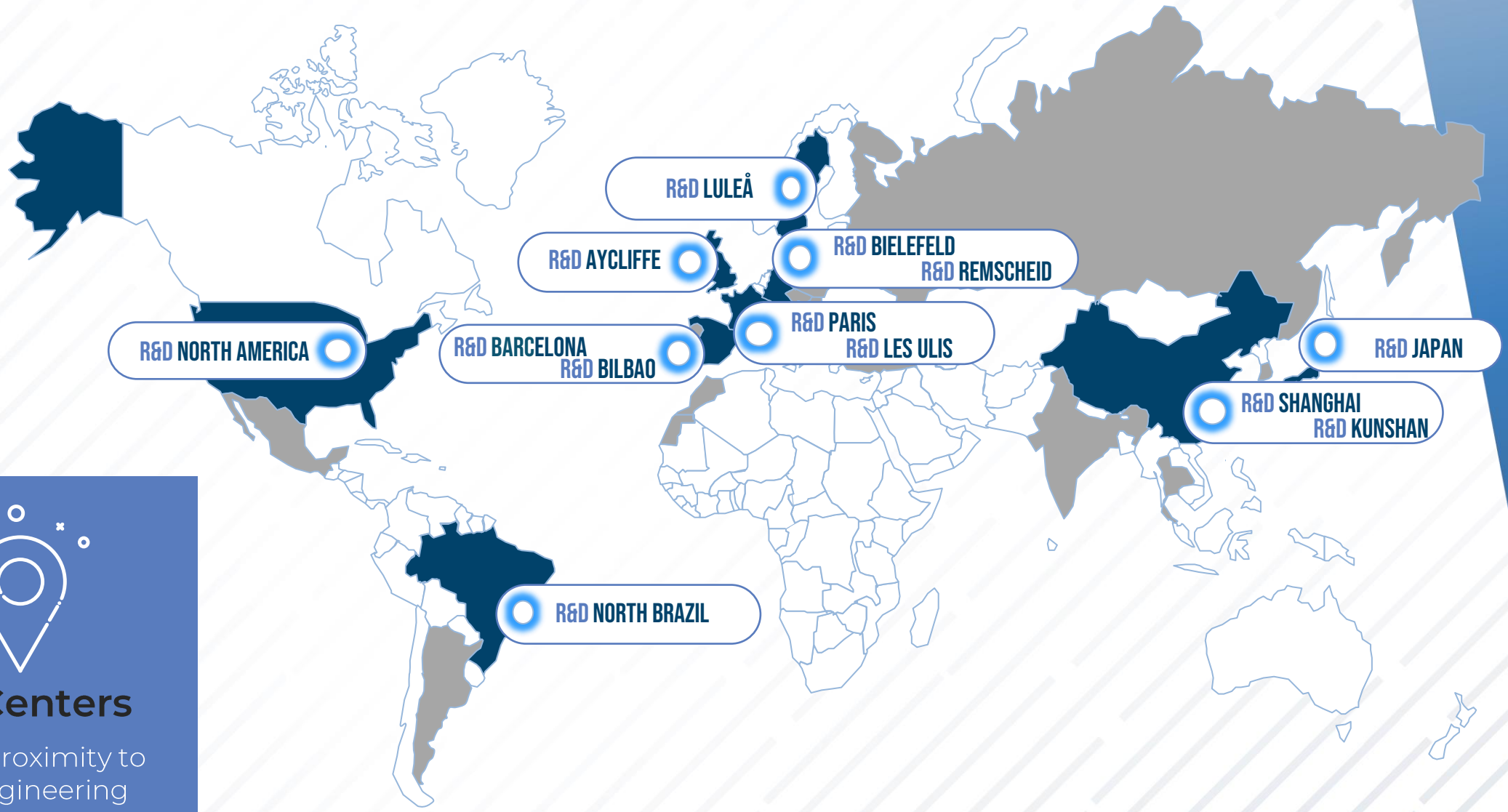
GREAT DESIGNS IN STEEL

EV STRUCTURE - LIGHTWEIGHT COMBO MADE OF OLPB DOOR RING & WAVE ROCKER

Dean Bartolomucci
Gestamp – Product Engineering Manager

2023

GLOBAL FOOTPRINT/R&D CENTERS



13
R&D Centers

In Close Proximity to OEMs' Engineering "Hubs"

EV PRODUCT FAMILY EXTREME SIZE PARTS

EXTREME SIZE PRODUCTS

1. ONE PIECE DOOR RING
2. ONE PIECE FLOOR
3. RING FRAME
4. ONE PIECE REAR FRAME
5. ONE PIECE DASHBOARD
6. ROOF RING
7. ROCKER REINFORCEMENT
8. FRONT RAIL SYSTEM

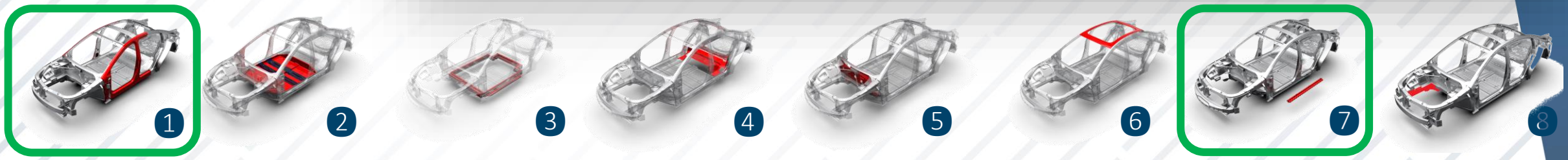
ADVANTAGES

GIGA STAMPING
- Integration of functions
- cost / performance / CO_2 reduction
- Improved quality vs big assemblies

ASSEMBLY LINE AT OEM
- Reduction of complexity
- Less floor space

PERFORMANCE
- Optimum Crash & NVH performance.
- PHS hardened with ductile grades.
- **Use of 2Gpa new PH grades.**

POST TREATMENTS
- **Laser Heat treatments** to improve energy management performance and mechanical assembly options.



