



150 YEARS OF RAILWAY IN CROATIA – OVERVIEW OF CONSTRUCTION AND DEVELOPMENT OF RAILWAY SYSTEM

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Abstract

On 24 April 2010 a century and a half of the presence of railway in Croatia has passed. This important anniversary shows that our country became a part of the European railway network soon after the revolutionary technical–technological innovation from 1825, when the first railway line between Stockton and Darlington in England was opened for public passenger and cargo transport and started its unstoppable march whose progression characterised 19th century.

Keywords: history, development, railway lines, vehicles

1 Introduction

The history of railway in Croatia began with the first plans to build a railway line through Croatia that were the part of technical study of construction railway lines in the Hapsburg Monarchy. The study titled *De konstrukcione et constitutione viorum* (On construction and maintenance of roads) was elaborated and in 1836 proposed to the royal office in Vienna by Georg Sinna, the Viennese financial magnate, and Franz Xaver Riply, professor at the Technical College in Vienna. The study envisaged construction of 13 railway lines with start points in Vienna and Budapest. The network of railway lines would spread in the form of star arms toward all regions in the Empire connecting these monarchy centres with larger and economically important cities and settlements and also providing direct connection with Trieste, Rijeka and other Adriatic ports. In line with the study, the first railway lines planned in the territory of Croatia were in direction of Zagreb, Sisak, Karlovac and Rijeka. However, by combination of circumstances, the first 42 km of railway lines in Croatia were built between Macinec, located at the present Croatian-Slovenian border, and Kotoriba. The line, called “the tail on the Croatian territory”, was put into service on 24 April 1860. It was the section of the Pragersko – Čakovec – Kotoriba – Nagykanizsa line and it directly connected Budapest to the magistral railway line Vienna – Trieste. At the section of the line running through Croatia three railway stations (Kotoriba, Donji Kraljevec and Čakovec) were built. The bridge over Mura River, with length of 153 m was the largest built structure on the line. Construction of the line commenced at the end of 1857, soon after putting the Vienna-Trieste line into service and it was used for transport of the first railway tracks from England to the building site from the Trieste port. Construction of the line was completed 20 months before the deadline.



Figure 1 Railway stations Sisak (left) and Karlovac (right) in the beginning of 20th century

2 Construction and development of railway lines in Croatian regions

2.1 Railway lines of the Zagreb railway junction

The first railway lines on Croatian territory represented the beginning of formation of the Zagreb railway junction. The first railway line in Zagreb region was the Zidani Most-Zagreb-Sisak/Galovo line. It was opened for traffic on 1 October 1862. Three years later the line Zagreb-Karlovac was built. Both lines had the status of side lines in the magistral line network Vienna-Graz-Zidani Most-Ljubljana-Trieste, and were built by the Imperial and royal licensed South Railways Association. With the first railway line Zagreb obtained the first railway station - Zagreb South Station (today Zagreb West Station) which was the only central railway station in Zagreb in next 30 years. Two months after opening, the newly established state post office, which was predecessor of Zagreb Post Office 2, was opened in the station building. During selection of location for the railway station, the need for the best possible branching of future lines in direction of Nagykanizsa, Karlovac and Rijeka at that location prevailed. In addition to the reception building, other infrastructure facilities were also built. The bridge construction, i.e. the bridge over the Sava River next to Zagreb and over Krapina River next to Zaprešić, attracted the largest attention during construction of the line and line facilities. Those were the largest structures on the line (the Sava bridge structure had the weight of 360 tons). In their construction the new building method using moving scaffold from which the bridge structure was pulled over the piers was applied for the first time in the Monarchy.

