



The Role of Bio-Plastics

Tony Breton

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Novamont

Living Chemistry for Quality of Life.

NOVAMONT PROFILE

- Pioneer and market leader in the sector of biodegradable materials containing renewable resources
- Tailor-made materials for a wide range of industrial applications (Mater-Bi trade-mark)
- Technology based on complexed starch and polyesters based on vegetable oils (Novamont technology patents)
- Strong patent portfolio (more than 120 articles, >90 patents, 9 awards, >100M Euro of investment)
- Research and development as the driving force of Novamont's Industrial development (>10% of turnover, more than 30% of human resources dedicated to research)
- European Inventor of the Year 2007 (SME & Research Category)

INDUSTRIAL APPLICATIONS OF MATER-BI



Overview

- What does “bio” mean?
- Standards
- Outline of Systems Approach
- Developing sustainable feedstocks / materials / systems
- Example of materials in closed loop systems

What does “Bio” mean?

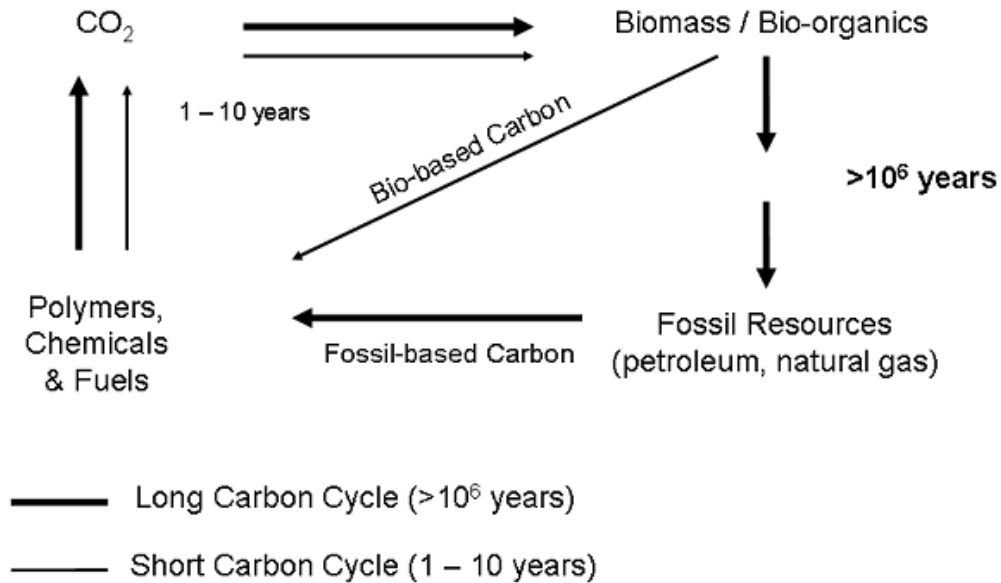
- “Bio” a positive perception but a need to clearly distinguish between:
 - Polymers / plastics made from renewable **biomass** resources
 - and
 - Plastics which are **biodegradable**
 - and
 - Products **biocompatible** with living cells and tissues



Bio-based

- Intrinsic Value Proposition

Global Carbon Cycling



Biodegradable

- Capable of undergoing biological anaerobic or aerobic degradation leading to CO₂, H₂O, methane, biomass and mineral salts depending on the environmental conditions of the process
- Aggressiveness of Environment¹ determines rate of biodegradation:

70 - 50 C	30 - 10 C			
Industrial Composting	Home composting	Soil	Fresh water	Marine water

