# Plastics in Packaging

Issue 243: January 2022

# PLA your part

*Why researchers believe they have found the magic formula to make thin-walled PLA injection moulded packaging*

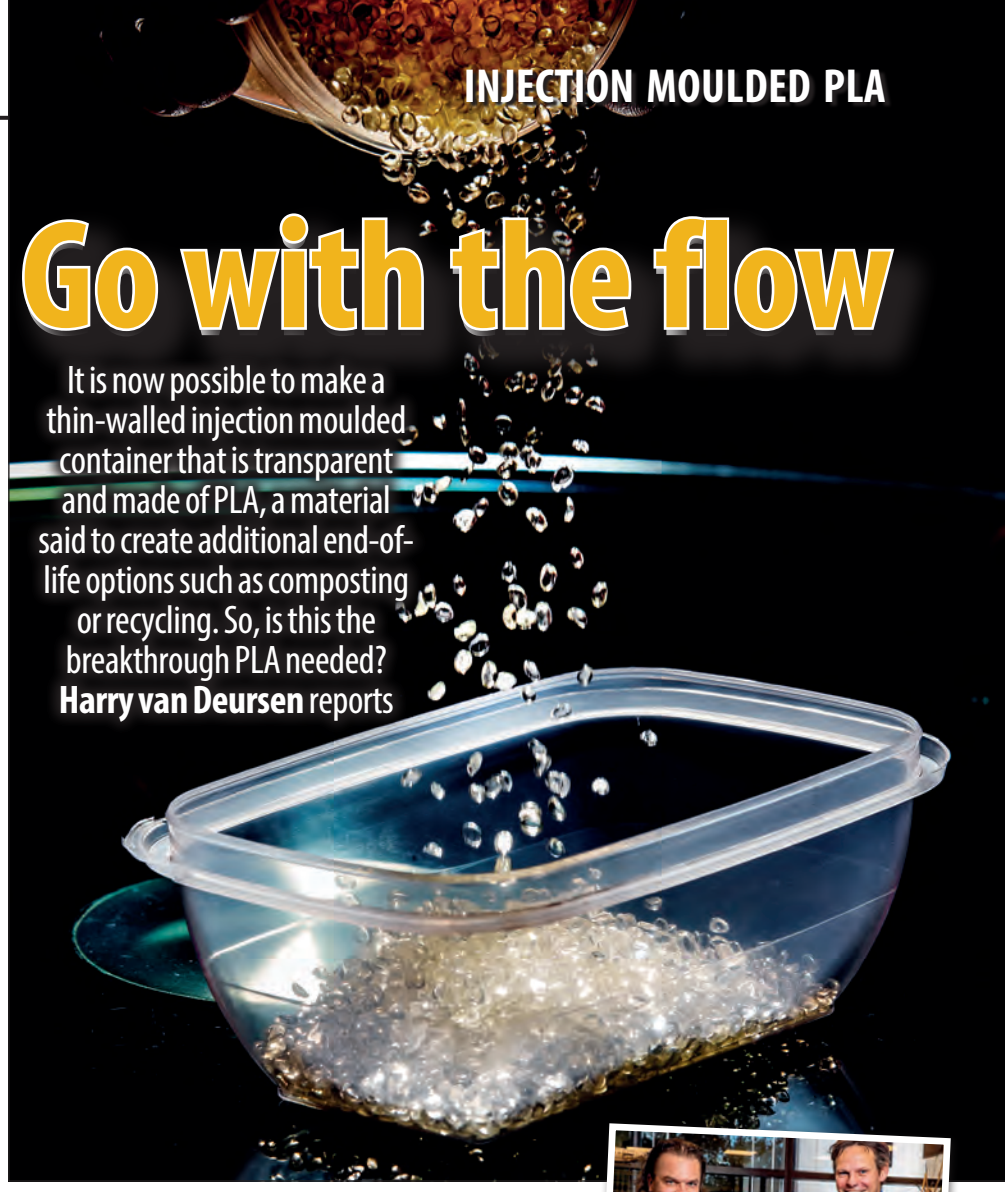
**IN THIS ISSUE:**

Tubes
Biopolymers
Food packaging
Injection moulding

www.plasticsinpackaging.com

# Go with the flow

**It is now possible to make a thin-walled injection moulded container that is transparent and made of PLA, a material said to create additional end-of-life options such as composting or recycling. So, is this the breakthrough PLA needed? Harry van Deursen reports**



