

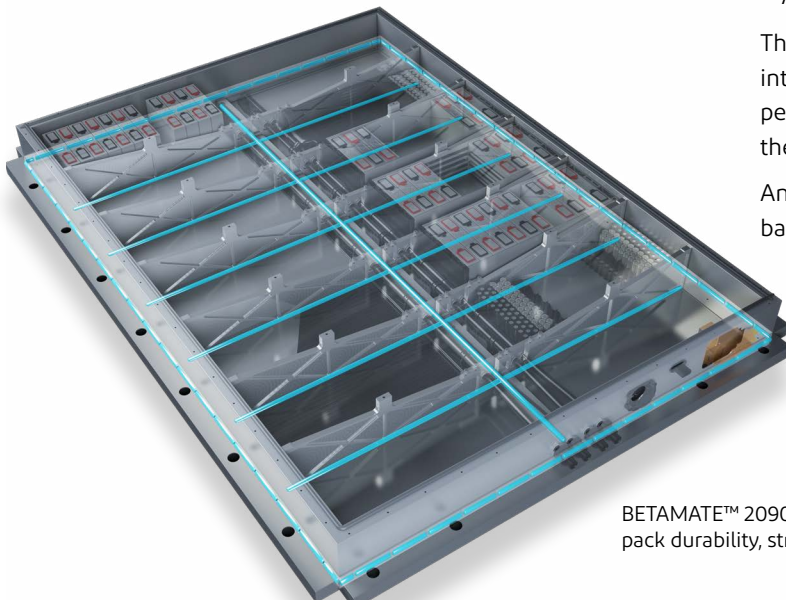
# Battery Pack Structural Integrity Enhanced by Use of New DuPont™ BETAMATE™ 2090 Structural Adhesive



Photo courtesy of Volkswagen AG

## Project

Supplier partners, like DuPont, will be crucial to Volkswagen's efforts to transform from combustion engines to electric versions of all their vehicles across all brands between 2019 and 2030. The modular electric drive matrix (MEB) platform relies heavily on the performance of the battery pack. It is essential that the battery pack frame is strong and crash resistant to protect the battery cells, and more importantly, vehicle occupants. When it came to the decision to utilize a structural adhesive for this important application, the excellent relationship between Volkswagen and DuPont helped to quickly develop the right material at the right time — BETAMATE™ 2090 structural adhesive.



BETAMATE™ 2090 structural adhesive enhances battery pack durability, strength, and crash resistance.

## Challenges

Volkswagen's challenges for battery pack assembly were two-fold. First, the solution had to provide durability, stiffness, and crash performance. Second, manufacturing process flexibility had to be enhanced. Mechanical joining could not ensure a continuous bondline, thus sacrificing structural integrity. In addition, long welding lines could not achieve the desired cycle time.

Once the decision was taken for an adhesive solution, there was the further challenge of needing one-part curing performance with a cold-cure, two-part adhesive due to the lack of an oven in the assembly line for a heat-cured process. And, no surface pre-treatment was a requirement to save time and cost.

## Solution

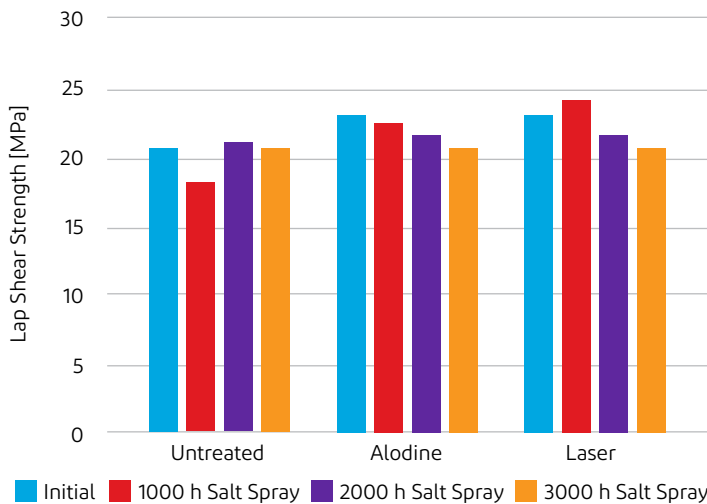
Known for best-in-class engineered chemistry and application knowhow, DuPont's R&D and technical service teams were able to quickly provide a solution by modifying existing technology to develop BETAMATE™ 2090 structural adhesive. The product exhibits:

- Strength and stiffness
- High elastic modulus
- Primerless technology for no surface pretreatment
- Curing kinetics allowing for 20-minute open time to achieve handling strength
- Non-oven curing
- Ability for robotic or manual application

These attributes help ensure battery pack frame structural integrity that demonstrates stiffness, durability, and crash performance while delivering process efficiencies that simplify the manufacturing process and shorten cycle times.

