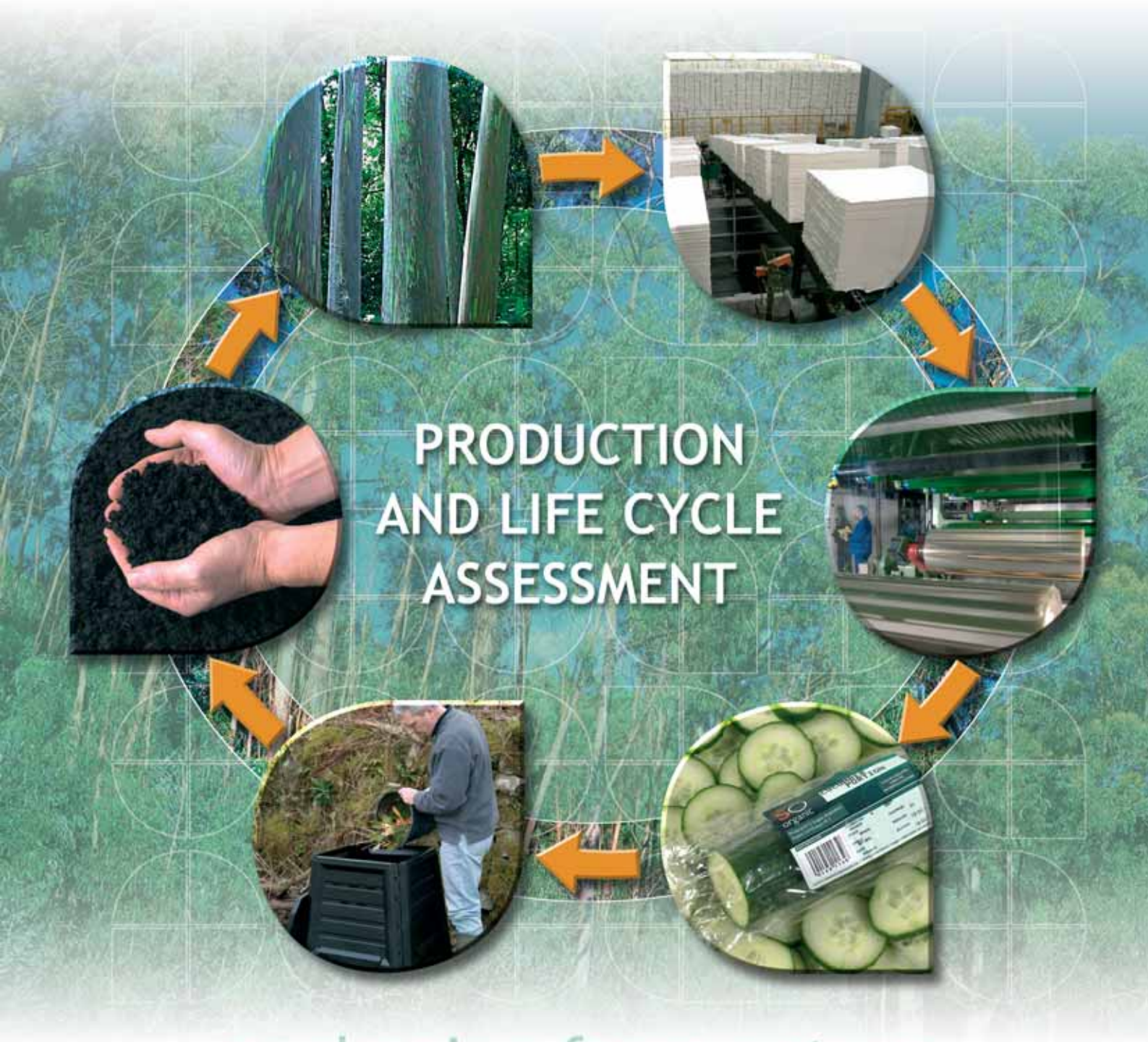
NATUREFLEX™



packaging from nature,
packaging for nature...

innovia
FILMS

Production

From forest to pulp

- NatureFlex™ films are produced from wood pulp, sourced from managed plantations. The suppliers who manage these plantations either have, or are working towards FSC, PEFC, or similar certification.
- Our wood pulp suppliers conform to the environmental management standard ISO 14001.
- It requires approximately 3 tonnes of wood for every tonne of wood pulp we use. The wood components that are not required are either burnt to produce energy for the process, or used to produce a range of useful and valuable products.

