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Unglehrt builds high-performance concrete paving stone production plant on green-field site

The building contractor Unglehrt has undergone an impressive development in the 125 years that have passed since its founding in Memmingen in 1890 by the master builder Franz Unglehrt. The company, which was transformed into Unglehrt GmbH & Co. KG in 1979 and is still headquartered in Memmingen, is managed today in the 4th generation by Thomas and Jürgen Unglehrt. Apart from construction work, the name Unglehrt stands for high-quality concrete products. Concrete pavers, including kerbstones, gutters and edging, as well as concrete manhole systems and special articles are produced in the Bad Grönenbach plant, in the midst of the Darast superregional gravel quarrying region. Unglehrt reacted to the growing demand for monolithic concrete manhole bottoms and a raised quality concept with the modernisation of the manhole bottom and manhole ring manufacture with two new systems from the Italian company Colle (detailed report in CPI 4/2014). The next step on the agenda was the modernisation of the concrete block making machine. The original plan was to replace the existing block making machine, which has been in use at the Bad Grönenbach site since 1998. The outcome was, however, ultimately an entirely different one and a new plant was built on a green-field site in Aitrach, a few minutes by car from Bad Grönenbach. Unglehrt built the new production buildings itself. Frima of Emden supplied and installed the concrete block making machine as well as the main components of the plant equipment on the wet and dry sides. Kniele was commissioned to supply the complete mixing technology, while HS Anlagentechnik supplied the curing rack, complete with façade. The CDS Group from England supplied the associated air recirculation system. CDS also supplied the noise insulation enclosures for the concrete block making machine and the hydraulic unit.

Mark Küppers, CPI worldwide, Germany

In the 125th year of its existence, Unglehrt can also look back on 115 years of experience in the production of concrete products. In 1900, i.e. ten years after its establishment as a building company, Unglehrt had already expanded its fields of business and had begun with the fabrication of cement pipes and concrete products. In the years that followed the building company was expanded by further fields of business - underground construction, road construction and hydraulic engineering - before Unglehrt's product range pushed onwards into new dimensions with the commencement of precast concrete element production.

That marked the birth of a rapid development into one of the top suppliers in industrial and commercial turnkey construction. Today, project sizes of up to about € 15 million are completed on time at fixed prices. Unglehrt stands for tailor-made conception, high quality of workmanship, adherence to delivery dates and cost-effective solutions.

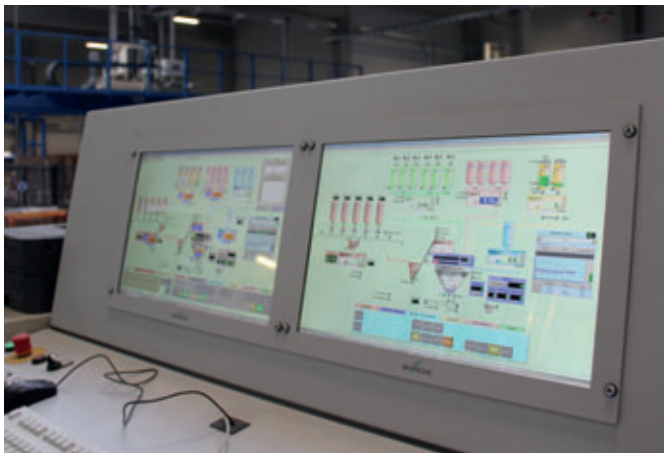
Unreinforced and prestressed precast concrete elements are produced today in the plant in Bad Grönenbach. The plant is one of the most efficient works and is equipped with modern formwork technology. The company delivers and installs with its own special vehicles and specialist freight forwarders as well as reliable fitting companies.

Success with concrete paving stones from the outset

Unglehrt has been producing concrete hollow blocks and pavers since the 1950s, initially on mobile block making machines, later on stationary multilayer machines. In 1998, shortly before the turn of the millennium, Unglehrt put a fully automatic production line for concrete paving stones into operation – a board circulation plant with high-bay warehouse. Manufacturing is subject to very high quality standards.

Up to this point in time (65 years), the company had its own secure supply of raw materials at the Darast site. Due to its high own requirements, however, the limits of the

Unglehrt's new concrete block plant in Aitrach



Everything in view: a control panel for the entire mixing equipment is located centrally in front of the concrete block making machine in the production hall

All control cabinets are grouped together in one room

gravel quarrying gradually came into view. This gave rise to the idea of investing in a long-term solution at a new site with a better raw materials situation, rather than modernising the concrete block production at the Bad Grönenbach site.

