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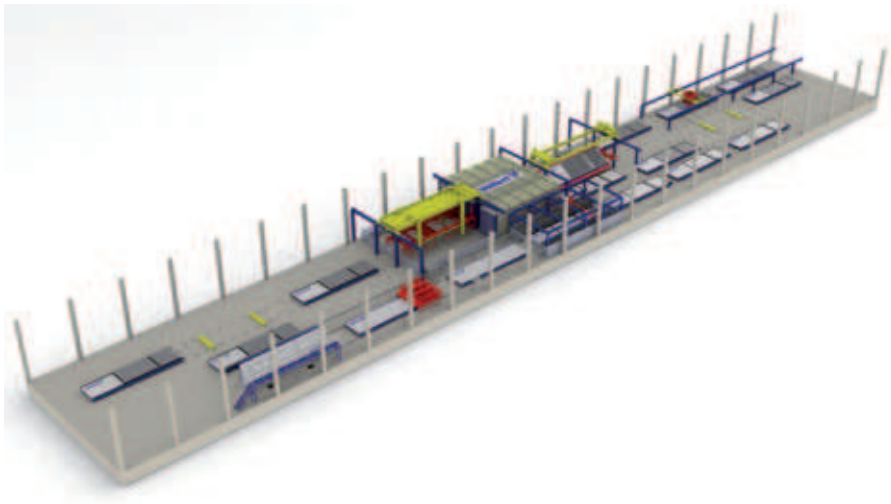
Plant extension for the production of double walls

The first double wall plant in the region of Murcia in the southeast of Spain went into operation in February 2010 at the Trabis company in Yecla. The solid wall plant installed by Vollert and its partners in 2006 was extended such that double walls can now also be manufactured economically and rationally in addition to the solid walls that have been produced up to now. Since 2006, Trabis Prefabricado Arquitectonico, S.L.U. has been producing structural precast concrete elements such as columns and girders, in both untensioned and prestressed executions, as well as solid walls for industrial construction on a carrousel plant in a newly built production facility. Vollert Anlagenbau from Weinsberg was commissioned as an experienced and reliable partner with the task of the overall conception.



Plant layout

Carrousel plant

At the start of planning in 2005, the carrousel plant was conceived such that, in the first construction stage, solid walls could be produced with wall thicknesses of 120, 160 and 200 mm.

In the second and third construction stages it was planned to extend the plant for the production of double walls as well as doubling the production capacity from 30 to 60 circulating pallets.

In the first construction stage in 2006, the basic equipment of the carrousel plant for the production of solid walls was supplied, installed and put into operation. The fundamental components were:

- Pallet transport by means of friction wheels, roller blocks and cross-lifting truck
- Formwork robot with plotter function
- Concrete distributor, discharge system: Spiked roller - flat slide valve
- Low-noise concrete compaction by means of vibrating station (German patent no. 43 41 387, European patent 0 658 382)
- Fully automatic storage and retrieval machine for the optional insertion and removal of the pallets into and out of the curing chamber compartments
- Curing chamber for optimal curing of the precast concrete parts
- Tilting table for gentle lifting of the solid walls
- Solid wall formwork system (tongue and groove) with integrated magnets
- Pallets with one-sided fixed edge formwork (120 mm) and attached formwork (40 or 80 mm)
- Formwork transport and formwork cleaner for solid wall formwork

The planning of a plant extension began in July 2009. In only six months all components necessary for the double wall production were retrofitted in the second construction stage:

- Pallet turning unit with pneumatic clamping of the first shell
- Low-noise concrete compaction by means of vibrating station (German patent no. 43 41 387, European patent 0 658 382)
- Double wall formwork system with integrated magnets

Situation before the installation of the turning unit and vibrating station

Situation after the installation of the turning machine and vibrating station


You visualise a partner who can deliver precisely tailored technologies for your precast concrete element manufacturing processes.
Steffen Schmitt
Vollert
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Formwork robot with magazine for solid wall formwork

Turning machine during turning in / situation after the extension

- Formwork transport and cleaning for double wall formwork
- Extension of the formwork robot for double wall production
- Extension of the formwork magazine for the acceptance of the double wall formwork
- Additional circulating positions in order to meet the increased formwork assembly work (built-in components, reinforcement) required for double wall production

Extension of the formwork robot for double wall production

The formwork robot already installed in the first construction stage for the placement of the solid wall formwork was extended by the function to handle double-wall formwork.
The robot receives the CAD/CAM data from the Promonal CAD system and the Nemetschek Allplan CAD system used by Trabis directly via the host computer.
The formwork systems used for both the solid wall and the double wall are placed on the pallet and aligned with an accuracy of +/- 1 mm. The magnets integrated in the formwork profile are subsequently activated by the robot gripper.
A plotter unit integrated in the robot gripper enables additional information, such as the position and type of built-in elements as well as window and door recesses to be plotted on the formwork surface of the pallet. The gentle and precise handling by the robot ensures a long service life of the formwork profiles. Beyond that it is ensured that the high-quality precast concrete parts are manufactured with accurate edge formation.
In order to store the double-wall formwork in addition to the existing solid wall formwork, part of the existing formwork magazine was converted to accept the double-wall formwork. For the highest possible manufacturing flexibility, the magazine is managed dynamically by the formwork robot controller, i.e. the individual compartments are used for different types of formwork, depending upon the formwork emergence. In addition, a new function for the automatic changing of products was integrated. Here, for example, the 120 mm solid wall formwork is exchanged for the 200 mm type.

