Solutions for automotive chassis and skin panel forming

- Large Panel Dies
- Trimming and Forming
- Structural Parts
- AHSS Thick Material

Metal Forming
Carbon-based coatings for aluminium forming tools

- Reduces the sticking of aluminium in the forming and trimming operations
- Keeps the press line clean of aluminum slithers and powdering affecting panel quality

**Solutions for trimming and forming:**

- **BALINIT HARD CARBON**
- **BALINIT TRITON STAR**
- Laser Hardening

### BALINIT HARD CARBON

**Trimming aluminum**

- Parts produced with minimal maintenance [1,000 parts]
  - Cleaning trim edges with a cloth after every 5,000 parts

- **Tool**
  - Trimming dies and punches
  - 1.2379 / D2

- **Workpiece**
  - Hood

- **Challenge**
  - Aluminum sticking to cutting edges

- **Solution**
  - BALINIT® HARD CARBON
  - Aluminum build-up over time was reduced

### BALINIT TRITON STAR

**Aluminium trimming and flanging**

- **Tool**
  - Aluminium trimming and flanging
  - 1.2333/1.2358

- **Workpiece**
  - Fender/Bonnet/Door/Trunk Lid
  - 5/6000 series Alu

- **Challenge**
  - Aluminium sticking and high scrap rate

- **Solution**
  - BALINIT® TRITON STAR
  - - Aluminium sticking significantly decreased
  - - Scrap rate has been greatly reduced

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All given data are approximate values and depend on application, environment and test conditions.
Reducing scrap & re-work costs while improving productivity in the press shop

Each process in the production of automotive body in white chassis presents unique challenges to the press shop. Oerlikon Balzers provides dedicated solutions for each process stage, tailored to solve the challenges of deep drawing, flanging and trimming of skin panels and forming structural parts both in steel and aluminium.

<table>
<thead>
<tr>
<th>Application</th>
<th>Solution</th>
<th>Description</th>
<th>Treatment description</th>
<th>Process temperature</th>
<th>Treatment zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large panel dies</td>
<td>BALITHERM PPD</td>
<td>Complete functional surface protection for mono-block cast iron tooling</td>
<td>Nitrogen diffusion (D) into the material + ceramic like compound layer (CL)</td>
<td>500 - 530 °C</td>
<td>80 - 150 µm (D) + 0 - 12 µm (CL)</td>
</tr>
<tr>
<td></td>
<td>LASER HARDENING</td>
<td>Localised protection for high load areas: Drawing/forming radii Cutting edges Flanging radii</td>
<td>Surface hardening (SH) via controlled laser</td>
<td>900 °C +</td>
<td>1.2 mm to 1.5 mm (SH)</td>
</tr>
<tr>
<td></td>
<td>BALINIT HARD CARBON</td>
<td>Anti-adhesive solution for forming and trimming aluminium sheet metal</td>
<td>PVD monolayer ta-C</td>
<td>&lt; 150 °C</td>
<td>Coating 0.5 - 3 µm</td>
</tr>
<tr>
<td></td>
<td>BALINIT TRITON STAR</td>
<td></td>
<td>PACVD monolayer a-C:H</td>
<td>&lt; 250 °C</td>
<td>Coating 1 - 3 µm</td>
</tr>
<tr>
<td></td>
<td>BALINIT FORMERA</td>
<td>Surface solution for tools forming AHSS (advanced high strength steel) and hot forming tools</td>
<td>PVD multilayer CrAlN based</td>
<td>480 °C</td>
<td>Coating 8 - 10 µm</td>
</tr>
</tbody>
</table>
BALINIT FORMERA for forming tough structural parts

- Surface solution designed to protect tools forming Advanced High Strength Material parts and thick material
- Durable, flexible coating. Outstanding performance in shear stress

Solution for forming structural parts, AHSS, thick material:
BALINIT FORMERA

BALINIT FORMERA ADVANCED
Deep drawing of seat components

<table>
<thead>
<tr>
<th>Parts produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>120,000</td>
</tr>
<tr>
<td>100,000</td>
</tr>
<tr>
<td>80,000</td>
</tr>
<tr>
<td>60,000</td>
</tr>
<tr>
<td>40,000</td>
</tr>
<tr>
<td>20,000</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

