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The new CDLP precast plant in France impresses by its compact plant structure and intelligent work processes

The French precast concrete element manufacturer CDLP recently put its new production plant in Pontcharra near Grenoble into operation. Up to 110,000 m² of floor slabs and 110,000 m² of double walls will be produced here annually on a modern pallet circulation plant in 2-shift operation. The plant equipment was supplied by the concrete works specialist Vollert Anlagenbau, which faced a particular challenge in the implementation, especially with regard to the compact plant structure and intelligently conceived work processes.

The limited spatial conditions on the CDLP works site in Pontcharra, France, presented a particular challenge for the layout of the new production plant for floor slabs and double walls, above all due to the fact that the planned pallet circulation plant was to be erected in an already existing factory building. In order to be able to produce precast concrete elements economically and to be able to react flexibly to fluctuating demands, CDLP focused from the outset on a sustainable plant concept with flexible work processes that had been thought out to the end. The plant, which was completed at the end of June 2011, is therefore tailored precisely to the environmental conditions and to the precast concrete elements to be produced.

Compact plant structure and economical work processes

CDLP selected an experienced plant constructor for this project that could not only deliver the know-how and the technology, but which was also able above all to coor-

ordinate the production processes precisely to the particular spatial conditions and the required production numbers. Under the technical project leadership of Dipl.-Wirt.-Ing. Björn Brandt, and on the basis of 3-D planning models, Vollert Anlagenbau from Weinsberg developed various scenarios that were presented to CDLP in project meetings in order to make the decision on the most economical plant concept transparent and to bring it about.

Based on an average capacity of the production plant, a semi-automated pallet circulation plant was chosen on which untensioned floor slabs and double walls are manufactured. "28 formwork pallets circulate constantly, which ensures considerably more efficient production processes and thus higher plant productivity in comparison with stationary production", explains Brandt. "This procedure enables machines, aids and materials to be used in the right place and thus to increase the quantity and quality of production whilst at the same time reducing manufacturing costs." Thanks to its compact plant structure, the pallet circula-



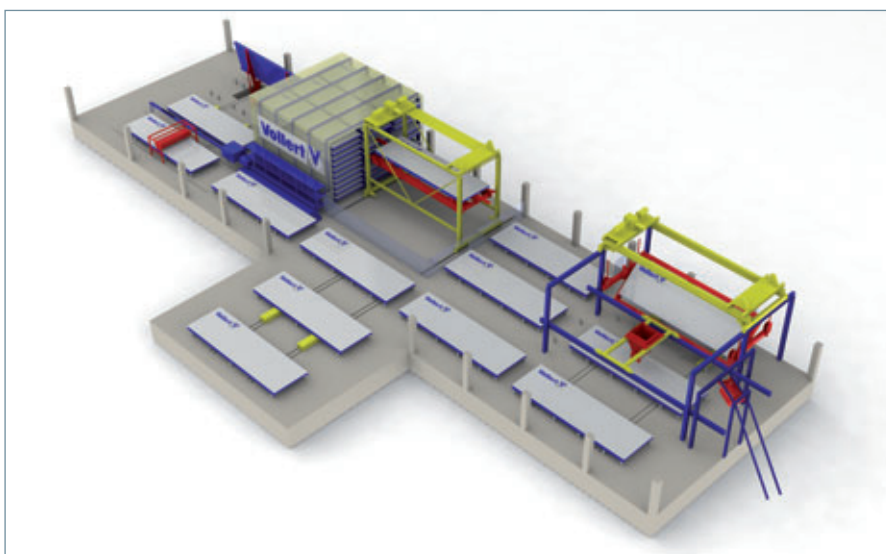
■ Philippe Marrié studied civil engineering at the University of Applied Sciences in Constance (gaining degrees in civil engineering and industrial engineering) and has over ten years of experience in the precast concrete element sector. Following tenures in a technical consultancy and as production manager at various precast works, he worked for several years at Reymann Technik as a project leader both in and outside Europe. He has been employed as a project manager at Vollert Anlagenbau GmbH since 2009.

