Wiggert & Co. GmbH, 76227 Karlsruhe, Germany

Modern mixing technology for the high-quality precast concrete elements from Befer GmbH

Mark Küppers, CPi worldwide, Germany

Design, planning, production, delivery and installation of sophisticated precast concrete elements are the core business of Befer GmbH in Halberstadt. However, with a steadily increasing proportion of customised components with sometimes significant differences in processing times, production in the precast plant increasingly reached its efficiency limits, as the existing production offered too little flexibility and the entire processes were dependent on each other in cycles. For this reason, the decision was made in Halberstadt not to gradually optimise production, but to make a radical change. As part of an extensive modernisation project, Befer restructured the existing production areas in order to optimise material flows, among other things, and built a new production hall in which a new circulation plant from Avermann raised precast production to a new level. The concrete required comes from the Wiggert mixing plant with an HPGM 2250 planetary mixer as the core component. In addition to the mixing technology, the complete dosing technology was also supplied by Wiggert.

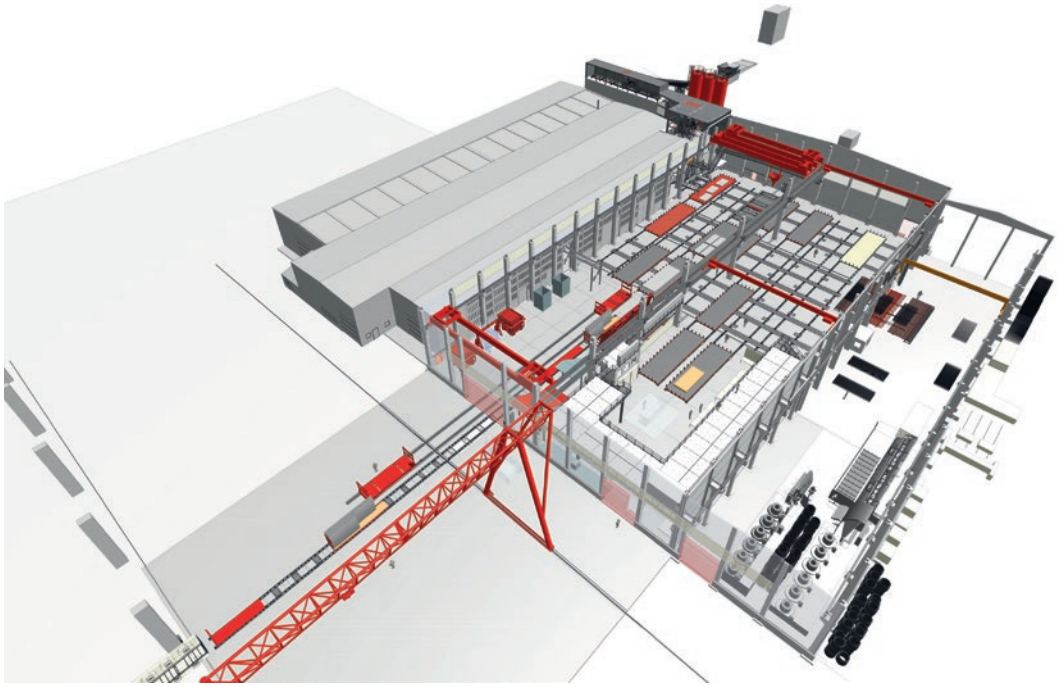
Befer's company history dates back to 1947, when F. and H. Conrad founded a limited company for the recycling of rubble. In 1953, the company was expropriated and transformed into the state-owned enterprise VEB Betonwerk Halberstadt. From 1973, the company developed into a sought-after manufacturer of customised precast concrete elements for large construction projects such as the Stendal nuclear power plant, the Palace of the Republic in Berlin and hospitals in Halle and Neubrandenburg.

In 1990, the plant was converted into Befer Betonfertigteilbau- und Betonwaren GmbH in the course of reprivatisation. One year later, Tunnel-Ausbau-Technik GmbH (TAT GmbH) took over the company and began producing patented tunnel beams. In 2003, the shares were transferred to Richard Schulz Tiefbau GmbH & Co. KG. Under new management, activities were expanded throughout Germany. 2018 saw the introduction of a new ERP system for more efficient planning, combined with a further change in management.