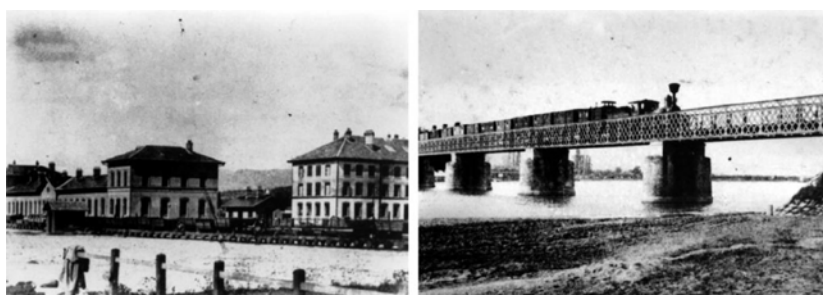


Figure 2 Construction of the first railway complex at the present Zagreb West Railway Station (left) and bridge over the Sava River near Zagreb, 1864 (right)

On 1 June 1865 the second line – Zagreb – Karlovac, running through the Zagreb area, was opened for traffic. The line length was 53kms and at time of opening it had four stations, i.e. Zagreb South Railway Station, Hrvatski Leskovac, Draganići and Karlovac. Trains on these first lines were driven by locomotives of series Süd 18 and Süd 19 which were produced in the Austrian locomotive factories in the period 1859–1870 and they were designed for traction

of passenger and express trains on the lowland lines. The Zagreb-Karlovac line was the first section of the railway line to Rijeka whose construction should be continued immediately. However, the connection with Rijeka was completed only after eight years, because the Hungarian state railways decided to give the priority to construction of the Budapest–Zagreb line.

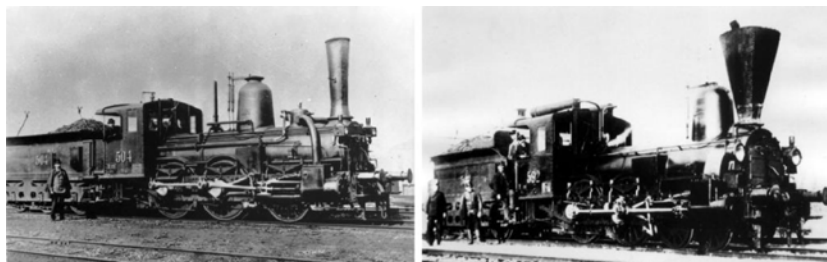


Figure 3 Locomotive series Süds B 18 (left) and Süds B 19 (right) were the first ones travelling along the Croatian lines

Already on 4 January 1870 so-called Žakanje line (Zakanya – Koprivnica – Dugo Selo – Zagreb) was opened for traffic. The line had length of 104kms and the highest status of the main railway line. This line was the third arm of Zagreb railway junction and also the first section of the magistral line Budapest-Rijeka. The line was built mainly in the lowland area, and because gradient elements were favourable, the line was already in the beginning of its use furnished for speed of 100km/h. Eight stations, four water stations, 69 station-houses and four bridges were built on the line. One of the railway stations was Zagreb State Railway Station built on the location of the present Post Office Zagreb 2. It was a plain building, which was demolished in 1936 with start of preparations for construction of the present Post Office Zagreb 2.



Figure 4 Reception building of the Zagreb state station in the beginning of 20th century

2.2 Railway lines in the Kvarner and Istria region

After completion of so-called Žakanje line, MAV continued to build the next section toward Rijeka – the section Karlovac – Rijeka. The line route was 176.2km long and its construction was a complex and demanding project. The line route involved the lowland and difficult mountain region with sharp curves. Therefore, established experts, who had proved themselves before in construction of the line over Brenner in Tyrol, participated in design and implementation of the line. The line was built, under numerous aggravating circumstances, within three and half years of hard work and it was opened for traffic on 23 October 1873.

