ŠTORE QSTEEL

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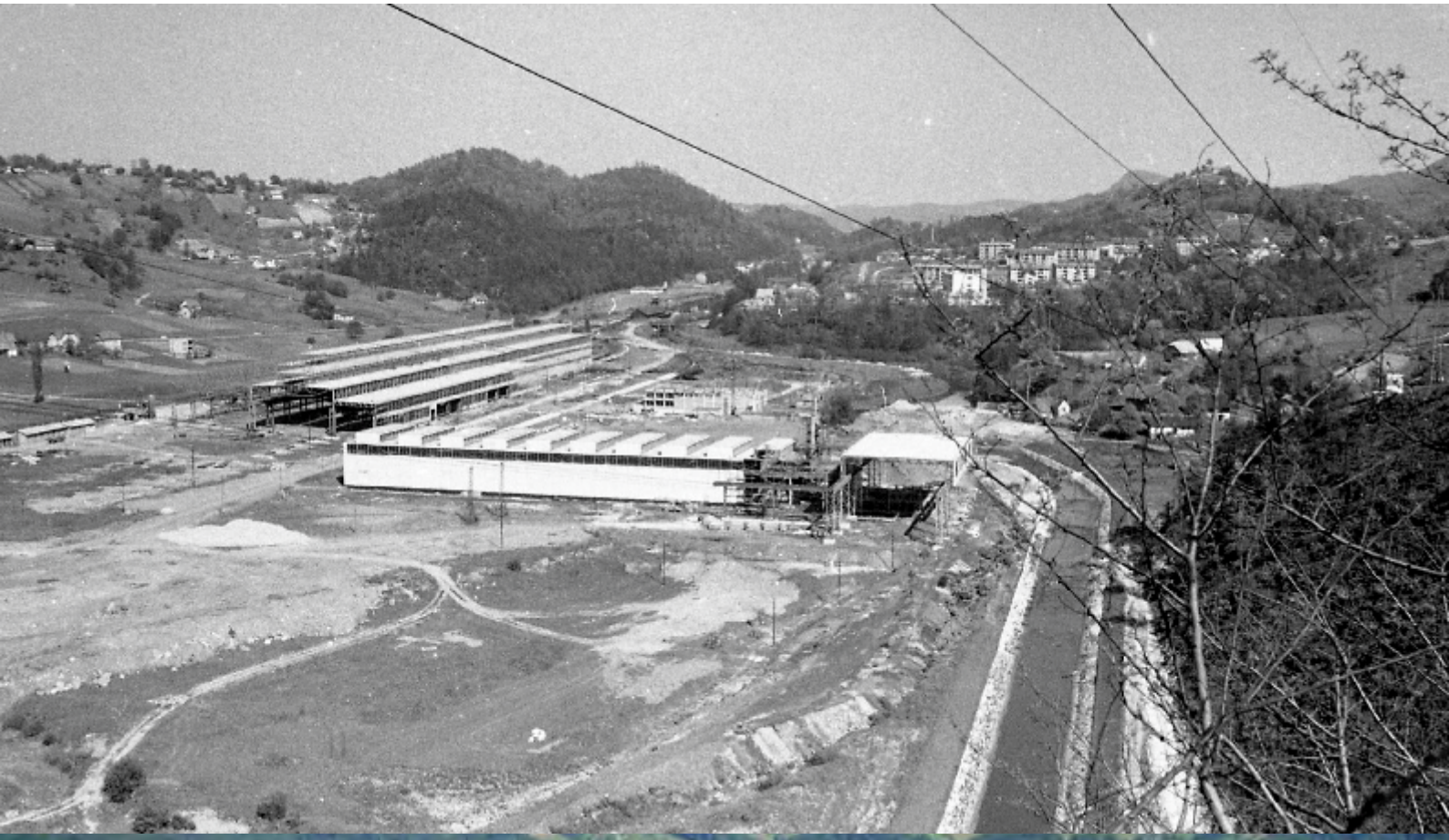


Marjan Mačkošek, interview

Leading Štore Steel for 20 years

Marjan Mačkošek has spent his entire career in Štore. He got the first job in the ironworks in 1973 as their scholarship holder and after he had finished the technical secondary school.
He started as a tool designer and continued as technologist at rolls production. During this time, he finished his studies at the Maribor Faculty of Mechanical Engineering. He was appointed to his first managing post in 1984; he became the head of production planning at Železarna Štore. In the nineties, he took part at the planning of reorganisation of the ironworks into companies according to their production programme. The independent companies started their business at the beginning of 1991, when he took over the managing of the company ITRO (industrial equipment, tractors and robotics) with activities that traditionally didn´t belong to the ironworking industry.
In 1996, he was appointed to the board of the long steel programme by Slovenske železarne (Slovenian Ironworks), which then owned the nationalized companies. The long steel programme merged the two locations of steel production, Ravne and Štore.
Jeklo Štore was a new company founded 1997, where he was appointed to the function of technical manager, and 1998 became its executive manager for the next 20 years.
Besides his work, he held several positions. Among other at the Slovenian Chamber of Commerce and Industry where he acted as chairman for one mandate.
He is a member of the Slovenian Academy of Engineering and recipient of the 2011 Slovenian Chamber of Commerce and Industry Award.

Let us focus on the part of your rich career after foundation the company Štore Steel. How did it start?

Slovenske železarne, which were nationalized at the beginning of the nineties, wanted to optimise and rationalise the production capacities, so they merged the steel production on the locations Ravne and Štore. The so-called long programme represented production of carbon and alloyed steel bars.
The idea was good, however after a few years of business of the merged company they realised that it is not functioning as planned.
Slovenske železarne d.d., decided to found a new steel producing company in Štore and prepare it for sale. Privatisation of Slovenske železarne was planned since they had been nationalised and by rehabilitation programme, which was done by passing adequate laws.

The company Jeklo Štore was founded in the middle of 1997 and started immediately its independent business.
State withdrawal from ownership and privatisation of the companies on the Štore location was carried out in the years 1999 and 2000. Different models were used: from ownership of the employees and purchase by the management to purchase by domestic and foreign companies. Besides Jeklo Štore, the companies Valji, Energetika and ITRO were also privatised .
Even before that indispensable means of the main production, companies were dedicated for development of entrepreneurship and self-employment within the Slovenske železarne rehabilitation programme. Thus, an industrial zone of companies that are still active and vital was created in Štore. The Štore industrial zone has been exploiting synergies of the common location ever since. All the companies at this location are able to conduct business and develop.

Photography above: Marjan Mačkošek
Frontpage: industrial zone Štore 2 (first page of 2019 Calendar with topic „before - after")

All together is driven by motivation, energy, knowledge and competences of the former ironworks quality staff and new entrepreneurs.
Such a model with its positive examples was later used as encouragement for other, later privatisations of the state owned companies.

How did the company operate before the privatisation?

The company operation prior to the entrance of the new owners was based on trust of their business partners – suppliers and customers. We managed to gradually increase the production in spite of chronic lack of working capital. There were no possibilities for equipment investments and development, but we managed to make certain improvements by optimising the production processes on the existing equipment.
Jeklo Štore was bought in 1999 by a Swedish company Inexa together with a domestic partner Unior. After a thorough overview of the company, they were surprised that the concept of management and control was very close to their own ideas.

