Car Body Painting 2010

Paint Shops Put to the Test

Plant Assessment as a Systematic Approach for more Efficiency and Sustainability in use of Energy and Resources

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Bad Nauheim, 03./04. November 2010
Agenda

- Paint shops – Installed base
- Plant Assessment: 1st step for improving existing plants
- Examples
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- Paint shops – Installed base
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Car Manufacturing

Age structure of paint shops

Age Structure of Paint Shops

Failure Function “Bathtub Curve”

(1) Early Failure Period
(2) Intrinsic Failure Period
(3) Wear out Failure Period

60 % of all paint shops are older than 20 years
Car Manufacturing

Developments in the last 30 years: Product

Design
Corrosion protection
Emissions
Price
Performance
Efficiency
Quality
Individuality
Diversity
Safety

Car Manufacturing

Developments in the last 30 years: Energy & Environment

Costs
Regulations
Renewable Energy
CO₂
Sustainability
E-mobility
Efficiency
Global Warming
Shortage of Resources

Natural Gas

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Car Manufacturing

Developments in the last 30 years: Paint process

- Waterborne Materials
- Compact Processes
- Efficiency
- Energy
- CO₂
- Sustainability
- 30 years
- Footprint
- TA-Luft
- 100% Bell Application
- CPU
- Substrate Materials
- Automation
- Quality
- Availability
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Agenda

- Paint shops – Installed base
- Plant Assessment: 1st step for improving existing plants
- Examples
Plant Assessment vs. New Paint Shop
CPU: Influencing Factors & Saving Potentials

Effects (Example: Top Coat)

- 10% material usage
  CPU Reduction: 8,50 €
  Saving potential: 1.275.000 €/a

- 20% energy consumpt.
  CPU Reduction: 4 €
  Saving potential: 600.000 €/a

+ 5% first run increase
  CPU Reduction: 9 €
  Saving potential: 1.350.000 €/a

+ 5% uptime increase
  CPU Reduction: 6 €
  Saving potential: 900.000 €/a

CPU 195 €

Europe, CPU (Example: Top Coat), Capacity 150.000 U/a, Medium-class vehicle (90m²)
Plant Assessment: Entry for CPU Reduction

- First run
- TE
- Colour Change
- Lifetime
- Equipment update
- Uptime
- First run
- Equipment update
- Uptime
- Energy
- 10%
- Staff
- 24%
- Maintenance
- 3%
- Material
- 44%
- Investment
- 19%

Europe, Total CPU (example) = € 195, Capacity 150,000 U/a, Medium-class vehicle (90m²)
Plant Assessment: Elements & Approach

Teamwork for new ideas

- Shows worldwide best practice
- Gives overview in new technologies
- Covers all types of processes
- Informs about green paint shops
- Guarantees systematical approach
- Generates more potentials
- Ensures quicker results
Plant Assessment

Teamwork and expertise ensure quicker results

Evaluation of customer targets (workshop) Handover Plant documentation

On site Assessment
Check single items

Analysis of Assessment findings
Conclusion of potentials/proposals

Presentation Assessment Management Report

Complete Assessment in 20 days

Time line in workdays

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

- Check documents as built
- Evaluate, define targets
- Kick off
- Assessment on site Ort
- Brief information
- Evaluate findings
- Assessment Report
- Final presentation

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Plant Assessment

Professional full range guaranteed

Specialists for Assessment

- Process
- Application
- Booth
- HVAC
- Oven
- Conveying
- Control Systems
- SCADA
- Energy Management
- Interfaces / Building
- Environment

**Selected targets**

- Cost per unit
- Energy consumption
- Longevity
- Quality
- 1st run
- Legal conformity
- Environment H₂O, CO₂
- Availability
- Flexibility
- …

Additional findings, proposals and conclusion regarding

- Replacement
- Repair
- Modification

to fulfill, to improve to meet customers targets
Plant Assessment

Worksheet: Systematically recorded findings

<table>
<thead>
<tr>
<th>Location</th>
<th>Situation</th>
<th>Proposal, measure improvement</th>
<th>Level to achieve targets</th>
</tr>
</thead>
</table>

**Situation**
- **Location**
- **Proposal, measure improvement**
- **Level to achieve targets**

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### Detailed results: Findings summarized and grouped to subjects

#### Definition of measures for replacement, repair and modification

- **Urgent measure**
- **Detailed study**
- **Replace**
- **Repair**
- **Modify**

#### Evaluate potentials for each measure according to the customer’s targets

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Plant Assessment

Management summary (example): Urgent measures per target – classified

**Legal conformity**

<table>
<thead>
<tr>
<th>Longevity</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASAP, &lt; 2 yrs.</td>
<td>orange = Longevity</td>
</tr>
<tr>
<td>2-5 yrs.</td>
<td>L</td>
</tr>
<tr>
<td>5-10 yrs.</td>
<td>M</td>
</tr>
<tr>
<td>&gt; 10 yrs.</td>
<td>H</td>
</tr>
</tbody>
</table>

