Avermann Maschinenfabrik GmbH & Co. KG, 49078 Osnabrueck, Germany

# Pallet circulation plant in Sydney for manufacturing façade and wall elements for industrial and commercial buildings

**"Down Under" as well, the manufacture of precast concrete components is increasingly gaining in importance. Sasso is a young, upcoming medium-sized business located in the metropolitan area of Sydney, Australia. The company offers an excellent example of the change-over from simple industrial production to a modern manufacturing facility.**

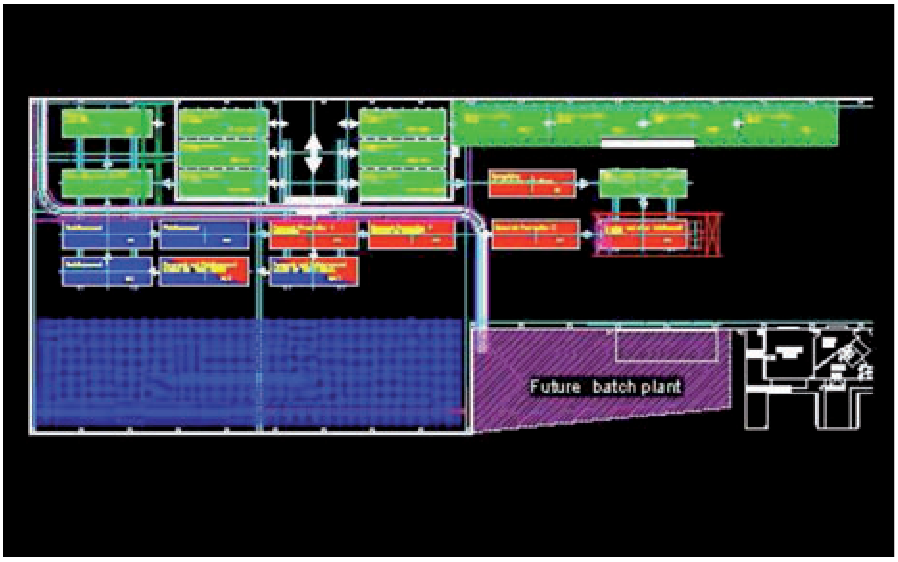
Thomas Strach, Avermann Maschinenfabrik GmbH, Germany

Although Sasso was founded in August 1999, its owners had been gathering experience in the precast element sector since the beginning of the eighties. The initial production location in Hoxton Park soon became too small and extending this site was not an option. So Sasso expanded in 2004 by moving both production and administration to the current premises in Wetherhill Park. Until mid-2007, the production of wall elements was carried out under simple conditions and on production lines with a great commitment of human resources.

From August 2007, a new era began with the up-to-date manufacturing capabilities of a pallet circulation system. The groundwork and planning for the new, modern precast element production facility commenced with BAUMA 2004. The show was just the right environment for Sasso to be able to acquire comprehensive information concerning state-of-the-art technology. Immediately afterwards, a design contract was awarded to Reymann Technik with the task of devising a tailor-made solution and of preparing an invitation for tender right up to its being awarded.

The main systems engineering and logistics priorities were laid down after a study on site. One of the most important requirements was a one hundred percent post-processing of all elements with a wing-type smoothing device. Another decisive criterion for Sasso was to have an absolutely reliable local service, whether it be for a question of procuring spare parts in Australia or organising customer support from far away Europe. The design concept, based on a similar plant in Denmark, was put up for tender in the spring of 2005. In the subsequent planning stage, the plant layout was again modified to permit an enlargement option for manufacturing double walls.