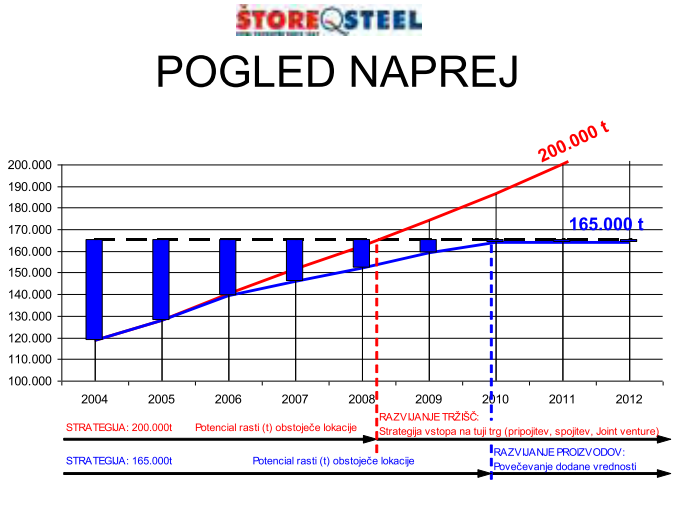
What did the entrance of the Swedish Inexa mean for the company?

The Inexa entrance meant a beginning of intensive market activities and customer acquisition. The important contributions of the Swedish owner were an interesting trademark and a new marketing approach. With collaboration of engineers in the technical field we mutually enriched our production and metallurgic proficiency. The majority foreign owner left to the local management to run the company, their representatives focused on business performance monitoring.
In 2003, the owner of Inexa made a decision to withdraw from steel industry because he focused on other fields (ship panel walls, production relocation to China).
The business partners of the company used the occasion to buy off his share and so realised the idea of clustering and vertical connections of partner companies with intention to make management of crises in economy crises easier.

The company got new boost and started with investments in modern equipment in the Inexa period. The ownership change had no negative influence on the business performance. The company reached in 2003 for the first time since the company foundation the sales of 100 thousand tons.

Did Inexa´s leaving slowed down the development of the company in any way?

In the period from 2003 to 2008, the company succeeded in using market conditions and by constant rise of production and sales in years 2007 and 2008 doubled the annual turnover when compared to 1998. That was feasible due to intensive investments in the entire period.
We opted for a strategic view into the future, where we found ourselves as a micro manufacturer of steel with a 50% share of steel processed after rolling. Important ideas of how to set new units and modernise old ones appeared to increase productivity and capacities.
The company was well aware of the importance of employees for the future of the company. That is why this period was also distinctive for intensive investment in staff sources (scholarships) and employee training.
This is also the period when we entered among the most successful Slovenian companies and strengthened the position as an important Slovenian exporter to the European market.



TIM ZA IZRACUN POTREBNIH KAPACITET PO PROCESU PRI PRODAJI 200.000 t

Photographies: Inexa board of executives visiting Štore; Company management visiting Inexa Profil
Drawing: material for preparing strategic plan 2005 - 2010

How did the company go through the big world economic crisis?

Entering year 2009 was a real shock for the company because we were left without orders overnight. They started to come gradually and in a much smaller volume. In 2009, we sold only for EUR 46 million of products; the amount was EUR 131 million a year before. We survived the crisis because we entered it in an excellent financial condition.
The management responded successfully with a set of measures to reduce all costs.
The company contrary to other manufacturers kept all the employees and even increased the extent of their training.
This enabled us to increase the production and sales in the following year; followed by a successful business performance in the years 2010 and 2011.
In 2012, the economic crisis repeated but with less intensity. Since then, the company has recorded a constant sales growth in quantities and results that have enabled the performance of the next investment cycle.

Which are the key elements for a company to operate successfully?

The strategy of the company has been all the time based on "just in time" deliveries, short production cycle (one month), custom production for a known customer with their special demands, running the production with the lowest possible stock and connected low working capital and with an optimal usage of existing space. All this can be done with adequately trained staff, proper information support and process automatization.
The key achievements of the period from the foundation of the company in the technical field were:
Stage 1 and 2 of steelworks modernization that included a total renovation of electric arc furnace, ladle renovation, setup of automatic alloying systems and a new steel continuous casting equipment.
In the rolling mill, there was a great achievement with the new continuous rolling line that enabled greater rolling flexibility (despite certain concerns) and further development of rolling technologies. We mustn't forget the up-to-date control systems in combination with other material finishing processes.
In cold finishing, we invested intensively into finalisation, so that we are capable of performing 50% of finishing processes after rolling (peeling, sawing to pieces and other).
It is of utmost importance with all investments that they were performed during regular operations and within existing workspace. A very precise planning was necessary and this was carried out by our professional staff.

How do you imagine the company's future?

This is work in progress. The vision and development ambitions of the company should be continued by younger generations: in the field of material development, investments, search of markets for selling steel in higher price ranges, by investing in staff development and strengthening the role of research and development.

Interviewed by Gorazd Tratnik

Photography: steelworks modernization has two phases

Flatness Measuring on Cut Flat Steel

Flat steel is besides round steel also a part of the Štore Steel production programme. Most of the flat steel is intended for goods vehicle springs.

Flat steel is sold in rolled length and according to customer's demands in shorter lengths as well. It is cut in the Rolling Mill on shears and band saw and in the Cold Finishing on circular saws with robotic bundling of cut bars.

The flat material is after rolling checked according to different criteria for flatness, shape, surface and internal defects. The problem of flatness of a lot of material is by not rejecting bars, which are not flat at certain locations but to recut them and recheck them afterwards.

The problem with this procedure is great amount of manipulation between two mills and a lot of additional manual control after sawing. That is why we have been looking for a solution with automatic robotic flatness control during cutting on the circular saw for quite some time. In the second half of 2017, we contacted the company MONODAQ from Trbovlje. We made an enquiry for a measuring device and immediately after the first contacts realised that they have a good solution for flatness measuring on a circular saw by a robot. We also agreed on additional feature of rejecting bars that have been marked in the rolling mill. In the Rolling Mill certain bar sections are marked due to various reasons at the inspection after rolling. They have to be rejected at or after cutting.

The measuring device is composed of a linear actuator on which four sensors travel along the bar length driven by a step motor and belt drive. Two are dedicated to measure the flatness of the profile thickness and width and two to detect colour chalk marks on the width and thickness. The measurement alone is very fast and executed in roughly five seconds. The measurements are analysed with the corresponding software and displayed on the screen.

The concept of setting the two saws, robot and the system of already existing roller conveyors enables the setting of the measuring device to the saw in a way to perform the measurement automatically during the sawing cycle with automatic placement and transport of rejected and accepted bars. It is also important that there is no prolongation of the sawing cycle due to extra measuring. That was achieved by changing the measurement procedure. We wanted to avoid placement of bars to the measuring location to perform the measurement. The procedure was chosen, where the robot only moves the bar close to the measuring location, where measuring sensors then travel on linear actuator along the bar.

The sawing and measuring procedure is performed as follows. A short bar is cut first by the saw, the robot picks it up and leans to the measuring device. The flatness and marks are checked. Based on the information from the measuring device, the bar is moved to one of the roller conveyors. Good bars are placed on the first and bad bars are placed on the second. Meanwhile the saw has already performed the next cut of a short bar, which is again checked. When the wanted package height and width are reached, the good material is moved to the packaging location. The bad material is gathered on the other roller conveyor and is also taken to the packaging location when the maximum bundle size is reached or at the position end.

