

Making Sustainable Products to Diversify Our Forest Industry and Create Good Manufacturing Jobs in Rural Maine



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Who is Biobased Maine?

- Industry-led trade association advancing Maine's emerging biobased manufacturing sector.
- “Biobased” means using renewable resources from forest, farm, and sea to make the next generation of sustainable materials, products, chemicals, and fuels.

Biobased Means Plants to Products

PLANTS, renewable biomass from:

- Forest: woody biomass (trees)
- Farm: agricultural waste
- Sea: ocean biomass/algae



PRODUCTS:

- Biobased Chemicals
- Advanced Biofuels
- Bioplastics
- Advanced materials



BIOBASED MAINE MEMBERS



Capital for Opportunity and Change

Tangible Examples of Biobased Products Made in Maine

- True Textiles made a fabric with 100% bioplastic. It won a Green Chemistry award, is compostable, and no petroleum was used in the manufacture of it.
- Revolution Research (Orono startup) makes an eco-friendly foam board using wood that is free of the carcinogens typically found in competitor's products.
- Grow-Tech makes growth media for edible greens using this felt made with biopolymer (it's compostable).
- Polylactic Acid (PLA) is a biodegradable bioplastic (this one is made from corn, but it can also be made from wood sugars).

Global Demand for Biobased Products Rising Sharply

- Market for biobased materials and chemicals has reached \$1B (a 28% annual increase).
- 2/3 of total chemicals worldwide can be produced from biobased material - over 50,000 products, a \$1T annual global market.
- Global demand for biobased and biodegradable plastics will rise 19% per year.
- Rising demand for bioplastics for food + beverages



WHAT'S DRIVING BIOBASED DEMAND?

1. Consumer demand for safer, less toxic products.
2. Corporate sustainability goals.
3. Oil price volatility.
4. Reducing climate risk.



BIOMASS → SUGARS → BIOPLASTICS → BIODEGRADE



Rising Global Demand for Bioplastics

- Global bioplastics market to reach \$30.8 billion, with 14.8% annual growth from 2015-2020.
- Biobased packaging for the food and beverage sector growing even faster at 36.8%
- TerraVerdae making biobased plastic beads.
- MHG's bioplastic Nodax™ PHA recently certified biodegradable in marine environments.



Image Credit: BBC News



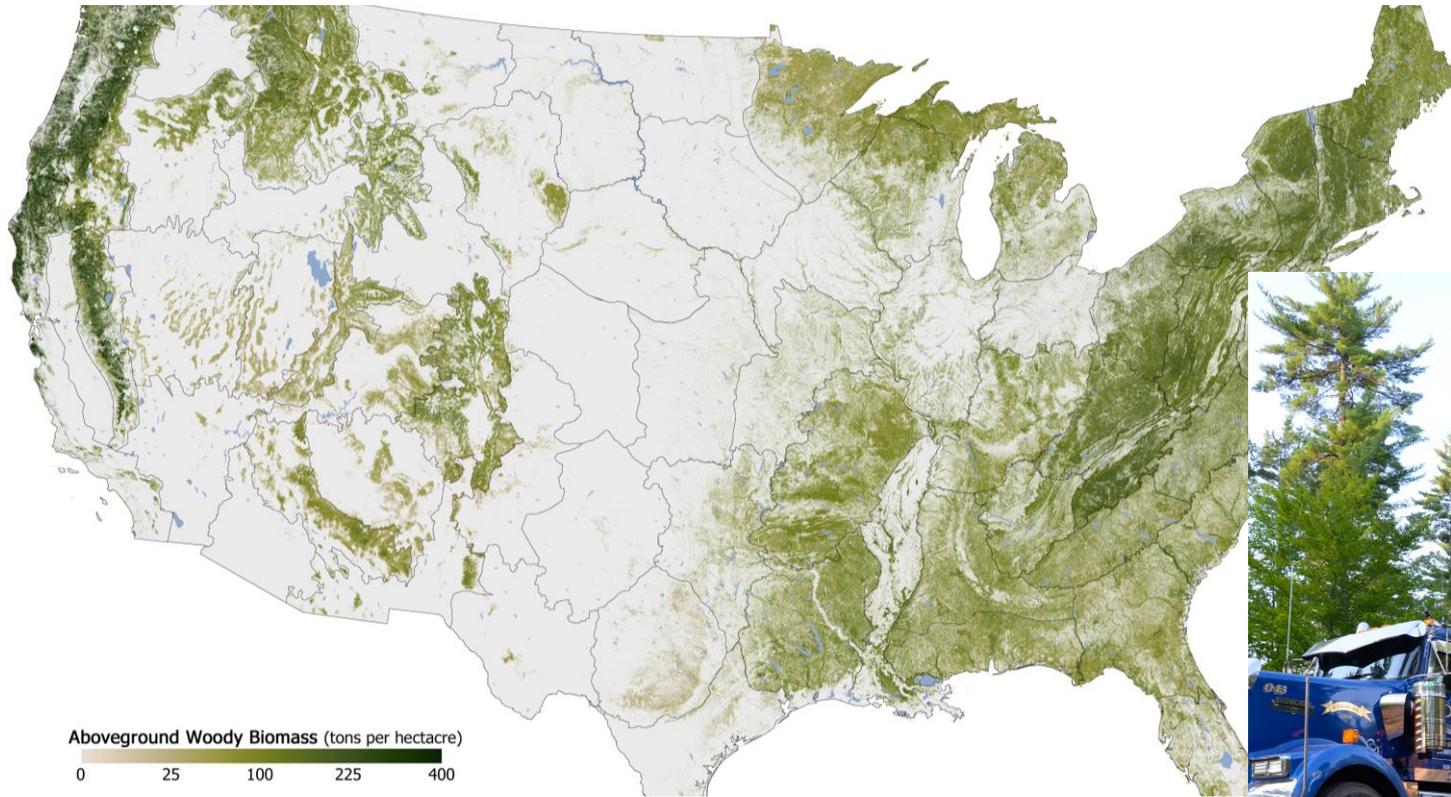
Maine's Assets Can Support Biobased Manufacturing

