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Intelligent information technology increases productivity

Fabrication of precast concrete elements is technologically one of the most demanding industrial manufacturing processes. It is made possible due to the seamless networking of CAD and CAM systems.

The CAM central computer, which is the central information and control unit for the precasting plant, assures manufacturing productivity and is the basis for future growth in productivity.

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Automated production for a batch quantity of 1

It is well known that people have very different tastes. This is particularly so when it comes to planning ones own home. Some architects could recount many a tale about what it takes to convert the special requests of customers into a feasible plan. Despite such a high degree of individuality, the necessary wall and ceiling elements can be produced automatically in a factory. The secret behind this lies in the abbreviations CAD (Computer Aided Design) and CAM (Computer Assisted Manufacturing).

The CAD system carries out the electronic registration of the geometrical measurements and functional details of the building. As a rule the architect already uses a CAD system for planning the dream house. The building is subdivided into wall and ceiling elements in the precast concrete plant's technical office. The data from these elements are then transferred to the CAM system. This controls all the relevant machines and transport equipment in such a way that by the end of the manufacturing process, a building kit for the customised private house is produced. Even the construction sequence for wall and ceiling elements on the building site is already taken into consideration. This technology puts the precasting industry far ahead of many other branches of industry.

Teamwork requires good communication

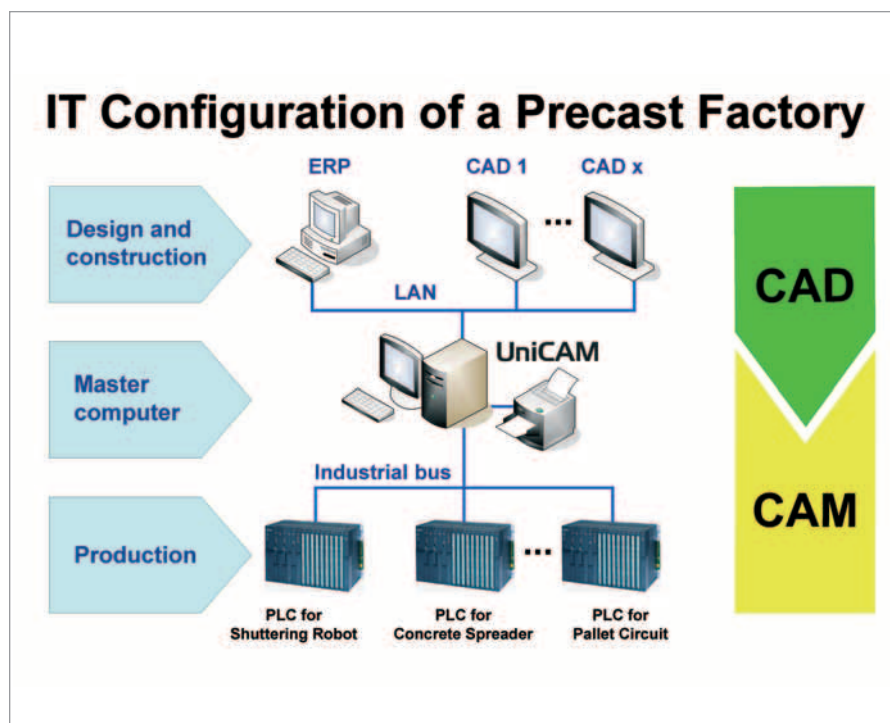
A factory for production of precast concrete elements consists of a large number of machines, plant and transport equipment, as well as data processing systems. These components sometimes come from quite different suppliers. Despite this, every piece of equipment has to be provided with the information it needs in order to work. The mixing plant needs to know which quality and quantity of concrete are required, the formwork robot needs to be informed about the outline of the component to be produced and the mesh welding facility needs the reinforcement data. In order for the whole process not to end up as a confused Babel, a standardised data interface between all the parties is required. The precast concrete industry uses the Unitech CAD-CAM Interface for this.

The data structure maintained by Unitech is openly accessible to every company in the industry and can be installed free of charge. New market requirements are taken into account in each subsequent new version.

What is the purpose of the central computer?

If each component can "talk" to every other component, for example if the CAD system can transfer data direct to the formwork robot, what need is there for a central computer?

In answer to this question, the most important functions of the central computer are listed below.



Simplified view of an IT setup in the precast concrete plant.

Order management

- Management of customer orders
- Tracking / status of each order
- Preview of all items in the order in 2D and 3D
- List of materials for work preparation

Pallet allocation

- Batch configuration allowing for several orders
- Automatic and optimised allocation of the production pallets
- Criteria for allocation can be configured by the operator
- Manual allocation changes using "drag and drop"

Production control

- Optimised pallet sequencing for production
- Preview of the next pallets in 2D and 3D views
- Coordination of transport and machine movements

- Independently configurable product-specific production schedules

Plant visualisation

- Plant layout with pallet tracking
- Allocation of curing chambers
- Information on fault elimination
- NC data for machines

Information management

- Reports on plant production and consumption of raw materials
- Lists and drawings for production, building site and controlling
- Statistics on production optimisation
- Interconnection with ERP or PPS systems

Installation of a central computer is recommended even with a medium-sized pallet circulation system and a low level of automation.

A central computer gives the plant operator the following advantages:

Efficiency

Optimal use is made of resources (machines, staff and raw materials). Delays and errors are avoided.

