



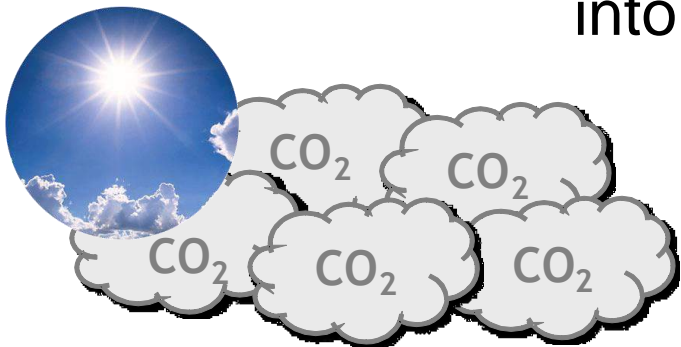
Successfully Introducing New Materials That Underpin the Circular Economy

A View From The Frontlines

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EU Public Affairs Manager
NatureWorks LLC
September 22, 2015

www.natureworksllc.com

NatureWorks is in the business of turning greenhouse gases into performance products

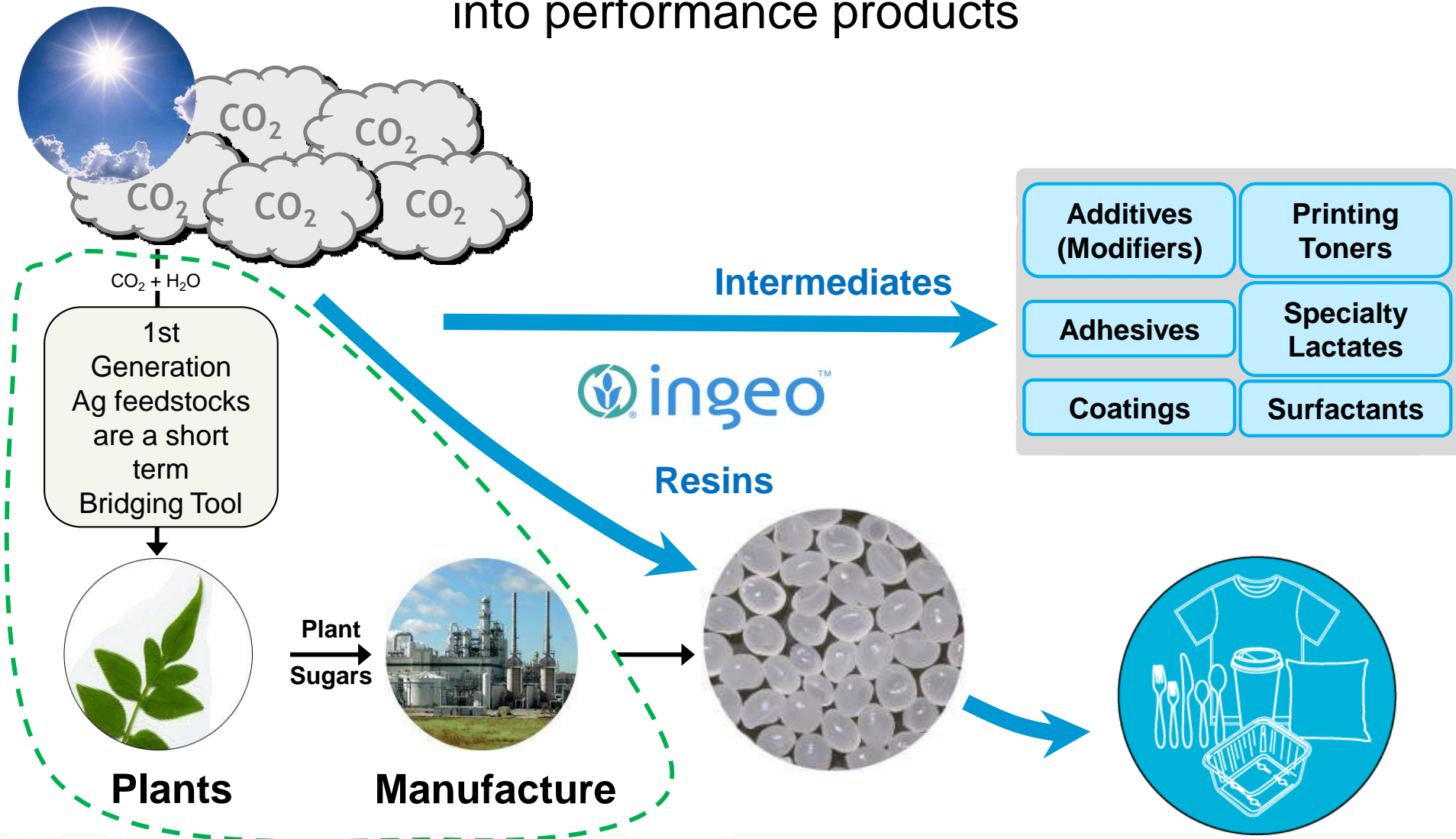


Additives (Modifiers)	Printing Toners
Adhesives	Specialty Lactates
Coatings	Surfactants

Resins



NatureWorks is in the business of turning greenhouse gases into performance products



We are committed to feedstock diversification:

Performance materials made by transforming whatever are the right, abundant, local resources

Investment in innovation and R&D collaboration to grow our Ingeo feedstock portfolio.

GENERATION I: 1st step



Where we are today

Dextrose from corn starch

“Bridging Crops”

GENERATION I: 2nd step



Where we are going now

Sucrose from locally abundant materials such as sugar cane

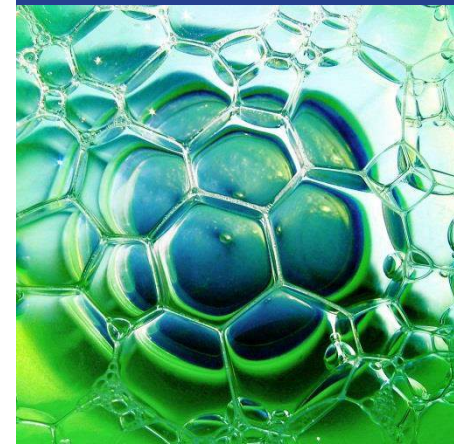
GENERATION II



Next 3-5 years

Lignocellulosics: Sugars from bagasse, wood chips, switch grass or straw.

GENERATION NEXT



And next?

CO₂ to lactic acid technology?

CH₄ to lactic acid technology?

