Global Automotive Finishes: Technology Trends

Hyundai Technology Fair
June 27, 2006

Dave Deters
Global Product Manager
DuPont Automotive Systems
DuPont / KCC Partnership

December 12, 2002 DuPont and KCC signed a technical license agreement relating to DuPont automotive OEM Coatings technology and know-how. The collaboration was extended on May 27, 2005 to a long term technical collaboration of both companies in the field of OEM coatings. DuPont and KCC are able to provide their technology and experience to Hyundai and Kia worldwide.

The conversion of Hyundai and Kia plants from solventborne to waterborne coating is a result of the successful collaboration. In addition, the partnership has produced new business awards with Mobis in the field of plastic parts.
Trends For Global Automotive Painting

- **Substrate**
  - Steel will remain key material

- **ED**
  - Environmentally friendly & New Processes

- **Primers**
  - 3 forms (Solvent, Water, Powder) will continue

- **Basecoats**
  - Solvent (SB) will continue to convert to Water (WB)
  - More Colors to Differentiate Models

- **Clearcoats**
  - Solvent based will remain major form

- **Processes**
  - Topcoat Consolidation (3C1B) will increase
Automakers included in Technical Trends Discussions
Voices of the Customer

Customer A
- Steam Jet Adhesion

Customer B
- Application Robustness

Customer C
- 10x Bake Adhesion

Customer D
- Modular Concept

Customer E
- 4x Layer Stone Chip
- Powder CC Compatible
- HAPS Compliant

Customer F
- Defect Free
- Lower Cost
- Durability
- Smooth Surface
- Color
- Stability

N. America
Global Automotive Paint Driving Forces

- Higher Quality
  - Appearance, Durability, Color
- Lower Cost
  - Process Consolidation
  - Reduce Manpower
  - Increase First Run Rates
- Environmental Compliance
- Shorter Development Times
- Product Differentiation by Vehicle Models, Colors
Standard Automotive Painting Process

Welding

Paint Shop

Assembly

Pretreatment (phosphate)  ED  Bake  Primer  Bake  Base  Clear  Bake
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%Conversion to Lead-Free Electrocoat

- **N. Amer.**
  - Lead-Free 100%
  - Lead 29%
  - Lead-Free 71%

- **S. Amer.**
  - Lead-Free 100%

- **Europe**
  - Lead-Free 100%
  - Lead 12%
  - Lead-Free 88%

- **China**
  - Lead-Free 100%

- **Japan**
  - Lead-Free 100%

- **Australia**
  - Lead-Free 100%

- **2009**
  - Lead-Free 99%
  - Lead 1%
Global Electrocoat Trends

Final Conversion to Lead-free will continue in small plants. All Major plants have been converted.

Global CED, lead and heavy metal free, edge coverage, high throwing power

New ED Processes to minimize Investment & Space

2009 ELECTROCOAT

Lead-Free 86.6%

With Lead 13.4%

Desire New Anti-corrosion Processes
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Global Primer Surfacer Trends

- Waterborne PS (Improved Properties & Solids)
- Powder PS (Lower Film Build)
- EcoConcept (2C1B) Primerless
- 3 Wet Solvent (3C1B)
- Solventborne PS

2009 - PRIMER:
- Solvent 66%
- Water 22%
- Powder 7%
- New Processes 5%
Consolidated Process

EcoConcept (Waterborne) or 3 Wet Process (Solventborne)
Application of waterborne or solventborne primer, basecoat and clearcoat all without a baking process between coats.

- Reduced footprint of OEM paint shop by removing primer spray booth and primer oven
- 15% reduction in energy consumption/CO2 discharge and up to 45% reduction in VOC content depending on baseline products
- OEM saves manpower & energy
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Conversion to Waterborne Basecoat

- Germany
- West Europe
- USA
- Japan

% Conversion

EU Directive

2003 2004 2005 2006 2007 2008 2009
Global Basecoat Trends

Waterborne BC

Consolidated Processes:
EcoConcept
(2C1B Water)

Consolidated Processes:
3Wet (3C1B Solvent)

Solventborne Basecoat

2009 BASECOAT

Water 59.8%

Solvent 40.2%
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Global Clearcoat Trends

- **Solventborne: Improved Appearance 1K & 2K**
- **Solventborne: Improved Scratch 1K & 2K**
- **Powder: Low Film Build, Mar Improved**
- **Waterborne: Improved Appearance, Etch & Mar Improved**
- **Solventborne: Super Solids 1K & 2K**
- **Powder: UV Cure**

2009 - CLEARCOAT

- 1K Solvent 75.9%
- Water 0.5%
- 2K Solvent 22.4%
- Powder 1.2%
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