As the largest indirect shareholder of a gravel quarry in Aitrach, the obvious thing to do was to build a new site for the concrete block production here. The relocation has meant a considerable reduction in the concrete consumption at the Bad Grönenbach site and the still existing raw materials will last for a much longer time. Unglehrt purchased a plot of land in Aitrach for the new concrete block production plant.

Unglehrt set about looking for suppliers in 2014. Numerous concrete block plants were visited in Germany and abroad. The overall impression and the suitability of the package on offer were important to Unglehrt. By the turn of the year 2014/2015 the suppliers had been finalised. Kniele was awarded the contract for the mixing equipment.

Complete mixing technology from a single source

The building project commenced in May 2015. By August the hall was far enough advanced for the assembly of the plant components to begin. The first tests were already running in November.

Kniele installed conical mixers for the core and facing concretes in the new plant in Aitrach. The mixers produce a homogeneous mixing quality and are also suitable from the production of small quantities. Furthermore, the fast, complete discharge and the simple, fast cleaning, which is important above all when changing colour, were properties that appealed to Unglehrt.

The automatic mixer cleaning enables colour changes within a very short time. According to the supplier it is only important that cleaning takes place regularly. The washing water is automatically drained away and the cleaning water can be reused for the next mixer rinsing procedure. As a result, very little fresh water is required for the cleaning.

Unglehrt built two concrete silo rows for the storage of the aggregates. These are set into the ground and can thus be filled easily and directly from the truck. This means that the aggregates can be stored virtually frost-free. The aggregates are protected by hydrauli-

Facing concrete mixer from Kniele; it empties onto a conveyor belt below the mixer

Core concrete mixer from Kniele

A board buffer served by a board stack conveyor is arranged in front of the concrete block making machine

cally operated covers. In addition, there is a possibility to load special aggregates for the facing concrete.

The facings are dosed using vibrating chutes in order to achieve the required dosing accuracy. Both in-line silos are equipped with mobile aggregate weighing batchers.

The aggregates run off the belt directly into the two lifting buckets that feed the two mixers at the higher level. The lifting buckets are equipped with a rubber lining and a special fall protector (double rope drum with suspension and safety rope).

The cement is stored in the cement silos. A double-chamber cement weigher is installed here to prevent any undesirable contaminants getting into the facing concrete mixer. The controller, including the water dosing system, comes from Bikotronic.

The concrete mixers empty downwards directly onto discharge belts that transport the concrete into the silos of the block making machine. The belts reciprocate so that the concrete is distributed better in the feeding silo and there is less segregation.

Frima HP1200 block making machine with core and facing part and board feeder

The main component of the new concrete block manufacturing is the block making machine itself, the Frima HP1200 with core and facing part and board feeder.

As a static board machine, the HP1200 was conceived in terms of both its performance range and its functional equipment for very high production outputs. The main focus during the development was on industrial suitability and ease of operation. The results are a very stable frame construction as well as components that are easy to install and maintain. A further advantage of this flexibility concerns the control technology. Whether central or local automation structures - extensions can always be adapted accordingly.

The HP1200 can be used for the production of numerous concrete building materials such as pavers, kerbstones, concrete slabs, hollow masonry blocks or garden elements.

Central control station for all system components in front of the CDS noise insulation enclosure for the Frima block making machine

Windows in the noise insulation enclosure allow a very good view of the Frima HP1200 while the production can be followed in real-time on the monitor.

The concrete mixers empty onto discharge belts that transport the concrete into the silos of the block making machine.

Frima HP1200 block making machine in operation

Unglehrt selected several additional options for the machine equipment, such as the Frima servo vibration for a further optimised compaction of the products.

Frima servo vibration

In the vibration system, which consists of four vibration-proof synchronous motors, four imbalanced weights are driven per servo converter. A positioning program permanently synchronises the current positions of the motors with the positions of the other motors in the virtual group.

Due to the mass distribution in the drive, the vibrating table is virtually free from vibration at full drive speed. If a vibration impulse is required, the mass ratios are changed by shifting the imbalance positions in relation to one another within a space of milliseconds.

The vibration system allows very high repeatability of the force and duration of the vibration. The individual setting of the speed between 2500 rpm and maximum 3800 rpm as well as the vibration force of

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The fresh products are transported by a walking beam conveyor on the wet side to the elevator with 23 levels

Once the elevator is completely filled, the Frima finger car takes over the fresh products on the 23 production boards.

