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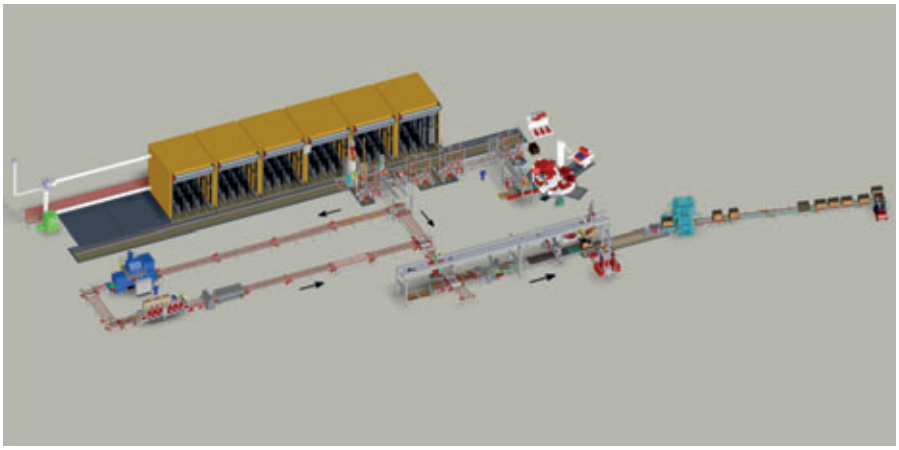
State-of-the-art tile production plant with finishing at BraunBeton in Baiersbronn

The family-owned company BraunBeton from Baiersbronn decided in 2012 to build a new production hall where a SR-Schindler tile production plant with finishing line and flat/upright packaging is now running. BraunBeton, known over many years as supplier of high-quality hermetic tiles, decided to expand its manufacturing capacities with the purchase of a 1200-tons hermetic press and to extend the product range by adding a new finishing line. The plant was delivered and installed in May 2013 and has been in operation since the end of 2013.

Like all large-scale SR-Schindler plants, care was taken in the conception to reserve space for subsequent extensions. In the current 1st stage the plant consists of the 1200-tons hermetic press with marbling and colouring device, the horizontal depositing devices on the wet and dry side, a finger car, a drying chamber with vaporisation, the finishing line with shotblasting and curling unit, and a Bürkle coating line. After finishing the tiles are packaged in a combined flat/upright packaging unit.



Extension stage 1

BraunBeton mainly uses the 1200-tons press to manufacture the formats 40/40, 60/40, 80/40 and 60/60 cm with a tile thickness of 40 - 42 mm. The tiles always consist of 2 layers, i.e. facemix and backmix concrete. Material is supplied by a mixing plant from Pemat with a PMPL 375 planetary mixer for the facemix and a PMPL 750 planetary mixer for the backmix. The press, as the core of the plant, consists of 7 stations and can manufacture formats up to max. 800 x 1,000 mm and thickness of 30 and 100 mm. The press operates with a press cycle of 12 – 15 seconds, depend-

The new production hall at BraunBeton in Baiersbronn

The hermetic press can manufacture formats up to max. 800 x 1,000 mm

ing on the product format and thickness. The max. pre-pressing force is around 80 t and the max. main pressing force 1,200 t.

The production cycle begins with the filling of the facemix by the first layer doser. The FMC marbling and colouring machine can be mounted at the first layer doser if required for the manufacture of two-colour, multi-colour or marbled tiles.

The facemix poured into the moulds is vibrated in the subsequent stations until pore-free and distributed evenly in the mould by first layer distributors. The vibrators are separately controllable. The first layer distributor is equipped with self-cleaning plastic distributors in order to avoid the adherence of material. Mould cleaning and mould changes are carried out at one of the vibrating stations.

The press is equipped with a separate single mould activation that allows sample tiles to be produced in just one station or to complete production, even if rubber matrices are worn in one or more stations. In this case these stations are not filled, hence no rejects are produced.

