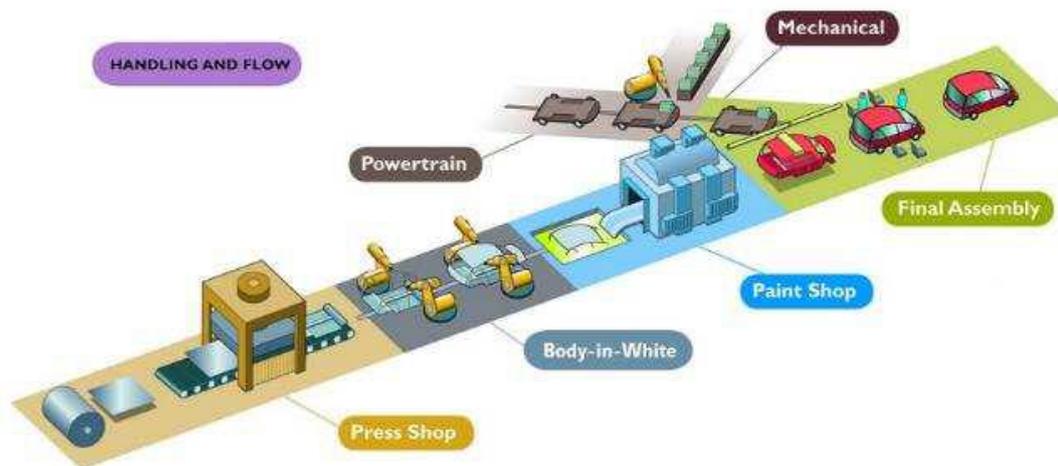


# PALMS Polishing of Automotive Stamping and Forming tools saves time and money and prevents weld- and paint defects

## PALMS - New, patented PALMS Polishing for Forming and Stamping tools

- Benefits both Hot- and Cold-forming
- Ideal for traditional and ALM manufactured tools
- Ideal preparation for hard-wearing coatings
- Excellent uniform polishing on tool faces and walls, undercuts and complex shaped areas difficult to reach by conventional machining and hand-polishing
- Minimal edge rounding
- Reduces both tool finishing costs and Time To Manufacture
- A recent study found a major automotive manufacturer could save €m per year



*Automotive production line scheme*

## The Challenge

Hot forming of car body parts:

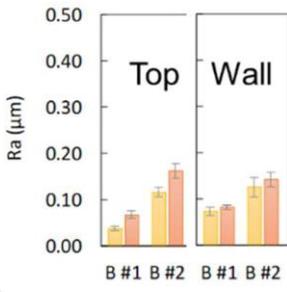
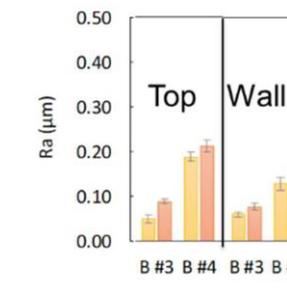
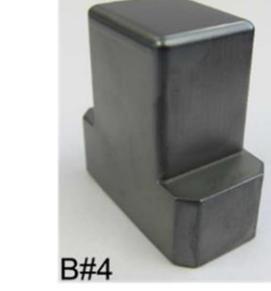
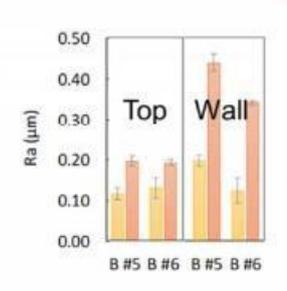
Traditional tool polishing plus graphite solid-lubricant leaves graphite deposits on the stamped parts which in turn cause welding defects and paint defects.

Standard production oils are easily removed by standard washing. Therefore, a surface finish which can operate successfully with standard production oils could reduce defects. Experimental tools were prepared with different finishes to compare PALMS polishing with standard polishing, on both traditionally manufactured – and ALM tools.

## The experimental study

A major car manufacturer produced 7 identical stamping tools in WP7V (Cr-Mo-V). Surface treatment of the 7 tools:

#1	PALMS polished
#2	PALMS polished with oxide layer
#3	PALMS polished + AlCrN coating
#4	PALMS polished + AlCrN coating
#5	Standard polished + AlCrN coating
#6	Standard polished + AlCrN coating
#0	Standard polished

<p><b>PALMS polished</b></p>  <p>B#1</p>		<p><b>PALMS polished + oxide</b></p>  <p>B#2</p>	<ul style="list-style-type: none"> <li>• Roughness is very low on the PALMS polished tools compared to the best standard polishing</li> <li>• Radii are also very well maintained (<math>\sim 0,2\div 0,3\text{mm}</math>)</li> <li>• Wall and top roughness are comparable</li> </ul>
<p><b>PALMS polished</b></p>  <p>B#3</p>		<p><b>PALMS polished + AlCrN coating</b></p>  <p>B#4</p>	<ul style="list-style-type: none"> <li>• Roughness is very low on the PALMS polished tools compared to the best standard polishing (<math>\sim 0,2\div 0,3\text{mm}</math> on radii)</li> <li>• Wall and top roughness are comparable</li> </ul>
<p><b>STD polished</b></p>  <p>B#5</p>		<p><b>STD polished + AlCrN coating</b></p>  <p>B#6</p>	<ul style="list-style-type: none"> <li>• Roughness in standard condition is low on top side</li> <li>• Wall roughness is higher</li> </ul>

### **PALMS polishing compared to conventional manual polishing:**

The PALMS process generates an excellent final roughness level, including in critical areas not accessible by CNC machining. Indeed, the PALMS process can improve both conventional and ALM steel tool blade, and the final results is comparable for the whole tool blade surface to the manual superfinishing operation.

### **Strip Tests – sliding friction tests:**

All the tools have been the tested with a dedicated ‘strip test’ tool at University of Padova at temperature ( $350^{\circ}\text{C}$ ) to compare the coefficient of friction and material adherence for manual- and PALMS polished both with/without coating and with/without lubricants.

### **Conclusions:**

PALMS process can generate an excellence roughness level in all the tool blade areas, even that not easily reachable by conventional machining equipment. The final friction test showed similar behaviour of PALMS super finishing process compared to the conventional plus manual machining operations.