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a Lingyun Industrial Company

Cutting edge required

Blanking precision in battery systems

Battery Systems in Car Body Engineering 2020

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www.edgeblanks.com
www.wa-de.com

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Two companies join forces to solve challenges in battery box assembly

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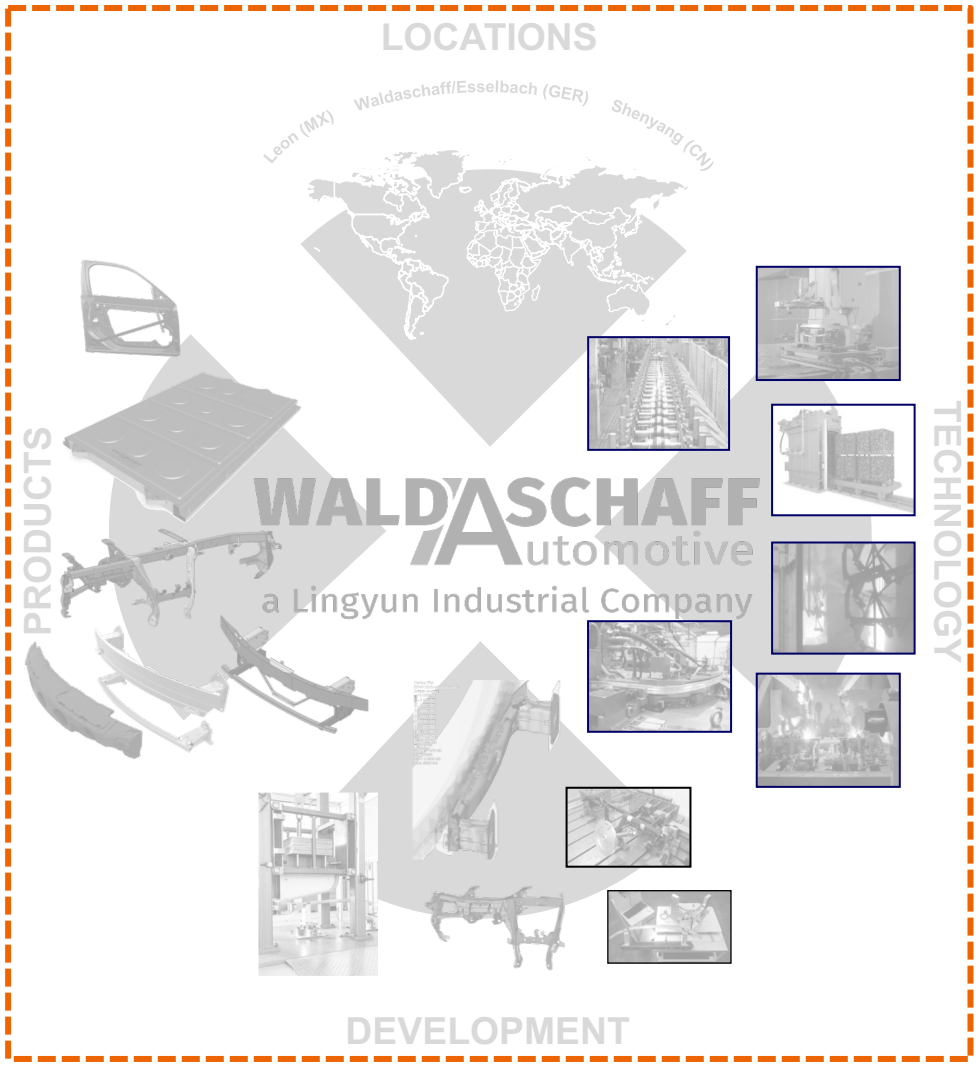
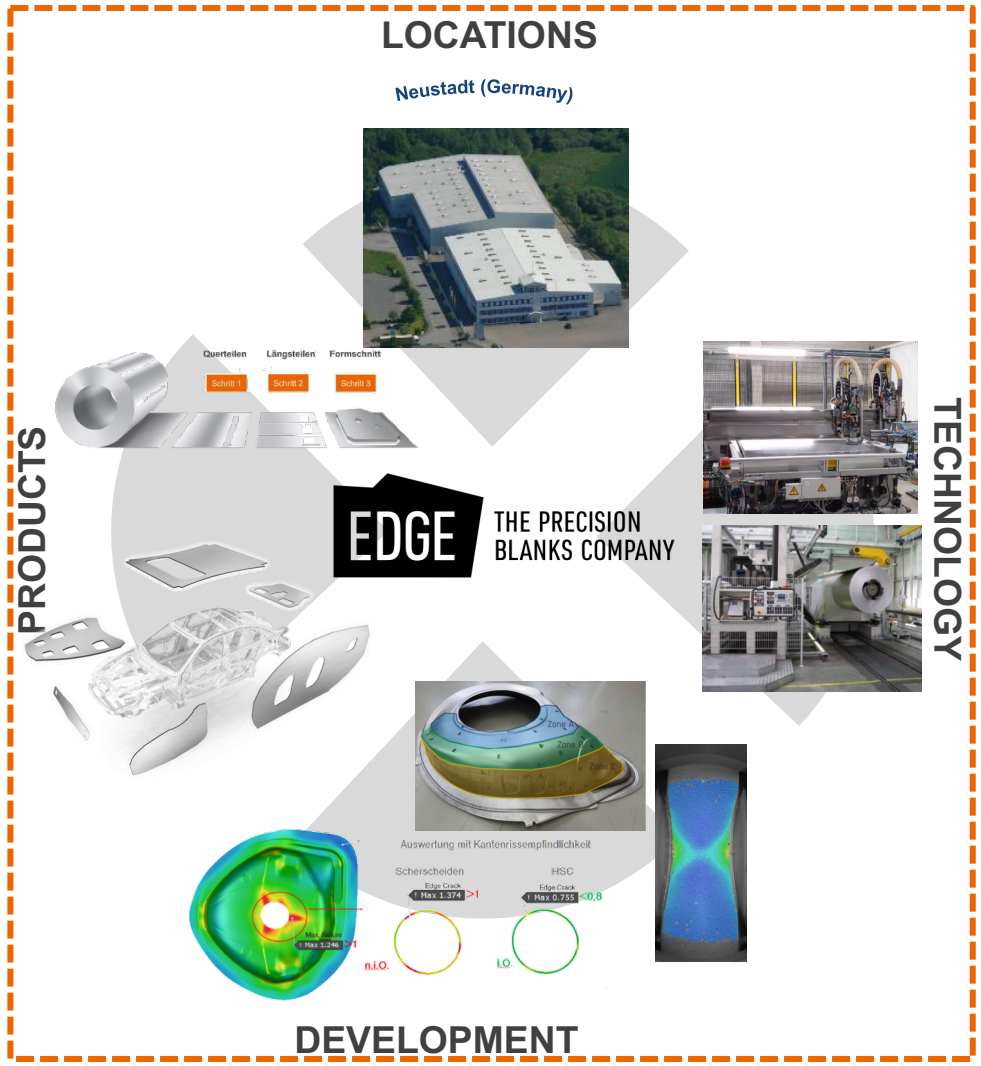
Two companies join forces to solve challenges in battery box assembly





