

Nägelebau GmbH, 6832 Röthis, Austria

Substantial increase in special concrete component manufacturing capacity using unique circulation system

Nägelebau GmbH from Röthis in Voralberg, Austria, is one of the major companies in the region and is active on a wide business front. Its core businesses include raw material extraction, civil engineering, and the production of precast concrete components. The company started pre-casting in the 1960's and, during the course of time, this field of activity has developed into the strongest area for Nägelebau GmbH. Their full range of precast products is very large today. Design-engineered, large-sized prestressed precast components with astounding dimensions, elements floors, frame-supported and ribbed slabs, façade elements in varying colours and surface finishes, numerous special components such as concrete driven piles, as well as precast for constructing stadiums, plus still more products, all are to be found amongst the precast on offer from Nägelebau. The company also provides a comprehensive assortment of concrete products for gardening and landscaping. Concrete paving blocks, concrete slabs, palisades, gutters and retaining walls can be named as some examples here. With a view to further expanding its special component segment and making it more economically efficient, a new pallet circulation system was commissioned for operations last year that must surely be the only one of its kind in the entire world. This new system was supplied by two German companies, Vollert and Weckenmann, and assembled in an added, purpose-built production hall (L x B x H = 90 x 50 x 15 m).

■ Mark Küppers, CPI worldwide, Germany ■

Nägelebau GmbH can look back on a 150-year tradition as a family-run business that began life as a building construction company. This was followed by its first activities in other civil engineering and road construction projects. Nägelebau has continued its development up to the present date to become a diversified company with a staff of more than 400 in the construction sector. About 100 of these employees are occupied in manufacturing precast concrete components. These are produced solely at their site in Röthis.

The customers of this largest manufacturer of precast in Voralberg are to be found mainly in Austria, Switzerland and Southern Germany. Approximately 80% of the components produced are installed on its own

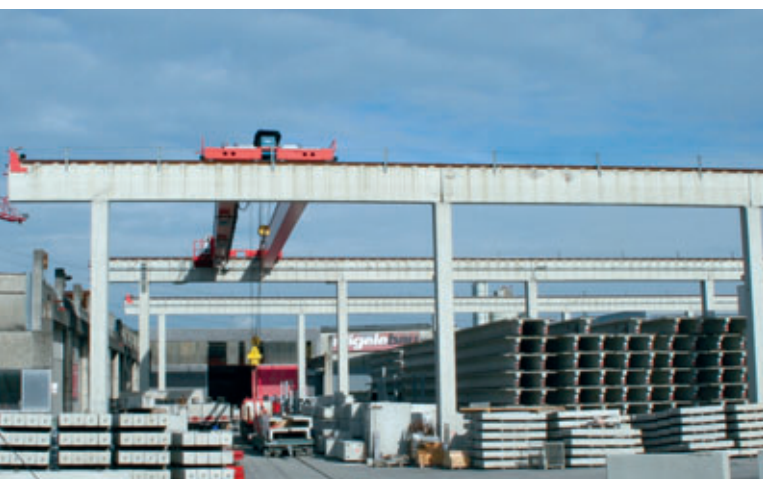
construction sites. The remaining elements are produced and supplied according to customer specifications. Nägelebau can offer its customers complete precast component structures including individual modular design buildings, and wide-span production and commercial areas.

If large amounts of precast have to travel over a large distance, then Nägelebau occasionally falls back on the railways. For one particular project, about 1,900 foundation beams with lengths up to 10 m and each weighing 10 – 12 tonnes were transported by rail to Switzerland. The company is also known to go the extra mile in order to satisfy customer requirements. Aggregates were sourced in Brazil for one particular project in Liechtenstein! In normal cases, however, aggregates come from the company's own gravel production facility. Nägelebau can manufacture prestressed