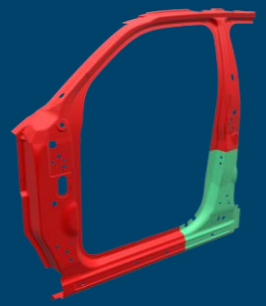
PRODUCTION DOOR RINGS

GDIS

RAM
TWB

Dodge RAM

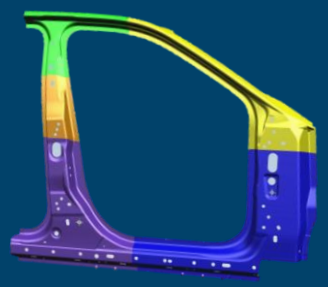
2018



US OEM
TWB

SUV

2021



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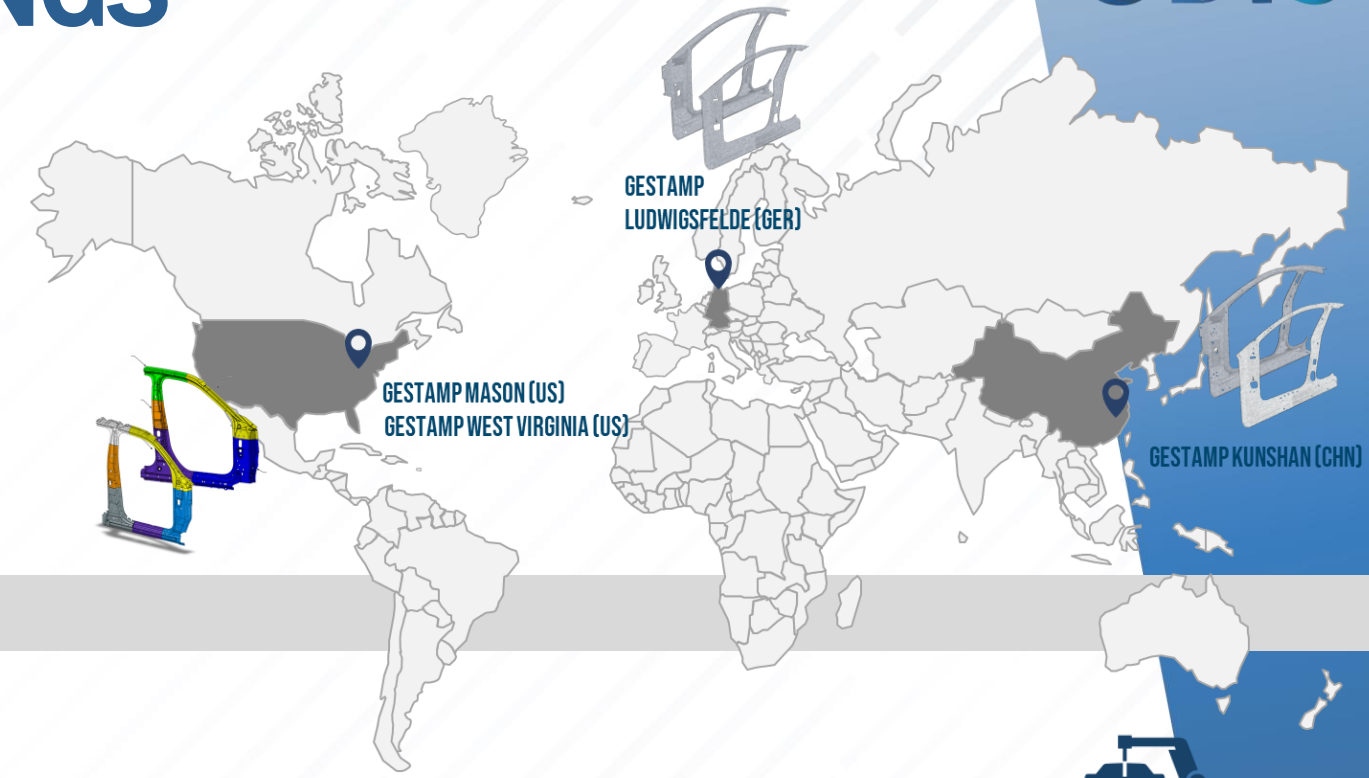
US OEM
TWB

C Segment

2022

Gestamp



~**3.5 Million** Door Rings produced

5 New awarded Door Ring projects:

1 DR TWB – Japanese OEM
1 DR TWB – UK OEM
1 DR Overlap Patch – US OEM
1 DR Overlap Patch – US OEM
1 DR Overlap Patch – German OEM

~3.5 Million/year

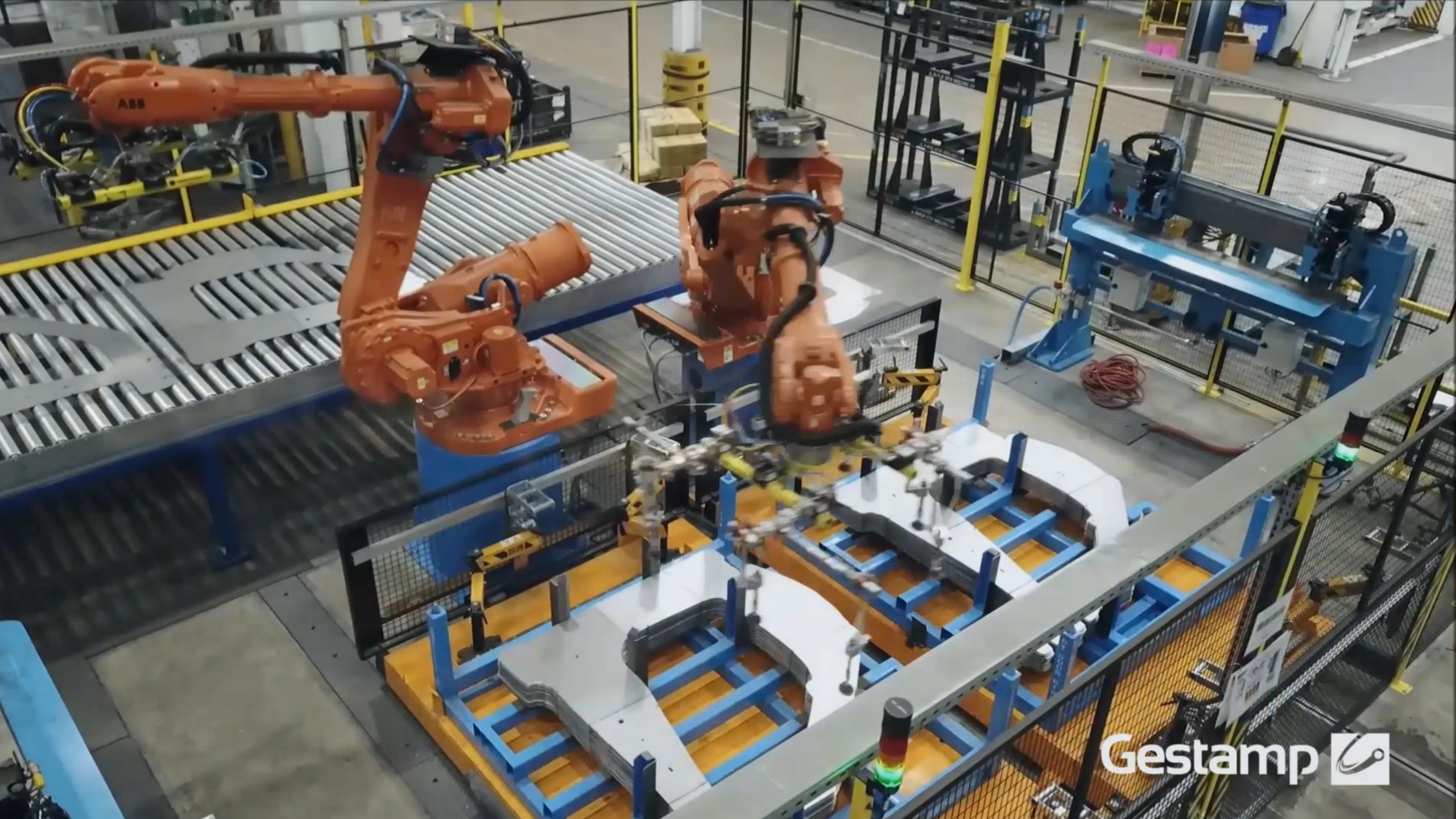


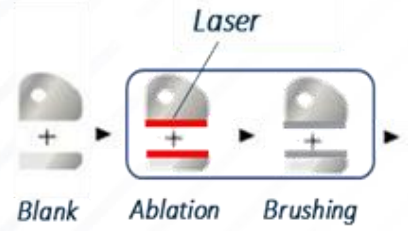
ABB
Gestamp

DOOR RING: FROM TWB TO OVERLAP

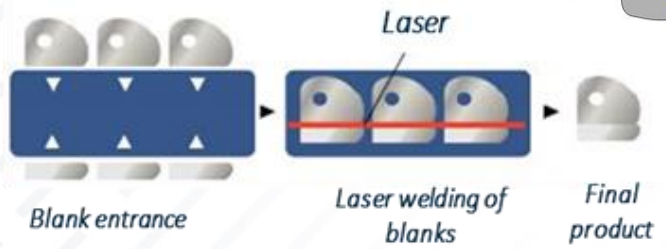
Key idea: Replace TWB process by simple RSW blank welding thanks to overlap the blanks