After the filling of the facemix, the backmix is filled into the mould by the latest generation of the backmix feeder, the Exact 9000. The backmix feeder is designed in such a way that conical tile shapes are avoided as far as possible and the scraping of surplus material from the mould is considerably reduced due to the even material distribution. Displacement of the facemix is minimised by the feed box travelling back and forth and filling the mould layer by layer.

The upper part of the Exact 9000 and the moving assembly can be adjusted in height by electric motor, allowing adaptation to different mould heights in a few seconds. The entire unit can be moved radially away from the press for fast cleaning.

Following the pre-pressing and main pressing processes, whose pressing force and time can be adjusted according to the format and thickness of the tiles, the green tiles are discharged onto a tile depositing carriage. It is possible to retrofit a vacuum-assisted discharge system for thin and/or large sized tiles that fixes the products by vacuum during the demoulding process.

The Siemens S7 controller for the press is located in a control cabinet. Operation takes place using a control panel with touch screen and visualisation.

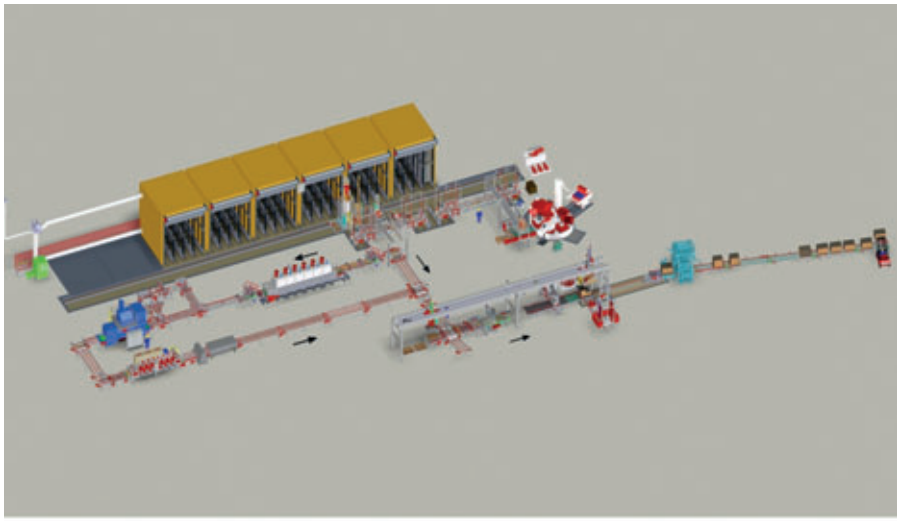
A green-tile turning device picks up the green tiles from the tile depositing carriage by vacuum, turns them by 180° and transfers them to the green-tile transfer device. The green-tile transfer device places the tiles face upwards on the steel pallets of the flat depositing device. The green-tile transfer device is designed to allowing the retrofitting of a second trolley serving a direct washout plant, which is then also to be retrofitted. The flat depositing device on the wet side consists of 8 stations. The transfer device is equipped with a 90° turning device so that the tiles can be positioned freely on the pallets depending on their format.

In the event that the green tiles are placed on the horizontal depositing device with the backmix side facing upwards, the green tile turning unit is deactivated and the green-tile transfer device fetches the products directly from the tile depositing carriage.

The flat depositing device on the press side consists of the take up device for empty pallet stack, the pallet separator, the depositing position for green tiles, 3 control stations, loaded pallet stacker and

Packaging unit with 2-sided grab for tile packages

Flat/upright packaging unit with robot for the placement of wooden strips



Extension stage 2

tower output. Each pallet stack consists of 21 steel lattice pallets with support plates and a support pallet. The steel lattice pallets, support plates and support pallets are galvanised in order to avoid rusting in the humid environment of the drying chambers and thus rust spots on the products.

The flat depositing device on the press side and the green-tile turning device are operated by a separate Siemens S7 controller with touch screen and visualisation.

