



Ingeo from a Cradle-to-Cradle Perspective:

Opportunities, Obstacles, and Optimism

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Where we are in the Market

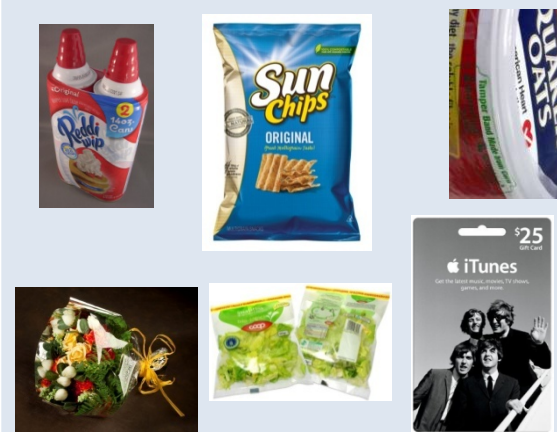
Rigids



Food Serviceware



Films



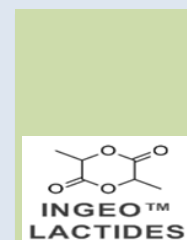
Nonwovens / Fibers



Durables



Lactides



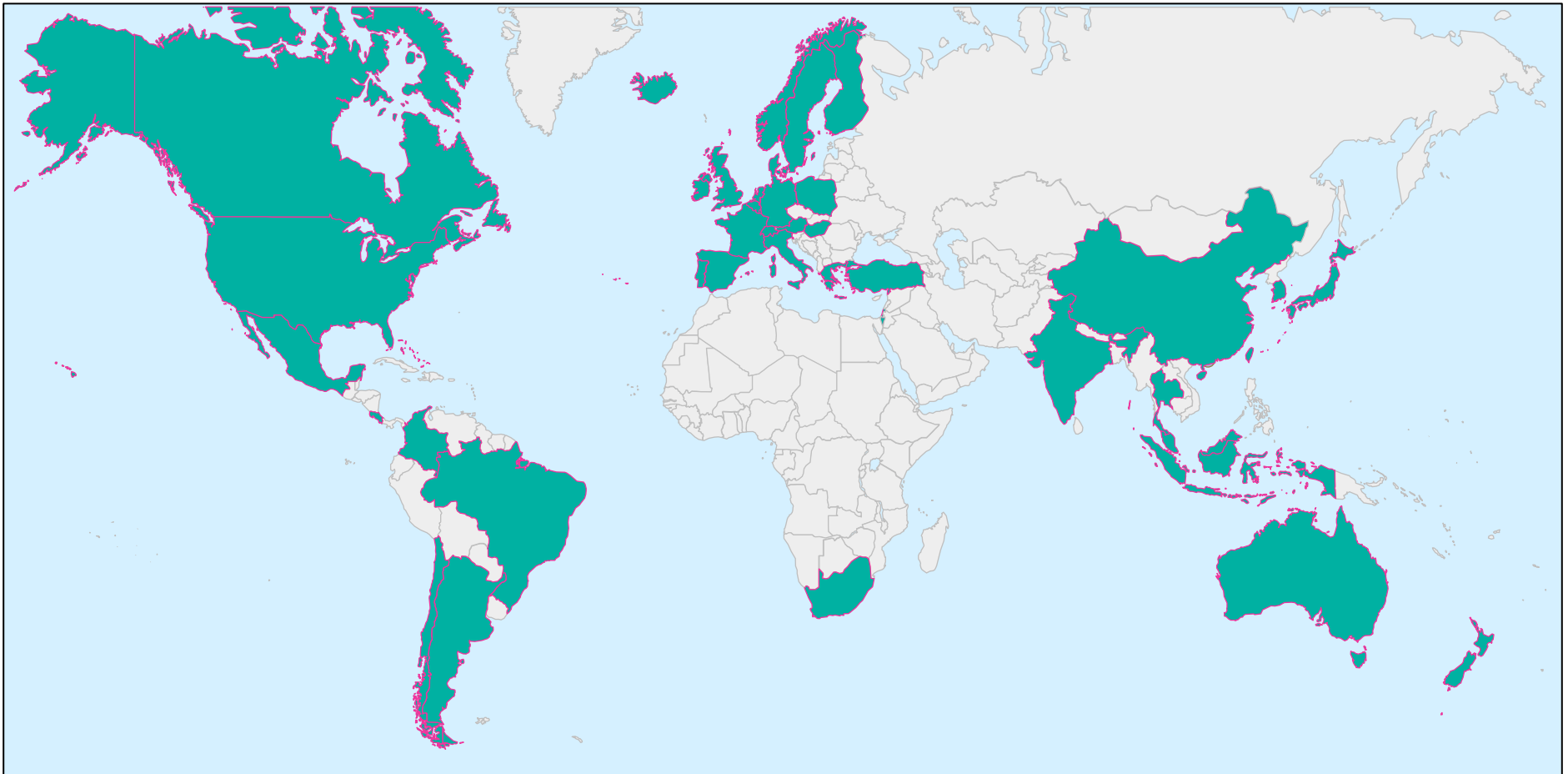
Bus. Dev.