TWB SOLUTION

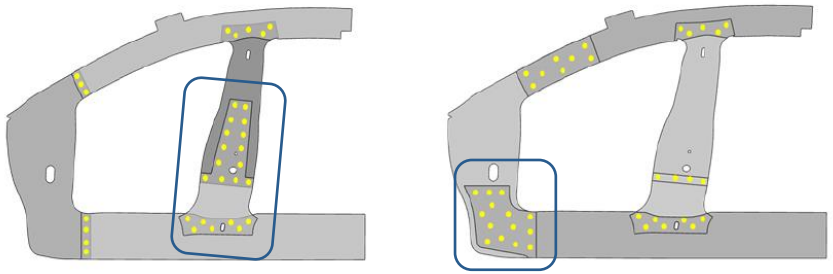
Ablation



TWB



GESTAMP OVERLAP PATCH SOLUTION

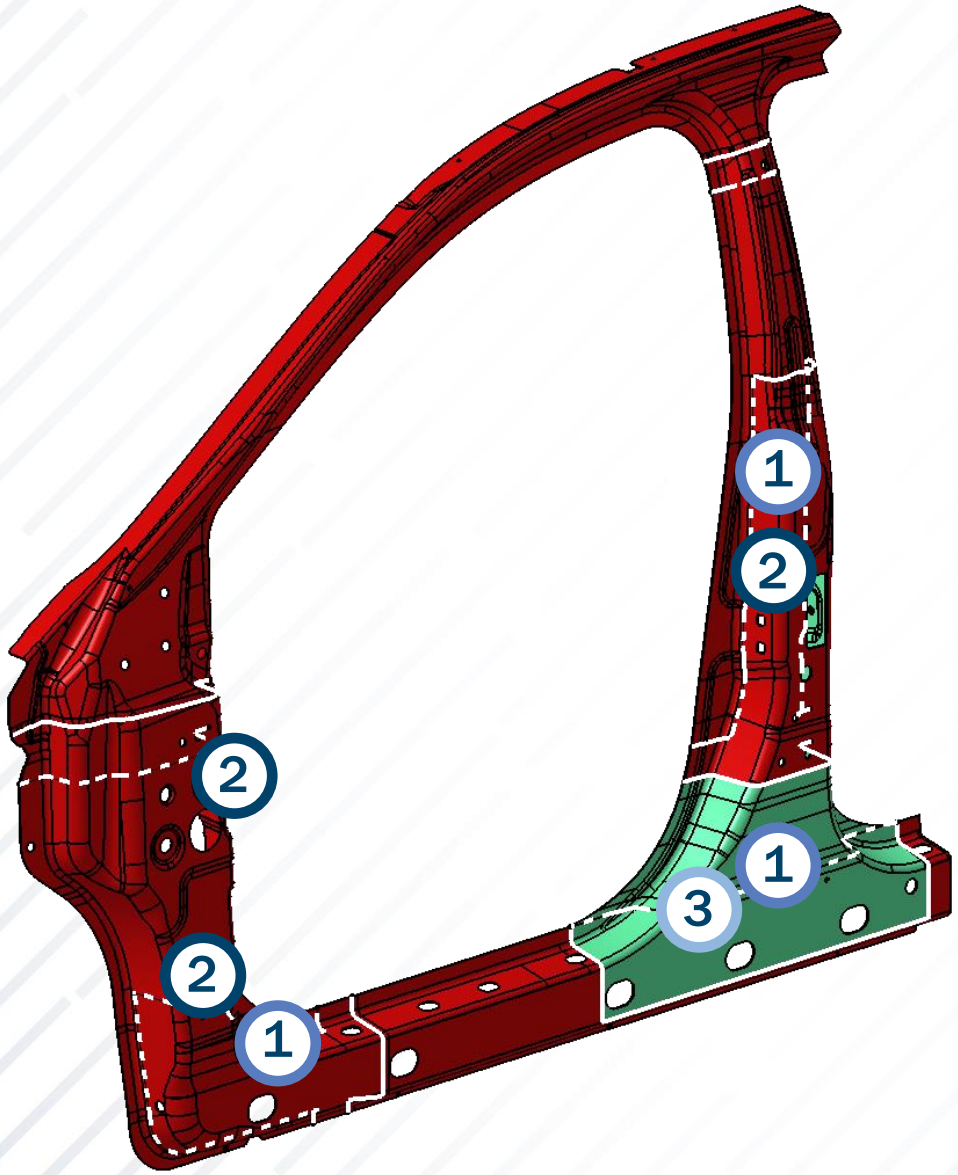


Overlap Joints are developed to structural requirements

Ablation needed Laser welding blanks Complex welding process	No Ablation Needed In-house Spot Welding Easy blank welding adjustment	**10-15%** Part Price reduction vs Multi Piece

Disruptive in design, legacy processes

BENEFITS OF OLPB DOOR RING



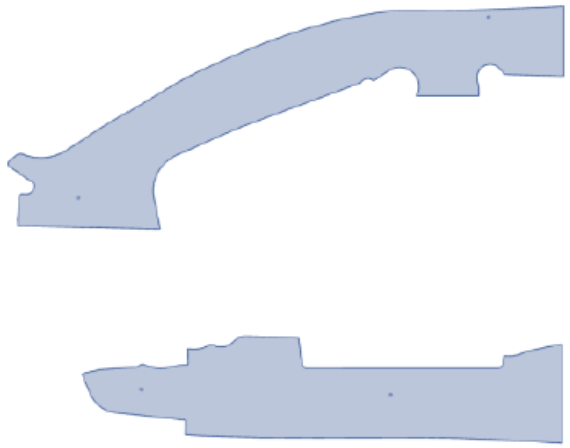
PRODUCT PERFORMANCE GOALS

1. Overlapping Material Where Required
   - Best Crash performance and local / Global Stiffness. Glove Fit, no gaps, structural joints
2. Part Integration (with Patches)
   - Patch Solution (great weld integrity, no HAZ)
   - Integrated Reinforcements (e.g. Hinge Reinf.)
3. Right Material In The Right Place
   - Ductile Material Use To Prevent Failure Risk
4. Savings vs Multi-Piece Design
   - Complexity Reduction (~300 less OEM welds)
   - Reduction of material (addendum) and Tooling
   - Improved dimensional quality
   - 0 - 10% mass and 10 - 15% CO_2 reduction

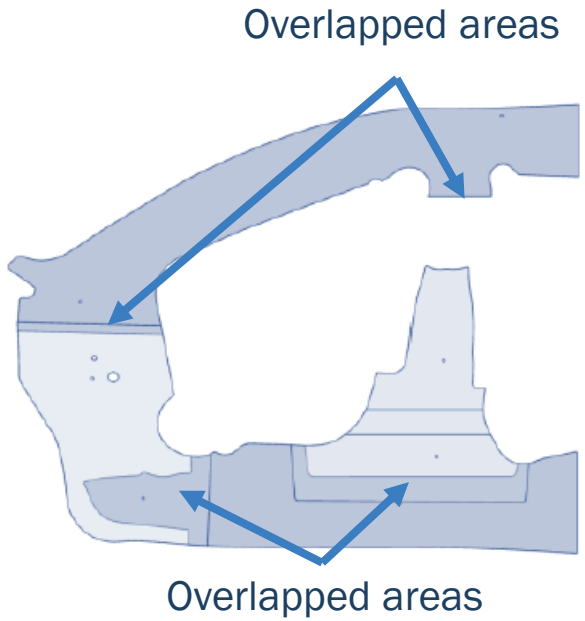
DOOR RINGS NOW WITH PROPRIETARY OVERLAP TECHNOLOGY

GIGA STAMPING™ – OVERLAP PATCH DOOR RING

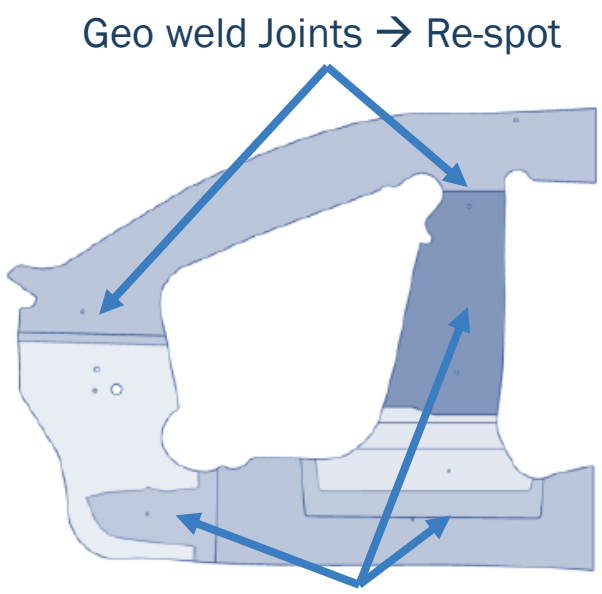
PATCH OVERLAP BLANKING WELDING PROCESS DESCRIPTION



A Pillar & Rocker blank centering



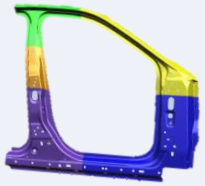
B & H Pillar centering



Welding process (RSW)