*View of the old production plant*




*Reymann Technik plant layout*

At the end of September 2005, the contract for the circulation plant was awarded to Avermann with SAA as partner for the control unit. The formwork system was to be developed and supplied by Ratec. There was no need for a mixing plant at this preliminary stage since a supply of concrete could be assured by ready-mix concrete production facilities belonging to the company. A bucket conveyor from Dudik was first to be filled by concrete mixing vehicles and then be connected to a mixing plant as

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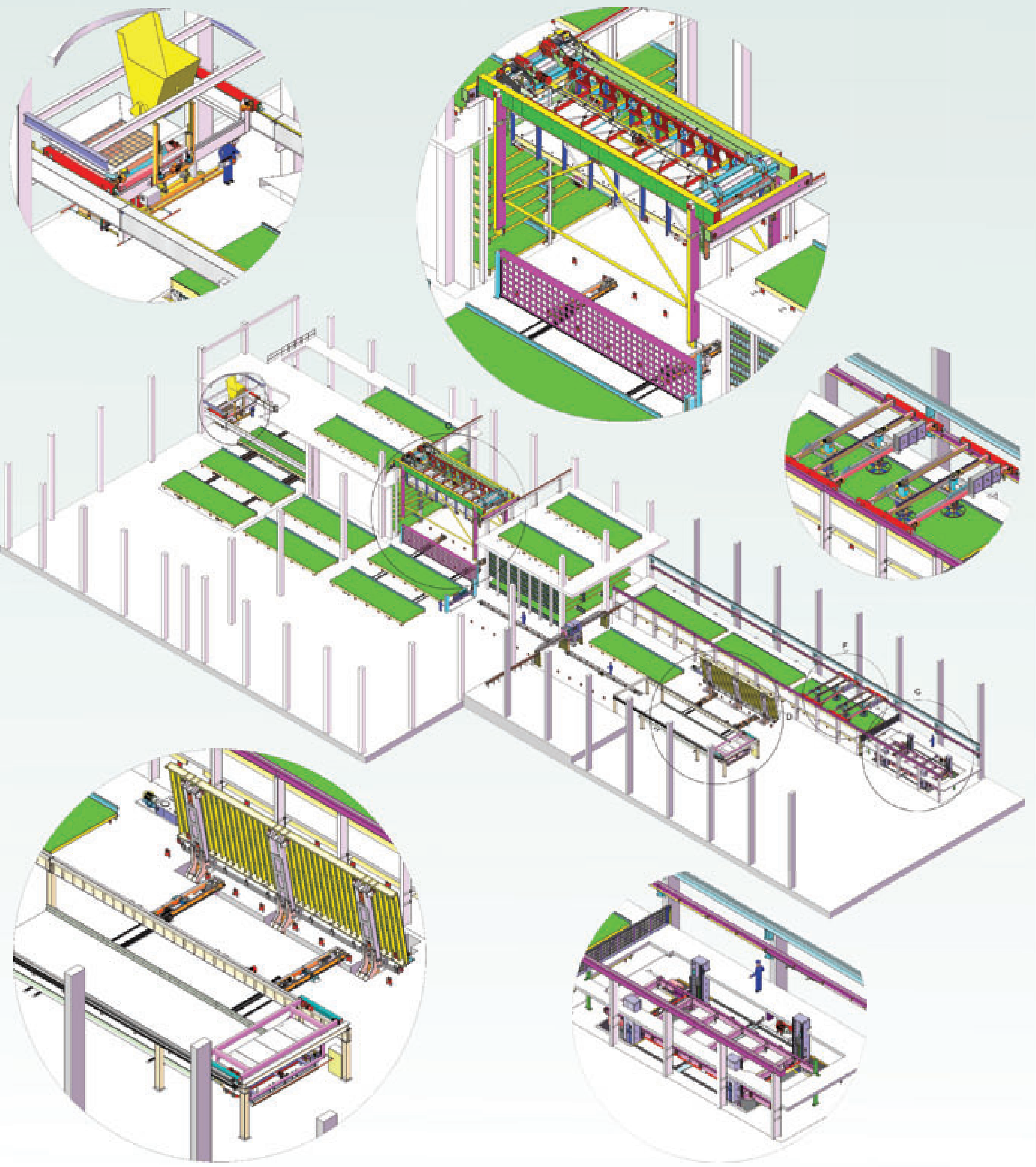
# Pallet circulation plant for the production of façade and wall elements



circulation plant • shuttering • tilting tables • vibrating lines • pallets • special machines

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*Avermann plant layout*

*Groundwork for the new hall*


*New production hall*

yet to be built at a later stage of expansion. Once the suppliers had been agreed upon, planning work was immediately commenced on the new hall. The existing production hall was too small for the new plant but part of it was also to be incorporated. Due to curing chamber capacity as well as a second level for special elements, the hall extension necessitated a height of just on 16 metres. The new production plant required a surface area of 128 x 36 m; another section of approx. 1,350 m² was set aside for preparing steel, inserting components and storage space.

