Aqueous Polyolefin Dispersion for Packaging Boards and Papers

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RETHINK PAPER:
Lean and Green

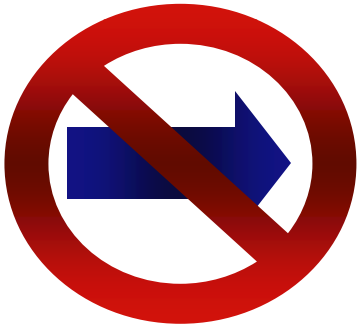
Outline

- Polyolefin dispersions processing and fundamental properties
- Materials and Results
  - Adhesion priming
  - Barrier improvement
  - Performance balance
- Summary and Conclusions

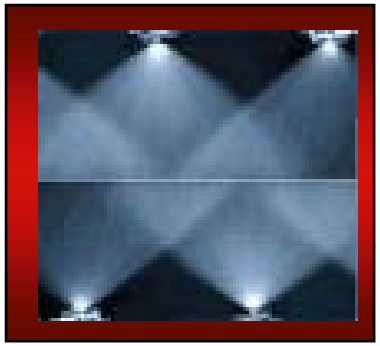
Introduction

Processing Plastic Pellets

Plastic Pellets



Printing/Coating



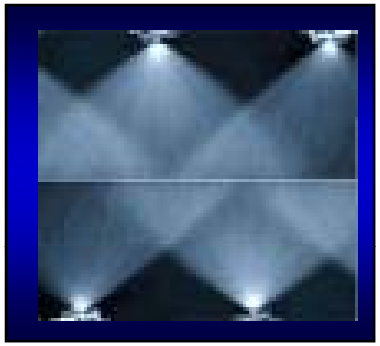
Spray coating

Dipping

Frothed Foams

Processing Waterborne Polyolefin Dispersions

Printing/Coating



Spray coating

Dipping

Frothed Foams

Aqueous Polyolefin Dispersions (POD)

Positive performance characteristics of polyolefins:

- Heat sealability
- Low temperature flexibility
- Water & chemical resistance

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Application benefits of water-borne systems:

- Adhesion to polar substrates
- Acceptance of inorganic fillers
- Low viscosity application

How are PODs different from other dispersions?

- Dispersion of polymers which are not self-dispersing
- High molecular weight polymers
- Thermoplastic and elastomer formulations
- Low viscosity
- High solids
- Solvent-free solution

Aqueous POD benefits

Waterborne Application vs. Extrusion

- Thinner coatings
- Use existing waterborne application equipment
- Higher line speeds
- Penetrate porous/fibrous webs
- Coat complex geometry
- Coat in pattern

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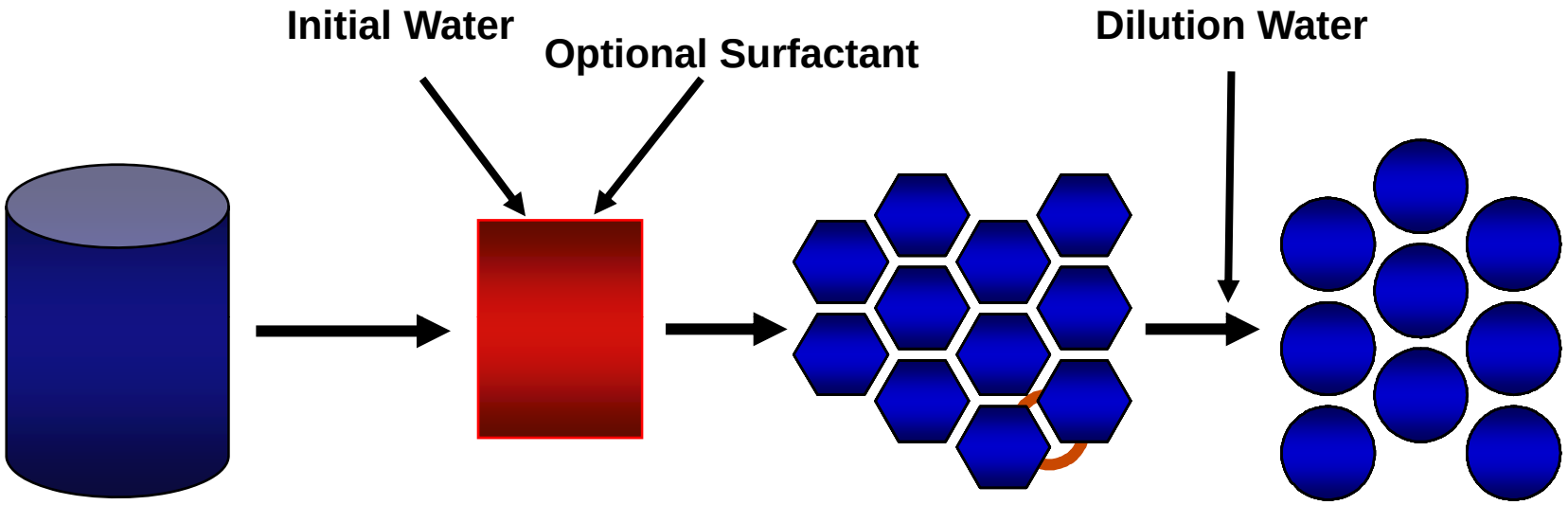
Properties of PODs