***Above:*** *The new PLA contains two additives: a natural oil-based raw material and a second biopolymer. Together, they greatly reduce the viscosity during injection moulding*
***Right:*** *Thijs Rodenburg (left) and Niels L'Abée call the injection moulded container a unique development on account of its transparency and PLA construction*

Until now, biodegradability, recyclability, food safety and transparency have been considered an impossible combination for thin-walled polylactic acid (PLA) injection moulding. But where those before have failed, researchers from Netherlands-based Wageningen Food & Biobased Research (a research institute within Wageningen University & Research), SFA Packaging and Rodenburg Biopolymers, have succeeded.

"The thin-walled injection moulding of PLA is difficult because it does not flow properly in the mould," says Niels L'Abée, a director at SFA Packaging. "PP turns into a very thin liquid at high injection speeds, whereas PLA retains almost the same viscosity. This so-called 'shear thinning effect', i.e. the thinness of the liquid at high injection speeds, is necessary to make injection moulds with thin walls. The better a plastic flows, the thinner you can make a tray.

"We have developed and patented an additive that makes PLA just as fluid as PP and also retains the desired mechanical properties. This makes it possible to develop all kinds of packaging, such as tomato punnets, salad containers, butter tubs, and so on. It is even possible to make fully bio-based in-mould labelled packaging."

## New possibilities

At a seminar in 2016, L'Abée got into a conversation with researchers from Wageningen University & Research, who were investigating the possibilities of PLA injection moulded packaging. "They wanted to develop bio-based packaging that, at a competitive price, emits about half as much carbon dioxide per unit, in terms of material and production, as conventional plastics," says L'Abée.

Besides SFA and Wageningen Food & Biobased Research, Rodenburg Biopolymers also became a partner in the project. The project is partly funded through the Top Sector Agri & Food (Top Consortium for Knowledge and Innovation) research network.

The new PLA formula was discovered after searching and testing for a long time, says Gerald Schennink, project manager at Wageningen Food & Biobased Research. "It is a combination of the addition of two additives, which, as it turned out, worked. It involves a natural oil-based raw material together with a second biopolymer. Together, they ensure that the viscosity during injection moulding decreases sharply. It wasn't easy. Interactions between more than one additive can often lead to negative results, but these two go together perfectly, even reinforcing each other."

The 10-30 per cent additive is also completely biodegradable, and the PLA currently used for the research is made from corn starch. "The land-use for growing raw materials for bioplastics is very low, but you could also get raw materials from side-streams," adds Schennink.

After various lab tests, the process is ready for large-scale production, says Rodenburg Biopolymers' chief executive Thijs Rodenburg. "We tested the material for viscosity, strength, and transparency, and did various tensile, drop, and impact tests, as well as research on food-contact approvals. The packaging passed them all with flying colors."

The first tonne of compound is ready for further processing in injection moulding machines. "The concept was tested on our own production line," says Rodenburg. "Besides the flow of the material and the quality of the final product, strict criteria also apply to the production speed. Every five seconds new packaging has to roll out of the machine. We met that requirement."

## End-of-life routes

The new bio-based packaging has two possible end-of-life routes, says L'Abée. "It is suitable for recycling and industrial composting. The only problem in the Netherlands is that neither route is supported yet. In the case of industrial composting, you often hear the argument that PLA needs too much time to compost, but according to studies by Wageningen Research, PLA packaging breaks down faster in an industrial composting plant than an orange, for example.

"To recycle PLA, recycling plants need to sort the material. That does not happen in the Netherlands yet, although it is technically possible. The technology is available – Wageningen Research has demonstrated the quality of sorting – and yet it is not implemented in the sorting installations. This is because the volume is still too low in the Netherlands. And if it were sorted, there would be no recycling capacity available. It is a chicken-and-egg story in which we hope the Waste Fund and large brand owners will take the lead. They should make long-term choices to stimulate the use of renewable raw materials." P