Formwork made by CTVS, a French manufacturer

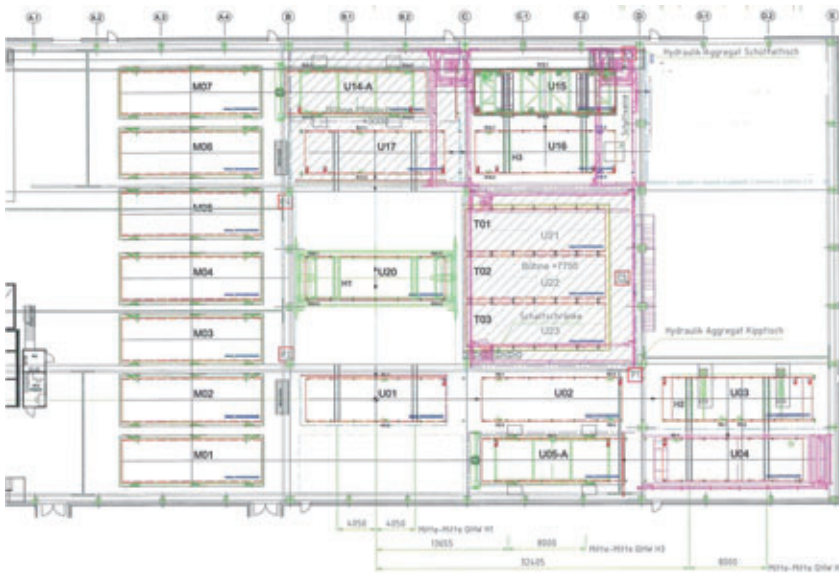
concrete girders up to 35 m in length and 40 tonnes in weight at its Röthis production facility. The girders are produced on a production line from Nuspl. Universal formwork from Howal is employed for producing columns and beams. For manufacturing curved concrete construction components, Nägelebau has purchased formwork from



The range of precast available at Nägelebau is astounding



Nägelebau supplies precast with varying surface finishes and colours in very high quality



Layout of the new circulation system at Nägelebau with the seven stations - M01 to M07

CTVS, a French manufacturer, that permits construction components to be made in any shape desired by dint of its practically infinitely variable possibilities of adjustment. With a view to opening up fresh paths in the production of special concrete construction components, Nägelebau decided to invest in a new production line for these products. The outcome of the plant concept created jointly by Nägelebau together with Vollert and Weckenmann is an ultra-modern, unique circulation system.

Three-level circulation system

Special components, as manufactured to order by Nägelebau, demand a great deal of manual activity in setting up their formwork because of their individual shapes. The consequence is that long periods are often needed where the pallets stand still until any number of individual operations

can be carried out. This means that other stations, such as the concreting bay for example, are not running at capacity and that longer downtimes can occur there. A plant concept with three levels was developed with the aim of avoiding this problem and creating an efficient production line. In this system, pallets are prepared at seven processing stations with all work necessary before concreting and there is a possibility that the pallets can "overtake" each other. This way, "traffic jams" can be avoided and continuous production is made possible. Production is carried out at Nägelebau on steel pallets measuring 14.5 x 4.5 m.

The pallets can be introduced into the circulation system independently from each other at all stations. This is made possible by an ingenious transport system in the basement 3.00 m below the working level. At this transport level, an elevating platform

takes charge of conveying the pallets. This elevating platform lifts empty or partially completed pallets to the appropriate station, lowers them again once that particular work has ended and then transports the pallets entirely automatically to the next station. This means that pallets at the transport level can overtake other pallets at the working level. Before the elevating platform lowers a completed pallet from the working level, the workplace, i.e. the emerging pit, is secured by guard rails that can be raised and lowered.

Laser projectors for positioning construction components precisely

The option of a formwork robot was abandoned due to the numerous differing products that Nägelebau manufactures on the new circulation system. Nonetheless, Uni-Laser projectors from Unitechnik were installed above two stations so as to be able to position formwork elements, power sockets and all other additional components rapidly and precisely. The lasers are suspended at a height of 7.80 m centrally above these two stations. Contours and inserted components are projected to enable the employee to set the relevant elements in place precisely. The laser lines are drawn on the pallet surface or on concrete components already on hand. The UniLaser is specialised in the production of multi-layered and three-dimensional concrete construction components.

The information being projected can be divided up into several individual pictures, which can be selected simply and directly by an employee using a remote control. Configuring these individual pictures and determining their projection height can be carried out easily by the UniCam master computer. Once all formwork and set-up work has been completed, the pallets are



A good view of all stations is provided from the control room. Unitechnik laser projectors are installed centrally above stations M01 and M02



Formwork storage



Special components, as manufactured to order by Nägelebau, demand a great deal of manual activity in setting up the formwork



After a workplace has been secured by its guard rail, the elevating platform from the basement level takes hold of the pallet, lowers it and transports it to the next station



conveyed fully automatically to the concreting station. A concrete spreader is used for concreting. This is fed by means of a bucket conveyor made by Dudik, which transports the concrete from a mixing plant located outside the production hall. Nägelebau possesses two mixers from Kniele and Liebherr for producing concrete; the batching system is from Doubrava. A colour batching system from Kimido is instrumental in giving the concrete the desired colouration when needed. Up to 180 m³ concrete is mixed and processed each day. The high quality of concrete required is continually monitored in an in-house laboratory.

