TAKING THE SCIENTIFIC APPROACH TO MATERIAL CHOICES

WE ARE:
YOUR PACKAGING

www.spectra-packaging.co.uk

CONTENTS

TAKING THE SCIENTIFIC APPROACH TO MATERIAL CHOICES

For many, making responsible decisions aimed at minimising the environmental impact of packaging can often prove a minefield.

When considering which materials we should use, albeit plastics, glass, aluminium or paper, we're frequently told that one is environmentally better than the other. Yet how can we be sure, and who do we trust to verify such claims? Most importantly, how do we measure the true environmental impact of a material or product if we only consider individual aspects of its entire lifecycle?

Removing emotion from the debate is difficult when misinformation forms preconceived ideas that often ignore the evidence. However, adopting a clinical, scientific approach is the only way to arrive at accurate factual data.

Often, it's difficult to access such unbiased, impartial and wholly scientific evidence, and when we do, the findings can sometimes prove confusing and hard to understand.

Luckily, there are mechanisms available that can take a scientific approach to measure environmental impact, from the cradle to the grave. These mechanisms are commonly known as a Life Cycle Analysis or LCA for short.

What exactly is an LCA?

An LCA provides a framework for measuring the the entire life cycle of a product, from its core material extraction to its end-of-life, analysing the environmental impact of each individual stage of its life.

LCAs can benefit businesses, from simply meeting regulatory compliance to measuring whether their product's emissions are as low as possible.

However, to carry out an LCA, we must first define what that life cycle constitutes. For instance, what are the key stages we need to consider when analysing a product's entire life span?

A complete LCA typically considers several critical stages of a product's lifecycle. It examines its ingredients supply, the packaging used, its manufacturing, distribution and storage, its life in the hands of the consumer, and ultimately how it is dealt with it at the end of its life.


INGREDIENTS SUPPLY
PACKAGING
MANUFACTURING
DISTRIBUTION & STORAGE
CONSUMER USE
END OF LIFE
THE FULL LIFECYCLE ANALYSIS

UNDERSTANDING THE STAGES OF OUR LIFE CYCLE ANALYSIS

Our analysis looks at the entire lifecycle of a personal care or toiletries product, such as a shampoo or conditioner product, including the packaging manufacturing element of that product. The real-life scenario analysis considers four comparative packaging solutions manufactured from either HDPE or PET plastic, glass or aluminium. Below explains the various parts of the full life cycle analysis.

INGREDIENTS SUPPLY

Because everything originates from nature, at some point, all materials can be traced back to where and how they were extracted. Our analysis focuses explicitly on the four packaging items made from HDPE, PET, glass and aluminium. It includes primary, secondary and tertiary elements that form part of the total supply chain. For the LCA, the assumed product in all four studies is the same, and therefore, the ingredients supply for the end product has no impact on our analysis.

PACKAGING

In our analysis, packaging is the processing of extracted base materials into end mixes and ultimately to final packaging bottles together with secondary and tertiary packaging requirements for each material, such as cardboard boxes and pallets.

MANUFACTURING

The manufacturing part of the life cycle is based on the actual product element. In this report, it has been set as the same for all packaging types within the study.

DISTRIBUTION & STORAGE

Distribution and storage apply to the transportation of finished goods into their intended supply chain. The same chain is used for all materials post-production for the analysis.

CONSUMER USE

Consumer use applies to any impacts at the consumer usage stage for the products analysed within the analysis.

END OF LIFE

Here we consider the impact of the item at the end of its useful life span. This part of the study considers the options and value of landfill, recycling, incineration, reuse (increasing the life cycle) and compostability.

THE ANALYSIS

In 2021, Spectra commissioned an independent Life Cycle Analysis (LCA). The report aimed to give customers scientific like-for-like comparisons on the environmental impact of four common materials used for packaging in cosmetics and personal care markets.

This brochure summarises the findings of the LCA, which compares four similar 300ml bottle shapes in 30% PCR HDPE and 30% PCR PET, as well as glass and aluminium containers that contain industry average amounts of recyclate, which currently stand at 67% and 75% respectively, all based on a UK market scenario (see below).

There are many LCAs online for those searching for environmental impact data on plastics and other materials. However, for many Spectra customers, the opportunity to see an average example, in this instance, a 300ml bottle in the four materials, is the closest they will get to real-case scenario evidence to help them in their decision-making process.

The full report can be found at https://www.flipsnack.com/spectrapack/spectra-lca.html

300ml HDPE BOTTLE

CONTAINS 30% RECYCLATE

The **HDPE bottle** used in the analysis contains **30% recyclate*** and falls within scope of the UK Government's Plastics Packaging Tax legislation.

300ml PET BOTTLE

CONTAINS 30% RECYCLATE

The **PET bottle** used in the analysis contains **30% recyclate*** and falls within scope of the UK Government's Plastics Packaging Tax legislation.

300ml GLASS BOTTLE

CONTAINS 67% RECYCLATE

To provide a balanced analysis, the **glass bottle** used in the study contains **67% recyclate**, which is in line with current industry average rates.

300ml ALUMINIUM BOTTLE

CONTAINS 75% RECYCLATE

To provide a balanced analysis, the **aluminium bottle** used in the study contains **75% recyclate**, which is in line with current industry average rates.

*Although the HDPE and PET products used in our analysis include 30% recyclate, Spectra can provide levels up to 100%.

MATERIAL SOURCES & APPLICATIONS

PLASTIC

Plastics derive from natural, organic materials such as cellulose, coal, natural gas, salt, and crude oil. Crude oil is a complex mixture of thousands of compounds and needs to be processed before being used. The production of plastics begins with the distillation of crude oil in an oil refinery.

TYPICAL PACKAGING APPLICATIONS

- Soft drinks and water bottles
- Cosmetics, toiletries, and personal care
- Caps and closures
- Milk and water jugs
- Food packaging

GLASS

Glass comprises three primary ingredients. Sand which makes up 72%. 16% soda ash, and the remainder is made up of limestone. The soda acts as a flux and lowers the melting point of glass. The Lime (calcium carbonate), C9O, stabilises glass and makes it strong and water and chemical resistant.