DOOR RINGS NOW WITH PROPRIETARY OVERLAP TECHNOLOGY

GIGA STAMPING™ – OVERLAP PATCH DOOR RING

			OEM 1 	OEM 2 	OEM 3 	OEM 4 	OEM 5 	
RAM	SEGMENT D SUV	SEGMENT D SUV	SEGMENT D	SEGMENT D	SEGMENT D	SEGMENT D	SEGMENT B	
		 Inner	 Outer					
SOP 2014	2020	2021	2021	2023	2024	2025	2025	2025
TWB	TWB	TWB	TWB	OVLP	OVLP	TWB	TWB	OVLP

Serial Production in 2025:

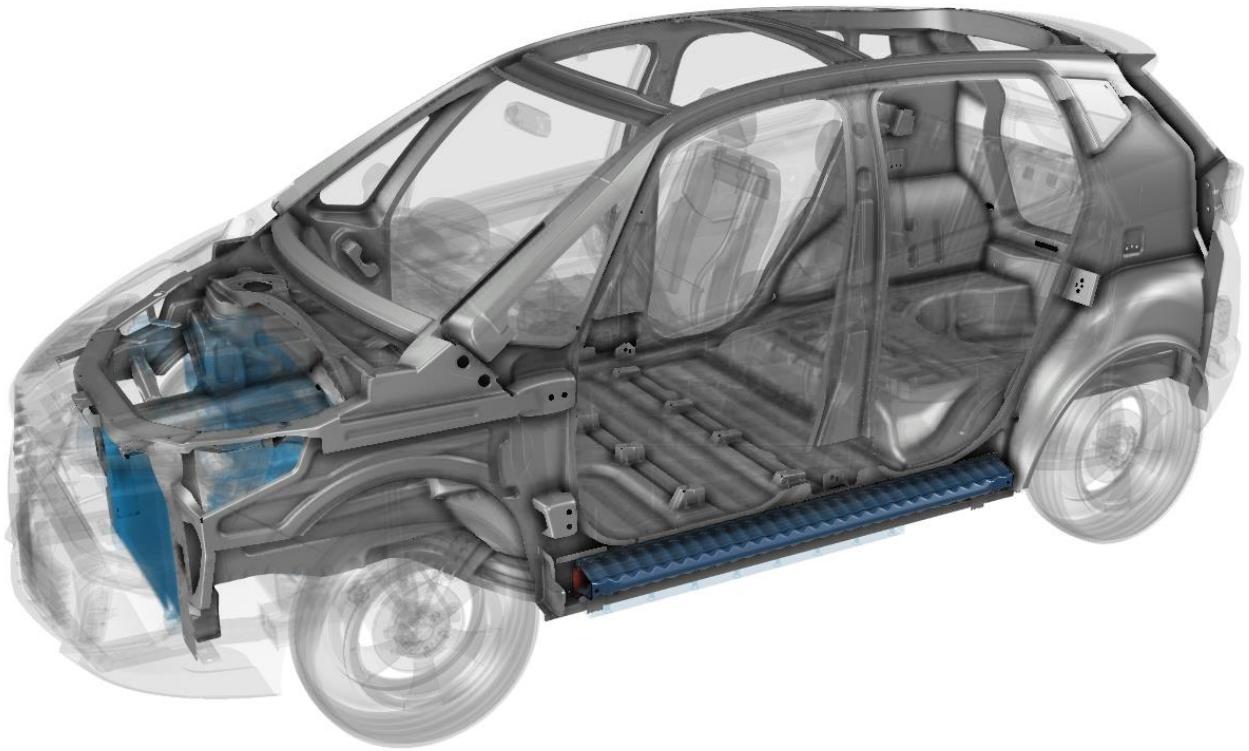
More than 4 M DR per year (according to contracted volumes)

Robustness :

Assured quality with 6 years experience

WAVE ROCKER

ROCKER REINFORCEMENT



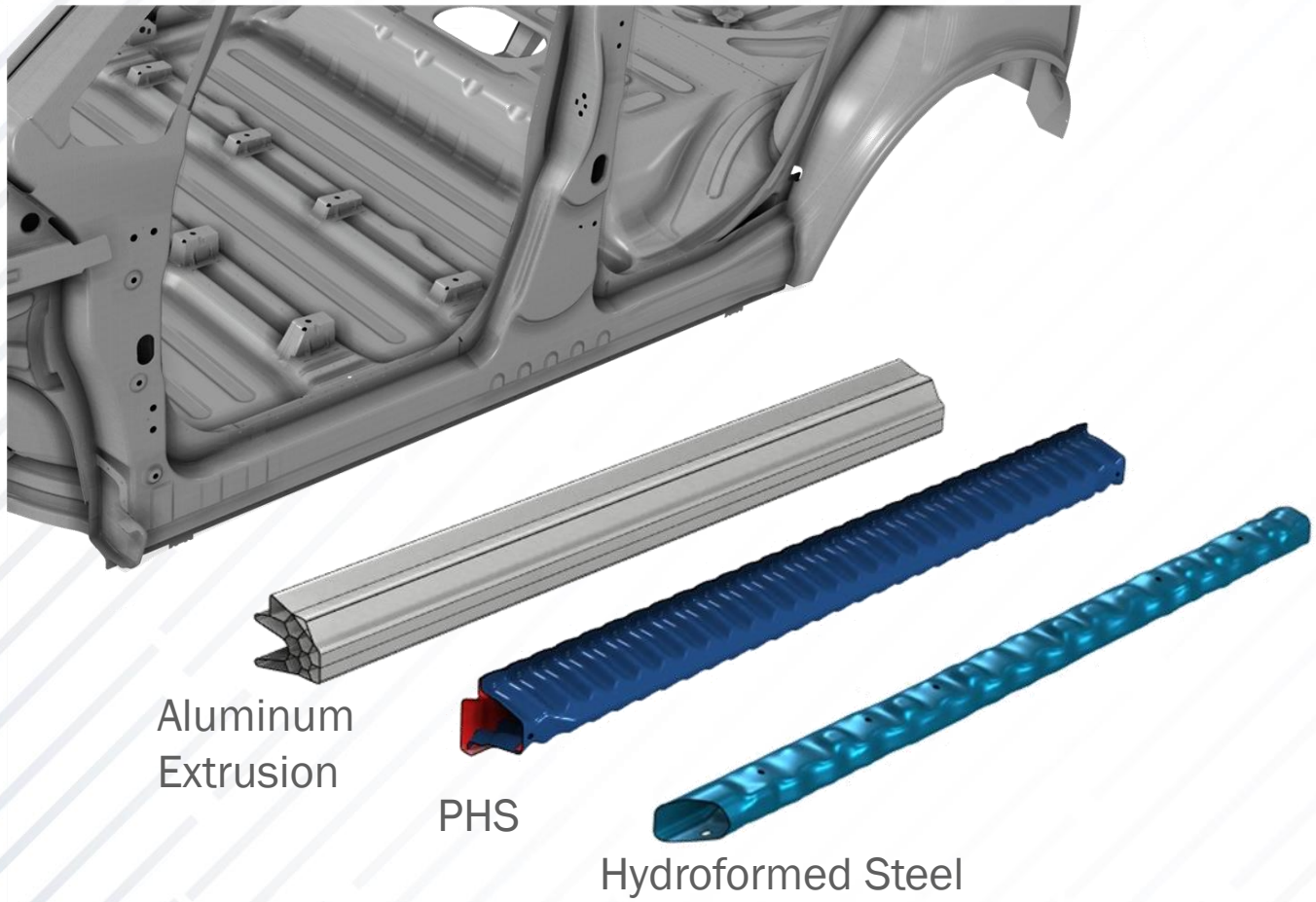
CHALLENGES

OEM Requirements

- Battery & occupant protection
- High energy absorption
- Cost & weight optimisation