- ✓ Renewable Biomass, particularly an abundance softwood and residuals that currently lack markets.
- ✓ Robust Workforce
- ✓ Industrial Infrastructure
- ✓ Transportation Assets
- ✓ History of Innovation and Entrepreneurship
- ✓ World Class R&D Capabilities at UMaine



EASTPORT deep water port

Woody Biomass Resource + Harvesting



Most forested state in the country with 8.27 million acres of certified sustainable forests AND the infrastructure for harvesting (this is IMPORTANT).



Biobased Manufacturing is...

An economic development strategy that:

1. Responsibly harvests Maine's natural resources to make higher-value products
2. Creates good manufacturing careers
3. Responds to rising global demand
4. Makes safer, more sustainable products
5. Replaces fossil carbon with carbon from renewable sources

Maine's Biobased Sector is Growing

Plants to Products Forum 2016 a Success

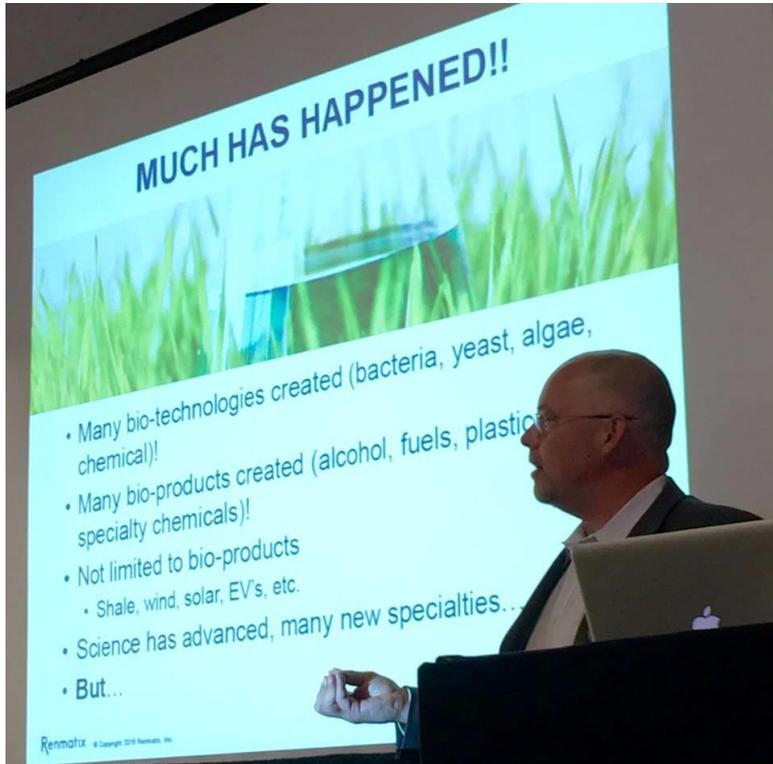
- > 55 attendees, 10 exhibitors
- National speakers
- Front-page news



Plants to Products Forum 2016



RENMATIX



- Viable technology to convert woody biomass into valuable industrial sugars.
- Recent investors: BASF, Total S.A., UPM
- 8/2/16 NEWS: U.S. DOE Bioproducts-Biofuels Program investing in Renmatix and partners to develop biobased, renewable hydrocarbon precursor for use in detergents, cosmetics, and transportation fuels.

