A Case Study of Manufacturing Automation in Automotive Industry

L P PEREIRA
Sr. Vice President
Mahindra & Mahindra Ltd

12th April '07, Mumbai
Key Drivers For Automation

1. Enhanced Operational Safety
2. Complexity of Operation
3. Large Volumes & Low TACT Time
4. Minimising Variability in Output Quality
5. Defect Prevention
6. Enhancing Utilisation of Assets to meet Peak Demands
8. Lowering the Cost of Manufacture
9. Integration of Operational Processes
Level of Automation

A detailed analysis is necessary in terms of feasibility, techno-economics, viability, sensitivity & reliability to decide the level and mode of Automation.

Automation is a high levered tool in de-bottlenecking an operation in an un-balanced line.
Types of Automation

• **Fixed Automation**
  Entails high investments for custom engineered equipment used for high production volumes.

• **Programmable Automation**
  Most suitable for batch production with flexibility to do variety of jobs.

• **Flexible Automation**
  Requires high investments to meet continuous production of variety of jobs with medium production volumes.
Areas of Automation

Body Shop / Welding

Automation in body shop/welding provides for a very high productivity, flexibility, consistency in quality, access in difficult areas and a relief from fatigue & health hazards.
Areas of Automation

Paint shop

Robotic/Programmable painting increases productivity of plants multifold, conserving resources of capital, paints & chemicals, & relief from health hazards.

Quality & consistency of painting through automated Paint shops & Paint mixing, is much better with respect to manual operation.
Areas of Automation

Machining

Use of CNC machines, FMC, FMS, CIM enhances substantially, not only productivity & precision, but also flexibility.

Components can be finished & supplied on line, starting from raw materials without human intervention especially when volumes are high.
Areas of Automation

Assembly Operations

Automation is generally for Mistake proofing, reduced variability and system discipline.

Also at large volumes and very low TACT times, manual operations are not feasible, at times.
Areas of Automation

Demand Management & Logistics

Digital Automation & use of ERP systems for seamless & effective integration of Operations internally and with the supplier base supporting SCM, RFID, JIT and DOL for meeting customer commitments in the most cost effective manner.
Case Study of Automation at Mahindra & Mahindra
## Manual v/s Robotic Painting

<table>
<thead>
<tr>
<th>Features</th>
<th>Manual Painting</th>
<th>Robotic Painting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Consistency of Paint Application</td>
<td>Varies with person to person and over a shift</td>
<td>Consistant</td>
</tr>
<tr>
<td>Paint Consumption</td>
<td>30% Utilised and 70% Wastage</td>
<td>75% Utilised and 25% Wastage</td>
</tr>
<tr>
<td>Reach in Intricate areas</td>
<td>Limited Reach</td>
<td>Flexible</td>
</tr>
<tr>
<td>Painting Speed</td>
<td>Limited</td>
<td>Fairly High</td>
</tr>
</tbody>
</table>
Process Integration with SCADA

What is SCADA?

• **Supervisory**
• **Control**
• **And**
• **Data**
• **Acquisition**
SCADA

• The SCADA is designed to have supervisory control from centralized location. It forms a single point source of data of a plant to be controlled.

• It is being used in Scorpio B/S, Scorpio TCF, New Paint Shop, Power & Free & MQS Paint shop.
Benefits of SCADA

• At a glance body tracking. No need of physical tracking & counting of Body Shells.
• Maintenance trouble shooting of system equipment
  Quick Identification by alarm displays & “MTTR” (Mean Time to Repair) reduction.
Engine Manufacturing
PISTON RING

Automatic Side Detection & Stacking
Piston Ring Side Detection

Automation Necessity

• Position of top side marking is very essential during Piston Ring assembly for desired Engine Performance.

• Need to check @ 400 Rings / hour for marking on up-side & insertion on piston.

• Development of an low cost Automated System to inspect off line & stack for assembly improved quality & productivity.
Piston Ring Checking Automation

• Optical Sensor
Piston Ring Automation

• Auto system

STACK RECEIVED

REV Not OK

Check & separate

OK
Piston Ring
To Sum-up

• Automation plays a significant role in our effort to satisfy the customer demands of newer models which are reliable, safe and defect free at competitive prices.
Thank You