ŠTOREQSTEEL

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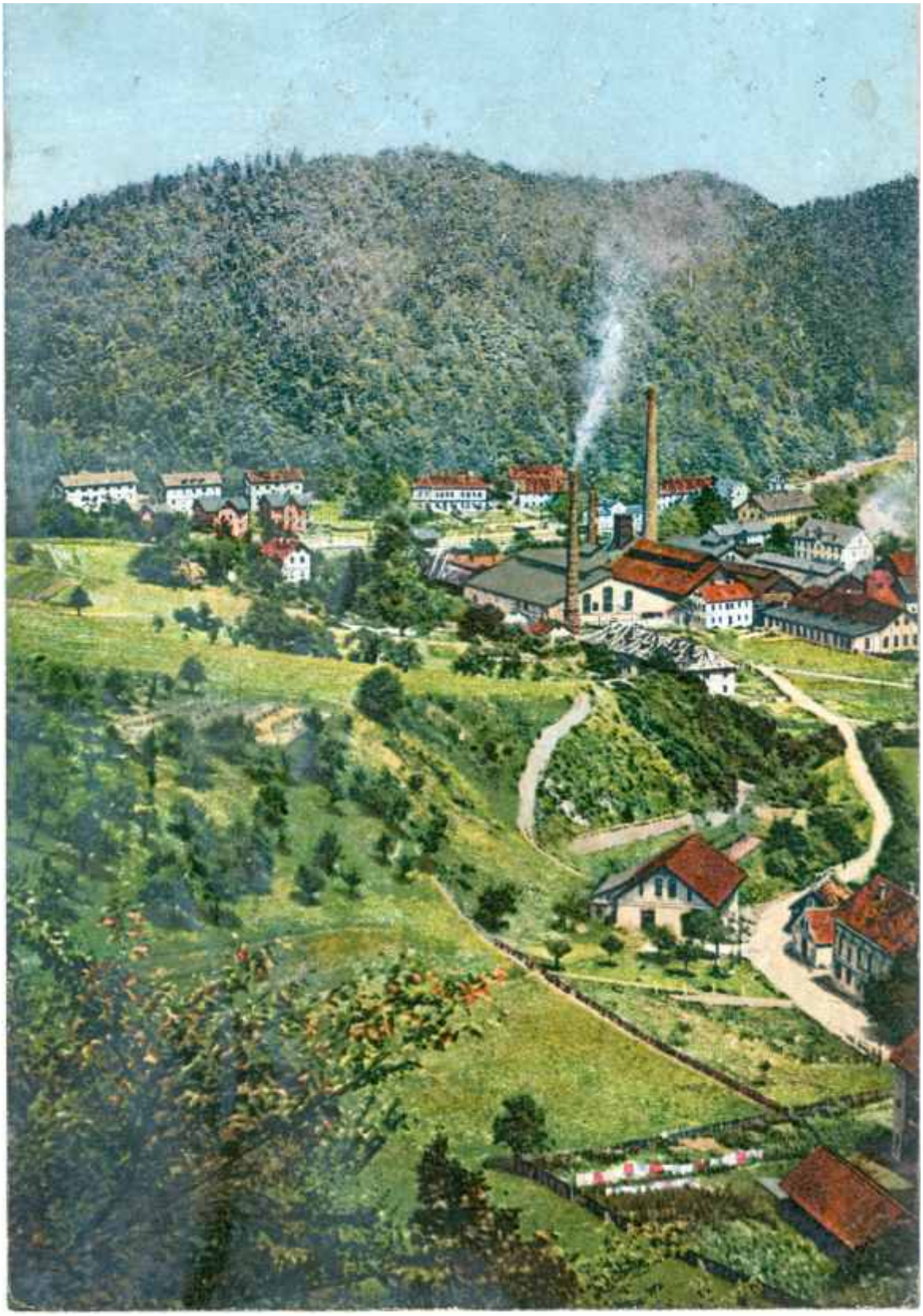

SPKŽ

1851 2011 ŠTORE

ŽELEZARSKI MUZEJ ŠTORE

160 years of our company

In this year we celebrate 160 years of steel production in Štore and to this anniversary is dedicated this issue of the internal magazine.

In such a long history of industrial production there were noticed many developmental cycles and also plant closures.

And there was always found a corporate interest and a solution for starting of production once again.

For a successful operation of a company it is important to balance and to satisfy interests of buyers, suppliers, employees, shareholders and the environment in which the company operates.

This awareness is one of the reasons that there are now active all metallurgical programs developed in the former ironworks, though they are now performed by different companies having different ownership structures.

The Štore steel production which started with puddling was modernized in the year 1912-13 with open-hearth furnaces. The next big investment cycle was building of a new steel plant in the Štore 2 industrial zone in the year 1973 what allowed a technological leap into an electric-arcsteel remelting process.

During the last investment cycle (since the year 2000) has been there invested in modernization more than Ä 66 mio and till the year 2015 it is expect to invest further Ä 30 mio.

It is important to be aware of our roots and of our responsibility to give the coming generations possibilities for their further development.

Clear and courageous vision of management and professionals was always needed for successful development cycles.
Therefore it is probably not too early to start with creating of the vision for the period which will come in 10 to 15 years.

Marjan Mačkošek
Managing director

On Cover: Štore, 1917-1918, postcard, from Železarski muzej Štore

From history of ironmaking in Štore

Beginnings of ironmaking tradition go back into middle 19th century, into times when towns Maribor, Celje and Ljubljana were interconnected by railway with Vienna, Graz and Triest, and into times when influence of industrial revolution brought numerous technological novelties and modernizations of plants that enabled increased production of iron and inronware, and coal became important source of energy.

Workers and employees of the Mine and Ironworks Štore, 1883, (photography), from Muzej novejše zgodovine Celje

Iron production grew from times of bloomeries to times of iron and steel works, and it was essentially influenced by the innovation of using lignite in the puddling process in the year 1838 in Prevalje. Simultaneously with the puddling process also steam driven rolling mills were introduced which essentially increased production of railway rails needed for construction of railway net in Austria. Thus living space was increased and new possibilities of economic development appeared, new habits and lifestyles were established.

Ironworkers in that time demanded gradual changes of existing Austrian customs system. As well, they insisted on protection of iron production from free market that was demanded by the fast developing German industry. The highest production of pig iron was in Styria with 67 530 tons (24.2 %), followed by Carynthia with 45 464 tons (16.3 %), Hungary (16.4 %), Bohemia and Moravia. In Carynthia there operated 19 blast furnaces in those times, one of the biggest was in Lölling that produced 17 919 ton pig iron in 1871, which represented nearly one third of the total Carynthian production.

In 19th Cent. in the region of present Slovenia there operated some successful ironmaking companies: Auersperg iron foundry in Dvor near Žužemberk, operating from 1796 to 1891, Rosthorn ironworks in Prevalje, operating from 1835 to 1899, Thurn ironworks in Črna, Mežica and Guštajn (Ravne), Kranjska industrijska družba (Carniolan Industrial Company) in Carniola, and Štore Mine and Ironworks in Styria. In 1850 Friedrich Bruno Andrieu, native Tyrolean, who has been few years book-keeper in the Auersperg iron foundry in Dvor and for short time also its manager bought from Ignatius Novak the complete coal property in Štore and he was granted the concession for establishing puddling plant and rolling mills.

Later there were built also foundry and forge with steam-driven hammers, and steam power station. Andrieu soon sold his company to Paul noble Putzer. Ministry of Commerce and National Economy granted him in 1862 a two-year privilege due to invention of »an unique method« of manufacturing large pieces of forged iron, especially battleship armoured plates. In Štore ironworks, as well as in Zeltweg ironworks, there were manufactured battleship armoured plates for Austrian Navy that has defeated Italian navy in the famous battle at Vis in 1866.

