Emirates' sky:
Ineco and Aena involved in start-up**

HIGH SPEED BETWEEN MAKKAH AND MEDINAH

Track assembly: in broad daylight

INTERVIEW

Berta Barrero, Ineco's Corporate
general manager

**"We have suitable resources and tools
to sort out the new challenges"**

TRANSPORT PLANS

Tailor-made road maps

BRAND SPAIN

Ceramics and stone: earth and fire



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Editorial



Ineco has managed to face the challenges of globalisation without neglecting profitability or quality in its work: in 2013, we have continued to increase international sales with a 19.2% growth in production as compared to the previous year, offsetting the reduction in the domestic market. The experience and knowledge of our professionals, jointly with the financial soundness of our company and our refurbished processes and structures have led Ineco to occupy a leading and competitive position as an engineering company both in Spain and abroad. We have been able to maintain the quality of the services to our clients with our stockholders' profits in mind at all times. Thus, net revenues as at December 2013 have been 187.3 million euros. This figure being consistent with a pre-tax income of 5.6 million, which is above the 2012 year-end closing.

Some of the lines of action we have recently undertaken in accordance with our bet to grow on the international market include transforming our productive model, opening permanent offices with presence in three continents, and creating strategic alliances with world-class partners and collaborators helping us to catalyse the value of Ineco as the spearhead of Spanish engineering and technology.

We are on the right path. A success story of our bet is the recent agreement to perform the operational transition and readiness of the future MTC terminal at Abu Dhabi International Airport, which is featured on the cover of this issue. Or the articles on Saudi Arabia's and Turkey's high speed works, the transport plans in different countries and the news on bids awarded in Malta, Brazil and Kazakhstan.

Spain is a country with mature infrastructures, where the great investment effort has turned more moderate and sustainable, and where the rational and efficient distribution of resources is the priority. And it is also in this task that Ineco continues decisively to contribute its value, knowledge, and experience to our stockholders Aena, Adif and Renfe with the aim of maintaining the high quality, safety and efficiency standards of our infrastructures.

I am confident that through this issue our readers will be able to identify the passion with which we at Ineco daily face the challenges posed by our projects committed to pursuing the excellence in our service to each of our clients.

Pablo Vázquez

President of Ineco

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Editor-in-Chief: **BÁRBARA JIMÉNEZ-ALFARO**
(barbara.jimenez@ineco.com)

Editorial Staff: **LIDIA AMIGO** (lidia.amigo@ineco.com)

Editorial Board: **JOSÉ ANGUITA, JOSÉ LUIS ANTÓN, ALEJANDRO FERNÁNDEZ, M^a JOSÉ G. PRIETO, CARLOS GUTIÉRREZ, RAFAEL MOLINA, JARA VALBUENA**

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COVER IMAGE: Abu Dhabi International Airport (Midfield Terminal Complex), courtesy of Kohn Pedersen Fox (KPF).



Spain's under-secretary of Public Works visits Ineco's offices in Mexico

Mario Garcés, Spain's under-secretary of Public Works visited the company's offices in Mexico in May (on the photograph, third one on the right). A presentation of Ineco's projects in Mexico took place there. The under-secretary attended the celebration of the World Forum of Logistics Platforms, held in Manzanillo (Colima state), which gathered representatives of more than 40 countries.

Abu Dhabi



Ineco's team already working on the ground

The first jobs to conduct the ORAT (Operational Readiness and Airport Transfer) of the new terminal of Abu Dhabi airport have already begun. Known as Midfield Terminal Complex (MTC), it is currently under construction and is expected to start operating in 2017 (see interview on pages 12-17). On the photograph, from left to right: Jaime Lázaro, Jaime Martín-Gurrea, Ignacio Alejandro, Yousef Al Jaouni and Antonio Martín at the offices of the client, Abu Dhabi Airports.«

Croatia | Malta
EUROPEAN COLLABORATION

Ineco designs transport models for both countries



On the photograph, Ineco's team and partners in the railway refurbishment project in Croatia, where they presented the job before government and European Union authorities in an institutional event held in April.

Croatia and Malta have awarded Ineco, in a consortium with other European companies, contracts to draft a national transport model for each country, for an amount of one million and around half a million euros, respectively. Ineco has consolidated experience in drafting this kind of models, which complete national plans or strategies, as in the case of Algeria, Costa Rica or Ecuador. (see interview on pages 30-35).

In March, the Croatian government awarded the international tender to a group of companies Ineco is part of, together with German PTV Transport Consult, Slovenian PNZ and Croatian Projekt. The school of engineering of the university of Zagreb also participates.

The works will take 31 months. Ineco is currently working on another project in the country: the refurbishment of an 80.5-km railway section between Dugo Selo and Novska (see *it50*). On the other hand, in February Malta selected the offer submitted by Ineco and the Italian company Systematica. Works include drafting the Strategic Environmental Assessment.«

Brazil



Signature of the agreement. Representatives of EPL, the Spanish embassy, AECID, UNDP and Ineco were present.

AGREEMENT WITH UNITED NATIONS/EPL

Ineco to reform Brazilian transport management

Ineco has entered into a technical cooperation agreement with the UNPD (United Nations Program for Development) for the institutional strengthening of EPL (Empresa de Planejamento e Logística), which is part of Brazil's Ministry of Transport.

The works will focus on the reform of transport management, especially in the railway area. A European-like model will be proposed, where infrastructure and operator are different agents. Attention will also be given to regulations on railway operators, safety and circulation, signalling systems and telecommunications.

Furthermore, a cost calculation model of the waterway network (river transport waterways) will also be prepared. This is essential for the country due to its size and to the volume of merchandise transported in said waterways. The tool will be included in the logistic and cargo transport models which are being prepared by EPL.«



Waterway of Tieté river in Barra Bonita, a town of the state of São Paulo.

Kazakhstan

Preliminary study for modernisation of Pavlodar tram

Ineco leads the consortium with Deloitte, which is drafting a feasibility study for the modernisation of Pavlodar tram for the European Bank of Reconstruction and Development



The city, capital of the oblast or province of the same name, is located to the northeast of Kazakh capital, Astaná. To cater for its 330,000 inhabitants, it has a 73-kilometre tram network and a fleet of 113 units manufactured in Russia, which are 30 years old on average. The purpose of the study is to provide assistance to the EBRD in the drafting process of the modernisation project, which includes the acquisition of 20 new trams and the refurbishment of another 40, not to mention improvements in management and a new integrated pricing system, among other actions. Ineco's works comprise the city's public transport market analysis, besides economic-financial, cost and environmental studies of foreseen actions.«

Aeronautical inspectors for the Aviation Safety Agency
The State-owned Aviation Safety Agency (AESA) has authorised Ineco to execute aeronautical inspection material actions. This authorisation entails an express acknowledgement by the aviation safety relevant body in Spain of Ineco's capabilities in the European regulatory framework.

News

Tunisia First results of the European project MEDUSA

In June this year, the results of the aviation demonstration, which includes a validation flight campaign of the project EUROMED GNSS II/ MEDUSA Ineco participates in have been submitted in Tunisia. The flights were performed in February in the Tunisian airport of Monastir, where Localizer Performance with Satellite Guidance (LPV) procedures designed by Ineco were successfully validated.



MEDUSA (MEDiterranean follow Upfor EGNOS Adoption) is part of the European program EUROMED TRANSPORT, focused on facilitating the introduction of satellite navigation services of the European system EGNOS in countries of the Mediterranean Euro zone: Morocco, Algeria, Tunisia, Libya, Egypt, Jordan, Israel, Lebanon and Palestine. Among its advantages, it is possible to mention the improved features of the GPS signal and the integrity guarantee, which increases safety and reduces costs, especially in aerodromes without radio navigation aids such as ILS.«



Spain

Adif tests Bacterio

Adif is interested in the innovative project Bacterio (see it48), developed by Ineco and Spanish biochemical firm Bio-Ilberis. Bacterio, a pollution control system which uses live microorganisms is being tested in the locomotive fuelling facilities of Santa Justa station in Seville, where temporary results indicate an hydrocarbon disposal percentage of 95%.

INNOVATION | 2ND INTERNATIONAL CONGRESS OF RAILWAY TECHNOLOGY

The company presented the **AV-RAMS** project in the event that took place from 8 to 11 April in the city of Ajaccio, in Corsica. It is an innovative analysis of RAMS parameter application to maintenance of high speed railway lines (see itransporte 50). Arsenio Andrés and Álvaro Calvete, project managers, were in charge of presenting it in this congress, which in its second edition gathered participants from more than 25 countries and the most advanced railway technologies.

Spain | TECHNICAL VISIT Omani delegation visits Madrid to see public transport system



On the photograph, the visitors at Ineco's offices: Hanan Al-Rahbi, general director of Planning and Strategy; Afan Al-Akhzami, director of Planning and Investment Development; Saleh Al-Badi, CEO of the National Transport Company; and Ali Al-Falahi, Oman's Royal Police Traffic director.

As part of Muscat's Public Transport Plan, which Ineco is executing (see it50), last May a delegation from Oman's Ministry of Transport came to Madrid. The purpose was to show them how public transport in Spain's capital is organised, under the "single entity" model (Consorcio de Transportes

de Madrid), which Ineco is considering to apply in Muscat. The delegates had the chance to visit it, as well as to see hubs and other infrastructures –such as urban bus lane or bus-HOV lanes. They were also able to observe first-hand the operation of bus, metro, light rail and commuter train networks, as well as the taxi sector, highly relevant for moving around the Omani capital.«



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News



ExpoRail in Cancún

Ineco was in ExpoRail in February. This is the most important meeting of the railway sector organised by the Mexican Railway Association in Cancún. The company was present in the Spanish pavilion along with other companies such as Ayesa, Cosci or Apia. On the photograph, representatives from Ineco in this edition of ExpoRail, José Solorza and Magdalena Garrigós.

Fairs | Congresses

INECO PRESENT AT WORLD ATM CONGRESS AND PASSENGER TERMINAL

International showcase

This year Spain has hosted two of the sector's most important aeronautical events. For the second time, Madrid hosted the World Air Traffic Management Congress (World ATM Congress) and Barcelona Passenger Terminal 2014 both held in March. Ineco was present in both of them with two stands, and shared its experience through technical presentations of its projects. Thus, at Passenger Terminal the conferences of María Sánchez (*Environmental considerations in airport master plans*) and Ainhoa Zubieta (*Impact and cooperation strategies between high speed and air transport*) took place.



Minister of Public Works Ana Pastor, the chairman of Ineco, Pablo Vázquez, and Javier Pérez-Diestro, director of International Air Navigation, at Ineco's stand at the ATM Congress.

CANSO (Civil Air Navigation Services Organisation), with the collaboration of ATCA (Air Traffic Control Association), organises ATM to gather and share the news of the sector. This event brings together the main professionals of the aeronautical world. At the event Ineco introduced the three air navigation tools

it commercialises: HECCO, IMPULSE and RUCCMAN. On the other hand, also in March, the Satellite Navigation Summit 2014 was

held in Munich, where Ineco's director of International Air Navigation, Javier Pérez-Diestro, participated with a lecture on GNSS.«



WORLD ATM CONGRESS_From left to right: Luis Paisán presented HECCO, an assessment tool for ground-air communications coverage. Carolina Ajates presented IMPULSE, a software to assess the effect of obstacles in the quality of pulsed system signals. José Manuel Rísquez introduced RUCCMAN, a prototype based on genetic algorithms to decide on changes in runway.

PASSENGER TERMINAL_María Sánchez focused on the environmental assessment in master plans of airports, such as Kuwait and Cartagena de Indias (Colombia). Ainhoa Zubieta analysed collaboration strategies among airports, airlines and other agents to accomplish more.

10TH
EDITION



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Messe Berlin

A new star in the Emirates' sky

Abu Dhabi Airports entrusts Ineco and Aena with the Operational Readiness of the MTC

By *itransporte* with the collaboration of **Ignacio Alejandro**, aeronautical engineer

Ineco has been awarded, together with Aena, the tender to perform the Operational Readiness and Airport Transfer (ORAT) of the new MTC terminal of Abu Dhabi airport. The two highly experienced companies will advise Abu Dhabi Airports until the start of operations, scheduled for 17 July 2017.