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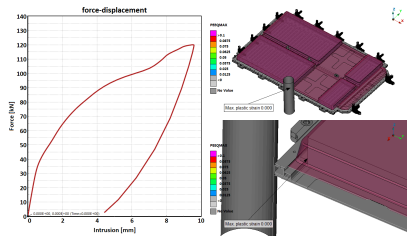
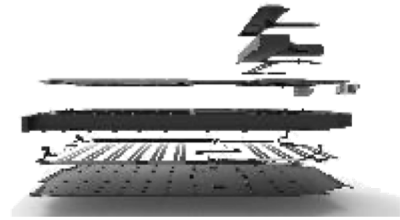
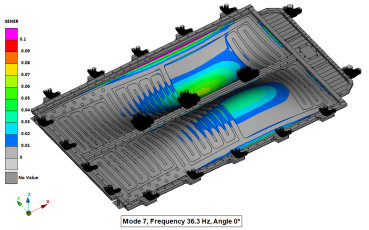
WA Expertise in battery housing design / simulation / test

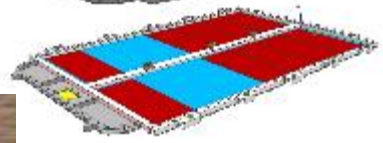
Product design and engineering

- WAG together with Lingyun have experience of more than 30 battery housing projects – half of them in series status.
- WAG has launched the most complicated battery housing just recently.
- WAG and Lingyun have developed concepts from scratch, including non-metal approaches.
- Lingyun has a completely equipped test center for battery housing in Shanghai.









