WG2-4 ADVISORY BROCHURE: KEY SUSTAINABILITY ASPECTS AND OPPORTUNITIES TO CONSIDER IN MOVING FROM OIL-BASED PACKAGING TO FIBRE-BASED PLASTIC PACKAGING

KEY SUSTAINABILITY ASPECTS OF FIBRE-BASED PACKAGING

The packaging value chain diagram (Figure 1) demonstrates that sustainability is a concept that can be considered in all stages of packaging life cycle. Furthermore, sustainability issues can be used to develop a roadmap, or a plan, referred to as sustainable development. Sustainable development has three main pillars – environmental, social and economic, which have to be reflected equally to achieve full sustainability.

The following opportunities must be considered when addressing the sustainable development of fibre based plastic packaging:

- **Sustainable Supply** – Fibre-based plastic packaging produced from renewable materials offers a theoretically infinite supply compared to packaging manufactured using fossil fuels.
- **Carbon Cycle** – Fibre-based plastic packaging materials are carbon neutral – i.e. their carbon cycle is very short, because the carbon used for renewable materials is derived directly, via photosynthesis, from the sun and the atmosphere.
- **Innovation** – Fibre-based plastic materials are a novelty and still require improvements in both properties and costs. This is important from the economic and social view of sustainability, and can be used to influence the marketability of packaging.
- **Eco-Design** – Fibre based materials can be designed to promote synergy with the packed products – especially food products – because both the packaging and product are made from renewable materials.

POTENTIAL BARRIERS

- **Education** – For industry to benefit from the sustainable opportunities offered by fibre-based plastic packaging, a robust education system is needed for all packaging stakeholders – especially regarding the end-of-life, because, for the general public, fibre-based plastic packaging is virtually indistinguishable from oil-based packaging.
- **Land use** – the fibre-based material industry has to ensure the public that fibre-based plastic packaging production does not use land that should be utilized to produce agricultural products.
- **Costs** – the costs of fibre-based plastic packaging are still larger than their traditional oil-based counterparts. Although costs are decreasing as greater economies of scale are achieved, it will still take some time for the prices to stabilise.
- **Waste Management** – Fibre-based plastic packaging offers many sustainable benefits in waste management – such as the possibility of composting. This however has to be reflected in waste management strategies on the legislative level as well as in the technology and infrastructure of waste management within the target market for fibre-based plastic packaging.

HOW TO ASSESS SUSTAINABILITY?

Key tools that can be used to assess sustainability can be grouped into four primary categories:

1. Tools for Sustainable Governance (e.g. GGP);
2. Methods and tools for assessing environmental, economic and social impacts (e.g. LCA, LCA, LCC);
3. Tools for environmental management and certification (e.g. EMAS);
4. Tools for sustainable design (e.g. eco-design).

Sustainability is most commonly measured using Life Cycle Assessment (LCA) a standardized (ISO 14040) and objective method for evaluation and quantification of environmental and energy inputs together with outputs and potential impacts associated with a product. This must address the entire life cycle, from the acquisition of raw materials until its end-of-life (often called ‘from cradle to grave’ LCA). In this technique, all phases of a production process are considered to be related and interdependent, making it possible to evaluate the cumulative environmental impacts. LCA can also be used to assess the social and economic impacts of products.

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The Future of Sustainable Development

A number of broad drivers in the packaging sector are shaping innovations in product and process development. These drivers include decreasing material and energy usage, reducing packaging mass (lightweight packaging), increased food safety and quality (through improved performance, additional functionality), and recyclability or biodegradability. The demand for more environmentally friendly solutions is a rising market trend, especially in the packaging sector and is linked to the drive towards sustainability. SMEs in the packaging industry feel the need to produce "greener" solutions due to consumers' awareness and demands. Furthermore, lots of larger companies are creating statements on CSR and find it important to show that their company is sustainable. Using fibre-based, renewable raw material for their products shows they are thinking about the future by securing feedstock and raw materials, and ensuring sustainability in its fullest and broadest meaning.

