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Production of double walls and solid walls with cavity at Alcrete Ltd., Ireland

Within the last decade Ireland's economy was booming and the infrastructure can't keep up. Due to this circumstance Irish building companies

were looking for building systems with solutions such as fast-track building and lightweight building.

Peter Kawan, Christian Prilhofer Consulting, Austria

Alcrete Ltd. in Ireland, a pre-cast factory which can produce pre-cast elements for up to 5,000 housing units per annum, started producing pre-cast housing components this year. With the new factory they reduce build up time by up to a third compared to certain types of concrete housing construction and are able to provide quality homes at affordable prices.

Many houses in Ireland are covered by a external cavity wall and therefore the production plant had to include the opportunity to produce solid walls with cavity.

The cavity wall elements consisting of the load-bearing concrete part of the wall, the vapour control, the insulation, the cavity and the carrier with bricks or mortar can



Soil composition of the building site



Factory building with three wings and batching plant

be produced in the new pre-cast plant, too. But before the design of the plant started some queries about the building system like special solutions for covering the corners, joints between the solid walls and connections between the window frames and the carrier had to be solved.

The new pre-cast plant is based on a 13-acre site in Arthurstown, Kill Co Kildare not too far from Dublin and the factory unit covers nearly five acres.

The project started with a ground survey and because of the bad soil conditions piling was essential.

The improvement of the soil conditions led to additional expenditure.

To meet the requirements of the variety of landscapes in Ireland, the facilities had to be painted in green colour and the total



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Piles in the area of the curing chamber

height of the building (including the batching plant) must not be higher than 14 m.



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Assembly of the production building

One of the first parts of pre-cast plant to be assembled was the batching plant because it was used for the manufacturing of the floor plate. The batching plant with one mixer is designed to provide the production plant with max. 30 m³ ready mixed concrete per hour and can be expanded with a second mixer for an additional production line in the future.

- Solid walls made of normal concrete (with or without cavity)
- Filigree slabs
- Double walls



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Piling equipment

The production building which can be expanded in the future for example with a production line for hollow core slabs or structural elements is made of steel and equipped with several mezzanines for the production of floor slabs, solid walls and double walls. Two of the three wings include the pallet circuit itself and the third wing includes the reinforcement preparation and moulds for the production of beams and columns.



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Batching plant without cladding

A bucket conveyor is used to transport the fresh concrete from the batching plant to the concrete spreader. This transport system has its own control system and is working automatically by means of a communication between the batching plant and the concrete spreader.

The pallet circuit itself is designed to produce the following products:



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Due to limited knowledge about the new building system in Ireland and due to the product mix, the production plant has to be as flexible as possible. After a check of the opportunities to use a second hand plant from Eastern Germany which was rejected because of high adaptation

Demoulding area

The demoulding area is created in such a way that a parallel demoulding of wall and floor elements is possible. That means two cranes are able to work at the same time without disturbing each other. In case

solid wall elements are taken out of the curing chamber with the help of the rack operator and are transported to a position where a demoulding crane for the handling of solid wall shutters is installed. With the help of this demoulding crane all shutters are removed or placed onto a conveyor belt. The shutters are transported to a cleaning and oiling device especially for solid wall shutters with integrated magnets. Afterwards the shutters are transported to the shuttering robot. After all shutters have been removed from the pallet the pallet is transported to the tilting table where the pallet is tilted for about 85° and the wall-elements can be lifted from the pallet with the help of two parallel-working overhead cranes. The elements are put into transport racks for walls which can be placed on seven deposit positions. After lifting off the wall elements the pallet is tilted back and transported to the pallet cleaning station. The demoulding of the double walls is similar to the demoulding of the solid walls but the pre-cast elements are removed from the pallet before the shuttering system. Filigree slabs can be lifted off the pallet with a special lifting device for floor slabs or by means of the overhead crane and then the slabs are laid to stacks according to the previously determined stacking order. After pre-cleaning all pallets from the pallet circuit come together to a reunion-point of the different circles in the plant where they are cleaned and oiled. ▶



Preparation of the floor plate

costs, a new flexible pre-cast plant was designed by Christian Prilhofer Consulting. The plant concept is done in such a way to guarantee the highest possible output and the maximum efficiency of labour and machines which is done in such a way that the unproductive time of machines and workers is cut down to a minimum. Producing different products at the same time is possible without disturbance in workflow and efficiency.

This system in the final stage of extension can produce 150 m² of floor slabs or 75 m² of double walls or 80 m² of solid walls (finished products). The whole process is controlled and supervised by the master computer which receives the data direct from the CAD system with all the information that are required for producing the concrete elements.