With a traffic exceeding 15 million passengers in 2013, Abu Dhabi international airport, which began operating in 1982, is the United Arab Emirates' second most important one. Over the last few years, it has experienced a great traffic increase and today it operates with the main European capitals, a large part of Asia, and North African countries, South Africa and United States and Canada. This is not surprising for a country with a robust economy –the world's eighth oil producer– and a permanent growth in tourism both for business and leisure purposes. Aware of the need to provide service to unstoppable demand, the Abu Dhabi air-

port operator has entrusted the building companies Arabtec, TAV and CCC with the construction of the new terminal Midfield Terminal Complex (MTC), the transfer of which will be managed by Ineco and Aena. The future new terminal –with 700,000 m² distributed in six levels– is intended to have an annual capacity to respond to a traffic of 30 million passengers in 2017 and become the operating base of the national airline Etihad Airways. With 65 positions for aircraft, MTC will have 3,000 car park spaces and a baggage handling system with capacity for 19,000 bags/hour. The premises should be prepared to receive up to 40 million passengers per year when the construction of a new satellite terminal is completed by 2021. The strategic location of the country, bridging the gap between Europe, Africa, Asia and Oceania, plays a key role in these traffic forecasts. In a near future, the passengers and crew of the airplanes approaching this airport will be able to see a splendid silhouette resembling a four-armed starfish, designed by architects Kohn Pedersen Fox Associates (KPF).«

STEPS TO ENSURE SUCCESS

Planning and team of experts

A team of Ineco and Aena's experts will work in the start-up of the new terminal with the purpose of implementing the operations necessary for the premises to operate properly and timely, avoiding incidents upon the start of operations, and ensuring the service level complies with the required standards. **PROCESSES** _To begin with, the companies have performed for Abu Dhabi airports the so-called "Concept of Operations", a pro-

ject where the main processes of the new airport are described and evaluated, from the first building phases until well after the transfer date. Although the most surprising fact is the use of thousands of extras, the purpose of the so-called operational readiness goes way beyond testing a new infrastructure weeks before its transfer. As a matter of fact, in large airports, works begin several years »



MIDFIELD TERMINAL COMPLEX (MTC)

In the photograph, the future new terminal Midfield Terminal Complex (MTC), which, with 65 aircraft positions, will cater for 30 million passengers per year in

2017. The company Abu Dhabi Airports has entrusted the architectural firm KPF with the design project.

PHOTO: COURTESY OF KOHN PEDERSEN FOX (KPF)

Ineco and Aena, with wide experience in transfers in Spain's most important airports, will advise Abu Dhabi Airports until the start of operations in the new MTC terminal, scheduled for 2017

before, during the preliminary phases of design and construction of the premises, as the function for which they are designed must logically be considered in the project. It is in this phase when it is important to define concepts such as business style, management model, which airlines are to operate, who will be the providers and what kind of

The methodology, designed by Ineco and Aena, allows defining the types of trials according to their complexity degree

providers there will be, etc. Ineco and Aena's experts identify the material needs for the operation of the expanded airport, and, if necessary, will make modification proposals both in the operating model of the airport and in the assignment of new spaces, types of connections among terminals, passenger and cargo categorisation, collaboration in environmental management, drafting of operating procedures, etc.

MODEL_To ensure success, the operating model as well as the procedures that should

be applied to properly satisfy the needs of air companies and passengers will be determined. Other relevant aspects are verifying that all the personnel is trained and acquainted with the new infrastructure, and finally, performing operation and transfer trials which ensure that everything works well and that the possible anomalies detected during the trials can be solved before the start-up of the terminal.

TRIALS_Trials are performed between the so-called "Coming-into-service", when the new infrastructure is in proper working conditions from a technical point of view and the "Transfer", when the expanded airport can start operating.

The methodology, designed by Ineco and Aena, allows defining the types of trials according to their complexity degree. They can either be basic or global trials. Basic trials focus on certain subsystems, independent from each other, where the operation of each section is analysed, that is check-in, baggage delivery, signs or security. Global trials aim at analyzing full processes such as flow of passengers and baggage at departures and arrivals.«

OWN METHODOLOGY

The 10 keys of the operation

- 1_Suggest a new operational model of the airport.
- 2_Define and implement the Airport Management Centre.
- 3_Determine the new model for operation, exploitation and maintenance, identifying the possible own and outsourced means for exploitation of the airport.
- 4_Collaborate in the definition of the

environmental management model.

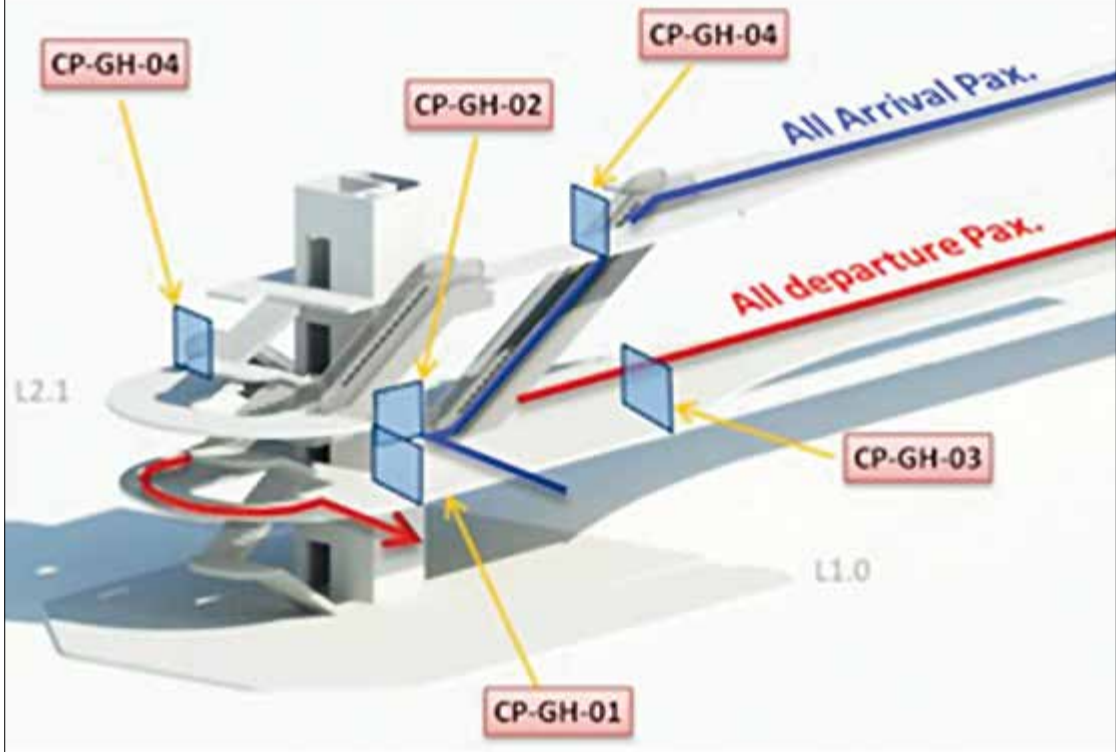
- 5_Advise in the adjustment of operational procedures and in the drafting of new ones, including contingency procedures.
- 6_Identify HHRR and material needs for the operation of the expanded airport.
- 7_Assign new spaces, after conducting preliminary functional analysis of needs and uses.

- 8_Design and provide a familiarization plan at job position.
- 9_Define and carry out trials.
- 10_Design and carry out operational readiness for new facilities.

OPERATIONAL READINESS

At the "Operational Readiness" stage, everything is simulated, from the arrival in a private car or public transport, or baggage delivery

to the boarding of the passenger onto the plane. The image below shows the door blocking system control, a critical issue considered in the job, is shown.



WORKS EXECUTION

The company Abu Dhabi Airports has entrusted the consortium made up of building companies TAV, CCC and Arabtec with the works.

Experts in readiness

Ineco and Aena –the world's largest airport operator– are pioneers in performing transfer trials. Both companies have developed an own methodology thanks to the over-10-year experience in operational readiness, not only in the large airports of Madrid, Barcelona, Malaga and Alicante but also in many others which have required enlargements and more complex facilities, among which those of Lanzarote, Zaragoza, Santiago,

La Palma, Ibiza, Gran Canaria, Burgos and Fuerteventura can be mentioned. Aena operates 46 airports in Spain, and participates in the management of another 24 in the world, which around 190 million passengers use every year. Ineco has collaborated with Aena in the transfer of more than 20 airports and has experts specialised in all operational readiness processes.«

T3 MALAGA

250,000 m²

12 contact positions + 24 remote

State-of-the-art installations and systems: security, IT, BHs...

A multi-storey car park with 2,500 spaces

Annual capacity: 18 million passengers

T1 BARCELONA

525,000 m²

49 contact positions + 19 remote

State-of-the-art installations and systems: security, IT, BHs...

14,000 new parking spaces

Initial service: 30 million passengers

ALICANTE

335,000 m²

15 contact positions + 31 remote

State-of-the-art installations and systems: security, IT, BHs...

A multi-storey car park with 4,200 spaces

Annual capacity: 20 million passengers

T4-T4S MADRID

760,000 m² (over)

64 contact positions + 43 remote

State-of-the-art installations and systems: security, IT, BHs...

A multi-storey car park with 9,000 spaces

Iberia's operating base

Annual capacity: 50 million passengers

MTC ABU DHABI

700,000 m²

65 contact positions + 19 remote

State-of-the-art installations and systems: security, IT, BHs...

A multiple-storey car park with 3,000 spaces

Etihad Airways' operating base

Initial service: 30 million passengers with expansion forecast of up to 40 million passengers per year

The Airport Management Centre (AMC) was developed by Spanish engineers, projected by Aena and Ineco; its role is essential, as it brings together the control of all the operations of the airport in real time

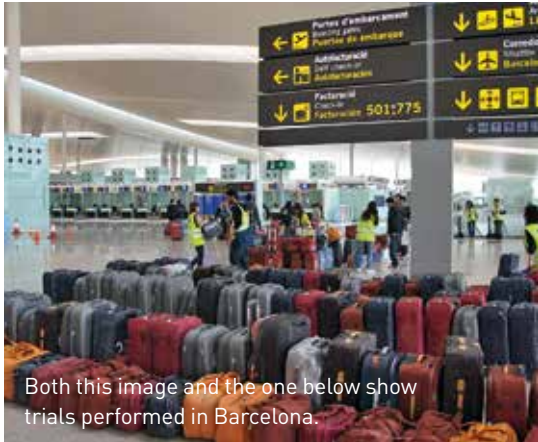


The AMC, the operation's heart and brain

The Airport Management Centre (AMC) plays a key role in the transfer as it brings together the control of all the operations of the airport in real time. From a central room, equipped with multiple service stations 24 hours a day, and provided with state-of-the-art technology (videowalls, integrated systems, contact centre, coordination IT tools...), all the operations being conducted at the premises are monitored and followed up minute by minute.

- Like an accurate scorecard, the ACM is responsible for the general supervision of the airport:
- Real time-monitoring of the development of all operations and performance of airport services.
 - Detection of hazards and threats and activation of contingency plans.
 - Critical decision making affecting

- the operation of the airport in real time.
- Automatic detection of incidents, use of tools and procedures for their resolution and recording of events in real time.
 - Intervention in emergency or alarm situations, particularly related to security, environment and scheduling.
 - Notification and reporting of all incidents.«



Both this image and the one below show trials performed in Barcelona.



Aena's Airport Management Centre (AMC).



Trials in Malaga.



Ineco's aeronautical engineers, Ignacio Fernández-Cuenca, Antonio Martín, Luis Cid-Fuentes, Yousef Al-Jaouni and Ignacio Alexandre, have developed this project in Abu Dhabi with the support of technicians from Madrid.

Antonio Martín

Aeronautical engineer, expert in ORAT



Ready for the big *première*

As in the rehearsal of a theatre play, trials consist in reproducing, as precisely as possible, the main operational processes to be developed in the airport once the new infrastructures and facilities start operating. Thanks to this simulation, potential anomalies are detected before the transfer takes place and corrective measures can be taken on time.

These trials represent the final phase of a long and complex process commonly called ORAT (Operational Readiness and Airport Transfer), the main purpose of which is to plan, coordinate and implement the actions necessary which guarantee the correct transfer of the new infrastructure.

In the case of Spanish airports, the methodology used in this kind of projects arose out of the need to respond to the expansion of Adolfo Suárez Madrid-Barajas airport. Throughout more than 10 years during which we have worked together with Aena in the expansion of Spanish airports, among which other large airports such as Barcelona's or Malaga's can be mentioned, this methodology has evolved and improved. As a result, we can proudly say it is fully reinforced and consolidated.

A methodology that is supported by both tools developed for the proper performance of the different jobs to be carried out, including follow-up of planning, hazard management or analysis of trial results, as well as by the experience and professionalism of the members of the team who have been working together since T4 times in Madrid.

I would like to highlight the importance of the human factor for the success in conducting this complex orchestra. Proper and coordinated performance would not be possible without the close collaboration among airport personnel and different professionals, such as, airlines, maintenance, handling, check-in or security personnel.

The award of the Operational Readiness of the Midfield Terminal Complex (MTC) of Abu Dhabi International Airport means acknowledging the outstanding work performed by Ineco and Aena throughout the last 10 years and offers us a great chance to position our company as an international reference in this kind of projects.

In broad daylight

The high speed line between Makkah and Madinah is already taking shape

With the collaboration of **Julio López** and **Javier Pulido**, civil engineers
Photos: Ineco's team

The Spanish-Saudi consortium **Al Shoula Ineco** is part of is already assembling and equipping the track in a 100-km section located in the central part of the alignment.

When works are completed in the section between kilometres 190 and 290 (Area 4) of the 450 km existing between Makkah and Madinah, 3,200 catenary poles will support, under the desert sun, 200,000 metres of catenary cables. They will supply energy to the Talgo trains that will run on the 36 km of slab track and on another 64 of ballasted track. The Saudi Railway Organization divided the project, called Haramain High Speed Rail (HHR), into two major contracts: phase 1, which includes alignment, track platform and stations, and phase 2, which comprises construction and equipping of track superstructure and, after commissioning, operation, management and maintenance of the line for twelve years.

