



My, Aren't You Smart!

Technological innovations are bringing intelligence to food packaging

Does your package sport a little mortarboard? It might metaphorically if it's up to the level of innovation needed for smart packaging.

There are many definitions of "smart packaging" and degrees of "smartness," but generally for packaging to be considered smart, it must perform some function above and beyond protecting and marketing the product it contains. While that can cover a wide range of things, one of the simplest and most vital functions is tamper-evidence. Whether showing evidence of malicious interference or consumer "sampling," tamper-evidence is central to the integrity of food products.

Active packaging performs a particular task, such as moisture absorption, or anything that needs to be done on a constant basis, or for which there is no activation mechanism. "Avery Dennison has two good examples," says Carol Zweep, manager of Packaging Services at the Guelph Food Technology Centre in Guelph, Ont. "Their air-release valve releases air or steam from a product, and their anti-microbial label inside a container of raspberries releases chlorine dioxide gas to suppress microbial activity."

Intelligent packaging changes over time, or is started by a reaction in the surrounding environment. Examples include indicators that tell time-temperature history, microbial growth indicators, spoilage indicators, and those that show evidence of physical shock, leakage or other damage. In addition, there are several different degrees of intelligence.

• *Complex Procedures* – In some cases, the consumer activates the process, as with the Wolfgang Puck self-heating coffee can. When the consumer removes the tamper-evident base and presses the "button" the heating reaction begins. The foam label markets the product and insulates the hand, and the cans can keep liquid inside hot for up to 30 minutes, and warm for an additional 30 minutes. Likewise, the Guinness "floating widget" releases gas into the beer, approximating the creamy head that a dedicated Guinness drinker expects from draft beer.

• *Burst of Health* – Some smart devices are designed to add health benefits. "The FreshCan wedge in Defense Effervescent Vitamin and Mineral Drink stores delicate micronutrients until the moment the consumer opens the can," explains Zweep. "The pressure drop releases the nutrients into the beverage. Lacto Tab Q10, a new performance drink soon to be available in Europe, encloses a tablet of micronutrients in a blister in the cap. The light- and oxygen-sensitive micronutrients do not enter the drink until just before it is consumed."

• *Monitoring and Responding* – These packages respond to changes in the vicinity. The simplest example is tamper-evident packaging that alerts consumers that someone has opened (or activated) the package. More sophisticated examples alert consumers when a product is freshest, or when it is no longer safe. "Time-temperature labels can be used to show whether the product inside has been allowed to reach inappropriate temperatures, or has been on the shelf too long," says Zweep. "A slightly different example from a quality angle is RipeSense packaging, which includes a freshness indicator. It was developed in New Zealand and is being tested as a clamshell container



Intelligent packaging can activate or monitor changes in the product

for four pears, with the freshness indicator in the centre changing colour to tell consumers whether the fruit is crisp, firm or juicy."

• *Radio Frequency Identification (RFID)* – Perhaps the ultimate in intelligent packaging is RFID. Tiny chips embedded in RFID tags store information about the product and its origin, and can be used to track inventory and sales figures.

As always, function drives form. Balancing consumer demand for health, convenience, taste and novelty will continue to challenge packaging designers and manufacturers, who will, no doubt, continue to amaze us with their ingenuity.

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