Already in 1853 a successful and ambitious metallurgist Karl August Frey became manager of Štore ironworks. He introduced use of carbon for reduction and use of limestone for making slag which was origin of the Lang-Frey filling method. In 1868 he was appointed the President of Mining and Iron Society of Lower Styria. Year later he became General Manager of Hüttenberg Steel Company.

Karl Neufeldt, Consul General of Sweden and Norway in Vienna merged in 1878 iron and coal possessions into "Berg - und Hûttenwerk Štore" Company with headquarters in Vienna.

Just before the 1st World War, company was modernized with a new 20-ton open-hearth furnace and with some other innovations, such as electric powered machinery. Before the World War II, plant for casting pipes was constructed, and this meant that company became the biggest foundry in Slovenia at that time.

New production breakthrough occurred in 1954 when the company started to manufacture springs and special sections while newly built electric blast furnace satisfied all the demands for grey and white pig iron. As state-owned company the Štore Ironworks was in 1959 the first company in Yugoslavia that was manufacturing rolls from the so called spheroidal cast iron.

In years 1953-1963 great investments were applied for technological modernization of steelworks by introducing modern steelmaking processes.

Štore with its ironworks became after the World War II one of the three Slovenian ironmaking centres. Ironworks there oriented towards production of high-grade steels with increasing the quantity and the quality of their products. Economic crisis in 1960s caused integration of Slovenian steelworks that had in 1967, for the first time after the World War II, financial loss. Yugoslav iron and steel industry was, taking into account the overall economic situation, protected with only 7 %. Orders fell to 80 % of planed sale, prices of raw materials increased for 42-60 %, while steel prices were higher only for 37 %. In that year also high and uncontrolled import of steel products occurred, thus domestic steel industry was in great troubles.

Celebration of the 1st May in Teharje, 1985-1890, photography, from Železarski muzej Štore

Open-hearth plant, stripping moulds, round 1970, photography, company archive

Also mechanical engineering industry found itself in troubles in the next year. Poor economic situation accelerated integration of Slovenian ironworks. In 1969 Jesenice Ironworks, Ravne Ironworks and Štore Ironworks merged into United Company of Slovenian Ironworks, few years later joined them also companies of metalworking industry.

Milestone in the history of Slovenian economy and also in the history of Štore Ironworks presented Slovenia's independence when loss of Yugoslav markets halved its steel production. Reorganization and privatization followed. Smaller independent companies were established that continued ironmaking tradition of the Štore centre, among them was also Štore Steel Company. In its 160 years long history, the ironworks transformed from a company that had few hundred employees in the 19th Cent. into a modern steelmaking company with and nearly 4000 empoyees in 1980s. Crisis in 1990s not only halved the production but also substantially reduced number of employees. Employees in the Štore ironworks were closely linked with their joint production process, with customs and habits, typical for steelmaking industry, they participated in various cultural and sports clubs, where important role played also the brass band. They celebrated together various holidays, especially the 1st May, the most important workers' holiday, related to industrial heritage and culture of working class. The International Labour Day, the 1st May, was described by writer Prežihov Voranc in his short novel "May the 1st ", in which he described how workers in former Austrian Empire were not allowed to celebrate this holiday, but nevertheless workers of Guštajn (Ravne) Ironworks went on that day with red carnations in their buttonholes on the nearby hill. Jurij Čehovin told to Slavica Glavan who interviewed him in 2010 about the celebration of May 1st holiday in Štore before the World War the following in his local dialect (that cannot be translated):

"At that time I was still a trainee at the factory and foreman said to me: three or four of you go there up and bring some vegetables and hang it on the outside wall of the foundry that it will be green. One year we picked beech, the next year when beech did not have leaves yet, we picked hornbeam that was green a little earlier /.../. And there was also brass band, the one from Štore. It made a round through Štore in the morning of the May the 1st, stopped at various places and played there a piece of music before moved on."

May the 1st is today the holiday that was uniformly established all over the world. Since constitution of the Second International in Paris that declared this holiday for its holiday, it was firmly connected with the socialist labour movement in all its variations. More and more it became symbol of modern, with industrial work characterized culture. Industrialization occupied the whole world and industrial culture is one of the most important if not prevailing factors that determine term "one world".

Dr. Karla Oder, Coordinator of the Slovenian Route of Culture of Iron

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Steel production in puddling furnace and in open-hearth furnace

After invention of steam engine (J. Watt 1775) and introduction of railways (Stephenson 1821) highly increased the demand for all types of steel. Steel could be hot or cold worked into any product.

Group of puddlers with their tools and with trolley for transport of white-hot bloom from puddling furnace to hammers where it was prepared for further rolling; 1905, photography, from Železarski muzej Štore

In those times steel was manufactured from pig iron also in bloomery furnaces next to direct steel production by reduction of iron ores. Pig iron was remelted, its carbon content was reduced till steel-like wrought iron was obtained. Productivity was low, and only few kilos of wrought iron were obtained in a single batch.

Blast furnaces were producing increasingly higher amounts of pig iron. Charcoal was substituted by coke, manufactured from hard coal. Pig iron contained 3.5 to 4.5 mass % carbon and 2 to 4 mass % of other elements (silicon, manganese, phosphorus, sulphur) next to 92 to 94 % iron.

Pig iron is very hard and brittle and it cannot be worked by forging or rolling. It is raw material for making steel and wrought iron. High carbon content reduces melting point of iron to 1150 to 1250 oC. Pig iron is suitable for casting.

In those times iron was frequently used for casting various machine parts and other products. But development of craft and industry demanded constantly greater amounts of steel. In bloomery furnaces that were similar to forges, steel was in direct contact with fuel, therefore charcoal was used since it did not contain sulphur. Bloomery furnaces produced wrought iron (steel) blooms from brittle pig iron.

Increasing steel consumption demanded increased number of bloomery furnaces and increased amounts of charcoal. Increasing number of trees was cut down and woods were disappearing. In order to substitute charcoal with coal, new processes were sought in which iron would be separated from coal.

