Sanitizing Hand Dryers

The Pursuit of a Sustainable, Hygienic and
Cost-Effective Hand Drying Method

WORLD DRYER

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Restroom Hygiene Challenges

Sanitizing Hand Dryers as a Solution

In the wake of the Covid-19 pandemic, today's world has become more invested in the use and development of superior hygienic technology. Many global health organizations agree that it is incredibly important to prevent the spread of infectious diseases in high-traffic areas, such as public restrooms, where harmful pathogens can thrive and spread.

While touchless faucets and antimicrobial surfaces have become standard in modern restroom design, the importance of hand drying is often underestimated. Wet hands and surfaces increase the risk of harmful bacteria and viruses spreading; therefore, methods used to dry hands should further help to prevent cross contamination and creation of contaminated waste, such as used paper towels.

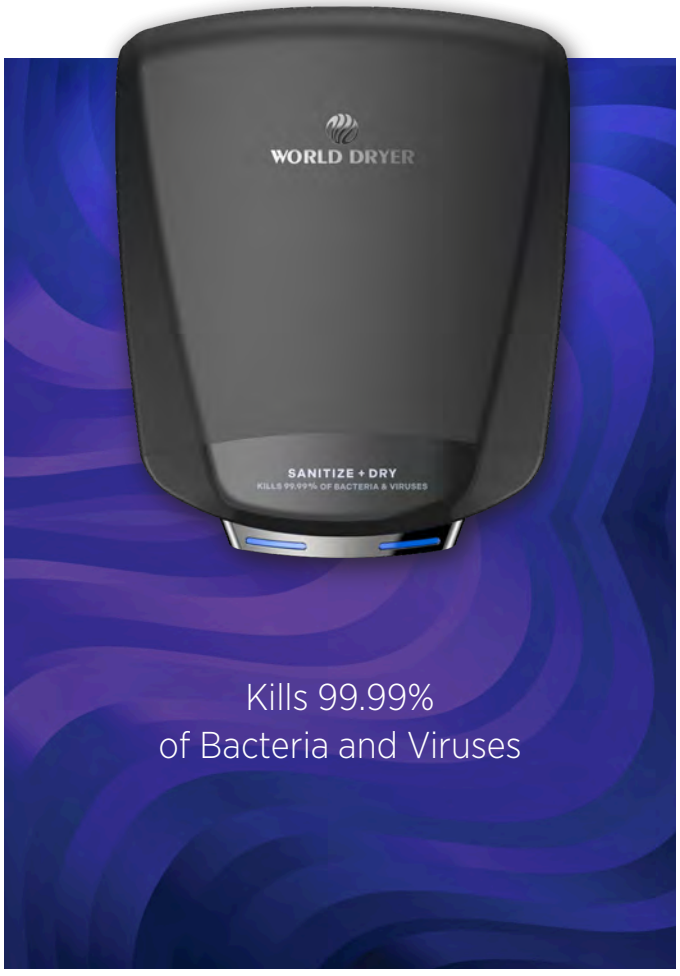
Hand dryers have steadily grown as a potential solution to this problem by incorporating proven sanitary technologies like touchless activation, anti-microbial materials/coatings and HEPA filters. However, with the consumer market recognizing this desire, it has led to the creation and use of misleading information around commonly accepted forms of hygienic and sanitary technologies.

Consumer Decision Making

Navigating Misleading Marketing

Many commercial hand dryers are marketed as "hygienic" without offering any direct evidence to substantiate their claims. Examples include ultraviolet (UV) lights and ionizers, which can be added to a hand dryer to create a "perceived" sanitary benefit.

It's important for consumers to know what to look for when buying a sanitary hand dryer. **It's critical to look for credible evidence behind sanitization/hygiene claims. Factors to consider include testing performed by third parties, methods involving real in-use dryer testing and significance of the tested organisms.**



Outlining an Ideal Solution

A hand dryer that sanitizes and dries in public restrooms should meet the following key performance criteria:

Demonstrated ability to kill and/or capture common bacteria and viruses with 99.99% efficacy.