New fully electronic, microprocessor-controlled weighing and batching system

It was originally intended that the old control unit from the former 1980's production line should be enlarged and adapted to the new circulation system. It became clearly evident in the planning stage that the old

control unit could not cope with the increased demands placed on it by this new, state-of-the-art production line. So, the decision was made to renew the control unit completely. Nägelebau, in fact, decided in favour of a new Dorner I.7 control unit made by Dorner Electronic, an Austria company, with whom Nägelebau has maintained a long-standing business relationship for some time. The Dorner I.7 control unit is a fully electronic, microprocessor-controlled weighing and batching system, which is composed of a power divider with two fully-fledged control stations for loading the plant and the mixing process. They can be operated independent from each other. Communication with the bucket conveyor and mixers can take place via a control station. All production processes are clearly displayed at the operator's terminal. An external operating terminal with display and touchscreen is situated immediately adjacent to the concrete processing station. Orders can be called up here directly from the production hall.

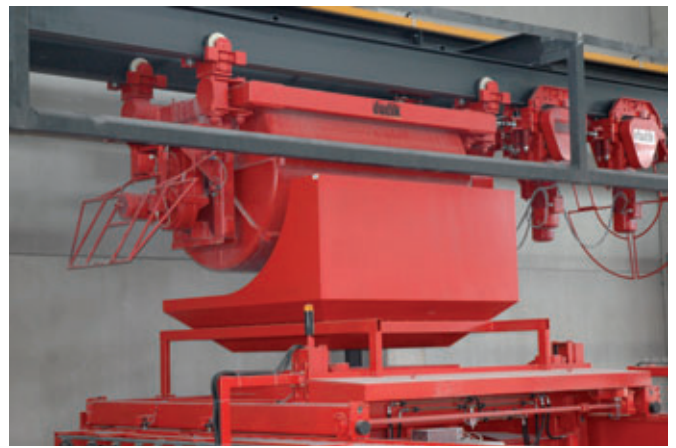
Mixing orders, recipes and all other data can be entered and processed at the workstation monitor for operating the Dorner control unit and database. The monitor display is clearly laid out; the production sequences can be controlled simply and reliably.

Geothermal energy ensures the right temperature

The now concreted pallets travel automatically out of the concreting station and are transferred to a storage and retrieval system. This system possesses an elevating platform that can also travel sideways and enables pallets to be placed into and removed from storage on both sides. Its maximum lifting capacity is 44 tonnes. The curing chamber system located in the centre of the production hall provides a total of 33 storage places, all of which can be opened individually. One other special feature, apart from the sheer size of the curing chamber system and the storage and



Inserting reinforcement at the next station



The Dudik bucket conveyor transfers concrete to the concrete spreader

retrieval system, is the fact that the chambers are heated by geothermal energy. Heat from the earth makes for agreeable temperatures in the entire production hall.

The circulation system's third level is to be found above the curing chamber. At this level, there are three smoothing stations arranged in parallel and serviced by a

power trowel. The surface can be processed at this stage if need be. Savings on space were made by this ingenious arrangement with the smoothing stations at a higher level.

Once the precast components have sufficiently hardened, the storage and retrieval system removes the pallet from the curing

chamber and conducts it to the formwork stripping station. Alternatively, it can be transferred to the smoothing stations as soon as the concrete has attained its stipulated early strength. Once the formwork has been stripped, the concrete elements can be lifted from the pallet by crane and transported to outside storage.



The concrete spreader ensures that the formwork is filled precisely



The storage and retrieval system services the 33 slots in the heated curing rack



Integrated cleaning station immediately adjacent to the concreting station





The formwork is stripped from the precast after being taken from the curing chamber and they are removed from the pallet by crane

The new circulation system represents a considerable increase in capacity when compared with the earlier stationary production line using tilting tables. In its imple-

mentation, thought was also given with the new system to future expansion measures that can enhance its potential still further.

FURTHER INFORMATION



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Power trolley above the curing chamber