

Avermann Maschinenfabrik GmbH & Co. KG, 49078 Osnabrück, Germany

Start of production of a highly flexible pallet circulation plant for Drössler in Siegen, Germany

After many years of manufacturing precast concrete elements on tilting tables and stationary production lines, Benno Drössler GmbH & Co. Bauunternehmung KG of Siegen decided to optimise the proven production by the use of a pallet circulation plant. The concept was specified with all detail requirements in autumn 2013, after which tenders were invited and quotations obtained from various plant manufacturers. The Avermann company was awarded the contract for the delivery of the pallet circulation plant in a package together with its subcontractor SAA Engineering, which supplied the process and circulation controller with control system.



Patented Ventur hybrid tower for wind turbines

Apart from structural elements, a wide variety of laminar precast concrete elements have been manufactured for many years at the location in Siegen; the range extends from simple solid walls to sophisticated façade elements with a sandwich design through to custom parts for large tanks, bio-gas plants and the like. In addition, Drössler has considerably extended its production range in recent years.

For instance, the company has developed its own patented construction system for the manufacture of so-called Ventur hybrid towers, with which particularly efficient wind turbines up to 160 m in height can be manufactured. The tower segments required for this are likewise manufactured from laminar solid elements with outer toothing for connection with one another.

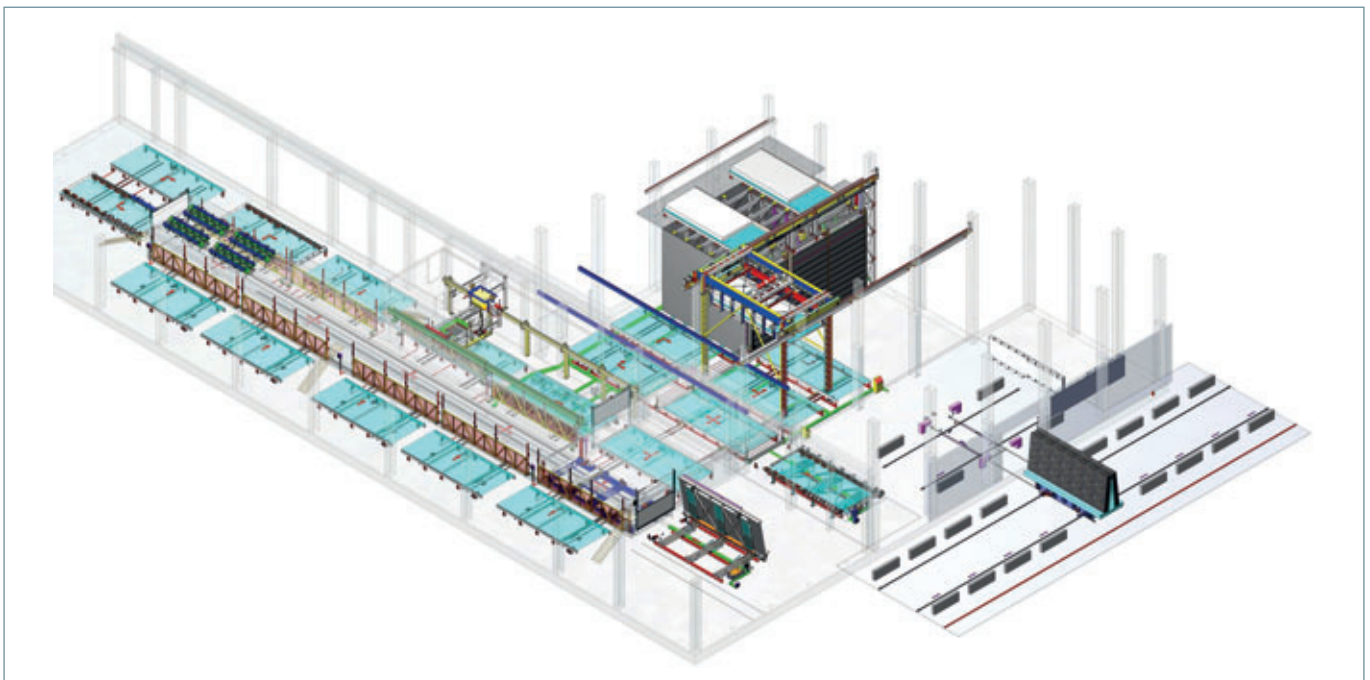
In order to meet these demanding requirements, the existing production has been

modernised and replaced by a highly flexible pallet circulation plant with a central moving platform.

Planning/building phase

Drössler had already begun to consider extending the existing plant in 2012. All the more so after it became apparent that the newly developed wind turbine towers had also been successfully accepted by the market and would result in an extensive field of activity for the coming years.

The Prilhofer Consulting planning office from Freilassing was commissioned to develop an appropriate concept. The major task was to improve the post-treatment of self-compacting and high strength concretes by means of hardening chambers in a newly planned hall, but with undiminished flexibility in the use of the plant. Beyond that, the existing hall with the con-



3D general view of the plant



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crete and reinforcement delivery was to be used further and the process of removal to the outdoor storage area was to be streamlined.

Due to these requirements as well as the varied production range, a classic pallet circulation plant principle was out of the question. Therefore planning was concentrated on a pallet circulation plant with a central moving platform.

The concept was specified with all detail requirements in autumn 2013, after which tenders were invited and quotations obtained from various plant manufacturers. As a result of the sounding-out/negotiations, the Avermann company was awarded the contract for the delivery of the pallet circulation plant in a package together with its subcontractor SAA Engineering, which supplied the process and circulation controller with control system.

