Website address:
https://www.gesundheitsindustrie-bw.de/en/article/news/liquid-plug-und-play-eco-designed-plastic-packaging-not-just-ultrasound-gel

Innovation for sustainable plastic packaging

Liquid Plug & Play: eco-designed plastic packaging – not just for ultrasound gel

Who hasn't been frustrated by the amount of product left in the packaging of toothpaste, body lotion and similar items? It is an even bigger issue in healthcare, where tons of consumables such as ultrasound gel go to waste because packaging can't be completely emptied. An invention called Liquid Plug & Play could offer a solution for the future. This innovation, which consists of a reusable outer shell and a disposable product pouch for viscous substances, can be completely emptied. It also prevents cross-contamination and offers many other benefits.

We all know that we need to live more sustainably. But even with the best of intentions, this can often be difficult to achieve in everyday life. Packaging is a prime example. It still accounts for around 36 percent of all our municipal waste[1)], and often a significant amount of product remains in the packaging, as is the case with lotions and pastes. The healthcare sector also often lacks suitable, sustainable packaging solutions. For instance, every single German hospital generates an average of eight tons of plastic packaging waste per year.[2)]

When the new EU Packaging & Packaging Waste Regulation (PPWR) comes into effect in 2025, sustainable packaging will no longer be optional. It will be a legal requirement - covering not only disposal but also design and production.

Sustainable re-use concept for all types of viscous materials



Jule Venrath has invented the Liquid Plug & Play Smart Bottle, an innovative and highly sustainable plastic packaging concept for viscous materials.
© Liquid Plug & Play

Graphic designer and business psychologist Jule Venrath has also been frustrated by unsustainable packaging in the past. This frustration led her, in 2019, to develop an innovative plastic packaging solution for all types of viscous products - from ketchup to lotion, shampoo, ultrasound gel and adhesive. It didn't take her long to turn her idea into reality: she sought out expert help, which enabled her to add the final technical touches to her invention. "The idea itself is not very complex, but I needed help with the details as I am not an expert in the field," she says.

Shortly afterwards, Venrath applied for a patent for her invention through her company, J. Venrath Venture UG, which was granted in 2023 under the brand name Liquid Plug & Play. Here too, the inventor sought support: "Patent attorney Elmar Meyer zu Bexten has been a tremendous help in guiding my idea over the past few years," Venrath says. "Additionally, I was and still am reliant on the institutional support of experts from the 'Senioren der Wirtschaft' association and from the Packaging Technology Department at the Hochschule der Medien in Stuttgart."

Several fully functional prototypes of the Liquid Plug & Play Smart Bottle are in the development phase, including a successful proof of concept. The packaging innovation for viscous and paste-like products consists of a double-walled, reusable outer shell into which a disposable

product pouch with the desired viscous product is inserted. The system resembles a conventional pump bottle, but is significantly less complex and has fewer individual parts. For example, compared to a standard bottle, the disposable refill pouch can save around 30 kg of plastic and a considerable amount of CO_2 per 1,000 units of 300 ml body lotion.

Additionally, it is an airless system, which prevents oxidation of the product and provides a thermal effect for heat- and cold-sensitive products. This means that viscous products stored in the refrigerator stay fresh much longer than conventionally packaged items. The flexible refill pouches can be stored space-efficiently in large cartons and have a very low transport weight, which significantly reduces CO_2 emissions. Both the content and the design and size of the pouches can be customised. The cost of the reusable outer system, which is just a few euros depending on the complexity of the design, is affordable for both manufacturers and customers. As well as the 'sympathy bias' companies might gain from the sustainability of the packaging, customer retention through the purchase of refill pouches is also a strong argument.

Developers' stroke of genius enables complete emptying

Thanks to a special technique, the contents can be completely emptied. The principle behind this is simple but surprising: "Every time the pump mechanism is activated, air enters the inner body," explains Venrath. "The inner body has a membrane at the bottom that pushes into the product pouch from below. The more air that enters the inner body, the further the product pouch is pushed upwards. In this way, any filling - ointment, food or hygiene products - can be used down to the very last squeeze."

