



Breaking the robot barrier

Robots have long been considered an impossibility for the custom-driven construction steel industry. But in Canada, thanks to Burlington Automation, Azimuth Three Enterprises has now broken the robot barrier - in the process boosting productivity and creating the efficiency edge that will keep it ahead of the pack.

By Jared Mitchell
Photos Daniel Royer

> The steel fabrication industry isn't for the faint of heart. The challenges it faces are huge, and they never get easier. Jean G. Diab, vice president of operations in the International Markets and Structure Division of Azimuth Three Enterprises Inc. (AZ3), points to some of the challenges: the thin margins, the cyclical nature of the business and the increasing shortage of qualified workers who are willing to work in the dirty confines of a fabrication shop. To achieve lasting profitability, Diab says, it's crucial to run your shop as efficiently as possible.

Diab's company, located in Brampton, Ontario, recently turned to an approach that is still so novel that executives in fabrication shops elsewhere don't even believe it exists: custom-fabrication robotics. Working with robotics integrator Burlington Automation of Burlington, Ontario, AZ3 has invested in a robot equipped with a plasma torch and linked to

software to undertake the tasks of cutting holes in beams and cutting the beams themselves. The result has been a burst of productivity, a way to address the labor shortage and a simplification of AZ3's production process.

At its heart, steel fabrication is the value-added treatment of beams delivered from a steel mill before they're delivered to construction sites. Depending on specifications supplied by architects, beams may have holes cut for bolts and other fasteners, slotted to accommodate stiffeners and trimmed to make copes or miters. Then they may be cleaned and painted. Highly skilled fitters may add clips on the ends and perform other tasks, depending on the job. Each job is custom, and usually the work varies from beam to beam even within the same order. That presents a formidable obstacle to robots, which usually perform repetitive tasks.

Paul Kwiatkowski, Burlington's sales manager and part owner, says his company has systems to overcome that obstacle. Burlington adapted standard robots supplied by ABB Robotics to the complex and constantly changing tasks of steel fabrication, including allowing them to cope with minor flaws in the steel, which can vary in dimension. (Even standard beams may be a 1.6 mm or more out of specified dimension.)

- > **People have been** skeptical about automating the industry with robots, Kwiatkowski says. It certainly hasn't been easy. Burlington has been working on robotics integration since 1995, with varying degrees of success. "The problem," he says, "was that programming was very difficult." The task got a little easier in 2000 when Burlington began porting technical data from 3D design program software, manipulating it and feeding it directly to the robot. Suddenly, the complex instructions that had to be programmed

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Jean G. Diab

for each piece of steel could flow through from the design software. "Now," Kwiatkowski says, "you don't have to manually program."

Burlington started out building its own robots, but decided in 2004 that it was a better use of its energies to buy off-the-shelf machines from ABB and concentrate on the peripheral machines needed, such as a conveyer to feed steel beams to the robot, and the programming.

ABB Robotics supplies Burlington Automation with the kinetic soul of its product, a special order

IRB 2400L 6-axis robot. This device is no stranger to the world's workshops: 14,000 have been deployed, and refinements are being made all the time, including innovations in software. Burlington works with ABB Canada constantly on refinements, such as improving data-connection times between the controlling computer and the robot. ABB Canada can provide integrators with welding and thermal cutting strategies tailored to their specifications. Options include off-the-shelf software as well as a suite of software known as ArcWare for more complex needs. In addition, ABB provides sophisticated software packages that enable integrators like Burlington to write their programming. A modular concept enables integrators to work with a variety of robots, power supplies, data networks, positioners and other third-party devices. And even more specifically, ABB Canada teams with Burlington on solving customer-specific technical issues. Says Tamara Mulcahy, general manager and vice president of operations for ABB Canada's robotics division: "If you're a system integrator, ABB is your ideal business partner. We'll support you with the tools you need to advance your customers' business."

Acceptance of robotics by the steel fabrication industry hasn't been easy, Kwiatkowski says. Companies want to see the robot systems up and running before they commit. "In this industry, everybody wants to touch and feel," he says. "It's like buying a car." But Burlington's case is compelling. Kwiatkowski says his robotics system can boost shop productivity by a factor of six. There is no need for a burning table, for drilling machines or many hand tools. The robot is suspended in an enclosure and can hover around various sizes and kinds of steel beams. At AZ3, the robot bustles above a 4,500 kilogram, 18 meter beam like an industrious bee, accurately zapping holes

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and slots and cutting copes in mere seconds. By contrast, hand cutting can take 10 minutes or more when you factor in the measuring. Many shops still use pencil and paper to interpret from blueprints where holes have to be cut. That process is slow and prone to misinterpretation of designers' specs. And then there's the shortage of workers, a situation that is getting worse, Diab says. Kwiatkowski's robot can even compensate for those minor variations in the dimensions of the steel beams.

Whether robotics in custom steel fabrication shops is a technology whose time has come remains to be seen. Diab says that the Canadian building market is booming, thanks to institutional construction in Ontario, petroleum developments on an epic scale in Alberta and building for the 2010 Winter Olympics in British Columbia. "Right now in Canada you cannot find a shop that has an hour of available time for six months out," Diab says. But therein lies an opportunity for adopting robotics. AZ3 can grow its business, Diab says, because the robot's speed and accuracy effectively increases the company's steel-handling capacity. "The more steel you pump out of here," he says, "the more money you make, the more you cut your overhead." And if and when the current building boom subsides, Diab predicts that those shops with reliability and efficiencies will be the ones to thrive, while the pencil-and-paper shops will see their margins sliced off.

For the future, Diab dreams of even more automation: a robot that not only cuts and welds, but attaches clip angles on the beam ends, effectively doing the job of highly qualified and difficult-to-find fitters. "Then it welds it and paints it," he says. "The only obstacle is finding someone smart like Burlington to build it." ☉



>FACTS

Benefits

- Burlington Automation's steel fabrication automation equipment reduces material-handling shop space, simplifies shop layout, increases speed and accuracy and addresses a growing shortage of skilled workers.
- Burlington's PentARC 3D Plasma Cutter consists of an ABB robot equipped with one of several models of plasma torches (some with marking functions) and linked to a PC and a CNC controller. The system is capable of doing the work of conventional drill, beam, flanger, angle and bar lines, coping machines, band saws, marking machines and small burning tables.
- By removing the need for discrete machines, Burlington cutting systems reduce both cost – capital and maintenance – and time. Burlington also provides ongoing support and regular software upgrades.
- Bolt holes made by the system conform to provisions laid out in the RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- The PentARC 3D Plasma Cutter also comes with fume- and dust-extraction equipment, resulting in a cleaner shop that is more agreeable to work in.

Burlington Automation

- Based in Burlington, Ontario, 60 kilometres southwest of Toronto, Burlington designs and builds computer numerically controlled machinery for use in steel fabrication.
- In addition, the company is experienced in custom automation of material-handling equipment, automatic tube cutting, processing and finishing equipment.
- Approximately half of Burlington's business is in building robotics automation applications for the steel fabrication and pre-engineered building fabrication industries.
- A new product, the PythonX 6-axis CNC plasma fabrication system, can automate cutting channels, HSS, angle plate and bar. It is capable of probing and measuring steel, compensating for inaccurate beam geometry. It directly downloads data for structural steel design software such as AutoCAD.
- Customers are located throughout North America as well as in Europe, the Middle East and Australia.

