Using Revolutionary Technology To Improve Rail Operations
Dear colleague,

Many thanks for downloading *Using Revolutionary Technology To Improve Rail Operations*.

A recent report by UNIFE – the Association of the European Rail Industry and Roland Berger Strategy Consultants, based on the analysis of several thousand rail projects around the world predicts that until 2019 the rail industry will grow 2.7% per annum and by 2017 the total market will be approximately €176 billion.*

A number of factors are driving this growth including urbanisation, population boom, climate change concerns, government initiatives, liberalisation, competition and an opening up of markets. But it's the themes of innovation and a focus on the future that this latest e-book from SmartRail World is concerned with.

We've gained insights from a pair of experts, one Lord Berkeley, an industry veteran, the other Renata Susa, just at the beginning of re-developing a network after years of neglect. We look at the use of drones, the development of 3D printing, the role of the station amidst all this and visit Stockholm to see some fantastic developments on a really inspiring network.

All of the themes of this e-book will be discussed and presented upon and Lord Berkeley and Renata Susa confirmed as speakers at SmartRail Europe in Amsterdam, Netherlands 19-20 May 2015. Consisting of two days of lively and informative debate and discussion in three co-located Congresses focussing on Signalling & Telecoms, IT Networks and Rolling Stock. It’s an event not to be missed.

Each of the features within this e-book was first published in an abridged form on SmartRail World which offers a truly global perspective on rail and metro signalling with a strong focus on the innovation and the future. Become a subscriber for free today.

Many thanks to all the contributors who took time to speak to me and help make this book happen.

We hope you enjoy this e-book and find it stimulating, informative and perhaps even a little inspiring. Hope to see you all in Amsterdam!

Regards and thanks,

Luke Upton  
Editor  
SmartRail World  
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* World Rail Market Study (5th edition) forecast 2014 to 2019
To open up this e-book, our Editor Luke Upton swapped the modest surroundings of the SmartRail World office, for the more salubrious setting of London’s House of Lords, to meet Lord Anthony Fitzhardinge Gueterbock, 18th Baron Berkeley – more commonly known as Tony Berkeley, chairman of the Rail Freight Group (RFG), Board Member of the European Rail Freight Association (ERFA), both hereditary and life peer and career-long transport advocate. A civil engineer by training, Lord Berkeley worked across a number of major international projects, before holding senior positions within the construction of the Channel Tunnel for 15 years.

We opened our discussion on the subject of ERTMS, which for those readers outside Europe, stands for European Rail Traffic Management System. Both RFG and ERFA support the deployment of ERTMS which aims to make rail transport both safer and more competitive by improving performance and raising capacity. ERTMS features two basic components: – GSM-R based on the GSM standard, but using different frequencies belonging to the railways, along with certain advanced functions. This refers to the radio system used to exchange information (voice and data) between trackside and on-board. And the ETCS (European Train Control System). A train-based computer, the Eurocab, which compares the speed of the train as transmitted from the track with the maximum permitted speed and slows down the train automatically if the latter is exceeded.

I asked Tony where Europe stands on ERTMS at the moment; “In the United Kingdom, Network Rail will deliver it, and its Chief Executive, Mark Carne has nailed his colours to the mast on this and is aiming to accelerate the implementation to provide the additional capacity that the network needs. . But for continental Europe the picture is not as positive with the fear that there may be several national systems that are incompatible with each other, completely undermining the whole purpose of the system!”

I asked Lord Berkeley why there was such an issue in implementing ERTMS when in addition to the safety benefits, the additional capacity can support revenue growth; “Capacity growth is important, but many infrastructure managers do not accept that the additional revenue from more trains is enough to fund the installation of ERTMS equipment in cabs; hence the plan in many member states that operators should fund this themselves, although the main beneficiaries are the Infrastructure Managers. So there is still much to do to get one common signalling system across Europe, but there has been some positive news this week. I’ve just returned from a meeting in Brussels where a specification for ERTMS Level 3, has finally been agreed and that’s an important step.”

On the subject of freight, Lord Berkeley offered an insight into how some of the European countries are currently performing; “The picture is again mixed. France has lost 50 per cent of its SNCF rail freight in the last 10 years. Why? A mixture of poor organisation of maintenance schedules, inflexible working practices and trade union challenges have led to this. And although some independents are picking up the slack, some of this freight has moved onto the roads. In the UK though, rail freight is growing and we will see a doubling, potentially even a tripling of some freight carried within the next decade.”