Ingeo in the Market

Rigids



Food Serviceware



Films



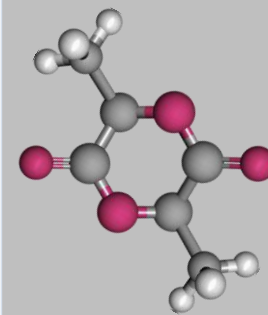
Nonwovens / Fibers



Durables



Lactides



Incubator



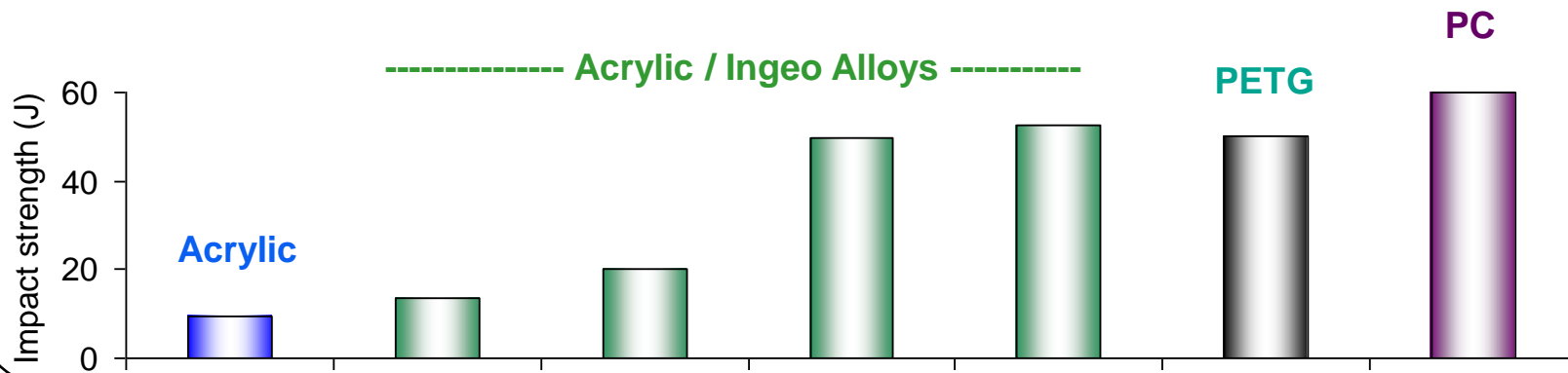


Innovation in Form-Fill-Seal Packaging



Improving Plexiglas PMMA Impact Performance with Ingeo

Impact performance comparable to PETG and PC



ALTUGLAS
INTERNATIONAL
ARKEMA GROUP

Source: Altuglas International a subsidiary of Arkema International



Shopping Bags Made from Naturally Advanced Ingeo *There's no Better Way to Bring Home the Groceries*

Introducing the BotanicBag™ a reusable bag made from naturally advanced Ingeo™ fibers. An innovative and more responsible material that satisfies practical performance needs while matching your environmental concerns. Ingeo delivers all the performance benefits of synthetic fibers with the reduced environmental impact and price stability offered by annually renewable materials.



Ingeo nonwoven bag performance characteristics

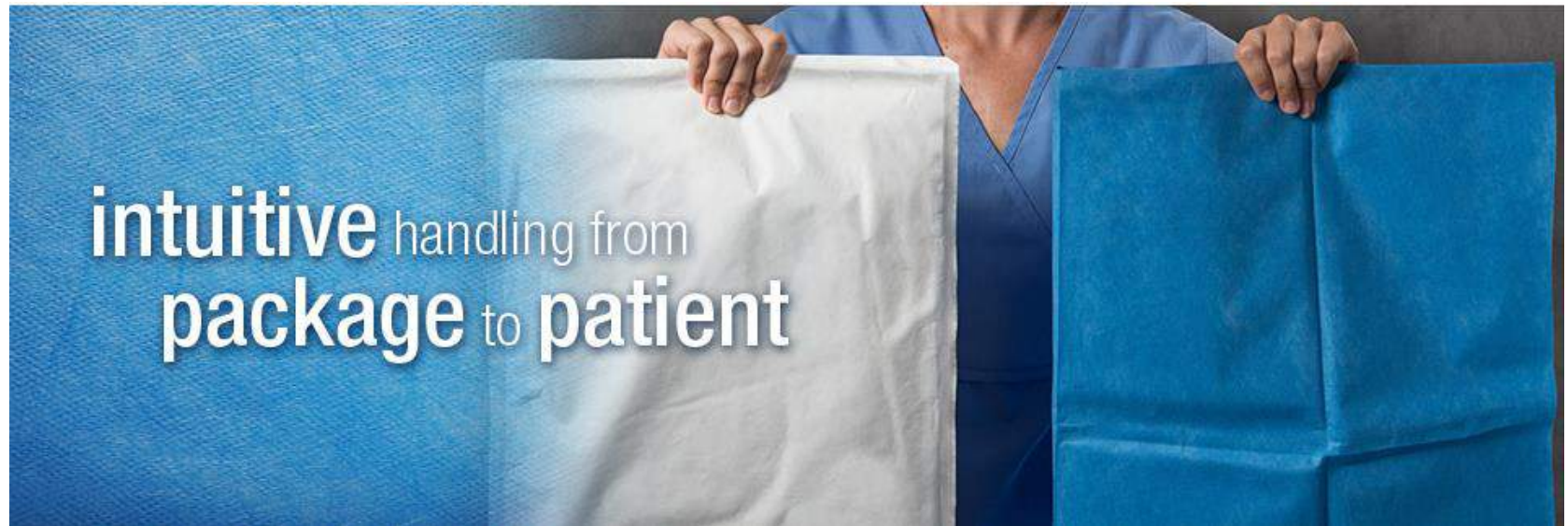
- Prints with ease providing excellent color vibrancy
- Features strong UV resistance, good flame retardant performance and low moisture regain
- Resists stains
- Repels odor
- Brings price stability