TYPICAL PACKAGING APPLICATIONS

- Beer and soft drink bottles,
- Wine / liquor bottles
- Food and juices
- Cosmetics, toiletries and personal care

ALUMINIUM

Aluminium originates from bauxite, an ore typically found in the topsoil of various tropical and subtropical regions. Once mined, aluminium within the bauxite ore is chemically extracted into alumina, an aluminium oxide compound, through the Bayer process.

TYPICAL PACKAGING APPLICATIONS

- Soft drinks and beer
- Cosmetics, toiletries, and personal care
- Caps and closures
- Food packaging

KEY DRIVERS FOR ANALYSIS

The comparative scenarios within the analysis looked at the six key stages of each of the product's lifecycle, including material extraction, packaging, manufacturing, distribution, usage, and end of life. However, within these six key stages, the analysis delves into five environmental impact measurement levers, and these are listed on the right page.

GREENHOUSE GAS EMISSIONS

Packaging components and conversion processes naturally contribute to greenhouse gas emissions.

HDPE resin has a lower carbon footprint than PET resin because it is created from the polymerisation of ethylene. At the same time, PET is made by polymerising ethylene glycol (derived from ethylene) and terephthalic acid. This process requires more processing stages, more energy, and a higher environmental impact across most impact categories.

Aluminium has high impacts due to the intensity of manufacture and conversion, despite its high recycled content (80%).

Glass impacts highly due to the extreme heat needed to mould. Its overall weight compared to plastic and aluminium, also significantly increases the environmental impact of its transportation (the analysis here is modelled on a supply from China in line with the UK's primary import market for this material).

NON-RENEWABLE ENERGY & MINERALS

Packaging components and conversion processes are naturally the highest contribution factor, in a similar trend to greenhouse gas emissions. This is usually the case where industrial processes are the primary source of greenhouse gas emissions. All other phases of lifespan incur minimal contribution. Only Distribution and Storage create a visible value with no real differential between materials of any significance.

FRESHWATER CONSUMPTION

Packaging again dominates this driver, where HDPE provides the lowest water impacts. Glass is shown to impact less than PET, which is drawn from the injection stretch blow moulding process. However, Aluminium provides the most harm within this driver.

LAND USE

Corrugated packaging elements have a higher contribution to land use. The main causation is the increased required elements for primarily glass and aluminium.

IMPACT ON ECOSPHERE

Packaging components dominate across this category; however, both HDPE and PET end of life landfill impacts increase due to there lower recycling rates.

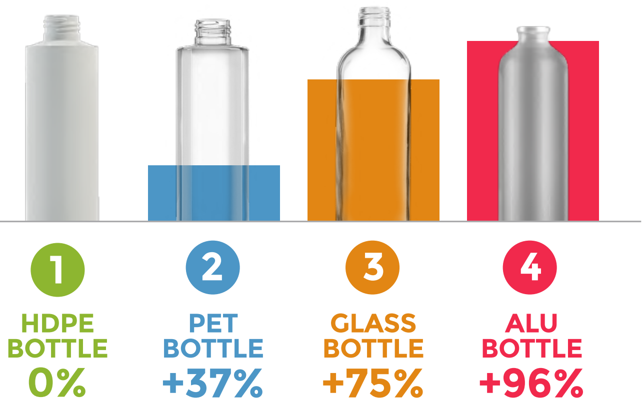
GREENHOUSE GAS EMISSIONS

DESCRIPTION:

This is a calculation of the global warming potential (GWP) due to emissions of greenhouse gases such as carbon dioxide (CO2) and methane. The contributors are burning coal for electricity through direct emissions from transport or from agricultural processes.

BASELINE ANALYSIS - 0% DIFFERENCE TO FIRST

Our **HDPE** bottle impacts the least on greenhouse gas emissions, but what are the baseline increases of the other materials in comparison? Using **HDPE** as the most efficient baseline figure, the comparative increases of the other materials are shown on the right.