“There are however, some interesting developments in the freight sector. We’ve seen some eye-catching developments in very long distance freight linking China with Western Europe, and in particular DHL doing some interesting work in this sector. Ultimately this comes down to cost and proving better value than shipping round to the busy ports on the North-West of Europe. Yet, there are other routes that could boost this, for example the Port of Constanța in Romania, on the Black Sea which could offer cheaper and more effective ways for rail freight to reach Western Europe.”

Few discussions on rail in the UK, particularly one taking place in the heart of British government can fail to address HS2, the proposed high-speed line linking London with the Midlands and potentially further north, I asked what the RFG’s view was; “We strongly support the development of HS2 and think it will provide vital additional rail capacity – a major benefit of the project and essential for the continued growth of the rail freight sector particularly with capacity becoming scarce on the West and East Coast Main lines. But there are two important points with HS2; firstly that HS2 should be designed to carry freight in the same way that HS1 was. Initially HS1 (the only existing high speed line in the UK linking London with the Channel Tunnel) wasn’t meant to carry any freight, but now carries significant quantities at night. In addition, in the future there may be high speed freight services which could go at any time if they can keep up with the passenger trains.

Our time is nearly up, so to finish I ask Lord Berkeley to sum up if he could the state of the rail industry at the moment; “Taking a Europe-wide view, as I do, I think the picture is pretty mixed. Rail is growing but to grow further and more efficiently, we need to foster a more ‘can-do’ attitude, which in many countries is lacking. Greater market liberalisation, transparency and the end to restrictive practices would help with this. There’s also potential with having a greater environmental focus and delivering more attractive options to customers. So I guess it’s a challenge of delivering growth through competition, really, which is a nice challenge to have!”
Stockholm Metro is famous for its creative flair with the majority of its stations decorated with mosaics, paintings, engravings and reliefs extending from the 1950s through to the most modern pieces. And in designing the latest fleet of Metro cars for its Red Line, the Stockholm Traffic Administration and Bombardier Transportation have aimed to reflect this heritage.

Based on Stockholm’s architectural characteristics of openness, modernity and diversity, the design language is based on the “Open City” vision and its derived concept “New Minimalism”. The interior layout has spacious gangways and features an innovative use of indirect light to create an open and bright environment. The new design also reflects extensive dialogue with representatives of various interest groups with the number of designated priority zones increased to eight, ensuring ample room for persons with reduced mobility as well as providing extra room for those traveling with wheelchairs, baby carriages or extra-large luggage.

Unveiled recently at EurasiaRail 2015 in Istanbul, Turkey the Bombardier C30 MOVIA metro provides fast-growing Stockholm with major capacity boost. As one of Europe’s most rapidly growing cities, Stockholm is investing heavily in sustainable transport. The Red Line upgrade is a key project and from the outset, the C30 MOVIA has been designed to sharply increase Stockholm’s transport capacity and comfort. Compared to the previous generation, also designed by Bombardier, the new metro features additional bi-parting doors for faster entry and exit and a mixed, four-by-four seating configuration with additional seats along the vehicle’s sides to optimize comfort, capacity and passenger flow.

Speaking of the new metro, Klas Wåhlberg, Managing Director of Bombardier Transportation in Sweden said, “When public transport is attractive, sustainable travel will increase. With this metro design, Stockholm has taken this motto to an entirely new level...”

Bombardier was selected in 2013 to provide Stockholm with 96 MOVIA metro vehicles with an option for up to 80 addition vehicles. The four-car vehicles, fitted with a driver’s cab at each end, are also equipped with an advanced driverless functionality. The air-conditioned C30 MOVIA metros also feature an advanced passenger information system and fulfill the highest environmental standards regarding energy consumption and choice of materials, which are 98% recyclable. Energy-efficient Bombardier Flexx Eco bogies and the well-proven Bombardier Mitrac propulsion system reduce maintenance costs and contribute to passenger comfort with minimal energy consumption and low noise.
9 Innovations that are shaping the rail station of the future.

Rail stations are changing. For a long time they appeared to be an after-thought for many train operators, designed simply to get as many passengers in and out as quickly and safely as possible. But no more. Stations are evolving and offering more to its passengers, making them a place to stay in and enjoy, an amenity all to itself, rather than a building to quickly head away from or arrive with little time to spare before catching a train. The central position of stations, also puts them at the heart of urban regeneration schemes and a crucial link between commercial, leisure and residential spaces. The global growth of rail travel this past decade has given both the impetus and funding to make these changes and today SmartRail World Editor Luke Upton runs down nine key station developments we are likely to see more of as we move in to 2015 and beyond.