Bird's eye view of the Befer plant

Befer's spectrum ranges from precast slabs with in-situ topping to wall panels, stairs and balconies for residential and commercial buildings, lift shafts and large columns and downstand beams for hall and industrial construction.

Volker Weidemann became the new Managing Director of Befer und Tat GmbH at the end of the year.
The spectrum of Befer ranges from the production of sophisticated structural precast concrete elements such as columns and beams, solid wall and solid floor elements, energy-efficient thermal walls for industry and commerce, the creation of structural designs, the calculation of statics, complete 3D preliminary planning, 3D mould planning and the construction of moulds with a CNC woodworking centre. All products related to residential construction round off the portfolio,



CAD drawing of the new production hall

whether staircase systems, lift shafts, ceilings and walls as well as components for the enclosure of properties. Last but not least, there are also products for infrastructure, such as flood protection, noise protection, precast concrete elements for bridge construction and railway platforms.

Lift shafts

The Befer lift shaft is manufactured as a finished, storey-high element with all installation parts for later assembly. The elements are manufactured to fit precisely according to storey height, resulting in a uniform joint width. Recesses for light strips or floor slabs can be planned. Execution in fair-faced concrete is also possible.

Balconies

Befer balconies are formwork-smooth on the upper side, smoothed on the underside and fitted with slopes, drains and built-in components. Drip edges, upstands, corbels or recesses can be realised as required.

Beams/downstand beams

Prefabricated beams from Befer are suitable for spans of up to 25.00 metres. They are designed as rectangular, T or I cross-sections for parallel, monopitch or gable roofs. Other design options can be agreed by the customer with the technical office.

Precast slab with in-situ topping

Precast slabs with in-situ topping are manufactured in widths of 2.50 metres and lengths of up to 10.00 metres. Width levelling is carried out using shims. The planning data is recorded in the technical office, transferred to the mould and the concrete is then poured and compacted.

Columns

Reinforced concrete columns are mainly used in industrial and commercial construction. They can be customised and carry very high loads with high concrete grades (up to C 50/60). Cross-sections of up to 1.00 x 1.00 m and lengths of up to 25.00 m are possible.

Staircase systems

Prefabricated staircases can be walked on immediately after installation. The step sizes adapt to the storey heights. Storey-high stairs or variants with landings are possible up to 2.65 m wide and can be supplied ready to surface or ready for covering.

Solid slabs

Solid slabs up to 12.00 m long and 3.00 m wide can be installed quickly and without support. Recesses for cables are pre-planned. The undersides can be painted after the joints have been sealed.

Solid walls

Walls up to 12.00 m long and 3.50 m high can be produced in one piece. Wall thicknesses from 10 cm are possible. Sandwich walls with thermal insulation as well as openings and built-in parts for electrical installations can also be realised.

Customised components

Customised components are manufactured individually according to customer plans. Examples include platform gantries, foundations, beams, flood protection walls, culverts, bridge abutments, steel composite beams or blocks

An additional part of the building serves as a foreman's office, storage room for admixtures and installation level for binding agent silos.

The 6-chamber in-line silo is fed via a flat feed hopper (complete lorry load) and a belt system.

First project step: New mixing plant

With the investment in the new concrete mixing plant from Wiggert, Befer GmbH has a state-of-the-art, automated mixing plant that ensures consistently high concrete quality and enables the production of fibre-reinforced, coloured and self-compacting concrete.

To integrate the new mixing technology from Wiggert & Co. GmbH in Karlsruhe, a reinforced concrete silo for aggregates and a technical building were erected directly next to the production hall. This includes the mixing plant, the cleaning level for the bucket conveyor from Dudik and a residual concrete recycling plant from Bibko.

The 6-chamber row silo holds approx. 600 m³ of aggregates. It is fed via a flat feed hopper (complete lorry load) and a belt system consisting of a hopper discharge belt, ascending belt and a movable and reversible distribution belt with inductive position control. The chamber allocation is automated via barcode scan on the delivery note.