Start-up of phase 2

Phase 2 was awarded on 26 October 2011 to the Al Shoula consortium, made up of two Saudi companies, the group Al Shoula and the building company Al Rosan, and twelve Spanish companies: Adif, Renfe, Talgo, Indra, Copasa, Cobra, Imathia, OHL, Inabensa, Siemens (which absorbed Dimetronic in 2012), Consultrans and Ineco, the top manager of which, Pablo Vázquez, also chairs the consortium.

After the award phase and the signature of the contract, the works commencement date was scheduled for 15 »

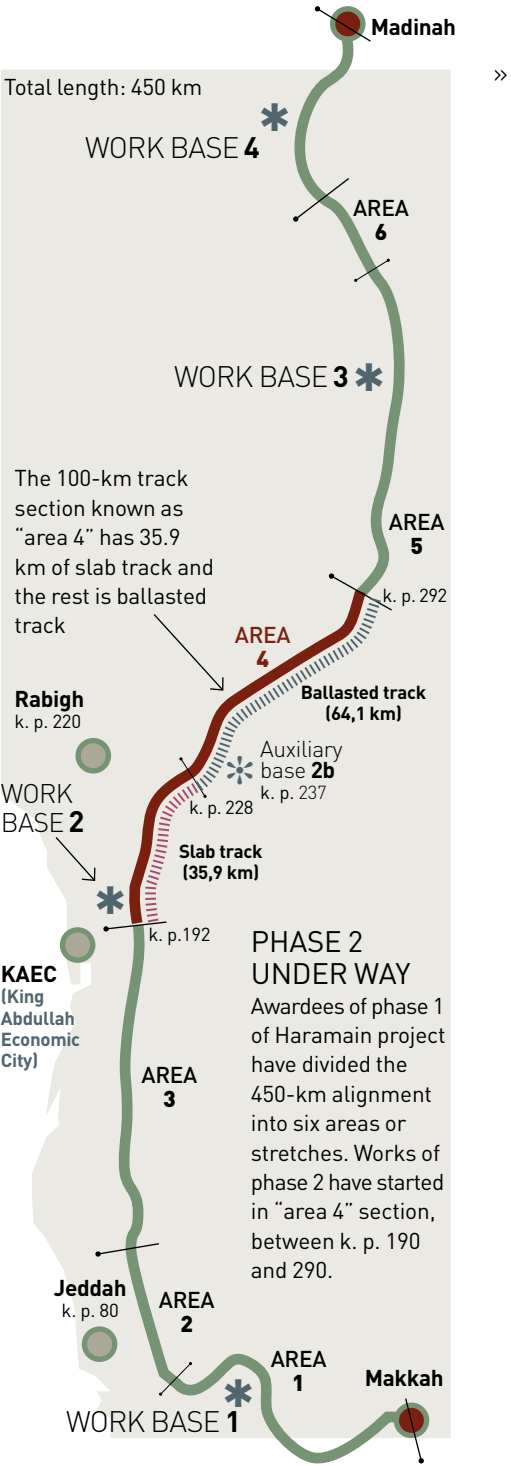
SLAB TRACK ASSEMBLY

José Ignacio Espinosa, Ineco's surveyor, performs leveling control during execution of the slab track.





AREA 4 IN FIGURES	
Track works	
130,293 m ³ of concrete for the slab track will be spread in 35.9 kilometres	
615,389 tonnes of ballast will be spread in 64.1 kilometres	
213,677 AI-04-type sleepers	
110,452 Rheda 2000-type sleepers	
400,000 linear metres of rail	
Two assembly bases	
base 2 , (k. p. 192), 160,000 m ² and 8 tracks	
base 2b (auxiliary), with 100,000 m ² and 4 tracks	
Infrastructure and civil works	
A railway bridge and a road bridge	
Three camel crossings	
Four vehicular culverts	
One siding	



Ineco is in charge of the overall management of the contract (project management), performs the quality assurance and elaborates all the designs

Ineco in Haramain

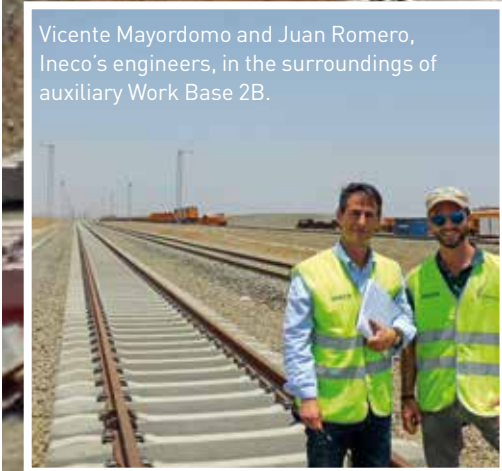
Ineco, under the present contract, deals with three large areas: global management of the contract (project management), quality assurance and design. Among the design tasks, the company prepares both the concept, preliminary and detailed designs of each of the different features of works of this size: track, electrification, signalling, telecommunications, etc.

It is worth highlighting that among all the activities mentioned, the company leads the project management of the contract, which includes:

- Contract management: defence of rights and obligations of members of the consortium with third parties.
- Financial management: control of the consortium's accounts.
- Planning: control of all the activities of the project.
- Interim payment management: interaction with the client for collecting the jobs performed.
- Traffic control: management, coordination and control of track works during the construction phase.
- Quality assurance: checking quality control performed by each of the members of the consortium.
- Drafting follow-up reports.
- Document control: identification, control and storage of all the documents delivered to the client, which ensures total traceability.
- General services: overall service management both for the consortium and the client.«



BALLASTED TRACK
A total of 64.1 kilometres of track of Area 4 are built with 615,000 tonnes of ballast and almost 214,000 AI-04 mono-block sleepers.



Vicente Mayordomo and Juan Romero, Ineco's engineers, in the surroundings of auxiliary Work Base 2B.



Ineco's team in Jeddah.



Madinah

The great mosque (Masjid al-Haram) contains the tomb of Prophet Muhammad, Islam's founder



Crossing the desert

More than half of the country is desert land



Jeddah

The city is an important financial and commercial centre



Pilgrimage to Makkah

Islam's holiest city attracts millions of pilgrims every year



Talgo manufactures the trains

Rolling stock will be adjusted to high temperatures and to running on desert areas

In green numbers

A “smart” method to assess transport environmental impact

By Patricia Rey, civil engineer, and María Carpio, chemical engineer

Using new technologies, Ineco has developed a tool to assess economic and energy impact, and polluting emissions of transport-related actions, saving up to one third of the time and costs of a traditional analysis.

Having a methodology to globally assess economic and environmental impact of measures and policies of the transport sector makes it possible to compare their possible effects. For example, setting speed limits, tolls, bus lanes or other type of reserved platforms or renovating train or bus fleets. The purpose is to provide preliminary conclusions on the possible application of the measure. After two years of research and within its portfolio of innovative projects, Ineco has developed two products: a methodological

guide and an IT tool. The guide provides a typology of transport measures and criteria for the assessment, whereas the IT tool performs a multi-criteria analysis of economic and social aspects and environmental implications of the foreseen actions. From a technological point of view, this is a so-called smart solution, accomplished by systematising the assessment process of policies and measures of the transport sector.

In the first phase, the methodology set forth in the guide was applied and tested to study the energy convenience of the

With the Mobility Plan, the city would reduce both its polluting emissions and energy consumption of its transport system



construction of a fast railway service to the airport of a city. The result of the analysis was that energy saving would be 22%.

Today, the le(CO)Trans2 project is being developed. This project was applied to a study performed in Ineco in 2013, the Sustainable Urban Mobility Plan (PMUS) of a model city. In parallel, the same analysis was conducted but with the traditional method, without using the application.

Results and sensibility analysis

The results of both processes were the same: with the Mobility Plan, the city would reduce both its polluting emissions and energy consumption of its transport system. The difference is that the use of le(CO)Trans2 saved 33% of time as compared to the traditional analysis. This implies remarkable cost savings.

Consequently, it can be established that the computer application developed by le(CO)Trans2 is very useful to perform simplified analysis and obtain quality results. These results should be completed with a sensibility analysis which would be carried out by Ineco’s experts.«



TRANSPORT, ECONOMY AND ENVIRONMENT

Transport is an essential element to accomplish energy sustainability. Economic development brings about an increase in mobility and, as a result, an increase in emissions and energy consumption of the sector.

Measures for cleaner transport

le(CO)Trans2 classifies actions to increase transport sustainability

TECHNOLOGICAL EFFICIENCY

■ Actions applied to the means of transport themselves or to their fuels, for example: use of electrical vehicles, use of biofuels, etc.

REDISTRIBUTION OR TRANSFER OF DEMAND

■ For example, measures limiting the use of private cars with urban tolls or parking regulation and, at the same time, measures which prioritise public transport, by improving frequencies, promotion

of interconnections among means of transport or pedestrianisation of streets.

DECREASE IN DEMAND

■ Actions aiming at the reduction of motorised means of transport: for example, walking or cycling or promotion of urban proximity models.

OPERATING EFFICIENCY

■ These actions focus on improving the system’s performance, implementing new technologies or management systems: automated signalling systems to regulate traffic, fleet management systems, etc.

How le(CO)Trans2 works

The transport sector largely depends on the consumption of non-renewable fossil fuels and, as a result, it is one of the main emission sources of polluting agents to the atmosphere. The most relevant greenhouse gases coming from transport are CO₂, N₂O and CH₄. le(CO)Trans2 calculates energy impact –measured in tonnes of oil equivalent avoided or generated– and greenhouse gas emissions. This is extremely useful especially in the current economic crisis and strong energy dependence context.

Furthermore, leCOTrans2 also assesses the economic and social impact of

a transport project. Accordingly, the definition degree of the analysis depends on the data (or inputs) introduced by the user. In any case, in spite of the numerous uncertainties of this kind of analyses, results are always taken as a guideline. Of course, the starting point will be the transport measure or policy

Today, the le(CO)Trans2 project is being developed. This project was applied to a study performed in Ineco in 2013, the Sustainable Urban Mobility Plan (PMUS) of a model city

chosen by the planner. Scenarios with and without application of the measure are taken into account, which will be analysed in the different time limits set by the assessment.

Once the necessary data have been compiled and processed –types of vehicles of the transport system, average speeds, travel distances, fuel consumption, financing hypothesis, etc.–, the results are obtained for each scenario and means of transport. In this way, the planner may compare the starting situation with the situation that would take place with and without application of the measure.«

Interview | BERTA BARRERO

Ineco's Corporate general manager

“We have suitable resources and tools to sort out the new challenges”

Only eighteen months into her administration as Ineco's Corporate general manager, Berta Barrero summarises the strategies used and initiatives launched during this period, which has been characterised by a major transformation in the company's corporate management in order to address its operations abroad. A civil engineer with an MSc in Railway Systems from Universidad Pontificia de Comillas (ICAI) and Program for Management Development from Esade, she has more than 14 years' experience in the transport sector. She has occupied several administration and management positions in companies such as Renfe Operadora and she has been a board member of several others in the railway maintenance sector. Below she tells us about certain key issues in her administration and some of the mid-term challenges ahead.

Early this year you told us that human capital and accumulated experience are the core around which Ineco's development and expansion revolve. What is the key to capitalising this value?

That's right. The value of engineering such as ours, a reference in its sector, is the knowledge arising from the experience in the most important engineering projects. However, making the most of it entails, not only boasting outstanding professionals, but also having in place structures, management models and mechanisms supporting an adequate organisation of work, maximum efficiency

and the leveraging of resources, as well as developing competitive and committed talent.

What was the situation like then and how has the change been implemented?

The starting point was not an easy one. Over the past four years we have witnessed a deep transformation in both the market and the clients' needs, and our organisation needed to evolve and adapt if it intended to face the future successfully. Addressing the new strategy called for a 180 degrees turn in our corporate culture, strengthening talent development and the work of our professionals with modern and efficient processes. It also entailed making difficult decisions in order to transform structures and enhance resources so as to make progress in the path towards the quality assurance, efficiency and profitability of our activity. In sum, we have focused our work from a different perspective and, even though there is still a long way to go, we are proud of our company and our professionals, since in just eighteen months Ineco has become a sounder, more dynamic, competitive and rationalised company.

“We have thoroughly reviewed our processes and working methods to confidently face the international challenge”

What has that corporate transformation involved?

Reducing costs and maximising two variables: the efficiency and quality of our

services have been the foundations for Ineco's transformation. As far as organisation is concerned, we have implemented a matrix structure which should allow us managing better and more comprehensively our clients' needs and satisfaction, as well as talent, knowledge and quality in developing our products. As to productivity and expense control, we have adjusted our organisational and productive size seeking to maximise efficiency and productivity. We have also implemented an efficiency plan to rationalise and trace the profitability of our expenses. Such plan has resulted in a year-to-year expense reduction standing at about 19%. The definition and launch of the company's strategic processes and the review of our related operational procedures are being key to improving Ineco's productivity.

We have also undertaken a thorough review of our commercial strategy and our competitive positioning so that our activity may be focused on and specialised in specific geographical markets, always paying special attention to our domestic clients.

Will there be any more changes to manage this approach towards internationalisation?

