

Quadra, 74130 Contamine-sur-Arve, France

Fully automatic wetcast stone production in the South of France

A family-owned company based in the South of France, Fabemi has been combining know-how and innovation since 1961, making it one of the most important players within the French market. With 14 plants spread throughout France, the Fabemi Group has been expanding its production thanks to innovative technology. Initially, Fabemi was known for the manufacturing of concrete blocks. Since then, the group has widened its production. Under the brand names Bradstone and Carré d'Arc, Fabemi currently produces and delivers a large range of wetcast products designed for the landscaping market: slabs, pavers, copingstones and garden products, retaining walls, and wall coverings.

In order to boost its competitiveness, enhance the quality of its products and avoid repetitive and painful tasks for its operators, Fabemi has invested in the full automation of the production line based in Donzere and exclusively dedicated to the manufacture of wetcast products.

To achieve this technological leap Fabemi has established a partnership with the French equipment manufacturer Quadra. Currently, only 4 operators manage the complete production process, from the mould cleaning, oil application and concrete filling through to the curing, demoulding and palletizing of the finished product. Equipped with a modern handling system, the plant is fully automated and achieves high versatility. All the items of equipment provided have the ability to adapt their system to the multiple product formats. This is the

main innovation. To do so, an RFID chip is integrated in every pallet and identifies the type of the product. Accordingly, this RFID chip controls the oiling settings, the concrete dosing, the automatic introduction of balls on the back of the products, the product reference printing, and the demoulding and palletizing conditions with high precision. This innovative system was developed and implemented by the supplier Quadra. This is a unique process, since up to now no device has been able to adapt to successive and changing mould formats in real time. More than 4000 manufacturing recipes are recorded, handled and automatically incremented. The production line and all stations permanently and automatically switch into all recipes .

Mould filling line

The production cycle begins with the handling of the empty mould stack. This step is completed by an automatic trolley. It transfers the stack of empty moulds to the lowerator. Since every pallet carries moulds of different formats, the RFID chip is of high importance, allowing the transmission of all mould settings. The automatic trolley discharges the moulds into the lowerator, which introduces them, one by one, to the next station.

The polyurethane moulds are fixed on plastic pallets (1400 x 1100 mm) provided by Assyx. The pallet includes a plastic foot in every corner, allowing the pallets to support each other.



Fabemi produces and delivers a large range of wetcast products under the brand names Bradstone and Carré d'Arc.



Mould cleaning

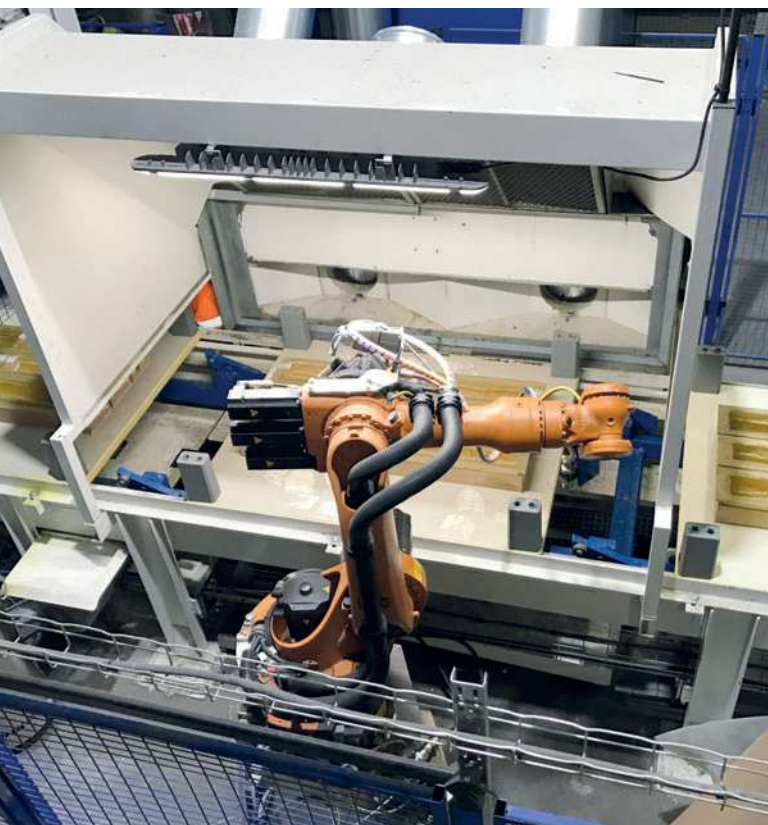
This operation is essential for the quality of the finished products and is connected with the oiling quality. The moulds are cleaned by turning over and blowing with an air jet. During the turning over, the moulds are maintained in position, and the air jet moves below the moulds to remove the debris.