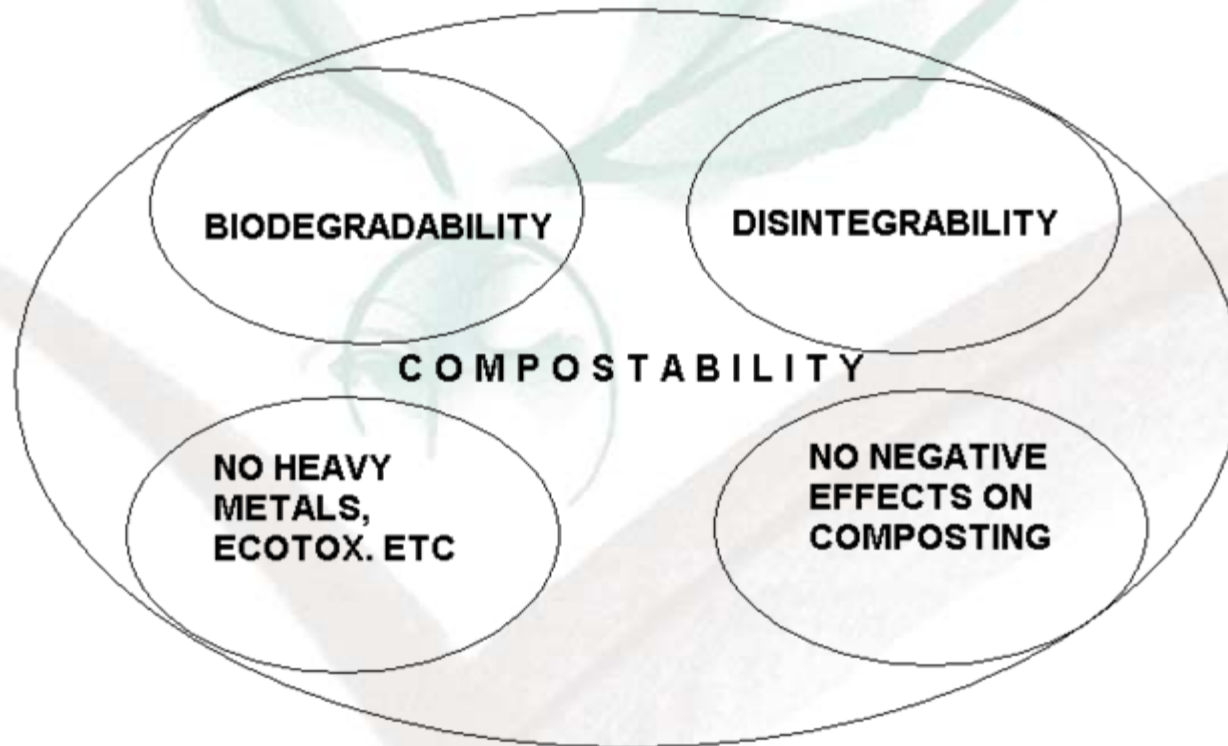
1 – From Vooijs (Plastics Europe), BPF Biobased & Degradable Seminar May 2009

But what does biodegradable mean to the consumer?



Standards

- There is no standard specification for “biodegradable” but standards do exist for “biodegradable **and** compostable”
- **EN 13432**
Packaging – Requirements for Packaging Recoverable through Composting and Biodegradation – Test Scheme and Evaluation Criteria for the Final Acceptance of Packaging
- **Vincotte OK Compost Home** – this is not a standard but a private specification which runs the same tests as EN13432 but at lower temperatures and for longer (UK version in development)
- CEN currently working on method of test for renewable (C14) content

Compostability is a set of properties



Industrial v Home Compostability

	Industrial Composting BS EN 13432	Home Composting Vincotte Certification Programme
Biodegradation	Test performed at 58°C / 90 % in 180 days	Test performed at ambient temperature (20-30°C) 90 % in 365 days
Disintegration	Test performed at high temperature 90% in 84 days	Test performed at ambient temperature (20-30°C) 90 % in 182 days
Current certification and logos	AFOR / Din Certco 	Vincotte 

Need for clear definitions and communication

- Bio-based contains renewable resources but may or may not be biodegradable or compostable
- Biodegradable must relate to compostability (EN13432) but material may or may not contain renewable resources
- UK Claims based on Green Claims Code (ISO14021) currently being update by Defra

OUTLINE OF SYSTEMS APPROACH

- Product development in response to improving system efficiency and reducing environmental impact
- Effective use of LCA to increase system performance
- Seek standardised framework
 - Actively follow developments within CEN, ASTM, UNI, DIN, BSI
 - Localised activity
- Products from bio-polymers are tools to enhance biological systems
 - e.g. waste bags / cutlery / packaging
- Avoid applications where established recycling schemes exist
- Drive market
 - Top down – constant consultation with regulators / legislators
 - Bottom up – Communicate the benefits of viewing whole systems to end-users (retailers, local authorities, event managers etc)

SUSTAINABLE FEEDSTOCKS AND MATERIALS

- What is meant by sustainable?
 - ? Renewable content or efficient use of resources
 - ? Environmental profile
 - Feedstock production (agricultural inputs / outputs)
 - Material production (energy, environmental emissions)
 - End of life

IMPORTANCE OF END OF LIFE

- 1 kg “humid organic waste”
 - 70% water, 10.8% O, 1.62% H, 11.04% CBio
- In sanitary landfill: 60g CH₄ (Biodeg 80%)
- Incineration: 0.08MJ net electric power at medium voltage (20% yield)
- Anaerobic digestion: 0.7MJ net electric power at low voltage (50% biodeg)
 - Above data from SMAR software (ambiente italia) I-LCA
- LCA studies show that biological treatment: either composting or AD followed by composting is preferable particularly with soil benefits from compost
- It is not the packaging that is important, it is its ability to enable the recovery of organic waste