Combining the existing hall with the new one, plus the practically seamless change-over planned from the previous line production to the circulation plant, presented all those involved with major challenges. Thanks to outstanding organisation, the existing production could keep running on two lines during the entire assembly time. In the last two weeks before production start-up, one production line was dismantled, the remaining part of the circulation plant assembled and commissioned. No production stoppage occurred at any time despite the confined spatial conditions.

Praise must also be given to the entire staff at Sasso. They were able to master the challenging change-over from traditional production to a modern circulation manufacturing system with practically no start-up difficulties and without delay. This elicited the highest regard from all firms involved.

## Plant design concept

The plant was conceived and planned rather as a plant for double walls than for massive walls. There is a natural sequence with a very uniform timing of the workflow. The majority of the walls produced are for commercial or industrial hall structures and thus relatively identical in the amount of work needed. For special elements, there are seven work bays available – three at ground level and four additional ones at the curing chambers.

The curing chambers are dimensioned to take a total of 46 pallets sized 13.5 x 4.1 m with a 40 cm element thickness. The headroom clearance and the load bearing capacity of the drying chamber and storage and retrieval unit are set up for a maximum element height of 120 cm. The plant's capacity was estimated at a daily output of approx. 700 m². It had already be ascertained at the planning stage that the average cycle time of 16 minutes per pallet, including all necessary intermediate stages,

*Filling the bucket conveyor with ready-mix trucks*

*Curing chamber with storage and retrieval unit*

*Tilting bay control panel and label printer*


Formwork handling device


Manual formwork bay

Concrete spreader with smoothing device

could be maintained by using a storage and retrieval unit working from above.
After the curing process, any formwork attached is stripped off and laid on a cleaning unit set up at right angles to the direction of production. This manual work is made considerably easier by a handling device for removing the formwork.

The pallet is subsequently brought straight to the tilting bay. Elements are stored at Sasso solely in an upright position all around the inside of the hall in element racks. After travelling sideways, the pallet is cleaned automatically and, should the next work bay be free, the operator can call up the decontaminated pallet immediately.

The formwork tilts at an articulated joint and its height can be adjusted at both the following bays where the formwork is applied. The pallets are equipped on the tilting side with fitted formwork whose height can be adjusted. This side formwork can be positioned with the aid of a continuously variable hydraulic lifting device from 100 to 300 mm and fixed. At both formwork work bays, all relevant production data is projected onto the formwork surface by four LAP laser systems.

For shuttering up, the operators can make use of a handling device from Ratec with whose aid the sturdy formwork elements can be positioned very rapidly and easily on the pallets. Great importance was attached to having as few parts as possible in the stop end panel, which is a new development. Ratec named its system for lateral and longitudinal formwork "Sasso Tower" after its customer. This formwork is only available in one length but can utilised variably in steps of 25 mm from 100 to 300 mm.

As a supplement to this, there is the well-proven RATEC PSV System based on magnet boxes with C profiles and wooden shuttering for lateral formwork plus windows, doors and special components. Once the formwork has been set up, the pallets pass directly through a release agent spraying device to the three subsequent reinforcement work bays. Parallel to this on another track, there are three buffer work bays for more elaborate steel insertions. Mats that have been prepared manually are mainly utilised for the steel work. The pallets then travel transversely to the concreting bay. The bridge-type concrete spreader is fed via an intermediate silo by the bucket conveyor, which, in turn, is filled by concrete mixing trucks outside the hall.
The concrete spreader is set up for automatic operation with a screw discharge and

*Transverse travel under concrete spreader and vibratory compactor*

weight measurement apparatus and can concrete the entire pallet in two longitudinal sweeps.

