

COVID-19

Recyclable Cardboard Face Shield

Briefing paper for PMG
16 April 2020

1.1 Safeguarding Our Community

The current COVID-19 pandemic is impacting directly upon daily activities of every person and is expected to continue to impact us all for many months. Key workers in the private and public service sectors are continuing to deliver essential services that often require close contact with customers.

Where appropriate, social distancing measures have been implemented. But additional safety and wellbeing measures could include the use of Personal Protection Equipment (PPE) by key workers and customers.

- PPE will help protect front-line workers who interact with customers.
- Social distancing together with PPE will further help safeguard customers

However, current UK Government guidance¹ on PPE focuses on the requirements for health and social care contexts; there is no specific guidance provided for the private and public service sectors. Consequently, the introduction of PPE into these environments would be a voluntary action and would require cost-effective solutions that can be delivered in large volumes and quickly.

This paper briefly presents a concept for a **Recyclable Cardboard Face Shield** that has been rapidly developed in a collaboration between Plympton based **Prestige Packaging** and the **University of Plymouth**.

The **Recyclable Cardboard Face Shield** is a low-cost, high volume manufacturing PPE option that could help protect our retail and public service workers.

The purpose of this paper is to generate a commitment from PMG members to assist and support the continued development and introduction of the **Recyclable Cardboard Face Shield** into our community.

¹ COVID-19 personal protective equipment (PPE) - <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/covid-19-personal-protective-equipment-ppe> (Updated 12 April 2020 / accessed 16 April 2020)

1.2 Eye and Face Protection

Eye and face protection provides protection against contamination to the eyes from respiratory droplets and splashing of secretions (including respiratory secretions). Eye and face protection can be achieved by the use of a surgical mask with integrated visor, full face shield or visor, or polycarbonate safety spectacles.

In medical contexts, the protection worn by medical staff is designed to protect the patient from the medics (as well as protecting the medics from the patient); as such the protection is considered to be a medical device. Whereas, protection that is required to protect a person from harm in the environment user is considered to be PPE.

In response to the short supply of PPE, there has been a surge in the manufacture of plastic frames for face shields using low-cost 3D printing technology based upon a free-to-use prototype design from Prusa Research² that has been shared under a non-commercial licence.

The **Recyclable Cardboard Face Shield** is an environmentally responsible alternative PPE that can be manufactured quickly, in large volumes and at low cost using processes already certified for food and pharmaceutical packaging.

1.3 The Recyclable Cardboard Face Shield

The **Recyclable Cardboard Face Shield** was conceived by Dr Antony Robotham, Associate Professor of Mechanical Engineering at the University of Plymouth. The motivation was to create a single-use face shield using an alternative material to plastic. Cardboard and starch-based materials were considered the most appropriate to create an environmentally sustainable product that could be recycled, composted, or even combusted once used.

A virtual prototype was developed using computer-aided design technology (Fig. 1) and a home-made prototype constructed using various types of cardboard packaging. Initially, the idea was to manufacture parts using a laser-cutter, but this is not a viable route for high-volume production.

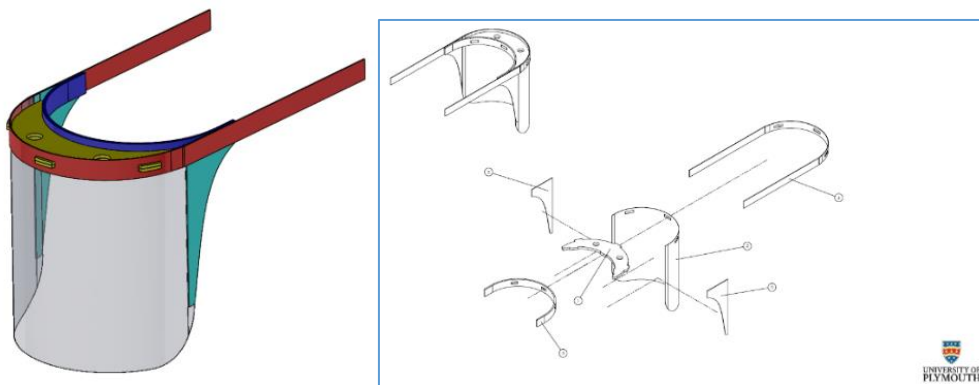


Fig 1: Initial CAD concept of Recyclable Cardboard Face Shield by Antony Robotham (University of Plymouth)