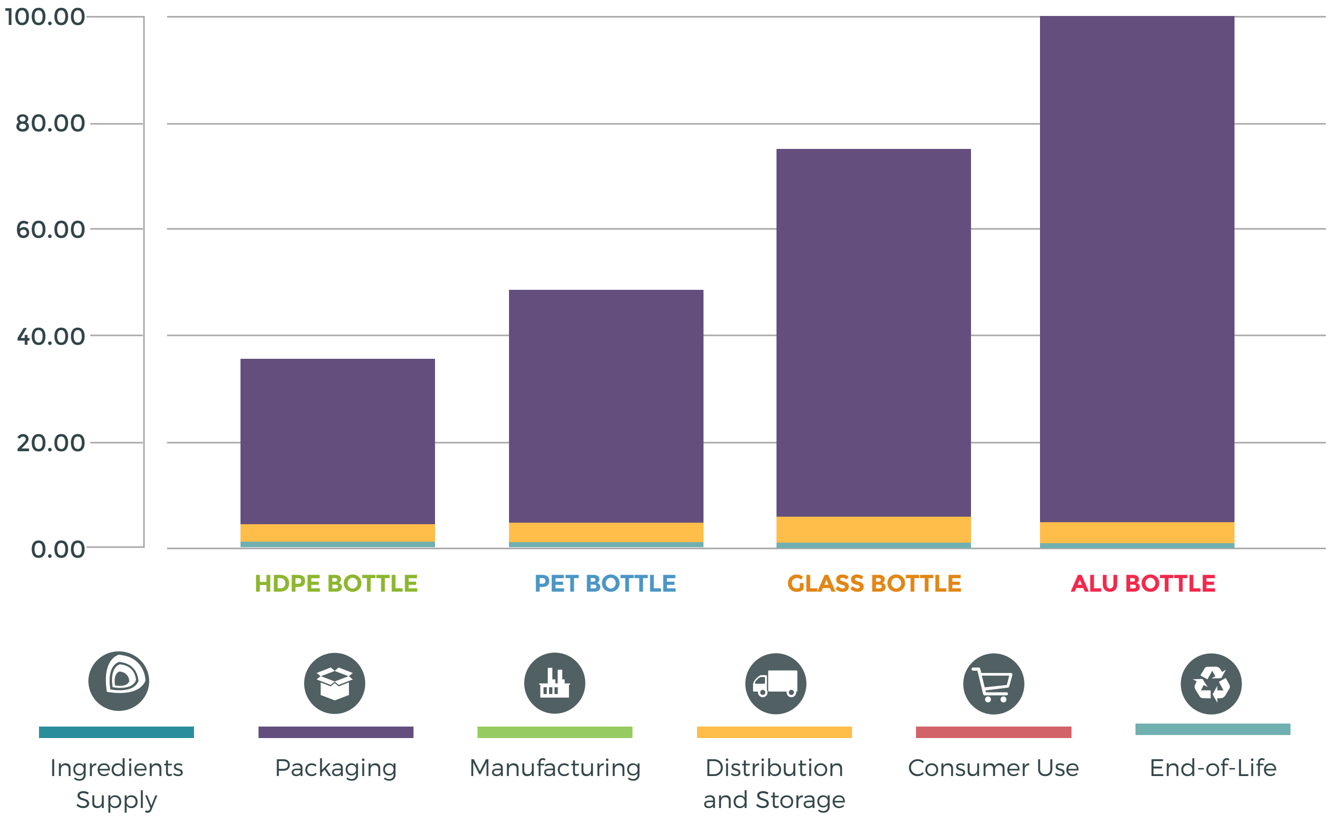


Results based on the impact of one bottle build

*Note: Cumulative score assumes all five measurements in this Life Cycle Analysis are treated as of equal importance to the end client. All clients should align the calculations in each of the five channels with their own internal environmental objectives and goals.

INDICATOR ANALYSIS FOR GREENHOUSE GAS EMISSIONS

Packaging Components and Conversion is by far the largest component of a bottles environmental footprint



EQUIVALENT COMPARISONS

MILES DRIVEN BY AN AVERAGE PASSENGER VEHICLE

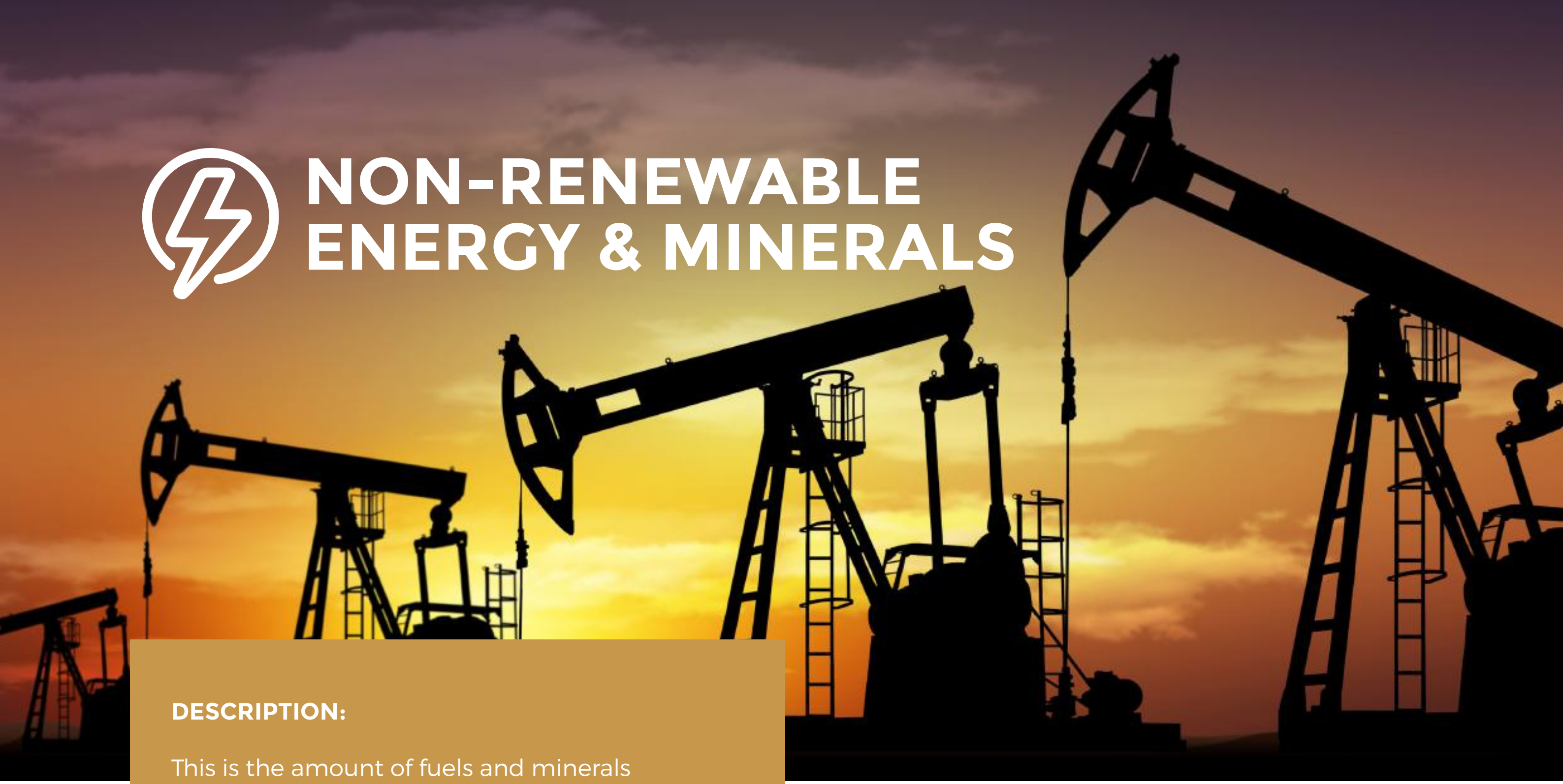
1. **HDPE** .... 17,989 miles
2. **PET** .... 24,759 miles
3. **GLASS** .... 39,540 miles
4. **ALU** .... 51,473 miles

NUMBER OF SMARTPHONES CHARGED

1. **HDPE** .... 870,681 phones
2. **PET** .... 1,189,646 phones
3. **GLASS** .... 1,913,773 phones
4. **ALU** .... 2,491,354 phones

AVERAGE HOMES ENERGY USE PER YEAR

1. **HDPE** .... 0.86 homes
2. **PET** .... 1.20 homes
3. **GLASS** .... 1.90 homes
4. **ALU** .... 2.50 homes