The foundations of change have already been implemented. In engineering terms, 'we just need to wait for the infrastructure to settle'. From now on, my major job is focused on providing the tools for the new management model to be consolidated and for our new corporate structure to develop, so that everything works effectively

and efficiently favouring the excellence of our services and securing the balance and rationality of both costs and resource distribution.

Which initiatives have been implemented to support management?

Our main asset is the human capital. We are engineers selling engineering. Therefore, *talent management*, as well

“In my opinion, we must continue to be ambitious, offering the highest level of service at a competitive price”

as *knowledge management*, are the new processes supporting our value as a company. Identifying and developing our talent, as well as sharing and developing knowledge, enhancing their value, are key goals throughout Ineco's transformation process.

And on an international scale?

There are many initiatives in motion but they are all headed in the same direction: being competitive and efficient in a global context. With this in mind, we have implemented expatriation policies and tools which foster international culture and people's mobility, such as the Global Mobility Centre, a virtual employee service which will offer support and will manage all the issues related to mobility as well as space and service management for project offices. Also, the definition of training programmes clearly aimed at contractual management specialisation, technical spe-



PHOTO: ELMIRA VILA

“We need to be capable of adapting our course should it be necessary, improving our reaction times and, with every new chance, fighting for it with team spirit: if you want to go fast, go alone; if you want to go far, go together”

cialisation and international focus, where language training is paramount to foster development in this context.

Which tools has the company used?

We have thoroughly reviewed our processes and working methods in order to

confidently face the international challenge with a degree of certainty. We want to learn both from our successes and our mistakes and share this know-how among us. This, along with our bet on excellence in quality and innovation capacity, places us where we want to be in the market, with suitable tools to face all challenges.

Indeed, Ineco has managed to increase its order book abroad by almost 60% in the last two years. How has the change in management impacted on this result?

We are being more flexible than ever: we need to be capable of adapting our course should it be necessary, improving our reaction times and, with every new chance, fighting for it with team spirit. However, there are always goals to be achieved, and we are investing all our energy to reach them. The recent contracts in Abu Dhabi, Brazil, Malta, Croatia and Oman are proof of this.«

Oman at bird's eye view

Ineco designs and validates flight procedures with a flight inspection aircraft

With the collaboration of Luis Chocano and Manuel Martín (project managers), aeronautical engineers

More than 80 hours overflying Oman's two main airports to test the safety of flight procedures and approach charts which Ineco designed for the Sultanate.

Ineco has started to test landing, take-off and approach procedures, designed, among other purposes, for the expansion of the Omani airports of Muscat, the capital city, and Salalah. To do so, it relied on Aena Internacional's flight inspection aircraft, a modified Beechcraft turboprop King Air 350, which travelled to the Sultanate in May. The aircraft travelled from its Spanish base in Mataban's airport, in Salamanca, to Oman for two days, in a flight with several stages which lasted 20 hours.

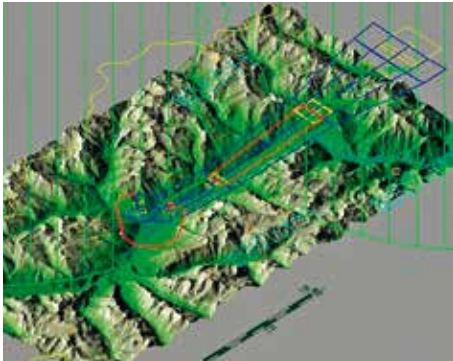


MAIN TASKS OF INECO

The project includes the design of over 100 instrument procedures for approach, landing and take-off, both standard and satellite navigation-based, and more than 120 hours of validation flights to be performed by Aena Internacional. In the photograph, flight inspection aircraft at Macatan's base.

In 2013, Ineco was awarded the contract, which includes the design of flight procedures and new approach charts, the carrying out of validation flights and nine-week training in Spain for technical and management personnel of Oman's Public Authority for Civil Aviation (PACA). For over a decade, Ineco has been collaborating with Aena in operational safety studies and certification of airports in Spain and abroad, as in the case of Luanda's airport

Works will be completed by 2015 and are framed within the civil aviation modernisation process of Oman



WHAT IS A VALIDATION FLIGHT?

Radio navigation aids act as a base for instrument flight procedures. During validation flights, the following is checked: that radio navigation aids work properly, that workload at the cabin is acceptable, that radio coverage is suitable, that obstacles are overflown safely and that approach charts do not contain errors. The image shows an example of obstacle assessment.

[Angola] in 2012. In 2011, Ineco designed flight procedures for Bergen airport in Norway; and in 2013, among others, for Changi airport in Singapore. In 2011, Ineco designed for Oman the AVPA (Airport Vicinity Protection Area Plan) aimed at ensuring compatibility of Muscat, Salalah, Al Duqm and Sohar airports with the urban development of their surroundings. To do so, amendments in Omani legislation were proposed concerning maximum building height and permitted use in the surroundings of the airports.

A geographic information system (GIS) was also developed, and training courses on this system and on the AVPA were delivered to civil aviation personnel and to members of other official entities involved.



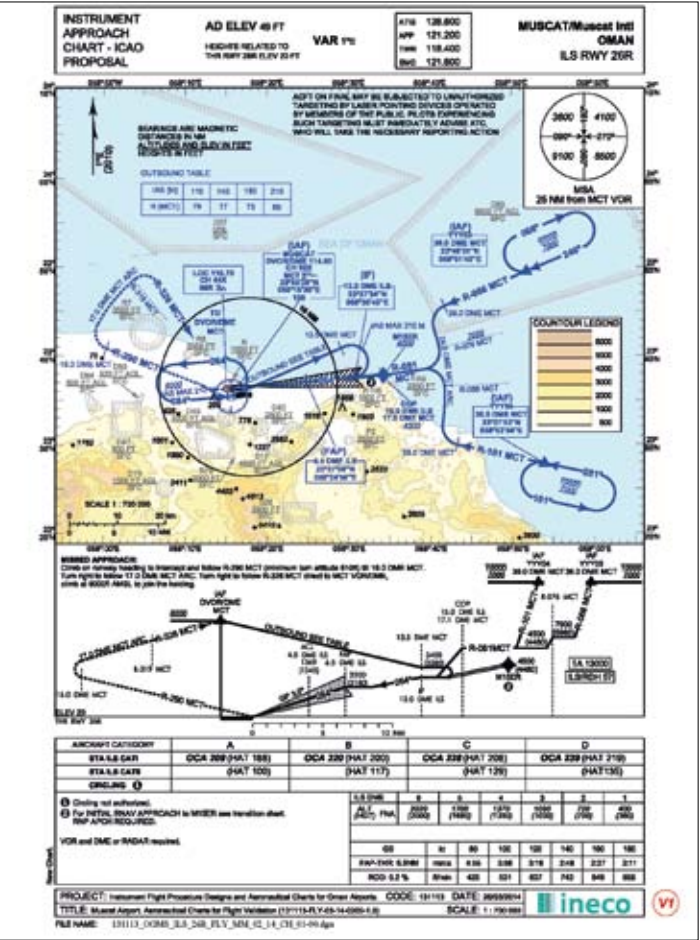
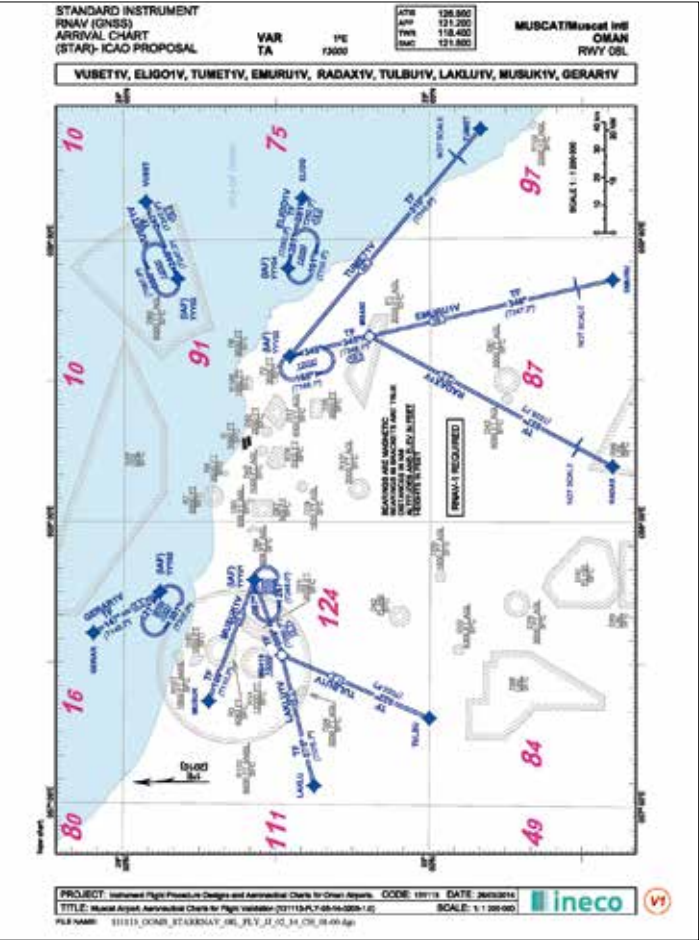
OTHER PROJECTS IN OMAN

On the other hand, Ineco is currently conducting the Public Transport Master Plan of Oman's capital city, Muscat (see it50). Besides the AVPA, other recent activities are the study of navigation easements for the new control tower of Muscat airport and the location analysis and Master Plan of the future Musadam airport.



AN AIRPORT FOR 12 MILLION PASSENGERS

In the photograph, Muscat international airport from the flight inspection aircraft. In the centre, the new control tower; on the right, the current runway; and on the left, the new 4-km-long parallel runway. It also has a new terminal and a renovated air traffic management system (ATM). Below, aeronautical charts designed by Ineco for the airport.



Tailor-made road maps

Ineco’s experience in National Transport Plans

Editorial staff of *itransporte*

Croatia, Malta, Algeria, Costa Rica, Ecuador and Spain: all of them with very different territories, economies, investment capacities and infrastructure development levels, have trusted Ineco for collaborating in the development of their transport strategies for the next decades.

Ineco and its partner, the Italian consulting company Systematica, have just been awarded a contract for drafting Malta’s National Transport Model 2014-2020. With a population of over 400,000 inhabitants and Europe’s highest density, congestion is a problem in Malta. Besides the airplane, sea transport is vital for the island, with a dense port traffic situation. On the other hand, Croatia, the most recent member of the European Union, has awarded to a consortium Ineco is part of the drafting of a Transport Model which would complete the National Strategy another Spanish company, Idom, is working on. The main challenge of the country is the modernisation of the railway network, a project Ineco is also participating in (see *itransporte* 50).

To the south of the Mediterranean, in Algeria, a huge territory split by two large mountain ranges, 80% of its more than 38 million inhabitants are concentrated along a 1,200-km long coastal strip, the centre and south being sparsely populated. The big challenge, besides renovating and extending technologically obsolete infrastructure, is to accomplish a more balanced redistribution of its population, improving connec-

tions between north and south. Across the Atlantic, orographic barriers and tropical weather –which affect, for example, the state of roads– are key factors to be taken into account when planning transport in Costa Rica and Ecuador. Both share expansive economic and demographic trends and their governments have been making remarkable investment efforts over the last few years to extend and improve their transport systems.

The Spain case

Spain is a different case: with over 44 million inhabitants, the challenges it will face in future years are those of countries which are mature in terms of transport. Spain has one of the world’s largest high speed railway networks, a wide road network, around fifty ports and a further similar number of airports. The medium and long-term targets are the enhancement of the use of already-built infrastructure, the improvement of management, maintenance and preservation.«

Ineco’s experience

Croatia’s National Transport Model (2014-2020)

Malta’s National Transport Model (2014-2040)

Ecuador’s Strategic Mobility Plan (2013-2037)

Algeria’s National Transport Plan (2011-2025)

Costa Rica’s National Transport Plan (2010-2035)

Infrastructure, Transport and Housing Plan*, Spain (2012-2024)

* [PITVI for its acronym in Spanish]



MALTA
Government palace next to Valleta’s port.



CROATIA
Line 12 tram of the city of Zagreb.



Malta
National Transport Model



Croacia
National Transport Model

“Population growth brings about increased mobility needs. Trends suggest that the increase in demand will concentrate in urban areas, particularly in developing countries”

Transport scene 2013, OECD’s International Transport Forum

TRANSPORT POLICIES, GOVERNMENT POLICIES

Basic considerations

First of all: planning

Efficient planning is vital so that governments, with the data collected and analysed by experts, can get to know the actual needs. In this way, it is possible to measure the road, railway, river, port, and airport networks properly and avoid that the lack of passenger and freight transport capacity damages competitiveness. With a transport plan, governments can reliably estimate the evolution of demand in the different means of transport in the short, medium and long term, the type of actions that would be required and the cost-benefit ratio. Costa Rica’s national plan analyses, for example, the technical and economic feasibility of renovating the old and disused railway network, built in the 19th century. The conclusion suggests that it would be preferable to perform an overall reconstruction as per 21st century criteria. For Algeria, a general cost and rate study for all means of transport was performed.

