

Newly Developed Products

from previously untapped plastic waste resources

Partners



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plasticityproject.eu

Executive Summary

Based on the processing and mechanical properties of different lumps, new products are designed from the recyclates using the Design-from-Recycling strategy, as such creating a new market demand for secondary plastics. A whole range of products (either new or existing products currently not made from recyclates) have been scanned and tested. The outcome is a set of products that are extruded/moulded at pilot scale and some products with focus on the COVID crisis produced at real scale.

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1. The Hague products and designs

1.1 Faceshield

On 28 February 2021, the Covid-19 virus has affected almost every country on the planet, there are 223 countries, areas, or territories with confirmed Covid-19 cases (WHO, 2021). During this pandemic, there was a shortage of personal protective equipment (PPE). To help overcome the shortage of PPE, one hundred face shields of 100% recycled PET were handed over to the Haga Hospital by partners of the Plasticity Project. The face shields were the first new product made of recycled plastic that has been produced as part of the Plasticity Project. More details can be found via the link below.

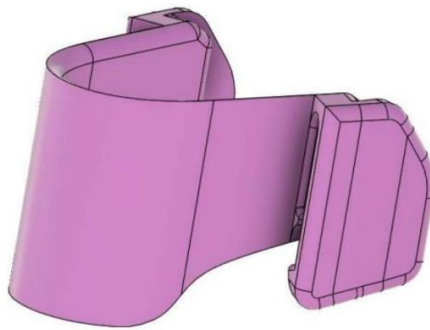


1.2 Nosebridge

The Nose Bridge was initially developed for spectacle wearers that suffered from poor vision due to fogged lenses when wearing a mouth mask. Together with several 3D designers, the ideas were transformed into an easy-to-use product, which is called the Nose Bridge. Inspiration was drawn from the concept. After extensive testing with dozens of people, the Nose Bridge turned out to reduce or completely stop foggy glasses. After the ever-expanding network around the Nose Bridge, it became clear that the Nose Bridge has more advantages than just stopping fogged lenses. In practice, mouth masks do not work as well as the indicated filtration. This is because the lab tests are done under ideal circumstances on a doll or tube. In practice, this filtration is much lower, because mouth caps leak a lot due to poor connection to the cheeks and nose. The Nose Bridge

helps to bend the bendable strip in the mouthpiece into the right shape. This creates a hermetic fit at the top of the mouth mask. People also often forget to shape the bendable strip of the mouth mask to their face. The Nose Bridge does this automatically for the wearer, so that a perfect fit is always created. Bringing the Nose Bridge to the market in a circular manner is a unique opportunity for the Municipality of The Hague and the PlastiCity project. The medical industry is an enormous consumer of plastic, and almost nothing is recycled. Producers hide behind complexity and contamination. The contamination argument is correct, but there are many options for solving it. It is the intention of the Nose Bridge to increase the recycling of medical waste and inspiring other companies to go circular as well.

'The Nose Bridge'



1.3 Boxo bag

The Boxobag is a reusable and traceable shipping packaging for clothes and shoes made in the Netherlands from recycled plastic that allows fashion retailers to ship sustainably, affordably clean and dry shipping. The bags are made from PP cloths from local hospitals. BOXO was founded with the goal of making circular, reusable packaging the norm in E-commerce. The pressure on retailers to become more sustainable is large but there are many practical hurdles to implement reusable packaging. Clothing & shoes make up the largest share of E-commerce. Together with the many return orders which fashion retailers receive, BOXO puts the focus with the Boxobag on fashion

retailers; this is where we can make the biggest impact. With the Boxobag we want to remove these barriers by developing reusable shipping packaging that can compete with single use packaging. The Boxobag is a reusable and traceable shipping packaging for clothing and shoes made in the Netherlands from recycled plastic that allows fashion retailers to ship sustainable, affordable, clean and dry.



2. Ghent products and designs

2.1 EarBuddy

The FabLab and the Centre for Polymer and Material Technologies (CPMT) at the Faculty of Engineering and Architecture of Ghent University came up with a clever hack for the wearing of facial masks: the EarBuddy. An EarBuddy holds the elastic loops of a mouth mask at the back of the head, thereby reducing irritation of the ears. The concept of the EarBuddy is a collective initiative of the FabLab, CPMT and the Green Office of the university. It is designed to be made from recycled polypropylene from (completely clean) empty pipette tip boxes from the labs or from

Polyethylene coming from industrial scraps of artificial turf. In this way, we realize a closed and high-quality material cycle from collection to recycling to reprocessing within Ghent University. This internally recycled polypropylene is a so-called "lost plastic" identified in the Interreg project PlastiCity, in which the City of Ghent and Ghent University work together via the CAPTURE platform to keep more plastics in the circular economy (and away from combustion). The pipette tip boxes are the perfect recycled raw material for injection molding the EarBuddies and are fully sterilisable.

