

Drive & Control profile

Rexroth Integrated Motors and Drives and CNC Help Cut Cost for Cutting Stone



Rexroth's MTX controller precisely controls the movement of the circular saw and waterjet to make sure each piece is cut properly with minimal waste and much greater accuracy.

AIM's Stonecutting Tool Uses Rexroth IndraDrive Mi and IndraMotion MTX Platform to Reduce Costs and Improve Productivity

Cutting large stone slabs into high-end kitchen countertops and other beautiful interior and exterior fixtures takes tough machinery and a lot of power and control. However, the "hardest" challenge facing the stonecutting industry isn't cutting through solid marble or granite; it's doing so with maximum productivity, precision, and efficient use of raw materials.

Recently, leading stonecutting tool builder Advanced Industrial Machinery (AIM) (Hickory, NC www.aimsaws.com) redesigned one of its top products, the *MasterJetSaw* combination cutting saw/waterjet system, to reduce design/build costs and significantly improve stonecutting throughput and productivity.

Challenge

Develop new control system for stonecutting tool to lower component costs, reduce footprint and build time, and improve performance.

Bosch Rexroth Solution

- IndraMotion MTX CNC controller
- IndraDrive Mi integrated servomotor and drive
- IndraControl VSP industrial PC
- SERCOS communication
- IndraDrive power converter

Benefits

- Substantial cabling reduction
- Replaced enclosure with smaller cabinets, reducing space/cost
- Cut electrical build time in half
- Eliminated 12 proximity sensors for over travel and home switches
- Considerable decrease in machine footprint
- Accuracy to within .004"
- Stonecutting production now running five days ahead of schedule



- Reduce the machine footprint
- Lower machine component costs
- Reduce the time to build machines and deliver to market
- Improve stonecutting productivity and materials utilization.

Ultra-compact IndraDrive Mi Saves Space and Money

AIM worked with Livingston & Haven (Charlotte, NC www.lhtech.com), a leading supplier of manufacturing productivity technology solutions, and a major distributor of Bosch Rexroth products, to identify the best solution to satisfy their requirements for the MasterJetSaw.

The parts are accurate to within four to five thousandths of an inch, far more accurate than what's been done in the past.

To achieve these goals, AIM incorporated a new drive and control system into the MasterJetSaw: the [IndraMotion MTX](#) CNC machine control platform, Profibus remote I/O, and the innovative [IndraDrive Mi](#) integrated motor and drive system, all from the Bosch Rexroth Corporation's [Electric Drives and Controls](#) technology group.

Water and Steel Combine to Cut Stone

The MasterJetSaw is AIM's top of the line tool, designed for high-throughput stonecutting for major stone surface applications. Combining a rigid, high-accuracy 20-horsepower (HP) rotary cutting head, high-speed diamond-tipped blade, and a 50-HP abrasive waterjet cutter into a single unit, the MasterJetSaw lets fabricators cut accurately and repeatedly in stone up to four-inches thick. Most cuts are straight, using the 20-HP rotary saw. The waterjet is used for

radiuses, sink cut-outs, and other circular or curved cuts.

Until recently, AIM built waterjet and saw machines using conventional servo drives and motors. They were looking for new technology that would:

AIM and Livingston and Haven chose to upgrade the machine with the Rexroth IndraMotion MTX CNC platform and the IndraDrive Mi integrated servomotor and drive system, for a complete drive and control solution.



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Rexroth's innovative IndraDrive Mi combines a servomotor and drive into a single, ultracompact unit that's about 50-percent smaller than conventional servomotor and drive systems. By mounting the drive electronics on the motor, instead of in a separate control cabinet, it's possible to dramatically reduce machine footprint and component costs.

Using IndraDrive Mi integrated motors and drives allowed AIM to replace a large freestanding enclosure that previously housed all the servo amplifiers, power supplies, contactors and other components with two smaller, 24-inch by 24-inch cabinets mounted on the machine. This reduced the overall machine footprint considerably and saved costs on the enclosure.

The IndraDrive Mi's cabling design — with a single combination cable containing both power and [SERCOS](#) communication — also provided significant savings. The IndraDrive Mi units are connected in a “daisy-chain” sequence with one cable running to each unit, eliminating the need to run separate power and communication cables from each servomotor back to the control cabinet. For AIM, which uses four IndraDrive Mi units on the MasterJetSaw, this reduced their cabling requirement significantly.

