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## Intelligent and active packaging



From ancient times when packaging was made from naturally occurring materials such as gourds and large leaves right up to the present day and the humble plastic bag, “intelligent” is not really a word you would expect to apply to packaging. But now “intelligent packaging” has become the accepted term for anything used in the packaging chain which informs the consumer that something has happened to the pack during the stages of its journey from the production line to the point of purchase or use. Examples are child-resistant packaging, tamper-evident packaging and what are known as “TTIs”, Time-Temperature Indicators. For some products it is very important to have a precise record of the temperatures they have experience throughout their lifetime inside a package. TTIs are devices used in packaging to achieve this. At one time such monitoring was only possible using a relatively costly instrument capable of maintaining a record of temperature over time. Modern TTIs of the type illustrated on the left use liquid chemicals contained in blisters formed between two flexible plastic layers. The indicator is activated by applying pressure which breaks the seal between adjacent blisters and allows the solutions to mix; starting a chemical enzyme reaction which when exposed to temperature over time undergoes a colour change from the

starting green colour to a final "end point" yellow. The picture on the right illustrates a typical application where a TTI is being used to monitor the temperature history of refrigerated salmon filets packed in foamed polystyrene boxes.



Active packaging is specifically designed to change the condition of packed food in order to extend its shelf-life, improve safety or enhance sensory properties. Among the examples are plastic films which incorporate an oxygen scavenging layer that can be “switched on” by ultraviolet light, and the inclusion of ethylene absorbers to increase the storage life of fresh fruit and vegetables. The gas ethylene is released by fruit after harvesting and accelerates ripening; the use of an ethylene absorber can extend shelf life significantly.

Some modern plastic films used for food packaging contain antimicrobial compounds which reduce, inhibit or retard the growth of micro organisms (yeasts, moulds, bacteria). First developed for use in pharmaceutical applications, because of the increasing demand for minimally processed foods, the use of plastic films that release antimicrobial agents at a controlled rate is increasing. They offer important

advantages over the alternative of incorporating the agent into the foodstuff itself. For non-fluid foods, microbial action is mainly a surface phenomenon, and controlled release of an antimicrobial agent from a plastic film means that much less needs to be used, and consumer demands for food which does not contain preservatives can be more easily satisfied.

Another type of active packaging is Modified Atmosphere Packaging (MAP), where the composition of the air surrounding the product is carefully managed to increase shelf life, preserve flavour and reduce the need for additives.

The composition of the micro atmosphere within the package is chosen to suit the needs of the product. For example, while lean fish needs a mixture of 40% N, 30% CO<sub>2</sub>, 30% O<sub>2</sub>, fatty fish is best preserved with a 70% N, 30% CO<sub>2</sub> mixture.



In the example illustrated, products from the Buitoni range of fresh refrigerated pasta are packaged in a modified atmosphere.

Some packages can also have a patented oxygen scavenging lid which removes residual oxygen from the package, achieving oxygen levels of less than 0,1% in three to eight days and increasing the shelf life of the Buitoni pasta products by 50%.