Compaction is mainly carried out by means of a vibrating compactor perfectly fine-tuned for massive walls. Special parts of more than 20 cm thickness are compacted by using an HF external vibrator attached to vibration frame. The surface of all compacted elements receives a preliminary refining from a tandem smoothing device built onto the concrete spreader bridge.

On the subsequent journey to the curing chamber section, the track system divides the elements into two groups. Conventional wall elements are conducted straight through the drying chamber into a precuring tunnel under the smoothing bay without being touched by the storage and retrieval unit. Special elements, on the other hand, are placed into storage in appropriate receptacles by the storage and retrieval unit or else are transported to the second level for further processing.

There is room in the tunnel for up to four pallets. These automatically travel further in a waiting line, at the end of which a bay is located for lifting them to the smoothing bays on the upper floor. If a working space has become free on the smoothing level, all pallets advance by one bay and the last pallet from the precuring tunnel is transported with the lifting device to the smoothing platform.
The average retention period for the pallets in the tunnel is approximately two hours so that they have already had sufficient drying time for their concrete surface to be smoothed. If only simple elements are being manufactured, congestion can not be avoided due to the short cycle times. In this case, the freshly concrete pallets are placed into intermediate storage in the drying chamber and conducted to the smoothing bay after precuring. This simple but effective arrangement with the smoothing platform means that practically all transport movements between the concreting bay and smoothing bays can be carried out using friction wheels. The storage and retrieval unit is not burdened down with moving elements in and out of storage unnecessarily.

The work cycle above the tunnel roofing is managed by two smoothing bridges. At Sasso, the level of quality desired is attained by dint of two smoothing sequences for each pallet. At the end of the four smoothing work bays, the storage and retrieval unit is once again on hand to insert the pallets in the drying chamber for their final hardening. It is worth mentioning another special feature that comes into play before they are thus stored: namely that the elements already possess so much basic strength after the smoothing process that the formwork can, to a large extent, be removed.

The formwork is laid onto a transporting device running at right angles to be cleaned by machine and fed into the circuit again via conveyors where it can once again be immediately reutilised. This gene-

*Precuring tunnel and smoothing bays*


*Smoothing bay with wing-type smoothing devices*

rates a particular advantage in terms of investment as the formwork is not retained in the curing chamber but is rather put back to work again after a short turn-around time.

The entire control unit was developed by SAA. Their Leit2000 system controls the plant's logistics and enables the pallet circulation plant to be tailor-made for the customer and managed in a very flexible way.

The various manufacturing specifications for different wall types are stored in flow charts in which the production sequence is configured in stages. To take just a few examples, there is defined: which line has priority in the reinforcement section; whether the post-processing platform should travel on the drying chamber roof; whether and for how long precuring should take place before travelling to the smoothing line; and, last but not least, the required drying time. The flow charts can be adapted dynamically by the production manager on the strength of experience and to the demands at hand, or expanded to accommodate new wall types.

The work flow sequences of the storage and retrieval unit are tuned to preset priorities in an optimum way so that maximum through-put rates can be achieved. At the formwork bays, all pallet and element plans pertaining to the production sequence generated by the work preparation unit are always printed out by default. A label printer at the tilting bay automatically provides the pallets with their allocated element data so that mix-ups can be ruled out.

