

Quadra, 74130 Contamine-sur-Arve, France

# Fully automatic wet cast plant for a versatile production in the United States

As a market leader offering a complete line of interlocking concrete paving stones, architectural paving slabs, precast concrete products, and segmental retaining wall systems, Nicolock Paving Stones and Retaining Walls, based in New York, has steadily increased its output and product offerings to further secure its dominant position in the concrete industry. To address these concerns, the company has invested in a fully automatic factory from Quadra for the production of wet cast products. Quadra's challenge was to design a versatile production plant to produce a board range of products with a sensible layout.

## Nicolock: Wet Cast Activities

A division of Nicolia Industries, Nicolock Paving Stones and Retaining Walls is backed by nearly 50 years of experience in the production and supply of quality concrete products. Headquartered in Lindenhurst, NY, with additional manufacturing locations in North Haven, CT and Frederick, MD, Nicolock services the Northeast and Mid-Atlantic regions of the United States.

In 1999, Nicolock began a new venture into wet cast manufactured products by purchasing the assets of Hastings Pavement Company. A full service wet cast products manufacturer, Hastings offered a broad range of products ranging from asphalt pavers, paving slabs, stair treads and stepping stones as well as lawn ornaments and hand-painted figurines.

A decade after the initial purchase of Hastings, Nicolock acquired a license to

manufacture Bradstone products in the United States. With this new acquisition, Nicolock refocused their wet cast division eliminating the production of ornamental concrete products while putting a greater emphasis on hardscape products that included the look of natural stone.

With Nicolock's prominent place in the hardscape market already established, hardscape products understandably dominated their wet cast sales, quickly outpacing production capacity. Due to this unprecedented growth, Nicolock was ready to invest in a fully automated and cost efficient means of manufacturing to increase output, production quality.

## The choice of Quadra

Nicolock chose Quadra to supply an automated manufacturing facility because the design allowed them to continue to cast their products without changes to their already well-received hardscapes products

while increasing production output and reducing costs. This production unit is characterized by an optimal operational flexibility. The filling line and the dry products line are separated and can operate independently or in a coordinated way. Modern methods of handling and robots arm have been used to achieve high productivity.

The plant is fully automatic, whilst being extremely versatile. The facility accepts manual secured stations. Fragile and complex design products can be removed from the mould manually by taking advantage of the automated cinematic of the system.

With help from Quadra's US representative, Concrete Plant Technologies, Inc., Nicolock's polyurethane moulds were mounted on 1400 x 1100 mm (55" x 43") production boards to provide a platform for their transport through the system. These pallets are identified to the system through the use of RFID tags. The individual tags



Example of stones produced on the Quadra wet cast plant

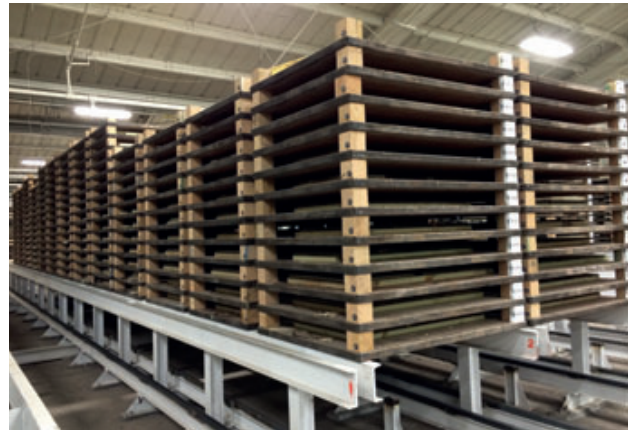
provide the information needed by the system to automatically know how each pallet will be handled. The number of molds per pallet can varied to accommodate single large slabs or they can hold as many as 20 molds for smaller sized products. Different height legs on the pallets can allow for varied product heights from 50 to 250mm (2" to 10"). Each stack of pallets stored by the system is configured so that a stack of pallets will yield the products needed to assemble a single package of finished product.

**Pallets stacks handling and storage**

The storage area consists of a steel framework supporting stacks of pallets. The plant concept is built on a flat monolithic slab avoiding any need for special foundation requirements. The curing and storage systems use two identical cars to allow for first in/first out handling. One car works on the wet side of the manufacturing area, bringing empty molds for filling and carrying recently filled molds back for curing. The sister vehicle works on the opposite side of the storage area and fetches the cured products for processing and then returns the recently emptied and cleaned molds from the demolding and packaging sides of the operation. Storage locations and curing times are managed through a touch screen panel. These graphical operator interface stations are provided in logical locations throughout the system so operators can create, store and recall specific recipes of production parameters.

**Filling line**

The filling line consists of a lowerator, a conveying system, a filling station, 2 vibrating table and one elevator.



