

**BOSSARD**

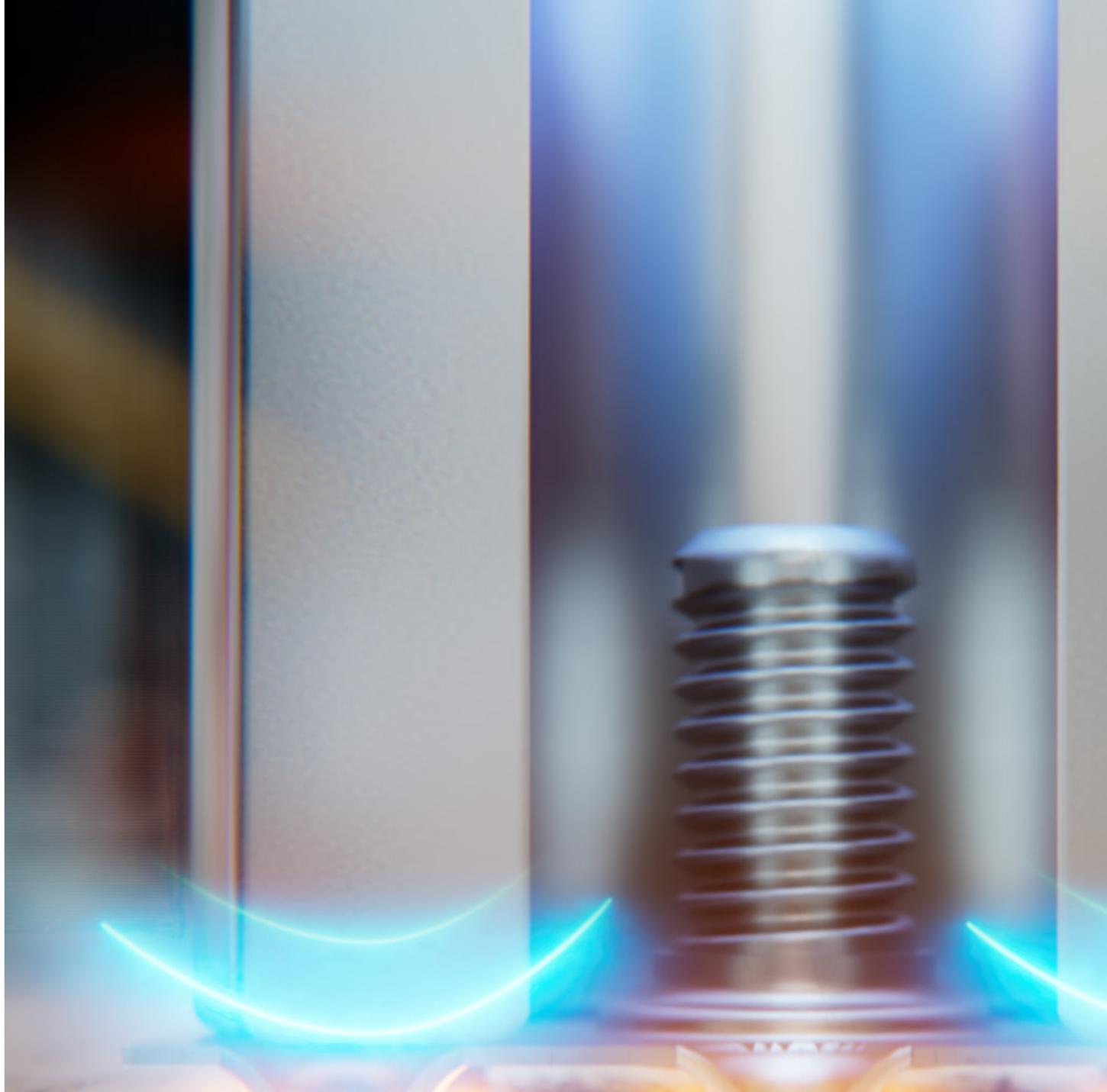
Proven Productivity



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MultiMaterial-Welding®

Smart. New. Intelligent



MM-Welding® technology is an innovative fastening technique using ultrasonic energy to create a frictional positive connection in porous materials, sheet structures, sandwich materials, injection-moulded and pressure mouldings.



