



DuraBind™

The Sustainable Solution for the Wood Industry

Niels Smeets – Ph.D. | Innovation Manager

October 25-27, 2017

Who we are

Enhancing Nature's Best

Adding functionality - tailored to overcome the challenges of fossil fuel based materials

Viable and Practical

Compatible with incumbent technologies, economically positive

Global Reach

Manufacturing, distribution, customer support in over 20 countries

Experienced Team

Global and local experienced industry team

What we do

EcoSphere™

Bio-based alternative to petroleum-based latex coatings in the paper market

>200M lbs

EcoSphere sold to date

- Economic
- Performance
- Sustainability

Commercial relationships with 5 of the top 20 of the industry's largest manufacturers

DuraBind™

Bio-based binder with no-added formaldehyde for building materials

Commercial

in wood composites with DuraBind

- Health and ecological
- Performance
- Economic

Multiple large-scale accounts producing commercial board while industrial trials advance through the supplier qualification process

How we do it

Sustainable Feedstocks
+ Chemicals



Patented
Formula

Proprietary Continuous
Manufacturing Process



Patented
Process

Engineered
Biopolymer



Patented
Process

Engineered
Solutions



Proprietary
Engineering

DuraBind™ is a sustainable adhesive alternative to UF for use in wood composite panel production

DURABIND ADHESIVE:



PARTICLE BOARD



OSB



MDF

DURABIND ADHESIVE SYSTEM:

NON-ADDED FORMALDEHYDE

People-friendly solution for the Healthy Home

SYNERGISTIC PERFORMANCE

Demonstrated improved production process and board end-use properties

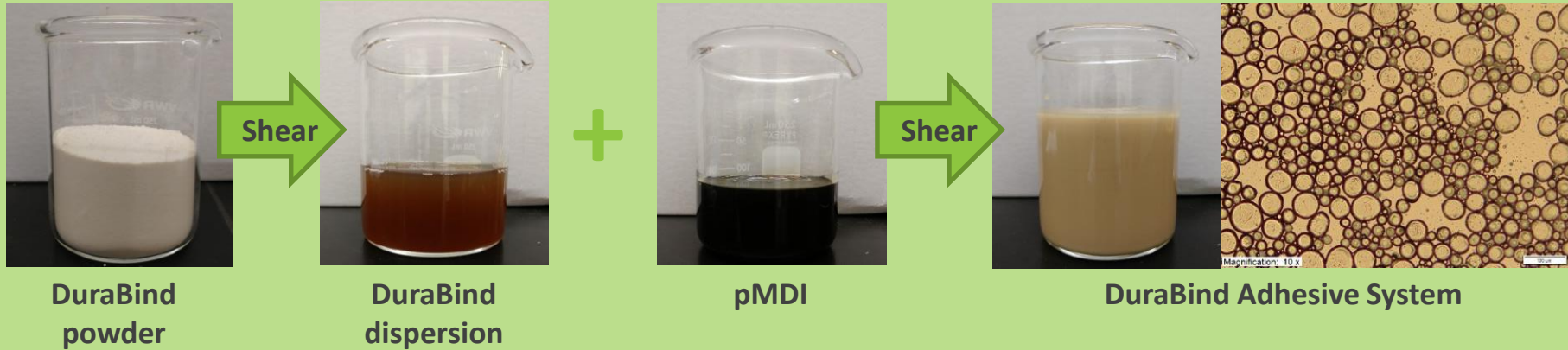
ENABLING TECHNOLOGY

DuraBind enables the use of pMDI through the improved resin distribution (MDF) and the addition of tack (PB)

SUSTAINABILITY

Partially biobased solution that can reduce use of fossil-based chemicals and lower VOCs

