Novel High Solids Waterborne Dispersions
Enabled by Dow BLUEWAVE™ Technology
Different From Other Dispersions

• Dow’s proprietary BLUEWAVE™ Technology is a mechanical dispersion technology that enables:
  » Dispersion of polymers which are not self dispersing
  » Thermoplastic and elastomers formulations
  » Deliver high molecular weight polymers
  » Low viscosity
  » High solids
  » Solvent free
HYPODTM Polyolefin Dispersions

Promote Differentiation and Growth
Using standard low-viscosity application techniques, converters can achieve a balance of properties not possible with conventional dispersions thanks to HYPODTM Polyolefin Dispersions, allowing greater product differentiation and expansion into new markets.

Waterborne Application Vs. Extrusion
- Thinner coatings
- Use existing waterborne application equipment
- Higher line speeds
- Penetrate porous / fibrous webs
- Coat at low temperature
- Coat complex geometry
- Coat in pattern

Properties of HYPODTM for Coatings & Adhesives
- Water resistance
- Oil & grease resistance
- Heat sealability
- Elasticity/flexibility
- Adhesion to polyolefins
- Adhesion to polar substrates
HYPODTM Polyolefin Dispersions

Easier than Traditional Processing Methods with Potential to:

Reduce steps to build existing structures and create new
  » Adhesion to polar and non-polar substrates
  » Penetrate porous substrates
  » Coat complex geometries
  » Enhance component recyclability

• **Lower systems costs**
  » Thinner coatings at higher line speeds
  » Coat at lower temperatures
  » Use existing coating techniques – spraying, dipping, gravure printing

• **Minimize solvent-related issues**
  » Low VOC
HYPODTM Polyolefin Dispersions

Characteristics

• Avg. Particle Size ~ 1 μ
• Solids Content (by wt) 40 to 55% solids
• Typical pH ~ 9.5
• Viscosity (Brookfield @ 25°C) < 500 cps
# Developmental POD Compositions

<table>
<thead>
<tr>
<th>Product Designation</th>
<th>Polymer Composition</th>
<th>Functionalized</th>
<th>Polymer Melting Point (deg. C)</th>
<th>Polymer Tg (deg.C)</th>
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</thead>
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<tr>
<td>Dispersion A</td>
<td>Ethylene Copolymer</td>
<td>Yes</td>
<td>60</td>
<td>-55</td>
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<tr>
<td>Dispersion B</td>
<td>Ethylene Copolymer</td>
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<td>83</td>
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<td>Dispersion C</td>
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<td>85</td>
<td>-25</td>
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<tr>
<td>Dispersion D</td>
<td>Ethylene Copolymer</td>
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<td>60</td>
<td>-55</td>
</tr>
<tr>
<td>Dispersion E</td>
<td>Propylene Copolymer</td>
<td>No</td>
<td>85</td>
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</tr>
</tbody>
</table>
Comparison of Various PODs

Functionalized PODs

• Adhesion to polar and non-polar surfaces
• Compatibility with fillers
  »CaCO$_3$
  »ATH
• Compatibility with other dispersions
• Shear stability

Unfunctionalized PODs

• Adhesion to non-polar surfaces
  »Polyolefins
  »BOPP
• Conversion into other forms
  »Foams
  »Powders
HYPODTM Polyolefin Dispersions

Backed by World-Class Know-How & Service

• Dow provides tremendous portfolio of expertise in:
  » Polyolefins and dispersion applications
  » Interfacial science and aqueous formulations
  » Scale-up of extrusion process technology
  » Bringing new technologies to market

• Dow is a leading supplier to markets that will benefit most:
  » Packaging & paper
  » Carpet & textiles
  » Automotive
  » Personal care
Application-Specific Features & Benefits
Fabric Coating / Impregnation

- PODs provide similar balance of flexibility and resilience of polychloropene latexes with potentially lower cost and reduced skin sensitivity in shoe insert applications
- PODs accept inorganic fillers
- Fabric coating opportunities being explored include:
  - Moisture/stain resistant coatings
  - Adhesive/binder in fabric production
  - Surface modifier
Carpet Backing

- Polyolefin Dispersions (POD) allow customers to apply thermoplastic backing systems using conventional coating equipment
  » Potential to be used in multiple applications
    - Modular carpet tile pre-coats
    - Broadloom applications
    - Thermo-moldable applications
    - Artificial grass applications
- Performance & Attribute features
  » Potential for greater recyclability
  » Excellent wet strength
  » Excellent tuft lock / delamination strength
  » Flexibility - hand
  » Potential for lighter weight
  » Market differentiation
  » Potential for chemical versus mechanical bonding
HYPOD™ Polyolefin Dispersions

Adhesive Lamination and Heat Sealable Coatings

• PODs allow converters to apply polyolefin sealant and adhesive layers using conventional water-application techniques
  » Eliminates need for melt phase extrusion
  » Enables thinner coatings than with extrusion
  » Can enable a significant increased line speed
  » Provides ability to coat in a pattern

• Dispersion allows separate application and activation of adhesive

• Very low melting point polyolefins can be applied with low heat seal initiation temperatures

• Polyolefin coating can be applied at low temperatures, reducing the risk of damage to the substrate
  » For latter two points the machine configuration and contact points will contribute to the success of these coatings
HYPOD™ Polyolefin Dispersions

Paper & Board Coating

- PODs are compatible with most conventional processes for applying water-based coatings
  » machine configuration and, mainly, the contact points will contribute to the success of these coatings
- Water-based application are often less expensive than extrusion
- PODs are not manufactured with fluorochemicals
- PODs provide excellent OGR which is maintained after creasing
- Other beneficial properties which could be provided to paper and board:
  » Moisture resistance
  » COF modification
  » Adhesion promoter / tie layer
  » Heat sealability
HYPODTM Polyolefin Dispersions

Tie Layer / Laminating Adhesive for Flexible Packaging

• Adhesives (PUR) and extrusion lamination for bonding substrates
  » Film-to-film
  » Film-to-foil
  » Film-to-paper
• PODs provide another option for adhering various layers together
  » Adhesion to polyolefins
  » Adhesion to polar substrates (paper, glass, metals, polar polymers)
  » Recyclability
• Fewer production steps for easier processing
HYPODTM Polyolefin Dispersions

Frothed Foams

• PODs can be converted into frothed foams
• Frothed foam properties
  » Soft hand, low modulus foams
  » Open cell from skin to skin
  » Can be hydrophilic or mostly hydrophobic
  » Recyclable with other polyolefins
  » Two and three layer composite structures
• Potential applications
  » Hygiene – absorbent core
  » Fabric backing for flame retardant and cushioning
  » Wound care
  » Interior panel backing
  » Roofing and ceiling moisture management membranes
  » Noise control
HYPODTM Polyolefin Dispersions from Dow

• Performance benefits of polyolefins with application advantages of water-based applications

• Promotes differentiation and growth
  » Can enable distinct balance of properties
  » May create new application and market opportunities for users of water-based processing equipment

• Easier than conventional thermoplastic processing methods
  » May be easier to build existing structures and create new
  » Opportunity to lower systems costs
  » Can simplify processing
  » May eliminate solvent-related issue

• Backed by world-class know-how and service
  » A leader in polyolefins and dispersion technology
  » Experienced in delivering new technology to market
  » Committed partners on board to provide greater breadth in Europe and North America
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