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Global-scale adoption



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Global-scale adoption



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Ingeo From A Cradle-to-Cradle Perspective

“Nature doesn’t have a design problem, people do”

William McDonough and Michael Braungart, 2002



“Technical nutrients”

- basically inorganic or synthetic materials manufactured by humans—such as plastics and metals-- that can be used many times over without any loss in quality, staying in a continuous cycle.



“Biological nutrients”

- Biological nutrients and materials are organic materials that can decompose into the natural environment, soil, water, etc. without affecting it in a negative way, providing food for bacteria and microbiological life

Ingeo recycle




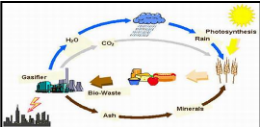


Ingeo composting

Source: **Cradle to Cradle: Remaking the Way We Make Things** by William McDonough & Michael Braungart



Ingeo Cradle to Cradle Options






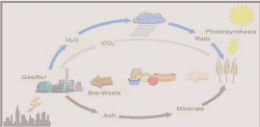


		Incumbent Plastics	Ingeo
Mechanical Recycle		✓	✓
Feedstock Recovery			✓
Compost			✓
Anaerobic Digestion			✓
Energy Recovery		✓	✓
Landfill		✗	✗

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Recycle Options

		Incumbent Plastics	Ingeo
Mechanical Recycle		✓	✓
Feedstock Recovery			✓
Compost			✓
Anaerobic Digestion			✓
Energy Recovery		✓	✓
Landfill		✗	✗

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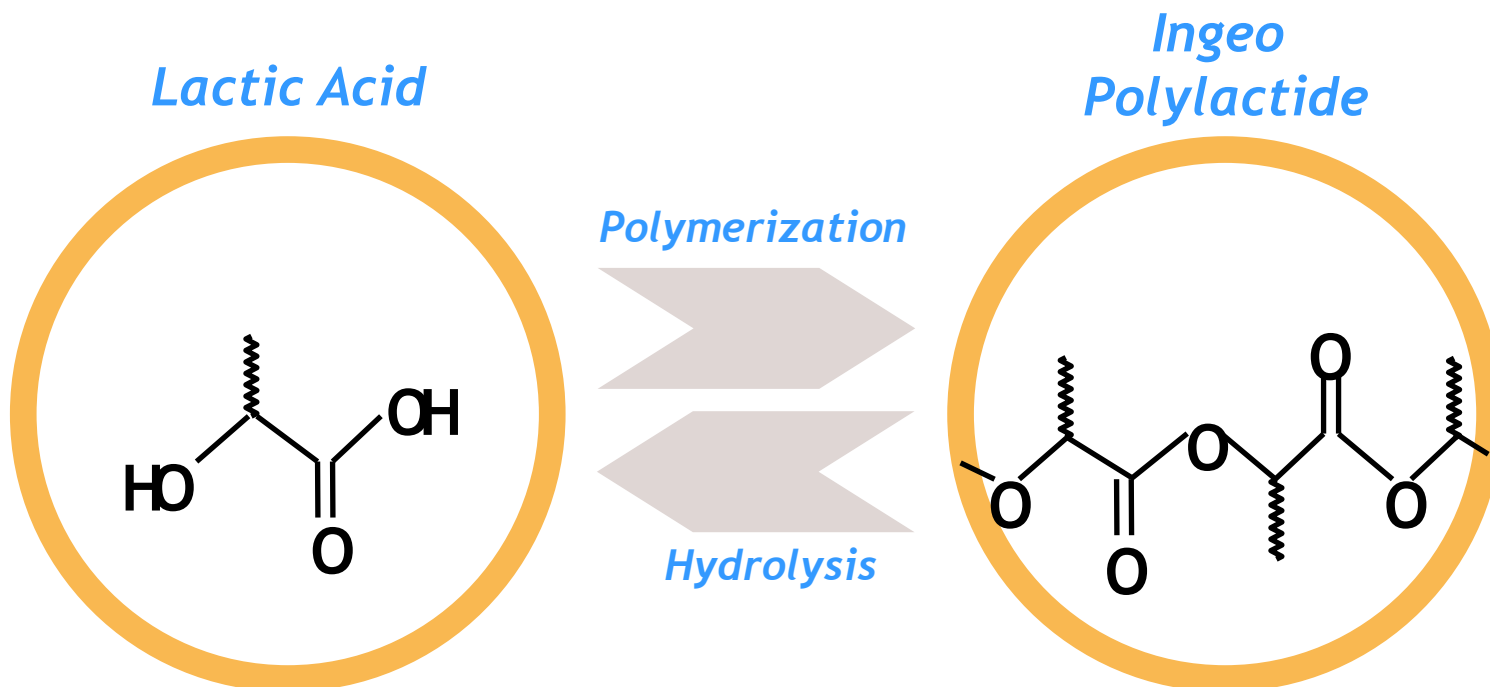