Another potential of the innovation is the digitalisation capability of the Liquid Plug & Play Smart Bottle. An E-Ink display in the reusable outer shell enables both product and fill level indication as well as sensory product recognition. Each refill pouch is equipped with a scan code, and the smart technology of the outer shell recognises the product when it is inserted. The display can also be paired with another device via an app, allowing for automatic and personalised use of overviews, ordering processes such as subscription models or even just reorder reminders.

Functional prototype: ultrasound gel

Starting with a plastic ketchup bottle, several different functional prototypes have now been developed. "After testing with ketchup and body lotion, we even tried products with higher viscosity," says the inventor. "Everything worked well and met our requirements. Even a bottle of ultrasound gel passed the test."

Ultrasound gel is used by the ton every day. The mixture is considered harmless in typical consumption quantities, but the safety data sheet[3)] states that the packaging should only be disposed of when completely empty – though no mention is made of the plastic shell itself. A solution needs to be found. Currently, complete emptying is not possible, and a significant amount of gel ends up in the bin - along with the (usually still usable) plastic bottle. However, the actual CO_2 impact is attributed to the gel itself. Hygiene is also a critical issue, so refill solutions are rarely used due to the high risk of cross-contamination.

A solution to this problem could be the use of Liquid Plug & Play Smart Bottles. The outer shell does in this case not come into contact with the gel, as the dispensing cap is attached to the refill pouch, preventing any contamination. After use, the disposable pouch, including the dispensing cap, is completely empty and can be discarded. The outer shell can be cleaned and sterilised if required.

When it comes to healthcare products in particular, it is not only the sustainability of the system that matters but also the time saved by medical staff, as the refill pouch can be easily replaced with a single hand movement. Possible applications include a dosing bottle for ultrasound gel, as well as applications for ointments and creams in various healthcare fields, including elderly care facilities.

Packaging innovation seeks manufacturers from all industries

The packaging system is currently being optimised at the Hochschule der Medien in Stuttgart and will soon be adapted for standardised production. Venrath, who does not intend to produce the packaging herself, is in the process of presenting the system to various manufacturers: "As the patent holder, I am offering the opportunity to buy or licence the intellectual property in full or in part. In return, companies receive a fully functional technical innovation, including all research findings and technical details, so that the data can be implemented in the manufacturers' development processes and an individual product can be developed and produced using my technology."

Interest in the packaging innovation is high and there have been a number of responses. Venrath continues to seek interested parties from various industries - including the healthcare sector.

Your browser doesn't support the HTML5 video tag.

Video: Liquid Plug & Play - Functional prototype and proof of concept © Liquid Plug & Play (only available in German)

References:

1) EUR-Lex: Proposal for a Regulation of the European Parliament and of the. Council on packaging and packaging waste. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022PC0677

2) Fischer. M.: Nachhaltigkeit und Müll im Gesundheitswesen. GGW 1/2024, 17-26. https://www.wido.de/fileadmin/Dateien/Dokumente/Publikationen_Produkte/GGW/2024/wido_ggw0124_fischer.pdf

3) Sicherheitsdatenblatt Ultraschallgel Fassung 2.0 (2023). https://asset.conrad.com/media10/add/160267/c1/-/de/000755369SD01/sicherheitsdatenblatt-755369-sauter-atb-us03-ultraschall-kontaktgel-1-st.pdf

Article

04-Sept-2024
Dr. Petra Neis-Beeckmann
© BIOPRO Baden-Württemberg GmbH

Further information

Jule Venrath
J.Venrath Venture UG
Phone: +49 (0)173 2670108
LinkedIn: Jule Venrath
Email: julevenrath(at)gmail.com

The article is part of the following dossiers



The alternative: “bioplastics”



Microplastics waste is a valuable resource, it is just in the wrong place



Packaging of the future

medical technology | environment | production | plastics | sustainability | digitalisation | innovation | packaging | resource efficiency