Testcenter Shanghai

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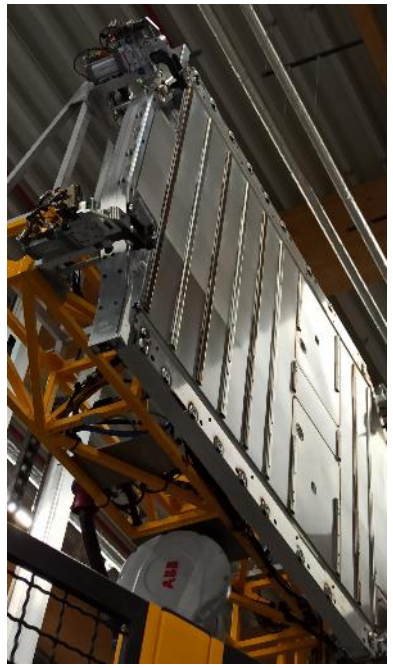
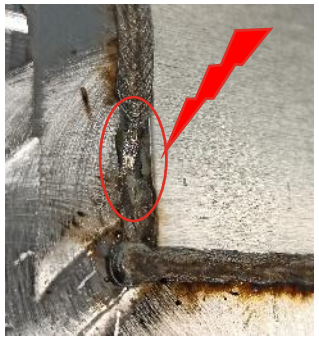
Specific requirements for blank edges in battery box engineering





Typical design includes bottom plate with continuous joining for water tightness

Main Challenges:

- Preparation / machining of MIG welded frame for flat joining surface
- Burrs on one side of the plate
- Radius edge / Rollover on the other side

Laser welding:

- tight tolerance of bottom plate gap to frame → less / no burrs
- tight positional tolerance of plate edge
- Meeting the edge right at the start point
- reliable continuous joint

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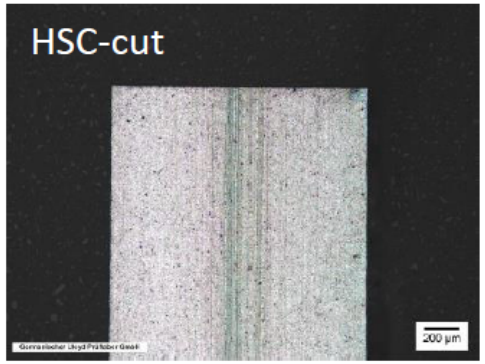
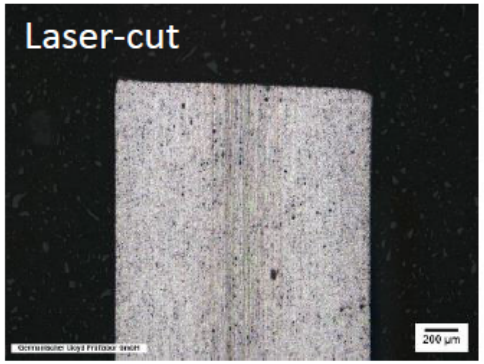
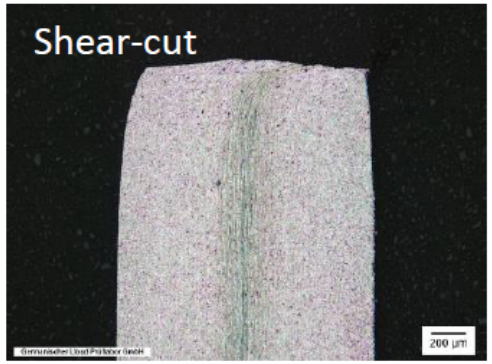
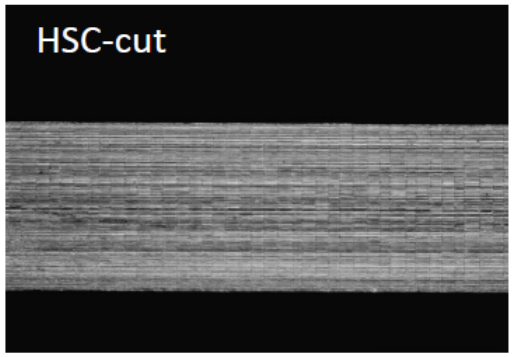
HSC Technology for Blanking