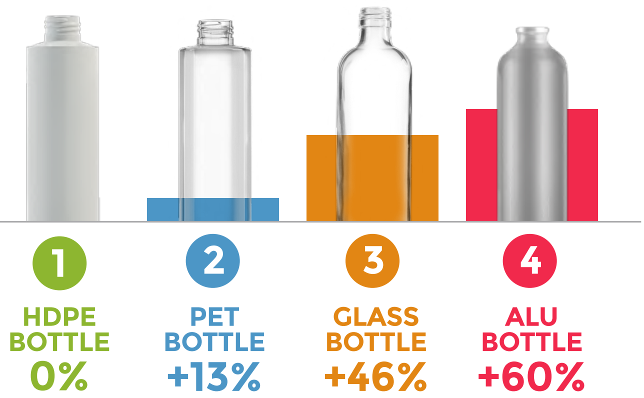
NON-RENEWABLE ENERGY & MINERALS

DESCRIPTION:

This is the amount of fuels and minerals extracted from the earth, weighted by a factor that considers their scarcity (conversion into kg Antimony equivalents). Although depletion of resources is not considered an environmental impact, non-renewable energy/minerals are essential to society and should not be wasted.

BASELINE ANALYSIS - 0% DIFFERENCE TO FIRST

Our **HDPE** bottle impacts the least on non-renewable energy and minerals, but what are the baseline increases of the other materials in comparison? Using **HDPE** as the most efficient baseline figure, the comparative increases of the other materials are shown on the right.

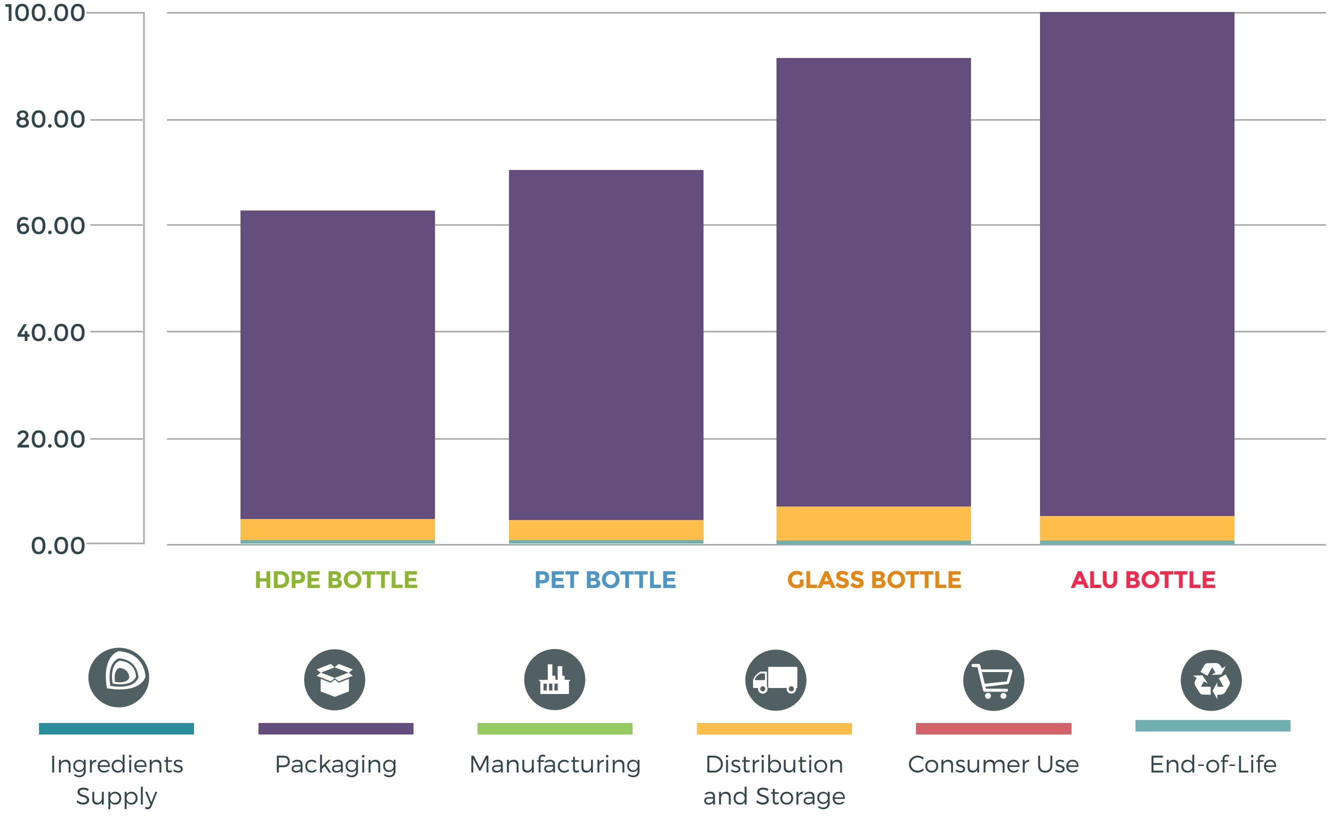


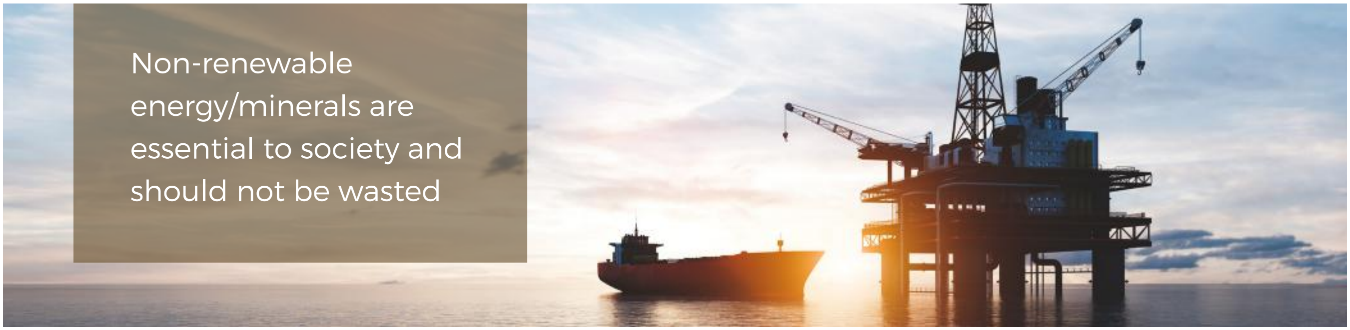
Results based on the impact of one bottle build

*Note: Cumulative score assumes all five measurements in this Life Cycle Analysis are treated as of equal importance to the end client. All clients should align the calculations in each of the five channels with their own internal environmental objectives and goals.