For the new plant the existing Hall 3 had to be cleared out and appropriate alterations had to be made with pits and the like, in particular for the operation of the moving platform. An additional new hall was erected for the hardening and removal area.

The construction work, with the required earth moving and foundation work, hall construction, etc., was then carried out by Drössler itself from spring onwards, allowing installation of the plant to commence at the end of May. Commissioning took place according to plan, step by step and under special conditions, since Drössler already had to produce during the plant assembly. First of all the equipment in the existing hall was assembled and put into operation, then the machines with the storage and retrieval machine for feeding the hardening chamber were completed and the automatic operation was set up.

Plant concept with production equipment

The plant is designed for the production of 33 pallets with dimensions of 10 x 4.5 m and a load-bearing capacity of 10 kN/m². The maximum payload per pallet is 320 kN.

All precast elements up to max. 500 mm were defined as standard component thicknesses; there is space in a hardening chamber compartment for each pallet with these elements. Beyond that, however, custom elements up to 1,200 mm in thickness can also be driven into the plant and stored in the hardening chambers. In this case each one occupies two compartments at the same time.

Expandability of production at a later date by the retrofitting of additional pallets and hardening chambers is technically possible, but is not planned at present.

The hardening chamber area consists of three racks, each with 11 hardening compartments. The hardening chambers are individually insulated and can be heated differently, so that in particular the special requirements for the Ventur production are met. The optimised feeding of the hardening chambers takes place from above by a storage and retrieval machine.

After the fully automatic removal from storage – this area is accordingly secured by means of fences and by light barriers/muting system – the pallets with the hardened concrete elements are pre-demoulded at the two processing stations and transported



Storage and retrieval machine for hardening chamber feeding



Central moving platform with cross-lifting truck at the entry to the compaction station

onwards to one of the two tilting stations, where the elements are lifted off by the hall crane.

After having been lifted off, the parts are usually temporarily stored in the hall, followed by appropriate post-treatment, cosmetics, etc. Removal for storage in the outdoor area takes place later. This is done using a special run-off truck with a load-bearing capacity of 60 t for longitudinal and transverse transport, usually allowing two elements to be transported to the outside simultaneously on suitable frames. The concrete elements are either set down on bearing blocks in the outdoor store or brought directly under the gantry crane for immediate transfer.

After the precast elements have been lifted off, the empty pallets are transported out of the hardening/removal area into the production hall. Here a fully automatically operated central moving platform takes care of the further transport tasks.

Due to the different processing procedures, the Ventur production – there is a small, pallet circulation plant at the rear end of the hall for this – and the rest of the production are separated at Drössler.

All shuttering and reinforcement work for the solid/sandwich walls and custom elements now takes place on the stations located in front of the central moving platform. The most diverse tasks can thus be performed in parallel and without mutual interference, independent of the actual scope

and duration of the work. Normally the shuttering work is carried out on the two front workstations and the reinforcement work on those at the rear, but this can be handled with complete flexibility, depending on the work schedules, bottlenecks, etc. The element reinforcement is prefabricated in a separate hall at Drössler and delivered to the reinforcement stations in relation to the specific pallet for further installation. All work for the Ventur production is carried

out at the rear stations. Hence, there is no influence on the rest of production. For the same reason concreting also takes place in several places.

Normal concrete is also processed in addition to self-compacting concrete (SCC). A concrete distributor with a bridge design is available for this; it is fed by a bucket track and serves two workstations. Including various additional items of equipment on the



Fig. 5: Shuttering and reinforcing stations for solid/sandwich walls and custom elements

SAA Engineering

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Hand in Hand





Concrete distributor in bridge design with levelling device

concrete distributor – lowerable internal spud vibrators are installed here amongst other things – and the HF compaction station installed at one station, all specified concretes can be discharged and compacted.

A height-adjustable levelling device is attached to the concrete distributor bridge for the direct smoothing of the top side of the concrete elements.

At the end of the production sequence the storage and retrieval machine is called into action once more. In accordance with specified sequence schedules the freshly concreted pallets are placed into storage in the hardening chamber or, if necessary, fed in time to the two rework stations located above the hardening chambers. Presently, smoothing is still carried out manually here; however, the installation of a power trowel is already planned.

Plant controller

The master computer as well as the circulation and process controller were completely supplied and put into operation by SAA Engineering from Austria. The control system IPS-LEIT2000 controls both the plant logistics and the data transfer for production preparation. The planned jobs are automatically transferred from the ERP system and permanently linked to the appro-

priate pallet at the start of production. The individual production processes are defined for each product in different work schedules.

The work schedules define the production sequence step by step and define the different paths of the pallets within production. The user-friendly control system allows the plant manager to intervene in the sequence at any time or to make changes, for example to the drying duration. Work schedules for new wall types can also be created by the production manager. The processing times at the manual workstations are recorded and fed back to the ERP system for recalculation. The entire documentation of the production, with evaluations, tables and statistics, is of course available at any time.

The functionality of the plant in conjunction with a smooth sequence is the major prerequisite for performance and quality assurance. One point that should not be underestimated is the complete remote maintenance of the controller. Errors that occur can be diagnosed and rectified over the Internet.

Conclusions and outlook

It is estimated that the demand for high-quality precast concrete elements in the

most diverse implementations will be very high in the coming years. The main strength of the pallet circulation plant that has been put into operation is its high flexibility: for example, the parallel manufacturing of structural elements with widely varying processing times. Experience shows that conventional pallet circulation plants reach their limits here.

Drössler thus has an extremely efficient multifunctional plant at its disposal for the manufacture of solid and sandwich walls as well as custom elements, as in the case of the specially patented Ventur construction system for the manufacture of towers for wind turbines. ■

FURTHER INFORMATION



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