

An update on Natureworks Ingeo™ bio-plastics (PLA).

Market place innovations
and prevailing roadblocks.



Sustainable Competition?

- We live in a very competitive world, and while there's no doubting the cost efficiencies that derive from a competitive environment, is there a potential down side?
- I think yes, when the competitive process has nothing preventing it from reaching an unsustainable conclusion.



- The current glacial rate of commercial adoption of bioplastics, is an example of this process. The choices available to consumers on retail shelves today, are still nowhere near as environmentally sustainable as they could be and need to be.



- For the purposes of this opinion, "Bioplastics" are defined as those made preferably though not necessarily, entirely from renewable resources, and which have a smaller environmental footprint than the petroplastics they can replace.
- Biodegradability or more relevantly "compostability" is not a prerequisite.



- We have drop-in bioplastics available today, that are much more environmentally sustainable alternatives to the incumbent petroplastics, but they're not yet being widely adopted in NZ.
- The reason is mainly higher pricing for bioplastics, but not always involving a big price premium.
- This sometimes hair splitting focus on the bottom line, flies in the face of the evidence for the human factor in climate change, overwhelmingly supported by the global scientific community.



- The climate change nay sayers seek justification by sheltering under the umbrella of the small but vocal minority of climate change sceptics.
- Sadly, professor James Hanson, the man who in 1988 introduced his findings on human influence in climate change, admitted a couple of weeks ago, that the very well funded nay sayer PR machine, is still winning the opinion battle.



- In spite of the pleas of many learned and passionate advocates such as James Hanson, that we are fast approaching a climate change tipping point, and must start adopting today all the more sustainable choices and practices that are available to us, the almighty dollar prevails.



- The ironic reality, is that fossil petroleum is going to run out, and get more and more expensive in the process.
- Via direct and indirect means the price gap between bio and petro plastics will narrow.
- We'll reach the point where initially there is no premium for a given bioplastic and soon thereafter, the bioplastic will actually cost less to produce than the equivalent petroplastic.



- But, if that is the only or major driving force, it will be too late, if climate change processes have already passed the tipping point.....
- The consequences if that happens, are unimaginably bad, and yet one day passes after another, with no apparent collective recognition nor the will to make the necessary changes.
- Catastrophic climate events are occurring with accelerating frequency and in more parts of the globe than ever before, yet we continue to act as though it could never happen to us.



- If we survive, ultimately, bioplastics will become the incumbents in most if not all plastics manufacture, both durable and disposable, and the greatest volume probably won't be compostable.



- Regarding those that are biodegradable, it will only be relevant if they are compliant with a recognised standard for compostability and where composting is a preferred end of life option.
- Food service ware and food packaging as a vehicle for diversion of food waste from landfill, is probably the best example.



- Even the biggest of the bioplastics technologies today, is still infant, lacking economies of scale.
- As the world embraces bioplastics, the technologies will accelerate in all aspects and start to realise the potential economies of scale.
- The commercialisation of technologies for conversion of waste cellulose to sugar is already on the horizon and this will further boost the sustainability of bioplastics (and biofuels).



- Additionally, when large volumes of post consumer product made of a hydrolytic homopolymer such as PLA, become a reality, infinite chemical recycling back to the feedstock monomer, then becomes a low carbon footprint reality.



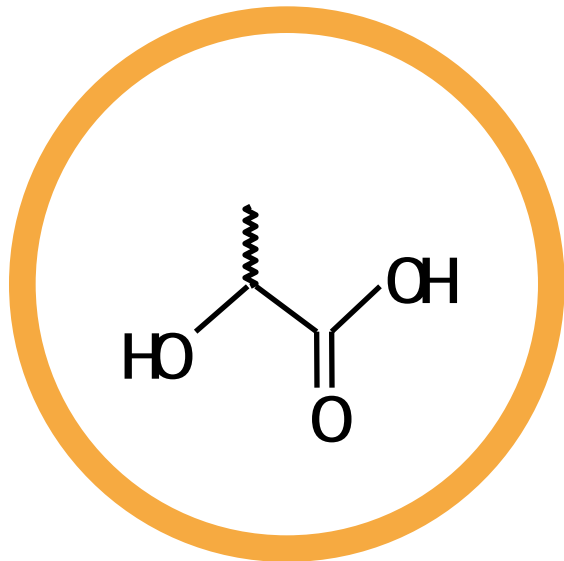
- Thus, instead of plastics recycling representing as it largely does today, a one shot extension of its life as a lower value product before its inevitable passage to landfill or an incinerator, it will instead represent true cradle to cradle lifecycle.