Economic-financial programme

From the economic and financial standpoint, a national transport plan, with an intermodal and long-term approach, allows determining investment priorities and, therefore, rationalising them to the greatest extent possible. At the same time, planning has to take into account the social rate of return, more complex to quantify but equally crucial. For Costa Rica, where taking into account the size of the country and the underdevelopment of the railway

network, roads are the main means of transport, the priority of its National Plan is to provide roads with more capacity. As far as Algeria and Ecuador are concerned, the improvement of their roads network is a key element to interconnect large areas within their wide territories. In contrast, as for roads, the Spanish PITVI focuses on the preservation and maintenance of the existing network, which is considered sufficiently developed in general.

Sources of financing

The study of the possible sources of financing of the projects –European funds, development banks, public sector contributions– and of management formulas (public, public-private, 100% private and all possible combinations) is another essential element in a national transport plan. Collaboration with the private sector, a rising trend throughout the world, is an option that is present in all national plans Ineco has worked on. In Spain, the PITVI envisages to increase private participation to reach 16% of the total (64% more than today) until 2024. Costa Rica inaugurated its first toll highway on a concession regime in 2010; Algeria faces the renovation and extension of its ports opening up exploitation to private participation. A national transport plan is therefore a strategic framework, an overall and long-term vision, which, as such, cannot ignore another aspect of critical importance: protection of the environment.«

In the backstage of a national transport plan

DIAGNOSIS

The starting point of a transport plan is data: they allow obtaining traffic forecasts or prognosis and making global demand projections or projections for specific actions; knowing the preservation state of infrastructure and even creating centralised systems for transport management, as in the case of Algeria. Ecuador, for example, has planned the future of its 20-airport network based on forecasts indicating that the number of passengers will rise from 10 million today to 26 million in 2037. The sources of information are many: national statistics, forecasts of international agencies, traffic censuses and direct surveys of users, companies and transport authorities.

“Transport must benefit the safest services for people and the environment, in this way efficiently acting as a catalyst of economic development”

_NTP Algeria

Once compiled, to process and analyse this enormous amount of information, the most advanced tools of the market are used, such as TransCAD –which was used for Algeria and Ecuador–, Emme, Visum, Cube, Aimsun or TransModeler. These simulation programmes allow



Spain
Infrastructure,
Transport
and Housing Plan
(PITVI)



Spanish high speed line.



Cotopaxi International Airport, Ecuador.

Ecuador
Strategic
Mobility
Plan



obtaining transport models which are simplified representations of reality. Different scenarios can be simulated and all kinds of demand forecasts can be obtained: global, per geographical region or per means of transport. They also allow studying the responses to rate, time or distance variations and are capable of

“The legal framework and the institutional organization contribute to the success of the system if they are well-designed, but they may lead to failure or collapse if they are not suitable”

_SMP Ecuador

providing many kinds of data: passenger flow per section, average vehicle intensity, passengers per line and station, service levels or polluting emissions, among others. The models can also incorporate Geographic Information Systems (GIS), as in the case of Algeria, where more than 3,000 kilometres of railway lines and more than 23,700 kilometres of roads and highways were modelled.

PROPOSALS

Once the diagnosis has been obtained, the next step is to draw up the proposals for the different means of transport, in different demand scenarios and with several development alternatives. For Algerian railways, the proposal includes the modernisation and enlargement of conventional lines throughout the country of an east-west 1,200 kilometres »

“Planning of national transport systems has been undertaken to rationalise the distribution of resources and investment in infrastructure (...). Data collection is essential for this job”

OECD’s recommendations

high speed line along the coast. Spain’s plan, with the world’s largest high speed network after China, focuses on other aspects, such as the liberalisation of the sector or the improvement of the existing network, with projects such as the Mediterranean Corridor (see *itransporte* 49). As a matter of fact, national plans not only depict infrastructure-related proposals. The improvement and development of the regulatory and fare framework in each country and the application of international standards –in terms of safety, for example– are vital to accomplish efficient transport systems. Costa Rica’s plan recommends applying the concession model to retail areas in airports, managed by a public social entity up to that moment. Ecuador’s Strategic Mobility Plan evidences that the country’s port capacity is about to reach its limit. As a result, the plan

“The government must delegate to the private sector or separate services by creating public companies with commercial purposes”

_NTP Algeria

proposes, among other actions, applying a modern landlord management model for international ports –such as Spain’s, Netherlands’ or Germany’s– as compared to fully state-run management. Intermodality is another axis of all national transport plans. This is the case of Ecuador’s road network planning,



which considers the creation of “general interest itineraries” which take into account connections with ports and airports. On the other hand, the Spanish PITVI influences the development of railway connections with ports, which has great

“Ineco’s proposal is to develop a 21st century railway: the development of two mixed inter-city corridors, that is to say, suitable both for passengers and freight, and the creation of a Basic Metropolitan Intermodal Network for Public Transport”

_NTP Costa Rica

economic and commercial relevance in the country with Europe’s largest coast. In Costa Rica, light railway transport alternatives are presented to improve road traffic, especially in the metropolitan area of San José, the capital city. National plans can also include proposals for the execution and follow-up of actions, such as the case of Ecuador with SMP’s Office; or propose institutional and organisational changes, such as the creation of a Railway Safety Agency in Algeria, or Spain, where the segregation into several partnerships of the railway operator and manager (Renfe and Adif), among other examples, is provided.«

José Luis Pardo de Santayana

Aeronautical engineer, expert in air transport



Planning in the global village

The image of countries depends on their communication capacity and, in this regard, communications beat transport, as they have taken us to the global village where all inhabitants can see and talk to each other. Another equally relevant element of a country’s image is air transport, above all in its international aspect, and which sometimes is not properly dealt with in Transport Plans. Air transport is a country’s gateway to the global village. All countries, regardless their political orientation, want their citizens to be able to trade or visit or be visited by the “village’s” neighbours and it is necessary to have some airports which increase the country’s connectivity.

Connectivity and self-sufficiency are conflicting elements which require –in some cases– cultural changes of the legislator both to sign bilateral agreements with other countries, according to Chicago’s convention, and to modify transport management modes or fare framework, especially in the air mode. The larger the connectivity sought, the greater the efficiency that is to be requested from the domestic interlinked transport network where air transport is to be included as one more link in the transport chain.

The transport network must be planned with a comprehensive view of all modes of transport and be conditioned by the pressing need to exchange the different modes in the user’s trip, either passenger or freight; infrastructure must be designed with intermodal and information technology intensive features, so that the user knows in advance the availability of the next mode to use and can do so with a single ticket which is valid for all modes.

In summary, the goal is to turn the country into an active and efficient agent in the global village. With this aim in mind, the Transport Plan must include four major elements:

- A comprehensive planning with special focus on intermodality and information technologies.
- A gap analysis between the existing regulatory framework and the framework necessary for an efficient operation, modifying all those aspects which outweigh self-sufficiency over connectivity.
- A detailed study of the fare framework in all means of transport, aimed towards intermodal use, fostering public-private cooperation in investment and exploitation.
- A multidisciplinary technical team capable of developing and controlling it as a single comprehensive system, such as those existing in Ineco.

A U-turn

The Observatory's data reflect the metamorphosis of Spanish transport

By *itransporte*

In more than a decade, Spain has overcome its transport infrastructure shortfall and must now face other challenges. Ineco has collaborated with the Ministry of Public Works in the development of a new analysis tool which offers thorough knowledge of the sector.

Does Spain have enough roads, railways or airports? Are Spanish infrastructures up to the same standards of other European countries? Are its transport companies competitive? Is there any way to measure the impact of the economic crisis on the mobility of Spanish citizens? The launching of the Transport and Logistics Observatory in Spain (OTLE for its acronym in Spanish) of the Ministry of Public Works, publicly introduced in February, intends to answer all these questions. And it does so with a wide approach.

An overall view
The purpose is to obtain an overall view

of all the elements which make up the national transport system: infrastructures, human and technological capital, investment, users' demand and inter-relations among them. This information is gathered in a unified database and is interpreted through a series of indicators specifically designed for the Observatory. For example, how the fall of the national GDP influences on the merchandise sector, or whether the development of the railway offer affects the demand of air transport.

X-ray of the sector
But this is not only about creating a database. The information is summarised and interpreted in an annual report which offers a full reading of Spain's transport sector, this year focused on matching the investing effort with the results obtained since the beginning of the 21st century. And as it is important to reach a wide public, the report is freely accessible through the OTLE's web (<http://observatori-transporte.fomento.gob.es>). Every year a new report will be submitted during an information day.«

A tool to make decisions

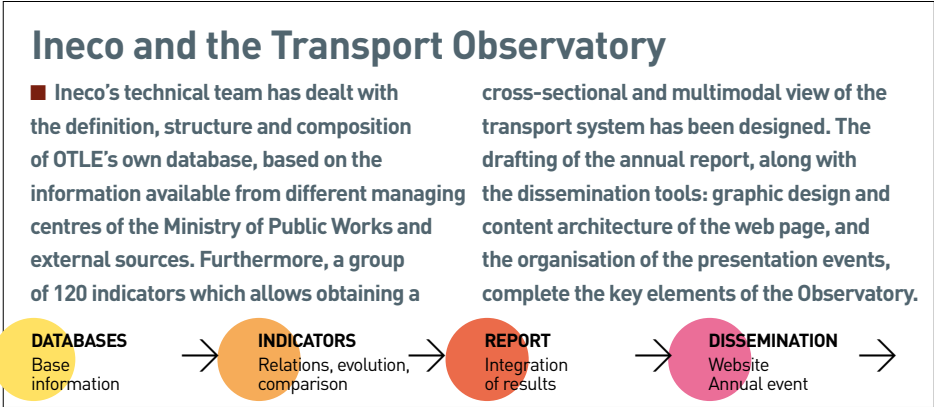
The indicators' system prepared made by Ineco's technical team is based on reality-adjustment criteria of the Spanish transport system, which is mature and has highly developed infrastructure networks, focused on user service. At the same time, the current economic context is taken into account, where efficiency, competitiveness and internationalisation play a leading role.



OTLE's presentation event, held in Madrid in February: in the centre of the photograph, Casimiro Iglesias, Ineco's Intermodal Business director and Mercedes Gómez, Transport Prospects and Technologies director of the Ministry of Public Works, and Alfredo Rodríguez, from Information Technologies at Ineco.

An analysis with multiple perspectives

Overall, the analysis is a comparison between efforts made and results obtained concerning easy access of users to infrastructures, mobility, security, quality, competitiveness, environmental sustainability, etc.



PHOTOGRAPH: LUIS A. LÓPEZ - <http://senorl.blogspot.com>

“Spain is fifth in the world ranking in terms of railway infrastructure, thirteenth in roads and twelfth both in airport infrastructure and ports”

World Economic Forum’s Global Competitiveness Report 2013-2014

The first conclusion is that, over the last few years, Spain has been able to overcome the transport infrastructure shortfall it suffered until the 80’s as compared to the rest of European countries. The fact that the country’s two largest cities, Madrid and Barcelona, were not connected through high-capacity roads until 1991 is given as an example. It is also mentioned that today,



PHOTOGRAPH: PABLO NEUSTADT

Four indicator groups have been defined: offer and demand; socioeconomic and economic activity-related; environmental; and transport infrastructure and capital

with a completely different economic context, “the transport network is already quite complete and shows consolidated improvements”. Other aspects which bring about clearly positive results are the quality of built infrastructure and accessibility of users,

with a wide territorial coverage. As regards road safety, the report underlines that the evolution has been “spectacular”, with a 65% reduction in road fatalities



PHOTOGRAPH: JUAN LUIS SÁNCHEZ (INECO)

The first OTLE’s conclusion is that, over the last few years Spain has been able to overcome the infrastructure shortfall

as compared to 2000. With this Spain stands among the first European countries in terms of road safety.

Areas to improve on

Obviously, not all indicators show such positive evolution. On the “debit” of Spanish transport, it is possible to find aspects such as innovation, research and development, corporate structure or decrease in transport demand. Therefore, it turns out that passenger traffic is currently 8% lower than at the beginning of the century, and cargo traffic is 25% lower. These data reflect the impact of economic crisis in transport demand. The main conclusion in terms

of Spanish transport competitiveness is that it features great heterogeneity. The sectors with best results are road cargo transport, sea transport and air transport, whereas “other activity areas remain strongly concentrated, such as railway transport and management of some infrastructures.” As far as environmental issues are concerned, the global level of polluting emissions has improved, in part because of the reduction of private road traffic as a result of the crisis. The increase in the use of renewable energies



PHOTOGRAPH: B. RUNNER

Positive aspects such as infrastructure quality, wide territorial coverage and global emission reduction stand out

(biofuels) in road transport is worth mentioning – “seven times higher since 2005” – while presence of the electrical car continues to be testimonial.◀



Observatorio
del Transporte y la Logística en ESPAÑA

MEANS OF TRANSPORT

How we move

→ BY AIR

Spain has a 46-airport and 2-heliport (Ceuta and Algeciras) network, operated by state-owned operator Aena, which is also in charge of another 24 airports throughout the world. Around 200 million passengers use these airports every year. Furthermore, they are essential for international tourism, one of the great powerhouses of Spanish economy, which in 2013 broke its own record as it received 60.6 million visitors. Four out of five tourists arrive by air. The challenges: enhancing profitability and opening airport management to private participation.