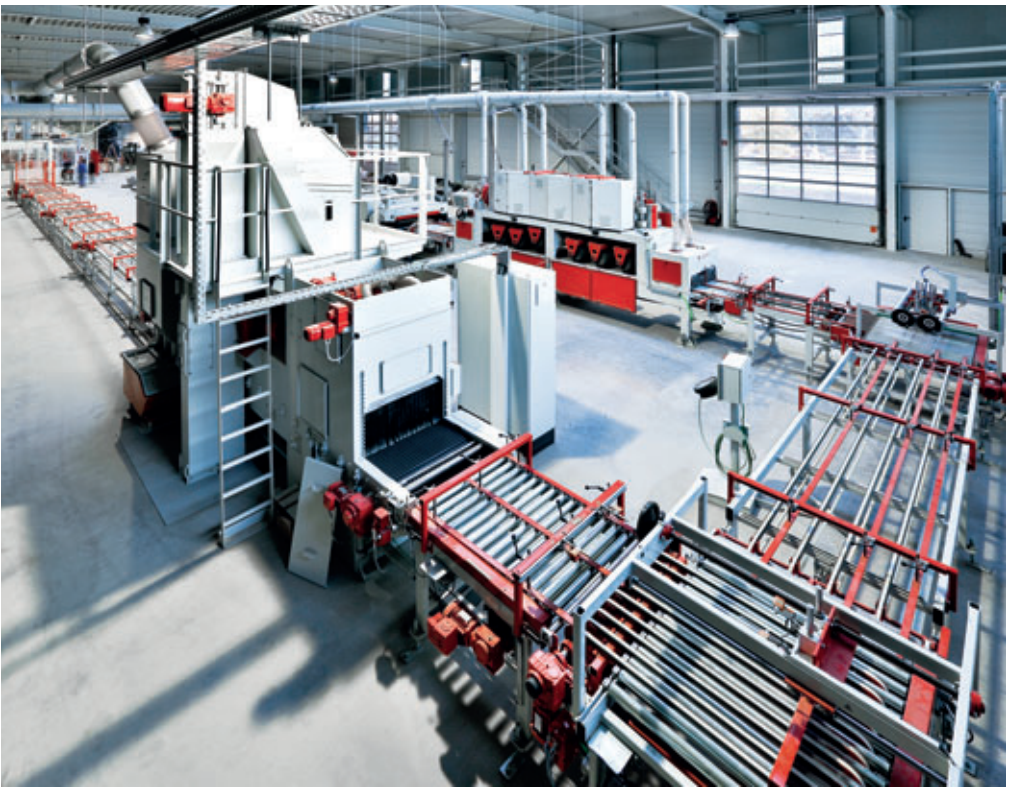
The fingercar transports the pallet stack with the pallets occupied with green tiles into the drying chamber. If necessary, the fingercar fetches a stack of empty pallets from the drying chamber or from the flat depositing device on the dry side and transfers them to the stack feeder of the flat depositing device on the press side.

The drying chamber consists of 6 chamber units with 6 roller shutters (including 2 empty chamber units), each with 4 storing places for double stacks. This results in a storage capacity of 2,816 pallets for a production time of 12 hours with a press cycle time of 15 seconds. To accelerate hardening, the drying chamber is equipped with a vaporisation system that allows products to be removed from the chamber after 8 - 12 hours, depending on the format and thickness.

The pallet stacks with the hardened tiles are transferred by the fingercar to the flat depositing device on the dry side. Here the pallets are separated and the tile transfer device removes the products and places them on an angle transfer device. The angle transfer device then transports the tiles either into the finishing line or by means of belt conveyors to the flat/upright packaging unit. The emptied pallets are automatically cleaned and lubricated in the flat depositing device and subsequently piled up to form an empty pallet stack, which is collected again by the fingercar.

The finishing line has a working width of 800 mm and consists of a belt conveyor on which the products are placed by the tile transfer device of the dry-side flat depositing device in a single or double row and transported to the shotblaster. The conveyor is around 30 metres long so that a grinding machine can be integrated in a further stage of extension.

The shotblaster with conveying equipment is designed such that the machine can be emptied at short notice in case of a backlog of products.