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ting plant has a footprint of 100 x 25 m. 110,000 m² of floor slabs and 110,000 m² of double walls (a total formwork area of 330,000 m²) will be produced annually in future in a 2-shift system.

Modern plant technology ensures high productivity

The formwork pallets are cleaned first of all. In the first work process a fully automatic CPR device (Cleaner, Plotter, Release agent application) frees the pallets from adhering concrete residues and adhesives by means of rotating brushes and steel scrapers. In the second work process the CPR device automatically sprays the pallet with release agent. Rotary nozzles were used in order to do justice to the aspect of economical dealing with operating resources and to ensure even application of the release agent. The rotary nozzles make it possible at any time to adapt the discharge individually in relation to the viscosity of the release agent. In the last work process of the CPR device, the plotter draws the precast concrete elements to be produced on the formwork surface on a 1:1 scale. In order to obtain the desired application accuracy of + 1 mm, the pallet is centred pneumatically at the CPR position from below by two cylinders. Once the centring has been released again, the pallet moves on roller blocks driven by friction wheels to the manual formwork positioning. Further development of even the simplest compo-



Pallet circulation plant for 110,000 m² of floor slabs and 110,000 m² of double walls annually



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The layout of the pallet circulation plant makes efficient use of space



Workplace system with integrated formwork transport for storing and positioning formwork and built-in parts.

ment of a pallet circulation plant – the roller block – is not yet complete. Through various long-term trials, Vollert has been able to replace the steel rollers that have been used for decades by a high-performance plastic that is able to withstand the required loads. The advantages are obvious: quiet running and no corrosion. Having arrived at the manual formwork station, a workplace system – a rack positioned alongside the pallet position with a catwalk at the height of the formwork pallet – serves to store formwork, magnets and built-in parts. The formwork transport track has been integrated into the workplace system in order to facilitate the handling of the formwork. This allows ergonomic working in the formwork storage area.

In the next work process the reinforcement is installed manually at several workstations. For particular flexibility it is possible to take

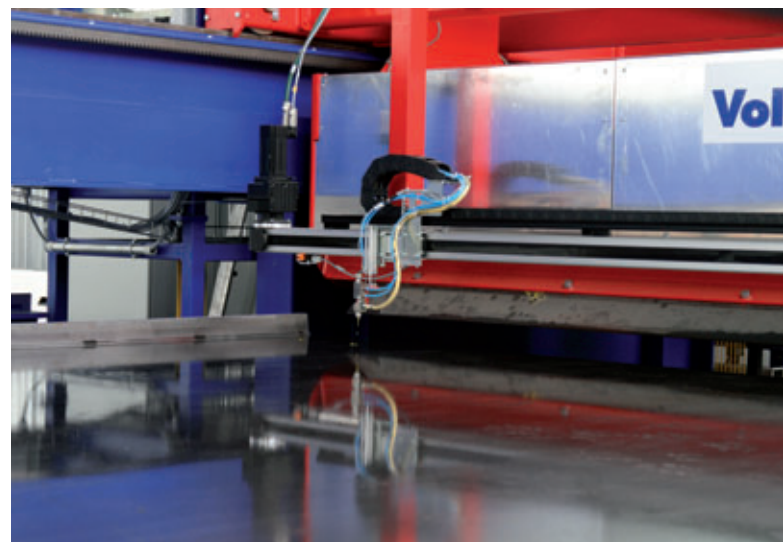
individual pallets temporarily out of the production circulation. This is done by a pair of cross-lifting trucks, which are supplied with power via a cable drag chain and are designed to lift loads of 15 tonnes. After exact positioning of the cross-lifting truck under the pallet, it is hydraulically lifted before being driven synchronously in a transverse direction to a workplace that is separate from the production circulation. This allows individual pallets to be taken out to another area of the building, for example in order to install elaborate reinforcements, without hindering the pallet cycle of the circulating plant and thus reducing production scrap.

