INSIGHTS FROM MEASURING THE “PRESS TONNAGE” OF 3RD GEN AHSS STAMPINGS

Vince Millioto – Senior Specialist
Martinrea International
On Behalf of Auto/Steel Partnership
INSIGHTS FROM MEASURING THE “PRESS TONNAGE” OF 3RD GEN AHSS STAMPINGS

3rd Gen AHSS Insights
• Some Basics & Top Takeaways
• Martinrea/Minster Test Setup
• Testing Highlights
• Eccentric Loading Results
• Load Mapping Premise
• 2D Results
• Assumptions & Eccentric Load Predictions

3rd Gen 980 Channel Section

Total Forces Legends
- Tools
  - Legend Color: Ram (Red), Bed (Green)
  - Max Force: 106.6 tonf

Graph showing load mapping and force distribution.
3000(T) Press
$P_T$

3000(T) Press
PROJECT GOAL:

Enable the accurate prediction of the “Press Tonnage” needed to form, trim and perform any secondary forming of 3rd Gen AHSS panels.

Insights & Top Takeaways:

- Press tonnage and forming tonnage are not the same
- The term “Bottom Dead Center” is not a unique event
- The “Press Tonnage Curve” has both predictable and less-predictable segments
PRESS SETUP

Ram Position Transducer
Pad Position Transducer
TU-750 X(8)
Load Cells
MEASURING PRESS TONNAGE

Forming Force = Press Force – Kiss Block Force – Nitro Force

Upper Die makes contact with the binder

Upper Die lifts off from the binder

BDC occurs at the 1.00 second Mark
BOTTOM DEAD CENTER

BDC #1 “Closest measured ram position to the bolster.”

BDC #2 “Highest measured Press force”

BDC #3 “Relative movement between the Upper and Lower Die ends”

It also needs to be remembered that “Bottom Dead Center” in terms of the predictive models occurs when the relative movement between the upper and lower die ends.
“Predictable”
BDC #1 “Closest measured ram position to the bolster.”

“Less-Predictable”
BDC #2 “Highest measured Press force”

BDC #3 “Relative movement between the Upper and Lower Die ends”

It also needs to be remembered that “Bottom Dead Center” in terms of the predictive models occurs when the relative movement between the upper and lower die ends.
At the higher press tonnage, the die is on bottom for ~ 0.034 sec’s longer forming process due to the press loading and unloading.
Eccentric Loads:

<table>
<thead>
<tr>
<th>Material</th>
<th>Test No</th>
<th>Total Press Force (kN)</th>
<th>Maximum Force Recorded (kN)</th>
<th>Forming Energy to achieve EDC (kN*mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gen3 780</td>
<td>3</td>
<td>2229</td>
<td>10038</td>
<td></td>
</tr>
<tr>
<td>Gen3 980</td>
<td>4</td>
<td>2265</td>
<td>11419</td>
<td></td>
</tr>
<tr>
<td>Gen1+ 1180</td>
<td>5</td>
<td>2296</td>
<td>14329</td>
<td></td>
</tr>
<tr>
<td>Off Center (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gen3 780</td>
<td>17</td>
<td>2213</td>
<td>11351</td>
<td></td>
</tr>
<tr>
<td>Gen3 980</td>
<td>18</td>
<td>2270</td>
<td>12620</td>
<td></td>
</tr>
<tr>
<td>Gen1+ 1180</td>
<td>19</td>
<td>2217</td>
<td>16368</td>
<td></td>
</tr>
</tbody>
</table>

- Approximately the same Total Press Forces
- Approximately 10% increase in Forming Energy
OFF-CENTER PRESS TONNAGE

On-Center
- 1180 Gen1+
- 3rd Gen 980
- 3rd Gen 780

Off-Center
- 1180 Gen1+
- 3rd Gen 980
- 3rd Gen 780
Very Similar Total Tonnages Will Read on the Press Tonnage Monitors with the Possibility of a very Different Press Capacity Going Undetected.
OFF-CENTER PRESS TONNAGE

On Center

Off Center
LOAD MAPPING

1. Off-Center Loading Gen1+ 1180
   Eccentric Load Position on the Bolster

2. Ram Position at Time of the Force Reading

3. Eccentric Load Evaluation

4. Gen1+ 1180 Die OFF-Center
   Eccentric Load Position on Bolster
   Load at That Position 6.42(Tons)
Current Development Work

3000(T)
Press
3000(T) Press
$P_T$

3000(T)
Press

F1, F2, F3, F4, F5, F6, F7, F8
“Press Tonnage” is a function of the press setup parameters.

Peak press tonnage did not increase proportionately with material properties.

All test parts were formed with Press Forces exceeding the predicted Forming Force required with no part yielded satisfactory quality results.

The term “Bottom Dead Center” is not a unique event.

The “Press Tonnage Curve” has both predictable and less-predictable segments.

Total “Press Tonnage” is not the “Forming Force”.

Peak Press Tonnage is achieved through the elongation of the stamping press.

Eccentric loads require additional energy to form similar shapes.
FOR MORE INFORMATION

Vince Millioto – Senior Specialist
Martinrea International
vince.millioto@martinrea.com

More Questions? Meet Vince at the Auto/Steel Partnership booth after this presentation.