This measuring device will save us time and material transport. It will also increase the measurement accuracy when compared to the present manual control.

Štefan Zidar, head of production in Cold finishing

Above left: measurements display on the screen; Above right: measuring sensors travel on linear actuator along the bar

50 years of Steel Drawing Mill – now Cold Finishing Plant

You cannot reach 50 years of existence of an industry without efforts, development and vision. The most important role goes to individuals as a team, who believe that their decisions are right.

There would not be the present Cold Finishing Mill if there was not the team (works manager Jože Urbančič, assistants Emil Krajnc and Ivan Čretnik) from the old Rolling Mill I 50 years ago (in 1966), who started to draw special profiles – the pole shoes for Iskra (now Mahle) from Nova Gorica (BW photography).

In 1968, there were the first 68,110 kg of drawn pole shoes manufactured, which were used for coil cores of dynamo stators and car and tractor starters.

The first successes and market demands were decisive that they started purchasing needed machinery and equipment. At the end of 1968 and at the beginning of 1969, they started with installation of equipment needed for drawing and grinding of profiles (colour photography) in the then not yet finished Rolling Mill II.

The first quantities of ground steel were so produced in May 1969. The actual start of production of drawn and ground steel was in 1969.

That means that we are in 2019 celebrating 50 years of the start of production of drawn and ground steel – creation of the Steel drawing mill. The team and development were in the hands of Mr. Franc Trafela.

BW photography: special profiles – the pole shoes
colour photography: production of drawing and grinding of profiles in the Rolling Mill

The market demand dictated growth of production and investments in new equipment. There were some organisational changes in 1972 and the Steel drawing mill became independent within the 114. branch. Mr. Franc Trafela was appointed works manager. He and his colleagues Marjan Kolar and Emil Hernavs take the most credit for fast development of the Steel drawing mill.

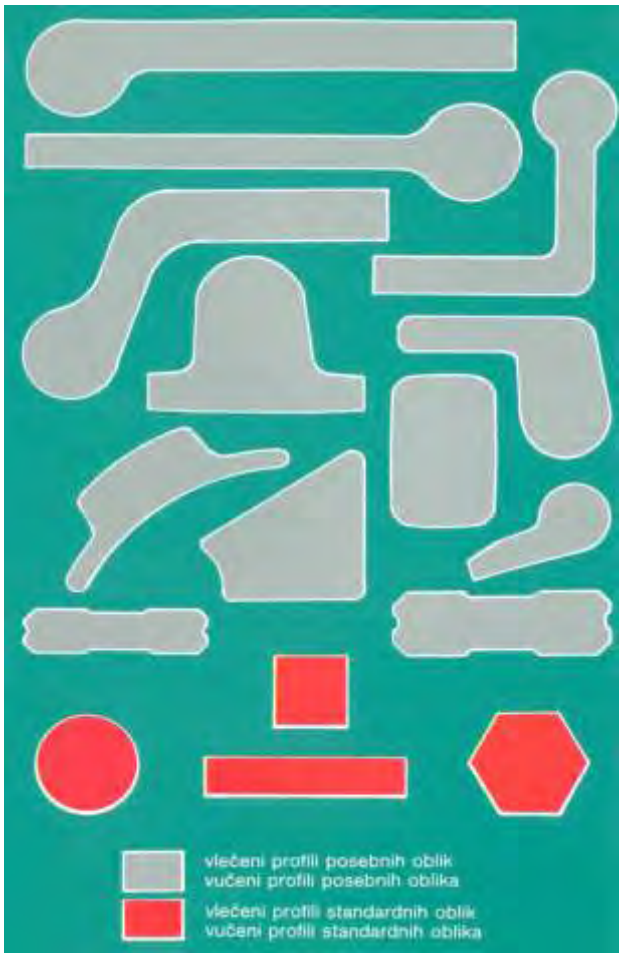
The quantities increased every year and reached 9,750 t of drawn and ground profiles in 1980.

Even before that, in 1976 plans had been made to build a new steel drawing mill. The market and the production development dictated an even larger growth of production, which was not possible at the existing location. In June 1981, the first columns of the new Steel drawing mill were raised at the present location.

In 1982, the equipment was moved to the new location and in October, the first bars were being ground. Intensive equipment relocating continued and in 1983, the regular production ran in the new hall (photography below).

Mr. Boris Marolt was appointed works manager in 1980 (then TOZD Jeklovlek). He was the driving force at the building of the new hall. He and his colleagues (Franc Trafela, Emil Hernaus, Marjan Kolar and others) successfully developed new technologies and increased the production.

Investments in new equipment (Schumag drawing line, DKS-Kiserling calibration line …) made quick production growth possible. In 1988, a 20-year record was set in the production of drawn and ground steel; 21,778 t. There were 182 employees at that time. That was the best period of the Steel drawing mill before the crisis and independence of Slovenia in 1991.



Further development and growth of the Steel drawing mill will be discussed in the next edition of the magazine in 2019, when 50 years of regular production are celebrated.

Alojz Gajšek, Head of Cold Finishing

Above right: special profiles
Photography below: production in the new Steel Drawing Mill

Activities in the field of investments

The common thread to all the larger investments is to increase capacities and share of inspected and processed material, which gives our products higher value.

This year has been intensive for our company in many ways. Production and sales figures are high but there are also many activities in the field of investments. We are now heavily involved in the current investment cycle.

The scheduled annual refit was used for instalment of a dusting device at the alloying system in the steelworks, which is one of many measures to increase working conditions. Recently a new heating place has been built in the steelworks, which increased the reliability of ladle heating capacities.

This will be most remembered by the "future of finishing" project. Prior to the refit, we had installed a refurbished Bronx straightening machine, then we moved and started the Mair straightening machine. By the end of the year a new control line with an integrated edge chamfering machine, NDT testing equipment, marking and automatic bundling will have been installed. The line will operate in connection with the Mair straightening machine and will start with full operation at the beginning of the next year. In the following months, the "old" control line and the straightening machine RS20 will be moved and partially updated. RS20 is currently in the cold finishing department.

The investment in the finishing department turned out to be demanding; mostly from the building point of view. The machines are being placed on the location of the old 550 line. The foundations needed to be adjusted to the situation and at the same time making the most out of the given terrain. The timeline was also very important due to confirmed delivery terms by the suppliers of the technological equipment and the fact that all the activities are carried out while the production is running.

Above left: instalment of a dusting device
Above right: new heating place in the steelworks

At the same time, all the flat programme machines are being relocated in the finishing department, the ISI press will be operating at the new location by the end of November, this year the new Kasto band saw with a manipulation attachment will be installed. All the flat programme machinery will be placed in a way to enable placement of a new round bar heat treatment line next to the continuous line cooling bench. The signing of the investment contract is planned for this year, the delivery time is one year and the startup is planned for the first half of 2020. The line will allow inductive quenching and tempering of bars and barcut.

Closely connected to the investment in the finishing department is an internal logistics project of a ground vehicle for transport of rolling pieces i.e. interphase material that will relieve the cranes. By that time, a 5-meter transport corridor next to the south wall of the BC hall has to be finished.

A new hall is being built in the annealing department that will be finished in the first quarter of the next year. Then follow installation and startup of the new Bosio annealing chamber furnace, which we already store. The new surface allows greater annealing capacities and enables due to its design different annealing modes.

