



Milestones to Alpine Success

The product range of Ebenseer GmbH, a Rohrdorfer company, is as diverse as it is high-quality: pavers, slabs, modern design elements and attractive wall and boundary systems made of concrete are manufactured at the two production sites in Maishofen and Vorchdorf (Austria) for the regional sales market in Salzburg and Tyrol as well as Upper Austria. The market is demanding for very high standards of the products, as houses and gardens are often located in alpine terrain and therefore exposed to extreme weather conditions. In addition to the visual appearance, technical product requirements such as load-bearing capacity, frost resistance and persistence must be met to an exceptionally high degree for the end customers. In order to be able to guarantee the future-proof production of the entire product range in accordance with the latest environmental, safety and quality standards, Ebenseer GmbH planned an extensive plant modernization project in Vorchdorf, which lasted several months and was recently completed.

The company is thus consistently following the goal of Rohrdorfer, a supra-regionally active building materials producer: The production of high-quality, contemporary and sustainably produced building materials. Ebenseer meets this target, by focusing all processes on a customer-oriented product range. Another central success factor is intensive quality monitoring based on efficient and environmentally optimized plant technology.

In order to be able to produce ambitious quality and quantity, Rohrdorfer invested in a modern, improved production plant at the Vorchdorf site. All core areas of the plant, from the dosing and mixing plant, the block making machine and the ring plant to the packaging and storage of the end products, were renewed step by step.

Milestone 1: Decisive approach in the planning phase

For this major project, Rohrdorfer relied on renowned plant manufacturers from Germany and brought Masa GmbH (block making machine and ring plant), Gasus Dosier- und Fördertechnik GmbH (dosing and mixing plant), Bikotronic-Industrie-Elektronik GmbH (control of the dosing and mixing plant) and Schlicker Metallverarbeitungs GmbH (steel construction framework structures) on board. Looking back,

the extensive coordination phase that took place in the first half of 2021 can be identified as the first important milestone. Targeted discussions at an equal level and concentrated meetings in pandemic times, making full use of the digital possibilities, made comprehensive detailed coordination possible, which was later described by all those involved as very constructive and purposeful. This also showed how important and forward-looking the decision made by Rohrdorfer was for these companies: From day one to the final project completion, all those involved in the technical coordination obviously benefited from the wealth of knowledge and experience that the traditional companies Masa, Gasus, Bikotronic and Schlicker demonstrate.

Milestone 2: State-of-the-art machine technology

Prior to the new construction, Ebenseer GmbH undertook the dismantling of the old production line and the existing foundations in fall of 2021 to subsequently erect the new machine foundations. From December 2021, the installation of the new plant components followed step by step. Masa concentrated on the block making machine as the heart of the production as well as on the pivotal points of the production plant, the transport and handling equipment.

Heart of the production: The Masa block making machine XL 9.1

Masa equipped the new XL 9.1 block making machine (production board size 1400 x 1150 mm) with a wide range of machine features that enable Ebenseer GmbH to manufacture high-quality products for gardening and landscaping in a future-oriented manner. The Masa engineers have succeeded in balancing flexibility and machine availability with an individually tailored XL 9.1. The XL 9.1 meets the customer's requirement to cover the greatest possible variety of products in correspondingly high quality without jeopardizing output expectations with lengthy setup times at the expense of machine availability.

The Masa servo-controlled vibration unit with four synchronous servo motors allows next to the control of the speed also the adaption of the amplitude by adjusting the axis angles. The vibration forces, speeds and shut-off characteristics for the vibration can be stored for pre-vibration, intermedi-

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ate vibration and main vibration depending on the product. These process data, which are often compiled and optimized over a long period of time, can be retrieved from the recipe database for subsequent production of identical products, thus ensuring a very high and fast reproducibility of individual products.

Four non-contact sensors are mounted below the vibration table, which measure the amplitude of the vibration table when needed. The plant operators can monitor the production process very precisely, whenever it is required. The insights into the condition of the vibration table and rubber buffers gained through the analysis enable better planning of maintenance measures. Therefore, unscheduled machine downtime can be reduced.

The bearings of the vibrators are supplied with lubricant cyclically via the automatic central lubrication system. On the one hand, this facilitates maintenance of the vibrators, and on the other hand, the system significantly increases operational safety, as Masa places the lubricant reservoir outside the safety area of the machine.

