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## CONCRETE PRODUCTS & CAST STONE

Stonedge meets market demand for wet cast hardscape



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Automacad, Inc., Candiac, Québec, J5R 6X1, Canada

## Stonedge meets market demand for wet cast hardscape

**Recession...what recession?** At Techo-Bloc Inc. and its subsidiary, Les Pierres Stonedge (Stonedge Stones), the recent recession came and went with barely a blip on the sales radar screen. Founded in 1989, Techo-Bloc has consistently lead its markets with innovative design and manufacturing of natural looking, dry cast hardscaping products such as pavers, retaining wall systems and masonry stones.

"We have gotten through the recession in relatively good shape," notes Techo-Bloc founder and president, Charles Ciccarello. "Our sales never stopped growing, which allowed us to continue to invest in research and marketing." One critical area for new investment has been wet-cast product development and manufacturing.

In 2004, St.-Hubert, Quebec, Canada-based Techo-Bloc created the Stonedge division in order to add high quality wet cast products to its growing product cata-

log. In order to meet the demand of Techo-Bloc distributors in Canada and the eastern United States, a dedicated Stonedge plant was built about 11 miles away in Chambly, Quebec, under the design and engineering guidance of Canadian engineering and manufacturing company, Automacad Inc. Within a couple of years, the 15,000 sq. ft. wet-cast plant began to stress the limits of its mix of manual and semi-automated systems. By the end of 2008, at the height of the recessionary slowdown, Techo-Bloc began

developing plans for a new, much larger wet-cast manufacturing facility. In 2009, the company acquired a 10-acre parcel just down the street from the original Stonedge plant and again enlisted the help of long-time partner Automacad to design and build a fully automated wet-cast plant on the new site.

"We have worked with Tech-Bloc and Stonedge for the past 10 years, helping them meet their goals for productivity, quality and innovation," says Automacad president Louis Hébert. Automacad specializes in the design, construction and installation of customized equipment for concrete product manufacturers. By the time the Automacad design team began working on plans for the new Stonedge plant, the original plant was operating seven days per week, two shifts per day to meet demand. The plant was fast reaching its maximum output of about 10,000 sq. ft. (929 sq. meters) per day.

"Stonedge wet cast products are an integral part of the Techo-Bloc product catalog," Ciccarello notes. "Most of our customer projects blend both dry- and wet-cast products, such as a column of dry cast stones topped by a wet cast cap. We needed a new plant that was capable of matching the output of our dry cast production facilities, and do so with extreme efficiency and the highest quality. When we started planning, that level of output was unheard of. Traditional wet-cast production was too labor intensive and time-consuming. We needed an entirely new approach based on precision automation."

Over the next two years, Stonedge and Techo-Bloc engineers worked side-by-side with engineers from its vendor partners to design, build, test and implement what is believed to be the first ever fully automated wet-cast product manufacturing facility of its size in the world.

"Automacad not only engineered and produced the majority of the equipment for the new plant, but also managed all of the resources and vendors needed to get this



*Charles Ciccarello, founder and president of Techo-Bloc, stands on the manufacturing floor of the new 80,000 sq. ft. Stonedge wet cast products plant his company recently completed in Chambly, Quebec, Canada. Just behind him is the Automacad-provided wet line (nearest) and (in orange in background) the ACT MobilMat mo2250-750 automatic concrete batching system.*



*Stonedge plant manager Louis-Phillipe Bernier started working for Techo-Bloc in 2002 and moved to the firm's Stonedge division in 2004 to incorporate wet cast concrete into the Techo-Bloc product line. The firm's wet cast masonry veneer is on the wall behind him and wet cast stone slab is underfoot.*