1. A RENEWED FOCUS ON DESIGN.

When one thinks of a ‘classic’ station they may well conjure up images of New York’s Grand Central Terminal (built 1913), Madrid’s Estacion de Madrid Atocha (1851), the only UNESCO recognised rail station in the world Chhatrapati Shivaj Terminus in Mumbai (1888) or Gare du Nord in Paris (1846) but few would consider many built in the latter half of the 20th Century as classics. However, the new millennium has seen a renewed focus on the aesthetic of railway stations.

Perhaps the finest example is the Berlin Hauptbahnhof, opened in 2006. Designed by Gerkan, Marg and Partners, it handles 1,100 overground and underground trains a day, serving routes that extend as far east as Russian and Kazakhstan, it is a large “cathedral” of glass and polished steel. On opening, national train operator Deutsche Bahn’s chief executive Hartmut Mehdorn described it as “the most beautiful station in the world”. Perhaps, but as the aesthetic grows, it is starting to get some serious competition. The image at the top of this article, of Kings Cross in London, illustrates another example of the blending of a new design and cutting edge facilities with an historic Grade I-listed structure dating from the mid-19th century.

2. GROWTH OF RETAIL.

Once upon a time at a major station, you could buy a newspaper, a coffee and perhaps if you were lucky a copy of the latest bestseller or tourist trinket. Now however, many stations at aiming to take advantage of the huge footfall they experience (and help pay for their investments) by developing a dazzling area of retail and catering outlets to serve every taste [and pocket].

To give just one example, St Pancras International, in London which is both a national station and international serving Continental Europe through Eurostar has turned excavated Victorian storage sheds into a high-end shopping mall with units from Fortnum & Mason, Whistles and L’Occitane en Provence amongst others. And interestingly, this shopping area is promoted as a destination all of its own, and not just to train passengers. Going to a train station but not catching a train? That would have been hard to believe a few years ago!

3. ZERO-NET ENERGY CONSUMPTION.

In the USA, the renovated Yawkey Station near Fenway Park in Boston will become a “zero net energy” commuter rail station when construction is finished in 2017. Solar panels and a shared-use garage on which a solar photovoltaic power plant will be installed is designed to provide all the energy required to power the station.

Whilst also in Massachusetts, this time in Greenfield, the John W. Olver Transit Center which houses offices for the Franklin Regional Transit Authority and an Amtrak station is the first zero net energy building of its kind in the United States. Some of the key green features include air-conditioning provided by an active chilled beam system, a solar wall that preheats fresh air by as much as 15 degrees during peak winter sun, second-stage preheating via a ground source heat pump, and daylight modelling used to determine optimal placement of windows, clerestory and skylights.

4. VIRTUAL TICKETING AGENTS.

Ticketing has been amongst the most innovative areas within rail and metro, perhaps most visible in smart-card systems overtaking paper tickets in a growing number of the world’s transport networks. The next development could well be Virtual Agents, essentially an at station computer offering a combination of ticket office, vending machine and call centre. A passenger using the Virtual Agent is able to talk a ‘real person’ in ‘real time’ offering a similar experience to being at a the ticket window except over a video link. The ticket agent you speak to would be likely at a central ticket office hub.

For rail companies this would enable a central pool of staff to be deployed across the network and be able to be focussed at certain peak times. It would also potentially offer the opportunity to offer ticket advice in different languages and even link staff from quiet stations into helping at busier stations at peak times. For passengers it offers a human contact but also the immediacy and speed of a ticket machine.
9 Innovations that are shaping the rail station of the future. [cont]

Challenges for this service exist, not least ensuring a communications infrastructure exists that can support non-stop video calls but with virtual ticketing agents already being trialled by Deutsche Bahn this is a technology that could be seen at major stations soon.

5. ENERGY EFFICIENT ESCALATORS AND MOVING WALKWAYS. The Mass Transit Railway Corporation (MTR) in Hong Kong is one of the busiest in the world, serving a population of over seven million people in a high density area. At the main passenger terminal, ThyssenKrupp has installed 73 escalators and eight moving walkways which when not in use will smoothly and automatically slow itself down to reduce electricity consumption and, when the built-in radar sensors detect a passenger, it will accelerate back up to normal running speed. Depending on passenger volumes, escalators and moving walks with this feature can save up to 60 percent of the energy consumed by conventional systems. But that’s not all! 33 escalators will be fitted with a unique regenerative system that not only reduces power consumption but which can actually generate electricity, feeding it back into the power grid of the terminus for use in other systems such as lighting and ventilation. It works by exploiting the effect of gravity on a heavily loaded, downward-operating escalator. The weight of the passengers drives the steps down, allowing the escalator to work as a generator and converting the movement into electricity.