Oil application

A 6-axis robot type Kuka KR360 applies the oil to the mould. The trajectories of the nozzles are defined according to the mould, which has been recognized through the pallet RFID identification. This robot application allows the repeatable, uniform and regular distribution of oil to all sides of the mould. Equipped with an extractor and filtering hood, a ventilating cabin is also provided in order to vacuum the oil mist.

Automatic mould filling with colour-blended concrete

The pallet is then transferred to the filling station. This filling step has been designed so that every pallet (from 20 x 20 cm to 100 x 100 cm) can receive the exact quantity of concrete for manufacturing the product (precision ± 50 g). More than 4000 recipes are implemented and recorded. They are now automatically handled and incremented according to the type of mould.



6-axis robot type Kuka KR360 oiling moulds

QUADRA

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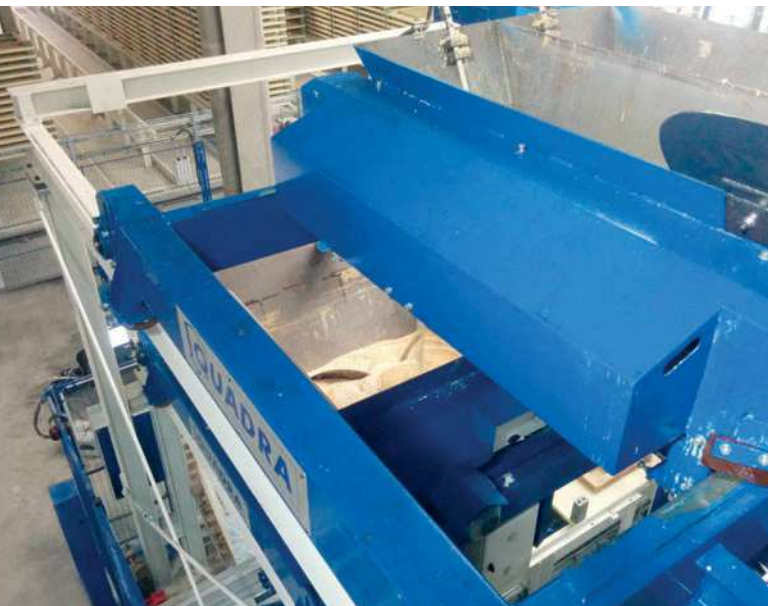
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Dosing system for colour-blended concrete

A hopper consisting of 2 independent compartments is filled with concrete by a travelling bucket. Each compartment is discharged through a concrete screw and fills the storage hopper with a colour-blended concrete that is manufactured by successive layers of coloured concrete.

The dosing system moves in the X, Y and Z axes. This allows filling in the middle of each mould. The concrete is discharged into the receiving hopper via 4 valves within 4 small hoppers. These hoppers are set up on load cells and allow accurate mould filling. The integrated automation sends the data for the quantity of concrete to be discharged into the mould, the number of valves to be used, the type of opening and the moving cycle of the dosing system for the best filling of the mould. The cycle time for the filling of 4 slabs is around 15 seconds.

The freshly-filled mould moves over 3 vibrating tables located after the filling station. The frequency and the vibrating speed are automatically adjusted based on the mould reference.

Plastic ball introduction into fresh products

An automatic system places plastic balls in each corner of the product in order to avoid any marks during curing on shipping pallets. These plastic balls avoid any contact between the products during palletizing. This system has the benefit of adapting to the size and shape of the products thanks to the RFID identification of the pallet.

Product reference printing

An inkjet printer was also provided for the automation of the product reference printing. The product reference and the production date are printed on the fresh product, while the printing height is automatically adjusted according to the mould.