Transparency

At any given moment, the operator knows which item is where in the plant and when the item or job is finished. Every component produced is documented and the manufacturing parameters can be retrieved years afterwards. ►



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Flexibility

Orders can be brought forward, components reproduced or production parameters altered, all at the touch of a button.

Increasing productivity by minimising non-productivity

If a plant fails to achieve the desired output despite the central computer, this can be due to a variety of causes. With the assistance of the UniCAM central computer, some of these causes can be eliminated, or at least reduced. Some sources of non-productivity are listed below and ways to rectify them pointed out



Control room with UniCAM central computer at Skandinaviska Byggelement in Sweden.

Control of CAD data

Data transferred by the CAD system can contain errors. These can be formal errors (syntax/notation which does not conform to the interface definition) or content errors (components which cannot be produced or cannot be used). If these errors are noticed too late, they then lead to production delays, waste of raw materials or even to delivery of faulty components to the building site.

The files are checked for technical accuracy when the data are read into the UniCAM central computer. This is followed by a check for production capability. For example, a check is carried out to see whether the stated type of lattice girder, the diameter of the round steel and the fittings in the special production plant are available and are permitted. A check of

the standards of the precasting plant can also examine whether wall strength, shell strength, air gaps and type of girder correspond to the standard items in the production catalogue.

In addition, UniCAM allows visual checks of the components to be produced at any time. Two-dimensional (2D) and three-dimensional (3D) views are available for this purpose where components such as reinforcement or fittings can be superimposed or removed.

The 3D view can be rotated by the operator and thus viewed from all sides.

Clock cycle synchronisation

Very labour-intensive pallets create a bottleneck in plants with serial production. The other pallets have long finished their process step and are only waiting to be able to advance. The central computer counteracts this phenomenon with a number of measures.

When allocating the pallets it makes sure that multiple labour-intensive items are not put onto a single pallet. Scheduling the production sequence locates the pallets in a favourable sequence so that production bottlenecks are avoided. Work schedules allow the plant operator to define individual products and to set their route through the plant.

Rapid fault elimination

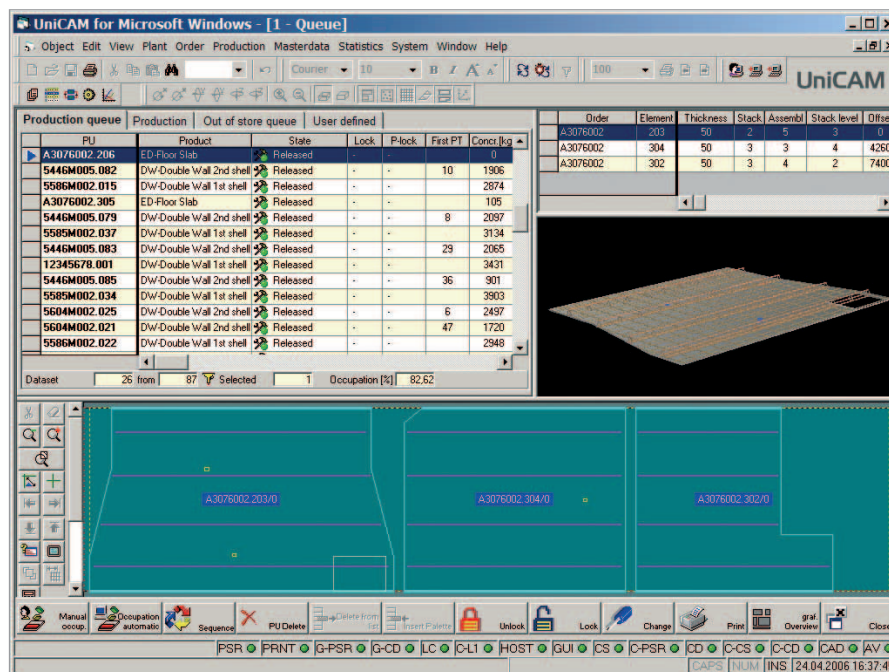
In complex plants faults do occur. These can be caused by wear and tear, contamination or damage of electrical or mechanical components, but also by incorrect use of the plant. In order to achieve high productivity, faults must be discovered quickly and repaired effectively.

All fault messages from the plant are accumulated by the UniCAM central computer. The lowest line on the central computer screen is the alarm control. It is visible in every mask and has a status light for every section of the plant. If all lights are green, the plant is trouble-free. A red light indicates a fault and provides a comprehensive fault message at a click. Detailed information required at the site can be called up on a display on the plant component. This allows most faults to be remedied quickly and without any knowledge of programming.

All fault messages are compiled and stored by the central computer. Statistics on the most frequent causes of faults help to pinpoint weak areas and to carry out preventive maintenance if appropriate.

Eliminating bottlenecks

Bottlenecks in a plant can result from the plant layout, they can arise from inefficient



UniCAM central computer screen masks

machines or human resource allocation or be caused by material logistics.

The first step in every case is to identify the bottleneck. In addition to the views of the experienced factory manager, the station log can be of assistance here. It reproduces the actual processing time for every pallet at every processing station.

Statistical evaluation enables identification of which station is putting the breaks on the whole system. If, for example, a weak point is located in the plant layout, then the central computer can take counter measures with a modified control strategy.

Conclusion

The central computer in a modern precast concrete factory should by no means be viewed as a nice toy for the factory manager – it is a prerequisite for ensuring high plant productivity in the long term.



Further information:



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