



This Food Science Fact Sheet is one of a series compiled by Institute of Food Science and Technology, providing clear, concise and scientifically reliable information on key food science topics for consumers.

Food and Drink Packaging

Why is packaging used?

Protection/preservation - avoids damage during transportation and storage. Provides a barrier to spoilage and disease-causing microorganisms and pests extending shelf life, ensuring food safety and minimising waste. Protects from oxygen, moisture, strong odours and light. Can be tamper-proof.

Labelling - provides information regarding ingredients, allergens, origin, quantity, use by date, cooking instructions and nutritional information etc. It is also important for traceability.

Convenience - supports usage making the product easier to prepare and serve e.g. resealability, portion control and heat stability (microwaveable, ovenproof, boil in bag etc.).

Marketing - attracts customers, supports brand image and differentiates the product in store, due to the design, shape, branding etc.

Where is packaging used?

Retail (primary) - in direct contact with the food or drink.

Grouped (secondary) - combines and protects individual units. Often used to display and market primary packs in store.

Transport (tertiary) - facilitates stacking and handling and protects during transit.

Example:



What materials are used?

Material	Usage	Pros	Cons
Glass	Bottles Jars	Transparent Reusable Varied shapes and colours Heat stable	Heavy Fragile
Metal	Tin cans Drinks cans Foil trays	Strong Good barrier (moisture, air, odour, light) Heat stable	Not microwave safe
Plastic	Bottles Trays Pots	Rigid/flexible Varied shapes and colours Transparent	Can be slow to biodegrade
Paper	Box/ carton Bags Sleeves	Printable Flexible Biodegradable	Poorer physical strength Absorbent

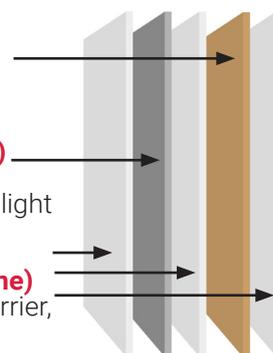
Can materials be combined?

Lamination is a technique of manufacturing composite packaging material with multiple layers to optimise its properties, such as drink cartons.

Paperboard
rigid and printable

Foil (aluminium)
barrier to oxygen and light

Plastic (polyethylene)
moisture barrier, adhesive



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Recycling: importance and challenges

Recycling packaging avoids landfill and delivers economic and environmental benefits by reducing the use of resources.

Composite materials must usually be broken into their original materials before they can be recycled, which is challenging.

Materials in contact with food and drink must meet strict legal requirements to ensure chemicals are not released into the product and that there is no microbiological contamination. Recycled metal and glass are considered safe to be reused for food contact due to the extremely high temperatures required to rework them, as opposed to plastics and paper-based materials which are not generally reused in such applications.

Whether a material is recycled depends on having the correct infrastructure and facilities in place which varies geographically, if there is a market for the recycled material and if consumers actually dispose of the packaging correctly.

Packaging symbols - examples

	Capable of being recycled		Widely recycled by 75% or more of the UK's local authorities
	Recycled by 20-75% of local authorities		Recycled by less than 20% of local authorities
	Number indicates the plastic type e.g. 1: PET (polyethylene terephthalate) 3: PVC (polyvinyl chloride) 5: PP (polypropylene)		
	Producer contributes to Green Dot packaging recovery scheme		Paper-based products from well managed forests
	Recyclable glass. Separate different colours		Made from recyclable aluminium
	Industrially compostable		Suitable to be home composted

What is biodegradable packaging?

Biodegradable means that a material can be broken down by naturally occurring microorganisms such as bacteria and fungi. Biodegradability depends on the environmental conditions that the packaging is exposed to e.g. temperature, moisture, pH, oxygen.

What is compostable packaging?

Some biodegradable materials are compostable although not necessarily in a home (domestic) composter. Compostable packaging is composed of material that breaks down under specific conditions. Industrial composting conditions involve elevated temperatures (55-60°C) combined with a high relative humidity and the presence of oxygen. To be legally labelled as compostable it must be certified to break down industrially within 3 months.

What is bio-based packaging?

This means it is derived from renewable organic matter either naturally from plant sources (e.g. starch from wheat/maize) or synthetically requiring a chemical transformation. It is not necessarily biodegradable.

How can shelf life be extended?

Modified atmosphere packaging (MAP) involves changing the proportions of gases (oxygen, nitrogen and carbon dioxide) as a means of preservation e.g. meat, crisps, fresh pasta. This relies on the barrier properties of the packaging and seal integrity. Vacuum packing keeps food in oxygen-free conditions to reduce bacterial growth and quality deterioration e.g. coffee, cheese. Active packaging incorporates a system into the film or container e.g. ethanol emitters; carbon dioxide and oxygen scavengers; moisture, flavour and odour absorbers.

Resources

Marsh, K. and Bugusu, B. (2007). Food Packaging—Roles, Materials, and Environmental Issues. *Journal of Food Science*. 73 (1), 39-55.

www.recyclenow.com/recycling-knowledge/packaging-symbols-explained

www.saxonpackaging.co.uk/difference-between-primary-secondary-tertiary-packaging/

www.wrap.org.uk/category/materials-and-products/plastics (understanding plastic packaging sheet)

www.wrap.org.uk/sites/files/wrap/Definitions.pdf