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Using blue shop towels in homemade face masks can filter particles 2x to 3x better than cotton, 3 clothing designers discover after testing dozens of fabrics

[Julie Bort](#)

Apr 2, 2020, 6:19 PM



A Suay employee modeling the blue-shop-towel mask. Suay Sew Shop

- Lindsay Medoff, the CEO of Suay Sew Shop, a 30-employee boutique Los Angeles clothing manufacturer, wants the armies of people sewing homemade surgical masks to add a specific blue shop towel inside them.
- Medoff and two friends were appalled by the dozens of mask patterns calling for cotton, a highly breathable, permeable fabric, and became obsessed with finding a fabric better suited for the job. They built a homemade testing facility that could test particle filtration down to 0.3 microns and tested every fabric they could find, from coffee filters to industrial materials.
- They discovered that by adding two blue shop towels and using a design that produces a tighter-fitting mask, they could make a mask that could block up to 95% of the particles they could test, while the cotton masks blocked 20% to 60% of the particles.
- These are not meant to replace [the N95 masks](#) worn by healthcare workers — they're designed to be an alternative to the cotton masks that many people are making and wearing for quick trips to the grocery store.
- The women are sewing about 200,000 masks (or until their own supplies run out) and giving them — and a design — away, as well as raising money to pay their workers their full wages.

- They're also raising money to get their mask tested with the actual COVID-19 pathogen to see whether their design could be validated as a safer solution during the mask shortage.
- "This is ordinary people taking their power back," Medoff said.
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The US boutique clothing manufacturing industry is abuzz as sewing shops [retool themselves into surgical-mask-making factories](#), like something out of a [World War II "it's up to you"-style poster](#).

Lindsay Medoff, the CEO and owner of Suay Sew Shop, a 30-employee boutique manufacturer in Los Angeles, has eagerly jumped on board. But when she got a mask pattern from an ER-doctor friend of hers a couple of weeks ago, she was shocked.

"They sent me a pattern that looked like [it was] from Etsy," she told Business Insider. "I thought, 'What do I do with this?'"

Suay's fashion niche is industrial [upcycling](#), a big fashion trend these days. The company takes unsold clothing items from major brands, such as Patagonia down vests, [and crafts them into new clothing](#), recycling 85% or more of the materials.

But the mask instructions circulating on the internet are not geared toward professional, industrial production. Pro shops use digital instructions, not the kind of paper patterns people buy from fabric shops like JoAnn, Medoff said.

Medoff called her best friend from high school, Chloe Schempf, who also sews and previously had a career designing displays for fashion brands like Urban Outfitters and Free People. Today she's a full-time mom living in rural Michigan, where her husband's veterinary practice is. (Her husband, Dr. Ray Harp, is a cast member on the long-running National Geographic show about country vets, "[The Incredible Dr. Pol.](#)")

Schempf had dusted off her sewing machine to join the troops of homemade-mask makers, but when she looked at the instructions, she had another surprise.

No one seemed to be thinking about the fabric that the instructions called for: cotton, and cotton fill for the filter.

How could a highly breathable cotton weave be the right material to filter microscopic pathogenic particles?

Then Schempf saw that the Centers for Disease Control and Prevention was telling healthcare workers unable to get proper gear [to use a bandana as a last resort](#).

"The recommendation of a bandana made me ill," Schempf said. "I couldn't understand how we can go from a 2020 N95 mask to a 1918-era cotton mask with a variable filtration of 20% to 60%."

3 women set up their own mask-testing shop

Clothing is all about choosing the right fabric for the right use. We don't use insulated down-filled fabric for a swimsuit or a T-shirt jersey knit for a winter coat. If a cloth mask is all that people have access to, then the CDC recommends using that and these clothing designers are not medical professionals and have no reason to contradict that advice.

Still, a few weeks ago, before the CDC recommended cloth masks, Schempf, Medoff, and Medoff's business partner, Heather Pavlu, a co-owner of Suay Sew Shop, became obsessed with finding a less permeable fabric for masks.