GLOSSARY OF KEY TERMS

Oil-based packaging
Packaging manufactured from oil-based plastics. Plastic is a polymer-based material that is characterized by its plasticity. The main component of plastics (from Greek: plastikos - fit for moulding, plastos - moulded) is a polymer, which is formulated by the addition of additives and fillers to yield the technological material – plastic. The majority of plastics in current use are manufactured from fossil fuels – a non-renewable finite resource.

Fibre-based plastic packaging –
Packaging manufactured from or containing fibre-based materials. They are most commonly combined, and/or become so called bioplastics. Bioplastics encompass a whole range of materials which can be biobased, biodegradable, or both. Biobased means that the material or product is (partly or wholly) derived from biomass (plants). Biomass used for bioplastics stems from e.g. corn, sugarcane, or cellulose – forest and agriculture products. The term biodegradable depicts a chemical process during which micro-organisms that are available in the environment convert materials into natural substances such as water, carbon dioxide and. The process of biodegradation depends on the surrounding environmental conditions (e.g. humidity or temperature, exposed or buried), on the material. Fibre-based materials – and therefore plastic packaging made from those materials – meet both properties.

Sustainability
Sustainability is most commonly described by the definition that arose at the Rio conference on climate change: The use of resources without jeopardizing the ability of future generation to do so as well - in other words ensuring that today's growth does not jeopardize the growth possibilities of future generations. Sustainable development comprises of three elements - economic, social and environmental - which have to be considered in equal measure at the political level. The strategy for sustainable development, adopted in 2001 and amended in 2005, is complemented inter alia by the principle of integrating environmental concerns with European policies, which impact on the environment (source: http://europa.eu).

Packaging Value Chain
A value chain is a chain of activities that companies operating in a specific industry perform in order to deliver a product or service for the market.

The packaging value chain encompasses the whole life cycle of packaging, including many companies from the producers of feedstock materials, packaging materials manufacturers, package fillers to distributors. It also takes into account the users of the packaging – usually the consumers, and all the infrastructure and industries that deal with packaging when it becomes a waste – the waste management industry.
Introduction:
Sustainability is a general term that describes the environmental burden of a process or product. When discussing the packaging industry one has to take a broad view of the full life cycle of packaging – that is, all the materials and processes that are associated with packaging production throughout the value chain.

The purpose of this Advisory Paper is to portray a general value chain of the packaging of a generic consumer product and explain the key aspects of sustainability in each life cycle step, taking into account the differences of oil-based and fibre-based plastic packaging, thus presenting the sustainable opportunities that fibre-based plastic packaging can offer.

This document also broadly explains what tools can be used to assess sustainability and what are the foreseeable trends of sustainability in the fibre-based packaging context.

The packaging value chain flow chart presented below briefly explains each step the packaging has to travel – from raw materials to waste - and explains what aspects can be considered as sustainable or moving from oil-based to fibre-based plastic solutions.

Therefore, we sincerely hope that this document will present the broad scope of sustainability in the packaging context and assist in building awareness of sustainability and decision making.

PACKAGING PRODUCTION

This step involves the actual manufacture of packaging design from packaging materials such as granules.

OIL-BASED SOLUTIONS:
The technology for producing plastic packaging is well established.

FIBRE-BASED PLASTIC SOLUTIONS:
The technology of production of fibre-based plastic packaging is the same as that for oil-based counterparts. In addition to that fibre-based solutions can offer opportunities for eco-design, which offers innovation, cost cutting and PR and marketing opportunities.

KEY SUSTAINABILITY ASPECT:
Eco-Design, Innovation

PACKAGING MATERIALS

Before a packaging is manufactured, one needs access to the raw materials from which the packaging will be produced.

OIL-BASED SOLUTIONS:
For traditional plastic packaging fossil fuels are the usual source. Fossil fuels are finite resources and their costs depends on unpredictable economic fluctuations.