At the end of the year, we are starting with preparations of the foundation for the new peeling line in the cold finishing mill. The line will allow inspection, peeling, polishing and bundling of bars. The startup is expected in the first half of the next year.

There are several other infrastructure investments going on at the same time – a new foreman cabin in the finishing mill, wall renovation in the steelworks and flat roof in the rolling mill. The new bath in the steelworks has been finished, at the beginning of 2019 follow renovation of locker rooms and bath in the rolling mill. The Godec gatehouse areas will be also renovated.

The common thread to all the larger investments is to increase capacities and share of inspected and processed material, which gives our products higher value. Some investments will have been finished due to their size by the end of the first half of the next year. Not all the work has been done yet, there are new challenges. Mostly in the steelworks within the "Centre of Secondary Metallurgy" project. Numerous smaller projects and technical improvements are being planned. In the future projects and investments will be planned that increase automation for the humanization of work, that reduce negative influence of the company on the environment and to modernise processes and equipment for higher degree of digitalisation.

Matjaž Vrbek, Head of Investments

Fotografija zgoraj: assembly of a new inspection line

Rearranging the Finishing Department

After starting the new continuous line and demolition of the old 550 line, we gained some space, which allows a more rational – new plan of the Finishing department.

The space in the Finishing department and the space intended for intermediate and sales stock was reduced radically due to the needs for the setting of the new continuous line. Machines were deposited, stored and moved to where there was still place available. After starting the new continuous line and demolition of the old 550 line, we gained some space, which allows a more rational – new plan of the Finishing department, which will allow better material flow, better space efficiency for material storage and more flexibility at setting new and moving old machines. Studies in the past have proven that it is reasonable to separate finishing into two sections: one for flat and the other for round steel. Ground transport of material shall be used to overcome the problem with crossing paths and cranes making way to each other.

The new plan for the Finishing department is not a typical investment but more a set of minor interventions, which are needed to be carried out to restore the area of the 550 line, rational setting of existing and future machines and arrangement of the corresponding infrastructure.

Space release in the area of the old 550 line dictates a much-needed expansion of the Finishing department and an opportunity for its modernization, in the logistic meaning too.

Bundle arrival from the continuous line separates the BC hall into two parts. The left side of the Finishing department occupies a smaller area of the department and is connected to the sales warehouse. Because there are larger areas on the right side, it is reasonable to place the round material finishing lines there. They are essentially longer and take over more space than the flat material finishing machines on the other hand.

This enables us to increase the areas for intermediate storage of round material in the right section due to the increasing share of round material trend. There is a problem of overcoming crossing of cranes and transport of finished material to the commercial warehouse. The solution was found in material transport by ground vehicles, which are planned to be purchased as a part of logistic arrangement of the company and which is closely connected to this project.

The stage, introduced in this text, includes the following major interventions:

- building the foundations for the finishing machines and paving the old 550 line area,
- moving the machines,
- installing computer workstations at the machines,
- additional containers for material storage,
- demolition of objects at the A line of pillars, where there are offices of foremen, nearby stacks, toilets and rest area,
- building a new foreman's office, nearby stacks, toilets and rest area on new locations,
- placement of additional energy installations (compressed air, gas, electricity).

Scheme above: new plan of the Finishing Department

The key effect of planned interventions is to provide conditions for a more efficient organisation and control, after-treatment and storage of rolled pieces. The area of the old 550 line is going to be used for an additional straightening and control line for round profiles. It also allows transport of rolled material cutting capacities from the Cold Finishing to the Rolling Mill and formation of logical process lines.

The new plan enables:

- increased productivity of the finishing machines (reduced time of material manipulation),
- possibility of production planning optimisation (coordination of material flow through after-treatment with rolling capacities),
- reduction of intermediate stock,
- risk reduction of material mix,
- improved safety of employees due to a more adequate way of storing material,
- increased sales warehouse area,
- ground vehicle transport of final products.

Individual interventions will be carried out through 2018; works are planned to be finished by the end of the first quarter 2019.

A new perspective and a new opportunity change the mentality of us as users, not only regarding our needs but also regarding our notion of the production process.

Operation of processing machines, feeding and transport are a part of a logically controlled comprehensive process, where all the participants communicate with each other to carry out tasks with the utmost efficiency.

Rolling Mill Manager
Čedomir Minić

Above: new foreman's office, below: new control line for round profiles

New peeling line in Cold Finishing

The decision to invest in a new peeling line is our response to market demands and is one of the strategic goals of the company to increase the level of finalised products and consequently increase of added.

Starting points for the new peeling line

The sales and therefore production of peeled steel has been increasing year by year. The production of peeled steel has increased by 100% in the last five years from 2012 (21,346 t) to 2017 (39,690 t). The peeled steel sales value reached 28.3% of total company sales in 2017.

The 2018 goal is to reach 40,000 t peeled steel sales, which is the upper limit of our technical peeling capacity. The demand on the market would enable us to exceed 45,000 t sales of these steels in 2018.

This is why a decision has been made to increase the peeling capacity. The decision to invest in a new peeling line is our response to market demands and is one of the strategic goals of the company to increase the level of finalised products and consequently increase of added value. The investment was comprised in the 2016 – 2020 business plan, which planned 55,000t of peeled steel sales in 2020.

Above: production hall of the Cold Finishing

Brief introduction of the investment

The new peeling line will have an annual technical capacity of 30,000 t and the total capacity of peeled steel on all three lines will increase to 60.000 t.

The new peeling line for manufacturing and inspection of bright profiles in the Ø18 - Ø105mm range will consist of:
- peeling machine,
- polishing machine,
- chamfering machine,
- inspection line and
- packaging line.

The line with the length of 65m will be located in the existing cold finishing plant (the former plant for pre-profile preparation). The position placement is coordinated with the planned development of logistic ways in the company.

Its design is based on placement of modern lines of our competitors and adapted to our needs. The material will travel from start to end of the finishing, inspection and final packaging through the whole line. No bridge cranes will be used, which is the case with the present setup of machines. The purpose of the line is to achieve the best results without physically moving the material from one machine to the other.

Investment effects

End of March, the contract was signed with the supplier MAIR from Italy for the delivery of the main equipment ((peeling, polishing and chamfering machines). The company has already supplied the existing peeling machines and the straightening machine in the Rolling Mill. The investment value is 3,030,000.00 EUR. The delivery is planned for the start of March 2019. The contract for the purchase of an inspection line (inspection of surface defects) with the company Pruftechnik from Germany is in the final stage. The investment value is 170,000.00 EUR. A new packaging line purchase is under negotiation with companies SAS and MAIR (both from Italy). The investment value is 400,000.00 EUR. The total investment value adds up to 3,600,000.00 EUR. The funding will be arranged with a long-term source (loan or leasing).
The peeled steel sales increase in 2021 (55,000t) to 37.7% of the total company realisation in accordance with the 2018-2022 sales plan.

The investment in the new peeling line will also have technological effects such as:
- Increased productivity - reduced finishing costs,
- Finishing (peeling) of steels with increased hardness (improved steels, spring steels…) will be enabled.
- Finishing of all steel qualities within very narrow tolerances.

Alojz Gajšek, Head of Cold Finishing

Above: peeling machine from the supplier offer; below: peeled bars

Inductive Line for Steel Quenching and Tempering

Heat treatments represents an increase of steel mechanical properties for a class or two by thermal procedures when compared with the properties in the rolled condition.