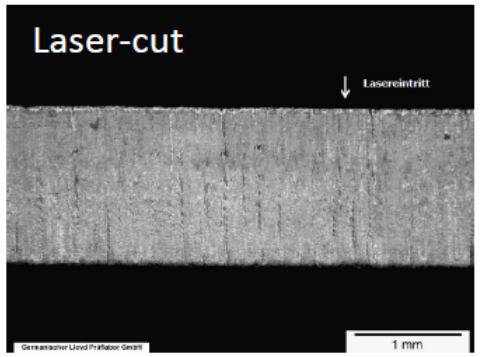


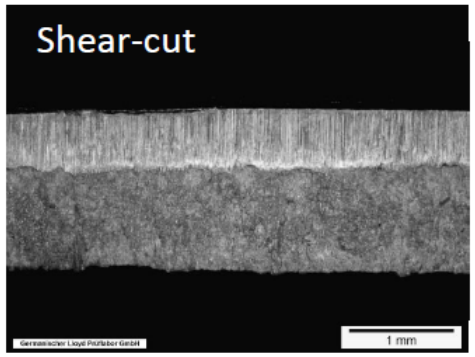




Rough-ness	Ra µm	Rz µm
HSC	0.21	1.16
Laser	1.94	10.29
Shear	4.52	23.75







Hard-ness	Vickers HV1
HSC	71-74
Laser	75-86
Shear	96-127

5 ADVANTAGES

- **No dust**
- **No chips**
- **No burr**
- **No heat impact**
- **Controlled surface**

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Improvements in laser welding assembly process by precision blank preparation

Multi trials done on various products and applications. Always running with very good results and reduced rework because of improved capability of laser welding process.

HSC cut edges …

No burrs on both sides
→ **Flat plate meets flat frame perfectly**

Rectangular Edge
→ **Laser joint meets / melts root zone**

Tight geometrical tolerances
+/- 0,5mm instead of +/- 1,0mm to 1,5mm outer edges
→ **Meet start point of Laser seam**

100% visual inspection
→ **No chips on the surface**

Homogenous material structure
→ **Perfect preparation for welding**

5xxx and 6xxx alloys with 1.5 to 3 mm thickness

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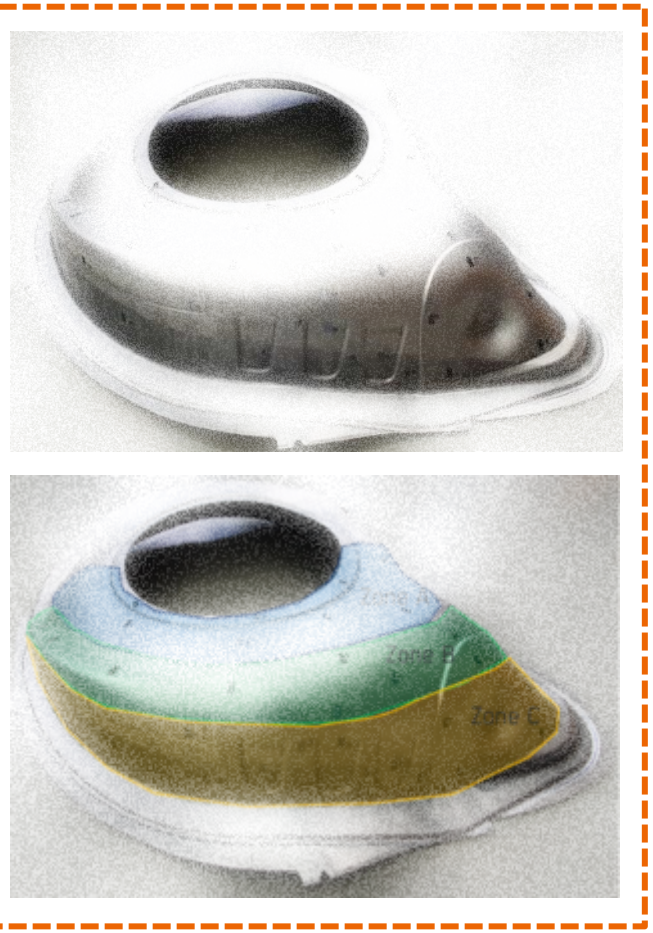
Overall performance impact of HSC cut edges – example