INDICATOR ANALYSIS FOR NON RENEWABLE ENERGY & MINERALS

Packaging Components and Conversion is by far the largest component of a bottles environmental footprint





FRESHWATER CONSUMPTION

DESCRIPTION:

This measurement considers potable, process, and cooling water but excludes turbine water used in hydroelectricity generation. The water sources considered include rivers, lakes, and oceans. We should interpret this driver with care. For example, we should consider water scarcity; however, we cannot currently do this with a simplified tool because it requires a local assessment. Furthermore, wealthier societies can adapt to water scarcity.

BASELINE ANALYSIS - 0% DIFFERENCE TO FIRST

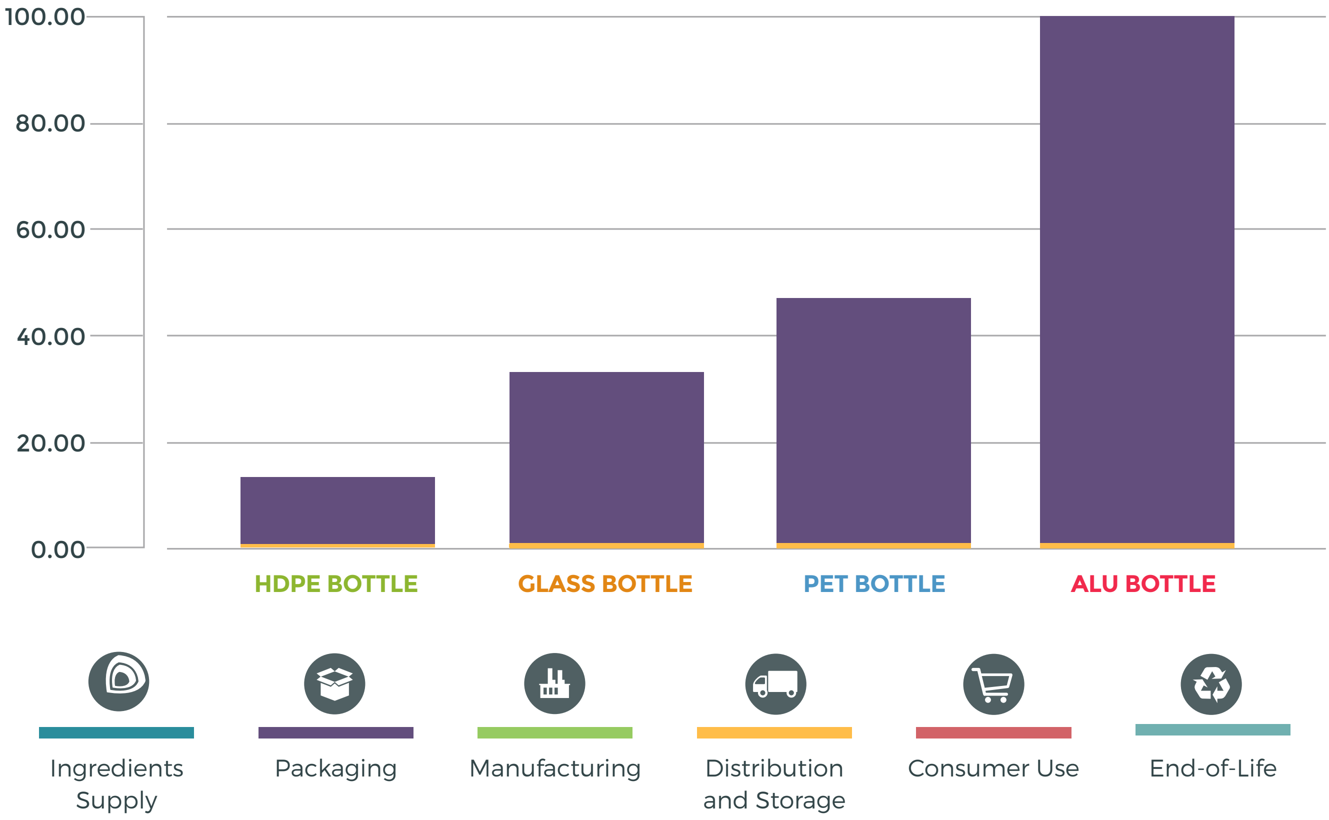
Our **HDPE** bottle impacts the least on freshwater consumption, but what are the baseline increases of the other materials in comparison? Using **HDPE** as the most efficient baseline figure, the comparative increases of the other materials are shown on the right.

Results based on the impact of one bottle build

*Note: Cumulative score assumes all five measurements in this Life Cycle Analysis are treated as of equal importance to the end client. All clients should align the calculations in each of the five channels with their own internal environmental objectives and goals.

INDICATOR ANALYSIS FOR FRESHWATER CONSUMPTION

Packaging Components and Conversion is by far the largest component of a bottles environmental footprint



EQUIVALENT COMPARISONS

OLYMPIC SWIMMING POOLS

1. HDPE .... 0.03 pools
2. GLASS .... 0.07 pools
3. PET .... 0.10 pools
4. ALU .... 0.21 pools

ONE PERSON HOUSEHOLD AVERAGE DAILY USE

1. HDPE .... 1.28 days
2. GLASS .... 3.26 days
3. PET .... 4,54 days
4. ALU .... 9.74 day

AVERAGE BUCKETS OF WATER

1. HDPE .... 3662 buckets
2. GLASS .... 9299 buckets
3. PET .... 12945 buckets
4. ALU .... 27791 buckets

LAND USE

DESCRIPTION:

This driver accounts for land use for a given time for occupation by the built environments, forestry production or agricultural processes. We should interpret this driver with care. For example, the use of 1km2 of rainforest is assumed to have the same impact as that of 1km2 of desert. Land use for agriculture is believed to have the same impact as that used by a factory.