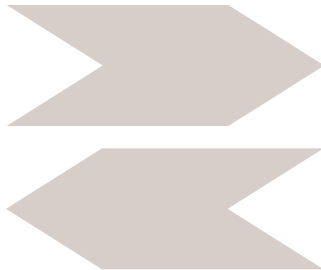
A new paradigm for Cradle-to-Cradle materials recycle . . .
 “Feedstock Recovery”

Ingeo is a biopolymer made from lactic acid

Lactic Acid



Polymerization



Hydrolysis

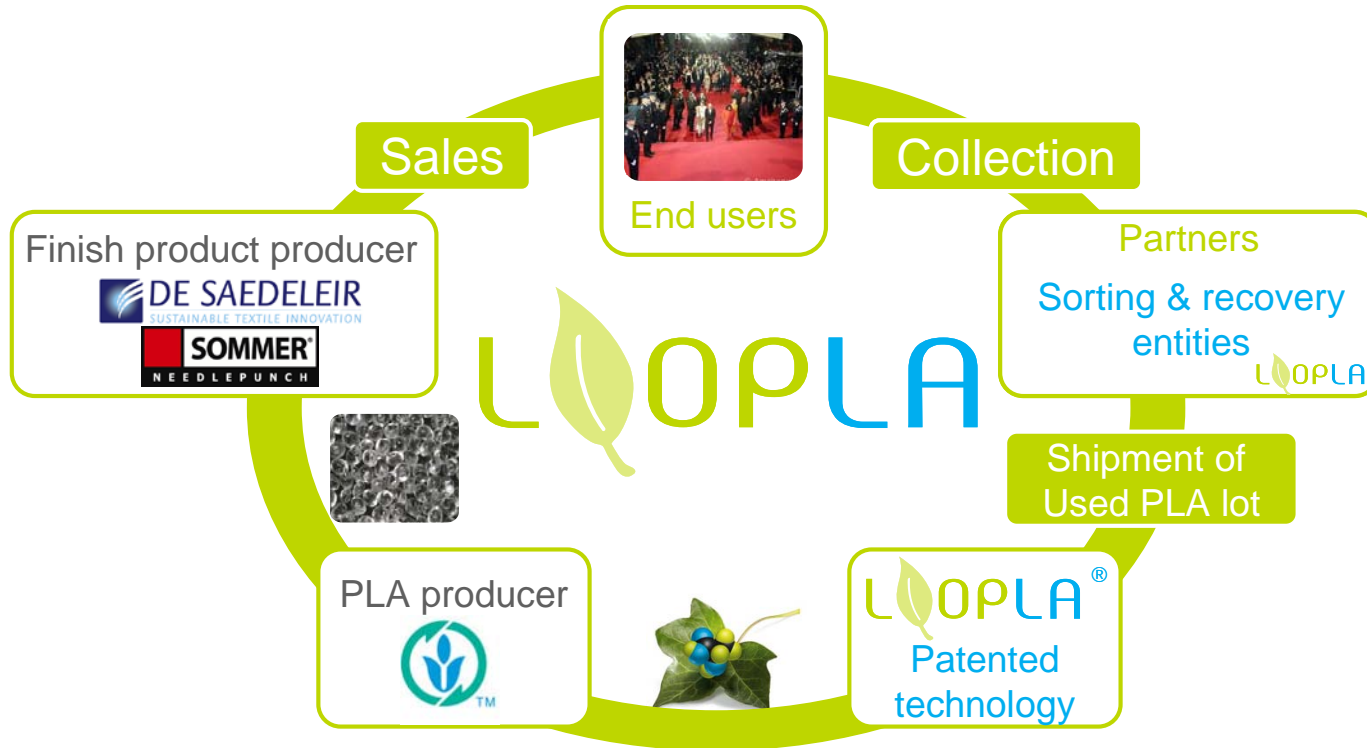
*Ingeo
Polylactide*





“cradle-to-cradle”

World Scale Lactic Acid Producer
Galactic investing in PLA recycle as means of generating Lactic Acid . . .



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- **“The biggest threat to the environment, is the belief that someone else will fix the problems.”**
- We all need to demand and adopt the more sustainable bioplastic options available now, before it's too late.



- In a market such as NZ where there's no supporting legislation or regulation, replacement of unsustainable petroplastics with renewable resource based bioplastics, remains largely a niche phenomenon.



- The first biobased plastic I ever encountered, was a product called Novon, developed by Warner Lambert and showcased at a Dusseldorf “K” fair in the early ‘90s.
- The renewable resource based concept, blew me away.



- My enthusiasm earned me an initial involvement with the Novon team, but it was short lived.
- The product was expensive and Warner Lambert decided they weren't really a polymer company, so mothballed the operation and put the technology up for sale. You might know it now as Mater-bi.