## TECHNOLOGY INTRODUCTION

# What is MM-Welding technology all about?

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MM-Welding technology is essentially about locally and partially liquefying thermoplastic materials with the aid of ultrasonic energy and producing a mechanical form fit with this melt and suitable geometric structures.

On the one hand, these structures can be cavities in the substrate material to be joined - for example, porous materials and honeycomb core boards - or they can be integrated into the joining element itself.

Properties:

- Significantly stronger bonds than some other fastening methods
- Can be used without pre-positioning to compensate for tolerances
- Clean processing, as no additional materials or surface pretreatment is required and no waste is produced
- Statistical control over the process that guarantees the quality of each bond
- The technology is used in a number of industrial processes and in other industries (e.g., medical and furniture)

**Key trends and challenges are resource efficiency, energy efficiency, CO2 footprint and recycling.**

The multi-material mix processed in the automotive and transportation industries presents manufacturers with numerous challenges when it comes to choosing the perfect joining technology: The solutions used must be optimally designed for the properties of the materials as well as the requirements of the respective company. At the same time, safety and efficiency are top priorities. The problem with using conventional joining technologies: They are primarily designed to join solid materials together.

Further, we observe that the digitalization of production and the implementation of efficiency programs are the current top issues driving companies, not least to be able to compensate for the losses of the current economic situation.

That is why Bossard is proud to present Multi Material Welding, a technology that enables completely new production techniques right now. We will be happy to show you how MM-Welding can help you redesign your ideas in lightweight construction and multi-material design for trend-setting technologies and sustainable use of our resources.

**Speed, resilience and high cost awareness are three of many criteria with which MM-Welding® technologies score in joining technology.**

**Because: lightweight materials, such as porous fiber composites or sandwich panels (so-called honeycomb core boards), make it difficult to either join them together or to attach a fixed assembly or joining element to them.**

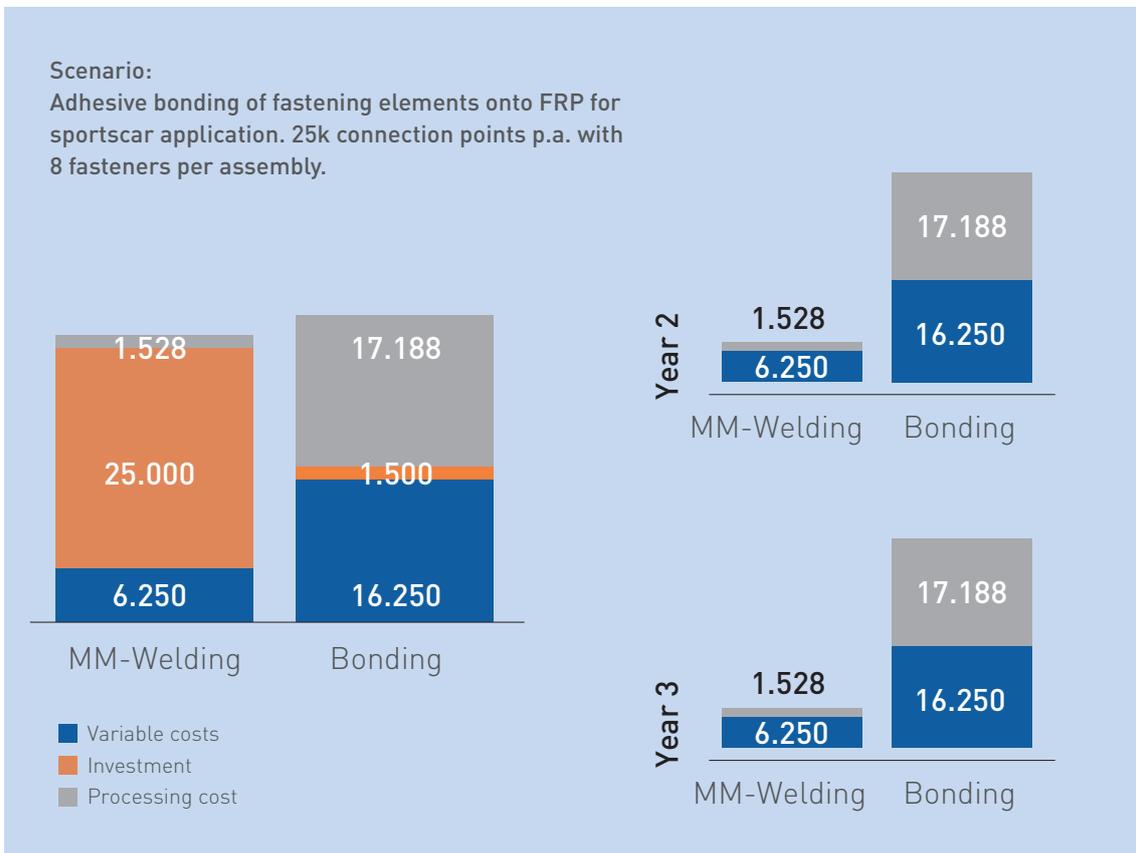
One way to streamline production processes is to reduce the number of steps in a given process. If a fastener needs to be attached to a lightweight thermoplastic workpiece, the number of process steps can be reduced by switching from adhesive bonding to another process that requires fewer preparation steps (preparation of the workpiece surface) and