The maximum number of pallets in the curing chamber is 80 pieces and the description of the production process of the pallet circuit is as follows:

of solid wall production the shutters have to be removed from the pallet first and because of this the finished pallets with



Demoulding area in the construction stage

Handling of shutters and formwork

Cleaned and oiled pallets are ready for a new production circle and are brought into the area of the shuttering robot with the help of the cross lifting truck, lifted up and fixed in a steel structure for the further processing. Additionally the shutters with the integrated magnets are transported after cleaning and oiling by means of conveyor belts in the area of the shuttering robot.

In the first construction stage one robot system is responsible for the storing and placing of the shutters but the pallet circuit is designed in a manner to be extended with a second robot system.

The shutters are placed onto the pallet with the shuttering robot according to the CAD-Data in automatic mode and after that the pallet is transported to the next free station for manual completion of the formwork. The shutters which were set by the shuttering robot are then completed, for example with pull-on profiles, telescopic profiles, formwork for doors and windows and inserts like sockets.

Furthermore the manual completion of formwork is disconnected from the pallet circuit which separates this level from the transportation area. When completion of



Mezzanine for manual shuttering

formwork is done, safety railings are lifted up and the pallet is transported to the next free station in automatic mode.

Automatic Reinforcement Centre

After completion of formwork the pallet is transported to one of the reinforcement stations where bars and lattice girders or welded meshes are laid onto the pallet. In

the first construction stage Alcrete Ltd. uses a reinforcement centre with a robot system for bars and lattice girders. This reinforcement centre consists of a straightening and cutting machine, a lattice girder cutting line and a robot system which places the transversal, longitudinal bars and lattice girders according to the CAD data on the pallet of a pallet circuit. The robot system is equipped with two arms or heads which can place up to three bars or girders at one go. One of the robot arms can be rotated by 90° to place the transversal bars or the girders for the double wall production on the pallet.

An interference of the pallet movement and the movement of the robot axis reduces the cycle time. Another advantage is the use of two production lines because the time for changing the pallet will be neutral for the production process and the robot is able to work on one of the pallets while the pallet on the other line will be changed.

The pre-cast plant is designed in a way that a mesh welding plant can be retrofitted. In this special case meshes are welded automatically according to the CAD-Data and the mesh welding plant is producing exactly every mesh for every single element.



Shuttering robot



Reinforcement centre

Casting and compacting area

After reinforcement is finished the pallet is transported into the area of the concrete spreader where the process of placing the concrete and compacting it is divided in two independent processes to save time. Casting can be done manually for solid walls and in automatic mode for slabs and for double walls. The supply of concrete is done with an automatic concrete conveyor travelling between the batching plant and the concrete spreader.

After casting the compaction process starts by shaking or vibrating depending on the thickness of the elements and of the concrete consistency. The casted pallets with elements like filigree slabs, solid walls and the first shell of the double wall are transported to the curing chamber and the second shell of the double wall is transported for further processing to the double wall equipment.



Casting and compacting area

Production of double walls and solid walls with cavity

For the production of double walls a vacuum turning frame is used. The pallet with the first shell of the double wall which was concreted one shift before and which has finished its hardening process is brought to a position where the elements are lifted off with a special device and placed onto the turning frame. The positioning of the elements is checked and afterwards the vacuum is activated. The turning frame is lifted and is turning 180° in automatic mode. When the frame has turned the freshly spread second shell is brought in underneath and then the frame with the elements of the first side is let down, until the lattice girders, fixed in the first shell, sink into the fresh concrete of the second shell. Then the second shell is compacted by shaking the pallet. The next step is to deactivate the vacuum, to lift the frame and then to transport the pallet with the double-walls into the curing chamber. When the frame has turned back 180° and is let down again the production of the next double walls can start.

Solid Walls can be smoothed with a helicopter system and after the pre-hardening time the pallet with the solid wall elements is taken out of the curing chamber and brought to the mezzanine with the helicopter-smoothing machine.

The solid walls with the cavity are also produced on this mezzanine and in this case the pallet with the hardened solid walls is brought by means of the rack operator from the curing chamber to the mezzanine floor. On this mezzanine floor a small pallet circuit for the completion of the solid walls is located. The cavity consists of an insulation, the air cavity and a cement board with brick slip or mortar. The parts for the cavity wall production will be stored and prepared on the mezzanine. After finishing the cavity walls the pallet will be brought by the rack operator to the curing chamber.

Curing chamber

The curing chamber is a rack system in which the pallets are brought in like a drawer by the rack operator and the segmented doors are opened by the rack operator when pallets are taken out or brought



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Rack with solid walls



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Curing chamber and rack operator during the assembly



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Batching plant with cladding

in. The whole curing chamber is cladded with insulating panels and heated with a directly heated hot air generator.

With this flexible pallet circuit Alcrete limited is well prepared to meet all the requirements of the market in Ireland in the future.

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