STONEDGE

SAROLI-PALUMBO ARCHITECTS

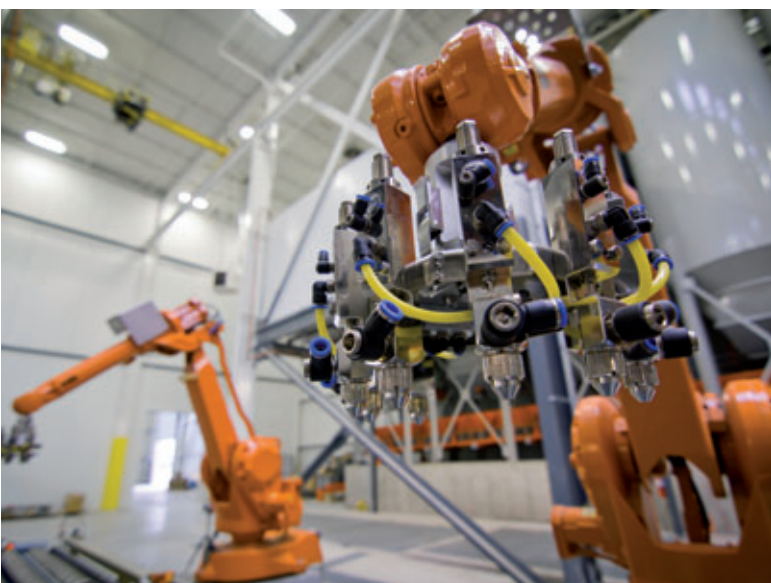
Completed in the summer of 2011, the new 80,000 sq. ft. Stoned Edge facility near Montreal, Canada, is believed to be the most highly automated wet cast manufacturing plant of its size in the world. A staff of just four per shift is required to run the entire plant, which has an output goal of approximately 2,000 sq. meters of product per 8-hour shift.

project done," Ciccarello explains. "Our close working relationship with Automacad means that we share information both ways. They learn about this business and what is needed to be successful from us and they, in turn, provide us with automated systems and process designs that help us meet our goals."

The new, 80,000 sq. ft. plant includes more than 200 custom and semi-custom innovations in manufacturing automation that make it unique in the industry, including:

#### Automated concrete mixing and batching plant

Fresh concrete is prepared automatically in the MobilMat Mo2250-750 batch plant from Advanced Concrete Technologies (ACT). Dual planetary high shear mixers, computer controlled mix and color recipes, and up to 48 cubic yards/hour (see "Recipe for success") ensure unimpeded throughput on the wet line.



Automacad Color-I color application robots can deliver up to 14 colors for unlimited coloration patterns and non-repetitive effects. The robots apply color to the inside of the mold cavity, just prior to volumetric filling.



The Stoned Edge plant wet line is shown here, prior to plant start-up. Two Automacad Color-I color application robots stand ready in the foreground, while the ACT MobilMat Mo2250-750 concrete batching system looms over the line in the background. Continuous automatic operation is controlled by the Automacad SCADA central control.



Dual Automacad product handling robots stand ready on the packaging lines in the foreground of this interior view of the new Stoned Edge wet cast concrete products facility outside of Montreal, Canada. Automacad, a Canadian design and manufacturing firm, engineered and produced more than 200 pieces of equipment for the new plant.



### *Recipe for success: master the mix*

Consistent, fresh concrete made with repeatable accuracy is essential to produce high quality precision precast concrete products. The new 80,000 sq. ft. Stonedge wet cast concrete products plant in Chambly, Quebec, features a dual-mixer MobilMat Mo2250-750 batching system from Advanced Concrete Technologies (ACT) of Greenland, New Hampshire, the American division of Wiggert + Co, and Würschum GmbH. The ACT plant has a output of 48 cubic yards per hour and feeds face and base hoppers mounted above the Stonedge wet line.

ACT engineers worked closely with Automacad and Stonedge teams to design the optimal layout for the batch plant. All critical plant components are located indoors to avoid the adverse effects of Montreal's harsh winters. Important batch plant features include:

#### *Dual Wiggert HPGM 2250 high shear planetary mixers*

These mixers can produce batches every 2.5 minutes in continuous production. Each mixer is equipped with a microwave Hydromat moisture probe that allows automatic batch water adjustment to maintain the target water/cement ratio defined by each product recipe. Combined with Hydrotester moisture probes in the sand bins, the ACT system provides the control needed to consistently produce precision mix designs required for wet cast production, including SCC (self consolidating concrete). The mixers are equipped with an automatic mixer cleaning system that requires just 10 minutes and a fraction of the water normally used in manual clean-ups. The clean-up water is recycled back into the production stream. A new automatic batch water temperature correction system compensates for the wide range of mix component temperatures found in the Montreal environment to maintain consistent concrete set times.