SPECIFIC PRODUCT FOR EV ARCHITECTURES

ROCKER REINFORCEMENT FAMILY



SPECIFIC PRODUCT FOR EV ARCHITECTURES

BENEFITS

OEM

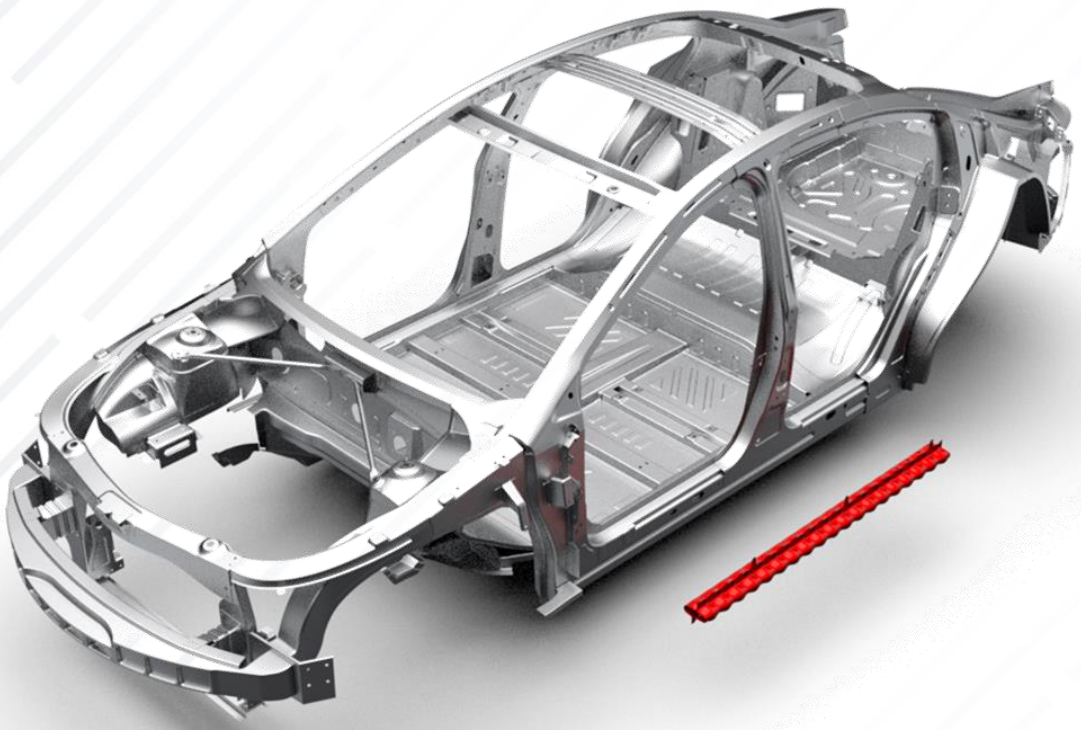
- Architecture and material options
- Need to use specific materials
- Co-development of rocker concepts

Gestamp

- Family of energy mgt. solutions
- Aluminium and Steel alternatives
- New ductile PHS material grades

PH ROCKER ELIMINATING THE HIGH COST AL EXTRUSION

HIGHLY ENGINEERED PRODUCT– ROCKER REINFORCEMENT



Alternative to Aluminium extrusions:

- Same level of Energy absorption
- Stamped in E-Coat drainage channels
- Mass neutral potential
- Full battery protection in any given pole position

Savings:

- 20 - 30% Part Price reduction vs aluminum extrusion
- 0%-5% weight reduction vs aluminium
- Avoid adhesives in the assembly
- No KTL/E-Coat required
- 5% CO2 reduction

OEM Body assembly line simplification:

- No changes in joining strategy – Savings in body shop
- Standard resistance spot-welding
- No KTL drainage issues (channels in parts)

Industrial facilities available:

- Existing Mfg. facilities (Hydroforming & PHS)

PROPRIETARY ROCKER STEEL SOLUTIONS FOR ALL TYPE OF BATTERIES

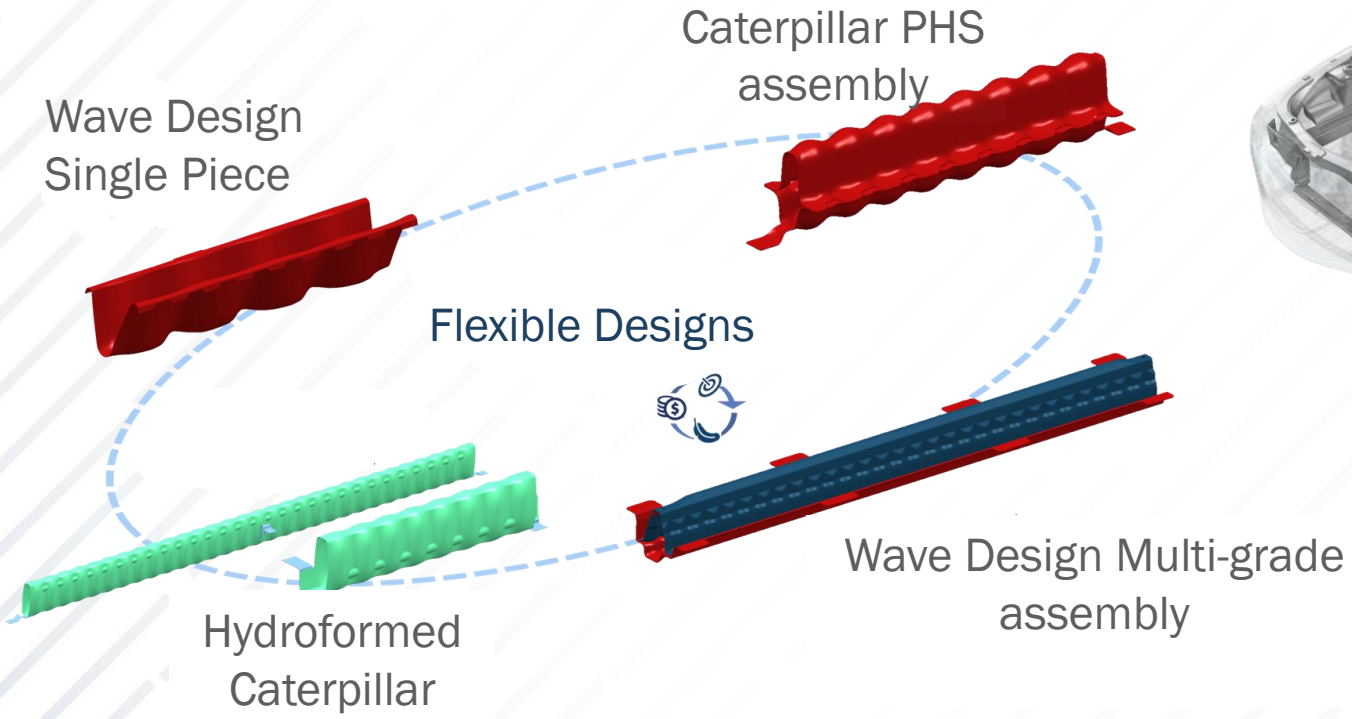
HIGHLY ENGINEERED PRODUCT– ROCKER REINFORCEMENT

GDIS

Performance :
Equal against aluminum extrusion

Flexible solution :