- In 1993, one of my Novon acquaintances joined the Cargill team that had been evaluating all known biopolymer technologies, and that group developed into what has now become NatureWorks with the Ingeo™ brand biobased range of polymers.
- That led to my involvement in 1994 by which time Cargill had a 4,000 tonne per year PLA pilot plant, that served the twin purposes of developing improved process and production techniques and making enough raw material for people to play with to determine what end applications, PLA might be suited to.



- The pilot process led to the construction of the first commercial PLA plant, commissioned in 2002. Its nameplate capacity of 140,000 MT pa will be reached within the next couple of years.
- The NZ plastics industry played a significant part, and some NZ firsts were horticultural twine and ISBM bottles. F&P made fridge door and cabinet liners.



- Early commercialisation of PLA in NZ saw its first milestone with Progressive Enterprises adoption of thermoformed fresh produce packaging.
- What is now Alto Plastics thermoformed a range of punnets & clamshells from Ingeo™ from their own extruded sheet, and high profile items such as strawberries, cherry tomatoes, capsicums etc. were presented for sale in these packs.



- This was the result of one man's vision. The then national manager of Progressive's fresh produce division.
- When Woolworths acquired Progressive, the rules seemed to change. PLA packaging could continue to be used, as long as it cost no more than PET.....



- Let's jump forward to the present.
- Today we're selling less PLA in NZ than we were four years ago.
- Elsewhere the story varies. Some countries have introduced legislation that supports the adoption of more environmentally sustainable materials. Germany, Taiwan and Korea are examples.



- In Japan, it seems the inherent culture and the lack of indigenous resources gives rise to a cultural preference for more sustainable items and practises.
- Internationally, NatureWorks are seeing demand for Ingeo materials grow 30% pa.
- Hopefully the emergence of organisations like Pure Advantage herald a positive change.



- To give some substance to where Ingeo is heading, here are some slides giving a representative update of the various relevant market segments.



Fresh Food Packaging



Food Serviceware



Films / Cards



Bottles / Containers



Nonwovens / Fibers



Durables





Ingeo Bead Foam Technology Development



Foam Fabricators, Inc. to use Ingeo bio-resin as a base polymer in a key development project aimed at commercializing an expanded Ingeo foam for shipping applications.

FFI will expand Ingeo into foam using technology developed in New Zealand by Biopolymers Network.



Biopolymers Network wins **“Best Innovation in Bioplastics”** category at the Bio-plastics Awards in Europe.



- Time doesn't allow me to run through an exhaustive range of pictorial examples of the current state of the art in Ingeo products, but for anyone interested in the specifics of:
- Food service and food packaging
- Durables
- Films and cards
- Fibres and non-wovens, I have comprehensive resource slides I'd be please to show you.



- The next two slides, showcase the example of how an American professional sports team and its stadium, based in Portland Oregon, transformed from a typical public facility, to one with state of the art sustainability.



Demonstrated Closed Loop Success

- The Portland Trail Blazers dedicated its April 9, 2010 NBA game to environmental sustainability. April 9th was also the first day of the Rose Garden stadium's LEED Gold Certification and launch of its new sustainability program, featuring compostable Ingeo™ food serviceware supplied by local company StalkMarket.



“The Portland Trail Blazers are proud to be recognized as the first American professional sports team to earn LEED (Leadership in Energy and Environmental Design) Gold certification,” Trail Blazers Chief Operating Officer Sarah Mensah said. “This distinction, backed by a commitment to sustainability partners like Ingeo and StalkMarket, can help transform our industry and influence the behavior of millions of people that visit sports facilities each year.”

The Blazers use Ingeo based food serviceware, providing specially marked containers for the collection of compostable items.



Portland Trail Blazer/Rose Garden Results

(Green Sporting Alliance Summit – Portland, OR. – August 1-3, 2011)

The financial return on this investment has been realized in the form of reduced operational costs of landfill tipping fees and solid waste hauling

Pre-sorted recyclable and compostable materials cost significantly less per ton than trash destined for the landfill

Recycling stations increased guest participation in carrying debris out of the seating bowl and sorting it properly reducing cleaning labor costs

Key Outcomes:

- 80% landfill diversion rate in 2010
- Removed petroleum base plastics from the supply chain
- Avoided greenhouse gas emissions by diverting food waste decomposition in the landfill



- To close, I have examples of one of the earliest and one of the most recent PLA developments here in NZ.
- The earliest was horticultural twine, produced by Donaghys Industries.
- The latest is this tomato vine clip produced by Premier Plastics.
- They're just now starting to be used in Australasia's largest glasshouse tomato operation.



- Thank you for your attention and if we have any time left for questions, I'll be pleased to try to answer them.