#### *COM70-2 Automatic pigment metering system*

Because wet cast concrete products are designed to simulate natural stone and other natural elements, color is a critical component of the Stonedge plant. Along with highlight colors that are added to molds by the Automacad Color-I robotic system, the ACT COM70-2 color metering system is used to produce any base/face color required by a particular wet cast product recipe, and do so with consistent repeatability. In addition, multiple colors can be preweighed and used to create marbled color effects if required, adding beauty, value and flexibility to the Stonedge production capabilities.

#### *PCS Control System*

PCS Control System features both touch screen and mouse/keyboard navigation and provides automatic order tracking, automatic in-flight correction of all components; production statistics, inventory administration and alerts, automatic diagnostics, and remote diagnostics and updates. The automated PCS Control is designed for unattended control room operation. The Automacad operator console includes a built-in ACT call station to enable the operator to initiate automatic concrete calls.

#### *Five 700-ton aggregate silos*

The aggregate silos are located inside the production building to provide protection from freezing and rain. Dual batching



Precision wet cast concrete recipes require state-of-the-art mixing and batching. At the new Stonedge plant outside Montreal, Canada, a computer-controlled concrete batch plant from Advanced Concrete Technologies (ACT) delivers consistent, fresh concrete to the Automacad wet line. The ACT MobilMat Mo2250-750 features dual planetary mixers, PCS Control System, and moisture probes for complete water/cement ratio control, automatic mixer cleanout system, color metering, and automatic batch water temperature correction.

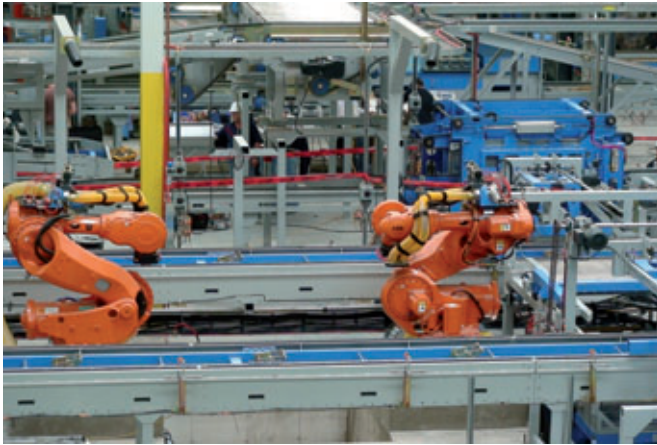
gates offer fast/slow batching accuracy. The silos are charged from an in-ground truck dump hopper that allows aggregate deliveries to be transferred via 300 ton-per-hour conveyor from ground level to the aggregate storage bins without a front-end loader – a 5-position shuttle belt automatically directs different aggregates into appropriate storage bins.

#### *Three 100-ton cement silos*

The 100-ton cement silos are equipped with radar silo probes for accurate level indication and user definable alarms for "low" and "high" silo levels.

#### *Site design engineering & commissioning*

ACT worked with Automacad and Stonedge to design a plant layout for optimal performance and profitability, including on-site visits, plan review, pre-delivery preparation (prewired, pre-plumbed, and pretested at factory), installation and start-up training.



*Close-up view of the dual Automacad packaging robots, each equipped with custom vacuum heads that use powerful suction to enable each to lift 700 pounds of product at full extension and maximum speed. The precise control system created by Automacad allows the robots to handle any size or shape concrete product and orient it vertically, horizontally or any angle in between required for packing.*

### Automated wet line

The Automacad-developed wet line features automatic release agent coating of polyurethane wet-cast molds; RFID (radio frequency identification) mold tracking; color application robots (Automacad's Color-I system) with up to 14 colors for unlimited coloration patterns and non-repetitive effects; feeds face/base hoppers that supply volu-

metric filling stations for precise dosage no matter what size cavity; adjustable frequency/amplitude vibration stations consolidate concrete ensuring complete cavity fill; and granulator dispenser that applies protective granules to some products to protect them later during packaging.

