



All good things come in threes

■ Mark Küppers, CPi worldwide, Germany

Together with its customers, **Andernacher Bimswerk GmbH & Co KG, or ABI for short**, has been creating value from concrete for more than 65 years. High-quality products from precast slabs with in-situ topping to precast concrete staircases are manufactured in three ultra-modern plants - precisely tailored to the customer's wishes, in standardised processes with a high degree of automation. At the Andernach site, where double walls and precast slabs with in-situ topping are produced, the precast slab production was recently extensively modernised. The result is a state-of-the-art and efficient production that impresses with precision and speed. Progress Maschinen & Automationen and Ebawe Anlagentechnik were responsible for the delivery and commissioning of the machine technology. Progress Software Development supplied the software solutions. All three are Progress Group companies.

ABI - the specialist for precast concrete elements

In the third generation

ABI is a family-run company in its third generation headquartered in Andernach and with further locations in Bedburg and Sinzig. Over 65 years of experience and a motivated expert team form the basis for the proven products and services.

Over the years, the company has retained its down-to-earth approach and its focus on detail in the production of precast concrete elements. ABI is a healthy company that is also characterised by its investment readiness, not only to remain competitive, but also to continue to perfect production and processes. The focus is always on the employees. Qualification and training through skilful personnel planning in production are examples of this.

Manufacturing through to fully automated production

In addition to ABI's headquarters in Andernach, there are two other production sites in Sinzig (since 1964) and in Bedburg (since 2002). At the site in Sinzig, which was completely overhauled in 2018, mainly balconies, stairs of all kinds and solid walls are manufactured. The Bedburg site primarily produces ventilated ceilings, matrix walls and thermal walls.

Sustainability and quality

The demand for energy-efficient buildings is growing steadily, as about 40% of the total energy consumption in the EU is attributable to the use of buildings. With concrete elements from ABI, building can be economical, sustainable and environmentally friendly. Energy consumption is not only reduced



The state-of-the-art administration building in Andernach was occupied in 2015

by the good thermal behaviour of concrete components in buildings. The integration of temperature-equalising elements in ABI's ventilated ceilings and climate walls also leads to significant energy savings.

Sustainability is already a key issue in the production of ABI's precast concrete elements. Special attention is paid to the efficient use of resources and energy-saving production techniques. Secondary materials from recycling are used wherever possible. The raw materials are purchased from regional sources with short transport routes. ABI stands for quality and sustainability - across generations.

Form Master with 3 axes

Probably the most impressive solution - also because it is definitely not run of the mill - that was implemented in cooperation with Progress at the Andernach plant, is the fully automatic Form Master robot system, which at ABI does not work with 2 axes as usual, but with 3 axes. While one robot is permanently responsible for demoulding the pallets on the demoulding side and a second robot is used exclusively for the shuttering operations on the shuttering side, a third robot serves as a jumper that always "helps out" on one of the two sides.

Demoulding robot

After removing the finished concrete elements, an employee carries out a rough cleaning of particularly stubborn dirt spots such as glue, concrete residues, etc. on the pallet. Finally, the pallet is released and moves via the lateral transfer unit into the automatic area from the stock into the station of the demoulding robot. The formwork scanner searches for the shutters on the pallet by means of laser triangulation and lifts them off fully automatically. The magnetic buttons are automatically released by the robot. For this purpose, a sep-

arate deactivation tool attached to the robot head grips the magnetic button and releases the magnet from the formwork surface. The deactivation tool is designed so that the applied forces are not transferred to the robot structure.

The shutters are placed fully automatically on a roller conveyor that transports each individual shutter away. The shutters are then automatically fed into a system for cleaning and applying a release agent and finally deposited back into the shuttering store sorted by length by a separate robot, the storage robot.

Storage robot

The three-axis storage robot manages the shuttering store and prepares the shutters for the next shuttering process. Cleaned shutters are stored in the active storage area by the storage robot and automatically retrieved and placed on the supply conveyor.

The concept of the storage robot allows a flexible design of the storage in terms of size and position. The storage robot relieves the shuttering and demoulding robot and thus enables higher cycle time performances, as the Form Master does not lose any time for storing the shutters.

In the shuttering store, the required shutters for the automatic shuttering process are available in different lengths. On the storage robot, additional roller conveyors have been arranged as buffer areas so that there are no delays when new formwork has to be provided and used formwork has to be stored at the same time.

