IMPROVING PRODUCTION EFFICIENCY

Dr. Frederic de Molière

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OEM’S COMMITMENT TO SUSTAINABILITY

- Sustainability image
- Environmental protection
- Cost control for sustainability
- Governmental regulations
Dürr approach to optimize economy & ecology targets

**ECO PAINTSHOP**

- **FEWER EMISSIONS:** Particulates, VOC, CO₂, Noise, Odors
- **LESS MEDIA:** Electricity, Gas, Water
- **LESS MATERIAL:** Paint, Chemicals
- **LESS WASTE**
- **LESS WASTE WATER**
Dürr approach to optimize economy & ecology targets
Dürr approach to optimize economy & ecology targets
ECO⊕PAINTSHOP

Stays for short-term and long-term perspectives

Economy & ecology over the whole lifecycle.

25 years $\Delta$ 5 x invest amount
Holistic view on the whole Paintshop

- EcoEMOS
- Ecopure TAR Suntec
- Eco+Energy CPS Suntec
- Variable exhaust air control
- Low volume air seal
- CIC Oven
- Straight Pass Oven
- EcoReBooth
- EcoDryScrubber
- Heat Recovery Wheel
- Heat Exchanger
- EcoLoopLinked HX System

Plant Layout
- General Paintshop settings
- Shop ventilation concept
- Paint Process
- Latent cooling storage
- Ecopaint RoDip
- EcoDC MACS
- EcoMultiCyclone
- PT/ED heat recovery
- EcoBell 2
- EcoBell 3
- EcoLCC
- EcoPump 9
- EcoRP E
- Ecopure TAR
- Ecopure TARCOM V
- Ecopure RTO
- Ecopure KPR
ECO+PAINTSHOP

Achievements: up to…

- 50% Energy
- 60% Water
- 30-50% Paint
- 60% Waste Water
- 90% VOC
- 50% CO₂
+ 10-20% Throughput
PROCESS EFFICIENCY

Products & Solutions

- Independence of climate conditions
- Minimized sealer application time
- Minimized paint application time
- Minimized color change time
- Eco+Speed
- EcoPaint RoDip
- Closed quality loops
- Optimized material flow
- Process decoupling
- Short lead time car body
- EcoPaint RoDip
- EcoReBooth
- EcoSmart AC
- EcoDC MACS
- Degrade Mode
- Approved products
- Stand-by equipment
- Splitted capacities
- Manual backup zones
- Decoupling buffer
- Preventive maintenance
- Short meantime to repair
- Bath maintenance concept
- Dust protection concept
ECO DC MACS

Modular Anode Control System
ECO DC MACS

Operating Scenario

Current detection for coating monitoring

L1- Gleichrichter 1
GL01 GL02 GL03 GL04 GL05 GL06 GL07 GL08 GL09 GL10

Current detection for coating monitoring

L2- Gleichrichter 2

Current detection for coating monitoring

L3- Gleichrichter 3

Operating Szenario

Busbar 1
L1-

Busbar 2
L2-

Busbar 3
L3-
ECO DC MACS

Breakdown scenario

Neighbourhood anodes compensate failure → no loss of car body!!!
ECO+SPEED

Fast body transfer & color change

- Time reduction for body transfer and color change from 16 to 8 sec
- Capacity increase up to 15%
- Up to 18m² reduction of polluted surface
- Reduction of cleaning time
- CPU reduction + higher sustainability
- Higher profitability
For color changes of 8 sec AB technology is necessary as well as a second dosing pump, a second color channel and a second main needle.

EcoBell3 is optimized for this requirement.
EMISSION EFFICIENCY

Products & Solutions

- Ecopure KPR
- Ecopure TAR
- Ecopure TARCOM V
- Ecopure RTO

- Plant layout
- Ecopaint RoDip
- EcoBell 2
- EcoBell 3
- EcoLCC
- Shop Ventilation Concept
- EcoReBooth
- EcoDryScrubber
- Eco+Energy CPS
- Ecopure TAR Suntec
- Heat Recovery Wheel
- Heat exchanger
EMISSIONS EFFICIENCY

Paintshop References

**CO₂ Emission (examples)**

- China: 291 kg/unit
- China: 268 kg/unit
- China: 208 kg/unit
- China: 141 kg/unit