Real component improvement test. Hypothesis – HSC cut edge results in global component performance improvement



- Performance of thickness measurements to investigate the influence of two cutting methods on the residual sheet thickness.
- Laser cutting versus High-Speed Cutting (HSC)
- Tactile evaluation of the sheet thickness with a quick measuring probe.
- Measurement of 42 points per part in three zones representing the entire component geometry.
- The higher the residual sheet thickness the better the overall component performance.
- Better component performance provides redesign opportunities incl. material savings.

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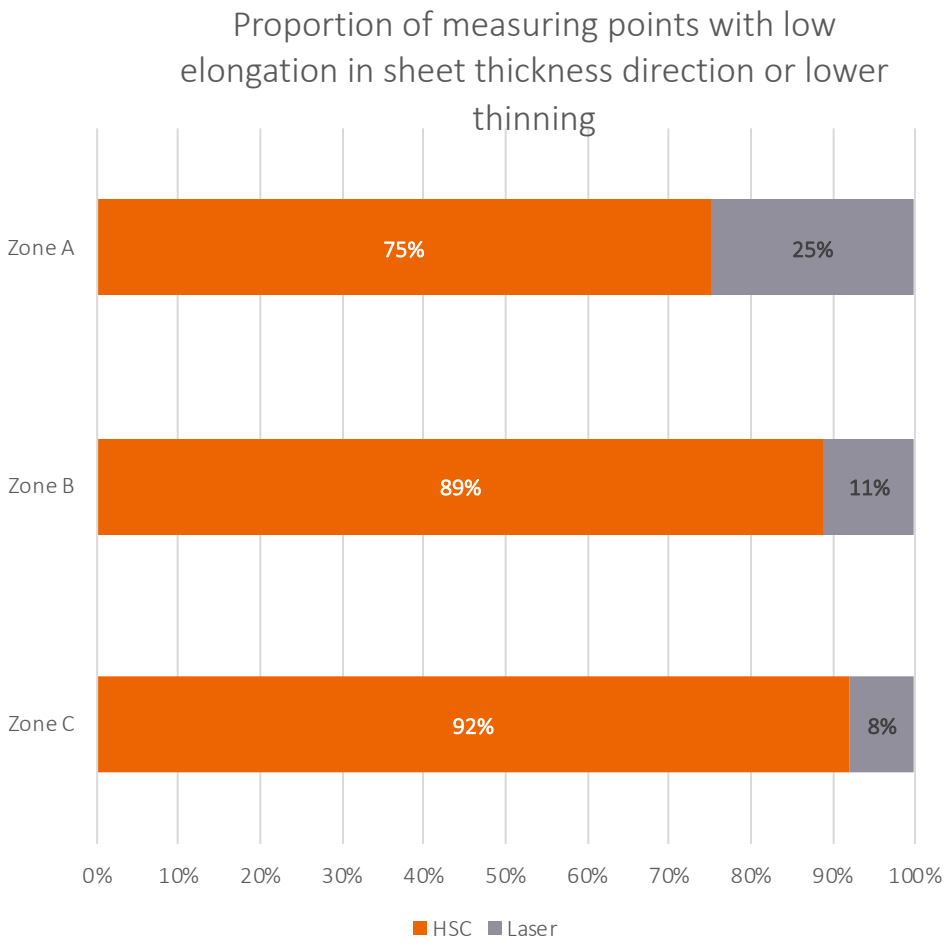
Overall performance impact of HSC cut edges – example

- The cutting process of the blank has an influence on the thinning or residual sheet thickness over the entire component.
- This indicates an influence of the nature of the blank edge on the flowing properties
- With HSC cut blanks there is generally a higher residual formability. A positive effect of HSC-cut blanks is particularly noticeable in zone C, where the proportion of measuring points with lower thinning is 92%.
- This could, for example, reduce the amount of material used (e.g. smaller blank) and still ensure process robustness.