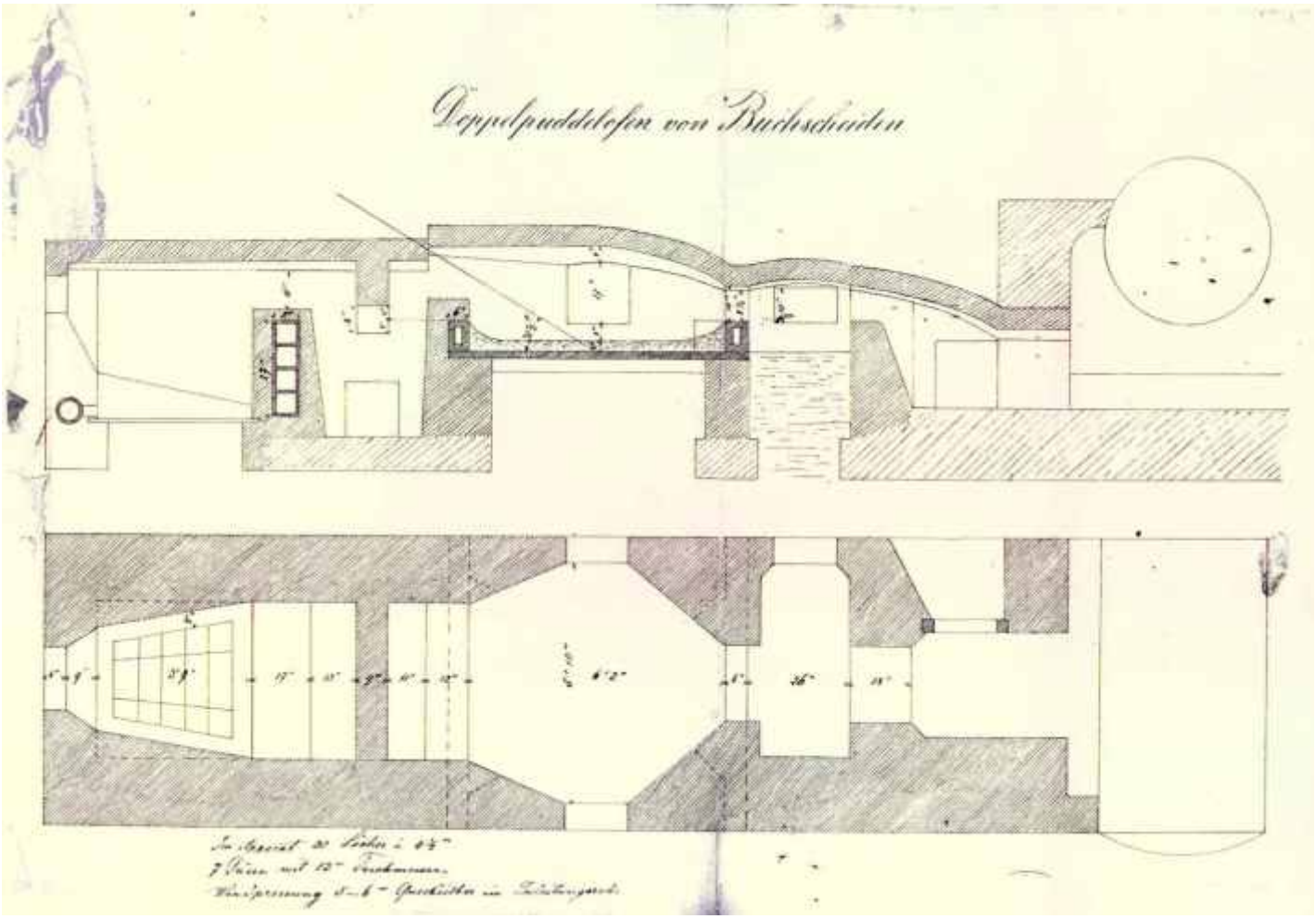
H. Cort (1784) proposed a process of making steel in a furnace in which hearth was separated from metallic burden, i.e. from pig iron, and in which wrought iron (steel) was produced. In his process, pig iron was remelted and the melt was stirred – puddled, therefore the process was called puddling process and obtained iron puddle iron.

Puddling furnace consisted of fire place with grate, bloomery hearth - working space for making wrought iron, space for preheating the pig iron, and flue. Fireplace had area of about 1 sq. meter and was separated with bridge (short wall) from the hearth.

Pig iron in hearth was melted by action of flames from coal combusting in the fireplace. Molten pig iron was then puddled through the puddler's door with iron stirring rods. Puddling increased contact area between metallic melt, molten slag and furnace atmosphere. This accelerated oxidation rate of carbon and thus pig iron was transformed into wrought iron (steel). During stirring rough surface of metallic melt was in contact with furnace atmosphere before it was submerged into slag. Slag contained high amounts of FeO.
Puddlers that were stirring the melt had knowledge and skill to control oxidation process of carbon and silicon. Decisive was the final stage of carbon oxidation process when carbon content was highly reduced. Reduced carbon content caused that melting point of iron was increasing. But flame temperature was not high enough to reach melting point of pure iron that is at 1538 oC. Melt became very viscous and sluggish. Experienced puddler knew to estimate the amount of carbon in iron by colour of the melt and its resistance to stirring. The lower was the carbon content in the melt, the more difficult was stirring since wrought iron (steel) commenced to solidify. By moving the stirring rod through the two-phase mass that started to solidify, the puddler formed a bloom of spheroidal shape weighing few tens kilos. If needed, bigger bloom was formed , depending on the size of product that was shaped by further forging or rolling.
When bloom was shaped, puddler pushed it towards firebridge where the temperature was the highest so that slag segregated out of the bloom. Several blooms of puddle iron were made from one melt.
Iron loss was 10 to 15 %. 80 to 150 kg coal was used to produce 100 kg puddle iron, depending on the calorific value of coal.
Bloom was first forged into such a shape that it could be latter worked by rolling into various sections or plates. Slag that was captured in the iron during the puddling process was squeezed out of iron during the forging or rolling process. Fraction of slag that remained in iron was stretched during the rolling process into banded microstructure of non-metallic inclusions.

Hammer-welded steel

Puddling process enabled to produce pieces of wrought iron (steel) weighing few kilos. Bigger or heavier pieces were made by hammer-welding. Rolled or forged rods were faggoted, bound with wire and put into furnace to be heated to white heat. At this temperature iron can be welded. The heated faggot was at first hammer-welded, then rolled or forged into desired shape of product. This was the procedure to manufacture bigger and heavier sections of smaller iron pieces. Furnace for heating faggots was called hammer-welding furnace and product was hammer-welded steel. In puddling plants there were also hammer-welding furnaces.



Technical drawing of puddling furnace, Technical archive of Železarna Štore

Open-hearth plant, round 1970, photography, company archive

Flue gases that were on the opposite side of fireplace leaving the working space of puddling or hammer-welding furnace were still very hot . Heat of flue gases was utilized for steam production in boilers. Thus puddling furnaces were equipped with boilers. Utilization of waste heat enabled to increase the energy efficiency.

Production of molten steel

Year 1855 is a very important one in steelmaking since H. Bessemer produced in that year molten steel in a converter for the first time. Since then steel was produced only in molten form.
Air blowing into molten pig iron enabled oxidation of carbon and silicon that liberated such amount of heat that iron remained molten. Pig iron was converted into steel and the furnace used for this was called converter.
The second milestone in molten steel production represented open-hearth furnace. P. Martin applied Siemens's patent of regenerative heating of air and generator gas in his furnace for manufacturing molten steel. Preheated air and preheated generator gas liberated during combustion enough heat that pig iron and also scrap iron melted in the furnace hearth.
Open-hearth furnace, in German called Siemens-Martin furnace, belongs to hearth furnaces. Generator gas that is mixed with air before it enters into the hearth combusts in the hearth. Air and gas are preheated in chambers filled with refractory checkerworks. There are two chambers on each side of the furnace, one for preheating air and one for preheating gas. Heat of gas combustion in hearth is transferred to metallic burden. Hot flue gases leave the furnace on opposite side through the chambers with checkerworks inside. When checkerworks are heated enough, directions of gas flow and air flow are reversed that cold gas and air are passing through hot chambers and are separately preheated. Air and gas are then mixed before they enter into the hearth and combustion flame is heating the burden and the melt. Molten steel is made from pig iron, scrap iron or from pig iron mixed with scrap iron.
In the granted concession for production of molten steel in Štore (Jože Šorn: The rise and decline of Lower-Styrian bloomeries) there were mentioned five single puddling furnaces, three hammer-welding furnaces, two annealing furnaces etc. Used fuel was coal. Steel, produced in puddling furnaces, was then hammered and rolled into sections and plates.
Production of puddle wrought iron (steel) began in Štore in the middle of 19th Cent. and it continued till 1907. Pig iron was transported to Štore from Fužine below the Bohor mountain and from Mislinja. In years 1912/13 production of molten steel began in a 20-ton open-hearth furnace. Wishes of ever-demanding purchasers for the top quality steels are in the second decade of 21st Cent. fulfiled by steel production in EAF or by the procedure of secondary refining. New technological solutions were always introduced into existing technologies to improve the quality of steel products and the competitiveness of processes.