Especially in the case of wall elements for dry masonry, the exact and parallel positioning of mold and compaction head is important. Masa achieves this on the XL 9.1 with a particularly solid frame design and four hard chrome plated, 120 mm thick guide columns. During the subsequent demolding process, the product benefits from the mechanical mold synchronization of the XL 9.1. The forced synchronous mold guidance ensures demolding that is gentle to the product.

The height limit system, which can be adjusted to the product, enables height-accurate production with tight dimensional tolerances. By using this function, the electrical shut-down of the vibration can be set in a variety of ways in the visualization. Here, the completion of the compaction pro-

cess can take place individually after the first, second, third or fourth distance bolt has been reached. The respective shut-down characteristic for the vibration can be set depending on product and mold and is stored in the product recipe.

The XL 9.1 compensates for production-related installation tolerances of the mold by means of another feature: Hydraulic table plate adjustment. A hydraulic cylinder is mounted on each side of the filling box table (main and face mix), which can move the filling box table horizontally forward or backward to compensate possible installation tolerances in the mold. The cylinders can be individually adjusted either on both sides, only on the right or only on the left via a hydraulic manual control.

The smoothing roller in stainless steel design with adjustable direction of rotation and speed, which is mounted on the face mix concrete filling box, supports, among other things, the production of large-format surface coverings in solid or multicolor colors.

When manufacturing products such as curbstones, the hydraulically driven cleaning device installed crosswise to the filling direction enables fast and reliable cleaning of the tamper head shoes (upper part of the mold).

The fully automatic mold changing system simplifies and speeds up the machine's straightening times, enabling fast changeover between individual products. Masa further optimizes this process with the electrical movement of the face mix filling unit and the hydraulically designed interlocking of the face mix filling unit with the compaction unit. A mold change grab designed as a column-mounted slewing grab (load capacity 3,200 kg) significantly supports and simplifies the handling of the molds. The grab transports the molds quickly and safely to the block making machine with little use of force and positions them precisely there. Standing on



Masa XL 9.1 with column-mounted slewing grab



Pre-wired to the construction site: The Masa Powertainer

a separate foundation and thus decoupled from the block making machine, the grab is not exposed to the enormous vibration forces during compaction of the products.

Both the hydraulic system of the block making machine and the control cabinets of the plant have found their place in the Hydraultainer respectively Powertainer.

Masa has been successfully using these special container solutions for many years as protected and clean locations, which also simplify the installation. Both containers are air-conditioned (by the customer). The Hydraultainer primarily performs a soundproofing function. Its equipment with an oil-resistant floor insert as well as an integrated oil pan offers great safety in the event of possible oil leaks. The Powertainer is the central and clearly arranged electrical control room of the plant. The container concept is also practical because Masa, by supplying the pre-installed, optimized rooms for control cabinets and hydraulic system, replaces the otherwise customer-supplied construction of separate rooms.

Modular transport systems: Wet and dry side

Within the plant, V-belt conveyors transport both the freshly produced and later the cured products. The modular systems ensure independent process sequences in the handling of the production and dry side. On the production side, Masa integrated a module for detailed and reliable quality control: a liftable chain conveyor. It pulls out one production board with freshly produced products at a time into an inspection



Control station for reliable quality control

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station. Non-conforming batches are marked either by machine operation or by a pushbutton at the control point. As soon as the production board passes the sorting point of the V-belt conveyor system, the pneumatically driven Masa tilting device raises the production board to a defined angle. Due to the inclined position the product or material slides into a bin or onto a waste conveyor. Products which do not meet the strict quality requirements of Ebenseer GmbH are sorted out before curing and can be fed into the recycling process if necessary. With this inspection system, Masa ensures continuity in the production process: during quality control, the block making machine can continue the production without interruption.

Quality control also plays a decisive role on the dry side: Only flawless end products may leave the plant in Vorchdorf. Here, the QA module provides a safe place that allows reliable visual inspection of the batches without hindering or slowing down the other automated processes within the ring plant.

Sustainability combined with new technology: The curing area

As the existing elevator, lowerator, intermediate finger car and the original chamber system for curing the products were still functional, Ebenseer GmbH was able to dispense with a replacement here. Masa integrated the existing components into the new plant technology, equipped them with new sensor technology and integrated them into the new bus system. This sustainable decision saved resources and money.