“Feds deliver \$7.7 million to diversify Maine's economy” – August 1, 2016

Mainebiz

MAINE'S BUSINESS NEWS SOURCE

“Global demand spurs growth in new forest product sectors” – July 11, 2016



Portland Press Herald

“Time running out for Maine to cash in on ‘biobased’ products, advocates say

“Leaders at a forum Friday urged the state to get more proactive about creating sustainable products from its rich resources, including 17 million acres of trees.” – June 4, 2016

“A new Maine manufacturing strategy could turn plants into products” – 9/3/15



Our Strategy to Create and Retain Jobs in Maine

- July 2016: U.S. Department of Commerce invests in our work.
- Project partners: University of Maine, Biobased Maine, and Environmental Health Strategy Center
- 3-Year Project to Diversify Maine's Forest-Based Economy through Biobased Manufacturing

Scope of Biobased Maine's 3-Year Project

- Task 1: Road Map to Advance Biobased Manufacturing in Maine
- Task 2: Market Maine's Assets to the Global Biotechnology Industry
- Task 3: Attract private investment, particularly for the manufacture of building-block sugars at underutilized mills

Global Marketing is in Full Swing

- Advanced Bioeconomy Leadership Conference 2017 – Washington DC: 450 of the world’s bioeconomy leaders got the message that Maine is a player now.
- Maine products displayed and relationships fostered.



ABL2017 Advanced Bioeconomy Leadership Conference Mayflower Hotel, Washington, DC • March 1-3, 2017

SUSTAINABLE AVIATION SUMMIT

ABLCS60

Natalie Mindrum, United Airlines

Pat Graber, CEO, Gevo

Jim Mariani, CEO, Fulcrum BioEnergy

Kevin Steink, CEO, Bragg

SUSTAINABLE AVIATION SUMMIT

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UDOP - speaker TBA

Terry Kulesa, CEO, Red Rock Biofuels

Randy LeTang, CEO, SIG Proton

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Steve Cooke, Ex. Dir., CAAF

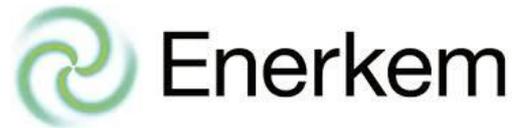
Mark Rummen, FAA

Nancy Young, Airlines 4 America

Biobased Maine's Global Marketing Effort Goes International at



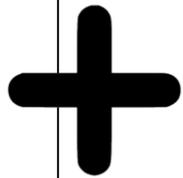
- Biobased Maine to Attend and Exhibit at Bio-Based Live Europe
- May 31 and June 1, 2017 in Amsterdam.
- Goal: to build relationships to help attract private investment in Maine
- End Game: JOBS in RURAL MAINE



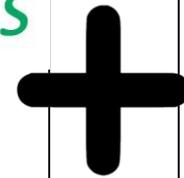
How Do We Attract Private Investment?

1. Under-Utilized Assets:

- Wood that currently lacks markets
- Mills – both active mills under-capacity
- Transportation Assets
- Workforce**



2. Technology Companies:



3. The DEAL:

- Financing/ Investors
- Policy Incentives
- Off-takes or finished goods manufacturers.



World-Class R&D Capabilities at



Nanocellulose Pilot Plant at Process Development Center



Technology Research Center adjacent to idle Old Town pulp mill.



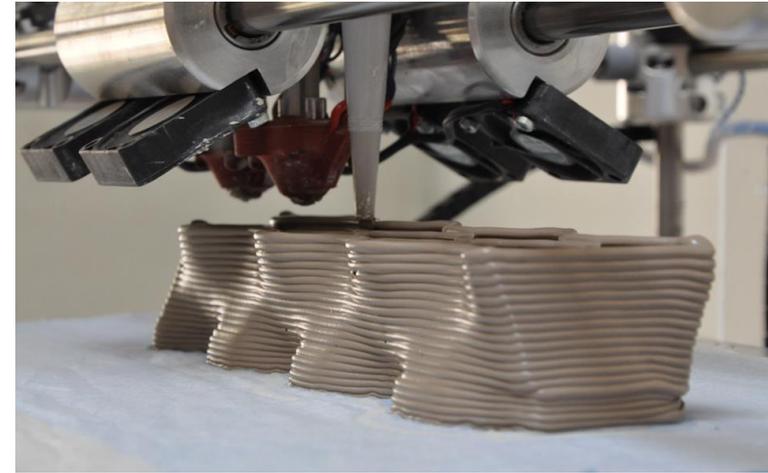
University of Maine and FBRI's

Continued Focus:

- Looking for new technologies suitable for Maine's abundance of softwood and finding the best, highest-value uses for wood, waste streams, and residuals, such as:
 1. Biobased Chemicals from Wood
 2. Advanced Biofuels from Wood
 3. Other biorefinery applications