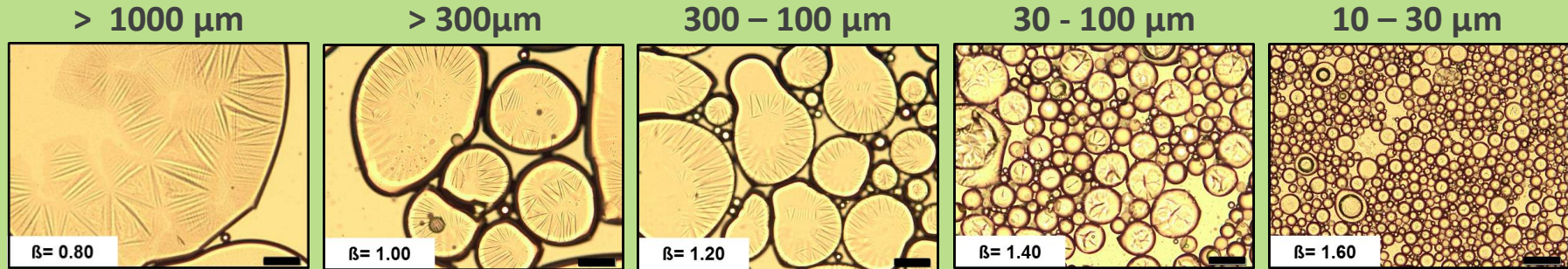
The DuraBind™ Adhesive System – NAF solution for wood composites



DURABIND ENGINEERED BIOPOLYMER

- Is a biobased, non-hazardous product
- DuraBind can be provided as a dry powder or as dispersion (30-35 wt% solids and 200±100 cP)
- pMDI can be emulsified in the DuraBind dispersion to form the DuraBind Adhesive System
- DuraBind can displace pMDI in most wood panel applications

Controlled emulsion properties with DuraBind™ adhesives system

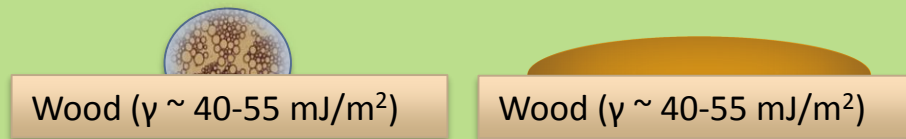


$$\text{Phase ratio } (\beta) = m_{\text{pMDI}} / m_{\text{water}}$$

MANAGING DROPLET SIZE DISTRIBUTION CONTROLS:

- Emulsion stability and resin application
- Pre-curing of pMDI
- Emulsion viscosity and resin distribution
- Wetting and penetration of the resin on the wood substrate