Ingeo credentials

- Made from renewable carbon
- Production requires less fossil fuel from cradle to pellet
- Ok Biobased/Vincotte certified



3M™ Steri™ Drape Surgical Drapes



“Now made with plant-based renewable resources, 3M Steri-Drape Surgical Drapes use fewer fossil fuels¹ and decrease CO₂ emissions to help reduce the environmental impact of medical disposables². Matching sustainability with improved product performance, the entire drape provides a high level of protection for patients and healthcare professionals ... “



'THE FEEL OF PAPER - BUT THE STRENGTH OF PLASTIC'

A blend of selected kraft pulp in combination with Ingeo

Ingeo
naturally advanced materials

 **NatureWorks**



DuraPulp
by Södra

www.sodrapulplabs.com

ingeo

naturally advanced materials

 NatureWorks

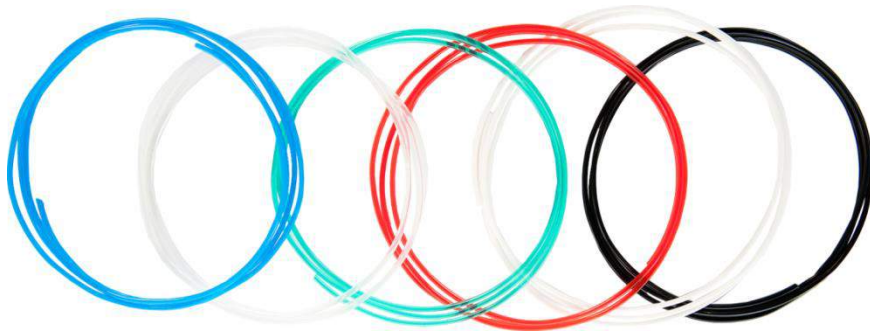
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11