The expertise from various research projects (Horizon 2020 Repair3D and Horizon 2020 PolyCE and the Flemish Catalisti-ICON Hybrid Moulds) was combined to quickly optimize the prototypes, design a hybrid injection mold and control everything via a Moldex3D flow simulation. With the practical support of mould builder VDS Technics, it was thus possible to switch from mould design to actual production within 1 week. By combining the knowledge of FabLab-UGent-CPMT, an innovative gadget was produced from sustainable and circular plastic.



2.2 Press Sheet

A sheet press has been developed that can process regranalates to sheets up to size of 2250 x 800 mm². These sheets can be used as semi-finished products or used as design objects itself. The sheet press has been developed within a design case with the artistic centrum "VierNulVier" in Ghent which will use the sheets in their fab-lab to create interior objects for their theatre and artist lounge. On the pictures below, one can see the intermediate sheets and as an example the use of the sheets a design coffee table.





2.3 3D printing case

In cooperation with the 3D printing company Bulck technical printing, some selected recycled plastic grades were chosen to use for printing tests of design objects (chair, vase and flowerpot) that were showcased on the Design Fest Ghent (April 2022).



2.4 The Urban Water Tree

The name is inspired by tropical plants that store fluids that can be used as an emergency source of drinking water. Baobab trees (*Adansonia*, Bombacaceae) - from which the shape of the tree is derived - are generally believed to store water in their stems for use when water is scarce.

The 'Urban Water Tree' is a container that collects and stores water and makes it available for 'small' use in public and semi-public spaces. The construction consists entirely of residual streams of plastic.

Context

The research project is part of the PlastiCity project that is part of the Interreg 2 Seas region - the coast and aims to discover economic opportunities and develop pilot projects in 4 partner cities: Ghent (BE), The Hague (NL), Southend -on-Sea (UK) and Lille / Douai (FR).

Why?

Plastic recycling rates are still very low. Especially in the urban environment, a lot of plastic waste is available that technically qualifies for recycling, but is not effectively validated. These so-called "lost plastics" can play a prominent role in the circular economy. On the other hand, the City of Ghent wants to be climate neutral by 2030. The PlastiCity project is therefore an opportunity to combine both challenges!

How?

In participatory and co-creative workshops with designers, actors from the field, and experts from Ghent University, the themes of 'Mobility', 'Water,' Waste and 'Green' in the City were explored and deepened. A project question was then distilled from the obtained the insights – in co-creation with the Departments of Economy, Work, Innovation, Procurement and the Green Department of the City of Ghent: "How can we make Ghent resistant to heavy rain, drought and heat with locally made products from recycled plastics from pre-consumer waste?"

What?

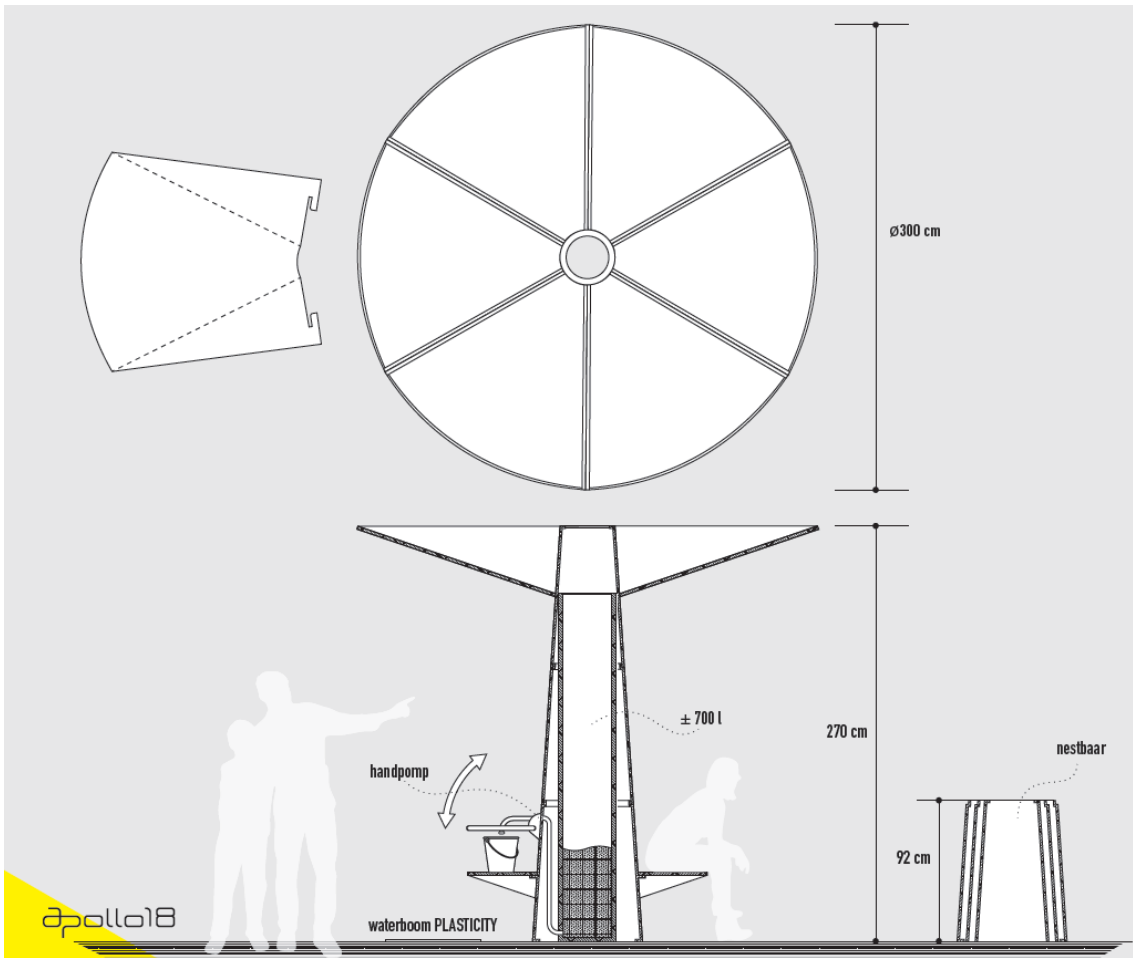
Apollo18 was commissioned to tackle this challenge and create a design that met the project demand. The most important parameters were capturing, storing and dispensing rainwater. Apollo18 investigated a number of important preconditions and defined some additional parameters. The object must be able to be integrated into the public space and become part of it