BASELINE ANALYSIS - 0% DIFFERENCE TO FIRST

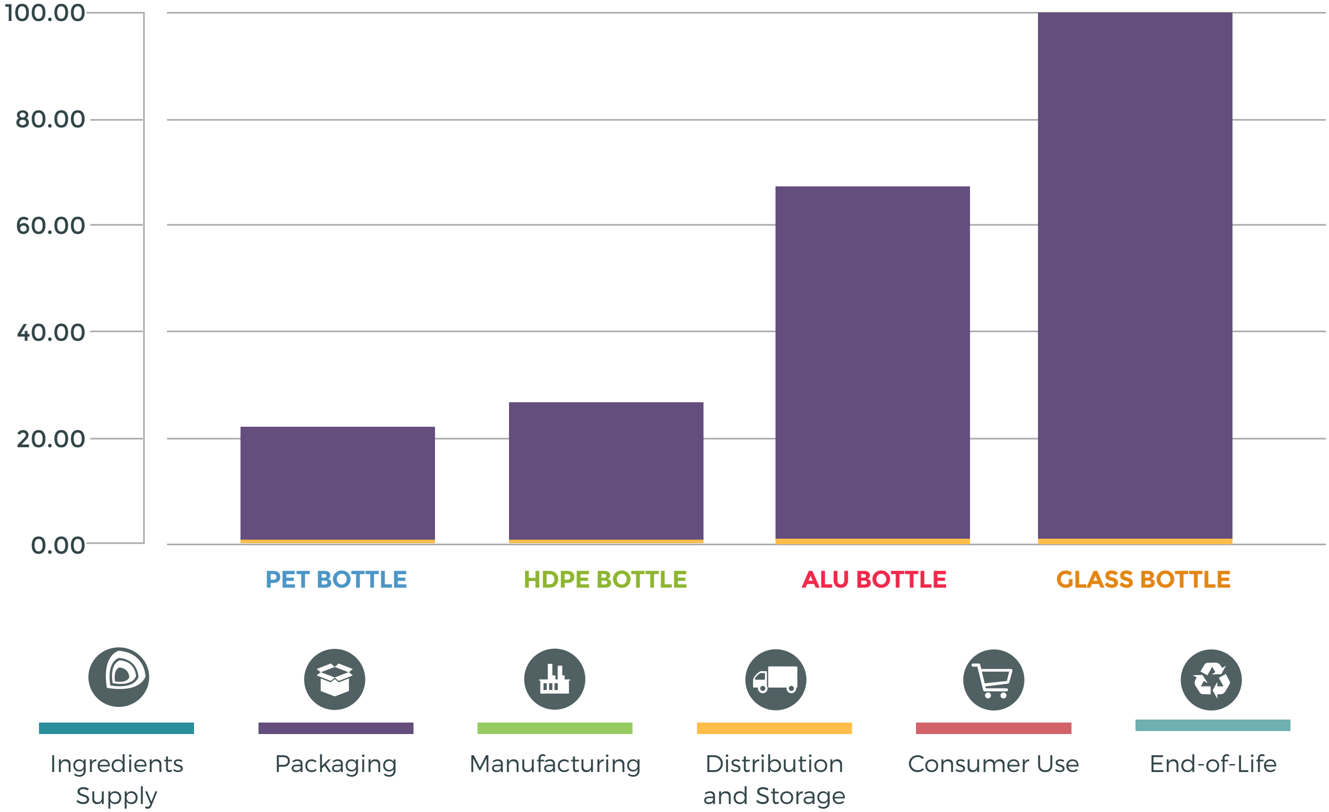
Our **PET** bottle impacts the least on land use, but what are the baseline increases of the other materials in comparison? Using **PET** as the most efficient baseline figure, the comparative increases of the other materials are shown on the right.

Results based on the impact of one bottle build

*Note: Cumulative score assumes all five measurements in this Life Cycle Analysis are treated as of equal importance to the end client. All clients should align the calculations in each of the five channels with their own internal environmental objectives and goals.

INDICATOR ANALYSIS FOR LAND USE

Packaging Components and Conversion is by far the largest component of a bottles environmental footprint



EQUIVALENT COMPARISON

EQUIVALENT FOOTBALL PITCHES

1. **PET** .... 0.03 pitches
2. **HDPE** .... 0.04 pitches
3. **ALU** .... 0.10 pitches
4. **GLASS** .... 0.15 pitches

IMPACT ON ECOSPHERE

DESCRIPTION:

This summary indicator accounts for acidification (acid rain from SO2 and NOX), eutrophication (Nm and P nutrient enrichment to waterways), and ecotoxicity (toxic pesticides and metals). Uncertainty is high due to a combination of indicators. These threaten forests and fish due to algae bloom and anoxic conditions that suffocate all animals and result in loss of species biodiversity.

