

## **Cleaning of cultivation systems**

Testing the chemical resistance of FormFlex® cultivation systems

*With the increasing prevalence of viruses and fungi in greenhouse horticulture, thorough and intensive cleaning during crop rotations is becoming more critical than ever. To better understand the selection and use of materials, tests were carried out to evaluate how different materials respond to the intensified use of various cleaning products and disinfectants, including those applied during fogging, roof cleaning, gutter cleaning, and the addition of substances through drip feeders.*

*The results offer valuable insights into the suitability of materials in combination with various chemicals and support the optimisation of their selection and use.*

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# Material options

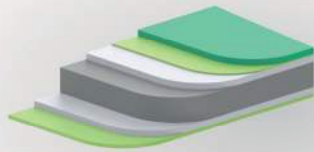
Traditional coatings, such as polyester and polyurethane, are more susceptible to penetration due to their semi-open structure and the presence of solid particles, compared to fully sealed layers such as PVC laminate or a polypropylene layer like Second Skin.

Because of the semi-open structure of traditional coatings, agents can penetrate into the zinc and steel layer, or in some cases, after prolonged exposure, react with the coating itself. This

increases the risk of damage, for example in cases of incorrect use, excessive exposure time, or the use of overly high concentrations of agents. The risk is further increased when rinsing is insufficient.

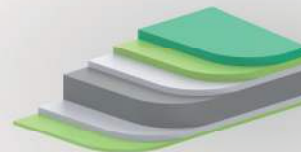
Fully sealed layers, such as PVC laminate or a polypropylene layer like Second Skin, provide a more robust and durable alternative, especially for systems with stringent cleaning and hygiene requirements.

## Polyester



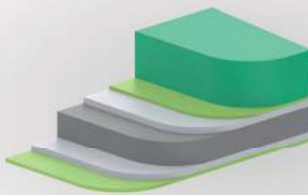
■ Polyester coating (20  $\mu$ m) ■ Primer (5  $\mu$ m)  
■ Zinc ■ Strip steel

## Polyurethane



■ Polyurethane coating (20  $\mu$ m) ■ Primer (15  $\mu$ m)  
■ Zinc ■ Strip steel

## PVC



■ PVC film (150  $\mu$ m) ■ Adhesion / primer  
■ Zinc ■ Strip steel

## Second Skin



■ Polypropylene film (600  $\mu$ m)

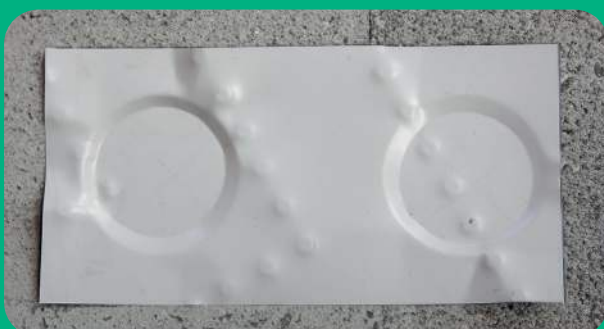
# Methodology

Samples of the various materials were exposed to a range of cleaning products and disinfectants. The tests were conducted under realistic conditions, including deliberate deformation and scratching of the samples.

During testing, the concentration of the products varied: both the manufacturer's recommended concentration and a higher concentration (2.5 times higher) were tested. The exposure time was

also varied: the recommended duration (20 minutes), twice that duration (40 minutes), and complete evaporation of the product, simulating the absence of rinsing.

Each test consisted of at least five exposure cycles. Samples were examined under a microscope for signs of blistering, discolouration, coating delamination or other forms of degradation.



# Test results

The research results clearly show that the different materials respond differently to the cleaning agents tested. Especially with porous coatings, such as polyester and polyurethane, prolonged exposure without rinsing leads to an increased risk of damage.

Scratched and deformed surfaces are the first to show signs of deterioration. In contrast, PVC-laminated steel and Second Skin proved to be almost completely resistant to all tested

agents. To prevent damage to porous coatings, it is crucial to always rinse thoroughly and to strictly include this step in the cleaning protocol.

Non-volatile agents that are not rinsed off will continue to act permanently. Especially under the substrate mat blistering and delamination can occur. In addition, it is advised to avoid certain agents. The table below provides an overview of the agents tested by Metazet and their active ingredients.