- Water resistance
- Oil & grease resistance
- Heat sealability
- Elasticity/flexibility
- Adhesion to polyolefins
- Adhesion to polar substrates

Continuous Mechanical Dispersion Process



Ref : U.S. Patents: 5,539,021; 5,959,027; 5,688,842; 5,959,027; 6,087,440
HIPE = High Internal Phase Emulsion

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Bluewave TECHNOLOGY

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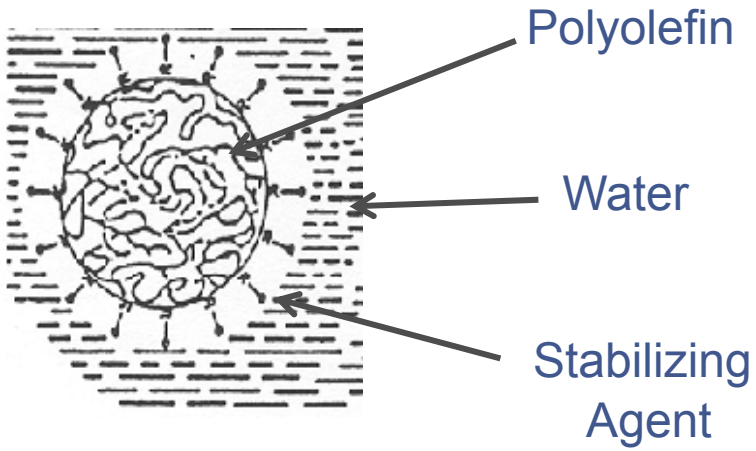
POD Characteristics



Semi-crystalline polymers

- Avg. particle size: ~ 1 µm
- Solids content (wt%): 40 to 55%
- pH: 8.0-10.5
- Viscosity (Brookfield @ 25°C): < 500 cps