View of the finishing unit from SR-Schindler

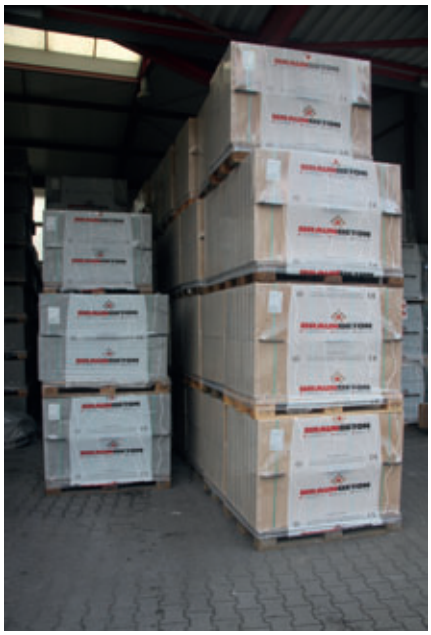
After blasting, the tiles are transported onwards by angle transfer devices and belt conveyors to the curling machine. The tiles pass through the curling machine with its six brush rollers in a continuous stream. The pressure of the brushes is controlled by the current consumption. There are three brushes in each tunnel, suspended at an angle of approx. 25°. The brushes are coated with different degrees of carborundum (SiC), wherein the brushes are arranged in the machine in the order coarse to fine. Brushes 1, 3 and 5 run in the opposite direction to brushes 2, 4 and 6. Due to this counter-rotating processing and the mirrored inclined position of the brushes, line traces of the brushes on the surface are avoided. The curling is followed by the coating line, which was provided by the customer.

The finished refined products run via belt conveyors to an angle transfer device. Here they are formatted for upright or flat packaging and transported onwards by the transfer device to the tile erector or to the collection position. Before packaging, the 2nd and 3rd choice products are automatically removed on the quality control section.

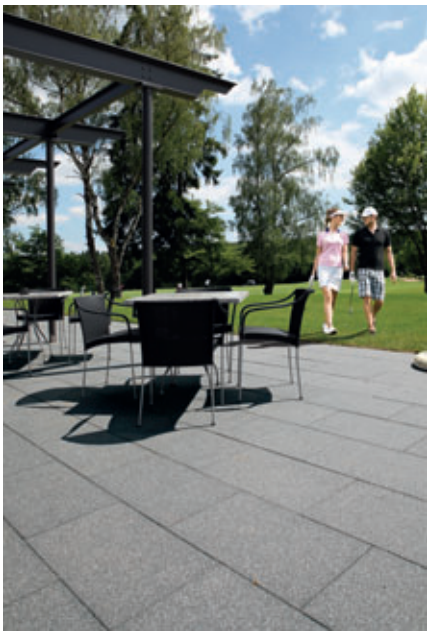
In the case of upright packaging, the tile formats 40/40, 60/40, 60/60 and 50/50 cm are formed by the lifting and turning table and tile erector into one tile line, one behind the other, or two tile lines, in pairs next to each other, which are placed by the hydraulic 2-sided grabs of the transfer device onto a conveyor and transported through the packaging stations. In the packaging stations, cords are pulled between the tile packages to protect the edges; subsequently the packages are vertically strapped. The 2-sided grab of the transfer device picks up the finished tile packages again and places them on the Europallet, which is inserted in the loading position by an automatic empty pallet magazine. For protection, a robot places wooden strips or plastic intermediate layers on the tile packages, which are stacked on top of one another.

Products that are packaged flat, for example the formats 20/20 cm, 80/80 or 80/100 cm, which have been formatted into layers capable of being packaged by means of a stopper system and a compression device, are picked up by a second trolley with a suction gripper, which is also mounted on the transfer device, and placed on the pallet. Afterwards the products likewise pass through the vertical strapping unit.