However, Ebenseer GmbH made no compromises when it came to the equipment that must operate reliably, effectively and intelligently and handle the storage and retrieval of the fresh or cured products. The new Masa finger car with turning device (14 t load capacity, 18 floors, 400 mm floor height) takes the sensitive fresh products from the elevator and stores them - documented in the database - in the curing racks. Masa equipped it with an optical data transmission system for wireless, bidirectional data transmission between the upper and lower car of the finger car: Two optical devices aligned with each other serve as transmitter and receiver. The system allows large amounts of data to be processed safely and efficiently. For very precise path detection and position determination of the lower and upper car, for the project in Vorchdorf Masa did not use the standard incremental rotary encoders, but equipped the lower and upper car with laser distance sensors and reflectors. The reflectors are heated so that condensation is avoided.

Quality pays off: Measures and components on the dry side

The high quality demand on the end products runs like a red thread inevitably through the entire plant design. Various protection and packaging devices integrated by Masa into the plant layout, such as a granulate spreader, a fully automatic film applicator or a layer strapping machine on the dry side, actively support the protection of the stone layer surfaces and the horizontal securing of the stone layers.



Finger car in the curing area



Dry side with transition to the packaging area

The basic assumption for a very good production is always a cleaned and undamaged surface of the production boards. Ebenseer GmbH uses production boards from Assyx GmbH & Co. KG, a company also based in Germany. The Assyx Duro-Board® consists of a Kerto-Q LVL veneer laminated wood core from Metsä Wood in Finland, which is protected by an approximately 3 mm thick air- and water-tight Baydur® brand polyurethane sheathing. The wood blanks are sawn out of endless, long, heavily pressed laminated veneer lumber panels. This results in a high level of homogeneous vibration transmission evenly distributed over the entire production board. Cleaning of the production board is another quality feature of the line. Clean boards are temporarily stored in the storage rack of the cross transport system, and clean boards are then available again for the block making machine. This has the advantage that the production boards are always completely clean, which ensures that the molds lie flat and the products are flawless. The cleaning is realized by a special cleaning system from Weber Bürstensysteme. The Crust Cracker® is a self-contained, automatically controlled inline system with five overlapping rotating disc brushes that quickly and thoroughly removes crusted concrete residues or dirt from the boards and effectively prevents new buildup.

Great flexibility: The storage solution for production boards

The possibility of intermediate storage of production boards has a considerable influence on the flexibility of a production plant. Only if the wet and dry sides have the greatest possible independence from each other, product-related cycle time differences within the individual plant sections can be compensated. Also cleaning and maintenance work or troubleshooting in the event of a malfunction can be carried out without stopping the complete production. For these reasons, Masa chose a very comprehensive storage solution in the plant layout, enabling Ebenseer GmbH to make a significant quantum leap in terms of flexibility within the plant. Whereas the previous storage solution was designed for 300 production boards



The new transport carriage with turning device and telescopic mast reliably takes over the storage and retrieval of production boards



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on one level, the new area now stores up to 1,560 production boards, which can be placed in stacks of 20 boards each in two rack aisles with a rack depth per aisle of 13 stacking locations on each of three levels. For optimal space utilization of the free area on the opposite side of the actual ring plant, Masa equipped the transport carriage for production boards with a turning device.

Modernization measures in existing plants and halls often present the project managers with exciting challenges resulting from the spatial conditions and available space. In the Vorchdorf plant, the transport carriage now runs under the existing concrete feed with a technical trick of the Masa design engineers. By means of a telescopic mast, the transport carriage adapts to the respective possible clearance and working height.

Another Masa component in the storage area of the production boards provides Ebenseer GmbH also more flexibility: As a matter of principle, the cleaned boards are turned over after



Shifter unit with vertical turning gear for individually adjustable handling of production boards

the return transport in order to ensure uniform use on both sides. For the Vorchdorf plant, Masa supplied an individually adjustable component: a shifter unit with a runway, lifting/lowering unit and clamping basket with vertical turning gear staples two production boards (previously collected from the return transport) and forms stacks of 20 boards on the subsequent transport conveyor. Depending on the requirements and the product, the shifter unit first turns the boards by 180°. This vertical rotation can be selected individually.