Properties of PODs

- Water resistance
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- Elasticity/flexibility
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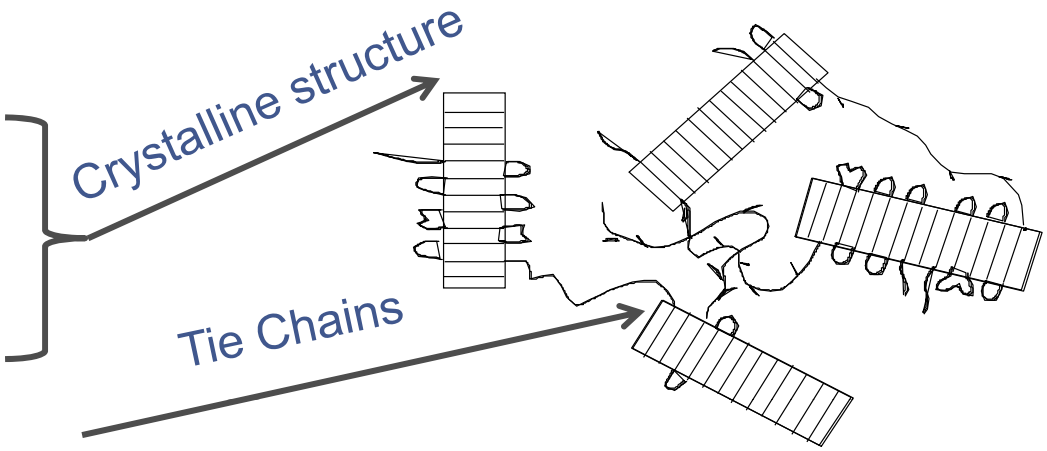
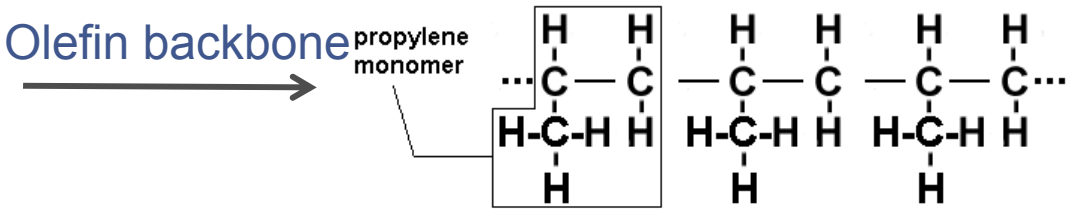
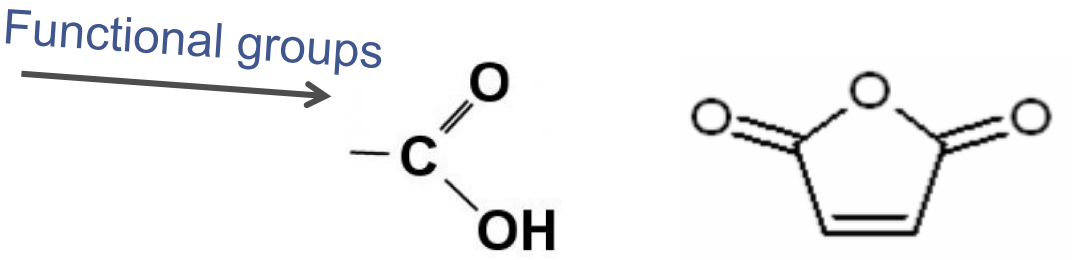




