

■ Christian Prilhofer Consulting, 83395 Freilassing, Germany

New pallet circuit and modernization of the existing production plant at Skanska in Stängnäs, Sweden

A general renewal of the Skanska factory in Strängnäs was done which includes a new pallet circuit and the modernization of the existing production plant. The possibilities of including the pallet circuit in the existing facilities and a new factory building was checked. The decision was made to build a new building for the pallet circuit

system and to use the existing building for up-grading the production of reinforcement, special products like facades and pre stressed parts. The pallet circuit system was designed to produce sandwich elements, solid walls, solid floor slabs and special elements with a maximum height of 3.800 mm and a length of 12.000 mm.

Skanska and ModernaHus

Skanska is one of the worlds largest construction companies, with a leading position in a number of home markets in Europe, the United States and Latin America. Skanska also carries out project development in selected geographic markets and focuses on finding innovative solutions through close collaboration with its customers and by combining the Group's international expertise with a local presence.

In Skanska Sweden strategic work with developing a more effective construction process is always ongoing. As a part of this program an increased level of industrial construction techniques are being adopted. Product platforms, such as ModernaHus, a residential apartment

building concept are being developed, which enable Skanska to repeat and improve, lower the costs and improve the quality.

Part of the improvements is done by moving working hours from the temporary construction sites to a more controlled environment within a factory. Through the investment in a new pallet circuit in Strängnäs, Skanska aims to increase both capacity and efficiency with an improved working environment and better quality of the pre cast products used at Skanskas construction sites.

New pallet circuit

The new pallet circuit is built around a centralized curing chamber with 6 towers and 10 levels each. The maximum useful

height for concrete elements per level is 400 mm but elements up to 1.000 mm can be produced and stored in compartments of the curing chamber. The size of the steel pallets is 12.50 x 4.50 m. The maximum weight of concrete elements to be handled in the pallet circuit is 24 tons, considering a load of 750 kg/m².

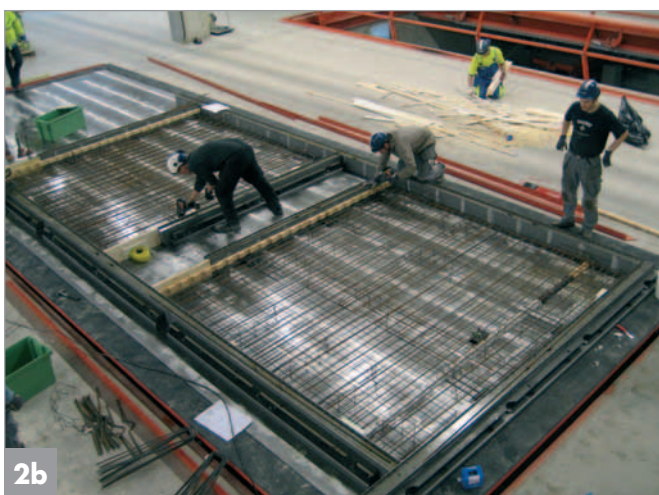
Pallets are transported with the help of rollers and friction wheels in longitudinal direction. In transversal direction the transport is done by pairs of cross lifting trucks. The workstations for set up side moulds, inserts and reinforcement are located on a special mezzanine and operated by two pairs of cross lifting trucks with special lifting device. These lifting devices are able to lift the pallets for 2 meters. These stations are the main manual workstations in the pallet circuit and located on a mez-



Placement of the side moulds, supported by a laser system



2a



2b

Preparation of the pallet; cleaning, oiling and placement of the reinforcement

zanine with a level of about 3.3 meters. The mezzanine has openings according to the pallet size. The pallets are lifted into the opening by the cross lift trucks and placed on interlocking devices. If no pallet is placed a telescopic railing is lifted up and prevents the workers from accidental falls.

The stations are accessible from underneath. Pallets can overtake each other by passing underneath the mezzanine. Therefore the stations are fully flexible and complicated elements which require intensive preparation and long working time do not negatively influence the flow of production for other products. The two pairs of cross lifting trucks transport the pallets in full automatic mode. The workers just have to press the button for lifting the telescopic



3

Concrete spreader

railing into the top position. Further pallet transports are done fully automatic and the workers can immediately continue working at the next pallet which has been placed in the meantime.

This system guarantees full flexible and effective working (as the workers do not have to wait during pallet exchange) and the highest level of labour safety because

there are no pallet transports longitudinal or transversal in the working area. The pallets are easily accessible for the workers because the pallet surface is nearly on the same level as the mezzanine floor. The most used material can be stored close to the pallet stations.