less postprocessing time (curing time of the adhesive). The challenge for the production planner here is to find a satisfactory substitute process.

### The solution

Bonding a metallic INWVERSE® FASTENER to a thermoplastic substrate using ultrasound is an excellent substitute method that can be used in place of adhesive bonding. This method is particularly suitable for thin (e.g. 2.5 mm) plastic parts. No pilot hole or through-hole is required, and less surface preparation is needed than with gluing. Once ultrasonic energy is applied, the part is ready for the next process step in less than a second, with no cure time required. The innovative crater-shaped design creates a strong, positive connection between the fastener and the workpiece.

As the table below shows, switching from adhesive bonding to the INWVERSE® FASTENER can provide significant cost savings. In this theoretical scenario (source: MM-Welding) for sports car assembly costs, the MM-Welding process requires significant invest-



ment in the first year. However, variable costs and processing costs are relatively low, and worthwhile savings can be achieved over a four-year period.

**MM-Welding technology has been successfully used in various applications for many years.**

MM-Welding has expanded this field of application by developing a broad portfolio of standard fastening solutions for the mobility industry and continues to develop it to increase customer productivity. Cars with MM-Welding fasteners are already on the road. The technology opens up a wide range of new appli-

cations and allows engineers to work with attractive multi-material combinations to further reduce weight in mobility applications. Ultrasonic processes will always be well suited for the fastener industry because fasteners are inherently small in size, allowing ultrasonic energy to easily penetrate the entire fastener. In addition, ultrasonic processes for all types of thermoplastic components, small or large, will likely continue to be popular with automotive manufacturers because these processes do not damage surface finishes or leave unsightly marks. A fast cycle time will continue to be one of the main advantages.

## POSSIBLE? POSSIBLE!

# MM-Welding – what else?

The MM-Welding process is ideal for attaching not only tie points but also directly functional elements or applications to sandwich structures.

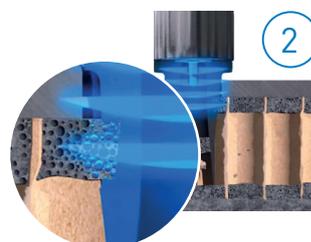
In a customer project, the task was to equip a light-weight and highly stable trunk loading floor with paper honeycomb core with fasteners. The customer required the loading floor in different thicknesses and with or without optional functional elements, depending on the car equipment ordered.