→ BY SEA

Spain, with an 8,000 kilometres coastline, has Europe’s longest coastline. It has 46 ports grouped into 28 port authorities coordinated by state-owned entity Puertos del Estado. They are essential for foreign trade and 85% of imports and 60% of exports pass through them. It has to be emphasised that cruise traffic has also increased. The challenges are, mainly, improving financial management and intermodality; improving port infrastructure and sea rescue system, and fighting against pollution.



→ BY RAILWAY

The length of the Spanish network is over 15,000 kilometres, 3,100 out of which are high speed lines, according to data from ADIF (Spain’s Railway Infrastructure Administrator). It is the world’s second network of this kind, only surpassed by China. Among the main challenges are renovating the standard network and developing cargo traffic, completing the high speed railway network and improving the railway commuter system.

→ BY ROAD

The national network is 165,593 kilometres long (as of 31 December 2012), 14,701 kilometres out of which are high-capacity roads: toll roads, free-toll roads and highways. Therefore, Spain is today the European country with the highest mileage in this kind of roads. Among the challenges are road preservation, maintenance and safety.

→ BY PRIVATE CAR

The Spanish car population was 27.94 million vehicles by the end of 2012 almost half of them with more than ten years. This positions Spain at the end of the European ranking in terms of car population age, only surpassed by Greece. The challenge is, in the short term, that the Spanish administration, through the Directorate-General for Traffic, can reduce car population age to seven years in 2016. To that end, several campaigns and incentive schemes for car purchase have been launched.

SOURCES: PITVI (Infrastructure, Transport and Housing Plan 2012-2024). Ministry of Public Works, Puertos del Estado, Directorate-General for Traffic (Ministry of Internal Affairs).



Ankara-Istanbul line

A look ahead of high speed in Turkey

Ineco is participating in one of Turkey's major railway projects: the renovation of the Ankara-Istanbul line to speeds of up to 250 km/h. This is a vital and technically complex infrastructure for the modernisation of the country's transport system.

Ninety five per cent of the platform works and the infrastructure of the 158 kilometres between the towns of İnönü and Köseköy are already finished in the railway line that connects the cities of Istanbul and Ankara. Ineco is conducting consultancy and supervision of the building works in a joint venture with the Turkish engineering company UBM (51% Ineco, 49%

UBM). Superstructure execution works continue throughout 2014.«

In the image, on the right, Francisco Javier Ruiz, engineer expert in Signalling and Telecommunications, next to Mustafa Emin Cirik, works manager of Alcatel-Lucent Teletas, at Bilecik station of the new line.

Ineco, in a joint venture with UBM

performs consultancy and supervision for the Turkish State Railways TCDD in the design and execution of the works

Works actions

1_TUNNELS

Tunnel mouth 22 connects with the longest viaduct, 1,900 m.

2_JOINT VENTURES

Sign of the line, Phase 2 İnönü-Köseköy, Section 2, İnönü-Vezirhan.

3_VIADUCTS

Viaduct to enter emergency bypass road, performed to open traffic between Ankara and Istanbul, result of the several difficulties encountered in tunnel 26.



4_CONSULTANCY AND SUPERVISION

Ineco in a joint venture with UBM for the control and technical assistance for TCDD.

5_WORKS BLOCK

Stockpiling of voussoirs for tunnel 26.

6_TRIAL PITS

Geometrical control of tower shallow foundations for the GSMR system of the line.



7_ELECTRIFICATION

Draisine for assembly of catenary that the Chinese company CRCC performs in 150 km.

8_TUNE-UP

CRCC workers performing the final adjustments at Bozüyük station.

9_WORKS COMPLETION

Viaduct 16 of the line. It is 850 m long between tunnels 14 and 15 where the execution of superstructure is 100% completed.



Antonio Benito

Civil engineer and expert at works coordination

Op-ed



Control standards and processes in the execution of infrastructures

In a railway project the size of the high speed line between Istanbul and Ankara, several technical aspects are involved, ranging from the initial layout of the idea to the commercial exploitation of the line. Of all phases, the one implied in the performance of the infrastructure is the longest and most expensive. As far as execution of superstructure is concerned, the diversity of elements included in it –more sophistication from the technical standpoint, stockpiling, adjustment and testing needs, as well as the pressure to comply with the deadline– turn it into a critical element for commissioning.

Therefore, it is necessary to conduct an intensive coordination job to ensure compliance with deadlines. It should be borne in mind that, besides the civil works building companies, there are other entities operating, which are in charge of control and follow-up of deadline analysis and possible budget-related implications. Environmental factors and observance of safety and occupational healthcare measures, both for own workers and for those not belonging to the company, are also key aspects to conveniently assess the development of works and future actions.

In these jobs, as a result of the great technical complexity involved almost all engineering and architecture specialities are required, within the different specialization fields, either civil, industrial or telecommunications. Worth mentioning are: alignment, geology and ground engineering, design and structural calculation, single works, replacements, hydrology and drainage, environmental supervision, road surfaces, signalling and communications, safety and healthcare, etc. As a result, it is necessary that the supervision team has qualified technicians with proper experience, and expert in these specialities. Likewise, it is necessary to have suitable IT tools which allow following up execution virtually in real time.

Ineco has been executing these works since the 70's, and has wide experience in works coordination and control, and has participated in tasks ranging from design and construction to commissioning of Spain's largest transport infrastructures. Thanks to the knowledge we have gained from this extensive experience, we continue to play a very significant role in the development of high speed in Spain and in major projects in Turkey, United Kingdom or Saudi Arabia.

Artificial intelligence

A pioneering system diagnoses, predicts and controls viaducts remotely

By **Justo Carretero**, civil engineer, **Jorge Navío**, forest engineer and **Sara Solanas**, industrial engineer

Viadintegra is an R&D project of the Ministry of Science and Innovation meant to improve reliability and maintenance of these critical elements of railway infrastructure. Ineco has participated as part of a consortium made up of four companies and Universidad Politécnica de Madrid and Universidad de Granada

This is a pioneering experience which seeks to increase the reliability of the railway system in viaducts, as they are critical elements of the system, according to maintenance needs and service life, which is long but finite (100 years as per current standards). Verifying the evolution of the viaduct's behaviour may be a sign of the need to conduct inspections, with different intensity degrees, maintenance operations, repairs, reinforcements, or may be a sign, in the long run, of the end of its service life. The project, which lasted three years, takes a step forward in maintenance of railway viaducts by using monitoring to continuously record their physical variables. In short, this is an ambitious study, the main activity of which lies in the installation of an intelligent monitoring-based system in some railway viaducts when they are in operation. In this way, it is possible to analyse their structural behaviour continuously and over a long period of time, know their real behaviour and verify whether design loads are suitable according to requirements. It is also possible to

know the evolution in time of static and/or dynamic resistant properties.

INNFACTO 2010 project

The project is part of the subprogram INNFACTO 2010 of the Ministry of Science and Innovation and had a budget of around 6 million euros. As its full title indicates, Viadintegra is the "integration of railway viaduct monitoring in the infrastructure management and maintenance system." The consortium engaged in developing it is made up of eight members: two private companies (Prointec and Geocisa); two foundations (Ferrocarriles Españoles, FFE, and Caminos de Hierro, FCH); two public universities (Universidad Politécnica de Madrid and Universidad de Granada); Adif and Ineco.

Ineco became part of the consortium in 2010, contributing its experience in structure monitoring as well as in dynamic load testing, after 25 years of experience in tests with Adif and different universities.

Encouraged by the Ministry of Science and Innovation, the project has had a budget of around 6 million euros

Furthermore, Ineco's team has worked in projects such as the monitoring of Arroyo del Valle and de las Piedras viaducts, in Spain, or those which took place in Mexico later, both Infiernillo iron bridge, in the state of Michoacán, and El Beltrán bridge, in the state of Jalisco.◀

Viaduct over Guadalquivir river

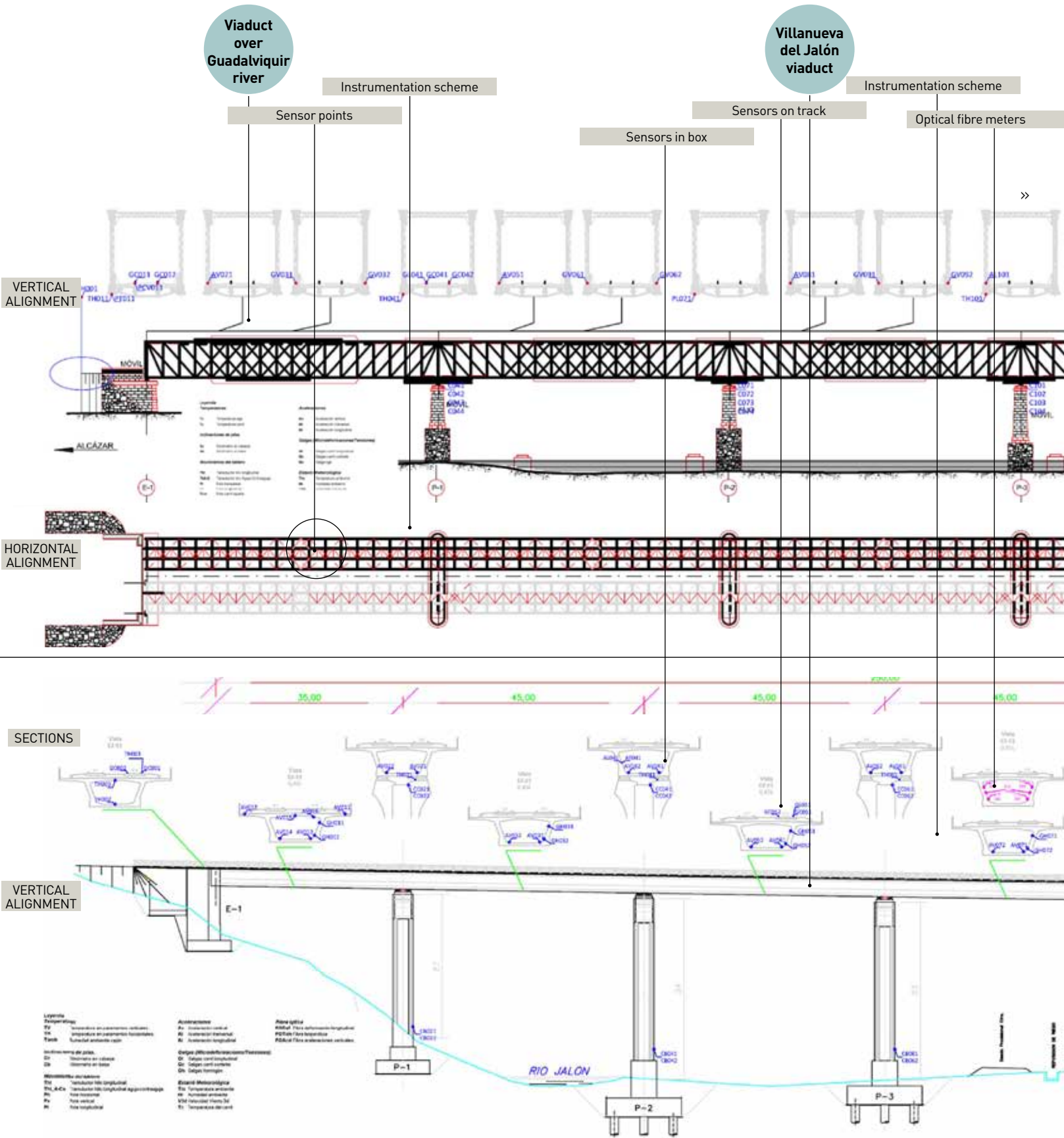


ALCÁZAR DE SAN JUAN-SEVILLE LINE
K. P. 523 + 467 / Track 1
The bridge has five sections with a total length of 254.400 m. It has two main continuous beams, with a theoretical span of 50.760 m in each section; with a Linville truss of 18 modules per section, and a 6.28 m abutment edge.