**Legend:**
- orange = Longevity
- yellow = Legal conformity

**Investment level**
- L = low (< 0.5 Mio EUR)
- M = medium (0.5…3.0 Mio EUR)
- H = high (> 3.0 Mio EUR)

*) or replace with primer robots
**) depending on availability of components
# Plant Assessment

Management summary: High potentials reducing CPU per target – classified

<table>
<thead>
<tr>
<th>Quality</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td></td>
</tr>
<tr>
<td>ROI = short &lt; 1 yr</td>
<td>ROI = medium 1 ... 3 yrs.</td>
</tr>
<tr>
<td>Recirculation of the Flash-off Air</td>
<td>Hot Air Seals on the Topcoat Ovens</td>
</tr>
<tr>
<td>Spraybooth Operating Window</td>
<td>Skid cover Spray Booth</td>
</tr>
<tr>
<td>Removal of the Black Out Line</td>
<td>Humidifier Water Management System</td>
</tr>
<tr>
<td></td>
<td>BC Robots</td>
</tr>
</tbody>
</table>

**Legend:**

- **Energy Savings**
  - **Investment level**
    - L = low (< 0.5 Mio EUR)
    - M = medium (0.5...3.0 Mio EUR)
    - H = high (> 3.0 Mio EUR)

- **Maintenance**
  - M

- **Application**
  - M
Plant Assessment

Result overview

Complete list of findings to single items and main conclusions grouped to
- Process
- Application
- Energy Management
- Environment
- Conveyors
- Controls

Management summary selected to
- URGENT – Actions: Focus on legal conformity, lifetime, uptime
- POTENTIAL – Actions: Focus on modifications reducing CPU

Refurbish supply air
Change, adapt exhaust air
Change controls
Modify conveyor
Replace PVC piping
Change process tank
Agenda

- Paint shops – Installed base
- Plant Assessment: 1\textsuperscript{st} step for improving existing plants
- Examples
## Examples (1)

### Repair of Chain Conveyor

<table>
<thead>
<tr>
<th><strong>Target</strong></th>
<th>Safeguarding of running production</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measures</strong></td>
<td>Exchange of chain guidings</td>
</tr>
<tr>
<td><strong>Budget</strong></td>
<td>Low</td>
</tr>
<tr>
<td><strong>Result</strong></td>
<td>Avoiding of investment</td>
</tr>
<tr>
<td></td>
<td>Lifetime extended until 2020</td>
</tr>
</tbody>
</table>
Examples (2)

Burner Replacement

- **Target**  Reduction of process temperature
  Attainment of emissions values

- **Measures**  Installation of new burner

- **Budget**  Low

- **Result**  Reduction of temperature by approx. 20°C
  Reduction of Energy consumption by approx. 5 – 8%
Examples (3)

Fill Stop Sensor for BC-ESTA

- **Target**  
  Reduction of paint losses during prepainting

- **Measures**  
  Installation of 18 sensors, commissioning

- **Budget**  
  Low

- **Result**  
  € 98,000 savings/a per zone
Examples (4)

Upgrade *EcoBell2 M* to *EcoBell2 HX* for Bumper Painting

- **Target**: More flexibility for a wide colour palette

- **Measures**: Installation of a prop-valve for a second shaping air, exchange of atomizer housing with an integrated shaping air ring, new bearing unit, bell cup
  
  Modification of four BC robots and one CC robot

- **Budget**: Low

- **Result**: 15% higher TE
  
  “Difficult” colours now applicable

  Brush width before upgrade: 300 – 450 mm

  Brush width after upgrade: 50 – 500 mm
Examples (5)

Exchange of Colour Changer System in 9 BC-Robots

- **Target**: Reduction of paint losses during prepainting
- **Measures**: Installation of a colour change system with significant reduced colour change loss
- **Budget**: Medium
- **Result**: € 70,000 savings/a per zone
  - Shorter colour change time

EcoLCC
Examples (6)

Exchange of Canister Type Atomizer to EcoBell ICC in Primer Zone

- **Target**
  - Reduction of complexity and maintenance costs
  - Increase of process time

- **Measures**
  - Exchange of atomizer, installation of the multi-pump paint dosing system, installation of regulators for shaping air and turbine speed, installation of HT controller and cascade

- **Budget**
  - Medium

- **Result**
  - Approx. 6 sec (14%) more process time
  - Significant reduced maintenance costs
Examples (7)

Automation of CC Interior Application

- **Target**: Reduction of overspray losses
- **Measures**: Installation of 4 robots and 4 opener in the manual zone
- **Budget**: High
- **Result**: €1,080,000 savings/a per zone
  Quality improvement
Conclusion

Efficiency and Sustainability in use of Energy and Resources:

- Also required for existing paint shops
- Plant assessment enables a cost efficient implementation