Plastic ball introduction into fresh products

The moulds are then transferred to the elevator by a conveyor and taken to the curing station by an automatic trolley. The latter is equipped with geared motors driven by servomotors, allowing automatic settings and progressive acceleration and deceleration. The position is also continuously monitored by laser.

Curing of the fresh products

The curing station is equipped with 2 automatic trolleys which handle the transfer of the moulds to the curing and storage area. The first mould to be placed in the curing station will be the first one to be removed so that it spends an optimized time in the curing station: the first mould in is then the first mould out. The first trolley is dedicated to the wet side of the



The curing area can store up to 5200 pallets

manufacturing area, bringing empty moulds to the filling line and freshly filled moulds to the curing area. The second trolley works on the opposite side and retrieves the dry products for taking them to the demoulding line.

The curing area can take up to 5200 pallets (360 stacks of 15 pallets). The curing area is set up on a flat monolithic slab avoiding any need for special foundations. The perfect flatness of the ground guarantees the quality of the products, allowing handling without any shaking.

This curing area is managed via a user-friendly touch screen and the supervisor receives all the information in real time with regard to the type of products, the number of products, the production day and the required curing time.

Automatic product demoulding

The demoulding operation is performed by a 6-axis robot type Kuka KR360, allowing the demoulding of products weighing up to 120 kg. The robot is equipped with a clamp including 4 independent vacuum pads moving in 2 axes. This station is equipped with an adjustable frame system that holds the mould on the pallet during the demoulding operation, with an automatic movement to follow the shape of the mould. This clamping system allows the demoulding of undercut products by deformation of the mould, in order to avoid any product damage during the demoulding.

Thanks to the RFID identification, the demoulding robot is able to remove any kind of products of different shapes and sizes. The adjustment is fully automated and does not involve



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any human action from the operators. The information sent to the robot enables it to control the pressure settings, the speed settings and the positioning of the clamps for perfect demoulding according to the products.

Once demoulded, the products are positioned on a flip-over device (180° rotation) in order to present the textured surface of the products (face-side up) to the conveying system. The products are held on the flip-over device by a gripping device and the rotation is completed by geared motors.

The products are then transferred by a belt conveyor from the demoulding station to the palletizing robot. This conveyor moves the products outside to a secured area where one operator can carry out quality checking without interrupting the automatic cycle.

Palletizing

The palletizing system is equipped with a measuring system including lasers and sensors. This system records the dimension of the product (height, width and length) and the position of the centre of gravity and transmits all these data to the robot.

The 6-axis palletizing robot type KR360 has a handling clamp with 2 grip pads. The data that have been sent to the robot include the orientation of the clamp and the type of grip and also determine where the product has to be placed on the shipping pallet. The robot also adapts the stone position following the quality checking.

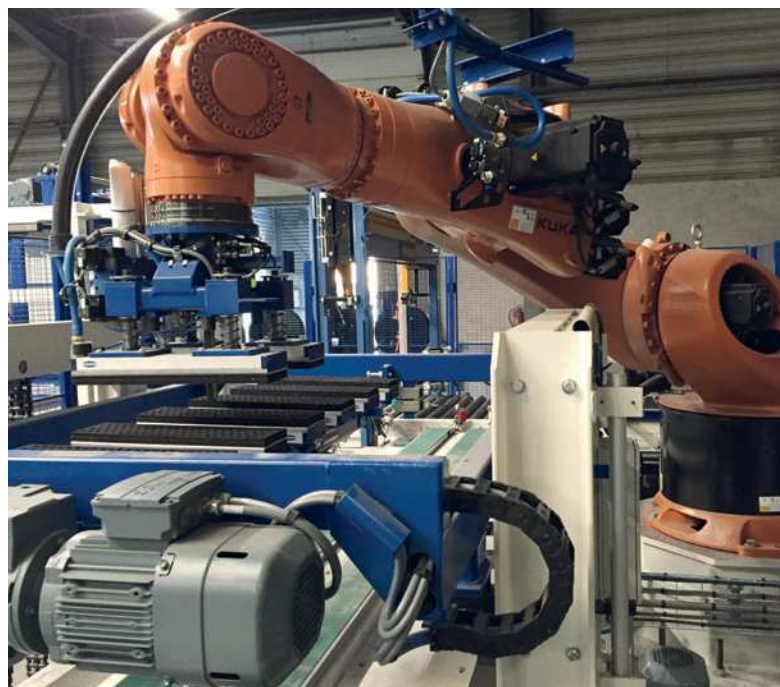
Once the pallet is finalized it is transferred to the packaging line by a conveyor. In order to complete full conditioning,

Quadra has provided a device that pushes the products vertically for horizontal strapping and the pallet then moves under a wrapping machine.