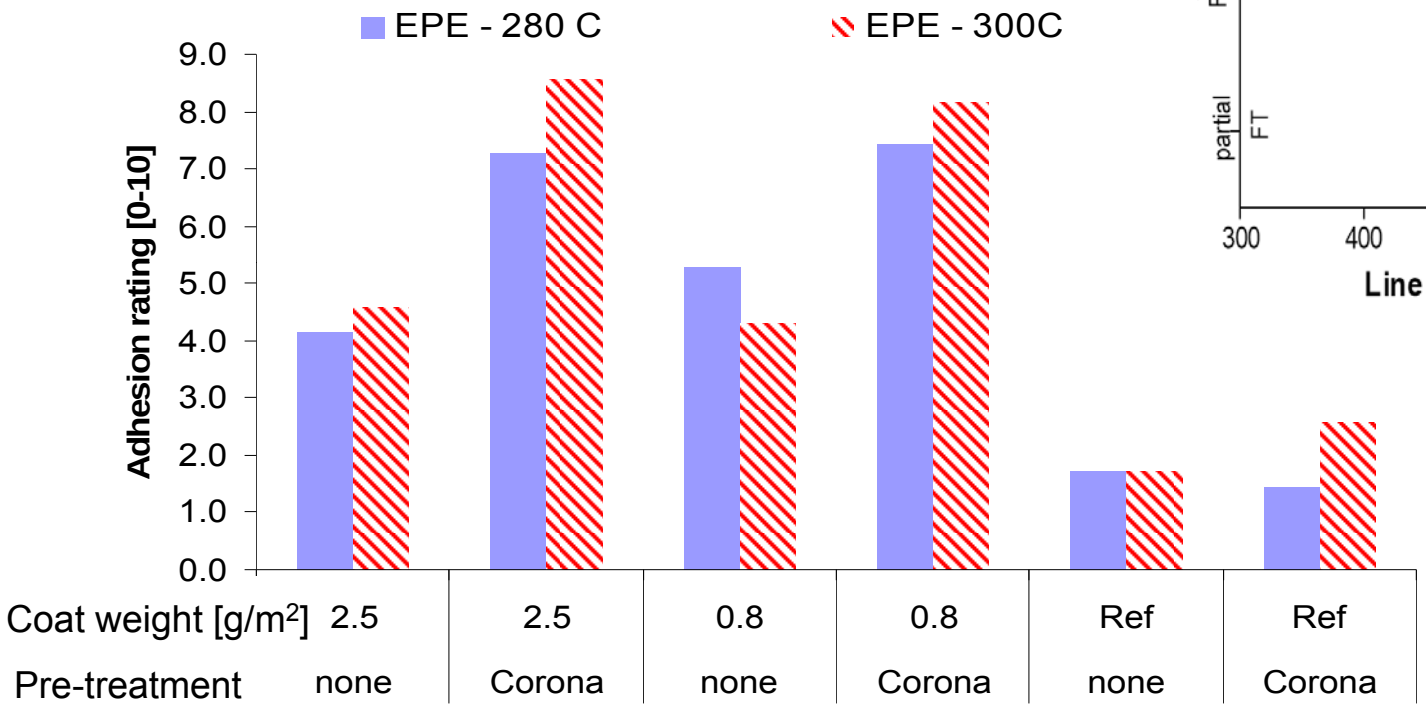


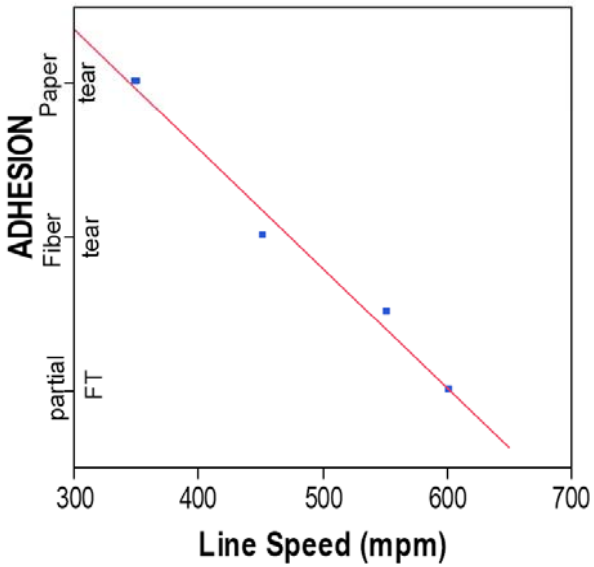
Materials and Results

Product description

Product designation	Target performance	Polymer composition	Functional groups	Polymer melting point [˚C]	Polymer glass transition point [˚C]
POD Primer	Primer	Ethylene-Copolymer	Medium	63	-53
POD Standard	Standard	Ethylene-Copolymer	Low	63	-53
POD BI	Barrier Improvement	Ethylene-Copolymer	Low	63	-53
POD BR	Blocking Reduction	Propylene-copolymer	Medium	80	-26