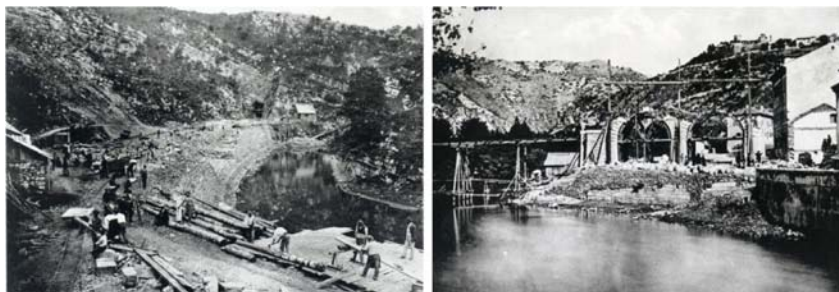


Figure 5 Tunnel construction near Vrbovsko (left) and viaduct construction above Rječina (right)

In the beginning, locomotives MÁV 326 and later marked with JŽ 125, produced in the locomotive factories in Vienna, Linz and Munich in the period 1882–1897 and from 1888 in Budapest, were used for traction of cargo trains on the line Budapest – Zagreb – Rijeka. These locomotives remained in use over 60 years and total of 497 locomotives was produced. Only one locomotive from the above mentioned series has been preserved in Croatia and since 1993 it has been exhibited at Zagreb GK. Later on, steam locomotives of MAV 601 series (later JŽ 32), that were specifically designed for difficult mountain line through Gorski kotar and which, at time of construction, were the most powerful locomotives in Europe, were used in traction of heavy cargo trains on the Rijeka line.

Also in 1873 another line, so-called Šenpeter line, was built to Rijeka. Its route ran from Sveti Petar u šumi to Opatija Matulji. It was built by the South Railways Association and was completed four months before MAV opened the Karlovac – Rijeka line for traffic. Inclusion of Rijeka and Rijeka port into the railway system with these two lines contributed to development of town and port which, in the end of 19th century, surpassed even the Trieste port in terms of traffic. In addition to economic benefits, inclusion of Rijeka and Kvarner into the railway network from two sides also promoted health and elite tourism in the region. So the South Railways Association built the first hotel in Opatija in 1884 - hotel Kvarner with the health bathing establishment. Direct railway connection with Vienna and Budapest enabled arrival of reach clients from other countries, including members of royal families. Therefore, Opatija became a recognised European summer and health resort within less than ten years.



Figure 6 The second railway station in Rijeka built in 1890 (left) and railway station in Matulji, built in 1883 (right)

After completion the railway line Budapest – Zagreb – Rijeka, traffic was increasing on a daily basis, and MAV in Zagreb had to increase the existing capacities and build new railway buildings. So in 1892 the new Zagreb State Railway Station (today Zagreb Central Railway Station) with require infrastructure was built according to the projects of the Hungarian architect Ferenc Pfaff. Two years later an important industrial facility - the MAV Machine Room (today

– TŽV railway cars factory Gredelj) was built. In 1903 Zagreb got another monumental railway building – the palace Railway Administrative Building in the present Mihanovićevea street. In 1876 the South Railways Association built another branch line on its magistral Vienna-Ljubljana – Trieste line. It was the Divača – Pula line (122kms) with a siding from Kanfanar to Rovinj (21km). In the Austrian time this line was called Istrian State Railway, with connection to the magistral line in Divača. Construction was initiated mainly by the need of linking the Austrian naval port in Pula and the shipyard located there with the network of monarchical lines. For these reasons the line was even extended (1.3km) to the military depot and the island of Uljanik, making it the only island in the Adriatic Sea with connection to the railway system. The railway stimulated development of tourism, especially of elite tourism at the Brijuni islands. In 1887 the line Trst-Hrpelje-Kozina was opened for traffic in Istria, connection with the Divača – Pula line. So two strong ports – Trieste and Pula were linked. The line was closed in 1959.

2.3 Railway lines through Slavonia

Simultaneously with formation of the Zagreb railway junction, in 1871 MAV opened for traffic the line Erdelj – Subotica – Sombor – Erdut – Dalj – Osijek with a siding to Beli Manastir. The line provided direct connection between Budapest, economically developed Osijek and opened the possibility for extension of the railway line network to the west to Slavonski Brod, Zagreb, Rijeka and to the east to Zemun. It is interesting to point out that, due to being in hurry with construction and reduction in costs no bridge over the Danube River between Erdut and Bogojevo was built. Therefore, trains were transported by train ferries over the Danube River. Such transport was utilised till 1913 and it was unique example in Europe.