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What we mean by “Feedstock Recovery”

Ingeo™ is a bio-polymer made from lactic acid



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the obstacles ?

- Identification & sortation methods
- Volumes available
- End markets

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In a nutshell - NatureWorks approach

Develop Business by:

- Selling Ingeo grades into consumer products where the potential for recycle stream contamination is minimal
- Targeting products which today, have little or no recycle yet occurring
- Achieving scale “safely”

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In a nutshell - NatureWorks approach

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Implications . . .

- Constrained sales into certain applications & geographies



In a nutshell - NatureWorks approach

Develop Business by:

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- Targeting products which today, have little or no recycle yet occurring
- Achieving scale “safely”

All the while simultaneously

1. Developing end markets
2. Characterizing Ingeo presence in recycling system today
 - where is it, (which streams),
 - how much is there
 - what’s the economic potential
3. Working with recyclers to address sortation challenges

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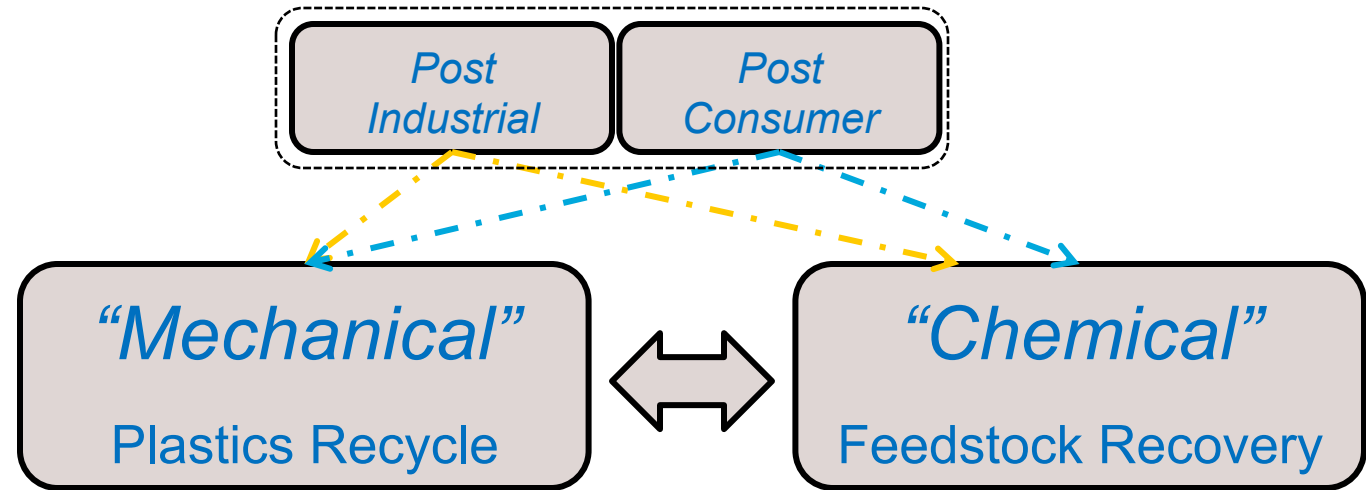


