Successful Sales of Novel PLA Compostable Packaging into Niche Markets in the United Kingdom

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Current Situation

- Petroleum derived industrial consumables and raw materials are becoming increasingly expensive
- Waste streams from petroleum based products, such as polyethylene, remain unchanged in landfill sites for more than a century
- The Earth has limited resources
- Convert consumers to bio-based products to minimise damage to the environment
- Our sustainable future is linked to the cycles of the natural world

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Sustainable Living Environment Drives Change

- Political pressure to be seen to protect the earth and be an example for the developing world economies to follow
- From a product life cycle analysis there are many technological routes to lowering the environmental impact of packaging solutions
- No “silver bullet” solution to environmental excellence but a set of socially acceptable standards constantly being re-assessed by consumers and industry

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Confusion Reigns

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Basic Guidance to Environmental Improvements

- Professor James Clark of the University of York (www.greenchemistry.net) states that:
- "Green chemistry is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances", and,
- "Green Chemistry is the discovery and application of new chemistry/technology leading to prevention/reduction of environmental, health and safety impacts at source."

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New Product Development

- The aim is to analyse the environmental impact of the Life Cycle Analysis of the product and application from 'cradle' to 'cradle' where the decomposition/recycling of one product will provide raw materials for another product

- We need to make products with:
  - the same or improved in-use performance as the traditional product
  - at an equal or lower cost
  - with a lower (the lowest) impact on the environment from cradle to grave
  - which is safe(r) to the user, and,
  - is biodegradable or preferably composts after use

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Compostable Films

- Compostable films made from natural resources which biodegrade in the composting process to CO_2 and H_2O to be consumed by the agricultural process

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Compostable Packaging

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Nomenclature as a Battleground

- "Plastic" means that the material has certain physical properties
  - polymers derived from, for example, petroleum (LDPE, HDPE, LLDPE) or crops (PLA, starch)
- "Biodegrade" means that when the film is placed in contact with bacteria e.g. in soil, then eventually it will break down
  - Many companies have used the "biodegradable" tag with products that are far from being 100% biodegradable
- "Degradable film" which often means that a chemical catalyst is added to a petroleum based PE film which reacts/degrades the plastic after use to make millions of small pieces of chemically doped plastic that become mixed into the soil

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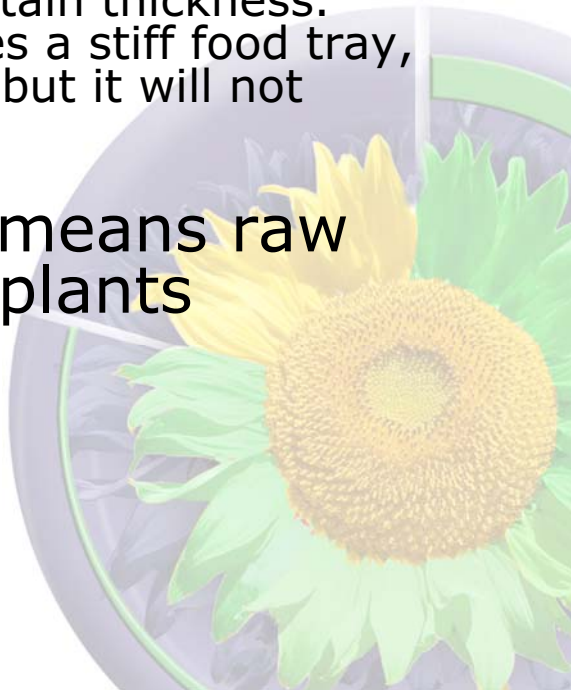
Nomenclature as a Battleground

- "Composts" means that when you process the bio-film through industrial composting (with defined levels of bacteria and heat) then it will decompose at the same rate as organic matter to water and carbon dioxide.
  - Compost films are well known but only to a certain thickness. When the film is too thick, e.g. when it becomes a stiff food tray, then it will biodegrade (eventually completely) but it will not compost
- "Renewable (bio-based) resources" means raw materials are made from crops and plants generally



