



By Rosamari Feliu

Packaging's Evolving Functions Promote Innovative Technology

To quote Jane Donaghey of Almac Pharma Services—though many others would agree—“A package brings a product to life.” No matter the product, if it is not contained, stored, protected, and transported, it cannot be used. In other words, packaging makes possible the use of a product as intended.

Packaging has evolved significantly through the years. Not only in its shapes and forms, but also, and most importantly, in its function. Historically, it has changed according to social structures and customer needs. As packaging functions change, they trigger the need to include innovative technology in package design.

The basic packaging functions are containment and storage, transportation, protection, communication, and utility of use.

It is believed that packages were born out of our ancestors' need for containment and transporting goods. Nowadays, product protection, communication, and utility are becoming essential functions of an effective package. It's as if we have attributed human characteristics to packaging—“personification”—in which it is expected that a package protects, communicates, and facilitates a product's utilization.

In life sciences, the container/closure system plays a leading role in delivering safe and effective drugs to the end users. For that reason, packages are evolving dramatically by incorporating new and innovative technology, so they comply with more demanding functions. Let's take a look at medical packaging. The table to the right shows examples of how the protection, communication, and utility functions have recently triggered the use of new and innovative packaging technology.

Child Resistant/Senior Friendly (CR/SF) or Child Resistant Packaging (CRP) is an example of a package design with the intent of protecting children from product toxicity while providing accessibility for seniors. If we ask a person to keep a toxic product away from children, the person will most likely hide it in a place with limited access. CRP relies on innovative packaging technology to achieve this task in using a container/closure combination that considers essential human factors elements for the targeted populations. Children and seniors behave at a different cognitive level. Hence, the graphics, messages, and color contrasts determine the success or failure of CRP. Even when the package's mechanical design is appropriate, if the graphics' visibility and instructions are not clear, the package might not be compliant with the Consumer Product Safety Commission's regulatory requirements for CRP.

Packaging's evolving roles of protection and communication are advancing along with consumer needs. Packaging can communicate to users what to do, how to comply with medication, alert them if the product had been tampered with, and provide information about its origin, among other critical information.

Packaging Function		Packaging Technology
Protection	Child Resistant (CR) /Senior Friendly (SF)	CR Caps CR Blisters with Paper-Back Foil
	Tamper Evident (TE)	TE Caps, ex. breakable, tear away TE Seals, ex. tape, stamp TE labels TE Cartons Sealed metal tubes Sealed plastics/laminate tubes Shrink bands/wrappers Blisters/Strip Packs Heat Shrink bands Container mouth Inner seals
	Authentication	Holograms Invisible printing with invisible inks Fine line color printing/ Micro text Sculptured text Sequential Numbering Dot shift patterns Water marks Hidden marks
	Track and Trace	Source tagging; Acoustic-Magnetic, Radio Frequency, and Electromagnetic Serialization
Communication	Temperature Exposure	Time Temperature Indicators
	Drug Facts	Extended Content Labels (ECL)
Utility of Use	Compliance	Blister Packed info cards

It will continue to evolve. Active and intelligent packaging can be used to enhance the protection and communication functions. When combining critical elements, like brand protection, safety, convenience, and conveying product information, smart packaging becomes a powerful tool in the packaging industry. With intelligent package development, the pharma industry, for example, can achieve traceability and patient compliance, among other benefits.

We're beginning to hear that the Internet of Things (IoT) has the potential to revolutionize packaging in healthcare and other compliance environments. An example of “Internet of Packages” for compliance would be an integrated container and closure that link up with a cloud-based application to which a patient and their doctor can input the information, reminding the patient when to take their medication. According to some experts, many of these containers will have an indicator or light showing when it's time to take medication.

The future promises more innovative package design triggered by more demanding functional requirements. Active and smart and intelligent packaging goes way beyond the inert, passive, and conventional containment and protection functions. The challenge to packaging designers is enormous and increases as modern packaging incorporates more demanding responsibilities to its design. **PW**

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