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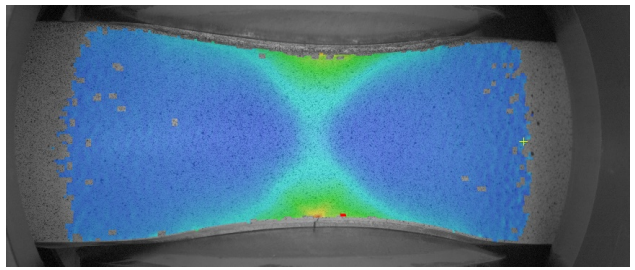
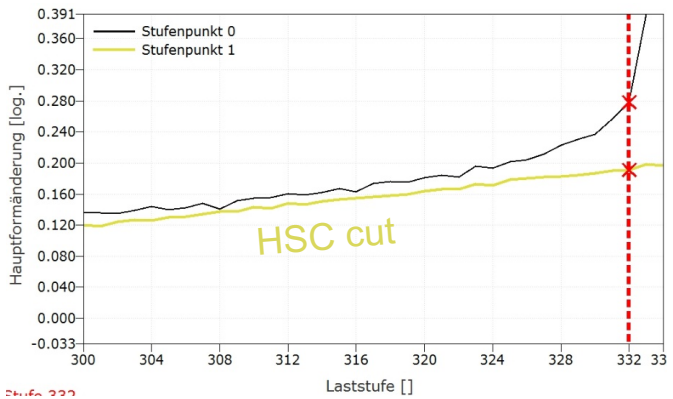
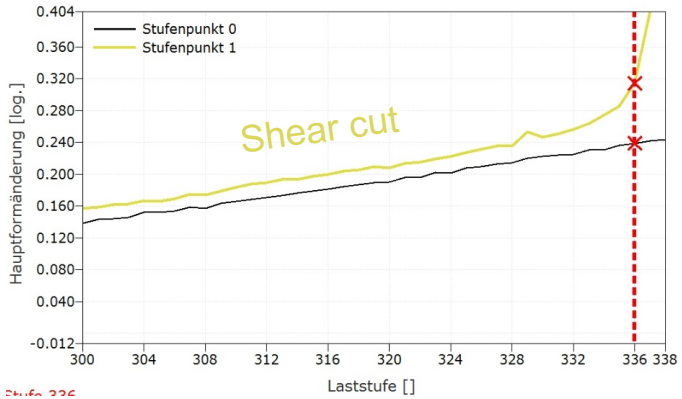
Overall performance impact of HSC cut edges – example

- EDGE is the first manufacturer of HSC cut steel blanks (launched 2020) and holds patents for HSC blanking in aluminium and steel.
- Especially for high- and ultra high strength steels we were able to verify that the non edge damaging high speed cutting results in significant edge performance improvement.
- Higher strain values (at identical load) were found locally at the shear cut edge. The residual formability of an HSC-milled steel sheet edge is higher than with shear cutting.







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Tailored Edges® – Further options of customized edge preparation

10 mm sheet thickness for the sake of better illustration. Tailored Edges® are generally not restricted to specific sheet thickness.

- When dealing with specific issues of edge preparation, we observe increasing requests for geometrical edge preparation improving downstream manufacturing.
- Tailored Edges® can improve joining operations in assembly especially in welding with filler wire (incl. Tailor Welded Blanks).
- Form-fit of blanks before adhesive bonding can be improved resulting in reducing pre joining and clamping operations.
- Tailored Edges® come with opportunities for undercut operations and multiple radii and angles.

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Thank you for your attention and feedback!