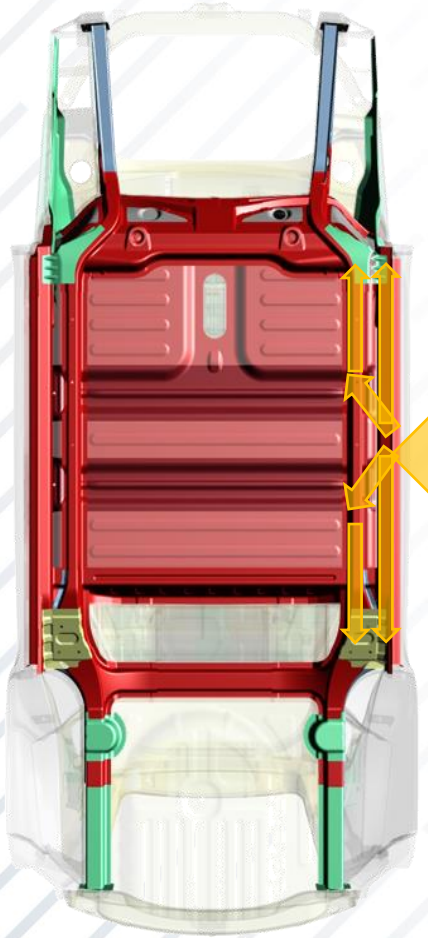
Customized design/materials for side crash strategy



SOLUTIONS FOR DIFFFERENT BATTERY TRAY STRATEGY + PASSENGER PROTECTION

EV STRATEGIC PARTS: ROCKER REINFORCEMENT

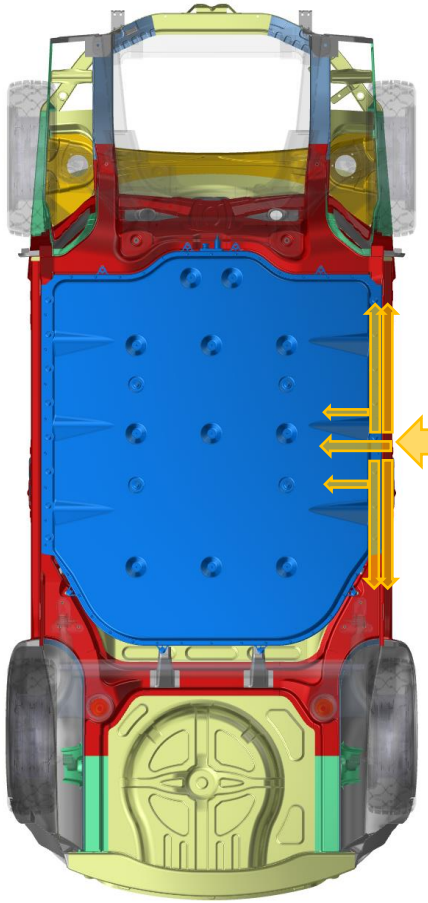
FOR NON -STRUCTURAL BATTERY TRAY CONFIGURATION



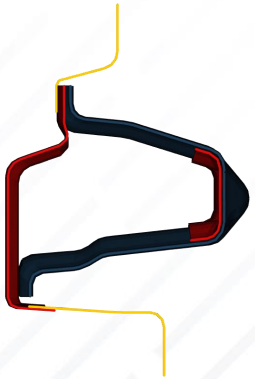
❖*HYDROFORMED CONCEPT*

❖*Main load path to Seat Crossmembers*
❖*Narrow sections possible*
❖*Traditional RSW joining method*
❖*Alternative to small aluminum rocker reinforcements*

FOR STRUCTURAL BATTERY TRAY CONFIGURATION



❖*HOT STAMPED CONCEPT*

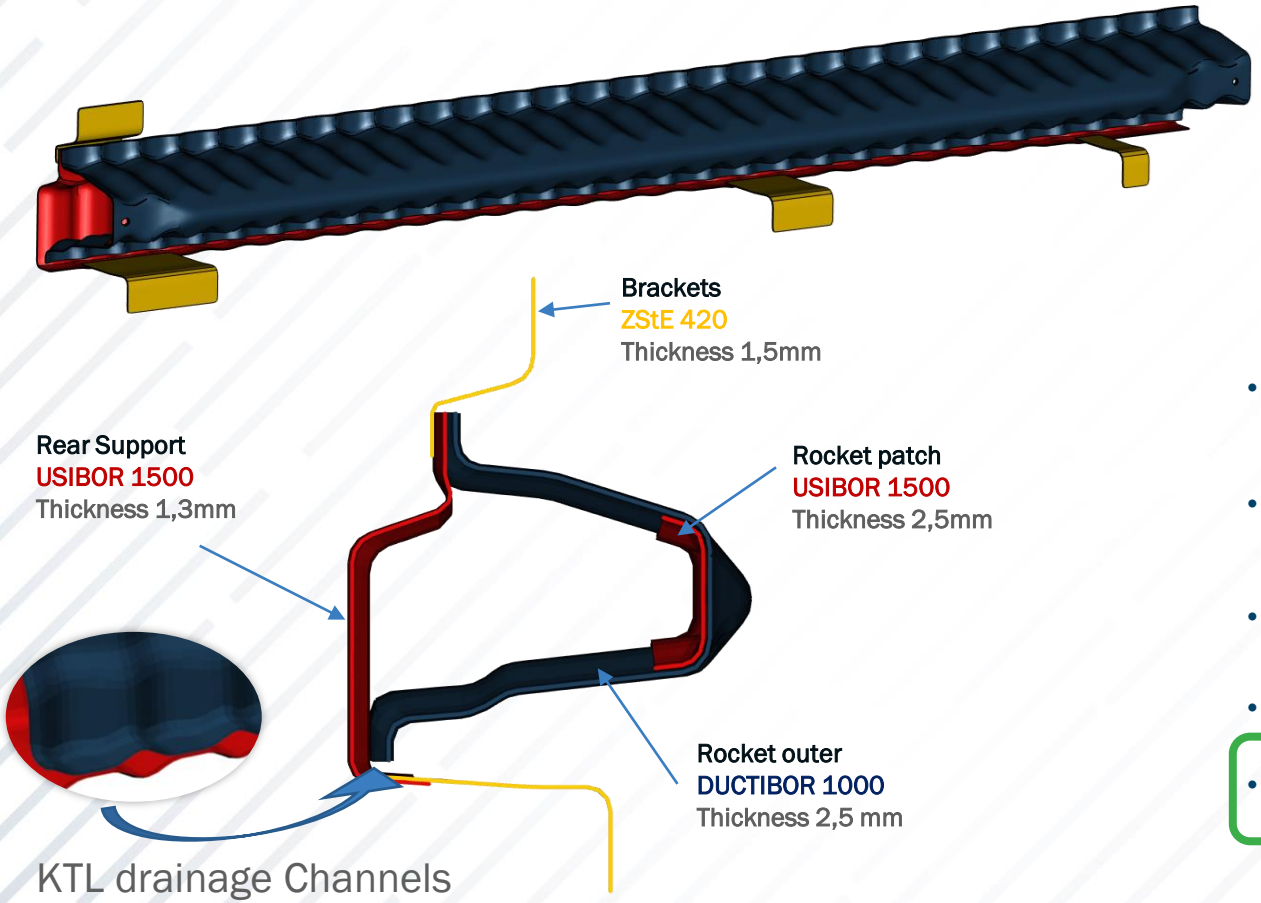


❖*Works with battery frame*
❖*Same mass as Aluminum extrusion*
❖*Avoids adhesives and multi-material joining*

WAVE ROCKER: ROCKET CONCEPT –STRUCTURAL BATTERY TRAY

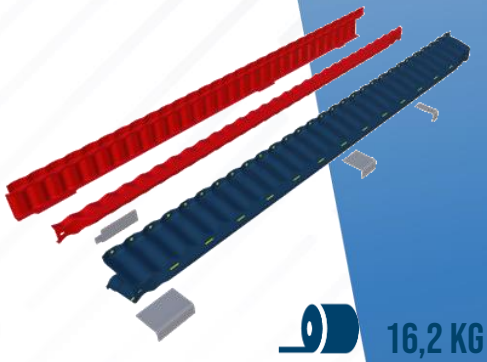
Key idea: Replace Aluminum extrusion with PHS Wave design

