

Ultrasonic Welding Key to Cadillac ELR's Consistent Quality for All Battery Packs

Ultrasonic welding, a high-tech manufacturing process used in the aerospace and medical industries, is helping ensure high quality for the new Cadillac ELR extended-range electric luxury coupe that goes on sale in North America in early 2014.

Ultrasonic welding's key advantage is exceptional and predictable quality and performance from one battery pack to the next, said David Darovitz, GM Manufacturing manager. Every ELR battery, for example, has close to 200 ultrasonic welds. Each is required to meet stringent quality requirements, enabling Cadillac to offer an eight-year/100,000-mile battery system warranty.

Short cycle times, low capital costs and manufacturing flexibility through the use of automation are other advantages of ultrasonic welding, Darovitz said.

"Ultrasonic welding is a far superior joining technology in applications where it can be deployed," said Jay Baron, president and CEO of the University of Michigan's Center for Automotive Research (CAR) based in Ann Arbor.

"Cadillac's innovative process will produce batteries with superior quality compared with traditional methods – and do it more efficiently.

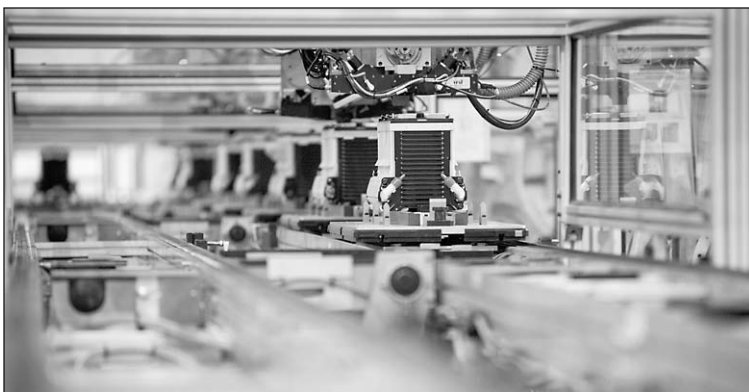
"This is one example of technology development that is becoming pervasive in today's world-class vehicles."

General Motors' Brownstown Battery Assembly plant, near Detroit, uses ultrasonic welding to join metal electrode tabs on ELR's advanced 16.5-kWh lithium-ion battery system, and does it with a proprietary quality monitoring process.

Brownstown uses an automated system to execute millions of these welds each year, Darovitz said.

Ultrasonic welding uses specialized tools called an anvil and horn to apply rapid mechanical vibrations to the battery's copper and aluminum electrodes.

This creates heat through friction, resulting in a weld that does not require melting-point temperatures or joining material such as adhesives, soldering or



Ultrasonic welding uses specialized tools that eliminate adhesives.

fasteners, Darovitz said.

An integrated camera vision system is used to shoot a reference image of the weld area before the operation to achieve pinpoint accuracy, he said. Quality operators check electrode tabs before and after welding, and the system monitors dozens of signal processing features during each weld.

The battery-specific welding process is a result of collaboration among General Motors' Manufacturing Systems Research Lab, Advanced Propulsion Center and the Brownstown plant. GM first applied the process on the award-winning Chevrolet Volt – its groundbreaking extended-range electric vehicle – and further refined it for the Cadillac ELR, Darovitz said.

"This effort is an outstanding example of teamwork between research and manufacturing engineering," said Catherine Clegg, GM vice president of Global Manufacturing Engineering.

"It has helped integrate the use of highly technical, complex technology into a sustainable manufacturing process, which means we can consistently deliver high-quality batteries to our customers for the Cadillac ELR."

Darovitz said the ELR's T-shaped battery pack is located along the centerline of the vehicle, between the front and rear wheels which results in optimal weight distribution.

The 5.5-foot-long, 435-pound pack supplies energy to an advanced electric drive unit capable of 295 lb.-ft. of instant torque to propel the vehicle.

Using only the energy stored in

the battery, the ELR will deliver a GM-estimated range of about 35 miles of pure electric driving, depending on terrain, driving techniques and temperature.

Charging the ELR's battery can be done with a 120V electrical outlet or a dedicated 240V charging station.

The vehicle can be completely recharged in about 4.5 hours using a 240V outlet, depending on the outside temperature and other factors, Clegg said.

The Cadillac ELR is built at GM's Detroit-Hamtramck Assembly Plant, one of the few high-volume electric vehicle manufacturing facilities currently based in the United States.

Its battery pack is built from cell to pack at Brownstown and shipped to Detroit-Hamtramck for assembly into the vehicle.

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Michael Mazzeo Named Dean Of Oakland Business School

Michael A. Mazzeo has been appointed dean of Oakland University's School of Business Administration, effective Aug. 15.

The appointment is subject to Board of Trustees confirmation on Aug. 12, said Oakland University Senior Vice President for Academic Affairs and Provost James Lentini.

Mazzeo comes to Oakland from the Michigan State University Eli Broad College of Business, Lentini said.

He brings nearly 10 years of experience in academic administration, and more than 30 years in scholarship in the areas of finance, mergers, acquisitions and corporate structuring.

"Dr. Mazzeo brings a strong record of academic experience and accomplishments," Lentini said.

"Additionally, he has successfully worked with the community in strengthening alumni relationships, cultivating business partnerships, developing executive education programs, and advancing study abroad and outreach opportunities," added Lentini.

"His combination of academic and administrative experience at a nationally ranked AACSB-accredited institution will further advance Oakland University's business school programs and reputation within and beyond the region."

As an administrator and professor for a nationally recognized and accredited business college, Mazzeo's accomplishments include developing new international degree and certificate programs, an entrepreneurship specialization and supporting economic development activities, Lentini said.



Michael Mazzeo

Mazzeo also partnered with Fortune 500 companies to create custom executive education programs and seminars, as well as created community partnerships and built external support for his school's programs and initiatives.

Mazzeo has been consistently recognized for his teaching with multiple MSU Faculty Excellence Awards and Business Week Guide to the Best Business Schools (Fourth Edition) honors as the top-rated professor on the Broad Graduate School of Management faculty.

Mazzeo focused on enhancing the student experience by introducing programs to increase the value of graduates to employers through programs to enhance their professional skills, Lentini said.

Mazzeo's record of scholarship includes the publication of articles in top-tier finance journals such as the *Review of Financial Studies*, Lentini said.

His research is cited frequently in textbooks, while national media outlets such as *Business Week* regularly seek his opinion. He served as an associate editor of the *Journal of Financial Research*.



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