Application and Design Solutions in Reaction Injection Molding (RIM) with Dicyclopentadiene (DCPD) material

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By: Zach Montognese
Custom Composite Molder and Painter Established in 2001

- Markets:
  - Agricultural
  - Construction
  - Industrial
  - Military

- Manufacturing Capabilities:
  - Compression Molding
  - Reaction Injection Molding***
  - Thermoforming
  - Resin Transfer Molding
Dicyclopentadiene (DCPD) consists of 2 separate components:
- Component A: Catalyst
- Component B: Activator

Components A and B are pumped into various molds using centrally located injection unit:
- Ratio: 1:1

DCPD Base Properties:
- Combination of properties from thermoplastics, thermosets, and fluoropolymers which result in a tough and durable material ideal for parts subject to high impact.

Above: Process diagram of Reaction Injection Molding of DCPD
Reaction Injection Molding (DCPD)

- Low Complexity/Cost Aluminum Tooling
  - Self Release
  - Low Pressure

- Large Part Production at Relatively Low O/H rates
  - Exothermic Reaction – No Heat
  - Low Tonnage

- Tool Longevity
  - No Abrasion

- Class “A” painted finish standards along with impeccable adhesion properties

- Superb defense against caustic chemicals and corrosive environments.
Dicyclopentadiene (DCPD) Products

- Class “A” Applications
  - Hoods
  - Fenders
  - Body Panels
  - Cab Roofs
Class “A” DCPD General Comparison by Market

Automotive and Over The Road Truck
  • Multiple ‘shell base’ panel assemblies and bonding to achieve part requirements

Agricultural, Construction, Military, and Industrial
  • Advanced ‘B’ Side geometries in a singular panel to achieve part requirements
Selling through Reaction Injection Molding Solutions

Project Award → Project Enquiry/Current Design → Solutions/Design → Design Validation (FEA) → Project Award
Case Studies

John Deere Construction and Forestry Hybrid Hood

Project Enquiry:
- John Deere FRP hood top with very high warrantee and service orders
  - Hood cracking under impact

Solutions in DCPD Highlights:
- Elimination of excessive warrantee and service orders
- DCPD to SMC bonding
- Ribbing and “B” Side Mounting Features
Project Enquiry:
- John Deere Combine FRP Rear Wall with excessive warrantee and service orders
  - Rear Wall cracking under deformation

Solutions in DCPD Highlights:
- Elimination of excessive warrantee and service orders
- “B” side mounting features with close to zero read through
- Strategic local thickening extending diagonals of part for rigidity
- 70 lb. Shot Weight
Project Enquiry:
- 5 Component Bonded Thermoformed Panel
- Less than ideal impact and material properties

Solutions in DCPD Highlights:
- Consolidation to a singular structural panel
- Extensive ribbing 45° to material flow
- Thick to Thin
  - 4.5 mm Nominal Wall
  - 25 mm Insert Pads
- 80 lb. Shot Weight
- Hardware
  - In Draw
  - Out of Draw
- Mounting Features
  - In Draw
  - Out of Draw
    - “A” Surface Undulations and Pads
- Reduced piece price by ~35%
- Full Serviceability of Assembly
Case Studies

Covers for Construction Marketplace #2

Project Enquiry:
- Currently DCPD
- Poor surface finish
- Design did not fully utilize capabilities of DCPD
- Quality/Delivery issues related to design

Solutions Highlights:
- Parts Consolidation
- Ribbing removal
  - Drop Test
  - FEA
- **12mm Nominal Wall Stock for Harsh Environment and Vehicle Roll Over
- Hardware
- Mounting Features
  - In Draw
  - Out of Draw
Case Studies

Covers for Construction Vehicle Marketplace #1

Project Enquiry:
- SMC Hood Model Year Styling Changeover targeting lower Tooling Investment than Previous SMC Hoods

Solutions in DCPD Highlights:
- 9 Piece DCPD Hood Assembly for Entire Hood Enclosure
  - Feasible due to Customer Exhaust and Turbo locations
Thank You!