

# Developing better packaging solutions for the environment

## Introduction

Plastics play a vital role in our everyday lives from packaging containers and car parts to medical equipment and mobile phones – in fact it's hard to imagine life without plastic as it plays such a fundamental part in developing the way we live today.

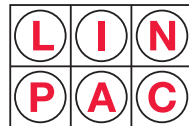
Plastic is versatile, lightweight, cost-effective, energy saving, tough, durable and recyclable. Therefore it has many applications and can provide significant benefits – protecting goods from damage, helping to better market products and extending the shelf life of goods.

Up to 50% of food resources are wasted in developing countries because plastics are not widely used for food packaging. Furthermore, research into the development of plastics and innovations in design have led to an overall decrease in the average weight of packaging by 28% in the last 10 years.

Only 4% of the world's oil production is used for plastics and much less energy is used to produce plastic when compared to other materials. Plastics are also easily recyclable and the calorific value of the plastic can be recovered through energy from waste incineration.



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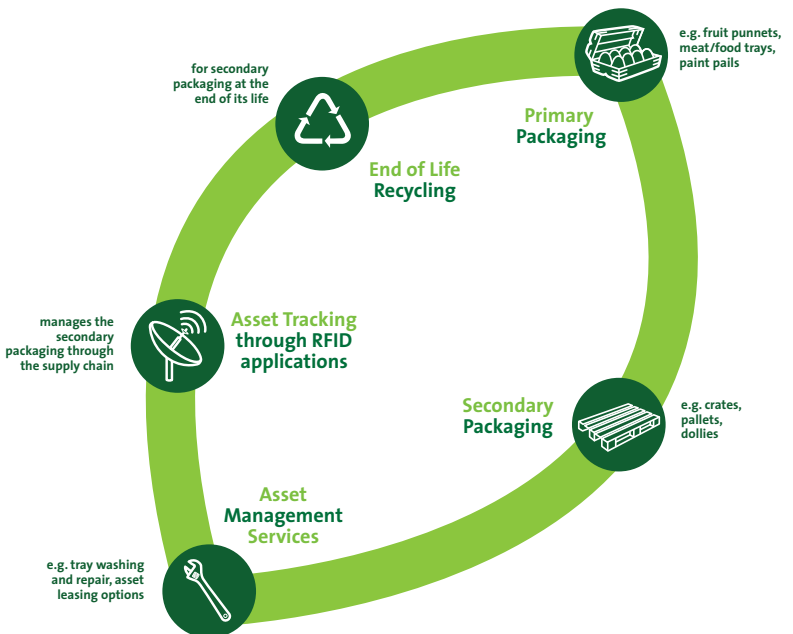




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## At LIMPAC we:

- reduce energy consumption through optimum weight packaging
- prevent double-handling of goods – delivered straight from customer to depot
- produce no significant waste in our manufacturing
- recycle water through closed loop production system
- delivered 441 energy saving projects in 2006 – saving some 17 million kgs of CO<sub>2</sub>
- are trialling bioplastic films – complete 'bio' solution of tray and over-wrap
- transport full loads
- have the largest UK facility for the recycling of rigid packaging waste
- process and recycle an average of 30,000 tonnes of plastic waste annually
- use recycled PET (RPET) in production of trays and punnets
- reduce emissions by improving efficiencies in our vehicles



# Primary Packaging Polyvinyl Chloride



## Performance Characteristics

### Strengths

- Good through packing machines
- Good clarity
- Natural barrier
- Good for Form Fill Seal
- Superior cling characteristics for film applications

### Weaknesses

- Colour expensive
- Needs a sealing layer for tray sealing

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## Environmental Characteristics

- Low carbon footprint
- Readily recyclable
- Not being collected for household recycling
- Some concerns about PVC generating dioxins when burned; however modern Energy From Waste (EFW) plants can combat this issue



PVC

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### LINPAC's view

Excellent barrier properties, transports and stores well.



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# Primary Packaging Polylactic Acid



## Performance Characteristics

### Strengths

- Good barrier
- Good clarity
- High rigidity

### Weaknesses

- Expensive raw materials
- Raw material is not readily available
- Not GM free
- Poor thermal stability – distorts at just 44°

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## Environmental Characteristics

- Readily recyclable but not yet collected from household waste stream
- Derived from crops such as maize, wheat and sugarbeet
- Biodegradable/compostable
- Low carbon emissions
- Potential contamination of recycling waste streams
- No energy benefits in processing the material

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### LINPAC's view

Compostable and derived from natural sources. A relatively new generation of plastics with different environmental characteristics than conventional polymers.



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# Primary Packaging Polypropylene



## Performance Characteristics

### Strengths

- Medium barrier
- Medium clarity
- Low cost
- Good through sealing machines

### Weaknesses

- Clarity is compromised
- Low shelf life
- Needs laminating to get high barrier

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## Environmental Characteristics

- Easy to recycle
- No current plans in place for local authority recycling collection
- Low energy needed to transpose and to process
- Good transport efficiency



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### LINPAC's view

Cost-effective material, can be recycled but needs recycling scheme to be implemented.



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# Primary Packaging Polystyrene



## Performance Characteristics

### Strengths

- Good through packing machines
- Good clarity
- Low density and low weight to strength

### Weaknesses

- Expensive raw materials
- Needs laminating to get high barrier

## Environmental Characteristics

- Readily recycle
- No collection schemes for recycling
- Low energy needed to process
- Good transport efficiency



### LINPAC's view

Cost-effective and easy to mould but too brittle on its own.