Steels with higher added value are by all means priority in the long-term strategy of our company. Heat treatment of steel by quenching and tempering is besides peeling, cutting and centering one of ways to increase added value.

A line for inductive heating, quenching and tempering is included in our 5-year development plan. The investment plan for this period has been confirmed by our owners; its realisation depends on financial means, company priorities and market situation.

Quenching and tempering as one of steel heat treatments represents an increase of steel mechanical properties for a class or two by thermal procedures when compared with the properties in the rolled condition. This is achieved by heating and quickly cooling the steel (tempering). Tempering alone would yield a very hard steel, which would be brittle as glass. This anomaly is eliminated by quenching.

The so-called quenching temperature depends on chemical composition of steel. This is different for various steels. For spring steel, such as 51CrV4, is the quenching temperature 450 oC. Quenching temperatures depend on time too. That is why we adapt the chemical composition of spring steel to different customers and their quenching and tempering procedures.

By quenching and tempering procedures, we get steel with high hardness and at the same time high toughness. Steels appropriate for quenching and tempering are those with carbon content from 0.3 % to 0.6 % or even more. Besides carbon, these steels can be alloyed with Cr, Mo, V or other elements. Each of the elements has a different role. Hardness is increased by building hard and stable carbides that influence the crystal grain size, which consequently affects the toughness.

Photos: presentation of inductive lines from producers web page

Products intended for quenching and tempering can be forged or treated mechanically. After quenching and tempering there may be a grinding stage, where grinding and product cleaning additives must be taken into consideration. A straightening operation may follow heat treatment with some complicated products.

Quenching and tempering of finished products is a lot more expensive (grinding additives, extra grinding, cleaning and straightening) than processing quenched and tempered steel (mechanical processing is more demanding due to increased mechanical properties).

Development of modern processing centres as well as specialised cutting tools has essentially changed possibilities of mechanical processing of quenched and tempered steel. It is true that the processing of quenched and tempered steel is more demanding and tool wear is higher, but there are fewer operations on the other hand. The cost difference is in the end in favour of product manufacturing from quenched and tempered steel.

Results of machinability examinations have proven that our EXEM steels (steels with increased machinability) have a big advantage after heat treatment when compared to conventional steels. Machinability of EXEM steel is not lost by heat treatment.

Quenching and tempering steel line investment has a big potential to expand the range of products and get customers in demand for quenched and tempered steel. We could not service this completely new customer segment until now.

Miran Prezelj, Head of Sales

Photos: from visiting the producer of the inductive lines

Billet Surface Visual Inspection Device

Before the new billet visual inspection device (VKG) was set, the surface of 140 mm and 180 mm square billets was inspected on, for this purpose adapted stands. To inspect the surface of billets, all the billets had to be rotated manually with a special open-end wrench to inspect all four sides.

Increased share of 180mm square billets at the end of 2012made us in the Steelworks start planning a new investment into a billet surface inspection device. With transition of complete steel casting assortment to 180mm square billets, the existing procedure of billet surface inspection was not possible due to the billet weight.

The Štore Steel policy to improve technological procedures, ergonomics and working conditions led the management in 2016 to start with the activities for purchase and setup of a billet surface visual inspection device.

By the end of 2016, we got two offers based on our technical specifications and chose the company KORING d.o.o. from Prevalje due to their preferences and price.

Above: Billet surface manually inspection

The company prepared all the machine, electrical and other technical documentation and automatization for the operation of the device. The whole device was also manufactured by KORING d.o.o.

The device is manufactured to enable visual detection of surface defects on all four billet sides and automatic rejection and rotation of individual billets and sorting to specified strand. The billets are automatically sorted to good and bad ones according to results of surface inspection. The device is capable of inspecting 60 billets per hour.

The billet visual inspection device was placed in the billet depot of the C-D plant. Between September and November 2017, preparations were done to prepare the space by moving the billet stacks to the new location in the A-B plant. The foundations were made in November according to the machine plans and in December 2017, the new billet visual inspection device was set, all the installations done, the device started, operators trained and the new device tested.

Operators had no serious obstacles with training of operation and feeding.

The new device improved the surface quality control and humanisation of work.

Janko Cesar, Head of steel casting

Photos above: the new device testing

Futuristic Creations in Front of Blast Furnaces

Fashion designer Barbara Repinšek on fashion shooting behind the walls of the Štore ironworks.

Mid-March there wasn't sparkling going on in the Štore Steel ironworks only at the furnaces.

Camera strobes were flashing too.

The air was charged because fashion models were posing in front of a known photographer's camera lens. They were wearing wedding dresses designed and sewn by a fashion designer Barbara Repinšek at her Delavnica mode (Fashion Shop):

„Who am I? I have been a textile and clothing modeller for 18 years. I attended a secondary textile school in Celje.

I have further improved my knowledge needed for clothing design by enrolling a modelling programme. I live in Štore, my shop is located in Breg (Celje).

I do mainly business fashion but make dresses for special occasions too. I enjoy working with young creators from the local surroundings i.e. illustrators, graphic and fashion designers

I invested a lot of my energy and considerable amount of effort into this project at the Štore Steel ironworks. Fulfilling my long-lasting desire created a feeling of satisfaction, which cannot be described. However, my creative strain doesn't rest. There is an idea going on in my brain to design creations for businesswomen. "

Wedding ceremonies are usually organised in romantic places, in nature too. I have decided to place models in wedding dresses in an ironworks' setting. One of my friends has been encouraging me to design a wedding dress collection for several years. When considering a shooting location, the Štore ironworks came first to my mind. I have been attracted by the building forever and I have many times thought about a fashion shooting behind its walls when driving after work home from Celje. One day a gate of one of the production plants was open. When waiting at the traffic light, I saw sparks flashing and the grey industrial environment. Where could you emphasize snow-white dresses better than in a huge iron factory? 'Contrasts attract each other', I said to myself and the decision was made.

Author of photographs Tibor Golob

I didn't envision typical feminine wedding dresses for the collection that we can see at every step. I didn't follow current fashion trends but listened to myself. I decided for a futuristic style. Trousers are common to all creations. Why? Women have to be strong these days, we mostly wear trousers literally and figuratively. However, this is not always good. We often take the burden of decision-making that should be left to men. In a way, we rob them of their desire to please their women.

An Excellent Team

A fashion shooting project amidst ironworks was a big undertaking, which I could not manage without the help of the team of devoted partners. First and foremost, there was the CTRL agency manager Andrej Košar, who helped me and who arranges for me photo publication in known fashion magazines. I chose the models from my customers. Make up was done by Gašper Gmajner and hair design by Zoran Pasarič. Photos were by Tibor Golob.

The team that created the fashion shooting followed the safety regulations meticulously. We wore safety helmets, reported any change of shooting location and complied with all the instructions. Safety really comes first. That is why I found it nice that we were taken care of in this respect by the employees. I have to be particularly grateful to the ironworks manager Jani Jurkošek, who helped me to realize my idea. I was nervous on the shooting day but got excited soon after having entered the ironworks, I liked everything. That is why I am thinking if I was perhaps one of the employees in my previous life.

When it flashes and glows

The team and I eagerly waited for the moments when workers shook iron into the cauldron. The scene became noisy and sparks were coming from the furnace. The scene in the ironworks became extraordinary, exactly as I visualised it for the fashion shooting. The moments were caught by the photographer Tibor Golob, who eternalised the models in front of these exceptional light effects. It seems to me that our work attracted views of many employees. I believe that beautiful girls in special wedding dresses made their day nicer.

