



ATI OC-210 master and tool modules coupled on a Yaskawa robot with an end-of-arm tool at Tennessee Rand.

Flexible manufacturing

Utility couplers and tool changers safely save time

When a welding job requires that pieces be worked on at various angles, the right equipment makes the process less complicated. A fuel tank or sub-frame on a Harley-Davidson motorcycle has to be welded with expert precision, for example. At Tennessee Rand Inc. in Chattanooga, Tenn., using the right system ensures workers can safely work with robots to get the job done.

Tennessee Rand provides robotic manufacturing solutions to a variety of industries including automotive, aerospace, military, power generation, off-road/heavy equipment and recreation (motorcycles, ATV, watercraft). The company frequently uses G4 utility couplers and QC-210 tool changers from ATI Industrial Automation, Apex, N.C.,

for robotic spot-welding applications, as well as ATI's tool stands and QC-21, QC-41 and QC-310 series tool changers for other robotic handling applications.

"ATI provides us the ability to offer more flexible work cells, which allows us to expand not only within a specific company, but also within other divisions of a company as well," says Andrew Neely, vice president of engineering at Tennessee Rand. "More companies are looking for more flexible work cells for rapid changeover between product variations or product lines."

"ATI manufactures utility couplers and tool changers so companies like Tennessee Rand can create cutting-edge manufacturing equipment," says Robert Little, CEO of ATI. "We provide tools to make robots more flexible and efficient."

Tooling breakdown

Without ATI's utility couplers and tool changers, manufacturers would need multiple robots to change tooling processes, whereas now, only one robot is needed, saving time, cost and space. "Before this tool change option, workers had to manually change tools and this caused a safety issue for workers going into the robot cells," Little says. "Automatic tool changes eliminate human contact and are therefore much safer than having workers go into the robot cell and manually implement the tool changes."

Utility couplers connect utilities for manual or automatic docking and fixturing operations to load power, hydraulics, air and fluids. Like tool changers, utility couplers are automatic, so workers can avoid the hazard of manually changing tooling between jobs. "There's a lot of effort that goes into manually changing utilities from say, fluid to air," Little explains. "If instead you have an automated method to do that, it provides for a fast connection, taking seconds as opposed to minutes, and it is much safer."

Tennessee Rand uses ATI's utility couplers for robotic quick-change of fixtures on/off indexers and robotic tool changers for end-of-arm tooling and/or spot gun changeover. ATI's setup allows Tennessee Rand to provide automated solutions to its customers, requiring less downtime be-

Robotics

tween part runs. “It makes the systems we offer more flexible between customer programs,” Neely says.

Ongoing changes

Tennessee Rand has used large handling robots and indexers equipped with ATI tool changers for Harley-Davidson projects that require flexible manufacturing. Robots dock and undock between fixtures and can run various fuel tank, frame sub-assembly and final frame assembly welding fixtures. Larger material handling robots then move the welding fixtures to smaller arc welding robots. “This allows for a flexible welding cell where the customer is not limited with one or two axes of rotation by a conventional positioner,” Neely says. Welds are positioned at an optimal angle for welding.

“We also utilized tool changers for locking the welding fixtures onto indexers, so the communication and air can be delivered to tooling and operators could load the fixtures while decoupled from large handling robots,” Neely says.

ATI has spent years developing tool changers for aluminum welding applications, which are significantly more complicated than steel welding applications. “Our engineers worked closely with robot manufacturers and welding suppliers to develop a tool changing solution for aluminum welding applications,” Little says. In order to complete its development, ATI worked with several automotive manufacturers to develop equipment that works seamlessly into their processes.

Using tool changers for stud welding was one particular problem for customers. Metal studs have to pass through the tool changer and still be guided by the large



ATI offers a variety of standard and custom tool changers.

tubes, which is not an easy process. “We had to do a lot of hands-on research in order to develop a solution,” says Little.

Computer components

In addition to its utility couplers and tool changers, ATI also has a variety of network utility modules that attach to them. These modules help robots communicate with various control devices on the tooling. Typical communication protocols include DeviceNet, EtherNet/IP and PROFINET.

“Tool changers running on these networks are performing several functions. They control the tool changers via network communication, pass those network signals to the end-effector and connect power to the tooling. While that sounds simple enough, the problem is the signals travel at high speeds, which means outside noise can disrupt the signals,” Little explains. “So you have to create electrical modules that protect the signals from the outside environment.”

DeviceNet is a common protocol in

manufacturing with data rates running up to 0.5 Mbps, but today EtherNet/IP is more common in manufacturing. EtherNet/IP runs up to 100 Mbps, making for a much faster network system, but also posing a challenge to create modules to pass these high-speed signals.

ATI developed network utility modules for Tennessee Rand with DeviceNet, but the company primarily uses ATI's EtherNet/IP utility modules, according to Neely.

“Ten or 15 years ago, there was very little use of the network systems, and today just about all manufacturing uses some kind of network system to communicate from robot-side to tool-side,” Little says. “Network systems allow customers to connect large amounts of sensors with only five wires, whereas in the past it would have taken dozens of wires. This is a major cost savings.”

Why the emphasis on network systems? “This is the future of manufacturing,” Little says. “Network systems are going to get faster and signals will have to be protected through the tool changers and utility couplers.

“What's in the future? We have just developed a network utility module for Gigabit Ethernet, which supports data transfer rates up to 1,000 Mbps. This will allow for the use of high-speed vision cameras and many other new systems.” **FFJ**



ATI OC-210 tool module mounted onto a gripper parked in a drop-off stand.

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