After the installation of the reinforcement the pallet is transported by a further pair of cross-lifting trucks to the concreting area. The concrete distributor is supplied by a rotary bucket track, which is dimensioned for up to 1.5 m³ of concrete. Due to the

limited spatial conditions, the concrete is delivered from the mixer to the concrete distributor over an 18° incline before the rotating bucket is semi-automatically emptied. Step-by-step rotation of the bucket provides for clean emptying of the bucket. Before the concreting procedure the pallet is fixed by a cylinder to the vibrating station, prior to the screw conveyor installing the concrete evenly into the prepared pallet. For accurate dosing the concrete distributor has a total of ten discharge screws. The screw tub is hydraulically hinged, making the screw discharge unit easy to clean. It is easy to dismount and can be quickly replaced by a spare tub. This allows more complex maintenance work to be carried out unhurriedly without having to take the circulating plant out of operation for long periods. In order to facilitate daily maintenance, the concrete distributor is equipped with a central, automatic lubricant supply system. In addition to



Cleaning, spraying release agent and plotting in one unit



Plotter unit with an application accuracy of +/- 1 mm



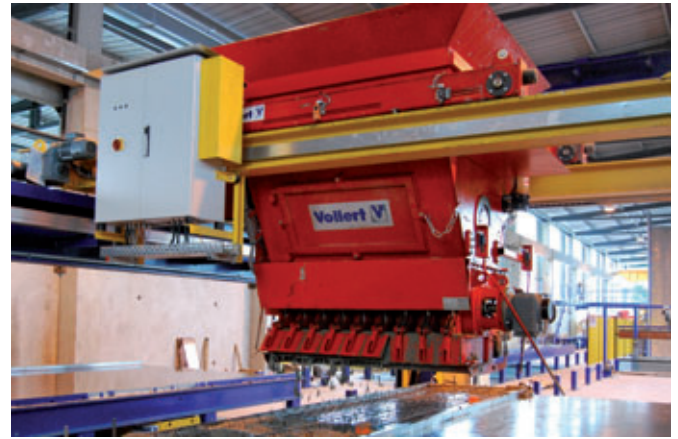
that it has a weight measuring system, which is connected to the master computer. A display indicates how much concrete needs to be poured onto the current pallet and what quantity of concrete is needed for the next pallet. This semi-automation enables concrete consumption to be reduced by up to 8%, since the nominal-actual comparison is signalled to the machine operator.

Following the concreting procedure the concrete is compacted by a low-frequency vibrating station. The vibrating movement is generated by four unbalanced drives, thus compacting the concrete. Unlike a conventional vibrating station, this enables the compaction energy to be precisely adjusted and stiffer concretes can also be processed. By lowering the water-cement mixing ratio (W/C ratio) whilst maintaining the same early concrete strength, the cement content can be reduced by about 10%, thus considerably lowering the manufacturing costs for the precast concrete elements. After an initial quality check, the pallet passes through a roughening device, which roughens the upper side of the floor slab or the hollow space of the double wall in order to improve the subsequent bond with the in-situ concrete. If a double wall is being produced, the roughening rake is raised and the pallet is transported further, directly into the heated hardening chamber for hardening. A floor-guided storage





3.3 m³ concrete distributor with screw discharge



Compaction takes place in parallel to the concreting by means of a low-frequency vibrating station

and retrieval machine (SRM), which is designed for a pallet area load of 375 kg/m², puts the pallets into storage and removes them again fully automatically. The hardening chamber consists of three lined rack towers, each with ten pallet shelves arranged one above the other; the rack doors are actuated by the SRM via a segment door opener when inserting and removing the pallets. The pallets are driven in and out via friction wheels and a rack and pinion pusher. The rollers on which the pallets rest during the hardening process are also made of a high-performance plastic. After a hardening time of about six to eight hours, the hardened floor slabs are removed via the central tower directly to the demoulding area, where they

are subsequently prepared in transportable stacks by means of a lifting beam.