- The wood pulp arrives as bales of sheets, each sheet resembling blotting paper. The bales are loaded onto automated storage conveyors which are computer controlled to feed a constant supply of raw material 24 hours a day, 365 days a year.
- The pulp is mixed with caustic soda solution in a pulper to produce a slurry with a consistency similar to that of porridge.
- Different chemicals are added in order to further break down the physical structure of the cellulose. The solution is a bright orange coloured thick liquid, hence the name viscose.

Regeneration and casting

- Computer control ensures that the entire process is closely managed and that all raw materials are carefully measured and dosed.
- The viscose is carefully filtered and refiltered in order to minimise waste and maximise the purity of the material to ensure the best film quality possible.
- The viscose is extruded through a flat die into the casting bath. Almost instantly the viscous liquid is converted into a film.

- Just prior to the extrusion, we have the option to inject inorganic pigments into the viscose in order to cast white or coloured films. In the majority of cases however the film is cast in a transparent format.
- Each machine is equipped with 2 flat dies, enabling 2 webs to be manufactured on each casting line.
- As the film webs progress down the line they are cleaned and softened in order to ensure the right optical and mechanical properties for our customers' applications.

Finishing and applications

- At the end of the casting line, the film is conditioned, dried and wound up into large mill rolls.
- For certain applications, for example the manufacture of transparent bags or adhesive tapes, the film can then be moved direct to slitting in order to be slit to the customer's required size.
- In most cases however, the mill rolls undergo an off-line coating process in order to provide heat-seal and moisture barrier properties tailored to the requirements of the customer's product.

- In many cases Innovia Films supplies large rolls to 'converters' who may print, laminate, perforate and reslit the film to meet the end customers' requirements.
- In other cases the film may be slit to smaller sizes where no intermediate conversion is required. In this picture narrow reels are being slit direct to the food packer's required width for a confectionery application.
- NatureFlex™ films are being successfully used in HFFS, VFFS, Twist, Overwrap, Bunchwrap and Bagmaking applications.

Waste Management

Compostability

- NatureFlex™ is suitable for composting in Industrial Composting plants, such as windrow and in-vessel.
- NatureFlex™ is suitable for home composting.
- NatureFlex™ is also suitable for biodegradation in a waste-water environment.

Incineration

- NatureFlex™ has the same calorific value as wood and can be safely disposed of in modern incineration plants to recuperate this energy value.

'Windrow' type, Industrial Composting Site Photo: Composting Association.

Recycling

- NatureFlex™ is recyclable through organic recycling (composting) as set out in directive 94/62/EC (Annex II). However, NatureFlex™ is not a thermoplastic material and is not therefore suitable for standard thermal recycling as it will not melt.

Certification

- NatureFlex™ films are certified to both the European (EN13432) and American (ASTM D6400) norms for compostable packaging. They can therefore carry the certification marks of Din Certco, AIB Vinçotte and BPI.
- In addition, NatureFlex™ is certified to the 'OK Compost Home' scheme, confirming its suitability for use in a home composting environment.

Disposal of Waste

NatureFlex™ film waste is composted at a windrow composting facility by the local Borough Council, successfully diverting all NatureFlex™ film waste away from landfill.

As part of Innovia Films' commitment to reduce waste, 70% of all solid waste produced on site in 2006 was recycled through a combination of segregation on site and working in close collaboration with external parties.