Pallet cleaning device

Clean pallet formwork surfaces guarantee high quality end products without subsequent post-processing. After all the



Form Master shuttering removal station



Storage robot in the active storage area



Pallet cleaning device

formwork has been removed by the robots, the pallet moves longitudinally in the production cycle to the shuttering station. The pallet passes through an Ebawe cleaning device to clean the formwork surface. Residues on the formwork surface and the edge shuttering are effectively removed. This ensures a consistently high-quality surface of the end product.

Shuttering robot

The storage robot selects the required shutters for new components from the shuttering store according to the CAD data transmitted by Progress Software Development’s ebos® control system.



Form Master shuttering station

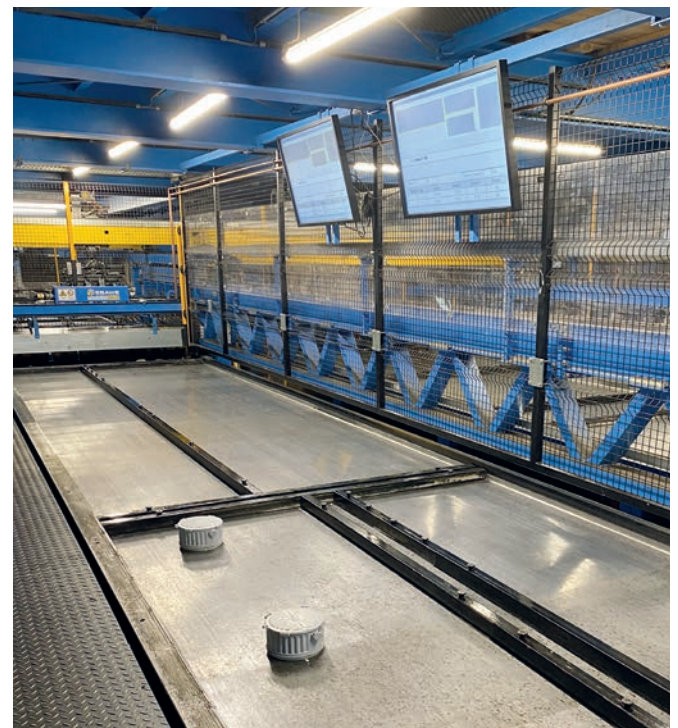
The formwork elements are also transported via a roller conveyor. The shuttering robot then positions the shutters precisely on the shuttering surface according to CAD-CAM, according to the elements to be produced, and activates the integrated magnets of the shuttering. The shutters are aligned with the joints by the robot grasping, aligning and activating the shutters in a row at the same time.

Progress has developed an innovative formula to enable precise shuttering in centimetre increments. This patented formwork system Infinity Line® Notch Free makes centimetre-precise shuttering a reality without filling elements such as polystyrene extensions. An ingenious combination system reduces the number of shutter lengths used to a minimum.

Since ABI usually has 2 robots working at the same time to set the formwork, even extensive shuttering work can easily be completed in time with production.

Paperless production

After the shuttering work has been completed, the pallet moves across to the next station, where manual shuttering work, such as placing installation boxes, etc., is still being carried out by an employee. Another special feature of ABI is that drawings of the components to be manufactured are a thing of the past. At the stations where employees intervene manually in production, detailed drawings are displayed on several large monitors, of course only of the precast slabs currently being processed. When the positions of the pallets are changed, the display on the monitors is also updated fully automatically.



Paperless production - printed drawings are a thing of the past at ABI



VGA Versa lattice girder welding machines for flexible production of lattice girders from the coil

Reinforcement provision

After all subsequent shuttering work has been completed, the pallet moves to the next station, where a multi-axis robot places the reinforcement on the pallet. The reinforcement for this is made to measure just-in-time by the lattice girder welding machine and the straightening and cutting machine.

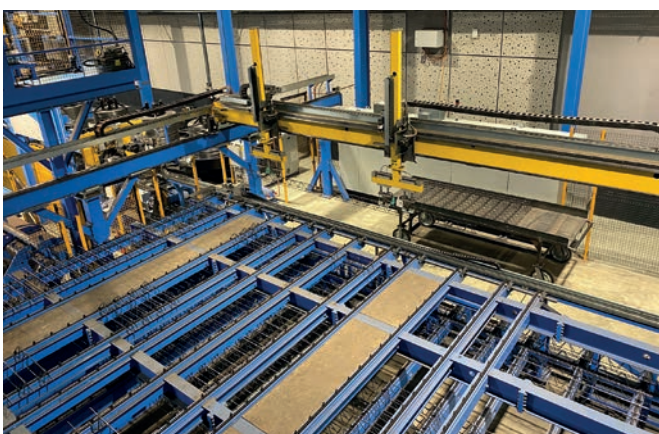
VGA Versa lattice girder welding machines

Progress has supplied and installed the new Versa lattice girder welding machine for the production of lattice girders. The system enables flexible production of lattice girders from the coil and consists of two lifting devices that can be moved separately from each other, the welding unit itself and the guide for the top chord. A special feature is the fully automatic height and diameter adjustment during production, which allows each product to be made to measure without time-consuming conversion. This eliminates both the storage problem and the problem of waste. In addition, the variable adjustment of the distance between the welding points of the diagonal wire enables a precisely fitting cut.