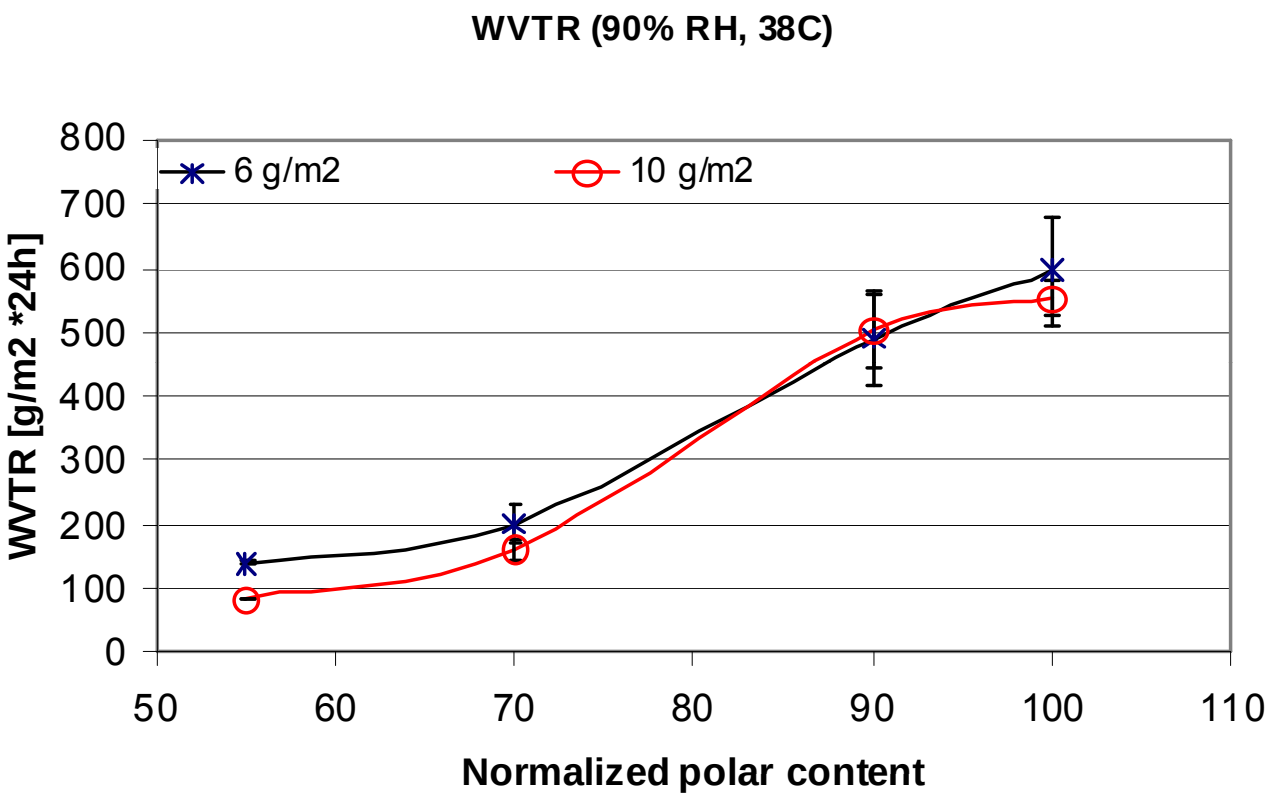
Adhesion priming





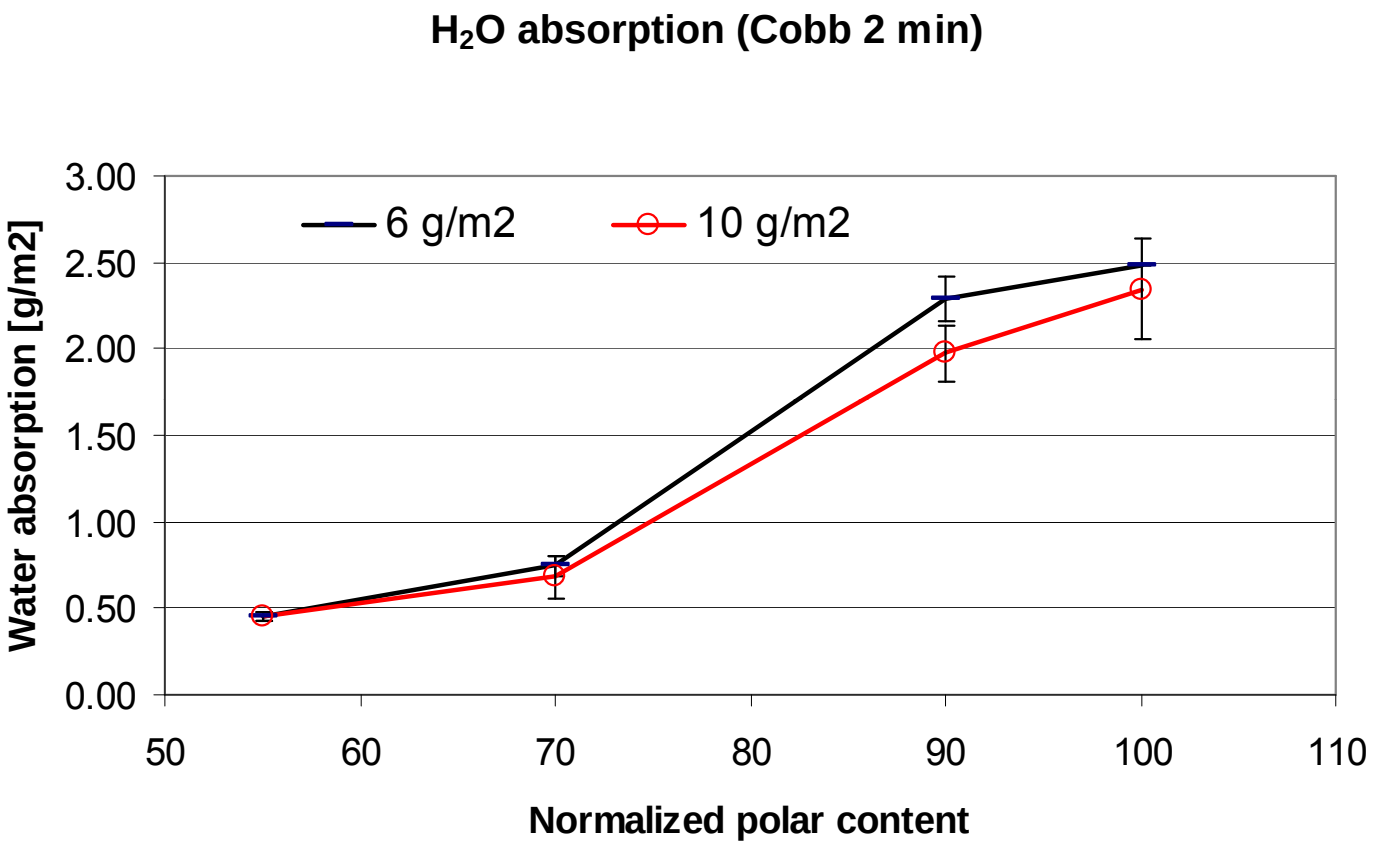
- POD priming improves adhesion already at 0.8 g/m^2
- Enables higher extrusion coating line speeds

Water Vapor Barrier Improvement



- Reduction of polar content improves significantly water vapor barrier

Water barrier improvement



- Reduction of polar content improves significantly water barrier

Improved dispersions

Test results	POD BI Barier improved dispersion	POD BR Blocking reduced dispersion
Barrier test results		
WVTR (90%,RH 38C) [g/m^2/24h]	**54**	**185**
WVTR (50%RH, 23C) [g/m^2/24h]	**13**	**9.5**
Cobb 2 min [g/m^2] [g/m^2/24h]	**0.1**	**0.6**
Grease resistance (Kit test) folded sample	**12**	**12**
Blocking test results		
Blocking rating / fiber tear % (45˚C, 1500 psi)	**3 / 0%**	**3 / 0%**
Blocking rating / fiber tear % (60˚C, 1500 psi)	**5 / 83%**	**4 / 0%**
Heat seal performance		
Heat seal initiation temperature (˚C)	**<70**	**<100**

Summary and Conclusions

Summary

- Polyolefin dispersion have potential to:
  - Reduce steps to build existing structures and create new structures.
  - Coating with online paper or paperboard machine
    - Thinner coatings at higher line speeds
    - Use existing coating techniques
  - Enable sustainable solutions
    - Fluorochemical free
    - Emits low VOCs
    - Lower material use

Conclusions

- Benefits demonstrated in:
  - Adhesion primer between paper and extruded polyolefin
  - Dispersions with improved water and water vapor resistance
  - Oil and grease barrier with balance of water vapor barrier

→ Polyolefin Dispersions have broad application potential

  - Low in-reel blocking with 100% polymer and heat sealing can be achieved

→ Enables on-line coating in paper or board machine

Thank you!