Expansion of the railway line network in Slavonia was determined by political circumstances, more precisely, resolutions of the Berlin congress held in 1877 which made the Austrian-Hungarian Monarchy obliged to build the railway lines for connection with Bosnia and Herzegovina and to expand railway lines to the east, via Zemun to Istanbul. So in 1878 the line Dalj-Vinkovci – Brod na Savi was opened for traffic, which, after the bridge over the Sava River was built in 1879, was connected with Bosanski Brod. After less than two months a siding line Vrpolje – Slavonski Šamac (19.7kms) was opened for traffic which was, 25 years later, extended in the direction of Đakovo and Osijek.

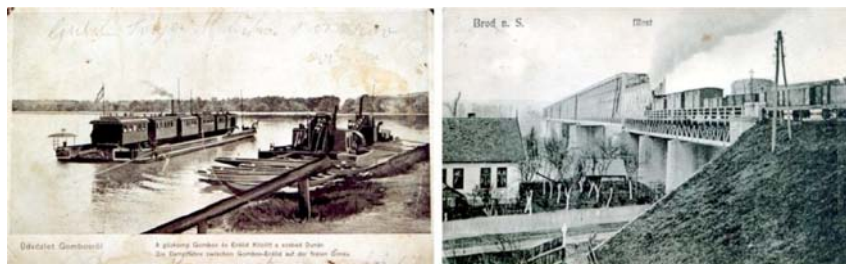


Figure 7 Transport of trains by train ferries between Dalj and Erdut (left) and bridge over the Sava River connecting Slavonski and Bosanski Brod (right)

In accordance with commitment to make connections with Bosnia, in 1882 the railway line Sisak-Sunja-Dobrljina was built and connected to the line in direction to Banja Luka in Bosnia. In the same period route definition to the east continued. So in 1889 the railway line Sunka – Novska – Nova Gradiška – Brod na Savi was rounded; two years later the line Vinkovci – Srijemska Mitrovica was opened for traffic, as well as the line Borovo – Vukovar which already in that time was a strong port centre.

2.4 Railway links in Dalmatia

The lines in Dalmatia were the last ones included in the state network of railway lines. The first kilometres of railway lines in Dalmatia were built in 1877 – the section Split – Siverić, with the siding Perkovič-Šibenik. Such incomplete line, which was left outside any railway network, was extended to Knin in 1888. However, the Dalmatian lines were included in the complete railway system only by construction of the Like line in 1925.

The Lika line is popular name for the railway line Ogulin – Gospić – Gračac – Knin. Its construction started not earlier than 1912 and was slowed down by the war and post-war political turmoils. Therefore construction took long time – full 13 years which resulted in significantly increased costs and designating it as the most expensive railway in the world. The line had 215kms, and it was opened for traffic in 1925. Only then Dalmatia was connected with the network of railway lines in the continental Croatia. The Zadar area remained outside the railway system until construction of the Zadar – Knin line in 1967.

3 Vicinal railway lines

Construction of lines by state capital was stopped at the end of 19th century. However, since 1884 construction of industrial (economic) lines, so-called vicinal railways by use of private capital of individuals, towns and joint-stock companies was allowed by regulations. Such lines connected more developed smaller settlements and linked them to existing main lines. Response of investors was significant so that in the period from 1884, when the first vicinal railway in Croatia was built between Barcs and Pakrac, to 1916 when the last vicinal line Zabok-Gornja Stubica was built, rapid expansion of the railway network was registered, especially in Slavonia and Hrvatsko zagorje. Many railway lines were built in such way and, over time, exceeded their local significance, for example the lines Zaprešić – Varaždin – Čakovec with the siding Zabok-Krapina (1886), Virovitica-Bjelovar-Križevci (1900), Osijek – Našice – Nova Kapela with siding Pleternica – Požega (1894), Vinkovci-Županja (1901), Osijek – Đakovo – Vrpolje (1905), Dugo Selo – Novska with siding Banova Jaruga – Pakrac (1897), and other.