**VOC Emission (examples)**

- China: 30.8 g/m²
- China: 17.6 g/m²
- China: 7.3 g/m²
- China: 2.3 g/m²

Dürr paint shops recently implemented.
EMISSION EFFICIENCY

Recuperative thermal exhaust air purification system

- Integrated purification and energy supply ideal for oven processes
- Integrated heat recovery for significant energy savings
- Significant flexibility due to adjustable operation points
- Highly efficient burner technology
- Reduced energy demand due to innovative pre-heating systems with reduced CO₂ emissions
ENERGY EFFICIENCY

Products & Solutions

- EcoEMOS Energy

- Eco+Energy CPS
- Ecopure TAR Suntec
- Variable exhaust air control
- Low volume air seal
- CIC Oven
- Straight Pass Oven

- EcoReBooth
- EcoDryScrubber
- EcoSmart AC

- Heat Recovery Wheel / Plate
- EcoLoopLinked HX System

- Paint Process
- Plant Layout
- site, product (m²), skid length, jph, working hours/day
- Shop ventilation concept

- Ecopaint RoDip
- EcoDC MACS
- EcoMultiCyclone
- PT/ED Heat Recovery
- Latent cooling storage

- EcoBell 2
- EcoBell 3
- EcoLCC
- EcoICC
- EcoRP E

- Ecopure TAR
- Ecopure TARCOM V
ENERGY EFFICIENCY

References and sensitivities

Total energy saving potential worldwide for reduction by 400 kWh/car (75 Mio cars/year):

- 4 nuclear power plants

Example diagram:

- China 922 kWh/unit
- Hungary 790 kWh/unit
- China 711 kWh/unit
- Russia 590 kWh/unit
- China 551 kWh/unit
- China 430 kWh/unit
- China 399 kWh/unit

Dürr paint shops recently implemented

Germany - 59 kWh/unit
Shenyang - 59 kWh/unit
Yantai - 59 kWh/unit
Brazil - 97 kWh/unit

Comparison diagram:

- 70 kWh/unit

16 h/day vs. 24 h/day
DRY OVERSPRAY SEPARATION

EcoDry X

The intentionally simple and robust paint overspray separation

EcoDry B

The exclusive paint overspray without additives

EcoDry Scrubber

Efficiency through dry separation

EcoDry Scrubber

Limestone-Recycling

Fluidized bed furnace – Limestone powder recycling
DRY OVERSPRAY SEPARATION

References

- Audi Mexico
- Honda East Liberty
- BMW Spartanburg
- VW Chattanooga
- Ford Kansas
- Porsche Leipzig
- BMW Leipzig
- BMW Regensburg
- Rehau Viechtach
- SMART Hambach
- Wagon Nagold
- PSA Sochaux TC I+II
- BMW Dingolfing
- Audi Győr
- Rehau Győr
- Daimler Kecskemét
- Ford Otosan
- Yamaha I Japan
- Yamaha II Japan
- Yamaha Indonesia
- HKK Japan
- BBAC Daimler Beijing
- SVW Yizheng CP 5
- SGM Yantai
- NVIS Changchun CP1
- SGM Dalian
- SGM Shanghai
- SCJLR Changshu
- SVW Nanjing CP4 TC I+II
- SGM Wuhan
- FAW Audi Chengdu CP 3
- FAW Audi Chengdu CP 3.3
- Nissan Huadu
- Toyota Chattanooga
- Ford Kansas
- Porsche Leipzig
- BMW Leipzig
- BMW Regensburg
- Rehau Viechtach
- SMART Hambach
- Wagon Nagold
- PSA Sochaux TC I+II
- BMW Dingolfing
- Audi Győr
- Rehau Győr
- Daimler Kecskemét
- Ford Otosan

70 paint lines with more than 2,200 EcoDryScrubber modules
ECOSMART AC

Optimal air supply unit control

Optimal control of air supply units and recirculation air units

Product information:

- Precise control of temperature and humidity
- Coordinated teamwork of modules instead of previous individual control for each module
- Measurement of external conditions for optimal selection of target setpoint
- Feedforward control for precise setpoint control depending on external conditions
ECOSMART AC

Classical air control: Plant startup and disturbance

- Booth Temperature
- Booth Relative Humidity

Module setpoints
- 100%
- 0%
- Optimum
- Optimum

- Sustained oscillations
- Increased energy usage
ECOSMART AC

Plant startup and disturbance

- Booth Temperature
- Booth Relative Humidity

°C

% 100% 0%

Module setpoints

Optimum

Small oscillations

Optimal energy usage
MATERIAL EFFICIENCY

Products & Solutions

- EcoDose
- EcoGun Sealing
- EcoRS
- EcoFlow Sealing
- EcoShot Meter
- EcoJet
- EcoTemp / EcoHeat

