New Aluminum Welding Process Strengthens Stingray

GM's $131 million investment in high-tech manufacturing techniques at the automaker's Bowling Green Assembly plant has resulted in the strongest and most precisely-built Corvette ever, said Chevrolet spokesman Monte Doran.

New technologies, such as the GM-patented process that allows aluminum to be spot-welded to aluminum, enable more accurate and efficiently produced subassemblies, such as the frame and the components attached to it, Doran said.

Enhanced, laser-based three-dimensional inspection systems verify overall assembly tolerances targeted to be 25 percent tighter than the previous-generation Corvette.

"Many customers will never see the advanced manufacturing technologies used for the new Corvette Stingray," said Plant Manager Dave Tatman.

"But they will appreciate the benefits of these technologies every time they get behind the wheel.

"For example, the new aluminum-welding process enabled us to make the frame lighter and stiffer, improving the performance and driving confidence. Measuring 100 points on every frame reduces the chance for unwanted squeaks and rattles that would distract from the driving experience."

Approximately $52 million of the total $131 million investment went to a new body shop that manufactures the car's all-new, lightweight aluminum frame in-house for the first time.

The frame is not only the foundation for the car's greater driving capabilities, said Doran, but the platform on which the 2014 Corvette Stingray sits is more precisely constructed.

The platform is 99 pounds lighter and 57 percent stiffer than the previous-generation frame, resulting in a chassis so strong that the new convertible model needs no structural reinforcements.

It is also the most complex frame design in the Corvette's history, featuring main rails comprising five customized aluminum segments, including aluminum extrusions at each end, a center main rail section and hollow-cast nodes at the suspension interface points.

And all of these segments contain varied thicknesses that make the most of the strength and mass requirements of each respective section.

Assembling the frame requires more advanced joining processes and more precise inspection methods to ensure strength and dimensional accuracy. That's where aluminum welding, Flowdrill-type fastening and laser welding help ensure the high-quality targets for the frame, said Doran.

The Stingray's frame features 188 Flowdrill-machined fasteners with structural adhesive.

The fasteners are installed by a high-speed drill that extrudes the frame material to create a strong, integral collar that is tapped for screw-type fasteners, Doran said.

It is a GM first for body structure joining.

Flowdrill fastening joins closed sections, where only one side has open access and where arc welding could cause heat distortion or weaken material.

Dimensional quality is also maintained, eliminating the need for post-assembly machining, said Doran.

Pioneered by GM, the aluminum resistance spot-welding process is an efficient method for joining aluminum to aluminum where there is two-sided joint access, Doran said.

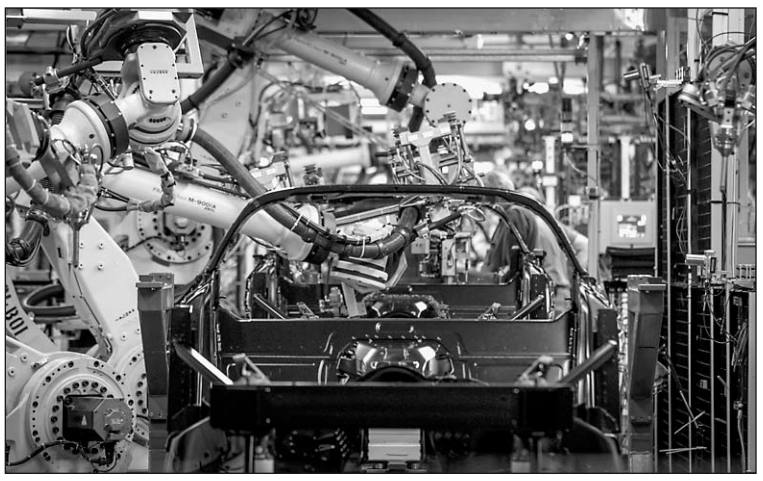
It is particularly effective with the thicker materials – up to 4mm – used on the new Corvette's frame.

It is also used for welding aluminum extrusions, die castings and aluminum sheet metal.

There are 439 aluminum resistance spot welds on the Corvette Stingray coupe.

The process is used in the Corvette's aluminum structure tunnel subassembly and in main-line attachments of various components, Doran said.

Additionally, licensed suppliers use the process to produce a few subassemblies for the car.



A 2014 Stingray frame in Bowling Green Assembly's new body shop.

GM's new resistance spot-welding process uses a patented multi-ring domed electrode that does what smooth electrodes are unreliable at doing: welding aluminum to aluminum.

And, the new process does it more cost-effectively than other methods of joining aluminum, Doran said.

The multi-ring domed electrode head disrupts the oxide on the aluminum's surface to enable a stronger weld.

Laser welding is used in the frame's tunnel subassembly to attach sheet aluminum closeout panels to the tunnel structure.

The process enables continuous welding quickly when only single-sided access is available.

Additionally, the precise beam of high energy used in the welding process minimizes heat beyond the weld area for improved structural accuracy, and the laser creates a leak-free joint that does not require additional sealing, which could add weight to the frame structure, Doran said.

There are two robotic laser-welding stations in the plant – one with a pair of robots and another with a single robot.

Each robot has a dedicated laser power generator and, together, they lay down 71 segments for 37 welded feet on every frame.

Laser-based vision inspection for quality assurance now includes Perceptron-supplied tools to monitor critical points on every Corvette body that comes down the line.

By checking every car and major assembly in the plant, process variation can be seen – and addressed – immediately, Doran said.

Tighter tolerances on parts and new, improved tooling for the Corvette's various assembly procedures are helping the plant achieve approximately 25 percent or greater improvement in meeting tolerance targets.

Perceptron is essentially a three-dimensional measurement system that uses fixed and robotic-mounted Helix laser sensors, or cameras, to monitor critical build features, Doran said.

It's a three-part, "in-process" quality inspection for frame rail assemblies, uniframe bodies and composite bodies with a fully dressed cockpit.

On the composite body alone, 39 specific points are measured. It takes approximately 2.5 minutes to measure each car in station to within 0.25 mm – 100 dimensional measurements are taken with each frame assembly, Doran said.

Michael Keegan Replaces Retiring Nancy Rae in HR

Nancy Rae, senior vice president for Human Resources at Chrysler, is retiring from the automaker, effective Jan. 1, 2014. Her replacement is Michael Keegan.

"In her leadership role, Nancy has been a highly valued business partner in driving cultural change, advancing leadership and talent development, and in rebuilding the company's workforce through the strategic hiring of more than 17,000 employees since 2009," said Sergio Marchionne, Chairman and CEO.

"We thank her for the many years of tireless dedication to the company. She was particularly helpful and close to me in the selection of the senior leadership that has been responsible for Chrysler Group's comeback since 2009. Together with them, I wish Nancy and her family only the best."

Rae joined Chrysler in 1978 and has held a series of positions with increasing responsibility in the Human Resources function.

She was named senior vice president of Human Resources in 2000.

Keegan will continue in his role as senior vice president, Supply Chain Management until a replacement is named at a later date. He will continue to serve as the automaker's Corporate Sustainability officer and will be a member of the Group Executive Council for Fiat S.p.A.

Prior to his current position, Keegan served as vice president – Volume Planning and Sales Operations. He joined Chrysler in 1990 and has held positions of increasing responsibility in the Treasury, Finance and Sales departments.