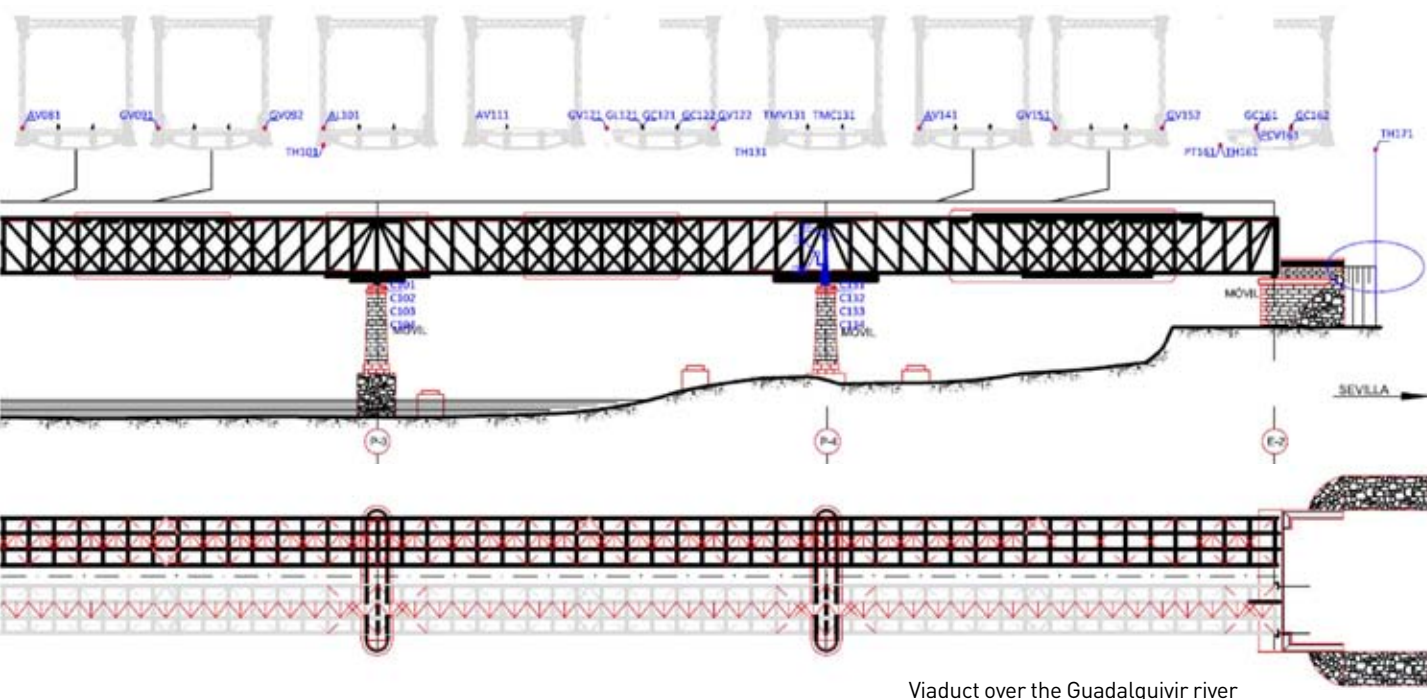
Villanueva del Jalón viaduct



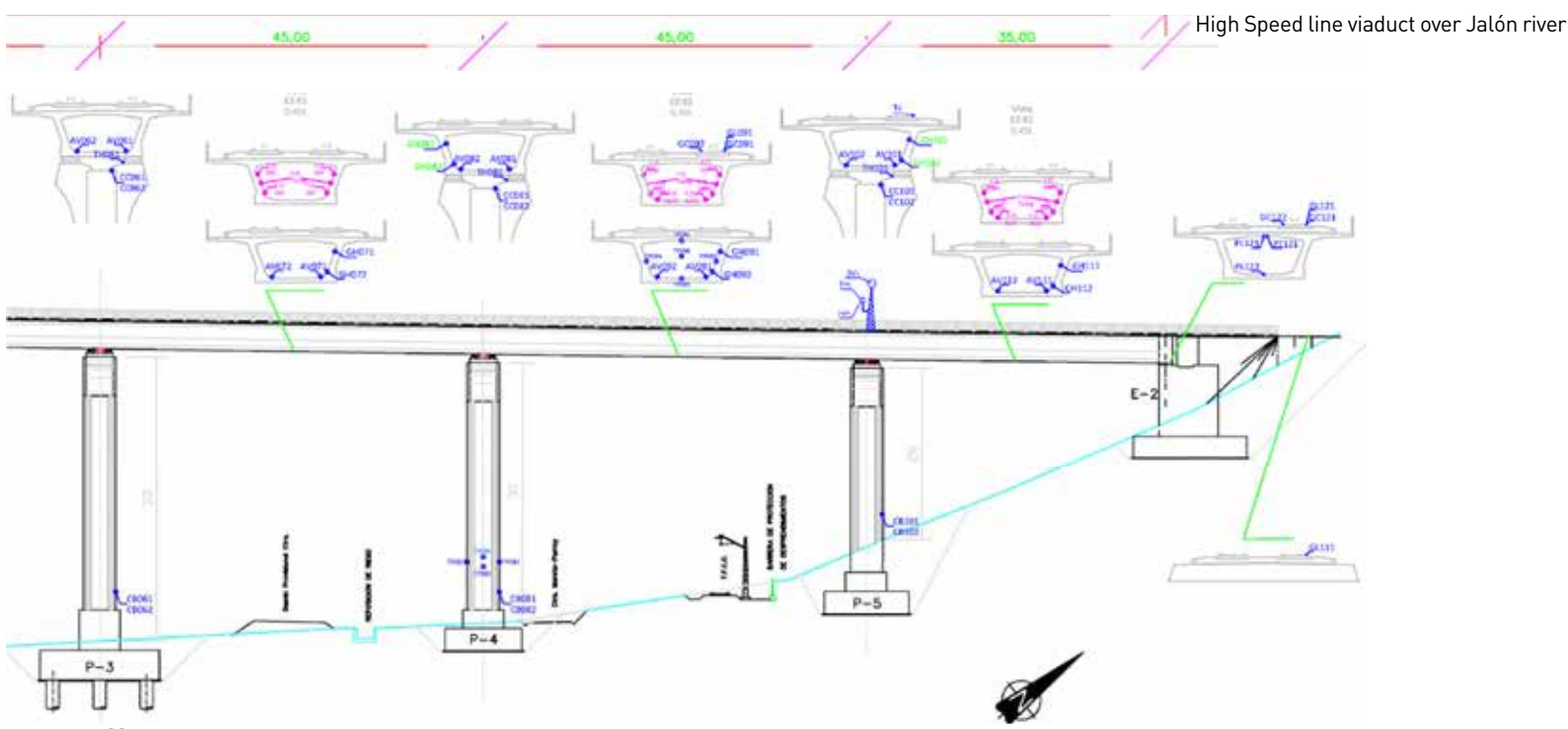
HIGH SPEED LINE MADRID-BARCELONA
K. P. 239 + 429 / Section Calatayud – Ricla
Continuous prestressed concrete deck with box section and concrete piles. Total length is 250 m, in six spans, two of 35 m and the four central ones of 45 m. The 96 points with regular technology instruments were supplemented with an additional network of 16 sensors and FBG equipment.



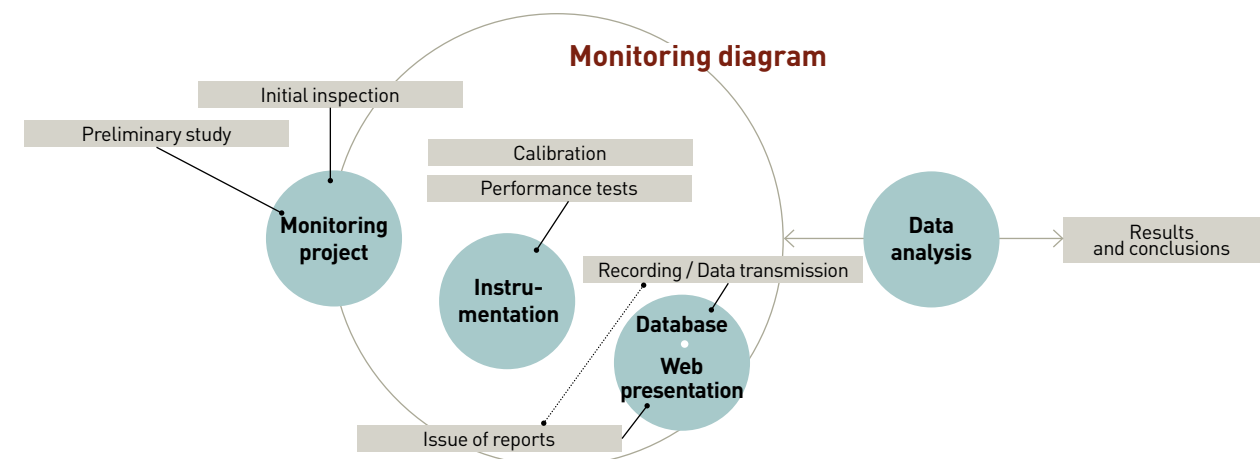
Two bridges have been monitored, one over the Jalón river and another one over the Guadalquivir river, through the installation of accelerometers and other instruments which measure gradient, movement, vibration and temperature



Viaduct over the Guadalquivir river



46



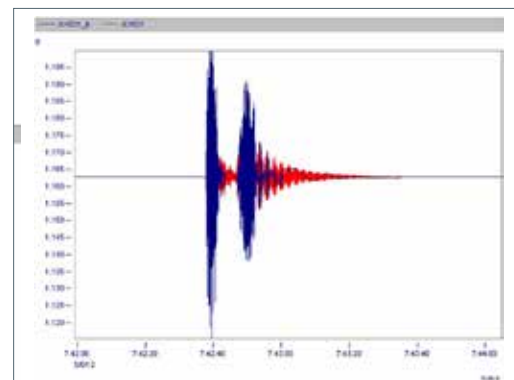
Parameter study of two bridges

Broadly speaking, Ineco's work has consisted in the study of parameters in two bridges to consider the possible changes of status from a functional and/or maintenance and resistance standpoint.

To perform it, two bridges were monitored, one over the Jalón river and the other one over the Guadalquivir river, through the installation of accelerometers and other instruments which measure gradient, movement,

vibration and temperature. The study of algorithms allows for quickly controlling any structure change. Likewise, previous analyses of the structure instrumentation have been conducted, as well as in-situ calibrations of the sensors to ensure they are always correct and fully reliable.

Ineco has also performed technical inspections of both the concrete bridge (Jalón river) and of the metal bridge (Guadalquivir river).«



PIONEERING TECHNOLOGICAL
EXPERIENCE

Viadintegra is a pioneering experience in the integration of different technologies which allow applying elaborate instrumentation, data handling and transmission techniques, advanced models of structure behaviour and, finally, diagnostic systems or expert systems which increase reliability, and improve maintenance and, eventually, the design of railway viaducts.

MAIN MAGNITUDES TO BE MEASURED IN RAILWAY VIADUCTS

- 1_Movements in foundation laying and pile heads
- 2_Relative movements in pile/abutment-deck
- 3_Accelerations resulting from centrifugal force and braking
- 4_Vertical accelerations
- 5_Microdeformations (tensions) in the deck
- 6_Temperature measures in deck or piles
- 7_Global measures of temperature, humidity, pressure and wind speed
- 8_Periodicity is a very important data because of the large data volume generated



INSTRUMENTATION AND MEASURING EQUIPMENT

Details of instrumentation and recording equipment installed in a control section in the viaduct over the Jalón river.

What does bridge monitoring imply?

- Monitoring means laying electronic signal transducers or collectors at selected points which, by means of the suitable equipment, would transform physical magnitudes into electrical signals which are fitted out and stored automatically.
- Once the instrumentation is performed, the signals are digitalised and stored in a central computer where they are pre-handled and controlled. Finally, these data are sent to the cabinet by means of an appropriate communications system (telephone, fibre, satellite).

Marca España* | CERAMICS AND STONE

*Brand Spain

Ceramic pieces in lattice of the Spanish pavilion at the International Aichi Exhibition (Japan) 2005. To the right, a perspective view of the building.

Earth & fire

Spain is the world's third exporter of ceramic tiles and one of the first producers of natural stone.

By *itransporte*

What do Granada's Alhambra, New York's underground, the world's most luxurious hotel, the Japanese city of Ebetsu or Oran's Convention Centre in Algeria have in common? All of them have Spanish ceramic material or stone. Spain is the world's third exporter and fourth producer of ceramic tiles and stands among the first ten producers of natural stone, mainly marble. Iberian soil has been known for its mineralogical wealth since Roman times and nowadays companies in the sector distribute their products throughout the world.

According to the most recent data of ICEX (Spanish Foreign Trade Institute) and ASCER (manufacturers' association) reported at year-end 2013, exports of ceramic tiles for cover walls and floors had risen by 7.5% as compared to 2012, that is 2,239.6 million euros, more than olive oil or footwear, considered "star" products for Spanish foreign trade. Eighty per cent of the sector is made up of small and medium-sized companies, geographically concentrated in the province of Castellón, in the so-called Spanish Levante area. Among the largest and most renowned

worldwide, it is worth mentioning Porcelanosa group, with 5,000 employees and presence in a hundred countries around the world. Pamesa, Tauell, Keraben or Saloni are, among others, some of the most outstanding firms in the sector.

A LONG HISTORY—Ceramic tradition in Spain is very ancient; inherited from Romans and, above all, from Arabs. Back in the Middle Ages, craftsmen from the area of Valencia exported their products throughout Europe. During the Enlightenment, high-quality porcelain factories were created, such as Retiro in Madrid or Alcora in Valencia, to compete with France's Sèvres, Italy's Capodimonte and Germany's Meissen, the most highly-rated in the world today.

On the other hand, Spanish ceramics from Talavera, considered more popular, flourished during the Baroque period. It was about to disappear with the inrush of factories using new techniques since the 19th century. This is the case of Galician Sargadelos or La Cartuja de Sevilla, which, since then and with a few interruptions, continue to be active. In 1953, Lladró was founded, dealing in ceramic art, which

today exports 80% of its production and has 4,000 POS outlets in a hundred countries around the world.

