

# CLEAN FACTS

Cleanroom Hygiene

Pros and Cons:

## PRESATURATED VS. DRY WIPES

This is a recurring subject that is being discussed increasingly among cleanroom operators worldwide. And with good reason. This report gives an overview of various aspects and lists the pros and cons of presaturated wipes vs. dry wipes in combination with spraying.

Saturated wipes are used to clean and disinfect cleanrooms. Wipes with a 70 / 30 isopropanol ratio, alongside other agents, undoubtedly account for the largest part. The quality of the liquid used (e.g., DI or WFI quality water, filtration or sterility, endotoxin level, etc.) should be taken into consideration. Conformity to the EU Biocidal Products Directive is another important aspect.

### WIPE QUALITY AND PERFORMANCE REQUIREMENTS

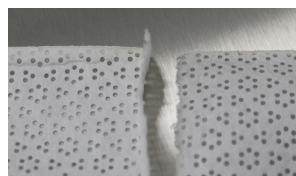
One of the most prevalent requirements in relation to wipe material being used for disinfection purposes is that it must release liquid well and wet the surface evenly.

Quality-related key features must be considered, particularly material condition and workmanship of the wipe manufacturing, any possible pretreatment (decontamination), extractable residues, the edge design, the cleanroom class

in which the wipes are packaged/filled, and the packaging and sterility.

The following materials are commonly found in the cleanroom market space:

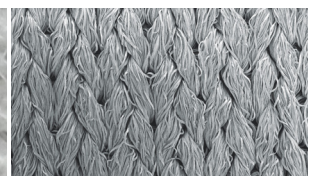
- \_ Melt-blown polypropylene (nonwoven)
- \_ Polyester/cellulose (nonwoven)
- \_ Polyester/polyamide microfiber (nonwoven)
- \_ Polyester, sometimes also mixed with other materials such as polyamide (knitted)



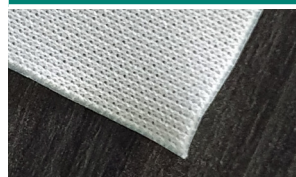
Polypropylene nonwoven material is commonly used for presaturated wipes



Polyester-cellulose nonwoven wipe



Polyester knit, magnified fifty times



Edge processing (picture shows polyester knit with heat sealed edges)



Edge processing (picture shows nonwoven wipe with cut edges)



It is important for the users themselves to individually determine and assess their process-based requirements in relation to the wipe quality and cleanliness, depending on the area in which they are being used. In this context, the creation of a specification document is recommended. Manufacturer/supplier specifications and recommendations can serve as a basis. However, cleanroom operators should conduct their own individual wipe validation process. VDI Guideline 2083, Sheet 9.2 is especially useful as a guide to what is required when using cleanroom wipes. Since consumables have different properties in terms of cleanliness and quality, but cannot be directly assigned to an air cleanliness class (as detailed in DIN EN 14644-1), it also becomes evident why, for instance, there can be no "ISO 7 wipe".

### CORRECT WETTING

When manually wetting a wipe with a spray bottle, it is obvious that not every wipe can be wetted or saturated in the same way. The user plays a crucial role in this process. The assessment of a wipe being "sufficiently wet", is always subjective and cannot be reproduced.

Presaturated wipes, on the other hand, are already wetted correctly and evenly in delivery format, which is important for achieving the desired reduction in microbial contamination when used for disinfecting purposes.

### WIPE BEFORE SPRAY DISINFECTION

The application (spraying) of disinfectants alone is not sufficient to efficiently kill microorganisms. Even if they are killed, the residues – such as dead cell material, proteins, pyrogens, and endotoxins, but also particulate impurities and any production-related residues – remain on the surface. Consequently,

a suitable wipe must be used in order to loosen and remove any dirt. Microfiber wipes in particular offer a number of benefits in terms of cleaning performance, and stand out by their ability to safely trap particles within the fiber structure.

### PROTECT YOUR STAFF!

Fine aerosol particles are inevitably released when spraying disinfectants. The more the agent is supposed to combat bacteria, fungi, and / or spores, the "more effective" (i.e., more aggressive and harmful) the chemical generally also is for the user. In this context, clear information is provided in the safety data sheets and extensive protective clothing is also recommended.

Examples from various safety data sheets for cleanroom disinfectants commonly available on the market (if inhaled):

- "May cause drowsiness and light-headedness"
- "May cause coughing and sore throat"
- "Inhaling vapors / aerosols may lead to irritation of the respiratory tract and cause inflammation of the respiratory tract and a pulmonary edema"

By spraying, however, the user is much more exposed to the aerosols on a long-term daily basis than by using presaturated wipes.

### HANDLING PRODUCTS AND BRINGING THEM INTO THE CLEANROOM

If used separately, dry wipes and disinfectants (in the spray bottle, for example) have to be taken into the cleanroom separately. The process must be defined for each product; the packaging must be cleaned or wiped beforehand if necessary. With presaturated wipes, only one product needs to be taken into the cleanroom, thus giving an advantage

also in handling and logistics. Equally, there are no empty spray bottles to dispose of, which is an additional benefit when high consumption levels are involved.

Processes can also be optimized outside the cleanroom where the products are used. Firstly, only one product has to be purchased and validated. At the same time, stock control is only necessary for one product, the presaturated wipe (instead of for the dry wipe and the cleaning agent).