4 Narrow gauge lines

In addition to gauges of 1,435mm in the railway history five lines were built as narrow gauge railway lines. The first one was so-called Gutmann railway. It was built by the Hungarian entrepreneurship, and later the founder of wood processing industry Belišće Salomon Henrik Gutmann as the line for transport of logs from forests to his saw mill in Belišće. After 1880, when all railway lines had to be included in the public passenger and cargo transport, Gutmann started to build the narrow gauge lines of 1,000mm, which was a unique example in the country, because other narrow gauge tracks had the width of 760mm. In the period from 1889 to 1908 Gutmann built the network of narrow gauge lines having the length of 182kms which connected Belišće, Osijek and Donji Miholjac. After 1945 some sections of Gutmann railway were closed. Until 1970 only section Osijek-Valpovo-Belišće remained in use, and then it was also replaced by the standard gauge line.

The most popular narrow gauge line was “Samoborček”, between Samobor and Zagreb, opened for traffic between 1901 and 1979. It was used for all types of transport, but was especially remembered by romantic picnics of Zagreb citizens on Sundays to Samobor and its surroundings. Simultaneously, people from Samobor were travelling to work and school, and by the evening train, so-called theatre train, to Zagreb theatre. This railway line was treated with nostalgia and made immortal in the cult movie of Krešo Golik “One Song a Day Takes Mischief Away”.

In the period 1901–1976 Dubrovnik was also the part of narrow gauge railway system. The line contributed to intensive development of the Gruž port in the 1920'es and to expansion

of its capacities. Its importance was lost after construction of the Ploče – Metković line and the port of Ploče in 1942.

The Parenzana, narrow gauge track between Trieste, Buje and Poreč existed in the period 1902–1935. It was the only line starting and ending “in the sea”. Traffic on the line was stopped in 1935, tracks were dismantled and sent by a vessel to Ethiopia. The vessel sank on the voyage together with tracks of Parenzana. Today, the route is revitalised as tourist-ecological destination.

Numerous memories of older citizens of Croatia are connected with “sinjska rera”, narrow gauge line Split – Sinj which existed from 1903 to 1962. The line was running through the east part of Dalmatinska zagora, and for populations of the Sinj region it was the shortest link with Split and other continental regions. It was used by numerous local users and was very popular. It was called “sinjska rera”, because rera, original folk songs, were often sung in the train. The line lost its importance after construction of the road toward Split.

5 Railway traction vehicles through the history of HŽ

The railway system in Croatia involves rich history of traction vehicles used in the past 50 years. The longest period, full 95 years, was related to exploitation of steam locomotives only, which were gradually replaced by diesel and electric vehicles after 1955. As the Croatian railway system commenced its development under various foreign jurisdictions, locomotives of the South Railway Association, Austrian State Railways, Hungarian State Railways, SHS Kingdom Railways, Kingdom of Yugoslavia and Yugoslav Railways and only after 1990 of the Croatian Railways were running on the railway lines throughout Croatia. It resulted in wide variety of the series of railway vehicles. For example, in steam-powered vehicles in Croatia there were total 83 various series of steam locomotives.

Locomotives used for passenger trains from 1860 on our first railway lines were produced in Austria. In passenger traffic these were two locomotive from SüdB 18 and 19 series and in cargo transport SüdB 29 (JŽ 124) and SüdB 35 (JŽ 132) were used. Steam locomotives of the Hungarian State Railways were included in traffic after 1870 when the Zákány – Zagreb (South Railway Station) was built. Among these locomotives the first mentioned is locomotive for cargo train MÁV 441. One of such locomotives brought the first train to Rijeka in 1873. In line with expansion more and more locomotives of various series were included in traffic, which were adjusted to different types of railway lines, for example, the Rijeka and Lika lines had sections with characteristics of difficult mountain lines (with gradients up to 25 ‰ and small radius curves). Therefore, after 1914 powerful dual system Mallet locomotives were also used among which MÁV 601 (JŽ 32) was the most powerful locomotive in Europe in the time.