Host computer

In the course of the plant extension the existing host computer was likewise provided with an update and supplemented by new functions:

- Function module for double wall production, i.e. the administration of the first and second shell in the production process as well as the automatic pallet population optimised for double wall production
- Separate control of the storage processes for finished elements and first shells
- Administration of the new double-wall formwork elements
- Integration of the new circulating positions and the new plant components (turning unit, formwork transport) into the production process
- Extension of the plant visualisation
- Extension of the production data acquisition and error statistics

The CAD data are transferred to the host computer via the standardised Unicam 6.0 interface. As part of the plant expansion, the existing Promonal CAD system for the solid wall production was supplemented by the Allplan system from Nemetschek for the production of double walls and precast slabs with in-situ topping.

Additional circulating positions

After the pallet leaves the automatic area of the formwork robot, the necessary built-in elements can be placed at several manual formwork stations. Due to the mixed production – solid elements for industrial applications and double walls for private housing construction – four additional circulating positions were installed. Single item production can now be accomplished at these circulating positions, independent of the cycle time of the carrousel plant. As a result, the demand for the greatest possible flexibility and increasing production of special parts is met by the plant extension.

Pallet turning unit with pneumatic clamping system

The pallet turning unit works above three circulating stations in the plant:

- Station 1: Provision and clamping of the first shell
- Station 2: Turning in
- Station 3: Handover of the empty pallet

The provision of the first shell of the double wall takes place, as does the handover of the empty pallet, at its own respective pallet station – independently of the circulation and optimised with regard to the cycle time. The first shell is clamped to the pallet by means of tensioning arms and a pneumatically operated clamp. Subsequently, the cross beam is raised via a four-rope hoist and turned by a rotary drive with a worm gear. The turning machine drives transversely over the vibrating station and lowers the first shell into the freshly concreted second shell. The bonding of the first and second shell is established via the subsequent compaction on the vibrating station. After compaction the tensioning arm clam-

Turned-in pallet during the compaction procedure

ping is released and the tensioning arms are removed and placed in the tensioning arm holders provided on the turning crossbeam. Turning back over and the handover of the empty pallet take place in automatic operation.

Patented, low-noise vibration compaction system

An additional compaction station was integrated into the plant for the compaction of the double wall. This is decoupled from the concreting area and the turning station. Due to the selected arrangement, work can be carried out independently at the individual stations.
Due to the patented pendulum suspension unit of the vibration frame, the Vollert vibration station induces the compaction energy into the concrete very efficiently. This allows the processing of stiffer concrete and the use of less expensive concrete with a lower cement content for high quality end products. In addition, the pendulum suspension is subject to extremely low wear.
The vibration station uses a frequency of 4 to 7 Hz, which corresponds to about 240 to 420 oscillations per minute. Like the oscillation direction (circular, lengthwise or crosswise), this value can be selected infinitely via the central controller without mechanical intervention. The noise level of the station is less than 75 dB(A).
The energy is induced evenly into the concrete via several unbalanced-mass drives and the energy quantity can be adjusted in relation to the total concrete weight. This ensures optimal surface and edge formation. The optimum parameters for each product to be produced are stored in the controller and can be called up directly in the production process without waiting times.

Formwork transport and cleaning for double wall formwork

Following the lifting of the finished double walls, the magnets of the double wall formwork are manually deactivated and placed on a conveyor belt. This takes the formwork profiles automatically to the cleaning station and makes them available to the formwork robot by means of a roller conveyor later on in the process. An identification system is integrated for the recognition of the length of the formwork profiles.

Know-how transfer

The Trabis company has gained a very good reputation in recent years as a competent partner for industrial precast construction with solid walls. The double wall product is not yet very common in the

Roller track with identification system in the formwork robot area

Spanish market and therefore requires special support in terms of technical planning and production. In addition to a well-trained team of experienced mechanical engineers, Vollert also has an experienced civil engineer, who places his knowledge in the fields of technical office, production and building site handling at the customer's disposal in the precast plant.
This combination makes it possible, not only in the field of mechanical engineering, but also in the field of precast concrete element production, to analyse the customer's wishes and needs and to support them in the best possible way.

Transport, assembly and commissioning

All plant components were produced in Germany and delivered on time despite a tight schedule. The assembly was likewise completed on time, with minimum downtime of the existing solid wall plant over the turn of the year 2009/2010.
Thanks to the outstanding cooperation of all project participants, it was possible to concrete the first double wall in accordance with the agreed time schedule at the end of January 2010, and the plant went into operation at the beginning of February 2010.
After the extensive briefing and training of the local personnel, the plant was handed over to the user and accepted. The plant can be inspected at any time via a remote data connection in order to analyse and rectify malfunctions that may occur.

Summary

Through the investment in the plant extension, Trabis has strengthened its position as an important producer of high-quality precast concrete elements in the southeast of Spain and is very well equipped for the coming demands of the market for new and innovative products. The taking into account of expandability right from the start of planning in the year 2005 and 2006 has proved to be an optimum solution and the correct strategy for an economical and future-proof plant.
Trabis and Vollert are already working on new projects and plans are in preparation for an expansion of the capacity of the existing plants. Vollert was not only able to convince Trabis as a machine manufacturer and general contractor during the overall planning; in fact it also offered advice and action where concrete technology was concerned.

FURTHER INFORMATION

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