6. ERGONOMIC STATION DESIGN. Ensuring that large numbers of travellers can move freely and efficiently to, through and from a station is an essential to maintaining the operational effectiveness of the transport system as a whole. Station developments now consider ergonomic and human factors, in particular looking in a scientific way at people and their needs, and then providing analytical evidence based on psychological, behavioural and physical factors to improve experiences. For example, in the development of stations experts can be used to analyse passenger movement and behaviour and then plan the station layout to encourage them to do the things you need them to do, for example travelling one the correct side of the escalator or arriving at gate lines with their tickets ready. Other areas of growth in this sector linked to this include the development of new technologies and smart ticketing and also the place for retail and catering opportunities within the station.

7. DIGITAL SIGNAGE. Signage at rail and metro stations has sometimes been a neglected area amidst the developments happening around it. But now a series of changes has created a new opportunity for the growth of this unglamorous but essential aspect of the industry and even in an era when mobile devices are omnipresent the usage of digital signage continues to grow. The Transportation Research Board recently published a report analysing its use and found that not only does it boost the perception that the transit service is being improved but also reduces the perception of wait time and highlighted how informed riders feel more safe and secure. The slow but steady increase of colour signage and video is outlined by Michael Welsh of Data Display: “A colour display offers a number of additional offerings to a traditional display – operators can customize the colour to fit their colour scheme or to colour coordinate with a particular line. It offers the capability to display a full colour video which opens up the opportunity to potentially run advertisements whether for local tourist attractions, for visitors or of a purely commercial nature. This in turn potentially opens up a new revenue stream for the agency.” The evolution of colourful digital signage which can run videos and adverts is a development which can not only improve the passenger experience but also create additional revenue streams and branding opportunities for operators. One to watch!

8. ADDITIONAL REVENUE OPPORTUNITIES. Shops and catering facilities are one growing area for revenue growth as are digital advertising opportunities. But other, lifestyle driven ways of stations growing capital are emerging. Speaking to the Financial Times, Graeme Craig, Transport for London’s director of commercial development, believes the transport system has the potential to be a “supermarket aisle” down which millions file every day. “They are time-poor people who’ve got very busy lives. All we need to do is work out what it is they need and give it to them in the most convenient format,” he said. An example of this is the development of “click and collect” services at London Underground stations in North London, enabling commuters to purchase their shopping online in the morning and then collect it on their way home via the station after 4pm. And also, the placing of Amazon or e-Bay lockers at stations, again for the collection of online purchases on the way home is surely an area of further growth potential for stations all over the world.

9. VERTICAL STATIONS

And to finish perhaps we stray into a more futuristic area with this but, a vision of vertical railway stations, stretching hundreds of metres into the clouds has been designed and according to its architects; “aims to resolve the inevitable challenges that cities will face by 2075, and offers a deliverable and sustainable solution for the future of the transport generation.” The Hyper Speed Vertical Train Hub (pictured above) is a concept that has been entered into eVolo magazine’s annual skyscraper competition by Christopher Christophi and Lucas Mazarrasa as an alternative to the traditional rail terminal. By flipping the station onto a vertical axis, the design reduces the impact on land use to meet the predicted rapid growth in city populations over the coming decades. Trains stick to the outside of the building using a maglev system and exit the terminal through a series of tunnels at the foot of the structure. The designers say the towers, which would be capped off by a rooftop green plaza, are envisioned as individual pieces of infrastructure that could be replicated in cities around the world. Maybe? Maybe not? Time will tell...
The steady development of the use of unmanned aerial vehicle’s (UAV’s), commonly known as drones within the rail industry will take a step forward, with the U.S. Federal Aviation Administration (FAA) recently unveiling plans to make it easier for companies to use drones in business operations. Whilst other railways around the world continue to develop their use in a variety of ways commercial drone flights are generally banned in the US. But the FAA will soon allow a far wider use of them and streamline the process for gaining authorisation. A wide variety of companies have pushed for these barriers to be eased, and amongst those that have already gained exemptions are BNSF Railway— who aim to utilise drones, equipped with cameras to monitor trains and inspect track.