Quality Standards

Innovia Films conforms to the quality standard ISO 9001:2000, the environmental management standard ISO 14001:2001 and the BRC/IOP Global Hygiene Standard for Packaging.

compostable

COMPOSTABLE

HOME OK compost VINÇOTTE

SYSTEM CERTIFICATION ISO 14001:2004 SGS UKAS ENVIRONMENTAL MANAGEMENT 005

The Road to Sustainability

- There is increasing awareness that the current model of development in the world is unsustainable and that our consumption patterns are having a negative effect on the environment and the climate.
- Minerals, such as fossil fuels, are non-renewable because they cannot be replenished within a human timescale. Traditional plastics are derived from petrochemicals.
- Biopolymers can be produced from renewable raw materials such as corn, potatoes and wheat. NatureFlex™ films are based on cellulose which is the most abundant of all naturally occurring organic compounds.
- NatureFlex™ films have been shown to have a renewable content of circa 95% according to ASTM 6866-06 for biobased content (measured by ^{14}C).

Process Improvements

- The plant has had a Climate Change Agreement (CCA) since 2000, which commits it to energy efficient targets and continual improvements. These targets were surpassed in 2006. In addition, significant reductions have been made in carbon emissions over the past two years. NatureFlex™ films are manufactured on a plant which is equipped with a combined heat and power unit to maximise fuel efficiency.
- The site is regulated by the UK Environmental Agency (IPCC) and has an improvement programme agreed.

- The plant is part of the European Union Greenhouse Gas Emission Trading Scheme (EU ETS) which is the main mechanism for reducing the emission of greenhouse gases in Europe. For phase 1 the emissions were within our allowance. Phase 2 will start in 2008.
- Significant investments in gas and by-product recovery have been made, including a state of the art closed-loop gas recovery system. Solvents used in the coating process are recovered with exceptional efficiencies.

*A copy of our Environmental Policy is available upon request.

Life Cycle Assessment

Introduction

The environmental impact for materials should be based on a Life Cycle Assessment (LCA), which provides a methodology for considering each stage of a product's life from extraction of the raw materials, through manufacture and construction to use and disposal.

An LCA affords a 'snap-shot' in time of any one process but in general most processes are subject to continuous improvement. Hence comparisons of different LCA's are not really feasible unless they have been carried out at the same time and are based on identical assumptions. In addition, the functionality of the material should also be considered, as this can significantly affect the true environmental performance of the material.

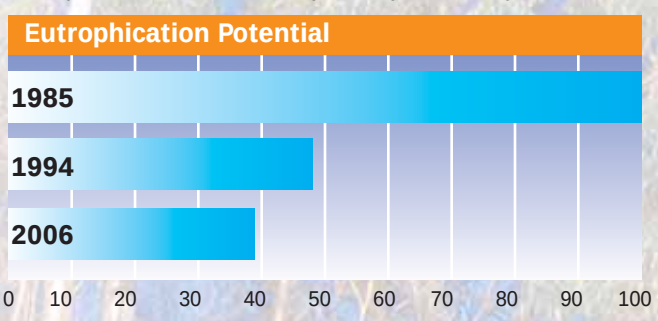
At Innovia Films, a 'cradle to gate' Life Cycle Assessment of NatureFlex™ has been carried out in conjunction with an external consultant in order to evaluate the impact of each stage of the process and to highlight the key areas which have the biggest environmental impact. Now these areas have been identified, suitable alternative technologies or processes can be considered and evaluated. 'Cradle to gate' refers to the scope of the LCA, which in this case encompasses raw material manufacture to finished film.

The results from the Life Cycle Assessment have indicated the current situation in terms of a range of indicators. Process improvements made during the last 25 years and the improvements which are scheduled to be completed in 2009 have also been analysed to determine their environmental effects.