After 1918 the rolling stock of Croatia included, for the first time, new steam locomotive, JDŽ/JŽ 26, 28 and 29 series manufactured in German and Austrian factories. After the Second world war the rolling stock was renewed with locomotives obtained as war reparations (JŽ 33 and 11 series) or locomotives received as help of the UN administration for reconstruction of countries damaged in the war, so-called UNRRA support (JŽ 37 and 62 series). The factory Đuro Đaković from Slavonski Brod also contributed to renewal of locomotive rolling stock by manufacture of locomotives JŽ 38 and 62 series.

Modernization of train traction in Croatia commenced in 1955 when the first diesel motor trains (JŽ 812 series, later HŽ 7221), manufactured in Germany, were delivered to the Zagreb repair shop. In 1960 the first diesel-electric locomotives (JŽ 611/HŽ 2061) were supplied by a vessel to the Split port from the USA. In February 1965 the first diesel-hydraulic locomotives (JŽ 731/HŽ 2131 series) were received in Zagreb which after five years fully replaced steam locomotive in shunting operations. Meanwhile, in March 1968, the first electric locomotives, single phase system, 25kv50 Hz JŽ 441/HŽ 1141 series were introduced to traffic and on 30 May 1970 the electrified railway line Zagreb – Belgrade was opened for traffic. By these mo-

dernisation projects started step-by-step removal of the legendary steam locomotives from traffic after over 100 years of use.

Steam traction on main lines was stopped in 1980 while steam traction on branch lines remained in use for next couple of years. The last steam locomotive JŽ 11-011(MÁV 424.001) from the Zagreb maintenance shop was ceremonially seen off on 1 March 1976. The last steam locomotive being in use in Croatia until 1988 was the JŽ 51-144 locomotive. It was set off with ceremony to due retirement on 20 July from the railway station Pleternica and on 23 September from the Pakrac railway station. Today that locomotive is one of total of 36 steam locomotives preserved in Croatia which are the part of holdings of the Croatian Railway Museum. In addition to steam locomotives other vehicles, used in certain periods of time on the Croatian railway lines, are kept at the Croatian Railway Museum. Part of holdings includes manual and automated rail vehicles, cars running along the tracks, diesel and electric locomotives, electro-motor and diesel-motor trains, passenger and cargo trains, special rail vehicles. All these items represent a part of rich heritage in move, which waits for appropriate exhibition space to be shown to public. Currently, 16 steam locomotives from HŽM are properly exhibited at the railway station throughout Croatia. A museum train can be seen at Lovrak centre in Veliki Grđevac, and restored moving exhibition railway carriage from HŽM makes cultural items open public. Other vehicles from rich collection of HŽM should soon get its space in the railway maintenance shops of TŽV GREDELJ which are protected as cultural goods.



Figure 8 Croatian Railway Museum logo

6 Conclusion

In 20th century the line network in Croatia was expanded in accordance with interests and needs of new state/legal systems whose part Croatia was after 1918. In traffic terms, the new magistral railway Zidani Most – Ljubljana – Zagreb – Belgrade became the backbone of the railway system. Within this context, redirection and different connecting of already built lines were performed, and construction of new lines was harmonised with traffic needs of the railway system shaped in different way.

Today, 150 years since the first railway track was built, Croatian Railways network involves near to 3,000kms of lines. International transport runs along total of 1,711km and regional and local transport on 600km of tracks. Total length of electrified tracks of open lines amounts to 1.228.4km and total length of HŽ sections in the pan-European traffic corridors is 767.6km. Currently there are 252 railway stations in the Croatian railway network.