Last year, fellow Class One Railroad, Union Pacific Chief Executive Officer Jack Koraleski, stated they too are looking at drones to improve the efficiency of maintenance on the network: “You could send a drone to do the inspection and then if it saw something you could send a person up to do the final inspection,” Koraleski said in an interview at Bloomberg’s headquarters in New York. “We’re just starting to explore what might make sense and how you could use them.”

Meanwhile in January in the UK, Network Rail (the owner and operator of most of the nation’s rail infrastructure) awarded a framework contract to four companies to use drones to perform infrastructure inspections and land surveys. Network Rail will use the map data provided by the drones to improve track maintenance and boost field worker efficiency while reducing the amount of working at height required on Network Rail’s assets.

Network Rail spokesman Dan Donovan, speaking to Rail Technology Magazine said bigger changes are on the horizon too, telling us: “We would like to bring this service in-house. We don’t own any UAVs or pilots; at the moment, we’re subcontracting it out to these four [companies]. They know we would like to bring it in-house eventually, and we are working with them to see what is the best way of doing that. Instead of using a helicopter to do these jobs, which is incredibly expensive per hour, we could turn it around in an hour – send up ‘one man in a van’ with a UAV to get the job done. It’s quicker, cheaper and safer. It’s something we’d love to do in the near future.”

For the light rail network in Jerusalem, the capital of Israel, drones are being deployed to act as extra surveillance following recent riots which saw stations and tracks of the line destroyed. “We in the city had made use of unmanned aerial vehicles (UAVs) for various purposes recently, and we thought this would be an excellent opportunity to make use of the technology,” Mayor Nir Barkat told The Times of Israel. “With UAVs, you get great high-resolution images taken from a birds-eye perspective, giving you the flexibility to zero in on any potential trouble spots in a way that ground level cameras cannot accomplish.” The drones would record video and images, which can then be analysed by the police to help narrow down culprits.

EDITOR’S COMMENT: As with many new technologies, the potential and the threats of the deployment of drones by the rail industry have probably both been exaggerated and overplayed. They are a tool like any other, and for certain jobs will save money and will improve efficiency. But usage regulations for example, in the US within three miles of an airport, and the cost of rolling them out in a time of stretched budgets will for the time being likely limit their deployment.
The 3D printed sedan car unveiled in China recently is just the latest in a growing list of items that have been successfully printed. The 3.6-metre-long, 1.63-metre-wide vehicle was printed with low-cost composite materials in five days using this technology and then assembled for a test drive. It can travel at a modest maximum speed of 25mph and is powered by rechargeable batteries. But what is 3D printing, and does it offer some serious potential for the rail industry?

Well, 3D printing (known to some as additive manufacturing or AM) is a process of making three dimensional solid objects from a digital file. The creation of a 3D printed object is achieved using additive processes. In an additive process an object is created by laying down successive layers of material until the entire object is created. As it has become more widespread, applications have included design visualization, prototyping/CAD, metal casting, architecture, education, geospatial, healthcare and entertainment/retail.

Colin Stewart, lead author of the Arup report, the Future of Rail 2050 states in Infrastructure Intelligence that, “3D printing has the potential to change the whole world – you can buy a blueprint rather than the actual item, but you still need the raw material. That still needs to be distributed to people’s doors.”

Rail is an obvious route and the report highlights the future significance of rail freight. But Stewart suggests there is further thinking to be done. “We have done studies in Amsterdam for example, on using the tram network to distribute goods to shops.”

UK Based 3D Generation see strong potential for the use of their technology for the rail industry: “Processes such as Fused Filament Fabrication (FFF) transform tough yet lightweight materials into fully functioning parts without the timescales or costs associated with machine tooling. Capable of limitless finishes, from rubber-like to smooth, 3D printing is ideal for the demands of rail, road and air travel where optimum strength-to-weight ratio is key to performance and fuel economy.”

There would be advantages for rail to develop their own 3D printing operations. Think of the cost savings of printing just one item required for maintenance, potentially even on site, over the bulk purchase and then waiting for delivery. The frustrations of the key part that is no longer produced? Over. The long wait for something to arrive? A thing of the past. 3D printing offers the realistic opportunity that anyone and anywhere can produce any object they want, completely on demand.