SUSTAINABLE FEEDSTOCKS AND MATERIALS

- What is meant by sustainable?
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 - Feedstock production (agricultural inputs / outputs)
 - Material production (energy, environmental emissions)
 - End of life
 - ? Functionality (fit for purpose, thickness)
 - ? Social impact
 - ? Economical impact
 - ? Interaction of and communication of the above

NOVAMONT FEEDSTOCKS & MATERIALS

- Biorefinery to utilise locally produced vegetable oils and starch
- Collaboration between Novamont and Coldiretti
- 600 local partners (farmers)
- Integration of agriculture, chemistry, industry, the environment and local economy
- Shorter value-chain
- Reduced dependency on oil
- Continuous Commercial production

THE SYSTEMS APPROACH





EXAMPLE OF MATERIALS IN CLOSED LOOP SYSTEMS:

CATERING MEALS WITH DISPOSABLE CUTLERY

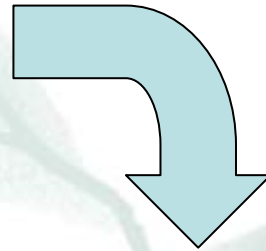
Food scraps

Plastic foam

Plastic or coated
paper cup



Plastic cutlery

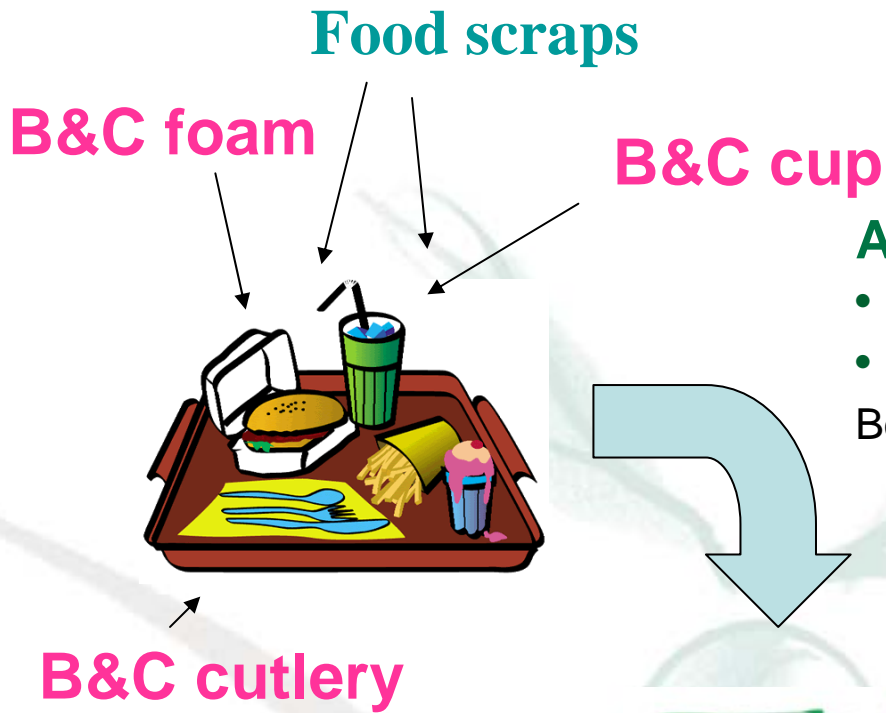


CURRENT SCENARIO



An heterogeneous waste is generated.

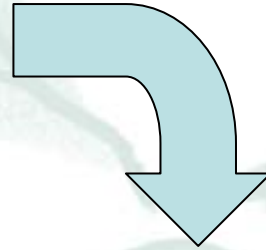
ALTERNATIVE SCENARIO



An homogeneous waste is generated

- B&C plastic waste
- Food waste

Both fractions are compostable and can be collected as a whole *homogeneous* fraction