Jakob Lamut

Železarski muzej Štore and activities of Slovenian route of iron culture Committee

Železarski muzej Štore (Štore Ironworks Museum) has been established only recently. It was was a half of century's desire of employees and inhabitants of Štore to present the ironwork heritage in a museum.

School excursion at Železarski muzej Štore

When we in 2003 received an initiative for cooperation at presenting the history and culture of iron making in Slovenia, it resulted one year later in opening of Železarski muzej Štore in the building of the former Teharje elementary school. Establishing and installation of a permanent museum collection called Iron Making at Štore was a collaborative project of Muzej novejše zgodovine Celje (Museum of Recent History Celje), the Štore Steel company and Izobraževalni center Štore (Štore Educational Centre).

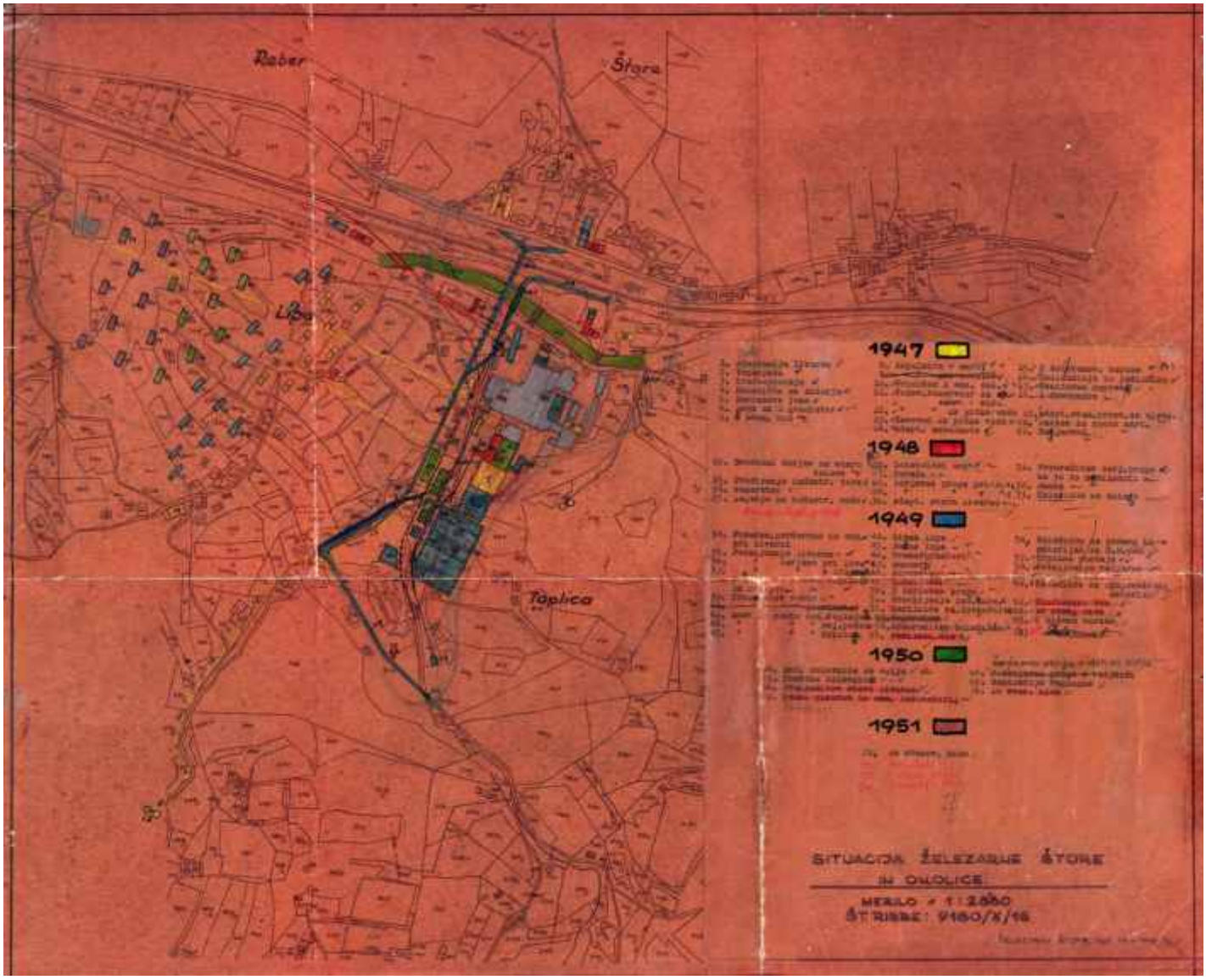
Today a part of industrial cultural heritage of the Štore ironworks is kept in the museum in a form of documents, photographs and plans as well as objects, machinery and equipment and being placed in the area of ? ? the former ironworks. The archival records for the period from the late 19. to the middle of the 20th century are kept by the Celje Historical Archives. A rich photographic fund of the post-war period until today is kept by the Museum of Recent History Celje.

The collection is chronologically and thematically based. A very heterogeneous material is presented there: drawings, photographs, postcards, catalogues, archival documents and objects talking about the development of the company and its production of iron since the early 20th century until today, material about life in the town of Štore, development of education as well as cultural and social life. The collection has been completed until now.

The museum is visited by over 1200 visitors per year. We are especially pleased when we are visited by schools as in this way we can present to children a part of our technical heritage and a type of working in ironworks which does not exist any more in today's steel production due to constant technological development in production of steel and steel products.

A part of the exhibition space is intended for temporary exhibitions which are thematically linked to contents of the permanent exhibition or give some other artistic and cultural messages. Up to now there were 35 exhibitions in the field of technical heritage and other topics presented to public in the museum gallery. With eight exhibitions in the field of engineering heritage we visited also other places in Slovenia and abroad.

Železarski muzej Štore and its permanent exhibition "Iron making in Štore" are included in the projects called the Slovenian Route of Iron Making Culture and the European Route of Iron.



Construction and renovation plan (1948), Technical archive Železarna Štore

A variety of activities related to conservation, protection and presentation of industrial and technical heritage have been performed for some decades in Slovenia.
The extent of industrial heritage dictates a need for integration of owners, administrators and guardians of cultural heritage with tourist operators to create some thematic tourist routes which enable an individual or a group to know an activity in a particular area. Some European countries have developed decades ago a variety of thematic routes, including the European Route of Iron (Tourismus 2004, 15).
The project called the Slovenian Route of Iron Culture was conceived in the year 2003 under the initiative of Hungarians, who, as the main partner, prepared a project called The European Route of Iron and competed with it for an European funding under the Culture 2000 program.
Under an initiative of Gorazd Tratnik and Janez Kovač, who then attended an international conference on possibilities of extension of the ''European Route of Iron Culture'' movement organised in Miskolc, Hungary, the Mayor of the Ravne municipality established a steering committee which on base of a common interest formed a program of activities.

The project is coordinated by the Koroška Regional Museum - the Ravne Unit. Mr. Janez Kovač is a coordinator between international members and committees of the countries involved. The main point at designing the program was iron and iron culture from the earliest finds on the Slovenian territory to the modern industrial age.
The preserved cultural monuments and existing museum collections kept in provincial and other museums give an opportunity and ability to link and to jointly promote the technical and especially the iron heritage.
Due to some organisational reasons is the project regionally designed and in this way is each particular regional museum a leader of activities in their own area and connects at the same time the local and special museums and cultural monuments in the region. In this way have the competent museums a possibility to emphasize the regional characteristics and the importance of economic development in their area. Such cultural cooperation and socializing is very important as it, besides learning about culture of other countries, also develops relations and a positive attitude of the heritage placed in their own area.