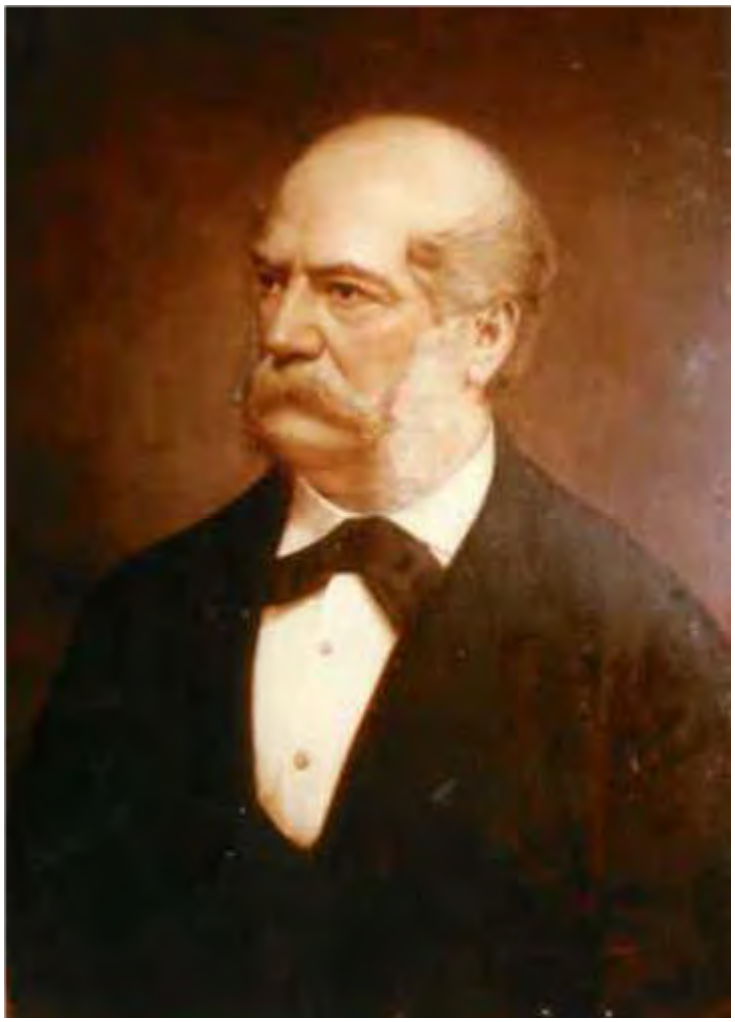
Materials were chosen according to the dress design. I used cotton, silk and synthetic materials. Finding completely snow-white fabric presented a major problem. I paid attention to the design of details too. I designed lace trousers for one of the dresses. For another product, I planned shorts with a lace crinoline. For one of the pieces I imagined a straight train and an open back.

There are as many ideas for wedding dresses as there are brides. Some swear by a cocktail dress, others choose glamorous white wear. I believe every bride has its own right and that she cannot miss with the choice if she follows her heart. Her well-being on the wedding day is the most important. And that the gown matches the woman's character and that it is appropriate for the wedding location.

All the dresses I have designed have been presented at Dvorec Gutenbuchel (Gutenbuchel Mansion) in Šoštanj from 23 March to 2 April. All the creations are intended for sale. They can be tailored to order for a special or solemn occasion. Although extraordinary, the dresses are wearable, which was my goal all the way.

FRIEDRICH BRUNO ANDRIEU, Entrepreneur and founder of Ironworks in Štore

Important persons and their role in a certain period of history can be often evaluated only after a certain time, which shows the actual contribution of an individual in art, culture, science, economy development and industry...
Respecting their accomplishments achieved in different circumstances, means respecting their work and creativity, and so the cultural and technical heritage, which heirs are we all today.



This time we are introducing an entrepreneur and founder of Štore Ironworks Friedrich Bruno Andrieu, who had an important influence on manufacturing and business processes in the 19th century, which refer to iron manufacturing in various places in Slovenia as well as Austria.
Friedrich Bruno Andrieu was born in Trieste to Augustu Andrieu and Anna Maria born Toso on 4 September 1812. His father's family came from Provence, to where they came from Lyon. In the time of the French Revolution, the family left France by boarding an English ship. The English disembarked them in Trieste, i.e. Austria, which was a city, where refugees resorted. Among others, also refugees fleeing the Turks from Greece. It was in Trieste, where on 11 June 1807 their father married Anna Maria, who was a Greek refugee. It was a very happy and fruitful marriage. Ten children were born in the family. The first four were born in Trieste. The rest six in Toulon, where the family returned after the kingdom restoration. The fourth, in Trieste born child, was Friedrich Bruno, born on 17 September 1812. He returned with his parents to Toulon in 1814. In 1827, at the age of 14, he returned to Trieste, where his grandmother's family took care of his education.

He mastered three foreign languages in his youth and did his apprenticeship in an iron hardware shop. He soon got several good jobs due to his education and knowledge of foreign languages. However, these jobs were interestingly not in the trade but in larger and smaller ironworks in Styria. Friedrich Bruno managed around 1840 a company of Friedau family in Leoben, which was an important post. It was during his job in Leoben that he met his wife Anna Victoria, who came from an old and respectful Eisen family, which was connected with iron manufacturing in Austria. He married Anna Victoria on 4 October 1841 and they started moving across the Austro-Hungarian Empire with their children as their jobs dictated.

F.B. Andriea's next known job was at the ironworks in Dvor ob Krki. He was employed there in the time, when a well-known expert Ignatz Vitus Engelbert von Pantz introduced various inventions and innovations in the ironworks there. The most important was heating up the air to be blown into the blast furnace to 365°C in the years 1836-1837. Andrieu got familiar with innovations in the world iron manufacturing, when he was employed at Dvor Ironworks.

Fig 1: Friedrich Bruno Andrieu (1812 -1884): private collection/owner Dr. Johanes Andrieu, Landhausgasse 7, 8010 Graz

After leaving Dvor, probably 1837-38, he got a post as controller at Friedau ironworks in Vordernberg in Austria. He had probably been considering becoming an entrepreneur until leaving Dvor and manufacturing iron in a then modern way – puddling. So he can be found in 1850 in Štore. It was here that his youngest of four sons in his marriage to Anna Victoria was born in 1852. There were rumours on building an industrial complex for locomotive and carriage repair in Štore since 1846, in the time the Southern Railway (Vienna-Trieste) was being built. Later a railway connection Tirol – Budapest was built and Maribor became an important railway crossing and consequently central railway maintenance workshops were built. According to certain interpretations, F.B. Andrieu didn't plan to build ironworks. However, due to a good location at the Southern Railway and the fact that he purchased the whole coalmining estate from Ignacij Novak on 23 January 1850 it is reasonable to assume that it was his goal to build a factory with puddling furnaces and a rolling mill. In this case, it was iron processing and not iron manufacturing in blast furnaces. Puddling was then a modern way of processing iron that was very profitable.