in an organic way. It must be able to fulfill a social function (resting, meeting, sheltering, ...), be modular, nestable and compact.

After extensive research of what exists today and is possible, manufacturable, feasible, affordable, and scalable, Apollo18 designed the 'Urban Water Tree'. A container in the form of a tree that has a seating function, provides shade and/or shelter and provides people with water to sprinkle their vegetable garden or water their plants. To point out to the user how valuable water is, a manual pump was chosen. The tree collects rainwater through large flexible plastic plates. In case of abundant rainfall, the water can naturally drain into the ground or be siphoned into large containers. In the event of a major drought, city services can replenish the stock. The Urban Water Tree can be placed in allotment gardens, on squares in neighborhoods of the city, on playgrounds and industrial sites. They can vary in size, color palette and water holding capacity. The tree consists of the following parts:

- ◆ Crown: pressed sheets, bend into shape from rPP regranulate
- ◆ Tree trunk: XL 3D print
- ◆ Seats: Pressed sheets bend into shape)





3. Southend-on-Sea products and designs

3.1 Kitchen Food Waste Caddy

Product:

- ◆ Product weight: 791g
- ◆ Material volume: 775.92 cm³

Material:

Source: post-consumer HDPE collected from Southend-on-Sea businesses and schools. No existing collection system in place so material likely destined for landfill/incineration.

Process:

- ◆ Material collected alongside other 'hard plastics' from Southend-on-Sea businesses and schools
- ◆ Mixed plastics consolidated and transported to Van Werven (Selby, UK)
- ◆ Plastics shredded and separated by polymer type and spec, to form polymer specific regrind
- ◆ HDPE transported to Southend-on-Sea for manufacture

Manufacture process: injection moulding (IM) + hand assembly

Alternative: produced from virgin polymer following the same manufacturing process



3.2 Tree stake/fence post

Product:

- ◆ Product weight: 5kg
- ◆ Material volume: 5154 cm³

Material:

Source: post-consumer HDPE collected from Southend-on-Sea businesses and schools. No existing collection system in place so material likely destined for landfill/incineration.

Process:

- ◆ Material collected alongside other 'hard plastics' from Southend-on-Sea businesses and schools
- ◆ Mixed plastics consolidated and transported to Van Werven (Selby, UK)
- ◆ Plastics shredded and separated by polymer type and spec, to form polymer specific regrind
- ◆ HDPE transported to Southend-on-Sea for manufacture

Manufacture process: injection moulding (IM)

Alternative: produced from treated (tanalised) 'green wood'. Some examples produced using mixed post-consumer recycled plastics



3.3 Cladding panel

Product:

- ◆ Product weight: 3kg
- ◆ Material volume: 3092 cm³

Material:

Source: post-consumer HDPE collected from Southend-on-Sea businesses and schools. No existing collection system in place so material likely destined for landfill/incineration.

Process:

- ◆ Material collected alongside other 'hard plastics' from Southend-on-Sea businesses and schools
- ◆ Mixed plastics consolidated and transported to Van Werven (Selby, UK)
- ◆ Plastics shredded and separated by polymer type and spec, to form polymer specific regrind
- ◆ HDPE transported to Southend-on-Sea for manufacture

Manufacture process: extrusion + compression moulding

Alternative: many options – stone, timber, fibre cement, composite, uPVC, porcelain tile



3.3.1