Dr Antony Robotham then approached Mike Corran, Director of Prestige Packaging, on 14th April 2020. Prestige Packaging has been supplying print and packaging for 25 years and offer a wide range of print and packaging products all produced in-house at their factory in Plympton. The production facility includes cut and crease presses, with window patching units that can incorporate acetate viewing material into the printed pack.

² <https://www.prusaprinters.org/prints/25857-prusa-face-shield>

In a matter of 48 hours, Mike and his team have devised a simplified version of the **Recyclable Cardboard Face Shield** (Fig. 2). This uses a 3-piece design that takes full advantage of sustainably sourced materials and the high-volume, certified manufacturing processes used for food and pharmaceutical packaging.

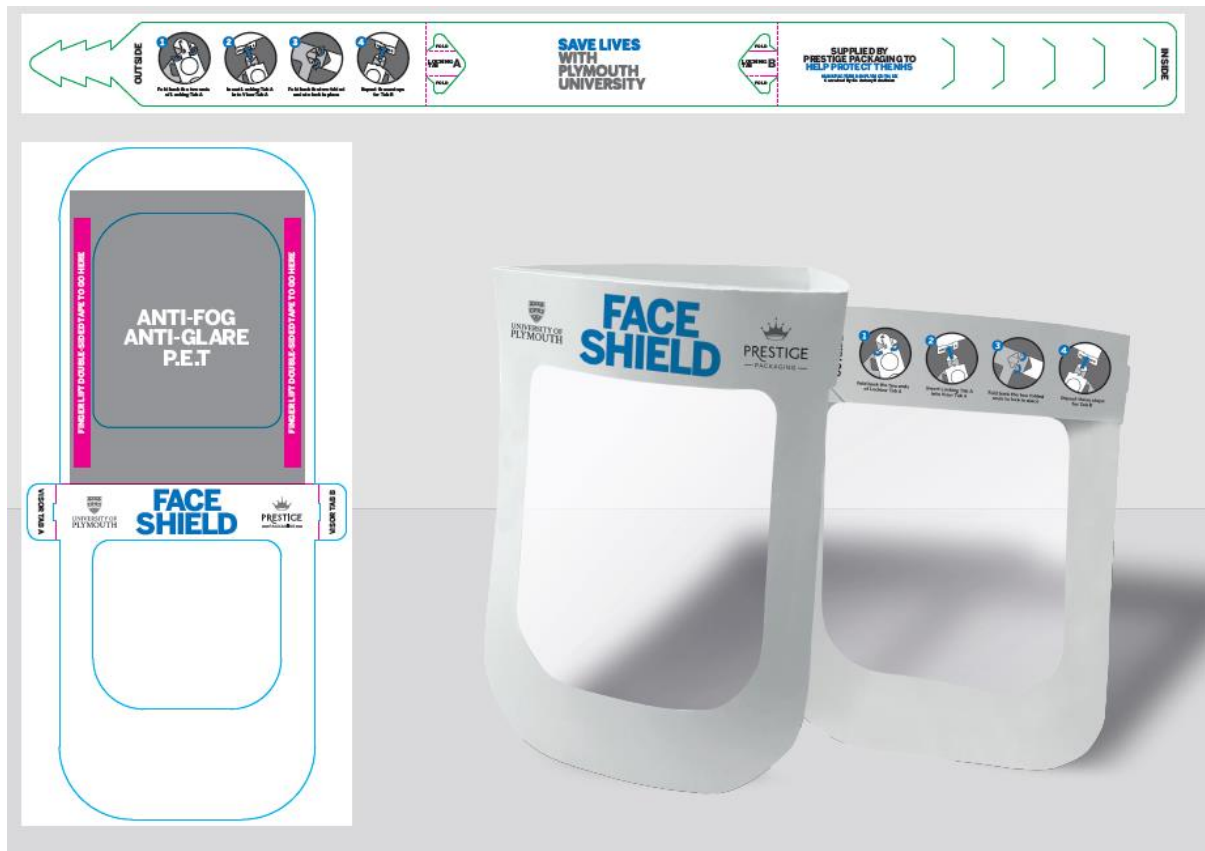


Fig 2: Production Prototype of Recyclable Cardboard Face Shield by Mike Corran (Prestige Packaging)

The **Recyclable Cardboard Face Shield** is constructed from:

1. Cardboard frame and adjustable headband. This material is 100% recyclable, 100% compostable and made from FSC certified wood products and has zero impact on the environment.
2. The anti-fog, anti-glare, PET see-through visor will be fitted using adhesive that has is applied during production to the cardboard frame. The visor would be recycled by arrangement with Prestige Packaging and returned back into the production cycle.

If there are doubts about recycling, the face shield can be incinerated.

To reduce costs, it is proposed that the **Recyclable Cardboard Face Shield** is delivered in a flat-pack form in sturdy outers for self-assembly by end users in-situ. Full instructions for self-assembly are printed on the adjustable headband.

The **Recyclable Cardboard Face Shield** can be personalised using your preferred branding and pantone colour schemes.

An initial print run of **20,000 units** could be available by w/c 27 April 2020, with production of **50,000 units** per week thereafter.

The unit cost is estimated at **£3.00 / face shield**

1.4 Point-of-Use Scenarios

We perceive the use of the **Recyclable Cardboard Face Shield** as follows:

1. Key workers

- 1.1. At beginning of work shift - select a Recyclable Cardboard Face Shield from stock