Štore, 1898, postcard, from Železarski muzej Štore

The participating museums keep diverse iron culture heritage. Some exceptional archaeological collections of pre-antique and antique finds of iron objects are kept by the Dolenjska Museum Novo mesto and the Gorenjska Museum Kranj. The focus of the Slovenian Route of Iron Making Culture is on the heritage of the past centuries and of that from the industrial age. Museums in Gorenjska, the Gornjesavski Museum in Jesenice, the Kropa Museum, the Železniki museum and the Tržič Mueseum keep rich historical evidence about obtaining metal in bloomeries and the production of iron and steel.

In the Dolenjska Museum Novo Mesto there are collected many valuable products of the Auersperg iron foundry at Dvor near Žužemberk , which was operating in the 19th century. In Slovenia there were three major iron and steel centres formed in the last century: Jesenice, Štore and Ravne na Koroškem. Their iron production legacy is presented in relevant museums. The National Museum of Technical Heritage also takes part at this project.

The preserved immovable heritage and permanent museum collections were the basis for creation of routes. A link between particular centres is a railway line being also a part of the culture of iron. We could say that by growth of the ironworks the railway lines also lengthened. The route is so designed that potential visitors can enter into a train route in whichever neighbouring country. In the area ofGorenjska (Jesenice) or Koroška (Ravne) the railway line enables a connection with the neighbouring Austria.

If we plan to enter on Koroška through the Mežica valley we can continue the journey by train to Maribor, where the way leads to the neighbouring Hungary or in the opposite direction to Celje respectively to Štore, continue through Zidani most to Novo mesto and from there to Ljubljana and Kranj - continuing to Jesenice.

The travelling direction can be reversed, allowing also the use of other means of transport - bus and car.

The thematic route has its key points in some regional centres: in Ravne, in Štore or Celje, in Novo mesto, Ljubljana and Jesenice. The regional museums are associated with municipal and local museums as well as with guardians of such heritage in their area and thus create their local routes.

A symbolic integration of these towns can be seen from a joint implementation of the plan defined and from activities done at promotion of cultural heritage: a common brochure, a conference, a collection of articles, researches, exchange of exhibitions – including setting of new museum collections.

So far the joint exhibition called “Three millennia of Slovenian iron making” has attracted the most attention. It is describing the historical background of some thousands of years of development of this important economic activity. It was firstly presented to public in the year 2008 in Ravne na Koroškem and it then toured to all participating museums as well as to Hungary to Zalaegerszeg (the Hungary Oil Museum) and to Budapest (the Hungary Foundry Museum). In this September it will be hosted by the National Polytechnic Museum in Moscow.

The result of integration of the Slovenian Route of Iron Culture with the European Route of Iron is its inclusion to the list of European cultural tourism routes in Brussels, which gives a new perspective to networking and integrating technical heritage in tourism. And this is besides conservation and protection of cultural heritage of iron one of the key objectives of the project.

Slavica Glavan

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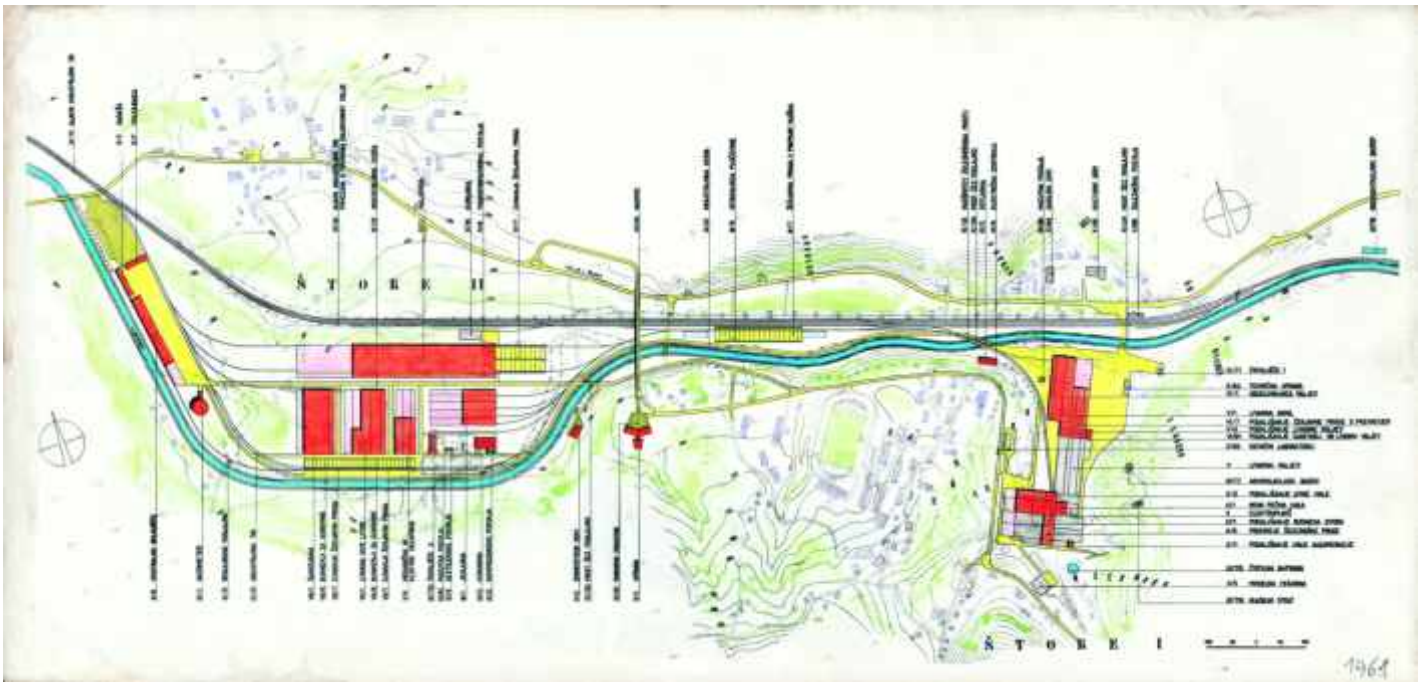
Štore od agrarnega zaselka do industrijskega kraja (Štore from an agrarian village to an industrial centre). Collection of articles, Štore 1995

50 years of idea of Štore 2 industrial zone

During a 160–year of ironwoks history in Štore were there noticed some production - expanding and modernizing investment cycles. As the most important can be considered that from the sixties when there was built a new, Štore 2 industrial zone.

In a period of administrative socialism was production volume defined by the responsible directorates in Belgrade which fixed the Štore ironworks the following quantitative targets: 112,000 tons of pig iron, 97,000 tons of rolled profiles and 10,000 tons of machined rolls. But the existed facilities enabled a production of only 35,000 tons of pig iron, 32,000 tons of rolled profiles and 2,600 tons of machined rolls.

To expand the capacity of ferrous metallurgy in the area of Yugoslavia issued the Yugoslav Investment Bank in the year 1961 an invitation to tender for a credit on favourable terms. The Štore ironworks was well prepared for the tender. A year before had the then director Voga formed a factory's body called Direction of basic resources for preparation of investment programs. All proposals given for the company's widening on the existing site had been already previously defined as inadequate ones. For this reason was there selected for the expansion a space along the southern railway between Štore and Celje.



