

INDUSTRY ARTICLE

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Is there such a thing as the perfect packaging?

People prefer simple answers. When it comes to the highly complex subject of packaging, which is currently being discussed in many sectors, simple answers don't exist. Or do they? At least for the question, "Is there such a thing as the perfect packaging?", there is a simple answer: "No!" And why is that the case? Well, that's when things get complicated again... How do you approach a complex network of topics like this? You turn to the experts!

For example, Dr Manfred Tacker, Head of the Packaging and Resource Management Department at the FH Campus Wien (Vienna University of Applied Sciences) in Austria. At the end of May, during a virtual panel discussion, he said that perfect packaging doesn't exist. Why does he see things that way? "Because designing and making decisions about packaging is a multidimensional process, and also because there are many conflicting goals that you come across when you're try to find the right packaging. When designing and making decisions about packaging, it's always about finding the right compromise. For example, between the environmental impact of packaging production and the difficulties when it comes to recycling. Unfortunately, you can never have everything," explains Dr Tacker.

What is 'perfect'?

"Perfect packaging only exists in terms of product, time and place. In terms of product, because a beer bottle, for example, doesn't have to have the same characteristics as a milk bottle. In terms of time, because the requirements for packaging change over time, with packaging's protective effect becoming more important and apparent for consumers during the ongoing coronavirus times. And lastly, in terms of location, because packaging may have been specifically developed and optimised for the German recycling system, but that doesn't necessarily work with the Spanish recycling system," adds Dr Martina Lindner, Business Manager for Packaging at the Fraunhofer Institute for Process Engineering and Packaging IVV in Freising.

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Many parameters influence decisions in packaging design

When you look at the tasks that food product packaging needs to perform over the entire product life cycle, Dr Lindner and Dr Tacker's words become clearer.

- **Product protection:** The contents should be protected from perishing for as long as possible.
- **Information:** The packaging must clearly indicate the ingredients of the product, where it comes from, how long its shelf life is, etc. But that's not all; smart packaging also has other tasks when it comes to providing information. For example, a special print can now be used to provide information that the recycler can use during sorting to ensure that the discarded packaging is properly recycled.
- **Transportability:** What routes does the product travel? How is it transported? Which secondary packaging is used for its transportation? What environmental influences is it exposed to during transport? Where does the customer take the product after buying it in a store?
- **Communication:** The product should convey a message to customers to make them buy it. That's why, of course, marketing aspects play an important role when it comes to packaging. However, the wishes of a marketing department may stand in the way of other parameters when designing and making decisions about packaging, for example, in terms of the packaging's viability and sustainability.
- **Viability:** How is the packaging sealed? Does it need to be resealable? In what quantities do consumers want the contents? Where and how does the consumer consume the product? How much product remains in the packaging because it cannot be completely emptied? This is a question that is particularly important for highly viscous liquids, such as yoghurt drinks. But viability is also an important parameter for manufacturers: Do existing machines need to be replaced to be able to fill the new packaging? In what quantities is the packaging being produced?
- **Sustainability:** Is the packaging reusable? Is it recyclable? How much of the packaging will actually get recycled? What rates of recycling are being prescribed by the government?

"You have to look at all these things together and then come to an optimised final decision," explains Dr Tacker.

Packaging research

Let's focus on the topic of sustainability in packaging research. This is also the focus of the Fraunhofer Institute IVV in Freising, which offers the beverage industry, amongst other industries, advice on recyclability and the use of monomaterials. Research is also carried out into how bio-based packaging can actually be sustainable – as this is only possible under certain conditions. In some cases, biomaterials can interfere with the recycling processes of conventional, fossil-based plastics.

The Fraunhofer Institute IVV also carries out research and provides advice regarding reducing the amount of materials being used and also shelf life modelling, i.e. calculating spoilage methods with food. On the basis of this, packaging can be designed in an optimised way, with minimum material usage and maximum product shelf life (IVV research project: SelectPerm). And this is only some of the research and consulting work on the subject of packaging research.

Cooperation with the industry

“We work very closely with the industry, in both bilateral and public research projects, and we are always on the lookout for industrial partners to bring the results of public research projects into industrial applications,” says Dr Lindner, explaining the practical relevance of packaging research at the IVV in Freising.