Aircraft designers already have in their sights the 3-D printing of a whole plane by 2050. Leading aircraft manufacturers Airbus (part of the European aerospace and defence group, EADS) and Boeing are using it to improve the performance of their aircraft and reduce maintenance and fuel costs. Boeing uses 3-D printing to produce environmental control ducting (ECD) for its 787 aircraft. ECD traditionally requires the production and assembly of up to 20 different parts, but can be 3-D printed in one piece. “Additive Layer Manufacturing is truly game-changing technology that has the potential to revolutionize manufacturing for the 21st century. It can be used for a wide variety of materials from metals to plastics - including composites - and is faster and more efficient to produce. It uses less raw material and produces parts which are lighter, more complex and stronger: in short, this is a leaner and greener technology which can be used in many sectors from aviation through to consumer goods,”

However, despite the clear advantages of further use of this technology, 3D printing does offer potential threats to the rail industry. Firstly, the ability to print your own parts, and eliminate transport costs will all in likelihood decrease the demand for both the transportation of the product and the intermediate movement of the raw materials required. So less use of train transport.

Secondly, it could be bad news for railroad employees with this technology limiting the number of human staff required. To quote US economist Michael Spence; “Now comes a ... powerful, wave of digital technology that is replacing labour in increasingly complex tasks. This process of labour substitution and disintermediation has been underway for some time in service sectors – think of ATMs, online banking, enterprise resource planning, customer relationship management, mobile payment systems, and much more. This revolution is spreading to the production of goods, where robots and 3D printing are displacing labour.” In his view, the vast majority of the cost of digital technologies comes at the start, in the design of hardware (in this case 3D printers) and, more important, in creating the software that enables machines to carry out various tasks. “Once this is achieved, the marginal cost of the hardware is relatively low (and declines as scale rises), and the marginal cost of replicating the software is essentially zero.”

EDITOR’S COMMENT: So, what is the role of 3D printing for the industry? 3D printing is without doubt a disruptive technology which could shake up the rail industry and potentially create a new sub-industry within it. And as with all technologies there are positives and negatives, depending on the perspective. But for maintenance in particular there are some huge potentials – just imagine being able to print and replace that spare part whilst still on the tracks? And eliminate the need to remove the train from service and roll into the maintenance yards. This example alone is surely enough for rail operators to look at this opportunity seriously.
The state-owned Croatian Railways was founded in 1991, after the dissolution of Yugoslavia and Yugoslav Railways. On November 1, 2012, Croatian Railways, which were at the time organised as a holding company, were dissolved and three independent companies were created: HŽ Infrastruktura (infrastructure manager), HŽ Cargo (freight operator) and HŽ Putnički prijevoz (passenger operator). Croatia became an integral part of the European transport market when it joined the European Union (EU) on 1 July, 2013, opening up both opportunities and challenges for its railway sector.

We asked Ms. Suša about how she has enjoyed the start to her new role: “I’ve really enjoyed it so far, it’s an area with huge potential for Croatia and it’s great to be able to start to see some of our plans begin to develop already.”

The network of the Croatian railways is centred round the capital Zagreb and connects all major Croatian cities. Croatia has also direct international connections with Austria, Switzerland, Germany, Hungary, Slovenia, Serbia and Bosnia and Herzegovina.

On the challenges Ms. Suša identified a few main areas: “We need to increase capacity for both passenger and freight. That is clear. This has been an extremely interesting period for Croatian railway with huge investment projects, the largest investment cycle in the past 40 years. However, in delivering such infrastructure growth we have to overcome all the challenges and mitigate the risks.”

However, with 2,604 km of tracks, Croatia’s rail network is close to the European average in terms of network density, and does have the potential to not only grow domestic traffic but also to increase transit along key European transport corridors, particularly for international cargo moving north into the growing Central European markets.

To finish, we asked Ms. Suša about what the next few years will bring in terms of developments; “We are undergoing some huge developments, aiming to both increase our passenger and freight capacity as well as safety. We are reconstructing existing rail corridors and building new corridors as well – we’ll have totally new track in the north of the country, that represent suburban line of Zagreb (See picture of Zagreb Glavni Kolodvor / Zagreb Main Station below). The fifth Pan-European corridor has two branches in Croatia, the ‘b’ and ‘c’ branch and both of these lines are being electrified and modernised. There are many projects in various phases, e.g. the second track on the line section Dugo Selo – Križevci, which construction will be started this year, and whose estimated value for works and supervision is B198.02 million, and the project of the construction of the new line between the towns of Gradec and Sveti Ivan Žabno, whose estimated value for works and works’ supervision is D32.4 million. There’s certainly a lot of hard work ahead, but we also see huge potential in the Croatian network!”