“Reducing the footprint, component cost and machine build time were all important goals for us,” said AIM president Bob Pharr. “The Rexroth IndraDrive Mi was key to meeting all three. In fact,



Using the MasterJetSaw, the customer eliminated overtime entirely and moved five days ahead in their schedule.

we cut the machine electrical build time in half,” said Pharr.

The IndraDrive Mi also improved the MasterJetSaw's operational efficiency. Previously, the machine utilized an incremental encoder feedback system for position feedback, requiring AIM to use over travel and home limit switches on each axis. Any time stonecutting was interrupted, each axis had to reset back to “zero” to resume cutting.

The IndraDrive Mi offers drive-based absolute encoder feedback, eliminating the need to reset the servomotors if cutting is stopped, thereby saving time. In addition, using the absolute encoder feedback allowed AIM to eliminate 12 proximity sensors previously used for over travel and home switches.

MTX CNC Controller Boosts Efficiency, Saves Material

The MasterJetSaw has four axis of motion. The cutting heads are mounted on a gantry for X and Y motion, the Z axis moves

the cutting heads, and the C axis controls the rotary saw blade.

In stonecutting, the circular cuts are the most challenging. According to AIM's Pharr, rounded cuts require true closed-loop control of multi-axis interpolated motion — which is why they chose Rexroth's IndraMotion MTX CNC system for their machine control.

IndraMotion MTX is a high-productivity machine tool CNC that contains all the components — drives, controller, operator software and a powerful engineering framework — optimized for machine tool automation. It can support up to 64 axes of motion and 12 independent CNC channels, providing the shortest CNC cycle times and minimum PLC program processing times for high-speed machining and reduced setup and changeover times.

The MasterJetSaw uses the MTX platform running on a Rexroth 15-inch [IndraControl VSP](#) model industrial PC. The controller

communicates via SERCOS to a Rexroth 70-amp [IndraDrive](#) drive unit and Rexroth KCU unit, from which a single cable system runs carrying DC bus, power, control power and communication to the integrated motor and drive servo axes.

Delivering true CNC control—and having the engineering expertise to make the MTX platform work for the MasterJetSaw—was absolutely essential, said Pharr.

“A lot of companies claim they can do controls, but all they can really do is point-to-point process control,” he said. “Rexroth proved they could cut a radius at high speed, with a high degree of accuracy, and then match that cut with a different tool or a different size, with the highest levels of throughput.”

A critical method for getting the most material from each slab is called “nesting”—cutting as many countertops, facings, and other finished products as possible out of one 6- by 10-foot, or 7- by 12-foot slab.

In the past, tool operators had to leave three inches of space between each piece to be cut, to avoid cutting into another countertop. The MTX precisely controls the

movement of the circular saw and waterjet to make sure each piece is cut with minimal waste and much greater accuracy to get more pieces from each slab.

“The parts are accurate to within four to five thousandths of an inch, far more accurate than what’s been done in the past,” said Pharr. “Because the original cut is more accurate, it speeds up the finishing process.”

MasterJetSaw Delivers Dramatic Labor Savings

One of the first companies to use the updated MasterJetSaw is Elite Installation and Designs, Inc. of Hendersonville, TN. Before using the MasterJetSaw, their order book was so full they were running at maximum capacity with lots of overtime—sometimes cutting until 9 PM.

According to Elite president Chris Brown, within the first week of using the MasterJetSaw, they were able to eliminate overtime entirely, and were cutting so fast they moved five days ahead of their production schedule.

“The nesting alone is incredible—we virtually have crumbs for waste,” said Brown. “We’re cutting at 166 inches-per-minute. In the first six hours of

using the tool we cut ten slabs and pushed them through our CNC polisher. Our fabricators were looking at us like we were crazy,” he exclaimed.

According to Bob Pharr at AIM, other companies that have recently begun using the MasterJetSaw calculate their return on investment to pay off within less than a year, and in some cases, half that.

Valuing a Productive Relationship with Bosch Rexroth

With a desire to continually improve and innovate rather than imitate, Pharr says he values the proven expertise and beneficial partnership AIM has with Rexroth and Livingston and Haven.

“When we make a change on a system, I want the technology to be good, but also the people *behind* the technology have to be good,” he said.

Pharr added he was particularly impressed with Rexroth’s technical expertise, especially in the area of CNC controllers and complex, multi-axis interpolated motion. “I had a lot of detailed questions about crucial issues,” said Pharr. “Everyone I dealt with there knows what it takes to make a true CNC platform work—and that made all the difference,” he said.

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