An additional part of the building serves as a foreman's office, storage room for admixtures and installation level for binding agent silos. These are equipped with state-of-the-art air loosening, purge air filters, overfill protection and radar level measurement technology. An integrated access road also enables the direct loading of truck mixers.

The chamber allocation is automated via barcode scan on the delivery note.

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Filling of the lifting bucket

HPGM 2250 planetary mixer

The core component of the new mixing plant is a Wiggert HPGM 2250 planetary mixer with a concrete output of 1.5 m³ per cycle. The lining with Wicodur 4000 composite armoured plates ensures a long service life, while the integrated mixer filter ensures almost dust-free production. The automatic high-pressure cleaning system, also from Wiggert, ensures thorough and fast cleaning of the mixer and thus minimises downtimes.

HPGM 2250 planetary mixer

High accuracy and repeatability

The aggregates are dosed onto a weighing belt via double dosing gates. Electronic weighing cells, automatic coarse/fine dosing and overrun correction ensure high accuracy and repeatability. Moisture probes in the sand chambers correct the effective sand weight. A microwave probe in the mixer floor records precise moisture values during the process.

Dry mixing with subsequent moisture measurement

After the aggregates, cements and additions have been added, dry mixing is carried out with subsequent moisture measurement. The missing water is then added and the wet mixing time is initiated. The mixer empties the ready-mixed concrete either directly into a truck mixer or transfers it to the bucket conveyor, which supplies the circulation plant with concrete. A water scale on the mixer can be used to replace some of the fresh water with treated wash water from the recycling plant.

Control room of the mixing plant

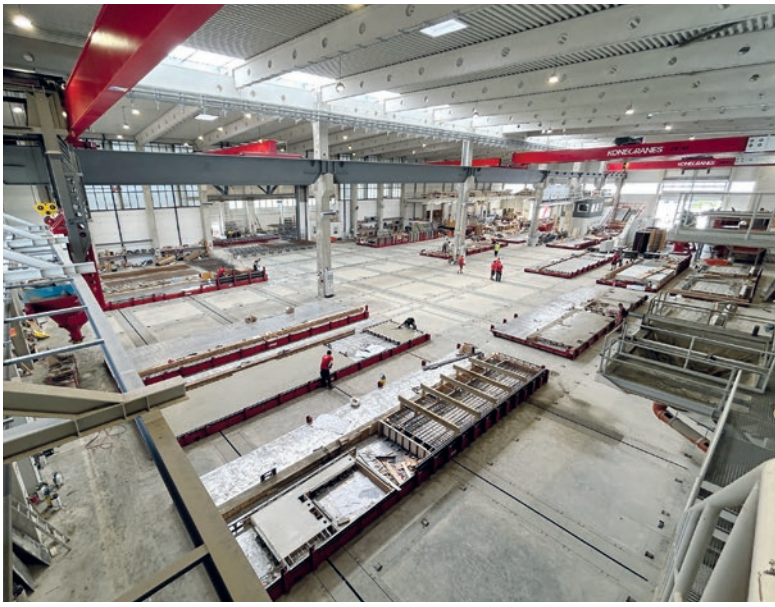
WCS control system

Based on the Microsoft Windows operating system and a Siemens PLC, the WCS control system, the heart of every Wiggert concrete mixer plant, offers simple and clear control of all plant functions, including mixer status, moisture correction, plant status, recipe and stock management. Call-off points at the delivery points are used for direct mixing triggering and thus short-term, demand-orientated concrete supply in production.

Second project step: New circulation plant

Before the decision was made to realise the new circulation plant as it can be found in the production hall today, various system models were planned and tested. A star-shaped production layout with a central transfer table was also discussed. However, this model could not be implemented and the decision was ultimately made in favour of the Avermann pallet circulation plant with underfloor conveyor technology.

This pallet conveyor, which is fully integrated into the hall floor, eliminates disruptive transport components in the production area. Different concrete elements can be produced in parallel and waiting times are almost a thing of the past. The highly automated system thus creates a significantly improved working environment along with greater flexibility. The new circulation plant is also characterised by a very high level of safety for employees thanks to numerous appropriate health and safety precautions and the underfloor solution.