BASELINE ANALYSIS - 0% DIFFERENCE TO FIRST

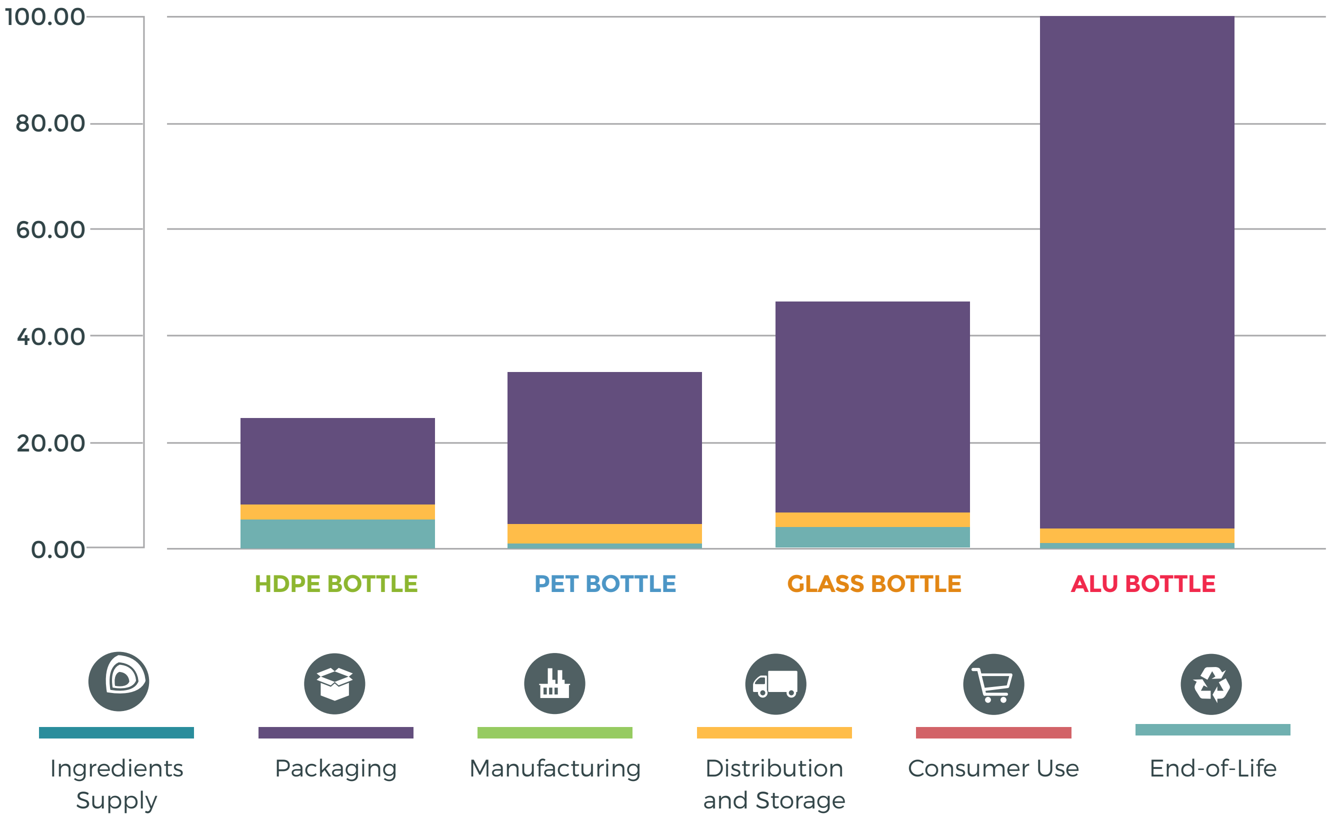
Our **HDPE** bottle impacts the least on ecosphere, but what are the baseline increases of the other materials in comparison? Using **HDPE** as the most efficient baseline figure, the comparative increases of the other materials are shown on the right.

Results based on the impact of one bottle build

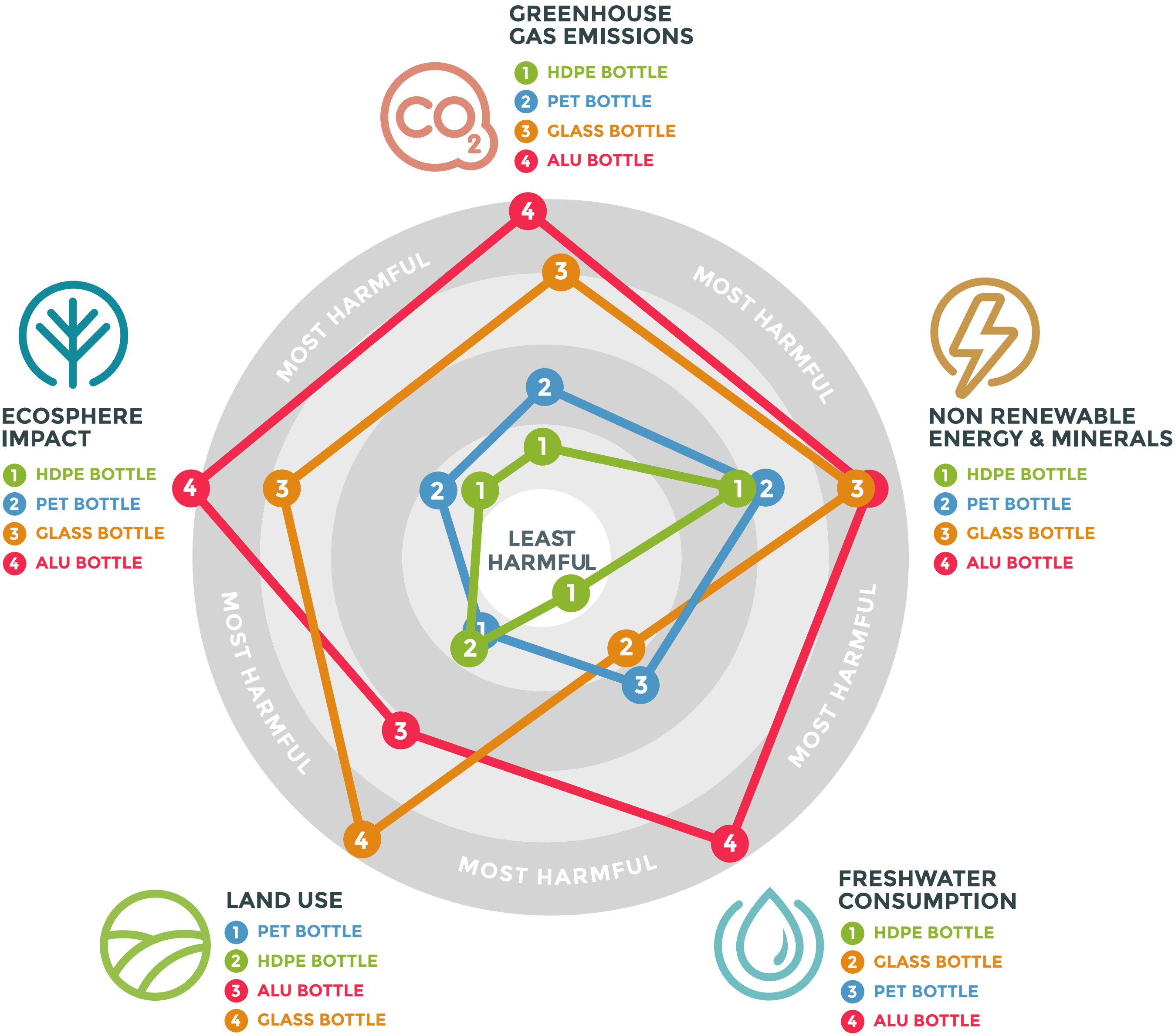
*Note: Cumulative score assumes all five measurements in this Life Cycle Analysis are treated as of equal importance to the end client. All clients should align the calculations in each of the five channels with their own internal environmental objectives and goals.