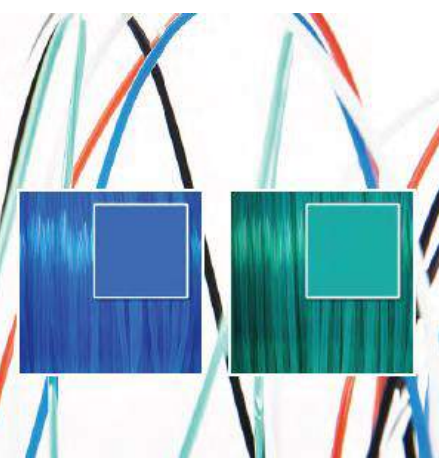
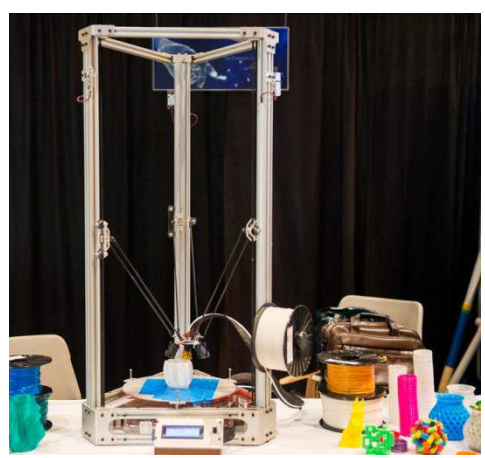
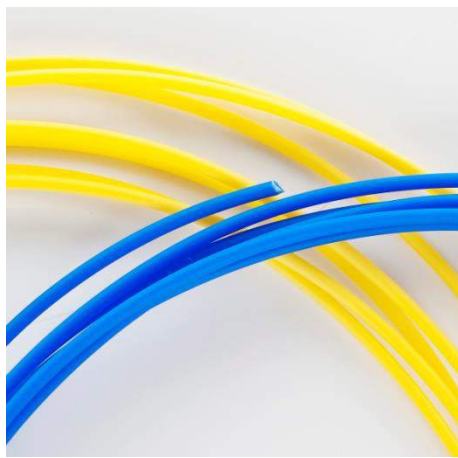
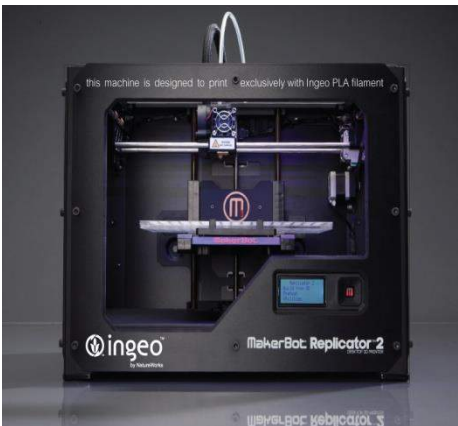
3D Printing - New Material Innovation Fueling Wholly New Markets ...

Ingeo Performance in a (rapidly) emerging end market

- Low polymer thermal shrinkage means high resolution printing of the most complex parts
- Strong Ingeo fusing performance means it's easy to use and performs well on most prints
- Low Ingeo melt point means safer, lower temperature printing.
- Very low emissions with Ingeo means no unpleasant odors



Ingeo in 3D Printing



**On the one hand, you'd think it would
be easy in the US...**

NATIONAL BIOECONOMY BLUEPRINT



**“The world is shifting to an innovation economy
and nobody does innovation better than America.”
—President Obama, December 6, 2011**

**April 26, 2012 - OBAMA
ADMINISTRATION
UNVEILS “BIOECONOMY
BLUEPRINT” ANNOUNCES
NEW R&D INVESTMENTS**

“Decades of life-sciences research and the development of increasingly powerful tools for obtaining and using biological data have brought us closer to the threshold of a previously unimaginable future: “ready to burn” liquid fuels produced directly from CO₂, ... plastics made not from oil but from renewable biomass . . .”

But translating that clear top down message into action in the US has been difficult

**In reality, the US (and all nations)
compete globally in attracting
bioeconomy investment**

Benchmarking what the 'competition' is doing

Incentive Schemes Around the World

Supply Incentives

- Tax Credits
 - Production
 - Investment
- Tax Holidays
- Loan Guarantees
- Preferred Loan Rates

Demand Incentives

- Tax Breaks
- Exemptions
- Quotas
- Bans

Global Incentive Schemes – A Sampler

Country	Supply Incentives	Demand Incentives
 Taiwan		✓
 Korea		✓
 Japan		✓
 Phillipines		✓
 Australia		✓
 European Union		✓
 USA	???	✓
 Thailand	✓	✓
 Brazil	✓	
 Malaysia	✓	
 Singapore	✓	
 Indonesia	✓	
 Canada	✓	

Putting It All Together - Thailand As An Example



Policy Recommendations to Realize Bio-Economy, US Global Leadership with Advanced Manufacturing

➤ Tax Incentive Parity (consistent with other renewables & sectors)

- *Renewable Chemical Production Tax Credit (PTC)*
- This pulls through manufacturing & production along value chain
- Needed to level playing field for US to compete against Sovereign Nations luring this industry abroad – ensure BioEconomy Takes Root here in US.

➤ Farm Bill

- Loan Guarantees for biobased chemicals
- USDA BioPreferred funding