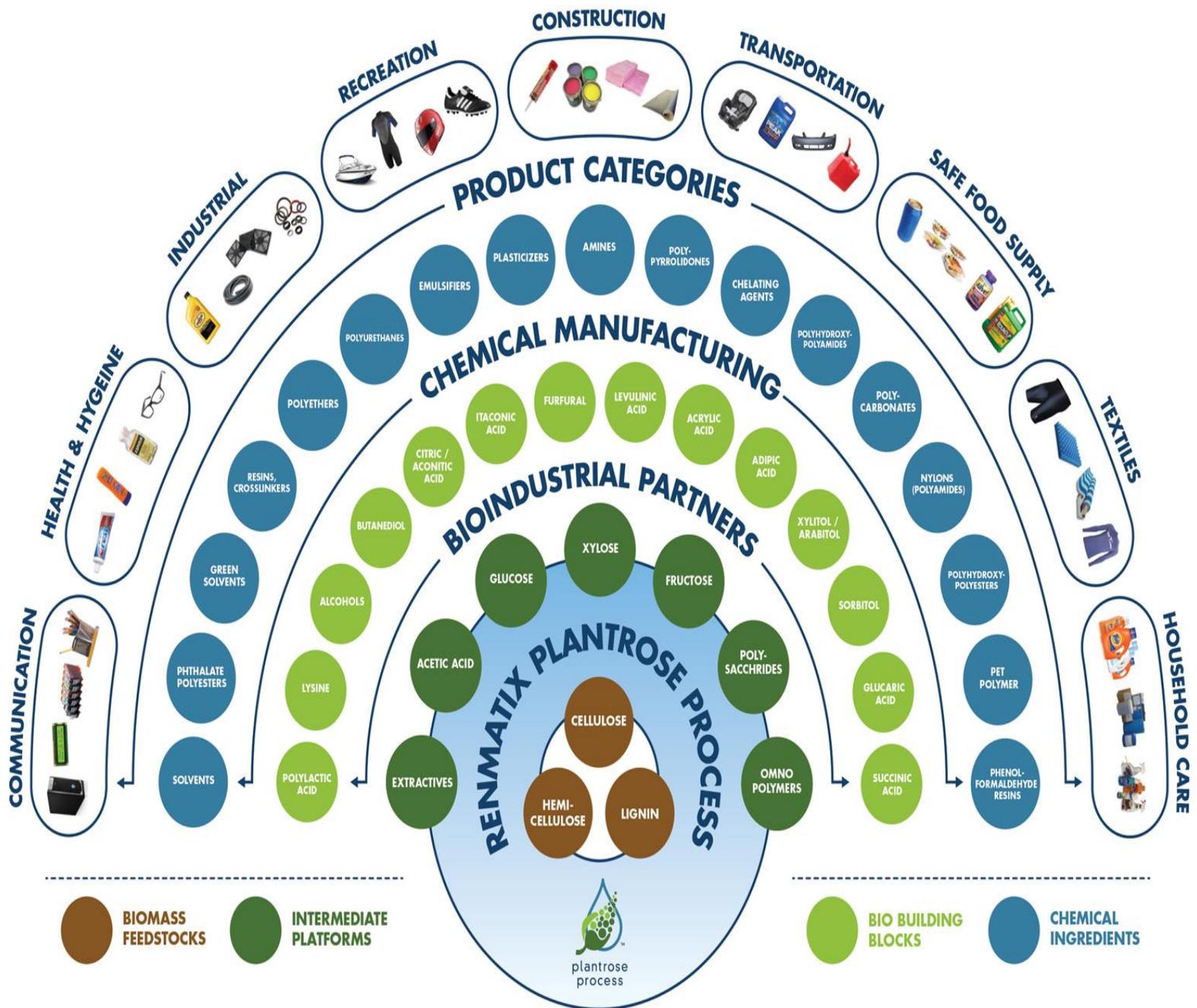
UMaine Collaborates with Oak Ridge National Laboratory: Additive Manufacturing with Biobased Materials

- 3-D Printing of Very Large Structures (buildings and boats!)
- Current synthetic materials are expensive. Wood fiber is BETTER.
- Thermoplastics made with biobased materials can be engineered to be stronger.
- Rapidly expanding applications



3-D Printer and Printed Yacht
(below)





BIOMASS FEEDSTOCKS

INTERMEDIATE PLATFORMS

BIO BUILDING BLOCKS

CHEMICAL INGREDIENTS

Get Involved!

- Biobased Maine: biobasedmaine.org
- Maine Development Foundation's Forest Economy Growth Initiative: mdf.org/foresteconomy
- University of Maine FBRI: forestbioproducts.umaine.edu/
- Environmental Health Strategy Center: ourhealthyfuture.org

Questions/Discussion