GESTAMP ROCKET REINFORCEMENT CONCEPT



REF ALUMINIUM EXTRUSION

100% STEEL PROPOSAL



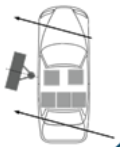
- **Same level of energy absorption**
  Material grades – wave design and Rocket shape
- **Equivalent intrusion**
  Battery protection for all pole positions
- **Mass neutral potential**
- **Avoids adhesives in the assembly**
- **Part price reduction potential 20 - 30%**

EV STRATEGIC PARTS: ROCKER REINFORCEMENT

BATTERY / BIW

ROCKER WAVE DESIGN FOR EV'S

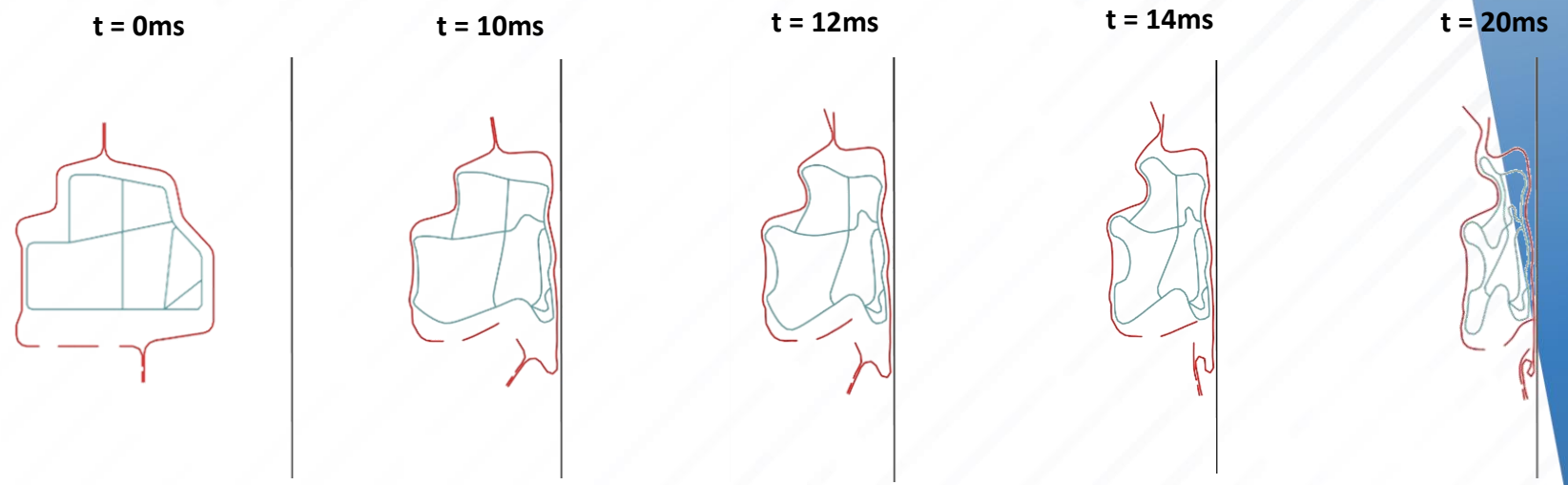
45 Km/h - x 1200mm



ALUMINUM REFERENCE 45km/h – X1200

GESTAMP PROPOSAL 45km/h – X1200

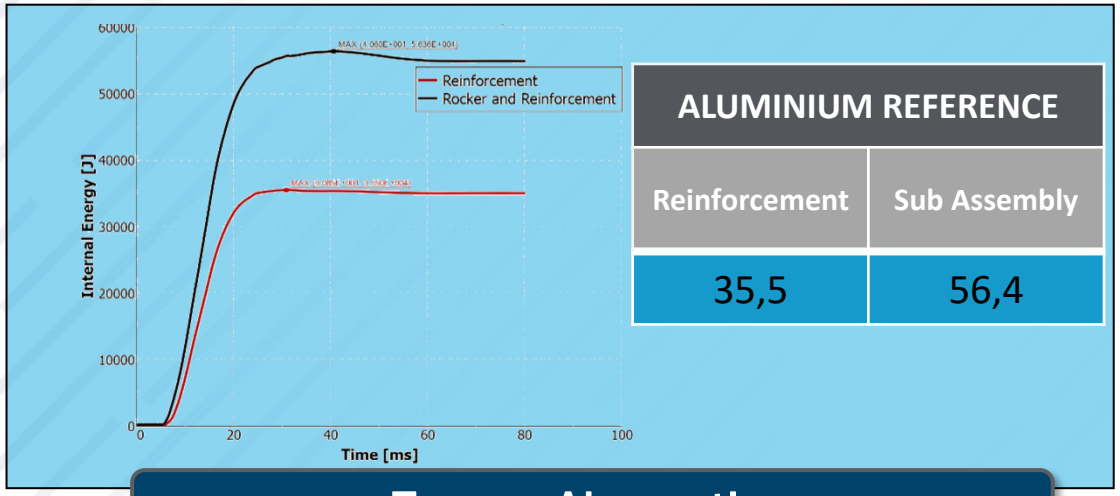
CONCEPT VALIDATION



EV STRATEGIC PARTS: ROCKER REINFORCEMENT

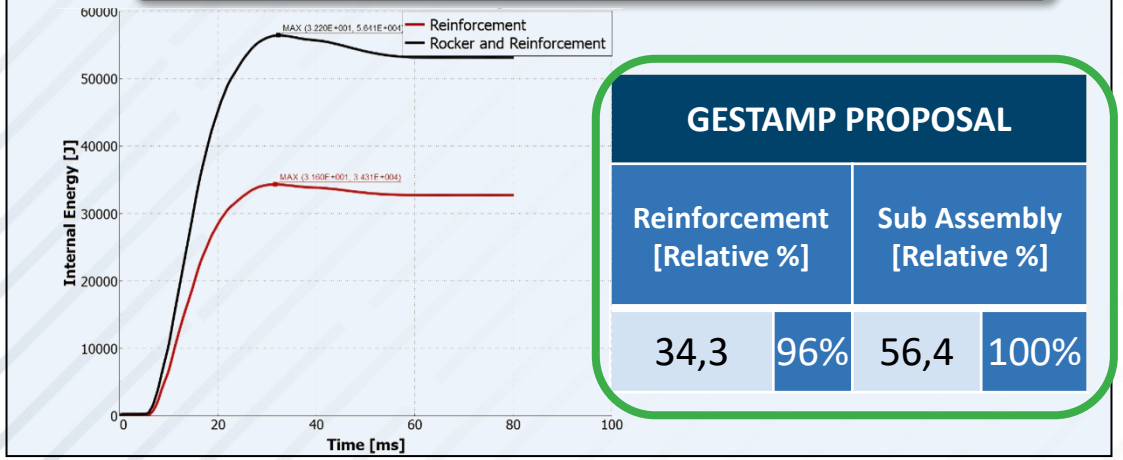
PRESS HARDENING – Steel solution

ROCKER WAVE DESIGN FOR EV'S



ALUMINIUM REFERENCE	
Reinforcement	Sub Assembly
35,5	56,4

Energy Absorption

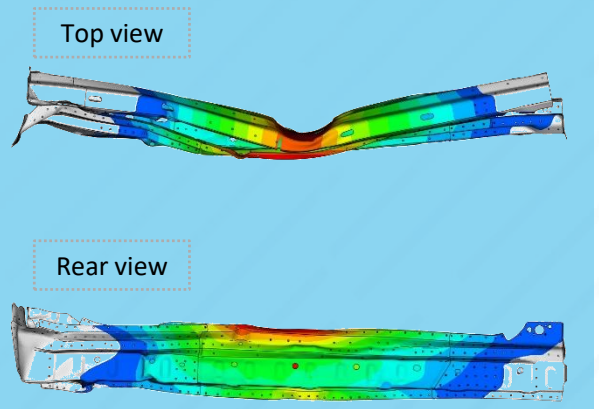


GESTAMP PROPOSAL			
Reinforcement [Relative %]		Sub Assembly [Relative %]	
34,3	96%	56,4	100%