Modernization plan of Ironworks and new industrial zone Štore 2 (1961), Technical archives of Železarna Štore

Left: new steel plant - casting (1973), right: production of tractors (1978), both Technical archives of Železarna Štore

Buildings constructed in the industrial zone Štore 2 by year 1975 (around 1975), Technical archives of Železarna Štore

The plans were accepted with a strong opposition in Belgrade as well as in Ljubljana and this fact required a lot of stubbornness and persuasion to stand by our plan.
And sometimes it was necessary to present a thing to the responsible as they wanted to be done but with an awareness that it would be executed in an own – different way.
The value of investments amounted to the then 167 million dinars – but the amount of the annual turnover of the ironworks was only between 70 and 80 million dinars.
The Yugoslav Investment Bank confirmed, with certain corrigenda, in the year 1961 the submitted investment plan and approved a loan in the value of 144 million dinars. But the loan was granted only in the year 1964 – and thus only in the value of 127 million dinars as in the meantime some rules had changed.
Ground works started already in the year 1962 as it was firstly necessary to regulate building site of the new industrial zone area. The Voglajna river flow meandering over the territory was regulated and moved to the utmost southern edge of the zone and the land was aligned on flood safety level. For rubble was there used slag and material arising from removal of a hill, which was with a bridge over the railroad connected with Teharje.
Communal and energy infrastructure for the target production level was built in accordance with the then most modern principles and is still environmentally acceptable.
Due to a high inflation and an own-fund providing of resources was the deadline for completion of the investment prolonged for 5 years. The investment value increased to an amount of the then 413 million dinars. And the then turnover of the ironworks already reached the amounts between 600 and 700 million dinars.
The nodular foundry began with its production in the year 1968 as it was anticipated, the rolling mill two years later, the mechanical processing plant in the year 1971, but the steelworks only in the year 1973.
Metallurgical programs in the Štore 2 industrial zone produce today the volumes which are within capacity limits defined by their investment plans. Annual production of ductile iron in the company Kovis amounts to 9,000 tons and the company Valji Štore produces 8,000 tons of machined rolls per year.
Company Štore Steel is with its investment in a new rolling line on a way to reach a volume of 200,000 tons of rolled products, what means doubling of use of space as it was defined in the then steel producing plans.
Production of pig iron, which was strongly imposed by Yugoslav authorities, was concluded in the year 1989. It never exceeded the value of 46,000 tons.

Marjan Mačkošek
Gorazd Tratnik

Impressions of time

Graphic presentation of Štore iron-making

Graphic image of Štore iron production reflect in all their manifestations characteristics of time in which they were designed, transformed and adapted.

In the oldest documents there are not observed any visual ambitions in a form as they are known today (1895 and 1913). It is mainly a reflection of the then way of printing preparation and probably also an absence of need of such communication. Thus is the company's symbol formed only with a selected typography of letters - and even this inconsistently. However, there could of course be found some standard decorations - as it was typical for all printed documents.

The first non-letter symbol that appears – a hammer and a pick (1923 and 1937) – is in fact not yet a real symbol in the sense of a logo - as it is a commonly used mining symbol. Therefore is with this symbol the iron-making overshadowed by the mining.

The subsequent non-letter experiment was a true illustration and can hardly be defined as a company's symbol. There is a wish to combine in one image symbols of homeland and social system (Triglav mountain and a star), of the company's product (gear wheel) from which proudly advance fuming chimneys (industrialization). But in this case the typography of letters (in contrast with an illustration) liberated from its historical look and is of light nature. Both are very consistent and in trend with the year of creation (1953).

New and more accessible possibilities of colour printing (water blue) in the sixties gave vivacity to both - to achievements in design and to more market-focused visual objects. An ambiguous illustration of “a sign“ is replaced by a single, cleaned and consistently evident (a shamrock, clamping of a roll) which focuses more on essence of the firm, on its product. The name of the place (Štore) is exposed in the symbol itself - probably because letter "O" well coincides with the hole in a roll. On the contrary becomes all other typography of letters "more heavier".

The symbol of the Štore iron workers indicating a symbolic (slightly changing) roll survived half a century together with different names of the changing company (Železarna Štore respectively Jeklo Štore with a renewed and again "lighter" typography of letters) - firstly within Slovenian Steelworks Company and later as a symbol of company Valji Štore (producer of rolls).

With entering of a new foreign owner - INEXA (1999) was tradition of this symbol changed with a systematic graphic image of this holding. However, the name Štore stayed as a part of the symbol (what was not an usual practice in the holding) and due to its red colour even surpassed the cover name "INEXA" in blue. With this colour is marked also the central graphic, optically interesting and confusing symbol.

After a new change of ownership (2003) the new concept continuous. It keeps the colour (red and blue) but changes their positions and thus even more exposes and consolidates the already well known brand of steel from "Štore" built during the last period.

Likewise, the central sign representing outgoing steel from a ladle (albeit symbolic), returns back to reality and an identical typography of boldface letters maybe announced a promise of a new and stable era of iron-making tradition in Štore.

Jana Špendl, architect

Changes of the company names and development of the logo

1863 - Paul von Putzer-Deutsche Werks Direction Štore
1865 - Berg und Hüttenwerk Actien Gesellshaft Štore
1878 - Berg und Hüttenwerk Štore
1913 – Rudnik in železarna Štore (Mine and ironworks Štore)
1945 - Železarna Štore (Štore Ironworks)
1969 – Združeno podjetje slovenske železarne (the United Company of Slovenian Ironworks)
1974 – Slovenske železarne Ljubljana – Železarna Štore (Slovenian Ironworks – the Štore Ironworks)
1991 - Železarna Štore – Jeklo (Štore Ironworks – Steel)
1997 - Jeklo Štore
1999 - Inexa Štore
2003 - Štore Steel

Logos

Until the year 1945 - a mining professional symbol – hammer and pick
Examples:
Logo in the year 1923 (source: M. Mikola: Zgodovina celjske industrije - History of Celje industry, the Celje Historical Archives, 2004)
Working map 1937
1953 - logo (source: M. Mikola: : Zgodovina celjske industrije - History of Celje industry, the Celje Historical Archives , 2004)
After the year 1953 – until the year 1999 - a clover - clamping of a roll ("O" from Štore as an hole or a letter), various typographies of letters
Inexa logo - in the group: Inexa Profile, Inexa Panel

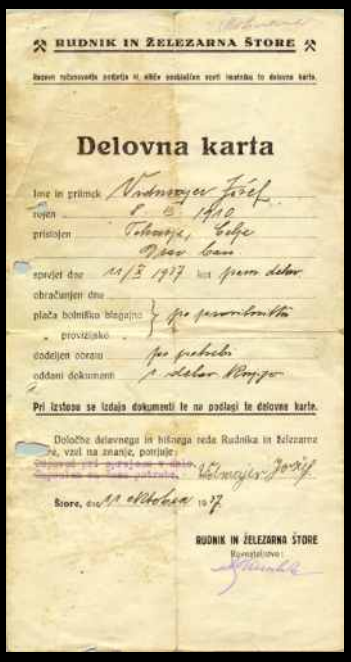
hammer and pick
before 1945

before 1969

1923

after 1975

1937



1991

1997

1895

1999

1913

1953

2003

A historical review of internal transport at the Štore Ironworks

The location of the Štore plant, near the former Southern Railway, not far away from flowing water and close to the location of a coal mine, appeared to be ideal for that time.

Already at the beginning of its operation a track connection to the Southern Railway was foreseen. But there were also different speculations, the content of these speculations is not yet known. Some economic subjects wanted to have a workshop for repairing of railway carriages in Štore, but a big industrialist Johann Weitzer from Graz who was originally a manufacturer of carts and carriages, thought about building a wagon factory which was in fact later really founded in another place - from his workshop for manufacturing road vehicles. That factory was developed into an industrial giant which was for many years operating as a part of the SGP - Simmering - Graz - Pauker A.G. trust.