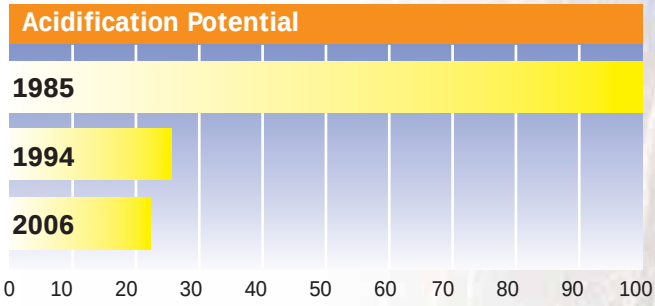
Eutrophication Potential (EP)

- Eutrophication potential has decreased by 61% since 1985 due to a reduction of the COD emissions, which is the main contributing factor.
- In 1994 an effluent treatment plant was installed which significantly reduced the eutrophication potential. The CHP conversion from coal to gas also had a positive effect on this indicator.

The enrichment of nutrients in a certain place (aquatic or terrestrial) is known as eutrophication. In water, eutrophication leads to accelerated algae growth, decreasing oxygen concentration which leads to fish dying and anaerobic decomposition, which eventually destroys the eco-system.



The transformation of air pollutants into acid leads to a decrease in the pH of rainwater and fog. This damages eco-systems, as it causes forest die-back, amongst other effects.



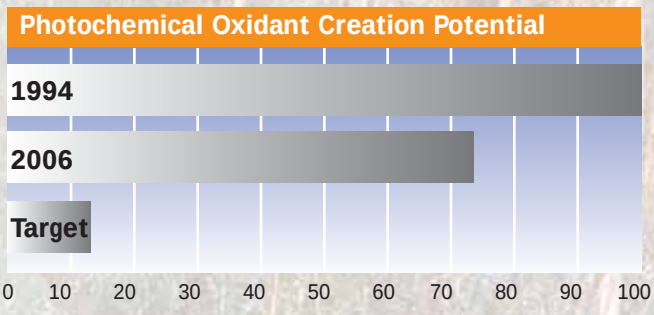
Acidification Potential (AP)

- The key impact areas for the acidification potential are the waste water emissions and pulp manufacture.
- The acidification potential has decreased by 78% since 1985 mainly due to the installation of the effluent treatment plant. Further improvements were realised due to the coal to gas conversion of the CHP unit.

Photochemical-Oxidant Creation Potential (POCP)

- The photochemical oxidant creation potential has decreased by 26% since 1994 due to improvements in site energy, the main factor being the CHP conversion from coal to gas.
- Alternative technology could reduce the photochemical oxidant creation by a further 61%. This is an area currently under evaluation.

In the stratosphere, ozone plays a protective role, but at ground level it is classified as a damaging trace gas. Photochemical ozone production in the troposphere, also known as summer smog, is suspected to damage vegetation and material.

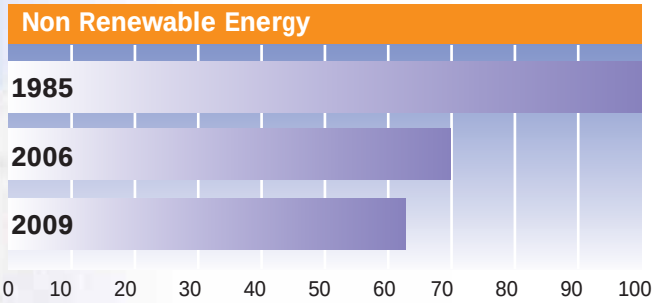


Note: Early data refers to historical Cellophane™ manufacture. 2006 onwards reflects NatureFlex™ manufacture.

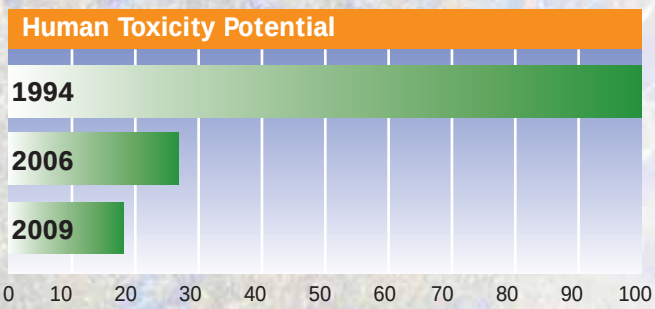
Primary Energy Consumption

- 30% reduction in fossil fuels since 1985 due to improvements in energy requirements on site and at raw material manufacturers.
- In 1985 a combined heat and power unit was installed which significantly improved the energy efficiency. Subsequent conversion from coal to natural gas further reduced the energy consumption.
- By 2009, full gas recovery will be implemented on all the lines and a new more efficient production line will have replaced older equipment, creating further energy savings.