Enhanced efficiency of pMDI through emulsification in DuraBind™

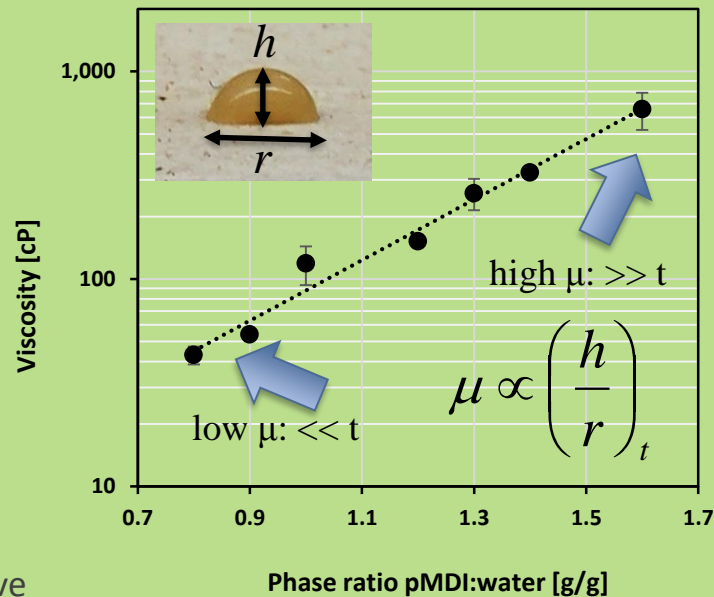
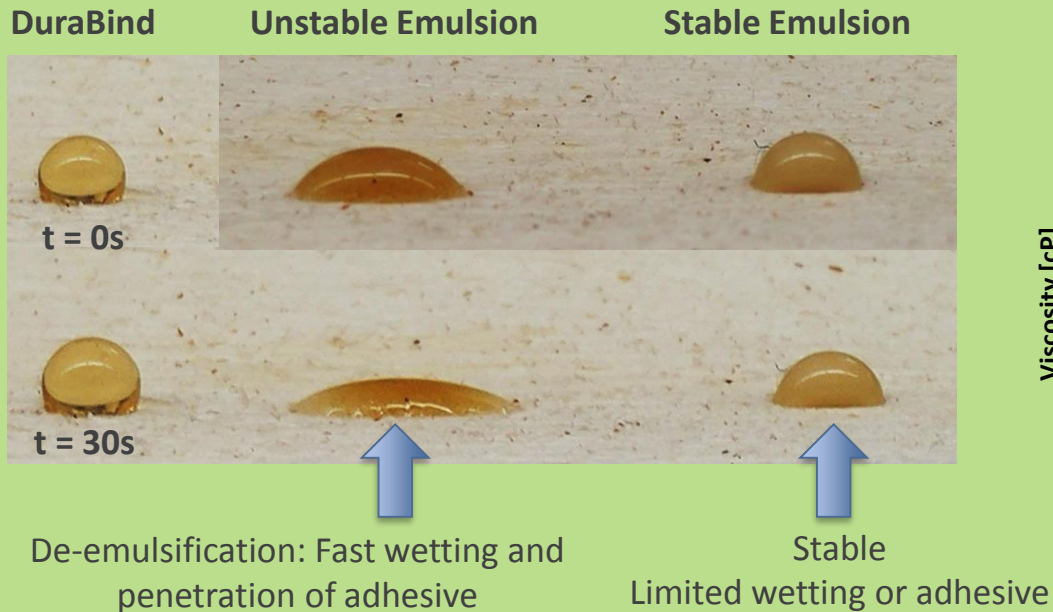


OPTIMIZES WETTING AND PENETRATION OF pMDI WHEN APPLIED ON WOOD CHIPS

10 μL of liquid placed on OSB strands
All liquids in the range of 100 - 300 cP

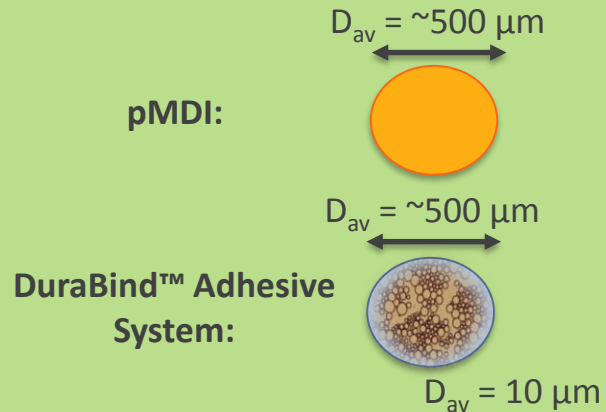
Adhesive properties can be tailored to meet application requirements with DuraBind™ emulsification

The degree of wetting of the DuraBind adhesive system is a function of the emulsion properties