More space for packaging: packaging and cube transport

The idea of flexibility was also the decisive point in the area of cubing, packaging line and cube transport. The investment in a very clearly designed solution now replaces the previous, rather complicated system design in this area. As a result, both the demand for high availability and the goal of flexibly and optimally preparing a wide variety of end products for transport by means of individual, high-quality and extensive packaging can be realized in parallel at the Vorchdorf plant. The be-all and end-all of reliable packaging is precise and at the same time careful cubing of the end products. The starting point of the cubing line is the Masa Cuboter. The Masa cubing system with highly dynamic servo drive solutions stands for speed, high positioning accuracy and high load-bearing capacity, while at the same time being equipped with energy-efficient Moviaxis components in an inverter system. For Ebenseer GmbH, Masa planned the track of the Cuboter in a short version to meet the requirement for short cycle times. With the integration of the downstream packaging machines (film applicators, horizontal and vertical cube strapping machines), Masa provides Ebenseer GmbH with all the options for optimum preparation of the finished stone cubes for transport. The required consumables such as plastic strapping and film are stocked centrally and are quickly available. The machines installed in the cubing area in particular require more space in order to make full use of their possibilities, which in many production plants is partly at the expense of the pickup positions at the end of the cubing line. However, since Ebenseer GmbH also placed an uncompromising focus on high plant availability here, Masa developed a plant concept with a separate cube conveyor for the cubing line, a cube shifter and a second cube conveyor for the removal of the finished cubes. The cube shifter is designed by Masa with a track, longer lifting mast, a horizontal turning device and special clamp equipment so that it can stack (double) the stone cubes with short distances between the cubes and in a space-saving manner. This function optimizes the removal of the cubes by forklifts and the transport to the storage areas in terms of time requirements as well as warehouse logistics. Flexibility is also provided by the safety area for cubing, which is decoupled from the areas for cube shifting and transfer operations: the Cuboter can continue cubing without losing time, irrespective of set-up work on the packing machines (e.g. changing the strapping bands), while the cube shifter can continue placing the cubes in the correct position. In view of any maintenance and repair work that may be required on the shifter, the Masa concept also provides a separate pickup

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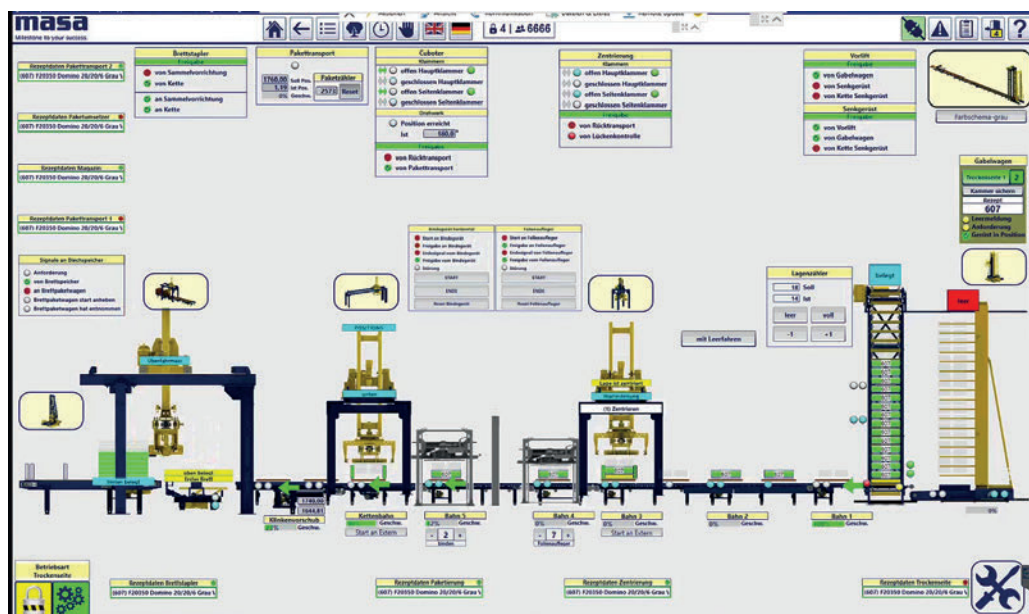
The cube shifter grabs the finished cubes with a special clamp and positions them

station for cubes on cube transport 1, thus avoiding time losses or downtimes at this point as well.

Alen Avdibegovic, Project and Plant Group Manager East, sums up the entire rebuild project at the Vorchdorf plant once again: "The new plant uses the most efficient plant technology and electronics currently available on the market. The design of the workplaces has been rethought. The clarity of the ring plant promotes cooperation among the production team. The optimized process flow has further reduced idle times."