### Automated transfer within curing chamber

Product handling systems (see "Handle with care" sidebar) from Hess Machinery efficiently collect and transport molds using finger car transport, and elevators and lowerators. A Hess-supplied rack system holds filled molds within an Envirocure curing chamber from CDS Concrete, where optimal temperature, humidity and air circulation are maintained for the 8-12 hour curing cycle.

### Automated demolding or dry line

Here, Automacad-developed conveyor systems move the molds along the line through various demolding steps, including a leg board flipper, rotation, an automated demolding station, mold return, and stacking station. Leg boards with demolded product may either be returned for an additional cure period or sent directly to the packaging lines.

### Automated packaging lines

Two independently controlled packaging lines, each featuring a product handling robot (see "Close-up on packaging" below) developed by Automacad, provide high throughput, eliminates manual labor, reduces breakage, and provides flexible palleting and wrapping options.

### ***Handle with care: Hess transfer and handling systems make a difference***

*"Hess was an important partner in providing a fully automated, integrated production solution for Stonededge," says Automacad Concrete president Louis Hébert, whose company developed more than 200 pieces of custom or customized equipment for the new Stonededge wet cast plant in Chambly, Quebec.*

*Hess Machinery provided 24-ton capacity finger cars for transporting freshly poured molds to the curing chamber and transporting cured product to the demolding line lowerator. The Hess finger car is powered by electric servo motors for precision movement, avoiding the possibility of damage to newly poured wet cast products.*

*In addition, Hess provided curing racks and elevator/lowerators. The zinc-coated curing racks were designed to meet Stonededge requirements for spacing, number, and distance of layers and load factors. Loading and unloading of the product happens with an automated roll door control. The racks are installed within the Stonededge curing chamber controlled by the Envirocure system from CDS Concrete.*

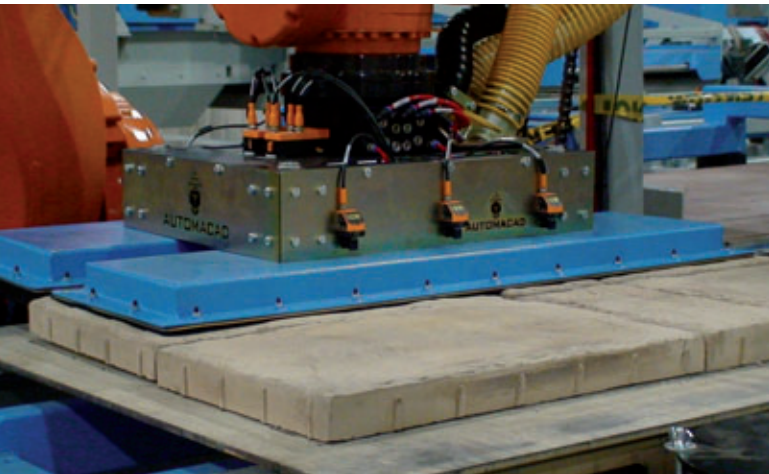
*Once curing of the product is completed, the product is transported to the lowerator by the finger car and transferred to the demolding line. The lowerator/elevators have a 24-ton load capacity, allowing them to take a full load from the finger car. "The scale of this plant required new specifications in size for the handling system and Hess really stepped up to provide a*

*high level of service for this project," notes Stonededge plant manager Louis-Philippe Bernier. "At various times, we had engineers from many different vendors helping us during design, development, installation and start-up. The Hess engineers worked alongside Automacad to fine tune their systems for optimal efficiency."*



*Hess Machinery played a key role in outfitting the new Stonededge wet cast manufacturing plant. The firm provided 24-ton capacity finger cars for transporting freshly poured molds to the curing chamber and for moving cured product to the demolding lowerator. In addition, Hess provided curing racks and elevators/lowerators.*





*Automacad designed a special vacuum head, powerful enough to lift any shape or size concrete wet cast product, and position it for packaging at any angle. Automacad used sensors from ifm efector on the head to control vacuum pressure and other parameters. The system enables Stonedge to pack a board of product every seven seconds without any human labor*

#### **Complete SCADA (Supervisory Control and Data Acquisition) central control**

Automacad oversaw development of the custom plant control system, requiring thousands of hours of design, programming and testing time. The system tracks individual molds with embedded RFID identification tags, and manages all recipes using 14 Siemens PLCs. The system also provides real-time cost monitoring via production dashboards that are web accessible by secure access. Potential daily production capacity is shown in bar graph form. As production is scheduled for the day, the bar graphs fill up to show how much time or capacity remains available for each shift. Trends, historic tracking and planning are all included in the control system.



