



## Why barrier properties are critical to food product quality

The barrier properties of the packaging you choose for your product will have a profound impact upon its shelf life. With so many options available to you, however, it can be difficult to find the optimum solution for your needs. Indeed, it is easy to choose packaging that is either over engineered, and therefore unnecessarily expensive. Likewise, the use of packaging with insufficient barrier properties can cause you all manner of headaches.

Read on to find-out more about shelf life, what we mean when we talk about barrier properties, and some of the things that you will need to consider as you work to design your packaging.

### **Shelf life**

Shelf life is the durable life of a pre-packaged product. It describes a period of time that commences on the day that a pre-packaged product is presented for retail

sale and ends at the point at which the product no longer meets the manufacturer's requirements for taste, nutritional value and/or safety.

The condition of foodstuffs deteriorates over the course of their shelf life, which will cause significant changes to their flavour, scent, texture, appearance and nutritional value and/or efficacy.

Consumers have an expectation of quality when they buy a product. The stated shelf life of that product serves as a guarantee from the brand owner that they will not be disappointed, if they buy it within the timescales presented. If a consumer's expectations of quality are not met, they are unlikely to buy the product again. And if the product has deteriorated to the point where the consumer comes to harm from it, the manufacturer could be facing costly reputational damage, and even legal action.

## Film properties



Moisture resistant



Impact resistant



Puncture resistant



Prevent transfer of moisture, gases, oils and aromas



Temperature resistant



Resealable



Gas resistant



Breathable



### Barrier properties

Accordingly, the barrier properties of the packaging that you choose for your product are of vital importance. Simply put, barrier properties describe the permeability of a material to gasses (such as oxygen, carbon dioxide and nitrogen), water vapour, aroma compounds and light. The nature of the product to be packaged determines which of these properties are of the most importance to extend shelf-life and to maintain the integrity of the product.

Traditional packaging materials, such as glass containers and metals, as well as plastic bottles, and laminates (such as paper laminated with aluminium foil) provide a proper barrier to oxygen. However, there are numerous differences between the various packaging systems. Metal tins and glass containers are impermeable to the passage of gasses, odours and water vapour. Plastic-based packaging materials, meanwhile, provide varying degrees of protection, depending largely on the nature of the polymers used in their manufacture.

### Traditional materials

Metal packaging guarantees a long shelf life by preventing microbes, light and oxygen from damaging the product that it contains. Glass, meanwhile, is inert and nontoxic, and its good barrier properties preserve the aroma of its contents while protecting the food from external factors.

Both materials, however, are being displaced by plastics owing to their flexibility, versatility, thermal stability and light weight.

### Plastics

In general, the barrier properties of plastic packaging depend on:

1. its chemical characteristics, such as its crystallinity, molecular orientation and chain stiffness
2. the properties of the substance from which the packaging is designed to provide protection from, such as molecule size and nature, and the conditions – the temperature and humidity – of both the product
3. the environment in which the product will be stored.

As it might be difficult to obtain all the required barrier properties from a single plastic film, multi-layered, laminated, coextruded, coated and metallised films have been developed.

### Laminates

Laminates comprise multiple layers of foil, paper and/or plastics that can be included selectively according to the specific requirements of the packaging. In combination, the various laminates provide more strength and barrier protection than using the constituent materials in isolation. In laminates of paper/aluminium foil/polyethylene, for instance, the plastic layers enable heat sealing, while the aluminium foil provides a barrier to moisture, gasses and light. Finally, the paper provides stiffness, strength and shape.

## Considerations

There are many things that you need to consider when selecting the right packaging for your product.

### The value of the product

Commodity items, such as bagged salads, are cheap and quick to produce, and the expectation of the consumer is that they will need to be consumed within a few days, if not on the day of purchase. As such, it makes no business sense to invest in advanced packaging for these types of products. Premium biscuits or cakes, on the other hand, are more expensive to manufacture and might sit on shelves for months before being purchased. Investing in packaging that grants good control over oxygen and water-transmission rates, therefore, is a worthwhile endeavour.



### Gas flushing

Gas flushing is a process through which various types of inert gas (most commonly nitrogen) are injected inside a package, sucked out, and then re-injected repeatedly to purge any oxygen. This is done to improve the shelf life of the product contained within. Using packaging that does not demonstrate sufficient barrier properties, however, renders this process almost completely redundant, as all the inert gas will leak out of the package over time. Manufacturers that gas-flush their product, but do not use the right packaging, are wasting both their time and money.



### Sustainability

While many brands are looking to reduce the quantities of plastics that they use, they should be selective, choosing high quality sustainable options that are fit for purpose. Poor-performing materials may only serve to complicate supply chains and might be of no overall benefit to the environment. Impaired shelf life of products packed in materials with poor barrier properties can lead to more frequent, more expensive pack deliveries and increased product waste through spoilage. A balance between quality and suitability is therefore recommended.

Barrier coatings on paper-based materials or mono-plastics are often considered to be two of the more sustainable packaging options. While they can be effective, their limitations in terms of barrier performance in comparison with traditional multilayer structures need to be understood at the packaging-design stage.

Barrier coatings may be used to prevent paper-based packaging from absorbing moisture or to provide some resistance to staining from greasy foods. A more demanding requirement is to limit the ingress of oxygen or moisture vapour, in order to extend the shelf life of the product. In essence, coatings are used to mitigate the poor performance of paper – when compared with most plastics – in applications that require some barrier performance.

Indeed, it is critical to be aware of the water vapour- and oxygen-transmission rates of 'sustainable' packaging materials so that their suitability for the packaging of moisture- and oxygen-sensitive products can be determined accurately. Furthermore, manufacturers need to take care when looking at the permeability rates quoted for barrier-coated papers. The act of folding or creasing a coated paper may have a marked effect on its barrier performance, unless the coating remains intact through the conversion and subsequent handling processes.





## Conclusions

As we have seen, the barrier performance of the packaging that you choose for your product is almost as important as the quality of the product itself. Indeed, when it comes to preserving shelf-life, it could be argued that the two are inextricably linked. With so many options available to you and so many variables to consider, however, it can be difficult to make the right choices. That is why you need partners that you can trust.

From our factory in the heart of the UK, Terinex Flexibles designs and prints flexible packaging for leading food brands as well as non-food packaging for the pet food and medical industries. We are experts in printing and supplying flexible films that demonstrate exceptional barrier properties, keeping your products fresh and improving shelf-life.



## A leading supplier of printed flexible packaging films and solutions

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### Sources:

1 <https://www.thegrocer.co.uk/category-reports/how-exotic-pie-is-getting-a-piece-of-the-action-savoury-pastries-and-meat-snacks-category-report-2022/673725.article>