View of the new production hall with the Avermann circulation plant

Avermann's scope of delivery includes twelve pallets with dimensions of 14.00 × 4.00 m, special trestle rollers with friction

Befer relies on an innovative control and production concept that has been precisely tailored to the operational processes.

Together with RIB One Prefab Automation and Avermann, a customised HMI/SCADA system with intuitive touch operation was created.

wheel drive for pallet transport, cross transfer units, vibrating compactors with high-frequency technology, a hydraulic tilting station and a battery-powered 40-tonne run-off truck.

The hall was also equipped with a 3D steel processing system from the Progress Group and fully automated concrete transport with the aforementioned bucket conveyor from Dudik. The Elematic concrete spreader then finally delivers the concrete to the pallets in precise doses.

The project realisation was based on 3D planning with the involvement of all suppliers, employees and the employers' liability insurance association. This made it possible to realistically simulate the working conditions and recognise potential hazards at an early stage.

Control system

Befer relies on an innovative control and production concept that has been precisely tailored to the operational processes. Together with RIB One Prefab Automation and Avermann, a customised HMI/SCADA system with intuitive touch operation was developed that enables flexible route planning across 28 workstations.

The bucket conveyor from Dudik transfers the concrete to the concrete spreader from Elematic.

Hydraulic tilting station from Avermann

Befer relies on machines from the Progress Group to produce the reinforcement

Special transfer carriage for transporting the reinforcement to the circulation plant

The new routing system based on a 4×7 pallet grid allows variable processing times, reduces downtimes and increases plant utilisation. This allows manufacturing processes to be efficiently controlled on a product-specific basis.

A successful project

"The collaboration with the project participants, in particular the companies Wiggert and Avermann as the main suppliers of the system technology, worked very well and the implementation was carried out to our complete satisfaction, also with the active support of our own production team," says Volker Weidemann with satisfaction. The workstations are all freely accessible and the pallets can be moved independently of each other. The bottleneck of the previous production was thus successfully eliminated. However, the special feature of the new system is the gained flexibility regarding the height and volume of the precast elements. "Capacity utilisation is already at around 80%," says Volker Weidemann, who is also satisfied with the order intake.

In addition, the reorganisation of the production areas has made it possible to reduce walking distances and thus increase efficiency.

With the recent investment, Befer is very well positioned for the future to be able to deliver the appropriate solutions quickly, reliably and in very high quality, even for particularly demanding projects. Befer does not see its strength in mass products with highly competitive market prices, but rather in customised components. Volker Weidemann summarises it as follows: "We offer the right products for demanding applications." ■

FURTHER INFORMATION

BEFER GmbH
In den Langen Stücken 10
38820 Halberstadt, Germany
T +49 3941 672441
info@tat-befer.de
www.tat-befer.de

Wiggert & Co. GmbH
Wachhausstr. 3b
76227 Karlsruhe, Germany
T +49 721 943460
info@wiggert.com
www.wiggert.com

Avermann Betonfertigteiltechnik GmbH & Co. KG
Lengericher Landstr. 35
49078 Osnabrück, Germany
T +49 5405 5050
info@avermann.de
www.avermann.de

Bibko Recycling Technologies GmbH
Steinbeisstraße 1+2
71717 Beilstein, Germany
T +49 7062 92640
info@bibko.com
www.bibko.com

DUDIK International
Mackstr. 21
88348 Bad Saulgau, Germany
T +49 7581 8877
dudik@t-online.de
www.dudik.de

Elematic
Airolantie 2
37801 Akaa, Finland
T +358 3 549511
info@elematic.com
www.elematic.com

RIB SAA Software Engineering GmbH
Gudrunstr. 184/3
1100 Wien, Austria
T+43 1 641 42470
office.aut@rib-software.com
www.rib-software.com

Progress Group
Julius-Durst-Straße 100
39042 Brixen, Italy
T +39 0472 979 900
info@progress.group
www.progress.group