- **Influenza A (H1N1):** The most common form of flu, accounting for 96% of cases in the United States for 2024.[1]
- **SARS-CoV-2:** Extremely contagious strain of coronavirus that causes the respiratory illness, COVID-19.
- **Human rhinovirus (HRV):** The most common cause of the common cold.
- **Escherichia coli (E. coli):** Bacteria responsible for 265,000 foodborne illnesses a year.[2]
- **Staphylococcus aureus:** Common bacteria responsible for a wide range of mild to severe infections.
- **Methicillin-resistant Staphylococcus aureus (MRSA):** Type of bacteria that's resistant to many antibiotics and can cause serious infections, particularly in healthcare settings.
- **Norovirus:** Highly contagious virus that causes gastroenteritis, characterized by symptoms such as stomach pain and vomiting shortly after exposure.
- **Enterococcus faecium:** A hospital-adapted pathogen with increased antibiotic resistance.

Third-Party, Lab-Verified Test Data

- Clear, publicly accessible test reports from an accredited laboratory must be readily available to prove that the hand dryer is capable of sanitizing the air and/or surfaces.
- The lab used should be qualified for microbiological testing of antimicrobial and antiviral efficacy.
- Efficacy results should be tied to real-world conditions and clearly state what bacterial and viral strains have been tested.

Cost Efficiency

- A sanitary dryer should be cost-effective to ensure long-term affordability. Based on the average cost of electricity in the United States, an efficient hand dryer costs ~$0.32 for 1000 uses.
- In contrast to sanitary hand dryers, paper towels can cost upwards of $25 for 1,000 uses. This doesn't account for additional service or labor costs.
- A hand dryer shouldn't require consumables such as HEPA filters, UV bulbs or chemicals, which further reduces facility maintenance costs.

Minimal Environmental Impact

- Energy efficient hand dryers have a smaller carbon footprint over their full life cycle compared to paper towels[3] and hand dryers don't create waste after use.
- Hand dryer use helps reduce the volume of paper towel waste sent to landfills. Recycling is not a practical option for used paper towels due to their short low-grade fibers and post-use contamination.

Cold Plasma Technology

A Dynamic and Sanitary Solution

With a clear outline for what can be considered an ideal sanitary solution, different technologies and sanitary functions can be assessed. One such technology is the application of cold plasma.

Cold plasma technology represents an incredibly versatile solution. When properly implemented, this technology is capable of near instant neutralization of 99.99% of all previously mentioned bacteria and viruses in the air. It can also be just as effective at sanitizing both dry and wet surfaces as well as extending that sanitizing effect to other objects like jewelry, keys, smart devices or anything else placed near the outlet of the dryer.

What is Cold Plasma?

Plasma is the fourth state of matter after solids, liquids and gases. Plasma can be thought of as highly energized gas. The most well-known forms of plasma include the sun, or the energy produced during lightning strikes.

Cold atmospheric plasma is super-energized air that includes electrons, ions and short-lived reactive molecules that kill germs, bacteria and viruses. It's specifically referred to as "cold" plasma because the energized air remains at ambient temperature.

How Does Cold Plasma Work?

A Cold Plasma Generator within the dryer energizes the air flowing through the dryer, raising it to the plasma state and producing special reactive molecules. It's these molecules that attack the structures and vital processes of viruses and bacteria, rendering them incapable of surviving or spreading.

There are several different approaches to generating cold plasma, and not all of them are equally effective at killing germs. With the right plasma technology, enough reactive molecules can be generated to eliminate bacteria and viruses on contact with 99.99% efficacy, including antibiotic resistant bacterial strains.

Reactive Molecules in Nature

Our environment has natural and manmade sources of some of the same reactive molecules found in plasma. Plants, for example, produce reactive molecules during photosynthesis.

Similarly, the human body also produces some of the same reactive molecules as part of normal metabolism and immune responses to help fight against infections.

Other Sanitary Options

Evaluating Commonly Used “Hygienic” Features

HEPA Filters

One of the current leading features available on hand dryers is a HEPA filter because they’re reliable and effective at removing contaminants from the drying air, including some bacteria and viruses. However, they can only trap contaminants in the air. The bacteria and viruses that land on or are trapped within a filter can remain viable for hours or even days. The germs that make it through the filter can still be a concern, possibly multiplying on other surfaces and becoming a new source of contamination.

An important thing to note about HEPA filters is that they must be replaced over time, and dryers equipped with them require this additional maintenance and expense of replacement.