In addition to a grip loop, each variant has a series of fasteners that engage with the body and center the load floor above. "The particular challenge arose from the fact that these fasteners have to be placed extremely close to the edge of the load floor," explains Christian Busch, Business Development Manager MultiMaterial-Welding. To meet the specific requirement of the application, special weld-in pins were developed together with the customer. MM-Welding technology allows these fasteners to be placed directly on the edge, invisibly from above, in accordance with the customer's specifications - this would not have been possible with any other solution.



### INSTALLATION PROCESS

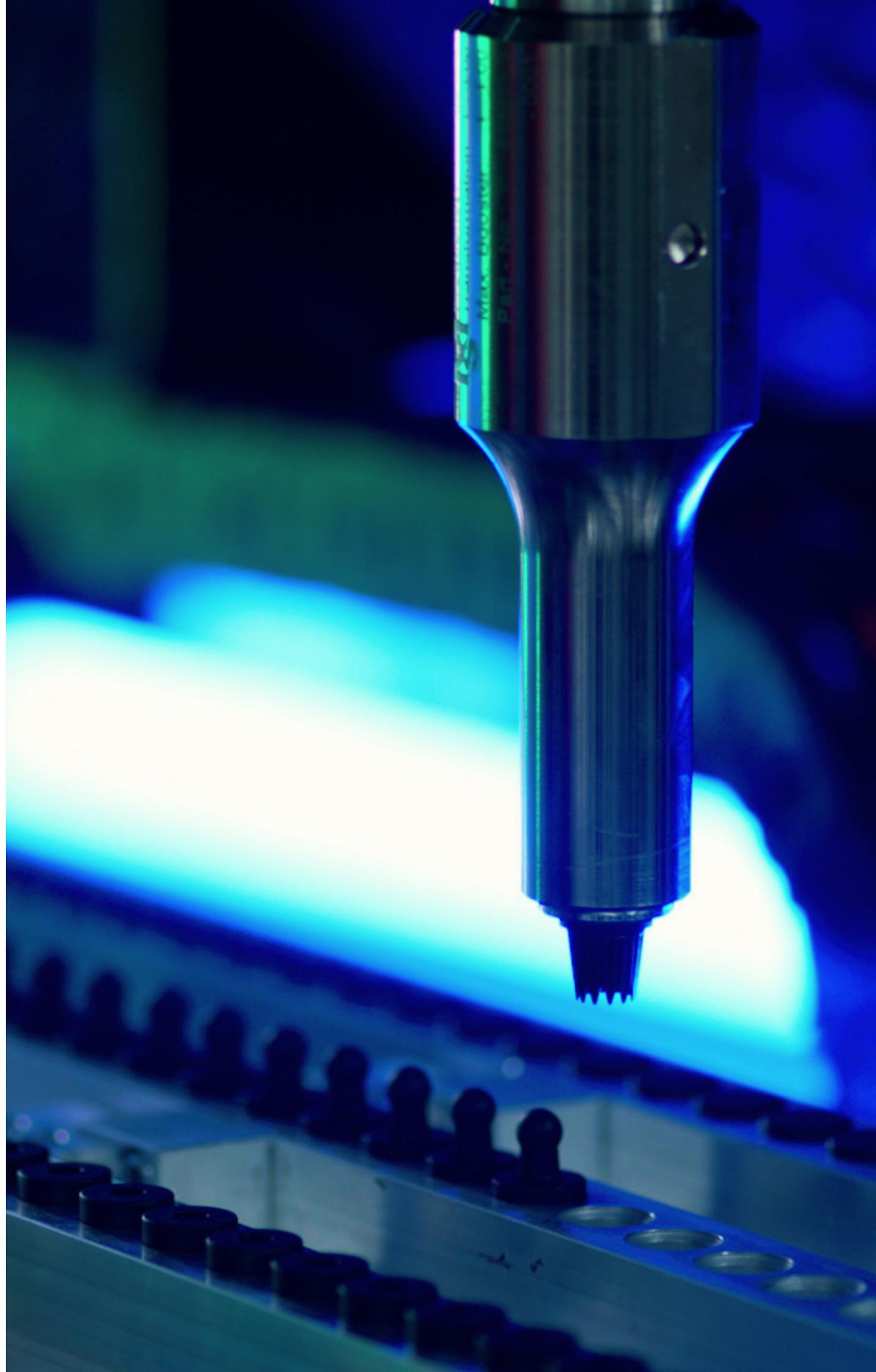
- Start process
- Activate ultrasound



- Pierce through top layer
- Create friction between fastener and substrate to liquefy polymer
- Fill porous structure of substrate with liquified polymer