*Automacad squeezer clamp is electrically and pneumatically powered and can handle blocks of nearly any design, size or height, prelocating them safely and easily in preparation for the packaging robot.*

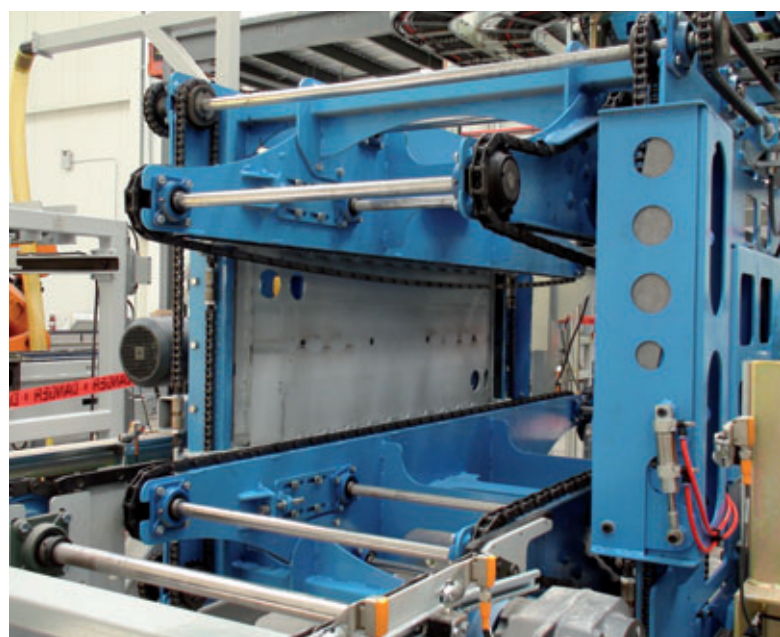


*Release agent applicator and volumetric filling station.*

The new Stonedge wet cast plant is capable of producing approximately 2000 sq. meters per shift of patio slabs, steps, and accessories. The plant will supply Techo-Bloc markets in eastern Canada, and the U.S. East Coast and Midwest.

"We expect more than twice the output from our new plant, yet we'll need less than half the staff to run it," says Techo-Bloc's Ciccarello. He notes that the company views the first Stonedge plant as a research and development treasure trove and that the lessons learned there were put to good use in the design for the new plant.

Ciccarello says that centralized control and full automation enable the company's new plant to overcome one of the most serious detriments to wet cast production: lack of consistency. The use of computer control and the reduction in manual labor and human intervention has made the new Stonedge plant a model of accuracy and quality control. From the computer-controlled concrete mixing and batching plant delivered by ACT – ensuring precision in maintaining



*Compact and durable turnover unit is self-adjustable to any mold thickness and holds even the tiniest pieces securely, making it one of the most efficient machines of its kind in the industry.*

consistent water/cement ratios, base color, and mix temperature — to the overall manufacturing flow control provided by the Automacad SCADA system, the Stonedge plant delivers repeatable accuracy 24x7.

This control and automation also makes it easy for Stonedge to meet market demands for product variety and innovative new features. "One big problem that other wet cast manufacturers face is inflexible production," explains Stonedge plant manager Louis-Philippe Bernier. "Many other wet cast manufacturers have lines devoted to specific products and are locked into those products or form factor. Our design goal from the outset was to make this new plant highly versatile and efficient. We've achieved that and then some."

In just five minutes, production at the Stonedge plant can be switched from patio slabs to masonry block, or any other product the plant produces. RFID labels on every mold and scanners throughout the plant allows the SCADA system to know exactly what's currently on the line and how much to produce. Integration with the ACT concrete batching system means the correct mix recipe is ready and waiting when a product change is required.

Automation specialist Automacad helped the Stonedge team study every aspect of wet cast production to identify areas of improvement and potential bottlenecks. To maximize efficiency and productivity, certain areas in the production process were

doubled to eliminate choke points. For instance, multiple vibration tables are used to increase throughput.