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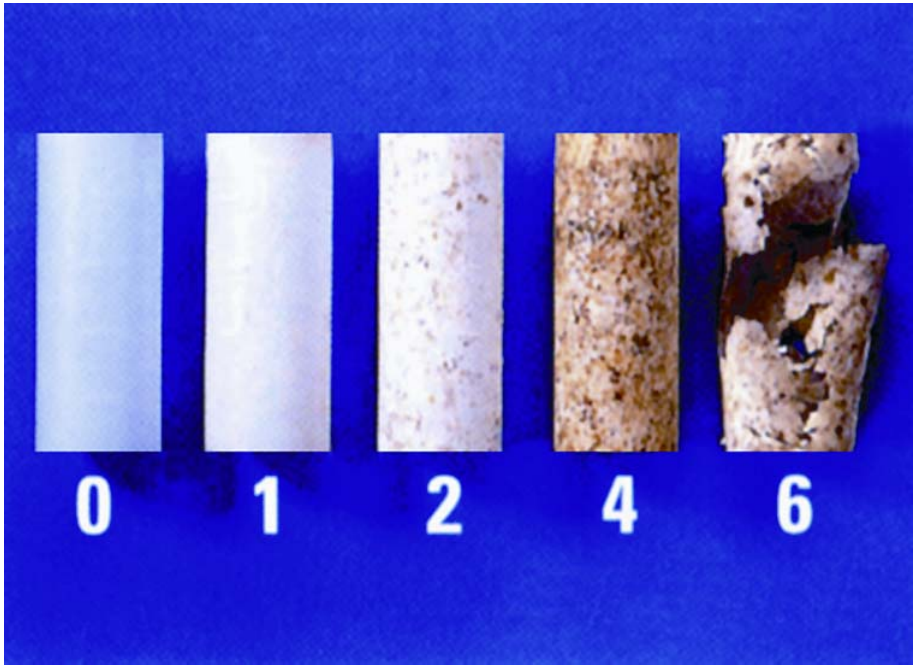
EcoFilm™ and EcoWorks®



Seen from one week to 6 weeks of the biodegradation process. It is gone in 3 months.

Passes all three parts of DIN 54 900 (compostability) and DIN38412 Part 30 (ground water contamination)

DINCertco approved

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EcoFilm™

- Soft, clear, highly elastic, synthetic polyester chemistry
- Appearance similar to LDPE, but up to 3 times stronger
- Starch and filler free, ensuring strength and durability

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EcoWorks®

- Derived in part from annually renewable resources (5 – 70%)
- Formulations from elastic to highly rigid
- Customised for rigidity, strength, appearance and clarity
- Shrink film forms available

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Case Study – Council Refuse Sacks

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Market

- Close packed terrace houses in the UK are limited in space for bin storage
  - Recycling (cans, bottles, paper)
  - Composting from garden waste
  - General household refuse
- City locations with 40,000+ households
- Kerbside collection every 2 weeks
- Niche market
- Councils responsible for refuse collection outsource to Environmental Waste Companies
  - Multi faceted selling process

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Products Used

- Refuse sacks made from recycled PE was the standard
- Starch bags fell apart
  - degradation by moisture even before use
- 2nd attempt using Polyester/Starch composite bags
  - complaints of poor filled-bag integrity of importance for 2 weekly collections
- Permanent solution to filled-bag integrity using EcoWorks® natural PLA/synthetic polyester

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Filling an EcoWorks® bag. Garden compost is often very dense. Kerbside collection point.

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- Residents have to be educated on what is acceptable for organic recycling. Leaflets and articles educate the general public on how to take part in the recycling scheme.
- EcoWork® refuse sacks were found to be tough enough by residents for the collection of twigs, flowers, cuttings, vegetable and other organic waste.
- Successful kerbside collection was possible since the filled EcoWorks® refuse sacks remain intact for 4 weeks.