AHSS solution | BALINIT® LUMENA | BALINIT® FORMERA ADVANCED |

Solution
BALINIT® FORMERA ADVANCED
- Better surface quality of products
- Much longer tool life without obvious wear

Tool
Drawing 1.2379 (D2 / SKD11)

Workpiece
Automobile seat parts 700 MPa, 1.5 mm

Challenge
AHSS drawing Heavy wear

BALINIT FORMERA DUPLEX
Deep drawing of axle beam

<table>
<thead>
<tr>
<th>Tool life [1,000 parts]</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
</tr>
<tr>
<td>160</td>
</tr>
<tr>
<td>140</td>
</tr>
<tr>
<td>120</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>80</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

BALINIT® LUMENA DUPLEX | BALINIT® FORMERA DUPLEX

Solution
BALINIT® FORMERA DUPLEX
- +200 % tool life increased
- Scratch/material sticking & polishing is totally eliminated

Tool
Draw tool
Tool steel (D2 / SKD11)

Workpiece
Axle beam 3.5 mm
Tensile strength 590 MPa

Challenge
Deep scratches & material sticking

The DUPLEX Series includes a separate diffusion process allowing deeper diffusion depths.
The decisive advantage for more efficiency: BALITHERM PPD for large stamping dies

Our future-oriented plasma-based diffusion process PPD (Pulsed-Plasma Diffusion) is applied in our INAURA systems. They provide a loading capacity of 10 x 3 metres and 40 tonnes. The fully automated process ensures a stable and controlled wear-protection coating procedure. The combination of hydrogen, nitrogen and electricity means that INAURA operates entirely without the use of poisonous gases and chemicals.

**Component arrival**

**Blasting of painted tools**

**Quality control**

**Initial polishing**

**Final quality control**

**Final polishing**

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**BALITHERM® PPD**

**Cold stamping of aluminium bonnet**

Output per production run [parts]

<table>
<thead>
<tr>
<th>Output per production run [parts]</th>
<th>Untreated</th>
<th>BALITHERM® PPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1,000</td>
<td>+ 400 %</td>
</tr>
<tr>
<td>1,000</td>
<td>4,000</td>
<td></td>
</tr>
<tr>
<td>2,000</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>3,000</td>
<td>4,000</td>
<td></td>
</tr>
<tr>
<td>4,000</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>5,000</td>
<td>6,000</td>
<td></td>
</tr>
</tbody>
</table>

**Tool**

OP 20 (stamping), EN-JS 2070

**Workpiece**

Aluminium bonnet inner / outer (1 mm sheet material)

**Challenge**

- Aluminium adhesion
- Wear on the sheet aluminium and on the forming radius / draw bead

**Solution**

BALITHERM® PPD

- No maintenance polish needed during production
- Better surface quality of parts

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**BALITHERM® PPD**

**Cold stamping of trunk lid outer**

Output per production run [parts]

<table>
<thead>
<tr>
<th>Output per production run [parts]</th>
<th>Untreated</th>
<th>BALITHERM® PPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>+ 100 %</td>
</tr>
<tr>
<td>100</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>300</td>
<td></td>
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<tr>
<td>300</td>
<td>400</td>
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<tr>
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<td>900</td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>1,000</td>
<td></td>
</tr>
</tbody>
</table>

**Tool**

OP 20 (stamping), EN-JS 2070

**Workpiece**

Trunk lid outer (0.7 mm sheet metal)

**Challenge**

- Zinc adhesion
- Wear on the sheet metal part and on the forming radius / draw bead

**Solution**

BALITHERM® PPD

- No maintenance polish needed during production
- Making longer production run possible
- Better surface quality of parts
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Canada
Mexico*
USA*

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Belgium
Czech Republic
Finland
France
Germany*
Hungary
Italy
Liechtenstein
Luxembourg
Netherlands
Poland
Portugal
Romania
Russia
Slovakia
Spain
Sweden
Switzerland
Turkey
United Kingdom

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