Emulsification delivers more efficient surface coverage and improved adhesion

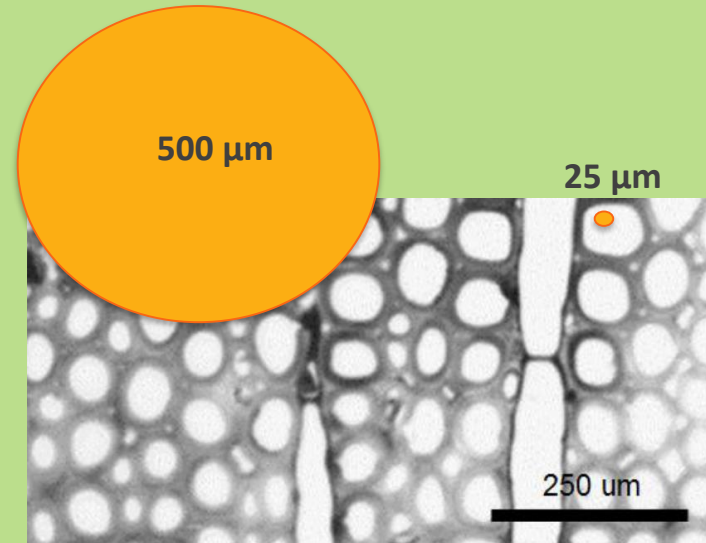
INCREASED RESIN VOLUME IMPROVES DISTRIBUTION + SURFACE COVERAGE



$$V_{pMDI} = 3\% \text{ to wood}$$

$$V_{DURABIND} = 5\% \text{ to wood}$$

SMALL DROPLETS HAVE A LIMITATION...

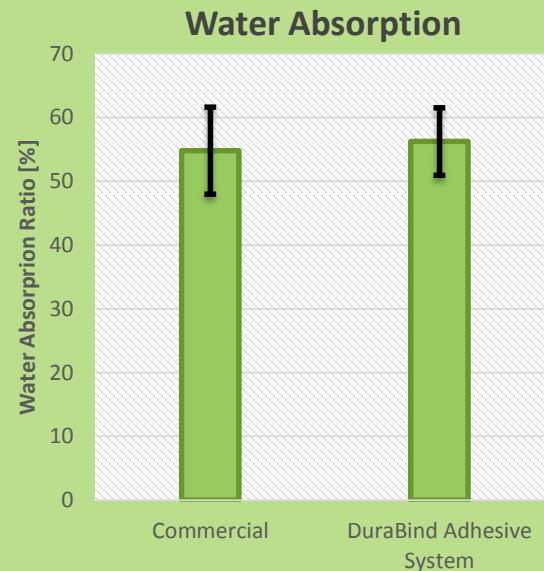
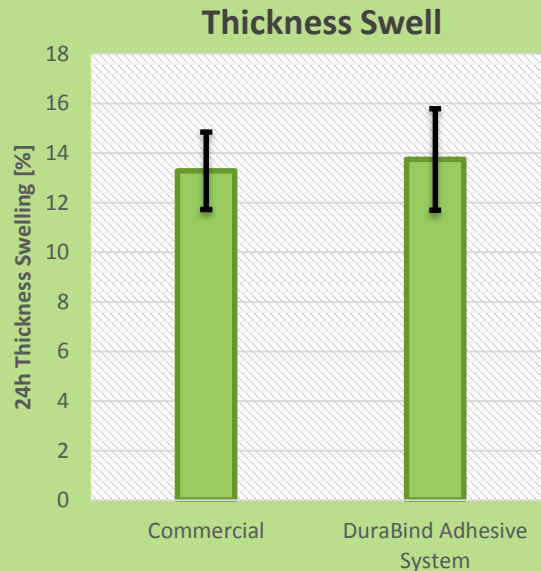
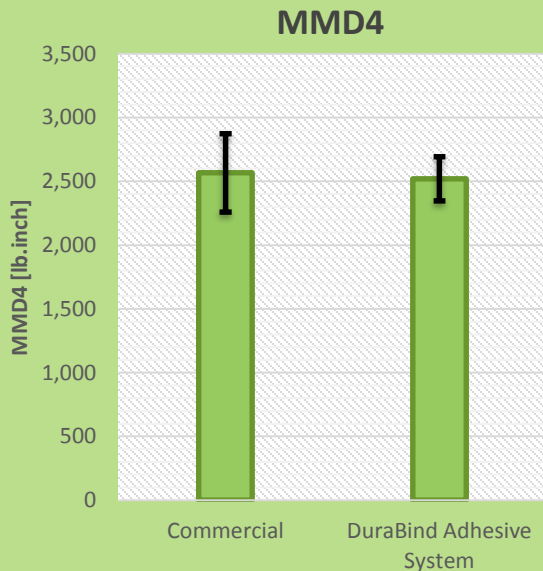