Specially galvanised curing rack from HS Anlagentechnik for 4186 production boards

up to 250 kN make this system very flexible. Through the mass distribution in the vibrating table, as well as the synchronised control of the mass imbalances, the mechanical vibration (amplitude) required for the vibration is aligned linearly and vertically.

Individual settings made via the visualisation system ensure an effective force dosage in the vibrating table, which can be precisely tuned to the product.

Other additional features include the transverse cleaning of the tamper and the central lubrication. The downtime when changing the product is reduced by the automatic mould change lifting device and mould intake.

The complete concrete block machine is housed in a noise insulation enclosure made of acoustic panels by CDS. This reduces the noise level in the production hall to approx. 85 dB. The Frima HP1200 can be fully observed during production from the control station outside the cabin through glass panes in the enclosure. The processes are also all visualised on screens.

A board buffer served by a board stack conveyor is located in front of the concrete block making machine. This conveyor also automatically supplies the destacker, from which the production boards are fed individually and cyclically to the concrete block making machine. Unglehrt produces on softwood boards.

The fresh products are transported by a walking beam conveyor on the wet side to the elevator with 23 levels. The products are brushed off with a stone brush if necessary.

All Frima components on the wet and dry sides are supplied by the central hydraulic system.

ProfiNet

The entire Frima system is networked via ProfiNet, allowing a detailed diagnosis of all local modules up to the displacement measuring systems and the individual sensors in the system. Networked power supplies and circuit breakers provide accurate information about the current state, such as the current load and voltage of individual potentials and the states of the circuit breakers.

Large-chamber air circulation system from CDS

The entire interior air is recirculated by three main fans arranged laterally

Messages for safe functions spanning the entire system such as emergency stop or the release of safety zones are also handled by the network function, as is the system-wide communication, including communication with external control systems, as well as the remote serviceability of all assemblies such as frequency controllers, position measuring systems and control components.

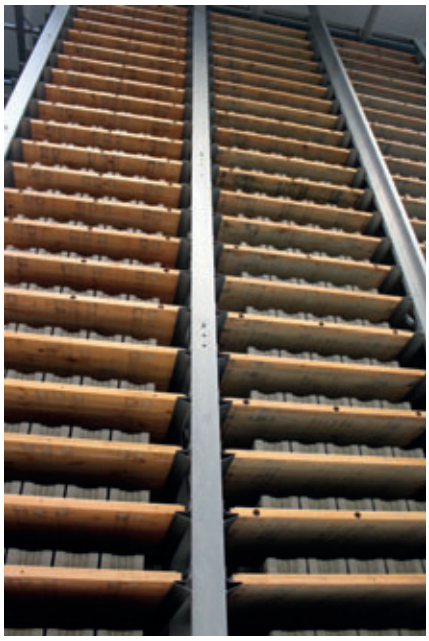
Energy

Unglehrt has taken a step towards saving energy costs by installing photovoltaic systems on the hall roof and on a large open space, with which up to 50 % of the required energy is produced by regenerative means for the company's own consumption.

Specially galvanised curing racks from HS Anlagentechnik for 4186 production boards

Once the elevator is completely filled, the Frima finger car takes over the fresh products on the 23 production boards. The finger car, which features a turntable and support arm adjustment, then takes the fresh products to the designated location in the rack of the drying chamber for curing.

The finger car controller is located next to the operating console for the concrete block making machine and is similarly equipped with a visualisation. One can thus see at a glance the current occupancy of the rack and the current activity of the finger car.



A special feature from HS Anlagentechnik is the special support profile with a length of up to 9 m

The dry side is served from the drying chamber by two lowerators.

The HS rack system is designed as a free-standing hall with roof and wall cladding and, together with the partition to the machine area, forms a large-chamber system.

A special feature from HS Anlagentechnik is the special support profile, which not only makes the overall design very stable with a length of up to 9 m, but also offers a high level of safety during production with integrated lateral board guidance right to the end of the chamber.

The spacious rack system consists of specially galvanised steel profiles, HS Anlagentechnik's core product.

ZM300 special galvanisation

Protection against corrosion is generally achieved through the ZM300 special galvanisation. With smaller layer thicknesses this ternary alloy of zinc, magnesium and aluminium promises at least double the corrosion protection offered by conventionally applied piece galvanisation (practical test by an accredited testing laboratory according to ISO 17025, May 2010), while at the same time exhibiting a much better deformability behaviour. The cathodic protective effect of the cut and punch edges has also proven to be much better; the intermetallic connection MgZn2 is available as a sacrificial anode.