An additional benefit is the ability to use the same material for battery pack repair.

## BETAMATE™ 2090 Exhibits Excellent Environmental Corrosion Resistance

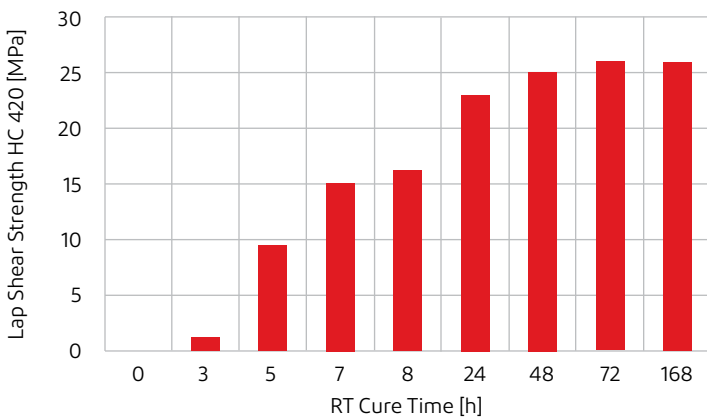


Aluminum 6061 Surface Pretreatment

Substrate: Aluminum 6061; 3.8 mm thick; Adh. Curing: 7d RT

Source: AKKA GmbH & Co. KGaA

## BETAMATE™ 2090 Demonstrates Fast Ambient Full Cure



- Joined parts able to be handled after 3 hours at room temperature.
- More than 80% of final lap shear strength after 24 hours at room temperature.

Source: DuPont

## Result

BETAMATE™ 2090 structural adhesive is being specified on the VW MEB platform for several models of electric vehicles now in production, including the Volkswagen ID.3.

## BETAMATE™ Structural Adhesives

BETAMATE™ structural adhesives offer high-performance adhesion to automotive substrates such as steel, aluminum, magnesium, and composites. It replaces welds and mechanical fasteners, reducing fatigue and failure commonly encountered with traditional processes, and substantially increasing manufacturing efficiencies.

Auto manufacturers use BETAMATE™ for many bonding/assembly applications, including:

- hybrid/electric vehicle chassis, e-motor and battery pack components
- ICE chassis/powertrain components
- aluminum closures
- aluminum, steel or composite roofs
- bonded seat structures
- cockpits
- composite body-in-white parts integration
- deck lid flanges
- doors
- engine compartments
- full aluminum vehicle bodies
- hoods
- load-bearing members
- magnesium suspension struts
- rails
- roof panels
- trailer flooring

DuPont is a leading supplier of materials, technology, and support for automotive adhesive applications. We offer you a globally consistent, reliable and secure material supply, with significant cost efficiencies. Plus, we have engineering expertise to facilitate the design with—and use of—structural adhesives.

dupont.com

DuPont™, the DuPont Oval Logo, and all trademarks and service marks denoted with ™, SM or TM are owned by affiliates of DuPont de Nemours, Inc. unless otherwise noted. © 2020 DuPont.



Transportation & Industrial

The information set forth herein is furnished free of charge and is based on technical data that DuPont believes to be reliable and falls within the normal range of properties. It is intended for use by persons having technical skill, at their own discretion and risk. This data should not be used to establish specification limits nor used alone as the basis of design. Handling precaution information is given with the understanding that those using it will satisfy themselves that their particular conditions of use present no health or safety hazards. Since conditions of product use and disposal are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. As with any product, evaluation under end-use conditions prior to specification is essential. Nothing herein is to be taken as a license to operate or a recommendation to infringe on patents.

Form No. 001-20458-HMC1020