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1. End Market Development

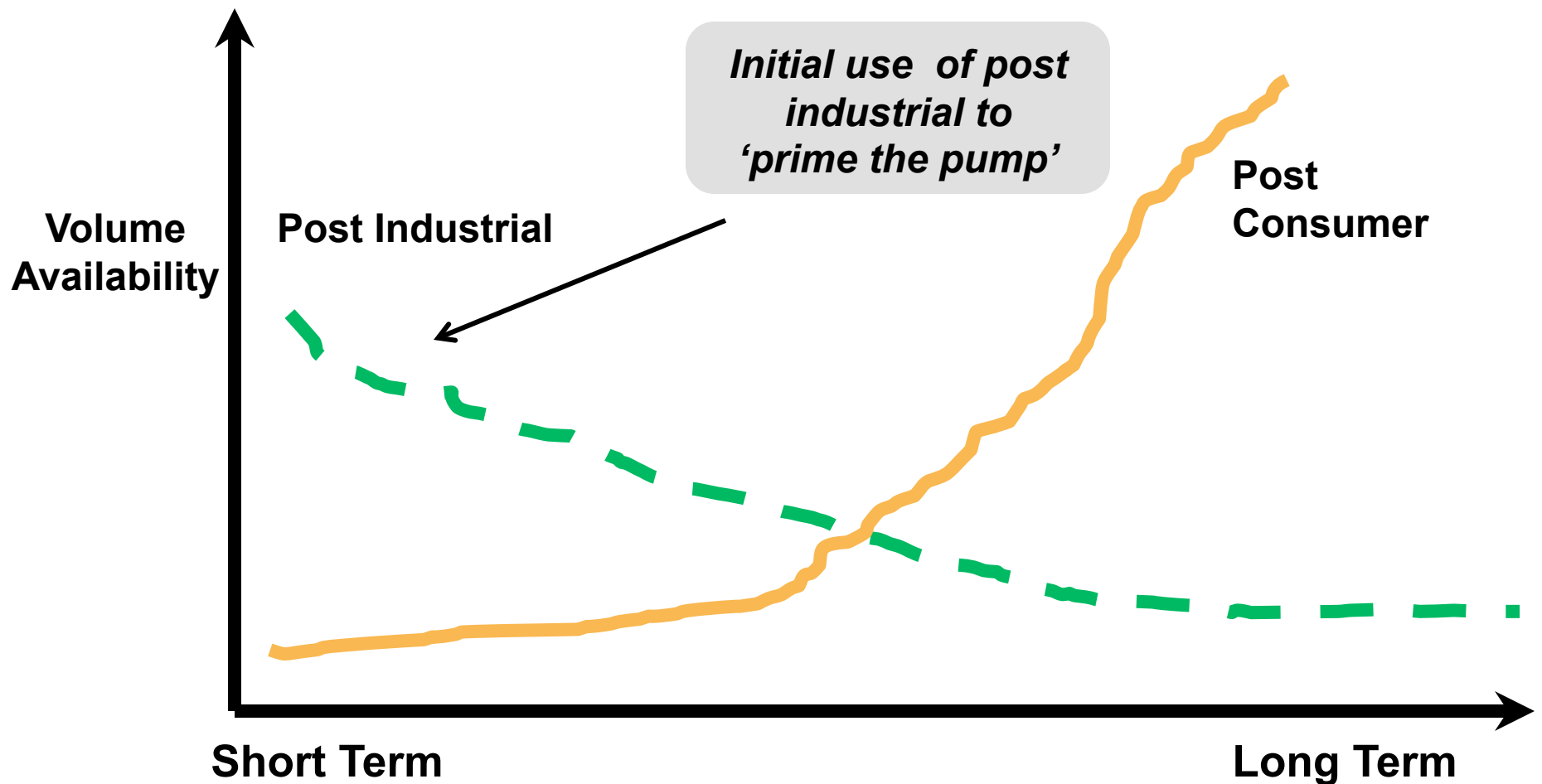
2 Sources:

2 Recycle Models



- Complimentary Sources
- Complimentary Models
- We're working to develop both . . . (not picking winners)
- Common Challenges at the post consumer level

Overcoming the Challenge of Recyclate Availability:



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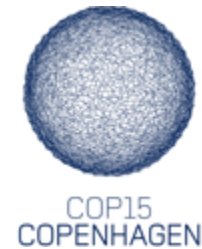
Feedstock Recovery Programs:

Post Industrial

- Routine Operation
 - Blair Off-grade Ingeo
 - ~ 25 MM Lbs lactic acid feedstock recovered and polymerized back to virgin Ingeo since Blair startup in 2002
 - Technology well demonstrated
 - Economics well demonstrated - with post industrial supply
-
- **The hydrolysis process is product & format ‘agnostic’**
 - **How do various post consumer materials perform in this process?**



“Post Consumer Feedstock Recovery” at the UNFCCC



**Ingeo
Carpet in
use at the
COP—15,
the UN’s
Climate
Change
Conference**

http://www.youtube.com/watch?v=dJEUf_mINxY&list=FLbrpVitp2IJBb8X9Z_5ThZw&index=23&feature=plpp_videos

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1. Developing end markets

“Post Consumer Feedstock Recovery”: Ingeo Cups from closed venues.

June, 2011
Brussels
Couleur
Café music
festival



Ingeo
Cups in
use at EU
music
festival
managed
by
LOC7000



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Working Globally:

MRF Sortation Demonstrations & Pilots

- USA:

- APR National Bale Audit



The Association of Postconsumer Plastic Recyclers

The voice of plastics recycling

- California Funded Bioplastics Grant



- Italy:

- “COREPLA” (CONsortium for REcycling PLASTic) Study

- UK: Waste Resources Action Programme (WRAP)

- Germany: Reclay's RePLA Group -



Reclay Group

Umwelt- und Entsorgungsmanagement

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Association of Postconsumer Plastic Recyclers (APR)

National trade association

***Representing those companies with 95% of the
post-consumer plastic processing capacity in
North America.***

***The goal of APR is to increase the amount of
plastic material recycled in North America!***



The Association of Postconsumer Plastic Recyclers

The voice of plastics recycling



APR Rigid Plastics Recycling Program

National Bale Audit, Market Destination & Supply Analysis for Rigid Plastics

The Project.....

A National Rigids Plastics Bale Sort and assessment of potential supply of recyclable rigid plastics.

Funded by APR Rigids Plastics Recycling Program members.

An overview of where non-bottle rigid plastics recycling currently stands and what potential there is to expand it into the future.



The Association of Postconsumer Plastic Recyclers

The voice of plastics recycling



Bale Sort Audit/PLA

- ***We found very little PLA; almost all of it was in the flat/thermoform category.***
- ***The west coast Household Container bales had the highest percentage of PLA; the average for the two bales was 0.4%, but the most in any bale sorted was one of the west coast Household Container bales with 0.52%”***



The Association of Postconsumer Plastic Recyclers

The voice of plastics recycling



Recapping – Our Approach:

Develop Business by:

- Selling Ingeo grades into consumer products where the potential for recycle stream contamination is minimal
- Targeting products which today, have little or no recycle yet occurring
- Achieving scale “safely”

All while, Simultaneously

1. Developing end markets
2. Characterizing Ingeo presence in recycling system today
 - where is it, (which streams),
 - how much is there
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Recapping – Our Approach:

Develop Business by:

- Selling Ingeo grades into consumer products where the stream is minimal
- Today, have little or no recycle yet occurring
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All while, Simultaneously

1. Developing end markets
2. Characterizing Ingeo (polymers),
 - what’s the economic potential
3. Working with recyclers to address sortation challenges

**it's a start
stay tuned ...**

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