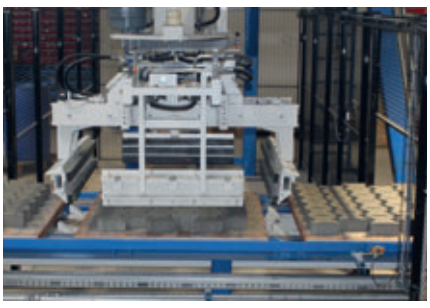
Apart from the special galvanisation, the HS rack systems are also characterised by the fact that they are always free-standing. They therefore form a statically closed system that doesn't require additional stabilisation.

CDS rounds off the product range for curing

In the field of air recirculation and curing systems, HS Anlagentechnik entered into a close and successful cooperation with the renowned CDS Group from England ten years ago. As a result, the customer can be offered the full range of products for curing, with long-proven and continuously improved systems.
CDS was responsible for the installation of the large-chamber air circulation system.
With three main fans arranged at the sides, the entire interior air is recycled in order to maintain a uniform temperature and humidity with a condensation-free environment. With a sensor-controlled exhaust fan, the air humidity or temperature can be limited to an arbitrary maximum value from which fresh air is added.

The production boards from the two lowerators are merged via a bypass onto a common transport line, a slideway.

Visualisation of the dry side on the monitor at the control station



The stone releaser pushes the stones together, thus releasing them from the production board

If the product allows, the cuber first doubles up two layers. The cuber then picks up the double layer and places it on a wooden pallet on a further conveyor.

This system forms the basis that can be extended if necessary to the CDS EnviroCureSystem. The latter system also allows the active increase of humidity and temperature. CDS doesn't work with steam here, but with diffusers that spray atomised water directly into the air stream. Concrete products can thus be cured all year round under identical conditions, regardless of the outside temperature.

Two lowerators on the dry side

The dry side is served from the drying chamber by two lowerators. The production boards from the two lowerators are merged via a bypass directly behind the drying chamber onto a common transport line, a slideway. On the one hand, the use of two lowerators creates a large buffer on the dry side, while on the other the bypass allows the simple mixing of different batches.

First of all, the boards with the cured products pass through a stone releaser, which is also designed as a transfer device. This transfer device can be used at a later date to serve a parallel finishing system, which is to be installed in the next step. Currently, the stone releaser pushes the stones together, thus releasing them from the production board.

The production boards with the released concrete blocks move cyclically via the slideway to the cuber. If the product allows, two layers are doubled up first. To do this the cuber picks up a complete layer from the production board and sets this stone layer down on top of the stone layer on the next production board that drives in.

The finished stone packets move via a roller conveyor to the cover sheet feeder and the strapping machine from Cyklop.

The boards are automatically brushed, turned by the board turner and automatically collected and stacked by the board stacking device.

The fully packaged stone packets stand on the buffer conveyor awaiting removal by the fork-lift truck

The cuber then picks up the double layer and places it on a wooden pallet on a further conveyor. As soon as the desired packet height has been reached, the packet moves via a roller conveyor to the cover sheet feeder and the strapping machine from Cyklop.

Once a packet leaves the packet assembly station on the wooden pallet, a new wooden pallet is provided from the wooden pallet magazine.

The production boards are automatically brushed off directly behind the cuber and then turned by the board turner to ensure even loading of both sides. The production boards are then automatically collected and stacked by the board stacker.

The complete production board stack is picked up by the board stack conveyor and either placed in the board buffer in front of the block making machine and thus fed directly back into the circulation, or temporarily stored in the spacious board buffer rack with three levels - also built by HS Anlagentechnik - until the next use.

Like the controller for the wet side, the controller for the complete dry side is also equipped with the Frima 3D visualisation.

Ambitious project with strong partners

"In terms of the schedule, everything went according to plan in all aspects", said Managing Director Jürgen Unglehrt, who is very satisfied with the implementation of the project. Unglehrt was able to complete the production buildings on time and the suppliers all met the deadlines. Trial operation was thus able to begin as planned at the end of 2015.

"Despite the variety of the technology, production started up smoothly", said Mr Unglehrt, describing the commissioning of the new production line and praising the good partnership with the suppliers.

The concrete block production is to run in both plants in future. Unglehrt's intention with the new plant is to increase capacities. The stated goal is four shifts of concrete block production per day.

Watch a video about Unglehrt's new concrete paver production plant in Aitrach:

www.cpi-worldwide.com/en/cpi-tv/video/Unglehrt_Aitrach

Simply scan the QR code with your smart phone and watch the video!

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