Small droplets results in loss of resin in wood topology or lumen

DuraBind™ adhesive system proven in industrial OSB production

DISPLACEMENT OF PMDI USING DURABIND ADHESIVE SYSTEM IN OSB:

- Moisture resistance performance on-par with incumbent pMDI resin technology
- Improved board economics and increased biocontent



650 kg/m³, 7/16" thick commercial OSB panel

DuraBind™ adhesive system proven in industrial MDF production

IMPROVED PROCESS CHARACTERISTICS

- Improved resin distribution due to optimization of blow-line injection
- Increased run-time due to decreased build-up in blow-line
- Lower press factor and improved productivity
- Improved machinability due to reduced energy consumption + tool wear

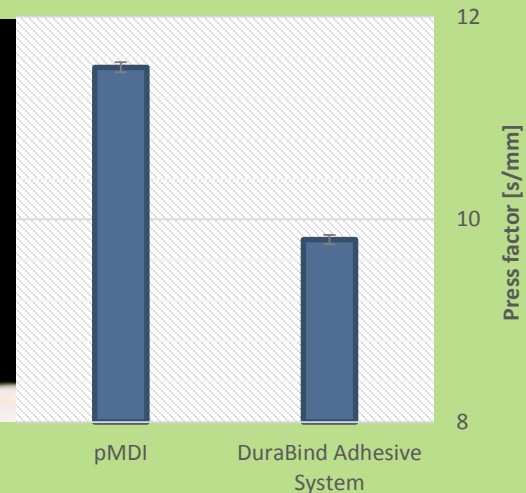
Blow line



Machinability



Press Factor



New generation of DuraBind™ provides Green Tack

ENABLES RESIN CHANGE FROM UF TO NAF IN PARTICLEBOARD