After strapping, the flat and upright packaged tile packages are covered with a stretch film in an automatic machine and in this way firmly fixed to the pallet. Finally, a



Upright packaged products



Sand-blasted tiles

FURTHER INFORMATION

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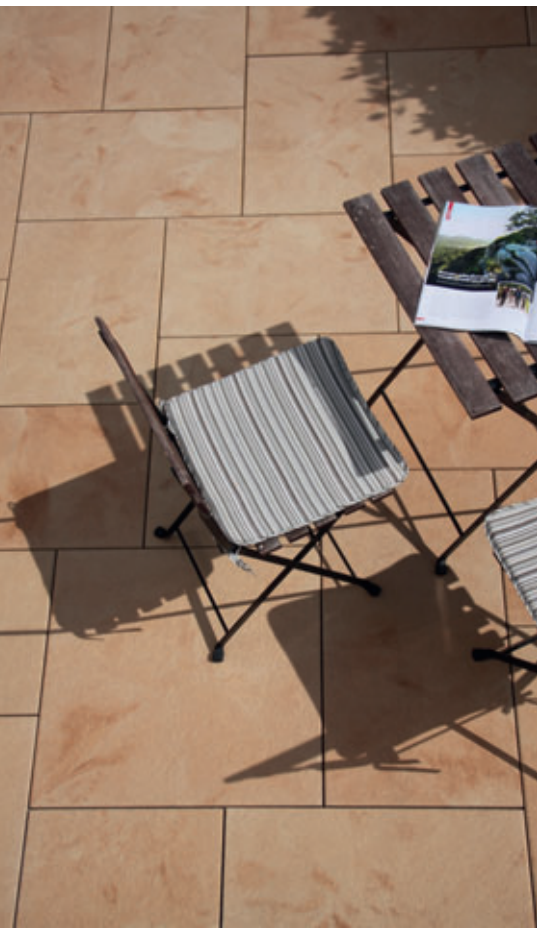
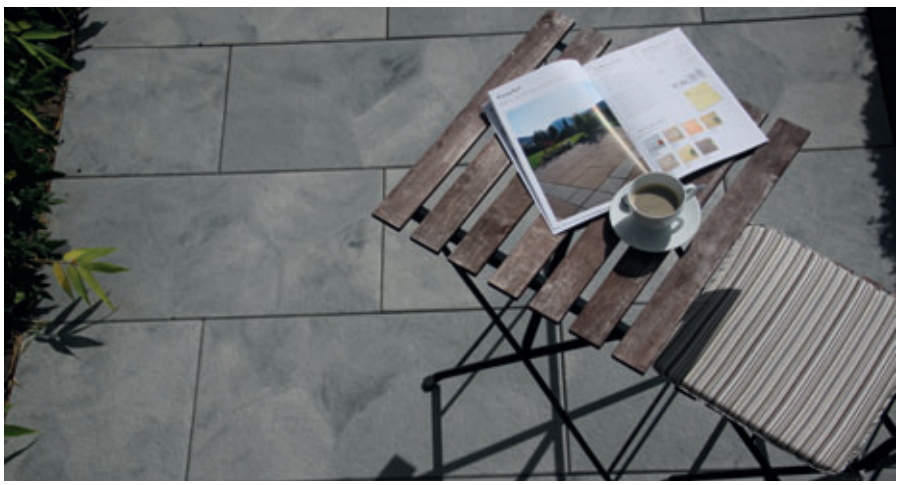
chain conveyor transports the packages to the fork-lift truck collection position.
The entire SR-Schindler plant has 7 individual Siemens S7 controllers in a total of 11 control cabinet fields, as well as 3 control cabinet fields on the curling machine, 2 fields mounted on and moving with the fingercar, and a central control room controller. The plant is operated via mobile and stationary panels. All controllers are networked with one another via Profibus; several decentralised I/O connections are distributed around the plant and likewise connected via Profibus. Universal remote maintenance is thus possible via the integrated VPN router.

The entire plant complies with the EU safety regulations and is equipped with fences and doors as well as corresponding fail-safe control.





Coloured, blasted, curled and coated tiles