Suay Sew Shop's Heather Pavlu testing mask particle filtration in the lab she and her friends built. Suay Sew Shop "We spent a few days researching and brainstorming any material that could filter: coffee filters, batting, window shades, Swiffer, interfacing, etc., all the way to more technical materials that are available to specialized industrial sectors like aviation, oil refinery, medical fields," Schempf said.

They bought a \$1,400 particulate-counter device from Grainger that measures filtration ability down to 0.3 microns and spent another 10 sleepless days testing all the fabrics they could find.

They wanted a material they could buy as easily as cotton but that balanced filtration with breathability — they discovered that HEPA vacuum-cleaner bags, for instance, had great filtration but were too suffocating to wear.

The ideal material turned out to be stretchy blue shop towels made from a polyester hydro knit.

Inserting two of these towels into an ordinary cotton mask brought filtration up to 93% of particles as small as 0.3 microns, the smallest their machine could test. Meanwhile, the cotton masks filtered 60% of particles at best in their tests, Schempf said.

Polyester hydro knit towels are readily available at hardware and automotive stores. The two brands they tested were [ToolBox's shop towel](#) and [ZEP's industrial blue towel](#). Interestingly, [Scott's pro shop towels](#), which are also made with a hydro knit fabric, didn't work as well, Schempf said.

The team is continuing to test other brands.



ToolBox shop towels. [Harbor Freight](#) Having found the material, they worked on a design. "The fit has a lot to do with your protection," Schempf said. "You can have a great mask, but if you aren't getting a tight fit, it won't protect you."

Pavlu said she sewed "at least 15 types of the patterns that were being spread on the internet" before the team realized they were going to have to design a new mask themselves.

So Pavlu tracked down and rented a PortaCount Respirator Fit Tester 8040 machine, and the team tested things like how a wire nose clamp could help create a high-filtration, one-size-fits-all mask.

They are putting the final tweaks to their mask design and plan to release the design for free to the public next week. The instructions will be good for home sewers and pros, available on [Suay's website](#) and its [GoFundMe page](#).

200,000 masks from an industrial material

During their tests, they discovered another material that filtered exceptionally well: cleaning towels made from a plastic called polypropylene, used to clean industrial machines.



Suay Sew Shop's homemade fabric-testing lab. Suay Sew Shop Suay bought a big supply of it. But the team can't recommend this fabric to the public. The supply is dwindling, Medoff said, because the industrial makers of the material are now dedicating themselves to manufacturing medical-protection supplies.

Still, Suay believes it has enough to make about 200,000 masks and has already sewn thousands, Pavlu says.

The team also discovered the mask held 95% of its filtration abilities after up to three machine washes.

"We are calling them semi-disposable at this point and are continuing testing after six, seven, 10 washes," Pavlu said.

Schempf believes the next step is to test this mask and the shop-towel version to see whether they actually block the COVID-19 pathogen, which is a smaller particle than their equipment can test.

They are curious and hopeful about their masks, but they don't have any proof that they will protect healthy people from getting the virus any better than an ordinary cotton mask.

[Health experts have said](#) that while surgical-style masks like these aren't likely to protect a healthy person from getting the virus, if people with COVID-19 wear them — especially along with following social distancing — that could help minimize the spread.

Schempf said she found a lab in Kansas City making COVID-19 testing kits that was willing to test their masks, but the testing fee is \$40,000. She's [started a GoFundMe](#) to raise the money and to fund mask-production efforts in her area of rural Michigan.

How masks can help

Medoff said that the shop-towel masks and the ones from polypropylene fabric that her staff is making are not foolproof safety measures. The logic is that if even cotton masks are useful, then ones made of less permeable material can only help.

Suay is in full production and giving the masks away to anyone who needs them, including medical professionals, nursing-home workers, hospice-care workers, people caring for an ill relative, and grocery-store workers — people who are "risking their lives" on the front lines, she said.



Suay Sew Shop's masks. Suay Sew Shop

Many of these people break down in tears when they get these masks, she said.

Because she's paying her workers their full wages to sew the free masks, and materials and labor costs are intensive, she's asking for donations [via a GoFundMe](#).

"This is by community, for community," Medoff said. "This is ordinary people taking their power back."