In the year he bought the land and the mine he asked the mining board in Leoben for a concession to build puddling ironworks and a rolling mill in Štore, which was granted on 17 November 1850. An important advantage of this location was a good position at the Southern Railway and an independent source of energy – coal from their coalmine. In those days, a concession for puddling ironworks was given only if the factory had its own source of energy because numerous forests were cut down in the previous centuries. The iron for the processing in the puddling furnace was delivered from nearby ironworks under Bohor and in Mislinja. Correspondence found between Anton Bonazzo in Mislinja and F.B. Andrieu from the period 1848-1851 proves that. It can be also seen from the letters that F.B. Andrieu was interested in slag samples from Mislinja ironworks already in 1851. He was probably interested in iron content of the slag. Other authors (Lang-Frey) patented in 1860 a procedure of puddling slag reduction and named it Lang-Frey method.

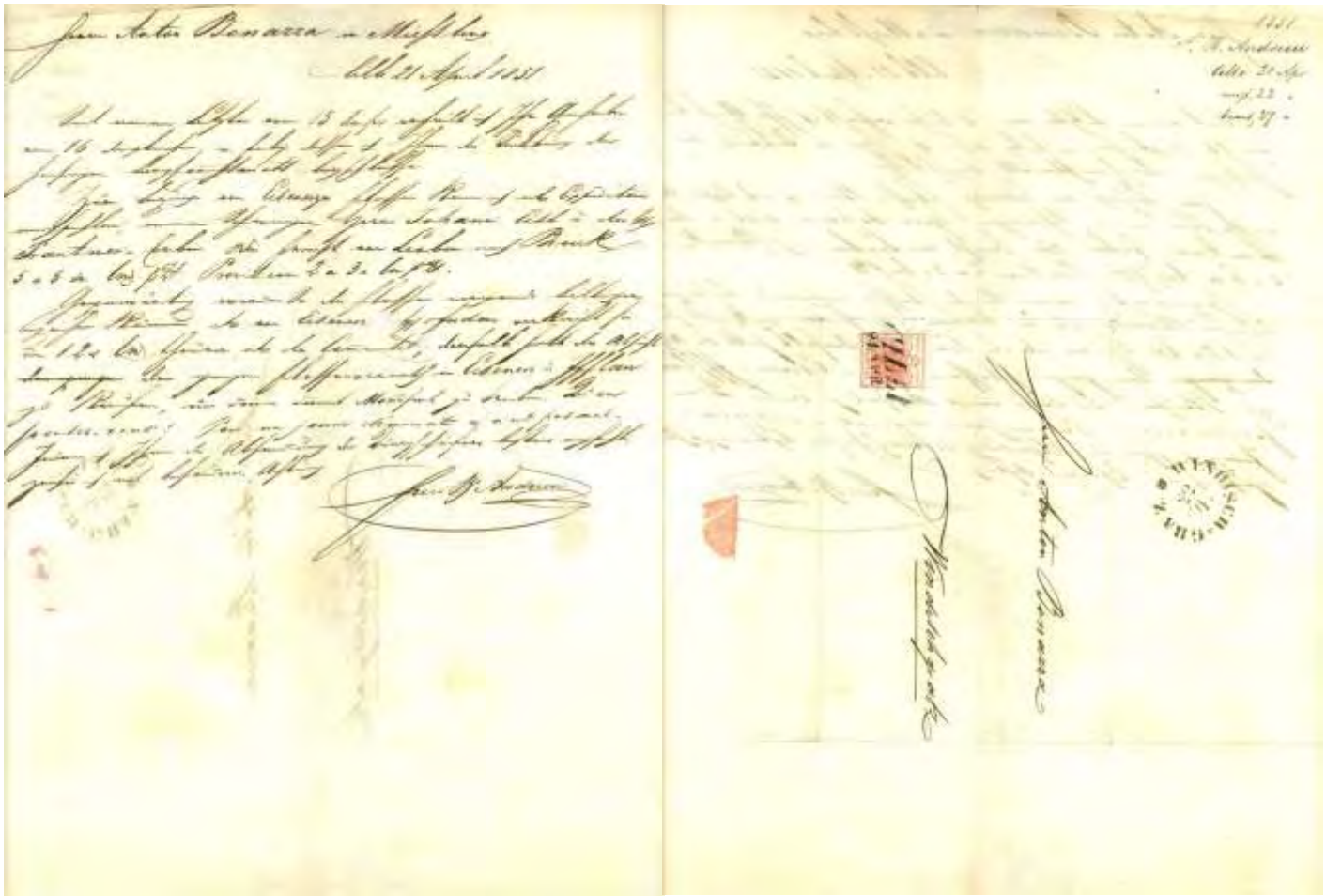


Fig 2: Statement from the Graz-Karlau vital records dated 18 July 1874, when F.B.Andrieu got married for the second time. His date and place of birth are stated in these vital records. Fig 3: The correspondence between A. Bonazzom in Mislinja and F.B. Andrieu in period 1848-1851 (Source: Koroški pokrajinski muzej, Muzej Ravne na Koroškem, Fund Mislinska železarna, Box 1).

blast furnace and elsewhere. Concession claim for the rolling mill proves that his purpose was to roll rails, for which there was great demand on the market in that period. Rails were already rolled in Prevalje and it seems he counted on their cooperation and help.

When he was given concession for the building of the factory, F.B. Andrieu was left without means to purchase the machines and equipment. That is why he accepted on 13 June 1851 Pavel von Putzerja from Bolzano for a co-owner. This co-ownership was not very successful and they parted the following year, when Andrieu sold his concession for the puddling ironworks and the rolling mill, all the estate and the coalmine to Pavel von Putzer on 22 January 1852. Pavel von Putzer became so the sole owner of the factory.

Unfortunately, there are no data and plans on the Štore ironworks building. We don't know the builders nor planners or consultants for the purchase of machines. It is obvious that they were well informed about the novelties in the world ironmaking since the ironworks was modern and technologically well organised for those times. Machine and equipment data are evident from the lawsuit procedure, which was filed in the Celje court for the ownership of concessions and land in Štore. It is evident from the preserved court records how the equipment was purchased. The new factory was actually puddling ironworks with standard puddling furnaces as were then built all over Europe. The waste heat from the furnaces, which originally went out through the chimneys, was used to heat boiler water and to produce steam to drive the steam engines. The factory didn't use water power to drive the machines but had to use steam to drive all the machines, which was top technology in those days. The Štore factory was from the beginning designed as a classical industrial object with modern equipment as was the case in Central Europe and America. The ironworks can be presented as a state-of-the-art design and energy independent factory from the mid-19th century with its own transport capabilities.

F.B. Andrieu used the capital he got for the Štore Ironworks to buy an abandoned dish factory in Graz in 1852, which he adapted for wire drawing and wire nails manufacturing. This factory developed nicely in the next few years. In 1867, Friedrich Bruno Andrieu bought a factory on the river Mürz in a town Bruck an der Mur. He expanded the factory by providing material for his wire drawing machines.

Friedrich Bruno Andrieu had a great influence at building business processes and factories in the 19th century in the towns he lived in. In Štore, where he became the first owner and founder of a modern factory for those times, which later developed into successful ironworks that changed the town. These changes are results of industry. The place turned into a typical industrial settlement and industry was the main activity, which accelerated creation and development of other activities.

It was very similar in Austria, where successful managing of the factory in the town Bruck an der Mur on the river Mürz led to development and industrialisation of the town. F.B.Andrieu was actually the pioneer of a today still very successful wire industry in the town.

The story of life and work of F.B.Andrieu speaks of importance of entrepreneurial spirit for realisation of technical and technological achievements in production and business processes. These achievements were later foundation for the development of potentials in all areas in the towns, where companies developed: be it in art, culture, education, health system, science…and after all generated new entrepreneurial ideas.