Milestone 3: Transparency in plant data

Masa equips each concrete block production plant with modular software for uniform operation and visualization of the components. The Basic version includes tools for visualization, product management and production data acquisition as well as password protection and language switching. The visualization software enables the operating personnel to monitor the plant on the PC, with the plant images used allowing quick orientation in the plant. The product management software enables the plant to be controlled by means



Visualization of the dry side



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of product recipes. All relevant information for the production of a stone type is stored here (such as data on the material mixture, determination of the driving mode of the finger car, data on the compaction of the stones, etc.). The software for recording operating data (PDA software) enables the operator to statistically record and evaluate the process data generated in the block production plant. The connected fault tool signals any faults that occur, enabling them to be localized and rectified quickly and precisely.

Transparency plays a very important role for Ebenseer GmbH. In this respect, it is essential to have a sufficient number of relevant plant data that can be logged and evaluated. The Masa programmers created the plant control software for exactly these requirements in the two expansion stages "Advanced" and "Professional". At the Vorchdorf plant, the installed Professional version offers numerous tools that allow conclusions to be drawn about the productivity and efficiency of the plant, enable cause research in the event of production interruptions, or tools for optimizing the plant, e.g.:

- Input history in the product data management: By means of an input logging, all operating actions can be traced (e.g. parameter changes). These changes are saved with the current user data and a time stamp. The old and new parameter values are displayed.
- Recipe comparator: A comparison function allows two product recipes to be compared with each other and the history of a product recipe to be viewed (using date preselection). Changes are marked.
- Mold management: A list function allows product recipes to be assigned to the various molds of the block making machine. A photo of each mold created can also be stored. A separate counter records product-specific production cycles of the mold, which are logged.
- Automatic recipe change: By means of a telegram shifting system, the product layers report to the respective

plant sections. This is followed by an automated change-over of the parameter values, which enables a product changeover on the dry side "on the fly" in a time-saving manner. This means that - in contrast to a manual recipe change - it is no longer necessary to empty the entire return transport. Recipe preselection is performed at a higher level, eliminating the need for changeovers at the individual stations.

- User management: The rights and function management ensure simple and clear operation. A separate password level from level 0 to 6 can be defined for each user. The password level (read and write) can be defined for each parameter in the product data management. The tool avoids unauthorized changes, which could also have a negative impact on product quality.
- Order management: A separate order preselection list allows automated processing of the specified products in terms of quantities.
- Logging: Continuous logging via Ethernet interface allows the output of shift logs as a predefined XML file for further processing. After the end of the shift, the corresponding log can be sent by e-mail to any address.

Project finalization and commissioning

The manufacture of saleable products is always preceded by rapid and, above all, smooth assembly and commissioning. The Masa service team coordinated the on-time delivery of the individual components and assemblies as well as the actual assembly process. During the coordination between project managers on site, Masa fitters as well as the local specialists, the Masa team proved to be professional and attached great importance to an open and target-oriented communication. The first saleable products were finally manufactured at the end of February 2022.

Project impressions before - after



The new Masa XL 9.1 with decoupled column-mounted slewing mold change grab

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Project impressions before - after



The wet side has now a station for safe discharge and quality control of the products

The stacks of production boards are well prepared and transferred to the storage area



The new storage area offers space on several floors for the flexible temporary storage of up to 1,560 production boards

The redesign of the cube transport offers with the Masa shifter a lot of flexibility for the storage of the cubes ready for shipment



Due to the increased overall productivity made possible by the new plant, the Ebenseer company plans to create up to five new jobs in the next 18 months. "Our goal is to produce high-quality and innovative products for the region using raw materials from the region," says Jakob Socher, head of Rohrdorfer's concrete products division and managing director of Ebenseer GmbH. "We are very pleased that the modernized plant in Vorchdorf will enable us to meet the wishes and needs of our customers even better. Short distances in the entire value chain represent an essential and immediately effective contribution to the protection of our environment. The Vorchdorf site meets the conditions for Ebenseer to achieve CO₂-neutral production of its concrete products by 2040."



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About Rohrdorfer

With a focus on sustainability, quality and customer orientation, Rohrdorfer, founded in 1930, produces high-quality building materials for regional needs at 142 locations in Germany, Austria, Italy and Hungary with 2,130 employees. The product range includes cement, ready-mix concrete, precast and concrete products as well as sand and gravel. Rohrdorfer is aware of its ecological and social responsibility and strives for harmony between economic goals and ecological values in all its decisions. With numerous initiatives for resource conservation and innovations, such as the first plant for CO₂ recovery in a German cement plant or Europe's first waste heat power plant, Rohrdorfer is a pioneer on the way to CO₂-neutral building materials production. The company is headquartered in Rohrdorf, Bavaria.

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