- Polymers solidifies in fractions of a second
- Strong mechanical form-lock connection is created



## PRODUCT OVERVIEW

# MultiMaterial-Welding-Technologies

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## LiteWWeight® Pin



This is a range of fasteners designed for fast and strong fastening on sandwich honeycomb structures or similar structures.



## LiteWWeight® Lotus



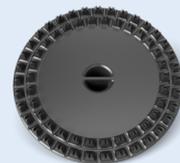
LiteWWeight® Lotus is a fast and reliable fastening concept for fibrous components (woven and non-woven) and textile structures.



## LiteWWeight® Lotus Abalone



MM-Welding® LiteWWeight® Lotus Abalone significantly speeds up the installation of the male clip component of floor mat fasteners. No punching or cutting is required and joining of two separate components is eliminated.



# LiteWWeight® zEPP



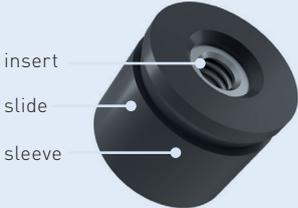
Fast and efficient joining technology for all EPP materials based on the innovative MultiMaterial-Welding process. Standard solution for a wide EPP sealing spectrum.



# LiteWWeight® Double Pin



This fastener is designed to provide fast and strong fasteners that provide a seat for plastic direct screws or a metal internal thread.



## InWVerse® Fastener

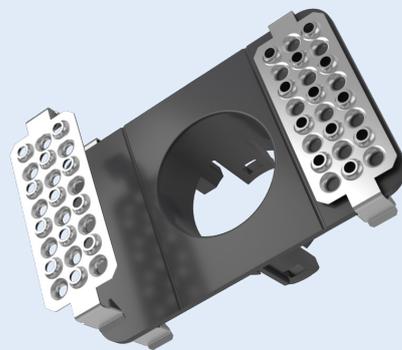


Based on the proven and extremely fast MM-Welding® ultrasonic technology, InWVerse® Fastener securely anchors threaded substrates to thermoplastic materials. Here, substrate material, fastener and process control can be coordinated in such a way that no visible marks are visible on the opposite side even with low wall thicknesses.



## InWVerse® Disc

Fastening solution for fast and secure joining of conventionally non-weldable plastic components. Even thin wall thicknesses can be joined securely without creating a "read-through effect". Minimal penetration depth and preservation of Class-A surfaces.



## Advantages of MM-Welding®



### Very fast

- Welding process time < 1 s.
- Ideal replacement for long-time curing adhesives or other complicated connection processes.



### Strong

- High pullout forces are achieved.



### Simple

- Very simple process.
- No pre-drilling required in most cases.



### Flexible

- Not limited to rotationally symmetric parts.
- High flexibility in geometries and materials of connectors and base parts.



### Clean

- Very simple process.
- No pre-drilling required in most cases.



### Smart Monitoring

- Quality control for each weld: monitoring, statistical check and remote assistance.



### Integrated

- Fasteners and parts can be integrated into 1 part to connect.
- Reduction of parts and therefore weight and costs.