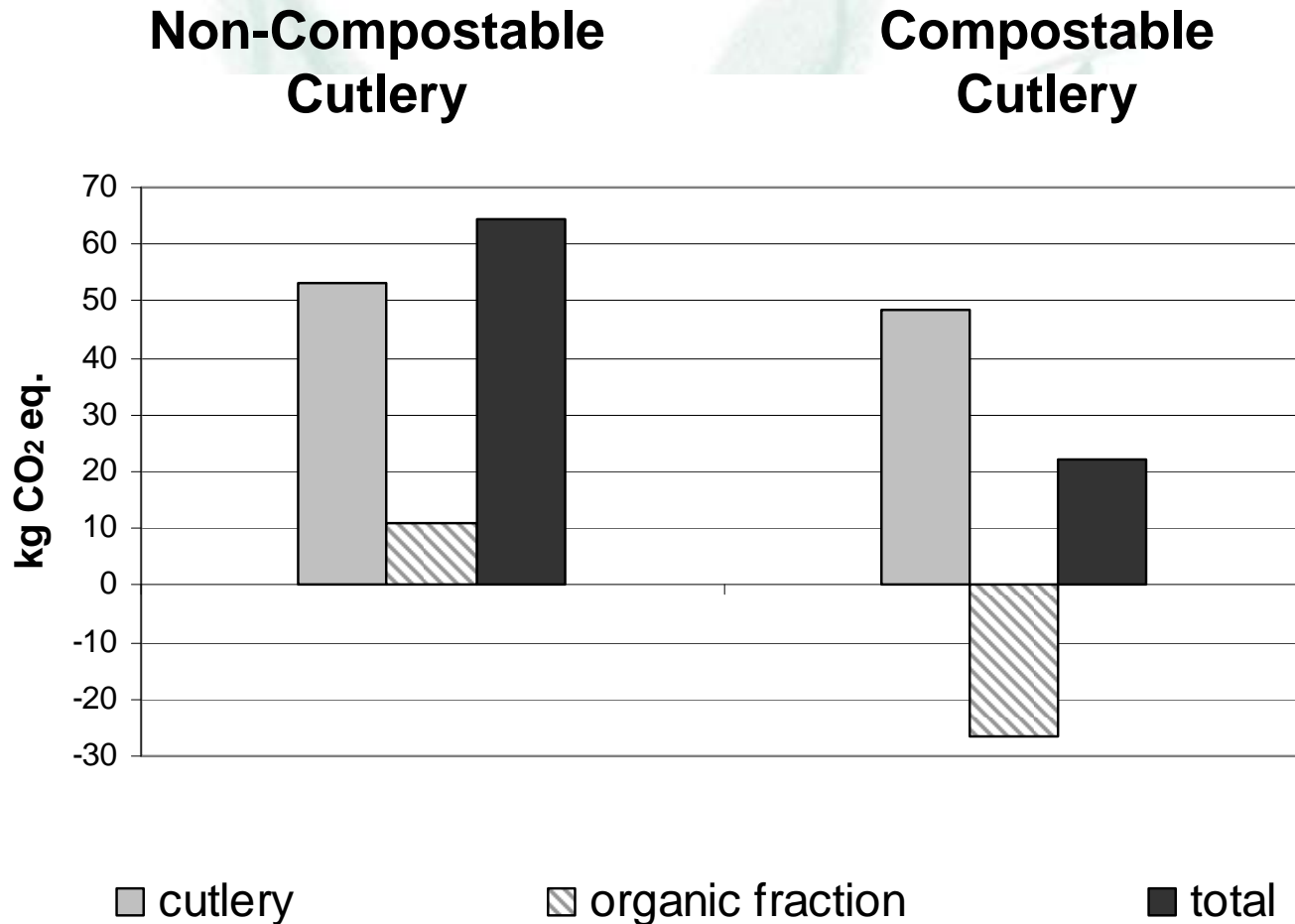
The homogeneous waste can be recycled by means of organic recovery, i.e. composting or anaerobic digestion followed by composting. Compost is a valuable soil improver.

LCA STUDY*

- LCA indicates that compostable cutlery is better than the traditional ones for most impact categories.
- If LCA also takes into consideration the fate of the food waste, then the advantages of using compostable cutlery and composting the whole fraction over the alternative solution is absolutely clear
- Compostable products clearly show an environmental advantage when the whole waste management cycle including collection, treatment, and disposal of organic waste is considered.
- Compostable products are tools to optimise the recovery of organic waste (the main environmental problem)
 - Similar applications include waste bags, carrier bags (reused as shopping bags then used to collect organic waste) and retail packaging for fresh produce

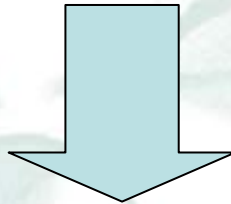
* - Razza, F. et al., Compostable cutlery and waste management: An LCA approach..., Waste Management (2008), doi:10.1016/j.wasman.2008.08.021

GhG Impacts of “Consequential” LCA



Conclusions

Bioplastics can become a powerful, demonstrative case of sustainable development and cultural growth



Redesign entire application sectors and systems

Affect the way raw materials are produced through the integration of entire agro-industrial chains

Modify product use and disposal

Extend experimental activity to local scenarios



Thank you
For further information:
Tony Breton: tony.breton@novamont.com
T: 07876 200934
www.novamont.com