However, finally there was an ironworks established in Štore, what was described in my writing debate about big problems and legal disputes between owners of the ironworks in the 1850s. We believe that the Ironworks had already at the beginning a track connection with the Southern Railway track although we have no evidence of this. But we know for sure that the factory's management had a narrow-gauge mine railway build to Pečovje in the length of approximately 4 km. The transport was performed in that way that horse-drawn wagons loaded with coal were brought into the ironworks and after emptying returned to the mine. We do not have any technical information on the track but believe that the track's width was the same as in the majority of Slovenian coals – it is two Vienna - feet or 630 mm. When the coal mine layers had been exhausted, the mine was closed down and the railway track dismantled.

We do not know precisely when they started with a systematic track installation in the industrial plant but some indications suggest that this happened around the year 1870. At that time there was a normal-gauge (of 1435 mm width) track constructed around the factory in a form of a large rectangle. In each corner of the rectangle there was an especially large plate placed, pivoting around the vertical axis – a turning switch in the length of 5 - 6m. A wagon, which was pulled by animals – most likely oxen, was brought and pushed to a switch and then with help of oxen turned by 45 degrees. From there the wagon was dragged away on the track towards the earmarked worksite. In this way it was possible to move wagons through all four switches around the whole ironworks. One of these switches existed until the end of the seventies when it was finally pulled down. It is clear that such movement of small freight wagons was slow, ineffective and also expensive. The management decided to modernize it.

A solution was found in purchase of a small steam-driven two-axle locomotive (Btn2), originally designed to operate on tram tracks. The locomotive was so small and short and it looked like a caricature of itself. It was made somewhere in Austria (probably in Floridsdorf) around the year 1885 (data are still under checking). As the locomotive was so small it was possible to bring it to all switches and it could be turned like a wagon. This was the only tramway steam-driven locomotive being ever in operation in Slovenia. The machine was in use till the year 1950 when it was cut and thrown into scrap.

The ironworks itself also possessed a series of small short open freight wagons without brakes for its internal services. We do not know the exact number of them. They were certainly bought from the Southern Railway and the oldest ones are regretfully not preserved. Some newer two-axle railway wagons are being used in the ironworks still today.

When the tramway locomotive was used up, immediately after its liberation from the National Railways the ironworks purchased a little JDŽ 162-004 (B1t n2) locomotive, formerly SB 4, which had previously operated on the route Ljubljana - Kamnik. The locomotive was in the year 1927 equipped with a new boiler in the Maribor workshops. In Štore it was registered under the internal code No.10 and named Urška and was in use until the year 1958 when it was sold to Aleksinac mine in Serbia. It was operating there until 1970, when it was found by the author of this record. The locomotive was moved to a heating hall in Niš after long agony and many difficult discussions. It still stands there as a technical monument and strongly deteriorates as nobody takes care of it. It is mistakenly marked with JZ 132-004.

Locomotives of the JDŽ 162 type were originally produced as Ebel steam post carts. After some years of use it was concluded that the postal department is not the appropriate one and they dismantled them from all the locomotives. So a steam driven carriage became a classic locomotive with an unusual design feature - the driving cylinders were placed behind, under the driver's cabin. The sister of this locomotive registered as 162-001 is kept by the Ljubljana Railway Museum.

The industrial railway track with four switches was in the long run clumsy and too slow. After the World War II the ironworks had to face many new tasks and additional requirements. The old system of the internal rail transport was out-dated and too slow. Three switches were eliminated from use and there the track lines were completely newly spread and expanded towards Celje.

When the tramway locomotive was used up, it was replaced by a JDŽ 50 (1C1t p2), formerly MAV 375 locomotive. It seems that the engine was in pretty bad condition and it was taken from use soon.

It was replaced by a JDŽ 153-006 locomotive (1Ct n2v), earlier known as the kkStB 99 type. Its internal code was No.11. In 1959 there was a new boiler made for it and new water tanks in welded form were installed in the Maribor locomotive workshop. The locomotive was in use till mid-seventies and was then donated by the ironworks to the

Ljubljana Railway Museum. Equipped with a new spark protector it was standing for many years behind the Zalog railway station where it completely deteriorated as it was not maintained at all. Now it is stored in the museum and waits for restoration.

At the end of the sixties the ironworks bought from the Maglaj factory of sulphate cellulose in Bosnia another locomotive. It was a modern steam locomotive 62-669, made in the Duro Đaković factory in Slavonski Brod in the year 1960. It got an internal code No.10. The locomotive was at the end of the seventies, when it was out of use, sold to England to drive on one of museum lines, where it is still running today.

After the World War II was there was also a narrow-gauge industrial railroad with a track width of 600 mm built in the Štore ironworks. Such railroads were at that time used in mines and quarries.

The first two locomotives were immediately after the war bought from the Bar copper mine. The mine in Bar expanded greatly at that time as copper had high value. There they introduced an internal transport based on rails with width of 900 mm and with large electric locomotives. In this way locomotives No.1 and No.2 arrived to Štore - (Bt n2) which were both manufactured in the Henschel factory in Kassel in the years 1935 and 1920. The vehicles were in use till the eighties when the internal transport was done away. The locomotive No. 1 was named Ida and the locomotive No.2 Štefka..

However, only two locomotives were insufficient for the growing market. As there were no imports the Duro Đaković factory in Slavonski Brod started the production of a new narrow-gauge locomotive for track 600 mm in accordance with ancient drawings arising from a period before World War I. These drawings were brought during World War II from the Göring machine factories in Austria to Croatia with the aim to produce a series of such locomotives for the German war industry. But the Ustaši system and a difficult war situation did not allow production of any new locomotives. The half-made machines awaited the end of the war and their completion in an early after-war period. In the years 1948 and 1950 the locomotives No.3 and 4 arrived to Štore. The first was named Nada. Both were cut and cut to scrap iron in the seventies.

In the year 1953 the tramway system in Rijeka was abolished. The machines were cut into scrap, but some electric equipment was purchased by the Senovo coal mine. From this old equipment (controllers, switches, electric motors, etc.) there were two large and strong electric locomotives for a 630 mm – track developed in Senovo and registered as No. 3 and 4. The locomotives started transporting trains fully loaded with coal on the relation Senovo – reload station Brestanica (Rajhenburg). It this way they had a surplus of two locomotives which were sold to Štore and got codes No. 5 and 6.

Both locomotives were originally designed for Austro-Hungarian Army of the kkHB RIIc type. They were one of the last typically military Heeresfeldbahn locomotives built partly in the Linz locomotive factory and completed in the year 1918 in Floridsdorf in Vienna. The machines were not taken over by the Army and soon after the war were given for sale. As the Senovo coal mine began to expand its production after the war, both locomotives were purchased in the year 1920 and included in their transport system. It should be noted that forest railways at Veliko Bukovje, Adlešiči and in the southern Rog region had the same type of locomotives.

The locomotives were not named and were in use until the closure of the narrow-gauge traffic in the eighties. Both of them are preserved. One stands in front of the Štore elementary school and the second one is privately kept in Ljubljana.

A little biaxial diesel-mechanical locomotive made in the USA in the Porter factory after World War II should be also noted here. It was painted dark-yellow and was eliminated from use in mid seventies due to lack of spare parts.

In the narrow-gauge railway transport there were at least 100 different wagons used. The most important were two-axle wagons – tippers, self-empty wagons as well as two and four-axle wagons without sides, platform wagons for transportation of larger and heavier items. Some of them were bought second hand but many of the large special wagons were produced in Štore by the ironworks workers themselves.

