KERKSTOEL 2000 Ü N.V., Grobbendonk, Belgium

Modernizing during production: rejuvenation for a pallet circulation system

Kerkstoel, one of the largest producers of element floors and double walls in Belgium, runs two lines for the production of element floors and double walls in Grobbendonk, Belgium. The production quantities in two-shift operation are 4,600 m² of concrete surface per day. The production plant for element floors was opened in 1992 and was then one of the most modern plants of its kind. The planning and coordination was done by Reymann-Technik, from Hockenheim, Germany.

Formwork removal area before modernization

From 1992 to 1999 the plant was run in its original state. In 1999 a link was made to the automatic mat welding machine and the original steel processing facility with a laying robot was taken out of operation. After a one year test phase, it was decided to expand the existing steel processing facilities and to bring the entire circulation system up to the state of the art.

At the beginning of 2001 the planning for the modernization was made by Firma Kerkstoel in cooperation with Christian Prilhofer Consulting, Freilassing, Germany. Since production could only be disturbed minimally, the modernization took place over 1½ years. The result is a circulation system which can easily compare to a newly built plant.

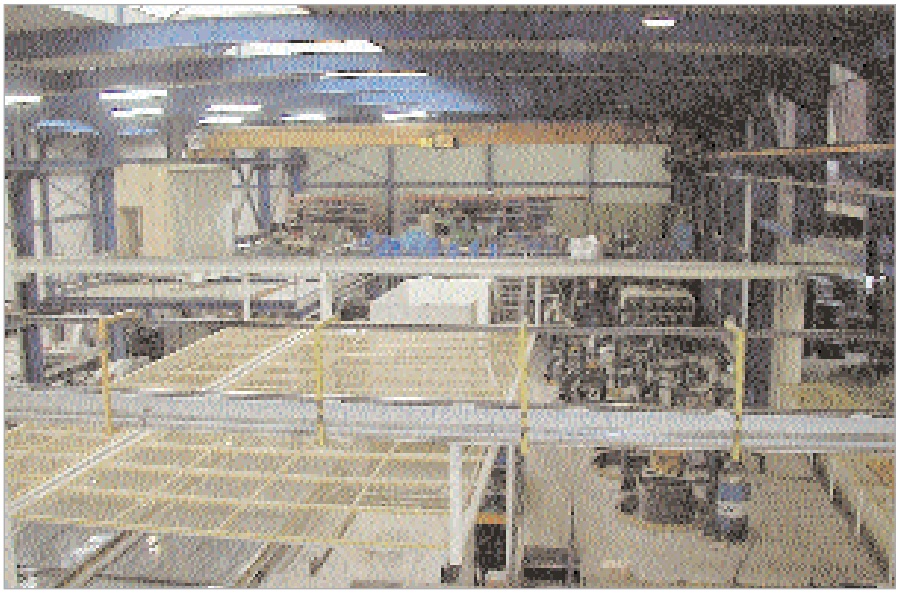
The following sections and systems were changed:

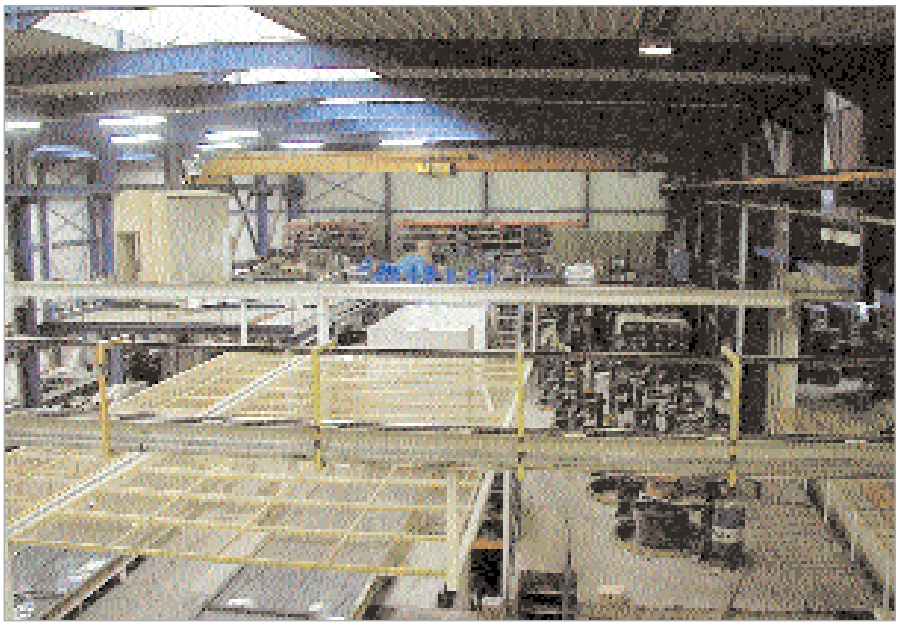
Control technology

The existing control system, which had been in use since 1992, was exchanged for a new system which uses Microsoft Windows NT Server with an SQL database. The control system is set up as a multi-user company-wide solution so that the company can react quickly and flexibly with all the information that decision makers need online. This allows operation from various work stations in the network. The CAD data is transferred to the control system using the Unitechnik CAD/CAM interface description, version 4.0 B or higher.