- 1.2. At end of work shift – separate visor from cardboard frame
- 1.3. Dispose of each component part in to separate recycling bins



2. Work Location

- 2.1. Supplies Recyclable Cardboard Face Shield to key workers
- 2.2. Organises separate recycling bins for the cardboard and PTE materials
- 2.3. Arranges collection of recycled materials by Prestige Packaging

1.5 Next Steps

To proceed further with this project for a **Recyclable Cardboard Face Shield**, we are immediately looking for the following support from PMG:

1. Commitment to sponsor the initial 20,000 units for trial in the Plymouth community.
2. Distribution of trial production prototype Recyclable Cardboard Face Shield to beneficiary private and public sector organisation of your choice in the Plymouth community.
3. Support the gathering of feedback from your chosen beneficiaries.

Following these trials, the production ready version of Recyclable Cardboard Face Shield will be finalised and final unit costs calculated. At which point, we would want to feedback to PMG to consider the a long-term commitment to assisting our community. We would also recommend that an independent evaluation of the Recyclable Cardboard Face Shield is commissioned by PMG to evaluate user perceptions of the product in use and its impact on their work experience.

1.6 Summary

The **Recyclable Cardboard Face Shield** is a low-cost, high volume manufacturing PPE option that will help protect your private and public sector workers.

The cardboard is 100% recyclable, 100% compostable and made from FSE certified wood products and has zero impact on the environment. The anti-fog, anti-glare, PET see-through visor would be recycled by arrangement with Prestige Packaging and returned back into the production cycle.

An initial print run of **20,000 units** could be available by w/c 27 April 2020, with production of **50,000 units** per week thereafter.

The unit cost is estimated at **£3.00 / face shield**

We thank you for your time

Contacts

Dr Antony Robotham
Associate Professor of Mechanical Engineering
University of Plymouth, Plymouth PL4 8AA
antony.robotham@plymouth.ac.uk



Mike Corran
Director
Prestige Packaging, Plympton PL7 4FE
mike@colourpress.co.uk