After the hardening process is finished the pallets with the pre cast elements are

taken out of the curing chamber and a demoulding crane removes and places the side moulds onto a conveyor belt. The shutters are transported to a cleaning and oiling device especially for shutters with integrated magnets. After all moulds have been removed the pallet is transported directly to the tilting station.

The pallet circuit can be equipped at a later stage with a special shuttering robot system for removing and placing of the shutters on the pallet.

At the tilting station the elements are lifted from the pallet with the help of two overhead cranes and a special beam. The elements are brought to the completion area with several finishing stations where the completion of the elements (painting, inserting windows, etc.) is done. After that the elements are put onto transport racks /trailers which are brought to the stockyard by means of a truck. After demoulding and cleaning by an automated cleaning machine. After this procedure the pallets are ready for a new production cycle.

Concreting is done manually or in automatic mode. The supply of concrete is carried out by a concrete shuttle that connects the spreader and the batching plant. After concreting and compacting different processes start. Solid walls and floor elements will be screeded. Solid walls are power floated on special stations on top of the curing chamber when the adjustable pre curing time is over. After finishing these processes on the solid elements they are transported into the curing chamber.

Sandwich elements require more effort. When the reinforcement for the 1st layer is placed in the set up side moulds the pallet is transported to the concrete spreader. The first layer is cast and compacted. The pallet is transported to the insulation station where the insulation is placed. Now the pallet must go in a smaller loop back to the reinforcement stations on the mezzanine to get the second part of the reinforcement and after that the pallet is moving back to the concrete spreader to get the second layer of concrete.

Depending to the type of element a treatment of the surface is made. Screeding on all elements and on some power floating.



4

Storing of the pallets in the curing chamber



Tilting station

The control system of the pallet circuit is a very important part of the whole set up.

The work-plan of a product includes the way a product has to take through the plant. This is necessary that the transports can be done in automatic mode.

The control system of the pallet circuit is an important part of the whole set up. It consists of the master computer system LEIT2000 and the PLC-control for the pallet circuit (pallet transports, rack feeder, concrete distributor, pallet cleaning device, tilting table),



Finishing of the wall elements



At the stockyard the elements are handled with several gantry cranes

which interact via working-plans. A working-plan of a product describes the way a product has to take through the plant. It consists of working steps for each of it a list of stations is configured, where this work can be performed (e.g. shuttering, reinforcing, screeding, etc.). When the operator presses the button for having finished his work on the actual pallet, the master computer calculates a free station according to the next step in the working plan and submits a transport command to the circuit control.

By means of that mechanism the track of a pallet and the needed labour time is clearly reported by arrival and departure times and the transports can be done in automatic mode.

At the shuttering and preparation stations, which are equipped with laser projectors, the master computer transfers the right data for displaying element contours, insert parts and cut-outs.

At the demoulding station a label with barcode is printed automatically for each element, when the pallet arrives from the curing chamber. This enables a further booking of element states in the completion area. By means of wireless barcode readers, an operator there sets an element to the "finishing"-status, when he starts with completion (painting, inserting windows, etc.). Before transporting it to the stockyard he books the "ready for delivery"-status. These element states are subsumed to an aggregate status of the order, which is used for disposal and delivery planning. Via database interface the superior ERP-system has online-access to the status-data.

Conclusion

The design of the pallet circuit was done in this special way to guarantee the best combination between efficiency and flexi-

bility for the complex sandwich and solid wall elements as well as to meet the high health and safety standards from Skanska and the Swedish authorities.

Owner:

SKANSKA

Skanska Sverige AB
Construction Frame Systems
Räsundavägen 2
169 83 Solna, SWEDEN
T +46 8 50435000,
F +46 8 7556317
info@skanska.se
www.skanska.se

Designer:



Christian Prilhofer Consulting
Pommernstr. 17
83395 Freilassing, GERMANY
T +49 8654 69080
F +49 8654 690840
mail@prilhofer.com
www.prilhofer.com
www.prily.com

Manufacturer:



Sommer Anlagentechnik GmbH
Benzstr. 1
84051 Altheim, GERMANY
T +49 8703 98910
F +49 8703 989125
info@sommer-landshut.de
www.sommer-landshut.de

Manufacturer:



saa engineering gmbh
Gudrunstr. 184/ 5/ 2
1100 Wien, ÖSTERREICH
T +43 1 64142470
F +43 1 641424721
office@saa.at
www.saa.at



SL Laser GmbH
Munastr.10
83301 Traunreut, AUSTRIA
T +49 8669 863811
F +49 8669 863848
info@sl-laser.com
www.sl-laser.com

Vollert WECKENMANN

Weckenmann Anlagentechnik GmbH & Co. KG
Birkenstraße 1
72358 Dormettingen, GERMANY
T +49 7427 949320
F + 49 7427 949329
info@weckenmann.de
www.weckenmann.de