FIBRE-BASED PLASTIC SOLUTIONS:
For fibre-based plastic solutions, the feedstock material is natural – i.e. forest and agriculture. The resource is limitless and depends solely on the carbon cycle which is in turn linked to the energy of the sun.

KEY SUSTAINABILITY ASPECT:
Sustainable Supply

PRODUCT PRODUCTION

This step incorporates all processes and materials needed to manufacture the product to be packed.

Although this step is not directly linked to the sustainability aspects that distinguish between oil and fibre-based packaging it is important to realise that in the final environmental impact calculations, the burden associated with the product far outweighs that of the packaging. Therefore to exploit the sustainable opportunity offered by fibre-based plastic packaging this step must include the design of the packaging in a way that offers synergy between the product and the packaging on the environmental, economic, social and public aspects of sustainability. For example: the compostable nature of fibre-based packaging for plants means that both plant and package can be introduced directly into soil.

KEY SUSTAINABILITY ASPECTS:
Environmental Innovation, Economy of Scale

PACKING + FILLING

Filling the packaging product with the intended product.

OIL-BASED SOLUTIONS:
The technology for packing and filling is very well established.

FIBRE-BASED PLASTIC SOLUTIONS:
The technology for packing and filling is also available and can offer a wider variety of additional and unique PR and marketing opportunities.

KEY SUSTAINABILITY ASPECTS:
No additional investment necessary, Simplicity

DISTRIBUTION

All processes of distributing the packed product to point of sale including shelf-life.

OIL-BASED SOLUTIONS:
Distribution technologies of products are well established, however, no product/package synergies can be attained for product issues in the distribution phase.

FIBRE-BASED PLASTIC SOLUTIONS:
Opportunity of utilizing product/package synergies – for example, out of date food packed in a compostable packaging solutions can be returned without sorting.

KEY SUSTAINABILITY ASPECTS:
Environmental synergy opportunities

USE

All processes taking place when a product is purchased or acquired. In consumer products the main role of packaging is to protect and promote the product.

OIL-BASED SOLUTIONS:
Oil-based packaging solutions are attractive and customisable and therefore can be used heavily in marketing.

FIBRE-BASED PLASTIC SOLUTIONS:
Fibre-based plastic packaging is very attractive due to its environmentally friendly and innovative nature, and can be promoted as such, offering a wide variety of additional and unique PR and Marketing opportunities.

KEY SUSTAINABILITY ASPECTS:
Green marketing and PR

TRANSPORT / LOGISTICS

This encompasses all the ‘arrows’ showing the processes needed to transport the packaging and the product from one step of the value chain to the next.

These stages are virtually the same for both oil and fibre-based plastic packaging, however due to the possibility of local feedstock sourcing of the materials from forest and agriculture, fibre-based plastic packaging can offer sustainability in terms of shorter logistics.

In addition to that, many fibre-based plastic packaging solutions are compostable and can therefore be discarded with organic waste, saving on transport and logistics costs of end of life operations.

KEY SUSTAINABILITY ASPECT:
Local sourcing

END OF LIFE

When packaging is not used to store a product or offer protection then the packaging is discarded as waste. This step includes all processes associated with waste management. There are different end of life options available such as recycling, composting, incineration and landfilling.

OIL-BASED SOLUTIONS:
Oil-based packaging can generally be recycled and/or incinerated with great efficiency. However, after these processes are complete, or the packaging is sent to landfill its life cycle ends, and the total carbon balance is increased by its carbon mass.

FIBRE-BASED PLASTIC SOLUTIONS:
Fibre-based plastic solutions are often compostable. They can be recycled organically to provide compost which can be used to catalyse the growth of feedstock materials, effectively closing the life cycle loop and offering tremendous life cycle assessment advantages and reducing the total amount of waste.

SEE ALSO – THE ADVISORY BROCHURE ON END OF LIFE

KEY SUSTAINABILITY ASPECTS:
Closing the life cycle loop, Waste reduction

Figure 1: Diagram of packaging value chain