The system supplies the precast slab production with lattice girders in the required number, height and lengths in time with the production cycle. All manufactured lattice girders are placed on a buffer magazine by a crane robot, which then automatically and individually feeds them to the laying robot. As soon as the Versa has exhausted its buffer capacities for the following elements, the plant starts to produce standard lattice girders for the double wall production in the adjacent hall. These standard lattice girders are automatically deposited on a removal trolley by the Versa's crane system.

Straightening and cutting machines

The single rotor straightening machine from the ESR series, also supplied by Progress, is equipped with a single rotor that is adjusted to the respective desired wire diameters. This all-round machine has been designed for use in companies that want to produce flexibly while ensuring high production output. The rotor straightening system, wire outlet and the appropriate logistics system are customised. Progress' rotor



All manufactured lattice girders are placed on a buffer magazine by a crane robot, which then automatically and individually feeds them to the laying robot.



Multi-axis robot for placing the reinforcement

straightening technology allows a very high processing quality in order to meet the applicable standards.

At ABI, the Progress straightening and cutting machine is used to produce all the transverse bars for the precast slab production. The longitudinal bars are produced on an existing plant, which Progress has modernised and equipped with new control software.

Multi-axis robot for placing the reinforcement

The loading of the pallet with the bar reinforcement and the lattice girders also takes place fully automatically in a secured area. The system, with two independent insertion units that can be moved in the X, Y and Z axes with triple robot grippers, lays transverse reinforcement with and without spacers, longitudinal reinforcement and then the lattice girders on top according to CAD specifications. In addition, the second handling robot is equipped with a second rotating head. This modern technology improves production performance, optimises processes, increases dimensional accuracy and helps to minimise errors. When the pallet is completely filled with



Concreting station



Final inspection of the reinforcement

reinforcement, it is ready to be moved to the next processing station.

Reworking and concreting

At the next station, the inserted reinforcement is checked by an employee or additional steps are taken that could not be carried out by the laying robot. The employee is presented with all the necessary information on large monitors. The pallet then moves to the concreting station and from there to the drying chamber.

Intelligent ebos software solution

All processes are controlled with ebos, which was developed by Progress Software Development. The software combines a very large scope of services with simple user guidance and replaces a multitude of partial software solutions with a single system in which all work processes are carried out. The integrated Progress process control system enables higher-level CAD-CAM data input and monitoring, with diagnostic system for locating errors and faults, and makes it easier for the user to program the respective grid data.

This control unit is an interface to the CAD, provides automatic transfer and processing of the data and distribution to the individual machines and also includes error message processing.

MES systems for planning, control and optimisation

Progress Software Development's powerful products also include MES systems for planning, controlling and optimising production.



Video about the modernised precast slab production at ABI



Such a system is also used at ABI, for the introduction of which works manager Werner Roth is responsible. "With the control of the entire plant, there are a total of 7,000 possible error messages. We have assigned this multitude of error messages to 35 superordinate fault reasons, in other words divided them into 35 clusters. The aim is to be able to find a possible problem more quickly. In addition, we distinguish the errors into two groups. Those that have no influence on production because the errors can be rectified within the buffer time of a cycle, and those that lead to extensions of the cycle times. It is particularly important to recognise and permanently eliminate these disturbances. These are often human errors that, once recognised, can usually be easily corrected," explains Werner Roth.

Fully satisfied and equipped for the future

After just a few weeks of operation, ABI is already enthusiastic about the modernisation of production and its influence on the overall efficiency of the manufacturing. "The plant is running like a dream," Werner Roth sums up succinctly. "The cycle time is now already 7.5 minutes, which we didn't expect to happen so fast. Initially, only single-shift operation was planned in order to run the system in properly. But after one week we were already able to go to 2 shifts and the unmanned production ran almost without any snags." The modern robot technology was able to significantly improve production performance, optimise processes, increase dimensional accuracy and contribute to the minimisation of errors. "The maintenance effort is also very low, so it's manageable." ■



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