MANUFACTURING EXCELLENCE.

MANFRED ERLACHER
HEAD OF PLANT SPARTANBURG.
BMW MANUFACTURING CO.
WHERE WE ARE NOW.

1,200 Vehicles Each Day

5.6 Million Square Feet

8,000 Jobs On-Site

$7 Billion Investment
BMW MANUFACTURING CO.
MODEL STRATEGY.

BMW X3

BMW X6

BMW X5

BMW X4

BMW X6 M

BMW X5 M
Our core elements are even visible at every step of our value chain.

<table>
<thead>
<tr>
<th>Quality Management</th>
<th>Body Shop</th>
<th>Paint Shop</th>
<th>Logistics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Innovation / Value Oriented Production System</strong></td>
<td><strong>Best Fit Line, Automated Hang-On Parts</strong></td>
<td><strong>Continuous innovation to meet sustainable production claim</strong> (e.g. IPP)</td>
<td><strong>Just-in-time logistics</strong> for efficiency and productivity (lean)</td>
</tr>
<tr>
<td></td>
<td><strong>Laser Radar Measurement System</strong></td>
<td><strong>Building to Booth (B2B) Ventilation</strong></td>
<td><strong>Continuous improvement (VPS)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Smart AGVs</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Assembly</strong></td>
<td><strong>Line production efficiency, Stable Takt</strong></td>
<td><strong>Productivity and quality increase through human-robot-collaboration</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Lean Production</strong></td>
<td><strong>Productivity and quality increase through human-robot-collaboration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sustainability</strong></td>
<td></td>
<td><strong>Continuous innovation to meet sustainable production claim</strong> (e.g. IPP)</td>
<td></td>
</tr>
</tbody>
</table>

Capital Markets Day – Manfred Erlacher
SUSTAINABILITY WITHIN THE BODY SHOP: BEST FIT. AUTOMATED HANG ON PARTS.

• **Three dedicated lines**: one for X5/X6 models, another for X3 and third for the X4.

• Lines operate a **fully automated process** for hang-on parts (doors, hood, tail-gate), the first in the BMW Group Production Network.

• Body shop operates **1,400 robots**.

• **Laser Radar Technology** lifts installed at the end of lines to measure entire BIW, sends data to ensure dimensional quality.

**QUALITY MANAGEMENT**

**BODY SHOP**

• **Best Fit Line**, Automated Hang-On Parts

• **Laser Radar Technology**
SUSTAINABILITY WITHIN THE PAINT SHOP: INTEGRATED PAINT PROCESS.

- In the Paint Shop, a Integrated Paint Process (IPP) technology integrates the primer coat process into the top coat process eliminating three process steps: primer, primer over and primer finish.
- This more efficient method combined with the latest in robot application equipment, as well as a new ventilation technology yields an ultra high-performance paint shop that has reduced the plant’s energy consumption by 30%, reduced carbon emissions by 43%, reduced VOCs by 7% and wastes 2% less than conventional technology.

- Continuous innovation to meet sustainable production claim (e.g. IPP)
- Use of high-tech, sustainable finish
SUSTAINABILITY WITHIN ASSEMBLY: COLLABORATIVE ROBOTS.

• Line production efficiency, Stable Takt
• Productivity and quality increase through human-robot-collaboration

Collaborative robots or “friendly” robots work around humans without protective fencing.

Each of the four robots, one per door line, contains a special interface device with a roller on the end.

The robot is programmed to apply consistent pressure with the roller around the perimeter of the door foil, securing it and the adhesive to the door.

This is an important part of the door assembly process since the door foil protects the electronics inside the door from water leaks.
SUSTAINABILITY WITHIN LOGISTICS: SUPERMARKETS AND AUTOMATED GUIDED VEHICLES (AGV).

**Value-added production principles or “VPS”**.

This is BMW's proprietary approach to lean manufacturing. BMW's VPS philosophy is developed to create:
- repeatable, robust processes
- improve logistics flow
- implement value stream optimized principles, and
- pinpoint and eliminate waste in the process

**LEAN PRODUCTION**

**ASSEMBLY**

- Just-in-time logistics for efficiency and productivity (lean)
- Continuous improvement (VPS)
MANUFACTURING EXCELLENCE.

BMW GROUP CAPITAL MARKETS DAY, SPARTANBURG, MARCH 2015