## MAKE THINGS EASY!

One of the key advantages of ready-to-use wipes is the time and effort they save. Right-handed people would fold the dry wipe, place it in their left hand, and spray it with their right hand. After putting down the bottle, they take the wipe with their right hand, wipe the surface, and fold the wipe again before taking it in their left hand, picking up the spray bottle, and repeating. Ready-to-use wipes are simply removed from the pack, folded, and can be used immedi-

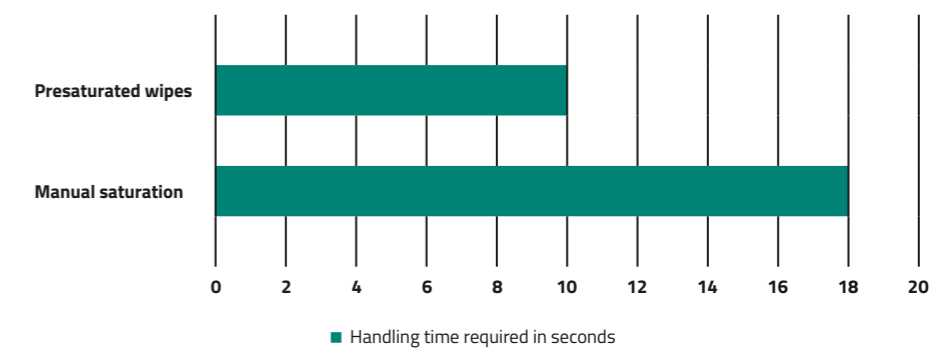
ately. This process is up to 50% faster for each wipe. By way of example, the following times were recorded in practice – from the moment the wipe was removed from the pack to the time it was ready to use (see diagram).

Presaturated wipes often contain much more liquid than can be sprayed onto dry wipes within a short period of time. Thus, cleaning / disinfecting measures can be carried out more quickly, efficiently, and evenly overall.

### PACKAGING

There are various ways of packaging of presaturated wipes available on the market. Ready, individually folded wipes offer the most benefits as they can be removed from the pack quickly and easily, piece by piece without the risk of touching multiple wipes.

The pack is easily resealable with a strong adhesive tab, preventing the wipes from drying out and thus ensuring that the remaining wipes can be used for a longer time. An additional aluminum coating on the inside of the pack provides good vapor diffusion resistance (which can be important when isopropanol or H<sub>2</sub>O<sub>2</sub> is used, for example).



	Packaging			Utilisation price / wipe
Customary polyester-cellulose wipes, 23 x 23 cm, non-sterile	150 wipes / pack	Net price / wipe		0,08 €
Isopropanol 70% / DIW 30%, non-sterile, 30 sprays per wipe (2 or 4 sides) = 30 ml	1 liter spray bottle	Net price / bottle	14,00 €	0,42 €
Additional work for spraying e.g. 2 sides of wipe, including handling, compared to presaturated wipes	8 seconds / side, 16 seconds total	Personnel costs / minute (= 30,-€ / hour)	0,50 €	0,13 €
<b>Total cost per manually saturated wipe</b>				<b>0,63 €</b>

## WHAT ABOUT THE COST?

Assumption: Saturated wipes may well be convenient and safer, but for the time saved when using them I have to pay a much higher price for the product. If I use a dry cleanroom wipe and spray my disinfectant on it, I will definitely save a lot of money.

## IS THAT REALLY TRUE?

At this point, a brief comparison of costs under normal market conditions is helpful. Let's take a standard dry cleanroom wipe (polyester / cellulose), 23 x 23 cm, approx. 68 g / m<sup>2</sup>, non-sterile. The current market price is around 0.08 Euro per wipe.

Many presaturated wipes of the same quality (nonwoven, non-sterile) are available at a similar price point on the cleanroom market – including all the above-mentioned benefits relating to handling and safety. A corresponding comparison of costs for sterile, saturated wipes leads to a similar result: The individual cost for dry sterile wipes, ster-

ile disinfectant, and the additional work involved are comparable to the cost of buying ready presaturated wipes (which offer a much higher level of quality and cleanliness).

However, there may be situations when using a saturated wipe rather than a spray bottle is less advantageous, i.e. in hard-to-reach places – even though these shouldn't really exist in the cleanroom setting. Here, spraying can be used additionally to achieve disinfection (the killing of microorganisms), although it will not be possible to clean (remove and trap dirt) the surface with it.

## SUMMARY

Individual requirements should be determined before using presaturated wipes in cleanrooms. Essentially, these are as follows:

- Wipe quality / material cleanliness in terms of residual particle content and abrasion resistance
- Cleaning agent and water quality (DI or WFI quality water?)
- Preferred type of packaging and unit

- Sterility, where appropriate (required for A / B areas)
- Conformity to the EU Biocidal Products Directive (for certain agents such as isopropanol)

Thus, presaturated wipes offer a number of advantages compared to manual spraying, particularly when used for disinfection purposes in cleanrooms:

- Validated product with a safe process thanks to even saturation, with full documentation
- Simple to bring into the cleanroom, hardly any preparation time needed
- Ergonomic work with ready-to-use products
- Very easy to use, no preliminary preparation, no spray mist (aerosols)
- Pack can generally be resealed after a wipe has been removed
- Cost-effective – the price is in a comparable range to the cost of manual saturation



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