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# Primary Packaging Expanded Polystyrene



## Performance Characteristics

### Strengths

- Good for packer filler processing
- Easy to produce colour options
- Excellent insulation
- Lightweight
- Printable

### Weaknesses

- Low barrier
- No clarity
- Needs laminating for barrier or sealing layer

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## Environmental Characteristics

- 98% air – its light weight minimises transport costs and fuel emissions
- Easy to recycle
- Insulation properties keep food fresh for longer reducing food waste
- Lowest carbon footprint of all conventional polymers
- Not being collected for household recycling
- Low energy needed to process



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### LINPAC's view

Excellent insulation and production, easy to recycle, hygienic and clean to handle with the lowest carbon footprint of all conventional polymers used to make trays.



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# Primary Packaging Polyethylene Terephthalate



## Performance Characteristics

### Strengths

- Good barrier
- High clarity
- High rigidity

### Weaknesses

- High density
- Hard to process
- Slower through pack stations
- More difficult to seal
- Higher cost due to polymer price and high specific gravity
- Needs PE laminate to get good seal in wet applications

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## Environmental Characteristics

- Readily recyclable
- PET bottles are collected widely for recycling
- Good transport efficiency
- Can use recycled content
  - RPET is the next generation

rfresh<sup>o</sup>



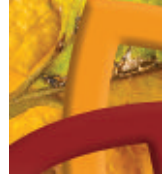
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### LINPAC's view

Excellent clarity and strong environmental credentials but has heavy impact on machines through manufacture.



# PrimaryPackagingHDPE



## Performance Characteristics

### Strengths

- Good chemical resistance
  - High tensile strength
  - Flexible material
  - Excellent rigidity
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## Environmental Characteristics

- Readily recyclable
  - Good transport efficiency
  - Can be collected from customers for recycling
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HDPE

### LINPAC's view

Can be easily recycled, reducing the waste stream and allowing for multiple onward applications.

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### Secondary applications

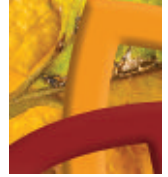
Bottle crates, box pallets, dollies, large folding containers, merchandising containers, pallets, medical packaging.



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# PrimaryPackagingPP



## Performance Characteristics

### Strengths

- Tough and flexible
  - Good impact performance
  - High resistance to heat
  - Resists stress cracking
  - Easy to screen print graphics
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## Environmental Characteristics

- Readily recyclable
  - Good transport efficiency
  - Can be collected from customers for recycling
  - Low energy needed to transpose and to process
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### LINPAC's view

Excellent balance between stiffness and impact performance. Easy to recycle with range of second use markets already established.

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### Secondary applications

Attached lid containers, stacking boxes, folding containers, merchandising containers.



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# Other Packaging Materials



## Paper:

### Arguments in favour of paper/board packaging use:

- Easily recyclable
- Uses naturally occurring renewable material
- Lightweight
- Flexible
- Compostable
- Less expensive for non-return applications

### Arguments against paper/board packaging use:

- Cost of collection and disposal
- Have to purchase in bulk
- Time and cost of assembly inc stapling, taping, banding and shrink wrapping
- Stray staples could damage / contaminate contents or injure operators
- Cannot be recycled indefinitely
- Unbleached and waste-based pulp board is less strong and may taint food
- Biodegradable – in landfill it is therefore at risk of emitting methane
- Limited reusability due to durability
- Not waterproof and may not protect product from damage

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## Glass:

### Arguments in favour of glass packaging use:

- Strong and durable
- Suitable for reuse
- Suitable for recycling
- Extensive recycling infrastructure
- Can be easily and successfully sterilised
- Glass is inert, will not transfer any chemicals into products, and provides an excellent moisture and gas barrier
- Packaging made from glass can be used to process foods at high temperatures, or for 'hot filling'; and can use high recycled content

### Arguments against paper/board packaging use:

- Heavier than other packaging materials
- Mixed, dark coloured glass is currently difficult to recycle
- Fragile
- Less safe to handle than other materials
- Imported green glass is not easy to recycle
- Cost of raw materials
- Energy intensity during manufacture



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# Other Packaging Materials



## Metal:

### Arguments in favour of metal packaging use:

- Suitable for recycling
- Uses high recycled content
- Established recycling infrastructure
- High strength-to-weight ratio
- Strong and flexible
- Goods stored in steel cans have a long shelf life

### Arguments against metal packaging use:

- Limited design formats
- Generally cannot be resealed once opened
- May react with food or contaminate product
- Mining and manufacture use considerable energy and resources

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## Composite:

### Arguments for the use of composite materials:

- Lightweight
- Uses minimal raw materials
- Good packaging performance
- Good protection
- Good barrier properties

### Arguments against the use of composite materials:

- Uses little recycled material
- Recycling infrastructure is not yet well developed

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## Wood:

### Arguments for the use of wood:

- Low energy consumption and low CO<sub>2</sub> emissions
- Organic, renewable material
- Sustainable resource
- Less energy intensive to manufacture

### Arguments against the use of woods:

- Absorbent and so may damage products
- Less safe to handle than other materials



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