Slavica Glavan, Director, Štore Ironworks Museum

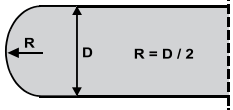
Sources:
- Austrian City Atlas (Österr. Städteatlas), Bruck an der Mur
-Tadej Brate: Po sledeh dokumentov neke pozabljene pravde oziroma Železarne štore v prvih letih njenega nastajanja Štore 1852,Med železom in kulturo-naša dediščina naša pot, Ravne na Koroškem-Koroški pokrajinski muzej 2007, str.80-83) .
-Correspondence between Antonom Bonazzom in Mislinja and F.B. Andrieum in the period 1848-1851, Koroški pokrajinski muzej, Muzej Ravne na Koroškem, Fund Mislinska železarna, Box 1
-Document - Lawsuit between Friedrich Bruno Andrieu and Pavel von Putzerjem from 1852, Zgodovinski arhiv Celje
-Slovenske železarne Železarna Štore, Collection, 1975, Pages 5-12.
-Die Geschichte der Familie Friedrich Bruno ANDRIEU, TYPESCRIPT, private collection /owner Dr. Johanes Andrieu, Landhausgasse 7, 8010 Graz
-Exhibition Stadtmuseum Bruck an der Mur
-Friedrich Bruno Andrieu's Sohne Feinesenwalzwerk, Draht- und Drahtstiftenfabrik, Bruck A.M., TYPESCRIPT, private collection /owner Dr. Johanes Andrieu, Landhausgasse 7, 8010 Graz

Fig 4 View of the factory at the end of 19th century, Slavica Glavan: Štore na starih razglednicah, 2017

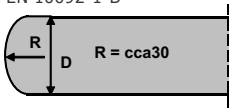
CROSS-SECTION SHAPES

FLAT BARS WITH SHARP EDGES
EN 10058

FLAT BARS
EN 10092-1-A



FLAT BARS
EN 10092-1-B



FLAT BARS
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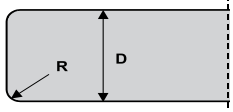
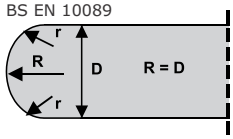


FLAT BARS
EN 10092-2

FLAT BARS
BS EN 10089

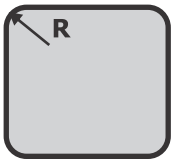


SPRING STEEL:
EN 10089: 51CrV4, 52CrMoV4, 56SiCr7, 56Si7, 61SiCr7, 55Cr3
WNr.:1.5025: 51Si7
WNr.:1.7792: 58CrMoV4

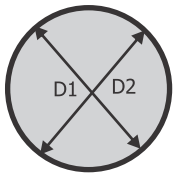
ENGINEERING STEEL:
Forging steel:
EN 10025-2: S355J2, S235JR
EN 10083-2:od C22R, C35R, C40R, C45R, C50R, C55R, C60R
EN 10084: 16MnCr(S)5, 20MoCr(S)5, 20MnCr(S)5
EN 10083-3: 30MnB5, 25CrMo(S)4, 34CrMo(S)4, 42CrMo(S)4,
DIN 17350: 31CrV3, 51CrV4
Carbon steel – for case – hardening:
EN 10084: C10E, C15E, C10R, C15R
Alloyed steel - for case – hardening:
EN 10084: 17Cr3, 16MnCr5, 20MnCr5, 18CrMo4, 20MoCr4, 17CrNi6-6, 20NiCrMo2-2, 18CrNiMo7-6
Carbon steel – for hardening and tempering:
EN 10083-2: C22E, C35E, C45E, C55E, C50E, C60E
Alloyed steel - for hardening and tempering:
EN 10083-3: 30CrNiMo8, 34CrNiMo6, 34Cr4, 41Cr4, 25CrMo4, 34CrMo4, 42CrMo4, 50CrMo4, 51CrV4
Structural steel:
EN 10025-2: S235JR, S275JR, S355J2, E295, E335, E360,
Steel for welded chains:
DIN 17115: 27MnSi5, 20NiCrMo2, 23MnNiMoCr54, 30CrMoV8
Steel for cold forging:
EN 10263: C4C, 17Cr3, 17CrNi6-6, 18CrMoS4, 34CrNiMo4, 20NiCrMoS2-2,
38Cr2, 34Cr4, 37Cr4, 41Cr4, 16MnCrS5, 20MnCrS5, 25CrMo4, 34CrMo4, 22B2
Alloyed steel:
WNr.:1.5231: 38Cr4
EN 10083-3: 30CrNiMo8, 34CrNiMo6, 34CrS4, 37CrS4, 41CrS4, 25CrMoS4, 34CrMoS4, 42CrMoS4, 50CrMo4, 51CrV4
EN 10085: 31CrMoV9
Structural steel for housings of bearings:
DIN EN ISO 683-17: 100Cr6, 100CrMnSi6-4
Steel for heavy duty automotive parts:
WNr.:1.5231: 38MnVS5
VW-TL 1427: 27MnSiVS6, 27MnSiVS6+Ti, 30MnSiVS6
VW-500-30: 36MnVS4, 70MnVS4, 46MnVS5

EXEM STEEL WITH IMPROVED MACHINABILITY:
po WNr.: 20MnV6 EX, 38MnVS6 EX, 30MnB4+Ti EX
EN 10084: C15R EX, 16MnCrS5 EX, 20NiCrMoS2-2 EX, 20MnCrS5 EX,
EN 10084 in UNI 7846:16CrNi4 EX,
EN 10025-2: S235JR EX, S355J2 EX,
EN 10083-2: C22R EX, C35R EX, C40R EX, C45R EX,
EN 10083-3: 25CrMo4 EX, 41CrS4 EX, 42CrMoS4 EX
UNI 7845: 39NiCrMo3 EX,
UNI 7846: 18NiCrMo5 EX,

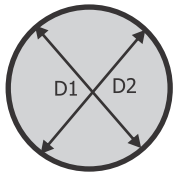
SQUARE BARS
WITH ROUND EDGES
EN 10059



ROUND BARS
EN 10060



BRIGHT ROUND BARS
EN 10278



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
80 x 80	12

FLAT

Standard	Dimensions mm
EN 10058	50-200 x 8-62
EN 10092-1-A	60-150 x 8-36
EN 10092-1-B	50-200 x 8-35
EN 10092-1-C	60-120 x 14-67
EN 10092-2	120 x 12-20
BS EN 10089	60-120 x 27-42

ISO 9001
ISO 14001
OHSAS 18001
BUREAU VERITAS
Certification
SL22548Q / SL22425E / SL22432S

IATF 16949
BUREAU VERITAS
Certification
SLO-20673/TS

ROUND

Standard	Diameter / Process
EN 10060	220–50.5 (korak 0.5 mm), 51 - 58 (korak 1 mm) 60, 62.5, 65, 68.5, 70, 72, 75, 77.5, 80, 83, 85, 90, 95, 100, 105 mm / rolled
EN 10278 (h11)	18–105 mm / peeled
EN 10278 (h9)	18–100 mm / peeled

IATF 16949
BUREAU VERITAS
Certification
SLO-20673/TS

ISO 9001
ISO 14001
OHSAS 18001
BUREAU VERITAS
Certification
SL22548Q / SL22425E / SL22432S

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