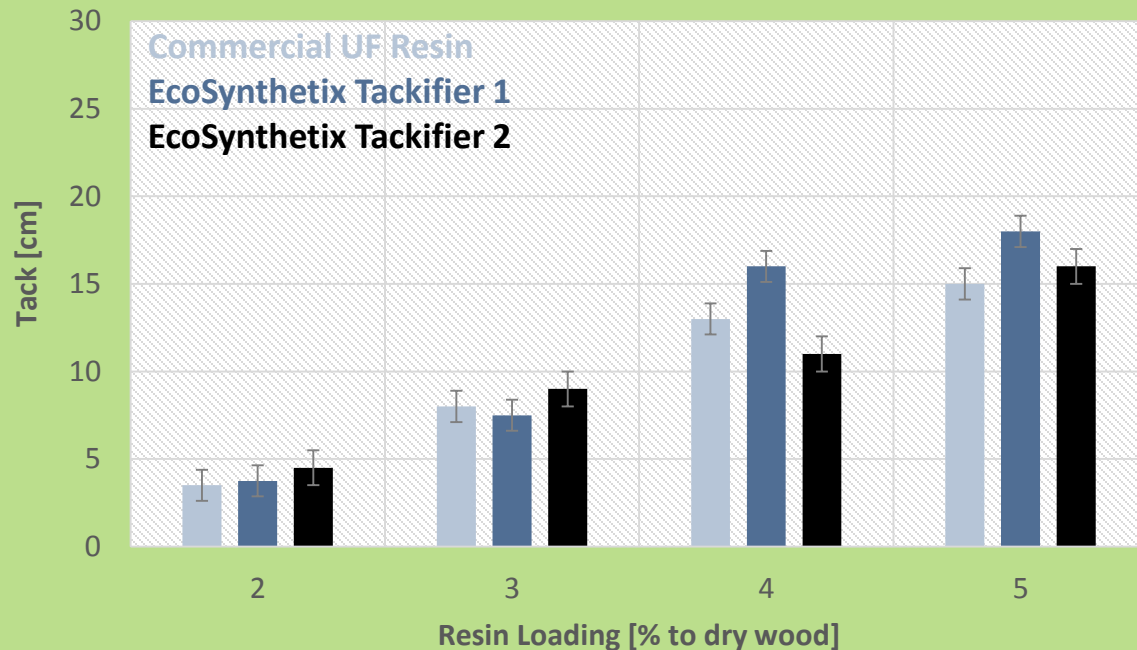
0%



2%



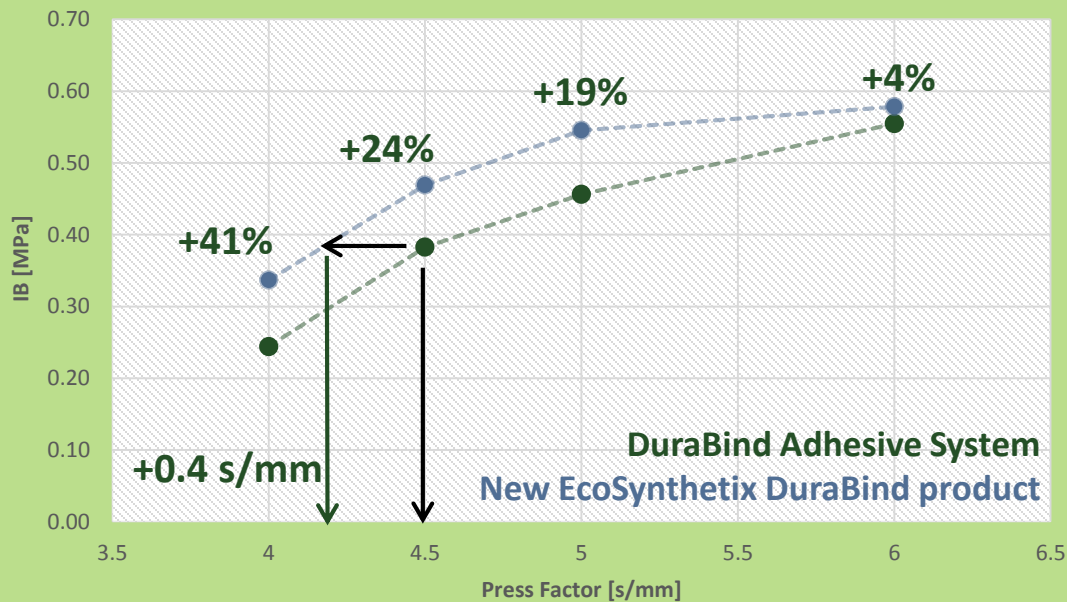
5%



New generation of DuraBind™ for line speed increase

ENABLES FASTER CURING AND INCREASED PRODUCTIVITY

- Up to 1 s/mm press factor reduction thicker grade particleboard



650 kg/m³, 15 mm particleboard

DuraBind™ value proposition will enable broad adoption

PERFORMANCE



VALUE

LONGER PRODUCTION UP-TIME

Reduced blow-line blockage

LOWER PRODUCTION COSTS

Longer tool life

Lower use of costly processing aids

LESS WASTE

Larger processing window

BETTER QUALITY, HIGHER VALUE BOARDS

Market share & margin for our customers

A CALL FOR COLLABORATION

**Collaborative development
partnerships accelerate the pace of
innovation**

**EcoSynthetix is seeking R+D
partners to work together and win**

Dr. Niels Smeets

Innovation Manager

nsmeets@ecosynthetix.com

289-245-4028

+ Team

CHIMAR 



EcoSynthetix Inc.

Question & Answer