The total 'Primary Energy Consumption (non-renewable)', given in MJ, relates to the gain from 'fossil' energy sources such as natural gas and crude oil, which are used for energy production or as material constituents, e.g. in plastics.



The human toxicity potential assessment aims to estimate the negative impact of, for example, a process on humans. The method for this assessment is still under development.



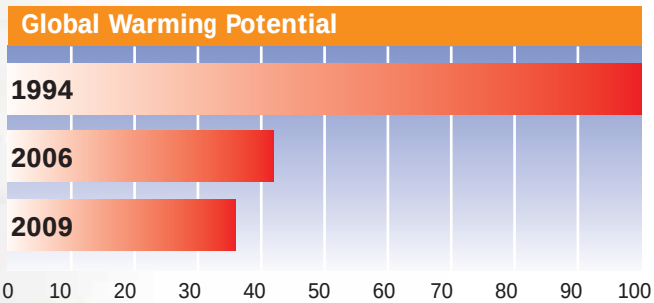
Human Toxicity Potential (HTP)

- Key impact areas for the human toxicity potential are site energy and raw materials.
- Human toxicity potential has decreased by 73% since 1994 due to conversion of the combined heat and power unit from coal to natural gas and the implementation of a closed loop gas recovery system.
- Further reductions by 2009 are due to the completion of the gas recovery system on all production lines.

Global Warming Potential (GWP)

- A significant reduction in global warming potential occurred when the CHP unit was converted from coal to natural gas.
- Raw material changes also contributed to a 58% reduction in GWP since 1994.
- By 2009, full gas recovery will be implemented on all the lines and a new more efficient production line will have replaced older equipment, creating further reductions.

An increasing amount of carbon dioxide (and other greenhouse gases) in the atmosphere leads to increasing absorption of radiation energy and thus to an increase in temperature, known as global warming. The main contributors to global warming are CO_2, N_2O & CH_4.



Key Improvement Summary:

Reduction	(%)
Fossil energy demand *(non-renewable energy)*	30
Human toxicity *(negative impact of a process on humans)*	73
Eutrophication *(enrichment of nutrients causing algae growth)*	61
Acidification *(air pollution leading to acid rain)*	78
Photochemical oxidant creation *(summer smog)*	26
Global warming *(greenhouse gases causing temperatures to rise)*	58

Reducing our Carbon Footprint

Information from the Life Cycle Assessment of NatureFlex™ has afforded a clear picture of our carbon footprint. Ongoing process improvements are reducing our carbon emissions each year, and the Life Cycle Assessment has identified the areas to target, but any manufacturing process will inevitably produce a level of emissions. From January 2008 NatureFlex™ films will be carbon neutral, as the residual emissions will be offset by investing funds in projects such as sequestration or re-forestation and energy efficient projects, which either absorb or prevent the release of a tonnage of carbon dioxide equivalent to our carbon footprint.

About Us

Innovia Films is a major producer of speciality Biaxially Oriented Polypropylene (BOPP) and Cellulose films with production sites in the UK, USA, Belgium and Australia.

We hold a leading global position in the markets for labels and security films, high performance coated packaging, tobacco overwrap and biodegradable and compostable films.

Our technical expertise and market-driven development process is the key to our position at the leading edge of advances in these markets.

Research and Development is at the heart of our business and we work closely with customers, suppliers, academics and commercial partners to ensure speed of delivery of new ideas and products.

We prioritise quality of service and support alongside product quality and have teams in place across the world to maintain the highest possible level of responsiveness to the needs of our customers.

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