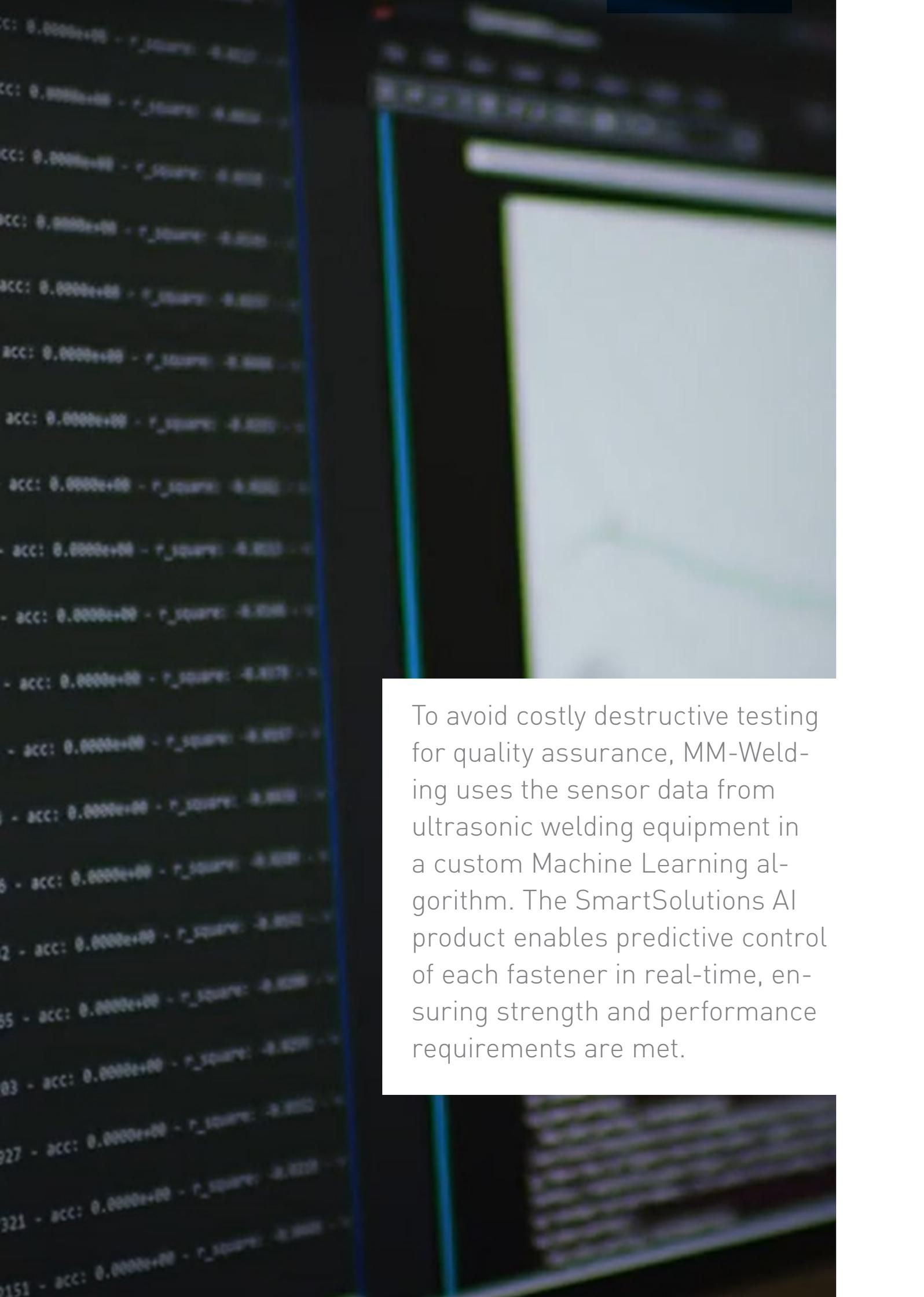
### Proven Productivity

- Technology successfully implemented in medicine industry and furniture industry.
- Successfully applied in high volume automotive serial production

In our video, we would like to demonstrate how full automation of plant technology is simplified and how the entire manufacturing chain can be digitized for faster and more economical production processes.

Different fasteners for joints of any kind, allow innovative constructions, absolute design freedom and flexibility in material selection.





To avoid costly destructive testing for quality assurance, MM-Welding uses the sensor data from ultrasonic welding equipment in a custom Machine Learning algorithm. The SmartSolutions AI product enables predictive control of each fastener in real-time, ensuring strength and performance requirements are met.

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[www.bossard.com](http://www.bossard.com)