- Pre-Treatment
- Electro Coating
- EcoReBooth
- EcoDryScrubber

- Ecopaint RoDip
- EcoReBooth
- EcoMultiCyclone
- EcoLon Ex
- EcoFilter-Oil-UF

- Ecopaint RoDip
- EcoBell 2
- EcoBell 3
- EcoLCC
- EcoICC
- EcoPump 9
MATERIAL EFFICIENCY

Minimized material consumption - less waste & waste water

Benchmark
118,5 € / unit*

Benchmark
397 l / unit

* (excl. water)
**INNOVATIONS IN APPLICATION**

EcoBell3 Ci: Application systems, new high speed atomizer for interior painting

<table>
<thead>
<tr>
<th>Application area</th>
<th>Water based paint 1K, 2K with high tension</th>
<th>Solvent based paint 1K, 2K with high tension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior painting</td>
<td><img src="image" alt="EcoBell3 Ci" /></td>
<td><img src="image" alt="EcoBell3" /></td>
</tr>
<tr>
<td>SB50%: 50-220 mm</td>
<td><img src="image" alt="EcoBell3 Ci" /></td>
<td><img src="image" alt="EcoBell3" /></td>
</tr>
<tr>
<td>Exterior painting</td>
<td><img src="image" alt="EcoBell3 E" /></td>
<td><img src="image" alt="EcoBell3" /></td>
</tr>
<tr>
<td>SB50%: 180-600 mm</td>
<td><img src="image" alt="EcoBell3 E" /></td>
<td><img src="image" alt="EcoBell3" /></td>
</tr>
<tr>
<td>Combined zone (interior &amp; exterior), plastic parts &amp; bumper painting SB50%: up to 600 mm</td>
<td><img src="image" alt="EcoBell3 C" /></td>
<td><img src="image" alt="EcoBell3" /></td>
</tr>
</tbody>
</table>

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EcoBell3 Ci: Application systems, new high speed atomizer for interior painting

- Lowest self-contamination
- Reduction of overspray
- Automatically cleaning without production cycle loss
- High productivity
- Further increase of the transfer efficiency

- Highest HT-safety (CE type examination)
- Compact design
SPACE EFFICIENCY

Products & Solutions

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SPACE EFFICIENCY

Products & Solutions

**Ecopaint ReBooth**
Minimized Footprint

**EcoRP E and EcoRP**
Reduced Booth width and length

**Ecopaint Oven**
Layout concepts

**High Bay Storage**
Minimized Footprint
SPACE EFFICIENCY

STORAGE SYSTEMS

Floor Conveyor Storage System

- Flexible Layout
- Function to design/Location
- Foot print requirement

Foot Print 970 m²

Advantages

Disadvantages

High Bay Storage System

- Compact Layout
- High functionality
- High flexibility

Foot Print 170 m²

Advantages

Disadvantages

Layout to requirement
EFFICIENCY THROUGH FLEXIBILITY

Flexible products & solutions
EFFICIENCY THROUGH FLEXIBILITY

Eco Screen 3D-on Site

- program editor
- graphics editor
- fitting tool
- call of further editors and tools
- change log
EFFICIENCY THROUGH FLEXIBILITY

Solutions

**Box Concept**
- Single stations (boxes) arranged in parallel
- Bodies fed in/out by adequate conveyors
- Painting task is maximized in each box
- Stop & go mode

**Color changer EcoLCC**
- Reduced color change time < 10 sec. with pushout

**EcoBell 3**
- Exterior and interior painting
- High automation level
Thanks to state-of-the-art technologies, Tiexi plant paint shop ranks the world’s most sustainable paint shops, water consumption, VOC emission and waste water are reduced to 1/3 of average level 10 years ago.

Major lever in resource conservation in production is the Paint Shop

- 41% of Tiexi total energy.
- 35% of total water usage.
- 100% of Process waste water:
- 100% Solvent emissions.
REMAINING POTENTIALS

- Process Efficiency
- Emissions Efficiency
- Energy Efficiency
- Material Efficiency
- Space Efficiency
- Efficiency through Flexibility

Your Paintshop
Remaining potentials
Subject to change without prior notice. The information in this presentation contains only general descriptions and performance features. In actual applications they may not be exactly as described here. The desired performance features are only binding if they are agreed explicitly upon completion of contract.

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