Packaging researchers at FH Campus Wien aren't sitting in ivory towers either; they are in close exchange with the industry. “We exclusively work on projects in collaboration with companies. When it comes to developing specific packaging for a company, these are projects that companies usually don't want others to be spying on. On the other hand though, you can't undertake projects related to creating added value in recycling economies all on your own: it's only possible if you bring the various companies in the value chain together, such as manufacturers, bottlers, retailers, collectors, sorters, recyclers and a collection system. So, some players will come together quickly. For example, we have developed the FH Campus Wien Circular Packaging Guidelines and more than 30 companies from the entire value chain are already involved. These guidelines can only be successful in the market if they are accepted by all the major players. It is also important for these projects to always be set up internationally,” emphasises Dr Tacker.

The beverage industry

When talking about circular and recycling economies, the difficult discussion of 'reusable vs. disposable' immediately comes to mind when looking at the beverage industry's packaging. If you look at the life cycle assessments of various bottles, it becomes highly complex: How heavy is the bottle? How far is it being transported? What is inside the bottle? Is the bottle made of glass or PET? How often is it being recycled? How much of the packaging is recycled? We can't expect to find simple solutions here either...

However, when it comes to beverage packaging, there are even more topics than this at the moment. Talking just in terms of PET bottles: the trend is heading towards them being made from 100% recyclate. Weight reduction is still a major topic for both glass and PET. "In the glass bottle sector, there are now new lightweight bottles that weigh 20–30% less and are still reusable," reports Dr Tacker.

In addition to that, smart packaging is also playing an increasingly important role in the beverage industry, whereby the packaging features additional functions and provides communication to the consumer, retailer, or recycler. Smart packaging can also be used to produce counterfeit-proof packaging or to trace the paths that packaging takes.

Blame game: plastic packaging

Plastic packaging currently has a difficult position from an environmental point of view. Is that justified? "Yes," says Dr Tacker from the FH Campus Wien, "because many environmental problems around the world haven't yet been solved, such as littering in the oceans. The plastics industry can't simply say that they manufacture a product and they have nothing to do with what the consumer does with it. It must seek solutions to these environmental problems. However, to do so, it needs all players in the market to take part in the recycling economy, because that's the only way to ensure the recycling economy works. The EU's recycling economy package forces everyone to ensure product recyclability and meet recycling quotas.

"The public often only points out the environmental pollution, without thinking of the consumer benefits. Especially when it comes to food packaging, consumers should be aware that packaging has an extremely important task: product protection. Without packaging, most foods would not have a long shelf life. And plastics simply have great properties that are highly relevant for packaging technicians, but these are rarely known by the end consumer," stresses Dr Lindner from the Fraunhofer Institute IVV in Freising.

Environmental pollution from plastics and the accumulation of microplastics in the oceans have long since become matters in the public eye. Due to increased consumer demand, the cosmetics and food industries are looking for environmentally friendly packaging alternatives. And there are certainly possibilities: thinner coatings, inorganic coatings, bio-based/biodegradable raw materials/papers, etc. However, these always need to be adapted to the product and the entire value chain.

However, new varieties of packaging materials lead to confusion amongst consumers. The result: a lot of packaging ends up in the wrong waste collection and therefore doesn't get recycled (even though it is recyclable). There needs to be education and workable waste collection systems for this.

Design for recycling

The SusPackaging project at the Fraunhofer Institute IVV aims to establish a green value chain for the production of bio-based and biodegradable packaging materials.

Dr Tacker from the FH Campus Wien makes this point as well: "There are new developments in materials on the plastics side, but what is even more important is so-called 'design for recycling'. Packaging developments must now be specifically designed so that the product can ultimately be identified, collected, and recycled in the process of sorting waste. Reusable packaging solutions can also be looked into. The plastics industry is in the process of promoting circular design and helping to ensure that waste collection and recycling systems are expanded further.

So, a lot is happening around the topic of packaging and a nuanced approach is definitely worthwhile. One thing is clear when you look at this topic though: only comprehensive approaches that involve as many players as possible will produce workable and sustainable solutions that are 'as perfect as possible' for their particular use.

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