Hot Stamp Rear Frame Optimization

Target 20% Weight-down

Brad Klein, Senior Engineer, Vehicle Research-Automotive Safety
Shawn Crichley, Principal Engineer, Vehicle Design-Body
Kou Khang, Platform Director Gestamp

Honda R&D Americas
Rear Frame Crash Mode Concept

- **FS Curve – Simple Bend**
  - Frame Load vs. Frame Crush
  - Average Load

- **FS Curve – Axial Crush**
  - Frame Load vs. Frame Crush
  - Average Load

- **FS Curve – 3 Point Bend**
  - Frame Load vs. Frame Crush
  - Average Load

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<th>Simple</th>
<th>Axial</th>
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<td>Stability</td>
<td>Good</td>
<td>Better</td>
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<td>Efficiency</td>
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<td>Repeatability</td>
<td>Good</td>
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Rear Frame Design Concept

Reduce rear frame comp mass & complexity while maintaining crush mode & performance

Cold Stamped Solution
• Multiple piece rear frame for forming
• Patches required for mode control
• High spot weld count increases piece cost and weld line investment

Hot Stamped Solution
• Single piece rear frame stamping
• Patches not required for mode control or energy absorption
• Minimal spot weld count reduces piece cost and weld line investment
Honda & Gestamp Partnership

- Global Presence
- BIW Focus on Safety And Weight Reduction
- R&D and Advanced Engineering
- Hot Stamping with Tailored Properties (Soft Zone)

Honda

Gestamp

Steel Matters Demand Nothing Less
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Hot Stamp Rear Frame Design Realization

- 780MPa Tensile Strength
- Localized Crush Initiation Zones
- 0.8t Thin Frame Cap
- 1.1t Thin Main Frame Rail

- Reduce Mass → Application of Thin HSS
- Maintain Crush Mode → Develop 780MPa Soft Zone
- Reduce Complexity → Develop Soft Zone Through Cross-section

20% Weight Reduction Compared to Previous Model
Tailored Properties Manufacturing

- In-die process to produce Soft Zone sections with Tailored Properties
- Smallest areas of application within the part becomes possible
- Design freedom to place Soft Zone features almost anywhere on the part

Manufacturing Process

Blanks

Furnace

Hot stamp

In-Die Controlled Cooling

Soft Zone

Hard Zone

Finished Product

- Faster Cooling
- Slow Cooling
- Fast Cooling

HT550
YS 490 – 600 MPa
TS 700 – 800 MPa

HT400
HT550
HT700
HT1150 (fully hardened)
Rear Frame Crash Mode Realization

- Tempered soft zones were utilized to achieve desired crush mode
- Location, size, and properties of soft zones were developed using CAE
Rear Frame Crash Mode Realization

Stable 3pt Bending Is Achieved Through Use of Soft Zone Technology
Presentations will be available May 18 at www.autosteel.org

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