As far as constructive and architectural uses are concerned, the turning point of ceramic industry in Spain takes place as from the 80's with the introduction of gas furnaces. Among other improvements, the new system reduced the firing process, allowed manufacturing thinner and larger pieces, as well as increasing quantity and quality of production. This resulted in the international launch of a sector which has bet on design and technological innovation.



PHOTO: CERÁMICA SAN JUANES TALAVERA

A ceramic workshop at Talavera was in charge of creating the world's largest hand-painted ceramic tiles mural in Oran (Algeria).



FOTO: CORTESIA DE ASCER

Intelligent ceramics

Ceramic products manufactured by Spanish companies comprise all kinds of uses and have become "intelligent" materials which are increasingly used because of their environmental sustainability. Thus, it is possible to build ventilated façade systems or ceramic solar panels with photovoltaic cells, which can be fully integrated in the façades or roof of a building, also contributing thermal and sound insulation properties.

Radiant floors with tiles containing



Güell park in Barcelona, designed by Catalan architect Antonio Gaudí.

nanoconductors produce clean heat and save up to 16% of electricity consumption of an average home. Another innovative application are the so-called "active surfaces", capable of self-cleaning or destroying polluting agents through the photocatalytic effect of their nanoparticles, which react with sun ultraviolet radiation, oxidizing any organic matter existing on them.



PHOTO: CERACASA, S.A.

Spain is the world's third exporter and fourth producer ceramic tiles and stands among the first ten producers of natural stone, mainly marble.

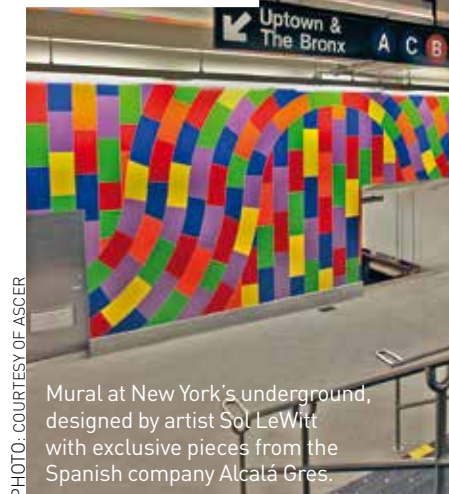
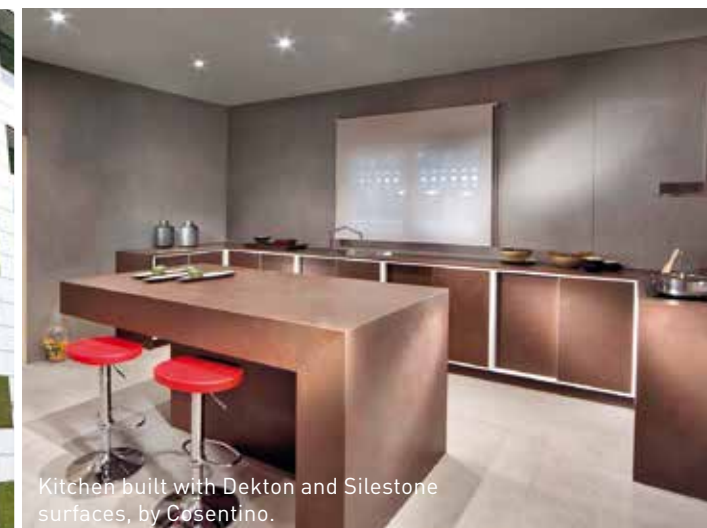


PHOTO: COURTESY OF ASCER

Mural at New York's underground, designed by artist Sol LeWitt with exclusive pieces from the Spanish company Alcalá Gres.

Natural stone

Spain is the seventh world producer of ornamental and lining stone, after China, India, Turkey, Iran, Italy and Brazil, according to data from the Natural Stone Market Observatory of the Research Association of Construction Industries (AI-DICO). Marble is Spain's most important material of the processed natural stone sector –also including limestone, granite and slate. It represents 71% of the total and 55.9% of exports, mostly unprocessed. Ninety-five per cent of production is meant for construction and the rest for funerary artwork and masonry. Marble industry is located in the province of Alicante and, above all, in Andalusia. The largest concentration of marble quarries in Spain is in the village of Macael (Almería). These quarries have been exploited since ancient times. White marble from Macael is the most famous one and can be found in buildings throughout the world. It is abundant in Granada's Alhambra but can also be found at Burj Al Arab's hotel hall, in Dubai, which is considered the most luxurious hotel in the world. This building also has 10,000 square metres of another Spanish product: Silestone, manufactured by Cosentino.



Kitchen built with Dekton and Silestone surfaces, by Cosentino.

Cosentino, a success story

Founded in Macael in 1979, Cosentino group is an example of innovation and business success, which has turned its "star" product, Silestone®, into one of the most renowned Spanish brands in the world. It is the largest world producer of quartz surfaces and exports 70% of its production to fifty countries. Fifty-five per cent of its sales come from North America, where it has a subsidiary based in Houston, (Texas). It employs two thousand people –half of them in Spain– and has six production plants, 14 natural stone quarries and 19 factories in several countries. The company expects to close the 2013 accounts with a total turnover of 500 million euros.

Experience, competitiveness and technology at the service of society

Ineco has extensive experience in transport engineering: 45 years planning, designing, managing, operating and maintaining airports, railways, roads, ports and urban transport systems throughout the world.

Ineco is a global Spanish transport engineering and consultancy firm. Since its creation in 1968, it has specialised in the development of transport systems that help improve people’s mobility. For 45 years, Ineco has served investors by developing transport infrastructure. With over 2,500 professional experts, Ineco uses its technological capabilities and capacity for innovation for society’s benefit, structuring territories and promoting environmental sustainability. Our experience and competitiveness has led us to execute projects in over 40 countries on four continents. The numerous international contracts in recent years demonstrate Ineco’s ability to work abroad.

Ineco in the world

SPAIN (Corporate Headquarters)
Paseo de La Habana, 138 | 28036 Madrid
Tel.: +34 91 452 12 00 Fax: +34 91 452 13 00
info@ineco.com

SAUDI ARABIA / Jeddah
Tel.: +34 91 788 05 80

UAE / Abu Dhabi
Tel.: +971 2 495 70 00

BRAZIL / São Paulo
Tel.: +55 11 3287 5195

ECUADOR / Quito
Tel.: +59 39 7942 1220

KUWAIT / Kuwait City
Tel.: +965 6699 2395

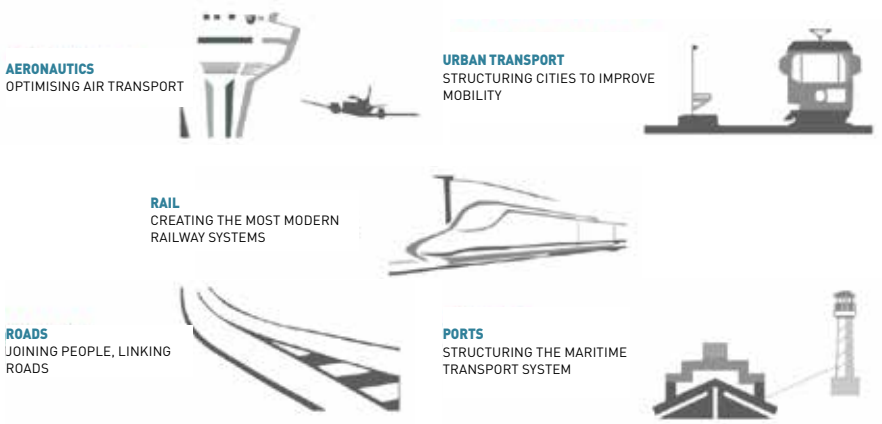
MEXICO / Mexico D.F.
Tel.: +52 55 5547 4110 / 1915 / 2084

UNITED KINGDOM / London
Tel.: +44 78 27 51 84 31

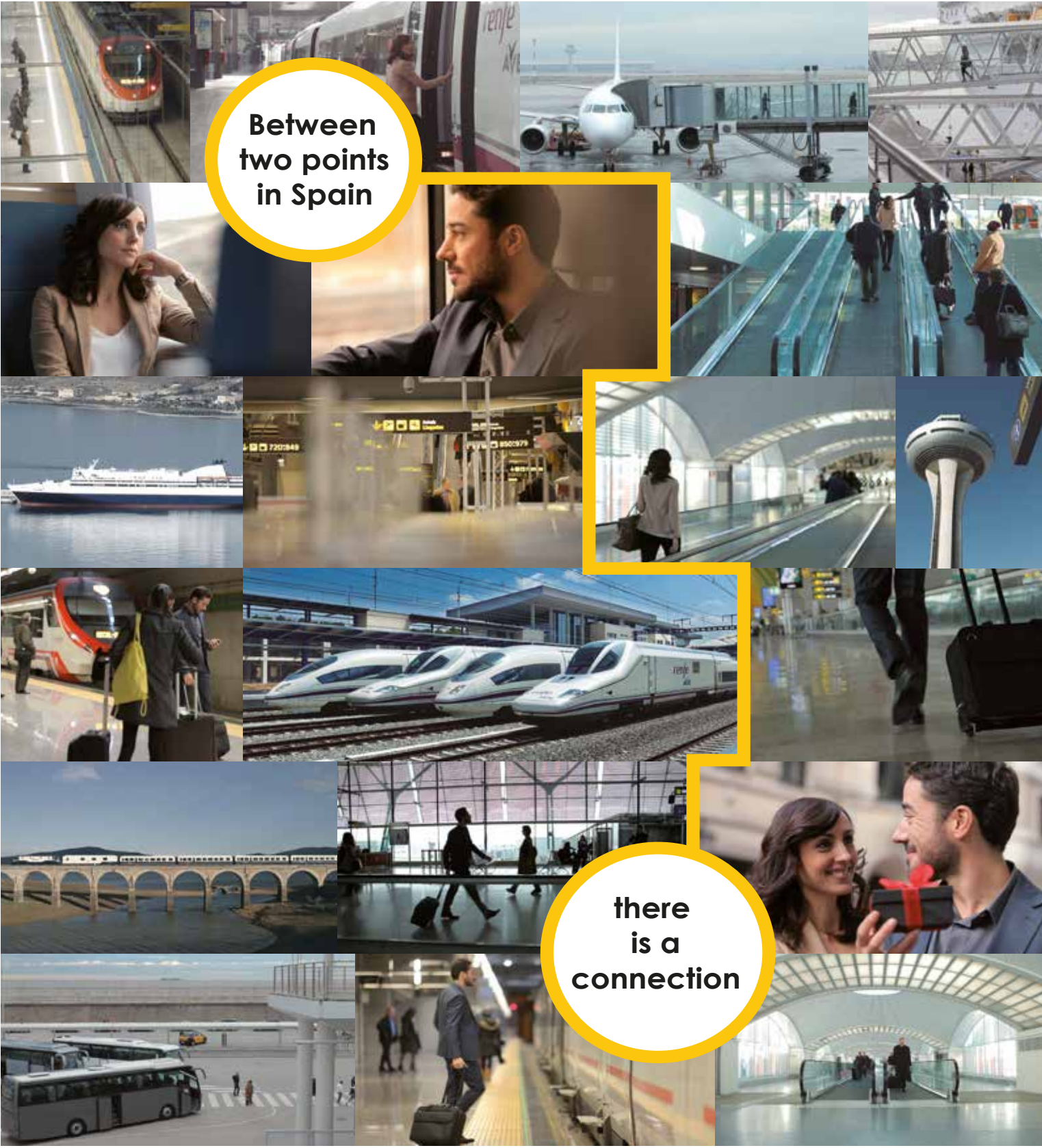
SINGAPORE
Tel.: +34 91 452 12 00

A 40 COUNTRIES OVER

High Speed Railway between Madinah and Makkah | Master Plan for Kuwait International Airport | Railway between Istanbul and Ankara | Guadalajara-Colima Highway in Mexico | Control Tower in Eldorado, Bogota | Strategic Plan for Railway Freight Transport in Spain | Airports Plan in Nepal | National Transport Plan of Algeria | Aena Airports, Spain | Improvement of the Railway Network in Lithuania | Snow Plan for Heathrow Airport | Road Improvement in Ecuador | Master Plan for Sangster Airport, Jamaica | Coordination of the São Paulo Ring Road | Improvements to the Moroccan Air Navigation System | New Industrial Complex in Shadadiya, Kuwait | Studies for the High Speed Railway between Haldia and Howrah, India | Tram Line 4 in Tallinn, Estonia | Transport Plan in Costa Rica | Consultancy for Luanda Airport...



America	Europe	Africa	Middle East	Asia
Mexico	United Kingdom	Cape Verde	Saudi Arabia	India
Colombia	Turkey	Algeria	Kuwait	Philippines
Venezuela	Italy	Morocco	Qatar	Nepal
Brazil	Portugal	Mauritania	Oman	Singapore
Argentina	Serbia	Namibia	UAE	
Panama	Poland	Ethiopia	Jordan	
Costa Rica	Norway	Mali		
Jamaica	Lithuania	Egypt		
Peru	Bulgaria	Angola		
Chile	Estonia			
Ecuador	Denmark			
Bolivia	Belgium			
	Spain			



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