After their elimination from use there was one wagon kept from each model. All these wagons were painted and prepared for a museum layout, but their movement into the museum was not realized.

And after a period of twenty years the wagons simply disappeared from their location. There was “a genius” who sent them into scrap.

The ironworks still has one two-axle steam rail crane. The vehicle runs on a normal track of width 1435 mm. The crane itself was produced in Germany in the year 1911 and the boiler was supplied by the Weinbrenner factory. In the sixties the boiler failed and had to be replaced. A new boiler was installed into the crane, a product of the Boris Kidrič Maribor factory. The vehicle was a few years ago excellently restored and is placed in on the premises of the Štore ironworks.

With the end of the era of steam locomotives and narrow-gauge tracks, the use of diesel locomotives prevailed on normal rail tracks. Some attempts were made with a diesel-hydraulic three-axle DHL 600 locomotive, a product of MIN Niš. The locomotive did not meet the requirements and was often out of order.

There was also a two-axle diesel-mechanical locomotive from the Duro Đaković factory, produced under license by the Austrian factory Jenbacher Werke. The locomotive was a good one but its power was only 200 HP.

The ironworks also bought a second-hand a JŽ 731 locomotive of the same construction as the previous mentioned one. It is still occasionally used.

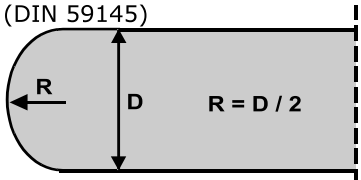
A specific vehicle is used for movement of freight wagons in the Štore ironworks in the last years. It is a car - truck - designed to be driven both - on rails and on road. This is one of the most advanced vehicles of this type in Slovenia!

The development of the rail transport in the Štore ironworks has not said the its last word yet!

Mag. Tadej Brate

FLAT BARS WITH SHARP EDGES
DIN EN 10058
(DIN 1017, DIN 59200)

FLAT BARS
DIN EN 10092-1-A
(DIN 59145)



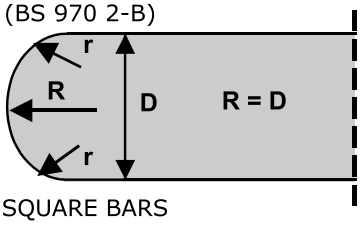
FLAT BARS
DIN EN 10092-1-B
(DIN 4620)

FLAT BARS
DIN EN 10092-1-C
(DIN 59146)

SPRING STEEL
EN 10089: 51CrV4, 52CrMoV4, 56Si7, 61SiCr7, 55Cr3

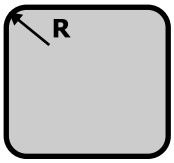
ENGINEERING STEEL
Forging steel:
EN 10025: St52-3, St37-2
EN 10083-1: from Ck22 to Ck60, 25CrMo(S)4, 34CrMo(S)4, 42CrMo(S)4,
EN 10084: 16MnCr(S)5, 20MoCr(S)5, 20MnCr(S)5
EN 10083-3: 30MnB5,
DIN EN ISO 4957: 31CrV3, 51CrV4
Carbon steel - case - hardening:
EN 10084: C10, C15, Ck10, Cm15, Ck15
Carbon steel - hardening and tempering:
EN 10083-1: Ck22, Ck25, Ck35, Ck45, Ck55, Ck50, Ck60
Structural steel:
EN 10025: St37-2, RSt37-2, St44-2, St50-2, St60-2, St70-2, St52-3
Steel for welded chains:
DIN 17115: 27MnSi5, 20NiCrMo2, 23MnNiMoCr54
Steel for cold forging:
DIN 1654: QSt323, 15CrNi6, 36CrNiMo4, 21NiCrMo2, 30CrNiMo8, 34CrNiMo6, 38Cr2, 34Cr4, 37Cr4, 41Cr4, 16MnCr5, 20MnCr5, 25CrMo4, 34CrMo4, 41CrMo4,
Alloyed steel:
EN 10083-1: 36CrNiMo4, 30CrNiMo8, 34CrNiMo6, 38Cr4, 34Cr4, 37Cr4, 41Cr4, 25CrMo4, 34CrMo4, 42CrMo4, 50CrMo4, 30CrMoV9, 51CrV4
Structural steel for housings of bearings:
DIN EN ISO 683-17: 100Cr6
Steel for heavy duty automotive parts:
WNr.:1.5231: 38MnVS5
VW-TL 1427: 27MnSiVS6, 27MnSiVS6+Ti, 30MnSiVS6
VW-500-30: 36MnVS4, 70MnVS4

FLAT BARS
BS EN 10089
(BS 970 2-B)

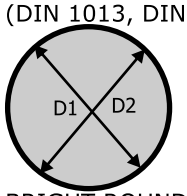


EXEM STEEL WITH IMPROVED MACHINABILITY:
WNr.: 20MnV6 EX, 38MnVS6 EX, 30MnB4+Ti EX, C15 EX,
EN 10084: 16MnCr(S)5 EX, 21NiCrMo2 EX, 20MnCr(S)5 EX,
EN 10084 in UNI 7846:16CrNi4 EX,
EN 10025: RSt37-2 EX, St52-3 EX,
EN 10083-2: C22 EX, C35 EX, C40 EX, C45 EX,
EN 10083-1: Ck45 EX, 42CrMo(S)4 EX,
UNI 7845: 39NiCrMo3 EX,
UNI 7846: 18NiCrMo5 EX,

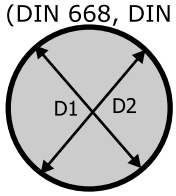
SQUARE BARS
WITH ROUND EDGES
DIN EN 10059 (DIN 1014)



ROUND BARS
DIN EN 10060
(DIN 1013, DIN 2077)



BRIGHT ROUND BARS
DIN EN 10278
(DIN 668, DIN 671)



SQUARE

Dimension mm	Radius mm
40 x 40	6
45 x 45	6
50 x 50	6
55 x 55	8
60 x 60	10
65 x 65	10
70 x 70	10

FLAT

Standard	Dimension mm
EN 10058 (DIN 1017)	65 - 120 x 40 - 55
EN 10058 (DIN 1017)	50 - 150 x 7 - 40
EN 10058 (DIN 59200)	150 - 200 x 7 - 25
EN 10092-1-A (DIN 59145)	50 - 120 x 8 - 35
EN 10092-1-B (DIN 4620)	50 - 200 x 7 - 30
EN 10092-1-C (DIN 59146)	60 - 120 x 16 - 62
EN 10089 (BS 970 2-B)	60 - 120 x 30 - 36, 40 - 42
EN 10092-2 (DIN 1570)	90-120 x 10-20

ROUND

Standard	Diameter/Process
EN 10060 (DIN 1013)	25 - 68, 70, 72, 73, 75, 77, 78, 80, 82, 83, 85, 90, 95, 100, 105 mm / rolled
EN 10060 (DIN 2077)	25 - 68, 70, 72, 73, 75, 77, 78, 80 mm / rolled
EN 10278 (DIN 668)	24 - 50 mm / drawn 24 - 95 mm / peeled
EN 10278 (DIN 671)	24 - 95 mm / peeled

ISO 9001
ISO 14001
OHSAS 18001
BUREAU VERITAS
Certification
N° 214241 / N° 221243 / N° 224323

ISO/TS 16949
BUREAU VERITAS
Certification


ISO 9001
ISO 14001
OHSAS 18001
BUREAU VERITAS
Certification
N° 214241 / N° 221243 / N° 224323
INVESTOR IN PEOPLE
ISO/TS 16949
BUREAU VERITAS
Certification
160 years