Double wall production by means of a ceiling-running pallet turning unit

If a double wall is being manufactured, the SRM takes the pallet out of the hardening chamber after the hardening of the first shell and transfers it via the circulation to a turning unit that runs along the ceiling. The formwork pallet is locked to the turnover spreader beam by hydraulic clamps before the first shell is pneumatically clamped to the pallet by means of a clamping arm system. The height locking of the clamping arms is variable, as a result of which insulation for core-insulated double walls no longer hinders secure clamping. The first shell is subsequently turned by 180°.

After exact positioning above the freshly concreted second shell, the first shell is lowered by an electric motor-driven rope winch on the turning unit. Once the lattice girders of the first shell are immersed in the fresh concrete of the second shell, the double wall is created by the synchronous vibration of the first and second shells. This synchronous vibration without movement of the first shell relative to the second guarantees high product quality and no concrete segregation in the vicinity of the reinforcement. The clamping arms are subse-



Storage and retrieval machine for the storage and removal of pallets in/from the hardening chamber



Hardening chamber with 3 rack towers, each with 10 pallet shelves



Pallet turning unit for the production of double walls



Manual reinforcement station

quently released and removed. The upper, empty pallet is turned back over and set down on the roller blocks at the return position.

Following a further quality check and the hardening of the double wall in the hardening chamber, the pallet is transported further to the lifting area and for manual demoulding.

Care was taken both with the storage and retrieval machine and the pallet turning unit to keep the continuous operating and maintenance costs low and to increase safety against rope breakage. Until now the ropes employed have had to be inspected annually and replaced if necessary according to the regulations. By means of the appropriate dimensioning of guide rollers, rope drums and ropes as well as high-quality

materials, the life span is extended by up to five years. Vollert uses rope suspension gear here with a spring system that absorbs the developing tensile force in a spring assembly, thus preventing rope breakage.

In the lifting area the demoulded double wall is erected to an angle of 80° via an overhaul tilting table so that the double wall elements can be lifted carefully off the pal-



Lifting cross beam for horizontally lifting off the floor slabs

let. Once again, the cramped spatial conditions were considered here. The vertical erection of an empty pallet returning from the pallet turning unit allows it to pass through. Hence, more time remains for lifting off the finished double walls, without lowering the productivity of the entire plant.

Following the demoulding of the precast concrete elements the formwork elements are placed on the formwork transporter, which is equipped with friction rollers and transports the elements to the formwork cleaner. The formwork is transported through the cleaner by means of integrated magnetic clamps, so that it was possible to increase the feed of the formwork profiles and hence the cleaning force also. Cleaning takes place conventionally by means of metallic circular and roller brushes. Subsequently the release agent is applied by nozzles in the release agent application unit before the formwork profiles are returned to the production circulation.

Intelligently controlled processes from A – Z

All warehouse and production process are controlled centrally via a Unitechnik master computer. Among other things, the fully automatic storage and removal process as well as the transport of the pallets in the production line can be controlled. Evaluations show the plant operator the economy and the production quantities of his circulating plant at all times. A central control console with touch-panel informs the works personnel at all times about the status of each component of the circulating plant.

In case of an error message, this allows a direct analysis to be carried out to determine which sensor is defective or which work process has not been executed correctly. This form of plant monitoring is based on a technology developed by the control specialist Unitechnik and should be considered an innovation for the precast industry. A safety PLC from Siemens has also been integrated in order to further increase the safety of the complete system.

“This plant concept is characterised by state-of-the-art technology and an appropriate degree of automation”, says Didier Pizzato, managing director and owner of CDLP. “Above all, the flexible work processes allow us to achieve economic production numbers in top product quality.”



Overhaul tilting table for vertically lifting off the double walls

Thanks to products that have proven themselves in practice over many years combined with detailed further developments and customer-orientated planning, it was possible to complete the entire project in the extremely short period of six months from the project enquiry to start-up. 75% of the maximum production capacity per shift had already been reached after just eight weeks



FURTHER INFORMATION



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