Ultraviolet Light-Based Solutions

UV-C light is specifically used for sanitation, located just under the intensity of X-rays on the spectrum. UV-C has often been advertised as a feature that can make hand dryers more hygienic; however, it isn’t realistic to produce enough UV-C intensity to substantially sanitize the fast-moving air in a hand dryer where the microbe’s exposure to the UV-C light only lasts for a fraction of a second.

Some hand dryers have UV-C light shining onto a HEPA filter. While UV-C can kill germs on the surface of a filter, this doesn’t add value to the user or the dryer. It doesn’t sanitize the air and doesn’t extend the life of the filter. In these instances, the value of the UV-C feature can only be implied because a direct benefit can’t be demonstrated through testing.

Ionic Based Solutions

“Ionizer” and “ionizing” are terms that have become generically associated with a broad range of products and applications—often involving air cleaning. Not all ionizing technologies are the same, nor do they all deliver the same effects. Some are effective at removing airborne particles through a process called electrostatic clumping. This process works by binding particles together, making them easier to remove through filtration, electrostatic attraction or by allowing the larger clumps to settle naturally from the air.

Some hand dryers also include types of plasma technology that may be generally referred to as “ionizers” because they produce ions; however, not all plasma technology is equally capable of producing the reactive molecules that eliminate germs from a dryer’s fast-moving airstream.

When considering the credibility of “ionizer” features reported with hand dryers, consumers don’t have to rely on “implied” benefits. An “ionizing” feature doesn’t necessarily guarantee germs are being substantially eliminated. Consumers should always question if hygiene claims are supported by accessible third-party testing that demonstrates effectiveness of reducing the concentration of significant germs in the air and on surfaces.

Antimicrobial Additives

Some hand dryers incorporate antimicrobial features, such as silver ion technology. These features provide long-lasting protection for treated surfaces by inhibiting the growth of bacteria, mold and fungus that can cause stains, odors or deterioration. These features prevent surfaces from being contaminated and/or becoming sources for contamination that could negatively impact a dryer’s airstream.

Conclusions

Over the years, the debate on the hygienic nature of hand dryers has led to the development of features like touchless interaction, antimicrobial treatments and the adaptation of HEPA filters. Now, with the advent of technologies like cold plasma, innovative hand dryers can offer worry-free drying in public spaces while delivering cost effective efficiency and sustainability.

With thoughtful design and proper testing, cold plasma technology can weaponize the air flowing through a hand dryer to kill germs and offer the following benefits:

Sustainability

- Reduced carbon footprint compared to other drying options
- Helps reduce used paper towels as a source of contaminated waste from facilities and landfills
- Supports LEED credits and WELL (WELL Building Standard) points
- Eliminates the need to replace sanitary consumables like UV lamps or HEPA filters

Hygienic Drying

- Eliminates common germs from drying air and surfaces
- Can sanitize other items, such as phones, wallets, keys, jewelry and more
- Offers a more reliable, worry-free drying experience in public spaces

Cost-Effective Drying

- Significant reduction in operating costs, up to 98% savings versus paper towels

Investing in this innovative technology offers many benefits to facility managers, business owners and specifiers seeking a hygienic, sustainable and cost-effective restroom solution. As a reminder making any purchase, it's important to ensure that any hygiene claims are supported by accessible, third-party reports that verify the benefits.

To learn more about World Dryer's SANITIZE + DRY™ Sanitizing Dryer, visit **worlddryer.com/sanitize-dry**.

Disclaimer: Kills 99.99% of common bacteria and viruses in the drying air and on exposed surfaces. Laboratory tests confirm 99.99% efficacy against Influenza A (H1N1), SARS-CoV-2 (COVID-19), Human rhinovirus (common cold), Escherichia coli (E. coli), Staphylococcus aureus, Methicillin-resistant Staphylococcus aureus (MRSA), Norovirus and Enterococcus faecium. Results indicate broad efficacy, though effectiveness may vary against specific pathogens.

This product is unavailable in California and Canada.

References

[1] "What's the Difference Between Influenza A and Influenza B?" *The Cleveland Clinic*, 22-January-2025, (https://health.clevelandclinic.org/flu-a-vs-flu-b)

[2] "E-Coli Infection" *Cleveland Clinic*, 22-November-2023, (https://my.clevelandclinic.org/health/diseases/16638-e-coli-infection)

[3] "How to Reduce the Carbon Footprint of Your Paper Towels" *Terrapass*, 30-December-2019, (https://terrapass.com/blog/how-reduce-carbon-footprint-paper-towels)