*Curing and storage area*



*Mold stack transport car*



Manufacturer of equipments for the concrete industry

## WET CAST EQUIPMENT FOR NATURAL STONE ASPECT










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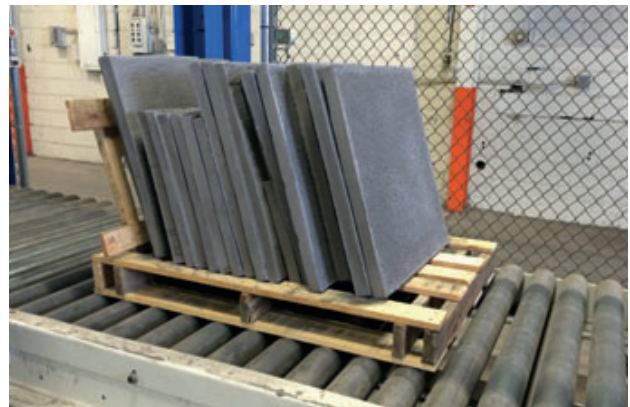
Demolding line



Products quality checks before packaging



Packaging robot



Finished package in progress (multi sized stones)

Empty molds on pallet stacks are presented to a lowerator where pallets are destacked onto a conveyor. Each pallet is then transported step by step to different stations to allow for successive operations:

- **Oiling:** Presently, the oiling operation is performed manually. Optionally this operation can be made by a 6-axis articulated robot. The trajectories of spray nozzles are defined according to the molds which have been recognized through the RFID identification. This system prevents any overspray and enables form release agent to be spread uniformly and regularly on all sides of the mould resulting in substantial savings of product.
- **Concrete filling and casting:** Performed manually in order to keep the original color blending already accepted by installers. Such process guarantees the natural stone aspect which Bradstone products are known for. Quadra also offers the possibility for automated dosing and filling.
- **Vibration:** at the filling station and a secondary vibrating station for further consolidation and finishing are employed to cast the products.

Vibration frequency is automatically adjusted by the system based on which products are presented. Stacks of molds are then assembled by the elevator and then the stacks are transported automatically to their assigned storage location for curing.

#### Fully automatic demolding line for every shape of stone

The demolding line consists of a lowerator, a conveying system, a 6-axis robot for automated demolding, a mold cleaning station and an elevator.

The first robot is able to demold any shape of product even with different shapes or sizes on the same pallet or if the product changes from one pallet to the next by recognizing the information provided by the RFID tag. A clamping system holds the mold onto the pallet while the 6-axis robot lifts the stones from their rubber mold. Next, the empty molds are processed by an automatic cleaning device that flips the pallet upside down and blasts it with moving air knives to loosen concrete debris before it is restacked in the elevator to be returned to its storage location for its next use.

#### Packaging line

The freshly demolded products from the first 6-axis robot are laid onto a product turnover device which places the product, side side up, onto a stone conveyor. This conveyor then moves the products outside of the protected area around the robot, so that a worker can safely perform a quality check without stopping the automatic cycle. The stones are then transported to a vision system which recognizes the kind of stone. The camera records the product's dimension, height and center of gravity position and transmits this data to the packaging robot. Once the packaging robot has this information, the system discerns whether the product needs to be face side up or down and either presents it to a turnover device or lets remain on the stone conveyor. Once the system determines where a product is to be placed it in the finished package, the packaging robot picks the product it next needs and uses it to build the packet. When completed, the package is sent down a gravity roller conveyor for strapping and carriage to the inventory yard for shipping. As a result, Nicolock has realized a 50% increase in daily production output using

only 20% percent of the normal labor force. The production crew has been reduced from 12-15 laborers to just 3-4, including the production manager. According to Roberto Nicolia Jr, Director of Operations/Business Development Manager, the additional of the Quadra plant has not only increased the amount of products produced in a single day, but has improved quality, safety and reduced daily operating costs. The open architecture provided by the new Quadra equipment should provide solutions for any unforeseen production challenges the future may bring.

Thanks to the flexibility of the installation, Nicolock is now able to add any new products into their range, without any support of Quadra. The ease of use and handling enables them to change their manufacturing parameters all by themselves.

Quadra applied their expertise to address all aspects of the wet cast manufacturing process. Their solution provides the flexibility to use manual processes as well fully automatic future upgrades. Quadra offers full line of production solutions which make use of today's most modern componentry to facilitate concrete dosing and casting, transport and storage of molds, mold oiling and demolding that includes the use of optical product recognition, RFID communication and robotic integration. ■

FURTHER INFORMATION



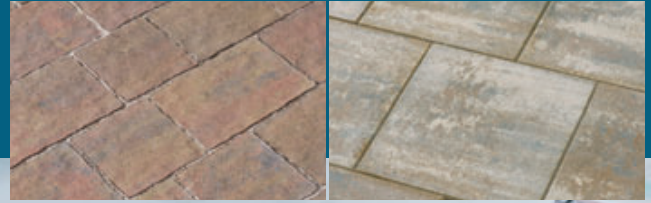
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