### Close-up on packaging

Special attention was paid to the design of the plant's demolding and packaging lines. These lines were found to be sources of delays at the original Stonedge plant. There, cured slabs, for instance, were stacked at the exit buffer, lifted by plant personnel and transported manually to the strapping area to be packed and shipped. In the new plant, these lines are fully automated and designed to be 20% faster than the wet line.

To achieve this goal, the Automacad team designed an automated conveying system equipped with two ABB® industrial articulated robots each with a 5-axis overhead arm that can pick and place the cured concrete slabs from the conveyor to the packing area. The robotic arms are equipped with a specially designed vacuum head that uses powerful suction to lift up to 700 pounds of product at full extension and at maximum speed.

Automacad create the precision control system to allow the robots to handle concrete products of different shapes and sizes. Each robotic vacuum head is equipped with ifm efector PQ Series vacuum sensors and communication modules that use the AS-I DeviceNet interface to send and receive information.

"Packaging was our number one challenge in order to obtain the efficiency we need for profitable operation," notes plant manager Bernier. "Our new plant is the first to be able to package a board of product in seven seconds, in any orientation — vertically, horizontally and anything in between. Most of our slabs must be packed vertically to minimize the risk of breakage since they are typically about two inches thick. With two robots and two lines, we can package different products if we need to at the same time. The robots can also be reconfigured very quickly with different vacuum heads to handle a variety of products."

What was it like to design, build, test and install more than 200 new pieces of equipment? "It's what we do," says Automacad's Hébert. "If you want to gain a competitive advantage in any market, you can't simply do exactly what the competition is doing or use the same equipment and expect to get better results. You need to innovate and challenge yourself. That's what Techo-Bloc and Stonedge have done"

Hébert credits the cooperation of Automacad's many partners and other equipment suppliers in helping to keep the complex development project on track for nearly two years. "ACT for mixing and batching, Hess for finger cars and elevators, CDS for the curing system — all of these partners played critical roles. Wet cast products have been very popular in Europe for many years. Only recently have we begun to see tremendous interest building in North America. We believe that automation is the key to creating a profitable wet cast manufacturing business and that Stonedge is a prime example of how to do it right."

### Why Automacad?

"They've done a great job for us for the past ten years and we're very happy with the results," says Ciccarello. "They are the ideal partners for this type of new venture. Nothing is beyond the realm of possibility when you work with a partner like Automacad that thinks outside the box and is focused on solving large scale problems with creative solutions." ■

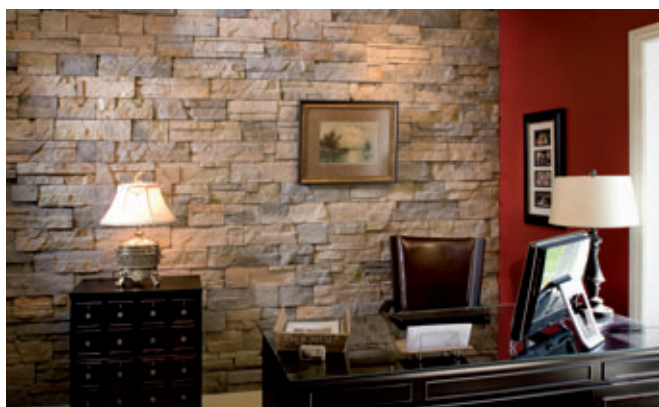


*Automacad deployed sensors from ifm efector North America throughout the Stonedge plant to track product as it moves through the facility and feed information to the Automacad-designed SCADA central control system.*





Wet cast stone and accessories deliver the beauty and warmth of natural materials at a fraction of the cost and with greater consistency and durability. In 2004, Techo-Bloc added wet cast products to its catalog and built a dedicated wet cast manufacturing facility outside Montreal, Canada, to produce the highest quality wet cast products for its customers in eastern Canada and eastern United States. Shown here are photos of actual customer installations. Photo A features the Inca slab series in the Victoria color scheme; Photo B features Monaco interior/exterior masonry veneer; Photo C features the Muro Naturale textured stone; and Photo D highlights the Portofino pool coping/edge.



#### FURTHER INFORMATION



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