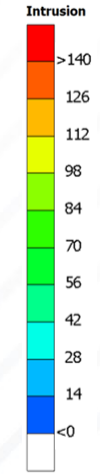
CONCEPT VALIDATION

Rocker Intrusion

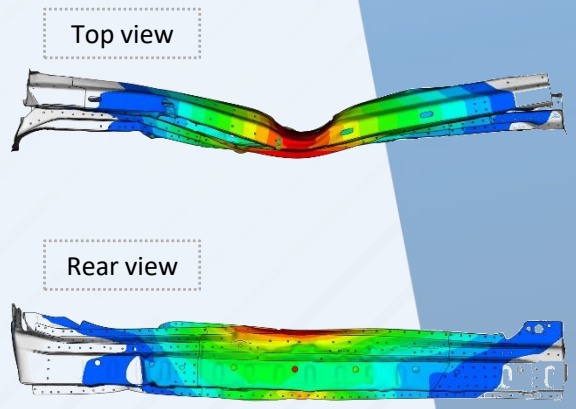
ALUMINUM REFERENCE



max intrusion at battery contact surface: 71.2mm



GESTAMP PROPOSAL



max intrusion at battery contact surface: 70.2mm

WAVE ROCKER: HYDRO CONCEPT

HYDROFORMING – Steel solution

DESIGN

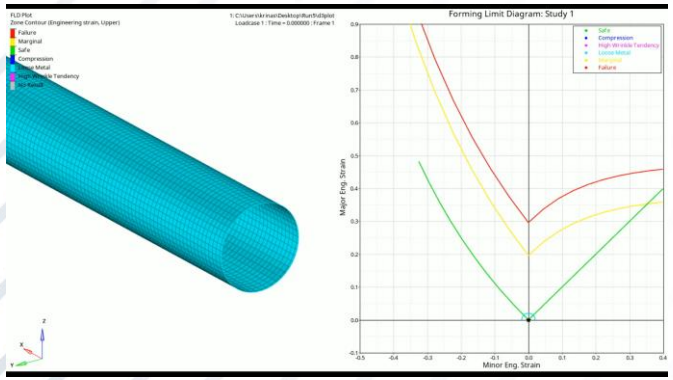
SMART Hydroforming Reinforcement Concept

Smart Hydroforming Rocker Reinforcement

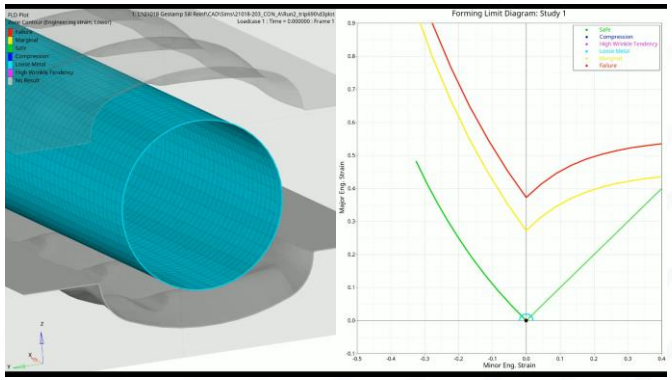
MATERIAL OPTIONS:

- TRIP/DP/CP 600/800 grades
- 3rd generation steels

Gen 3 980 1.7mm



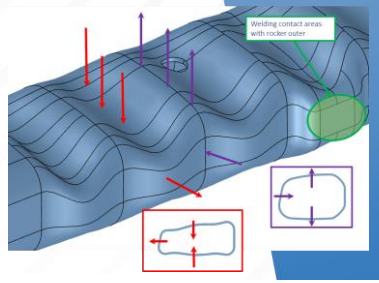
TRIP 690 2.0mm



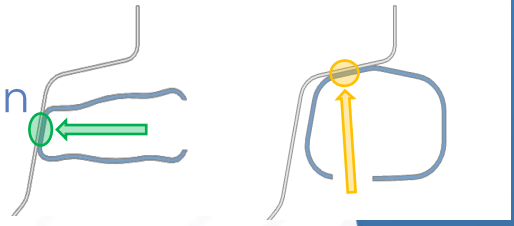
Forming sims courtesy of Vari-Form

CONCEPT VALIDATION

Maximize energy absorption and adapt to environment



Flexible spot weld location



Removal of adhesives needed in Aluminum designs

Improved KTL coverage concept with design gaps

WAVE ROCKER: HYDRO CONCEPT

HYDROFORMING – Steel solution

PROTOTYPING

TESTING VALIDATION

WAVE ROCKER: HYDRO CONCEPT

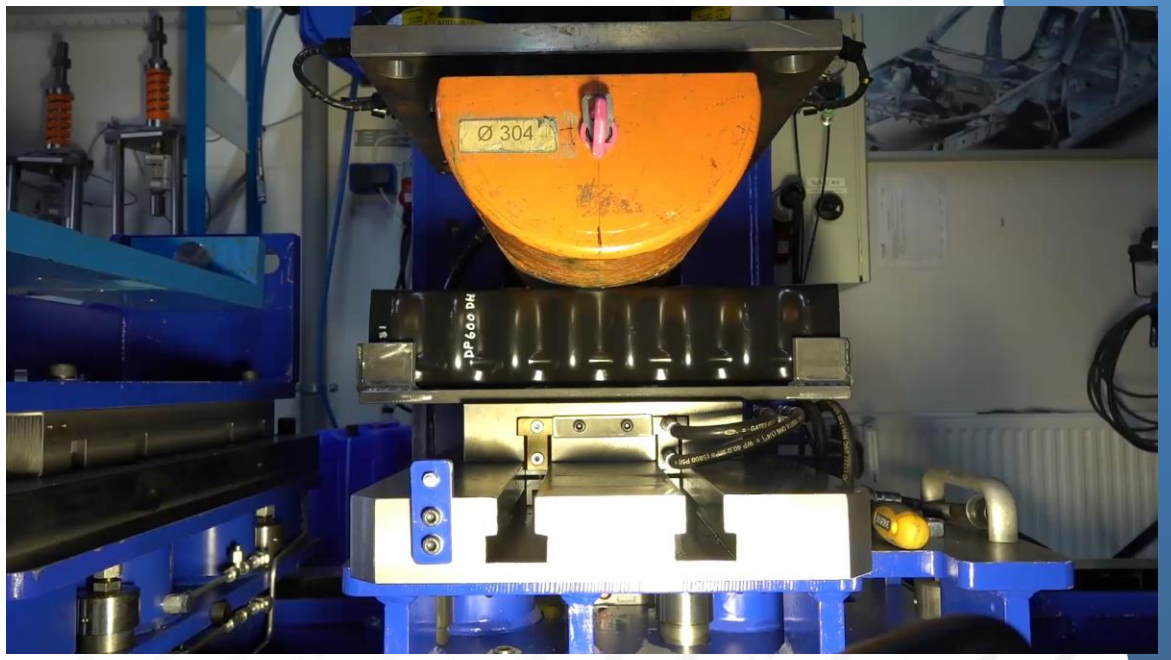
HYDROFORMING – Steel solution

PROTOTYPING

Hydro Prototypes : Full validation on going

TESTING VALIDATION

STATIC POLE TEST IN PROGRESS



Summary

❑ OLPB Door Rings

- Key Benefits
  - Cost/Weight reduction vs. Multipiece
  - Cost Reduction vs. TWB One-piece
  - Part consolidation: OEM Body Shop space, complexity & dimensional
- Technology risks mitigated – Validation projects complete
  - Lessons learned – Design/Tooling best practices
  - Surrogate panel performance confirms functional objectives achieved

- Launching now

❑ Wave Rocker

- Key Benefits
  - Cost
  - Standard RSW joining method
  - Minimal to no change to BIW assembly
  - Existing Mfg. facilities (Hydroforming & PHS)
  - Comparable weight/performance to Aluminum

THANK YOU!