

Our mask features a triple-layer fabric approach. A bamboo charcoal cotton blend is the innermost layer, a 100% cotton fabric is in the middle, and cosmetic cotton mesh is the frontmost layer. The bamboo charcoal fabric layer (BCF) has several positive attributes including advanced moisture control^[1], deodorizing abilities, and antimicrobial functions. An interwoven 30% cotton blend supplements BCF's properties by creating a cooling effect^{[1][2]} that increases breathability^{[1][2]}. The middle layer of 600 TPI high staple 100% cotton provides a filtration efficiency of 79% compared to the 76% of current surgical masks^[a]. Our mask relies entirely on mechanical filtration. Unlike other materials, it won't need to be recharged or lose efficiency^[b]. Additionally, there is no need to rely on vents or replaceable filters that can contribute to excessive waste. Due to our fabric-only approach, we maintain low-costs^[3] and a low carbon footprint while maximizing efficiency and filtration.

The Toroid mask features a built-in mask fitter^[c] between the cotton and BCF layers to increase comfort and fit while preventing fogging of glasses^[4]. The fitter utilizes a moldable foam wiring^{[5][6]} over the nose bridge to accommodate all facial shapes. Additionally, by using biodegradable elastic and medical-grade polyethylene microtubing, the fitter features a passive adjustment system^{[5][6]}. The bottom fitter portion adjusts up/down depending on the user-set tension on the straps allowing an adaptable fit. Straps provide the option between going around the ear or - "C" clips for - behind the head; silicone cord-locks on the straps allow for a comfortable fit. With adjustable straps and a fitter designed to provide comfort, we maximize functionality according to the user's preference^{[5][6]}.

We realize that expressing personal identity in regards to mask-wearing is essential to users. With this in mind, we've integrated interchangeable cotton mesh mask covers and developed a virtual community platform where users can upload and share their designs. This platform grants users with greater flexibility in incorporating their preferences and allows them to explore numerous styles.

Alongside promoting personal expression, the Toroid mask incentivizes users to wear masks in public. We've developed an app concept^[7] that forges a mutually beneficial relationship between local businesses and mask wearers. When a Toroid mask is purchased, it comes with a code to unlock the app. The app introduces users to various local landmarks. If users take a selfie in their Toroid mask – or any mask – they will receive points, allowing them to receive coupons or other benefits supplied by local establishments. This system encourages people to wear masks in public while allowing local businesses to receive greater publicity.

Our mask is designed to use a hybrid of die-cutting, stitching, and material fusing during the manufacturing process. The materials are industry tested and have track records of lasting hundreds of wash cycles. We highly recommend handwashing the Toroid mask with cold water to prevent excessive wear and tear- ensuring it lasts over 365 wash cycles.

The Toroid mask is the perfect low-cost^[3] solution that avoids hassles and problems associated with other plastic, surgical, high-end, and mainstream masks.

Article References:

[a]: *Aerosol Filtration Efficiency of Common Fabrics Used in Respiratory Cloth Masks*

Abhiteja Konda, Abhinav Prakash, Gregory A. Moss, Michael Schmoldt, Gregory D. Grant, and Supratik Guha | *ACS Nano* 2020 14 (5), 6339-6347 | DOI: 10.1021/acsnano.0c03252

Study tested the filtration efficiency of several materials. Study illustrates 600 TPI of 100% cotton has a filtration efficiency (%) of 79 ± 23 , while a surgical mask with gaps has an efficiency of 50 ± 7 and without gaps has 76 ± 22 .

[b]: Godoy, M. (2020, July 01). *A User's Guide To Masks: What's Best At Protecting Others (And Yourself)*.

Retrieved September 15, 2020, from

<https://www.npr.org/sections/goatsandsoda/2020/07/01/880621610/a-users-guide-to-masks-what-s-best-at-protecting-others-and-yourself>

Excerpt from article above:

"Cui and Chu note that polypropylene will lose its electrostatic charge when you wash it, but you can recharge it by ironing it or by rubbing it with a plastic glove for around 20 seconds."

[c]: The design for the mask fitter was initially developed by the University of Wisconsin-Madison. The design has been iterated and improved for our implementation. PVC Tubing has been replaced with medical grade polyethylene tubing for longevity and safe-use. Strap implementation has been redesigned for flexibility in wearing preferences (behind the head or ear). The fitter has also been adjusted to allow implementation between fabric layers. The design is offered for free-use and commercial manufacturing for the duration of the COVID-19 public health emergency.

Reference for Problem Solutions Provided in XPrize Documentation:

https://assets-us-01.kc-usercontent.com/5cb25086-82d2-4c89-94f0-8450813a0fd3/d08058b8-0002-49e7-bee6-8a3cbee72e81/NextGenMask_Qualifying%20Submission_Instructions%202.0.pdf

[1]- Problem 1: "Too hot on my face"

[2]- Problem 3: "Difficult to breathe in"

[3]- Problem 10: "Difficult to acquire"

[4]- Problem 2: "Fog my glasses"

[5]- Problem 7: "They hurt my face/ Don't fit my face properly"

[6]- Problem 4: "Uncomfortable"

[7] - X-Factor of Style: "promote positive mask-wearing behavior"