*Formwork cleaning unit with transporting device*

*SAA control centre*

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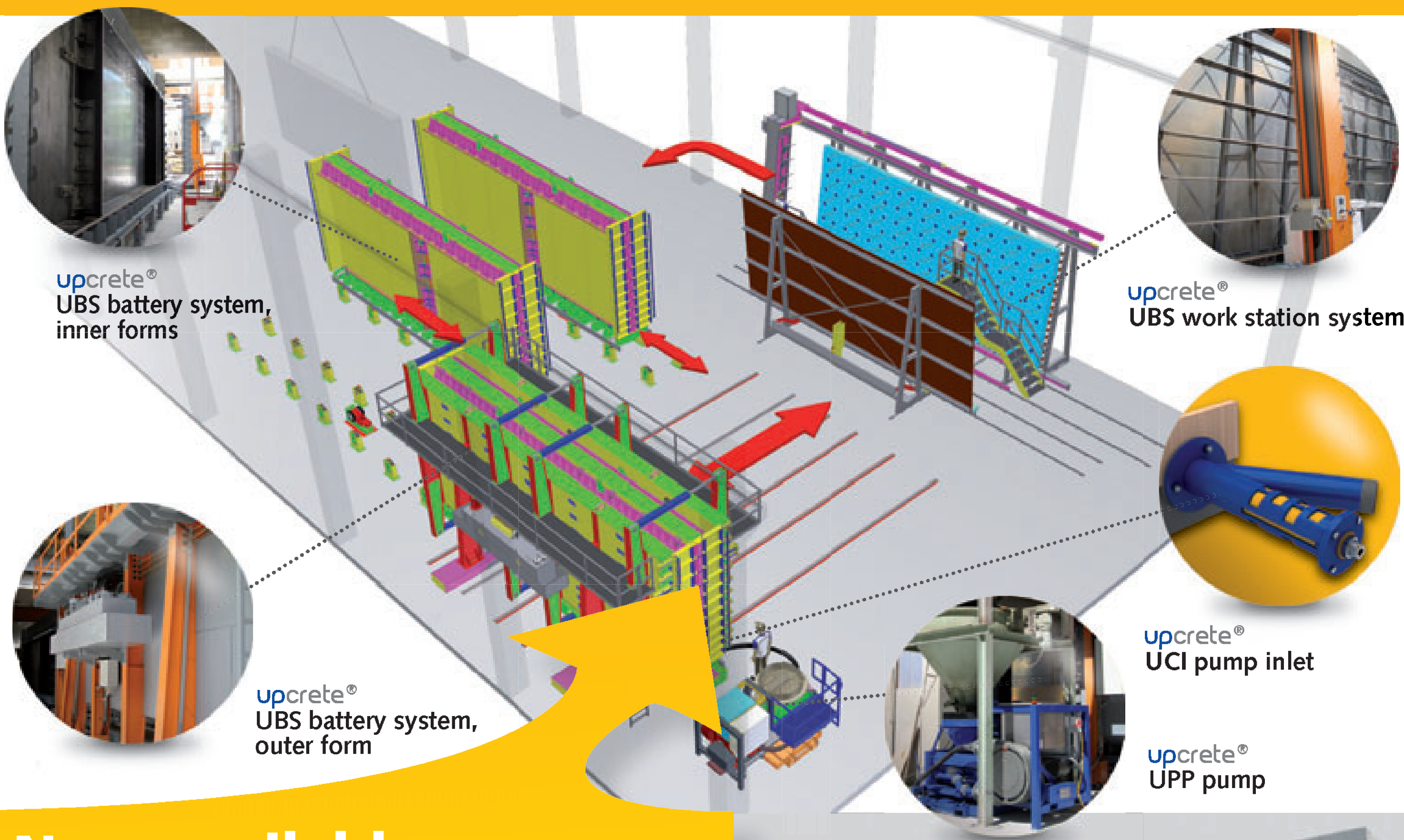


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*An example of an commercial hall supplied and assembled by Sasso*



As was already mentioned at the beginning, one of the factors in the decision was perfect service and support for the plant. When the early shift begins at Sasso, the late shift is just about finishing up (10 pm) in Europe. The SAA 24 hour hotline, open seven days a week, guarantees permanent support. Both in the domain of control systems as well as with control technology, engineers are on call round the clock - but can still get enough sleep.... since you can count the telephone calls from Sydney on one hand. Once again, this has to be as yet unexpressed praise for Sasso and an extremely well-running production plant.


*Control panel – storage and retrieval unit*

## FURTHER INFORMATION

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