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How Long Do Pollution Masks Last? | New Data

📅 2019-11-11 (<https://smartairfilters.com/en/blog/how-long-air-pollution-masks-last-lifespan-data/>) 👤

Thomas Talhelm (<https://smartairfilters.com/en/blog/author/thomas/>) 📁 Air Pollution

(<https://smartairfilters.com/en/blog/category/air-pollution/>), India

(<https://smartairfilters.com/en/blog/category/india/>), Masks

(<https://smartairfilters.com/en/blog/category/masks/>)



Scientific tests have found that simple [pollution masks are incredibly effective](https://smartairfilters.com/en/blog/masks-really-work/) (<https://smartairfilters.com/en/blog/masks-really-work/>), but how long do masks last? Most tests are done with brand new masks, so there's very little data on used

ones.

And in that data vacuum, people have wildly different ideas about how masks remain effective. I've seen several people say they only last a day or two, such as this person who emailed me about the question.

The 30-Day Mask Longevity Test

It's not a complete data vacuum. We tested a new 3M mask and an 11-day-old 3M one (<https://smartairfilters.com/en/blog/how-long-masks-last/>) in Beijing and found effectiveness dropped just 1.4%. But what happens after 11 days? And is this true of all masks or just that particular 3M ones?

To get some good data on this question, Smart Air India ran fit tests on the same type of Venus V-430 SLV N99 mask under three conditions:

1. New
2. Used for 20 days
3. Used for 30 days

This was heavy usage. Smart Air India head Dhariyash wore these masks in Delhi, which is a tough environment for masks because it's hot, sweaty, and one of India's most-polluted cities (<https://smartairfilters.com/en/blog/did-delhis-air-get-better-in-2018/>).

Test Method

The fit test works by using the white tube to sample air **inside** the mask while the tester is wearing it. Meanwhile, the blue tube is sampling air just **outside** the mask.

The wearer completes a number of movements during the test, such as bending over and moving the head side to side. Thus, the results represent how well the mask seals while people are moving—not just while sitting still.

The TSI PortaCount detects particles down to .01 microns—far smaller than the oft-mentioned 2.5 microns (<https://smartairfilters.com/en/blog/pm10-pm2-5-difference-particle-air-pollution/>).

Then the machine uses this data to estimate the percentage of particles going through the mask (as opposed to leaking in around the sides).

Results

The data showed the mask was far more resilient than the “just a day or two” story.

Even after 30 days of use, the mask still scored over 99%.

Is This A Fluke Result?

It can seem hard to believe that masks retain their effectiveness so well. Yet this surprising result is similar to earlier test results with a 3M mask (<https://smartairfilters.com/en/blog/how-long-masks-last/>). The 9332 mask effectiveness decreased just 1.4% over 11 days of heavy use.

Masks “Age” by Getting Loose, Not by Letting in Particles

A simple understanding of how masks “age” can help explain this counter-intuitive finding. Before I saw the data, my intuition about masks was that, over time, they become worse at filtering particles.

It turns out, I was wrong. Masks actually get **better** at capturing particles over time (<https://www.quora.com/How-long-can-you-run-an-air-purifier-before-changing-the-filter/answer/Thomas-Talhelm>).

What **does** get worse is air resistance. As masks get more particles stuck in them, it gets harder for air to get through, and harder to breathe. It works just like strainers in the sink when they are full of gunk.

Do All Masks Remain This Long?

One reason the Venus mask aged so well is that its straps are made out of elastic fabric. This fabric retains its tightness even after heavy use.

In contrast, many 3M masks use rubber bands, which loosen and snap after heavy use. Thus, those with rubber straps will probably have shorter lifespans.

Bottom line: They remain far longer than a single day. This data suggests masks can retain fit effectiveness up to the point masks become so gross and hard to breathe in that most people would want to throw them out anyway.

A Practical Guide to Mask Longevity

Based on the data, I throw my masks out when:

1. The straps break or become so loose that I can't get a tight fit.
2. The mask is so full of particles that it becomes noticeably hard to breathe in.
3. The mask gets so sweaty and gross that I want to throw it out anyway.

Breathe safe!

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Thomas Talhelm (<https://smartairfilters.com/en/blog/author/thomas/>)

Thomas is an Associate Professor of Behavior Science at the University of Chicago Booth School of Business and the founder of [Smart Air](https://smartairfilters.com/) (<https://smartairfilters.com/>), a social enterprise to help people in China breathe clean air without shelling out thousands of dollars for expensive purifiers.

Here's what else you should know about:

Do masks really work in India's air pollution?

(<https://smartairfilters.com/en/blog/pollution-masks-india-air-pollution/?rel=1>).

Does AC Bring in PM2.5 air pollution? (<https://smartairfilters.com/en/blog/does-ac-bring-in-pm2-5/?rel=1>).

New Data Shows Beijing's Air Pollution Progress Reverses in March
(<https://smartairfilters.com/en/blog/new-data-shows-beijings-air-pollution-progress-reverses-march/?rel=1>).

how long (<https://smartairfilters.com/en/blog/tag/how-long/>)

Mask longevity (<https://smartairfilters.com/en/blog/tag/mask-longevity/>)

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SUSHEEL JALALI





Hi, thanks for the detailed studies, analyses and results.

Perhaps you may also mention or analyze about any new nano-filtering material that can be lighter and not too expensive, which can be washed with soap to extend its life. Are the filters you used not washable i.e. their factory made fibres get spoiled if they are washed? Because news reports suggested that soap-wash of hands is even better than sanitizer wash to get rid of corona virus.

Thanks a lot,
Keep up the good work !!

 Reply


 2020-03-18 8:01 am 

Liz - Smart Air



Hi Susheel, we had this article on whether you should wash your mask:
<https://smartairfilters.com/en/blog/wash-n95-mask-effective-virus/>
(<https://smartairfilters.com/en/blog/wash-n95-mask-effective-virus/>)

Reply


 2020-03-19 3:07 pm

Robert



Great test! What about bacteria starting to grow on the mask if you use it for too long? Might that cause a health hazard? Can you sterilize the mask and kill bacteria and viruses growing on it using high heat? If so, what could you use? A hair dryer? Heat gun? Oven? Put it out in the sun and let the UV lights kill them? This question is important since there seems to be a shortage of masks and people will need to know how to make them last longer and safely handle them, etc.

 Reply

 2020-03-15 3:59 am

Parth Misra



Thanks for all the work you guys are doing! I had a question. How come masks with such a thin fabric can stop 99.95% of PM2.5 particles, but it requires a hefty HEPA filter when it comes to indoor air purifiers? Wouldn't it make more sense to strap the same fabric masks are made out of onto the purifiers if they're that good?

 Reply

🕒 2019-12-30 10:29 pm ^

Liz - Smart Air



Hi Parth, here is our new article, there is a session explains how masks works (there is also an video): <https://smartairfilters.com/en/blog/wash-n95-mask-effective-virus/>
(<https://smartairfilters.com/en/blog/wash-n95-mask-effective-virus/>)

Reply

🕒 2020-03-19 5:26 pm

◀ Did Delhi's Air Pollution Drop 25% in 2019? What The Data Says (<https://smartairfilters.com/en/blog/delhi-pm25-air-pollution-2019-analysis/>)

How long does the Sqair's HEPA filter last? ▶ (<https://smartairfilters.com/en/blog/sqair-hepa-lifespan-test/>)

ABOUT SMART AIR

Smart Air is a social enterprise based in China, India, Mongolia and the Philippines that creates simple, no-nonsense air purifiers and provides free education to combat the impacts of air pollution. More about who the heck we are (</en/about/our-story/>)



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