SmartDrum – more than clever

Because up to now no suitable multi-way systems for liquid and paste-form goods in the intermediate volume range exits, as a rule disposable packaging is used. The innovative SmartDrum packaging system can now close this gap. The flexible, collapsible plastic drum is comprised of an outer sack, bracing elements and a removable inner sack. It saves on material and reduces transport operations for the empty packing drum and on the production of waste by the reuse of the outer covering and the recycling of the inner sack.

For liquids and paste-form substances from the foodstuff area and from the chemical and cosmetic industries, container transport plays an important role. Drums with a typical volume of around 200 litres have achieved a decisive position. They enable cost-effective transport in the intermediate volume range. In addition, larger packaging media, such as the intermediate bulk container, are also gaining in importance.

The drums are used for the most part as disposable packaging. For packaging from the hazardous goods area, multi-way solutions are also widespread. The recovery of packaging material is achieved here through reconditioning. They enable cost-effective transport in the intermediate volume range. In addition, larger packaging media, such as the intermediate bulk container, are also gaining in importance.

The environmentally compatible product and system development in pursuit of this idea required an interdisciplinary approach. Packaging material manufacturers, packaging manufacturers, logistics services, filling facilities and users are thus working hand in hand. The Fraunhofer Institute for Chemical Technology is in charge of the scientific side of the research project. The requirements of the entire transport chain are considered in the development process. The participation of the DIN standards committee for packaging ensures a systematic standardisation.

Firstly, the researchers investigated the basic requirements and conditions for the use of the new packaging system. Besides the analysis of existing logistics concepts and potential areas of application and fill goods, they determined the requirements of the users and existing legal specifications.
Building on this, suitable materials had to be developed for films and sacks and optimised for selected fill goods, such as juice concentrates, whey, ketchup and paints. At the centre of these investigations was the mechanical, climatic and chemical loading during transport, handling and storage. In order to be able to guarantee the multi-way circulation of packaging, the research team carried out user-oriented material tests parallel to the material development. Depending on the fill good, the team took account of criteria such as the barrier effect against gases and steam, tear and material resistance and UV protection. The researchers also studied the use of recycled material in order to support the material recycling of packaging wastes. The FOLIEtec company then successfully created packaging material fulfilling the demanding requirements for the fill goods and for transport. The fundamental usage of recycled materials was demonstrated.

In its form, the future-oriented packaging is similar to drums, so that it is designated Smart-Drum. It is comprised of an inner sack for the fill goods and an outer sack, incorporating hollow chamber plates made of polypropylene as bracing elements. The outer sack is made of polypropylene fabric and should be as smooth as possible on the inside in order to prevent friction with the inner sack during transport. The material of the inner sack depends on the fill goods. Polyethylene, polypropylene or multi-layer films, as well as films coated with aluminium oxide, are in principle all possible.

While the outer covering and the bracing elements, which make up about 90 percent of the material required, can be collapsed and retracted and then reused, the inner sack can be used only once and then recycled either in the form of energy or in the form of material. This concept offers the advantage of substantially reducing empty transport operations. The one-time use of the inner sack avoids costly rinsing and cleaning procedures. This leads to a number of advantages in terms of environmental considerations: packaging materials are used sparingly, and the consumption of natural resources is lowered due to reuse and recycling. The avoidance of unnecessary transport with empty containers reduces traffic loads, in turn saving energy and reducing the emission of greenhouse-relevant carbon dioxide.

The first prototypes are currently undergoing thorough testing. Waste and transport tests on a production scale have already been performed. The knowledge gained is utilised as the basis for the further optimisation of the container system. The primary goal is the automation of the filling and emptying processes for industrial application. In this connection, the automatic filling capability of the packaging material is of fundamental importance. Together with potential users, the researchers are currently developing suitable equipment for the implementation of this function. For economic use, a fast and, as far as possible, complete emptying is also important. Numerous processing variants are being tested and further developed.

The results to date are very promising: the new type of packaging has fully proven its suitability for use. As a result of the pragmatic approach and the interdisciplinary collaboration, the rapid market introduction of the environmentally compatible SmartDrum can be expected in the short term. Equally attractive for both the environment and the user, the container system will enable the German packaging industry and German logistics companies to further expand their position on the international market.