INDICATOR ANALYSIS FOR ECOSPHERE

Packaging Components and Conversion is by far the largest component of a bottles environmental footprint



LCA SPIDER DIAGRAMATIC



THE RESULTS

Based on the five key areas within the full life cycle analysis and comparing an identical product packed using the four materials in the report, it is clear that our packaging choices, which include material extraction and conversion, present the most significant impact on the environment.

In comparing four similar 300ml bottle shapes in HDPE, PET, Glass, and Aluminium, HDPE provides the lowest overall environmental footprint based on a UK market scenario.

HDPE

HDPE ranked lowest across four of the five measurement levers (greenhouse gas emissions, non-renewable energy/ minerals, freshwater consumption, and ecosphere impact). Within the land use driver, HDPE came second to PET.

PET

Overall, PET ranked second in our analysis, with the lowest measure recorded on land use of the four materials in the study.

GLASS

Glass ranked third overall. Although it was more efficient than PET in the freshwater consumption lever, it was less efficient than HDPE bottle production due to high processing temperatures. Despite its high recyclate level, its significantly higher weight resulted in a high impact.

ALUMINIUM

Aluminium ranked last of the four materials across four of the key levers, with only the high land use for glass proving more inefficient overall. Aluminium manufacture is highly energy-intensive, resulting in the high impact of the bottle despite containing the highest recycled content.

RECYCLING RATES

Our report used all materials' latest recycling figures for the UK market to provide a fair analysis. The LCA includes a high recycling increase on previous figures for aluminium and what continues to be a flatline constant recovery figure for glass. Recycling figures for HDPE and PET are based on recycled bottle recovery figures to provide a more realistic score than total recycled plastics.

It is impossible to provide a split between plastic bottle materials in recycling (in this case, HDPE, and PET), so the overall figures have been applied to both materials, understanding that there is a solid growing framework to recover both in the UK market. We look for a 10%+ marker to guide significant step-change where percentage change differences are shown.

RECYCLING RATES OVER THE LAST 10 YEARS

ALUMINIUM
2010 rate: 54%
2020 rate: 75%
↑ 21%

PLASTIC
2010 rate: 45%
2020 rate: 59%
↑ 14%

GLASS
2010 rate: 67%
2020 rate: 67%
↔ 0%

WHAT SPECTRA IS DOING AS A MANUFACTURER

The results from our LCA show that the two plastics products manufactured at Spectra present less harm to the environment than their glass and aluminium counterparts across all key drivers.

We are fully aware that not all manufacturers are the same. The internal measures we take as a manufacturer have been developed to have a tangible effect on some of the key drivers mentioned earlier within this document.

As a responsible manufacturer, we pride ourselves on ensuring we minimise our overall impact on a per-container basis. We achieve this through several measures, from managing our energy and waste, to programmes aimed at minimising single-use behaviours. Some of the steps we take to minimise our impact are on the facing page.

HOW WE MINIMISE OUR MANUFACTURING IMPACT

Our purpose-built manufacturing facility has been designed specifically with the environment in mind.

We accurately measure our impact using Power Factor Correction (PFC) technology, ensuring energy usage is maximised. Our consumption is reduced courtesy of the latest energy-efficient lighting, heating, and cooling technology,

We have also invested in the latest technology in our moulding departments to ensure we are as energy efficient as we can be to reduce our impact. Other features include flood prevention measures, animal-friendly lighting and a purpose-built cycle path for staff wishing to reduce car usage.

HOW WE MANAGE OUR MANUFACTURING WASTE

We view our waste as a valuable resource, instigating several measures to ensure we manage it responsibly.

For example, we reuse as much of our manufacturing waste as possible. Any waste materials that cannot be reused are supplied to UK recycling plants, ensuring none goes to landfill. Other measures include ISO 14001 environmental management certification and full membership in Operation Clean Sweep, an initiative for reducing plastic pellet loss to the environment.

HOW WE RECYCLE, REDUCE AND REUSE

We are constantly evaluating all our practices to reduce unnecessary waste and minimise single-use behaviours in our business.

For instance, sustainably sourced recycled and recyclable materials are used when packaging our products. Similarly, our products are transported to customers using multi-use reclaimed wooden pallets,

Our waste cardboard, wood and plastics are gathered and re-entered back into the recycling chain. Other measures include changing single-use disposable items to multi-use alternatives within our factory.

HOW WE HELP CUSTOMERS MAKE A DIFFERENCE

To support brands wishing to decrease levels of virgin materials in their packaging, Spectra has instigated an environmental initiative called **PCR30**.

PCR30 will see all new quoted projects include a minimum of 30% PCR as standard. Any customers not wanting 30% recycled content will need to advise us on their opt-out wishes.

PCR30 follows our successful PCR10 initiative, launched in 2018 to widespread customer support. **PCR10** provided the perfect launchpad for brands looking to embrace recycled content. It is anticipated that **PCR30** will further incentivise others to ramp up their responsible packaging endeavours for the environment's good.

PPT READY

PCR30 falls within the plastics packaging tax requirement

Spectra has rapidly established itself as a leading independent supplier for innovative, high-quality rigid plastic packaging.

Our energetic and flexible approach has ensured lasting relationships with many leading high street brands within the toiletries, cosmetics and personal care sectors.

We can offer an extensive range of standard containers to choose from and an in-house custom tooling facility to provide bespoke designs. Additionally, we can provide environmentally responsible solutions in PCR (Post-Consumer Recycled) and Biopolymer.

Brands need not look further for innovative decoration either, Spectra boasts a dedicated in-house decoration department, offering an array of print finishes.

We also make closures for customers seeking a complete packaging solution, with everything produced at our purpose-built manufacturing plant in Suffolk.

Our in-house services include:

- An extensive range of standard designs
- Custom Moulding Solutions
- Environmentally Responsible Packaging
- Decoration and Finishing
- Colour Matching

www.**spectra-packaging**.co.uk

Antonine Way, Sparrowhawk Road, Holton, Halesworth, Suffolk IP19 8RX UK

Tel: +44 (0)1986 834190, Fax: +44 (0)1986 875380, Email: sales@spectra-packaging.co.uk

Printed on FSC certified paper