The measuring system plays an important part in the production management since all information can be assessed and reviewed to check the output results. The production data are available in real time, and the daily activity report is directly printable.



The palletizing system is equipped with a measuring system including lasers and sensors: view of the quality checking station



The palletizing 6-axis robot type KR360 6-axes has a handling clamp with 2 grip pads



Conclusion: productivity, flexibility and versatility

The automation of this production line has strengthened the competitiveness of the company, whilst opening up new markets. As a result of the partnership between Quadra and Fabemi, this investment has had a direct and tangible effect on Fabemi's production output with a current production capacity of 3 million sqm per year.

In addition to the performance, the automation has improved the work conditions. In fact, while the preceding production line required 18 operators, the new production line requires only 4 operators who supervise the complete line without any manual intervention in the process, and with a significant reduction in the handling of heavy loads. Finally, the automatic filling process has also strengthened and unified the quality and the production output. As no human intervention is involved, all the know-how belongs to the machine and thus to Fabemi. The operator becomes a supervisor. The automatic management of the 4000 recipes allows high-quality mould filling and the manufacture of products with a regular and high quality. ■

FURTHER INFORMATION



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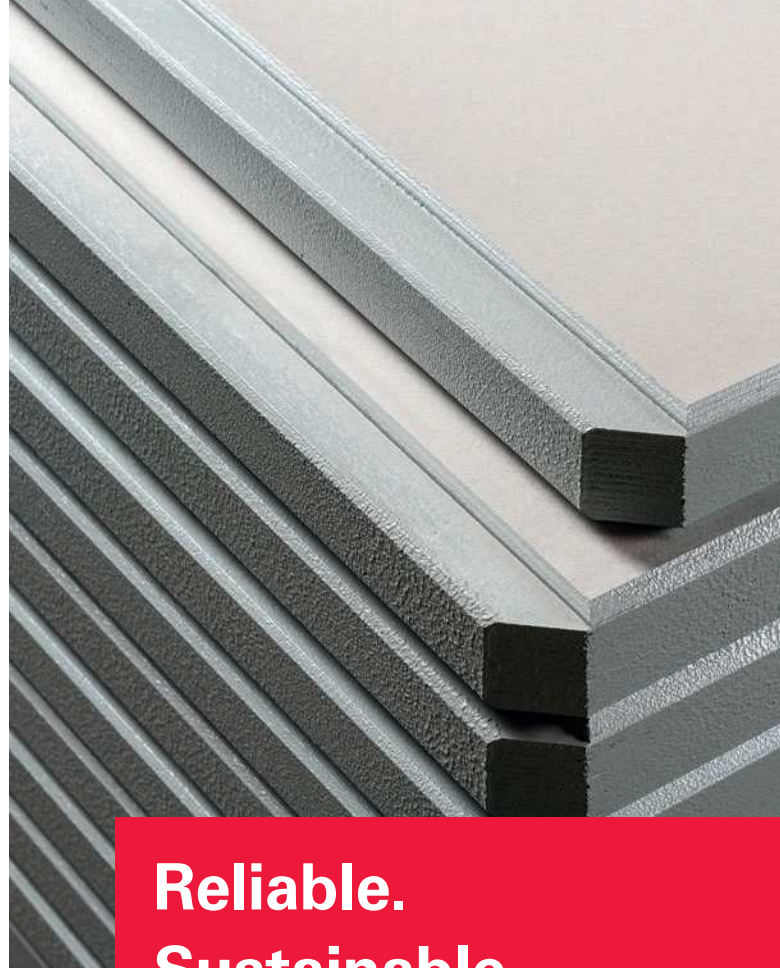


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