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- The composting process includes shredding, watering and mixing.
- The composting company develop the correct mix of organics to ensure a loam rich compost product.
- Temperature exotherms within the windrow in excess of 70°C causes steaming.
- Regular turnover and watering controls the composting process.
- After 16 weeks in open windrows, moving one windrow per week to compost and the EcoWorks® refuse sacks are gone.

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Ongoing Commercial Projects

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Flower Flutes

- Niche market where consumer is willing to pay for a compostable packaging and price of packaging versus the product i.e. flowers, is acceptable
- Film clarity was an issue at start of project
- Resistance to water is a key attribute
- Film conversion process speeds i.e. costs, became more important as the value of compostability became entrenched
- Needed to consider the effects of transferring to another film type on the profitability of interested parties

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Ready Meal

- Preparation of ready meals that meet the growing requirements for biodegradable and compostable packaging from major food retailers
- Replacement of PET and aluminium foil
- Combination of EcoWorks® and EcoFilm™
- Reduction in land fill and carbon footprint
- Conditions of use
  - Resist moisture and oil
  - pH application range of 3 - 7
  - Withstand temperatures up to 200 ˚C
  - Low transmission rate of carbon dioxide and nitrogen through the film

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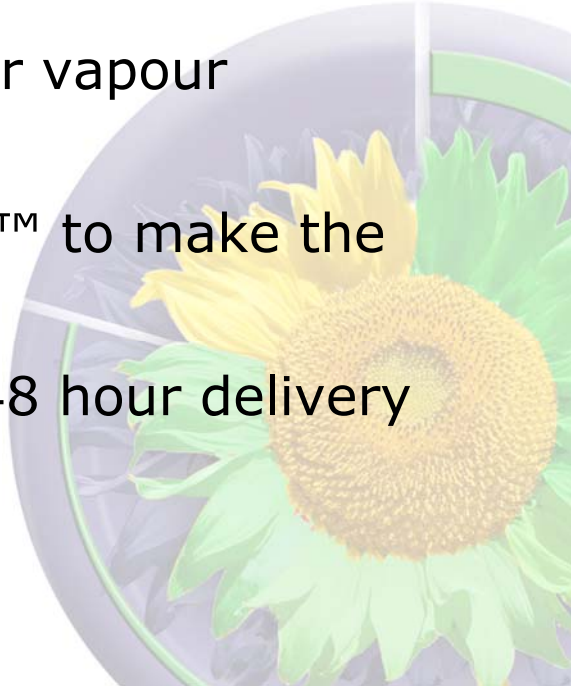
Meat Packing

- Organic farming requires differentiation of total product offering
- Previously packaged chilled meat cuts in lambs wool (for insulation), covered in micro-perforated oxo-degradable PE in a box
- Micro-perforated film allows adequate water vapour transmission
- Replaced oxo-degradable film with EcoFilm™ to make the package 100% compostable and recyclable
- The packaging meets the requirement for 48 hour delivery of chilled meat cuts for online shoppers



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Oven Ready Pizzas

- Chilled oven ready pizzas using PE, aluminium foil and cardboard box
- Replacing standard PE with EcoWorks® 45
- Films used must be compatible with flow wrapping line process used by the packager
- Estimated film usage is 100tpa
- 100% compostable and recyclable packaging fulfils supermarket specifications

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Lettuce Packing

- About 35 million lettuces are packaged in micro-perforated PE bags each year
- Supermarkets now mandate that compostable packaging is used
- Packers use manual labour in the fields to hand-wrap each lettuce
- In addition to providing an answer for the supermarkets the issue of bags scattered throughout the growing fields is solved

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Summary and The Future

- The growing market size for biodegradable and compostable packaging is primarily driven by emotion
- Consumers and customers are still confused about packaging technology and cradle to grave environmental analysis
- EcoWorks® and EcoFilm™ technologies represent a higher technical standard in compostable packaging
- Commercial success will be determined by the ability to sell the technical value of the new films in niche markets

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Thank you

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