The estimate of the time of completion of production units is another innovation of this control system. This is used to optimize the scheduling in the storage area and when loading the trucks. The estimate of the time of

Gantry crane loading a stack of floors





Reinforcement area before modernization, the steel rod straightening unit is in the background

completion is done using plant-specific planning data. This is possible since the plant works with a production queue. The calculation is therefore based on the following variables, cycle time, throughput time, curing time and the size of the curing chamber, and the corresponding work time model.

● Pallet circulation

In order to be able to optimally include all additional processes, the existing pallet circulation system had to be enlarged. This was possible since the hall was built larger than necessary for the circulation system in use at the time in 1992. The circulation system was expanded by four circulation stations between the formwork robots and the automatic placement of the lattice girders. These additional stations are used with a mat crane to place the spacers and the welded mats. Buffers had to be built so that the automatic machines could work independently of each other.

● Formwork removal area

In order to dissolve the dependency between the formwork area and the formwork removal area, a pallet buffer was placed in front of the automatic cleaning system and the formwork robots. The cleaned, empty pallets are stored in this buffer. This creates a buffer of approximately 1.5 work hours. In addition, the transport situation was changed and the existing transport cars were made automatic. The automated cars now independently take the element stacks to the area of the gantry crane. This means that the employees in the formwork removal area no longer need to operate the transport cars.

● Formwork area

Kerkstoel has one of the first formwork robots. This formwork robot was equipped with a single gripper. This repeatedly caused delays in production since a lot of time was lost when placing the magnets. In order to make up for this disadvantage, this robot was equipped with a double gripper which halved the time necessary to place the magnets. At the same time the control of the formwork robot was changed to bring it up to the state of the art. In addition, the continuous

Transfer station for the elements from the transport car to the gantry crane

supply of pallets to the formwork robot is ensured by the pallet buffer.

● Reinforcement

As has already been mentioned, Kerkstoel changed the reinforcement for element floors from individual rod reinforcement to mats welded using CAD technology. This was achieved by linking it to the existing mat welding system. Since only one automatic mat crane was in use for the two circulation systems, which also had to serve a magazine with 30 places, there were a number of delays in the process. In order to make up for these, a second mat crane was installed to improve the supply of mats.

In addition, the second mat crane made it possible to set up a better emergency strategy should one of the cranes break down. By using an additional mat crane, it was possible to increase production on both lines. After the mats are automatically placed in the pallet with formwork, the lattice girder robot begins its work. The existing robots, which used to lay rods and lattice girders, were converted to a lattice girder robot. Instead of the straightening machine, a lattice girder buffer magazine was installed which makes it possible to cut lattice girders for one hour of production in advance.

Exterior view

● Curing chamber

After the concrete is poured and compaction has taken place, the pallets are sent to the curing chamber. Because production was increased it was also necessary to increase the size of the chamber. This was accomplished by installing a pallet lowering station in the exit area of the curing chamber. The capacity of this lowering station is set up so that an additional hour of curing time can be achieved.

Formwork removal area with pallet buffer in front of the formwork robot

● Storage area

The storage area for element floors was also modernized. Kerkstoel tries to bring the stacks of element floors directly from the transport car to the truck with as little handling as possible, as is common in the Benelux countries. This is possible on the one hand because of the ability to temporarily place the units near the gantry crane

Automatic mat crane laying the reinforcement mats

Robot laying the lattice reinforcement

and on the other hand by the expansion of the control system. This way about 30 percent of the stacks of floors can be temporarily stored away from the storage area. This has the advantage that storage costs are reduced and the risk of transporting the stacks several times is reduced.

Summary:

The measures outlined above made it possible to bring the plant back up to the state of the art with low investment costs and minimal modernization effort. This was urgently necessary since the demands on quantity for elements floors are increasing year by year, which is unfortunately combined with a decline in prices. Kerkstoel will be able to successfully defend their market position in the years to come with the plant thus modernized. ▶

Lattice magazine and cutting unit

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