	Polyester		Polyurethane		PVC		Second Skin	
	Rinsing	No rinsing	Rinsing	No rinsing	Rinsing	No rinsing	Rinsing	No rinsing
<b>Ammonia</b> <i>(ammonia)</i>	✓	✗	✓	✓	✓	✓	✓	✓
<b>Ammonium phosphate</b> <i>(ammonium phosphate)</i>	✓	✓	✓	✓	✓	✓	✓	✓
<b>Acetic acid</b> <i>(acetic acid)</i>	✓	✗	✓	✗	✓	✓	✓	✓
<b>Chlorine bleach</b> <i>(sodium hypochlorite)</i>	✓	✗	✓	✗	✓	✗	✓	✓
<b>Citric acid</b> <i>(citric acid)</i>	✓	✗	✓	✗	✓	✓	✓	✓
<b>EcoForte</b> <i>(hydrochloric acid, ammoniumbifluoride)</i>	✗	✗	✗	✗	✓	✓	✓	✓
<b>FerSol</b> <i>(potassiumhydroxide, potassium ferrate)</i>	✗	✗	✓	✗	✓	✓	✓	✓
<b>FloorClean 10</b> <i>(glycoethers)</i>	✓	✓	✓	✓	✓	✓	✓	✓
<b>FoamCalc</b> <i>(phosphoric acid)</i>	✗	✗	✓	✗	✓	✓	✓	✓
<b>FoamOrg</b> <i>(potassiumhydroxide, sodiumhydroxide)</i>	✓	✗	✓	✓	✓	✓	✓	✓
<b>Formaldehyde</b> <i>(formaldehyde)</i>	✓	✗	✓	✗	✓	✓	✓	✓
<b>GA Clean</b> <i>(sulfuric acid, ammoniumbifluoride)</i>	✗	✗	✗	✗	✓	✓	✓	✓
<b>Glutaraldehyde</b> <i>(glutaraldehyde)</i>	✓	✓	✓	✓	✓	✓	✓	✓
<b>GreenEx</b> <i>(ammoniumchloride)</i>	✓	✓	✓	✓	✓	✓	✓	✓
<b>Hyperclean X</b> <i>(sodiumhypochlorite)</i>	✓	✗	✓	✗	✓	✓	✓	✓
<b>Intra Multi-Des GA</b> <i>(glutaraldehyde, ammoniumchloride)</i>	✓	✗	✓	✓	✓	✓	✓	✓
<b>Jet 5</b> <i>(hydrogen peroxide, acetic acid, peracetic acid)</i>	✓	✗	✓	✗	✓	✓	✓	✓
<b>Machine descaler</b> <i>(phosphoric acid)</i>	✗	✗	✗	✗	✓	✓	✓	✓

✓ Safe to use ✗ Not safe to use

List continues on the next page >>

	Polyester		Polyurethane		PVC		Second Skin	
	Rinsing	No rinsing	Rinsing	No rinsing	Rinsing	No rinsing	Rinsing	No rinsing
<b>Menno Fadex H+</b> (formic acid)	✗	✗	✗	✗	✓	✓	✓	✓
<b>Menno Florades</b> (benzenic acid, formic acid)	✓	✓	✓	✓	✓	✓	✓	✓
<b>Menno Hortisept</b> (sodiumhydroxide, sodiumsulfate)	✓	✓	✓	✓	✓	✓	✓	✓
<b>Menno Ter Forte</b> (ammoniumchloride)	✓	✓	✓	✓	✓	✓	✓	✓
<b>Mosskade</b> (formic acid)	✓	✗	✓	✗	✓	✓	✓	✓
<b>Sodium hydroxide</b> (sodium hydroxide)	✓	✗	✓	✗	✓	✓	✓	✓
<b>Oxalic acid</b> (oxalic acid)	✗	✗	✗	✗	✓	✓	✓	✓
<b>Oxiline-50</b> (hydrogen peroxide)	✗	✗	✗	✗	✓	✓	✓	✓
<b>Syn-formaline</b> (formaldehyde)	✓	✓	✓	✓	✓	✓	✓	✓
<b>Virkon S</b> (potassium peroxymonosulfate)	✓	✗	✓	✓	✓	✓	✓	✓
<b>Water</b> (water)	✓	✓	✓	✓	✓	✓	✓	✓
<b>Hydrogen peroxide</b> (hydrogen peroxide)	✗	✗	✗	✗	✓	✓	✓	✓
<b>Sulfuric acid</b> (sulfuric acid)	✗	✗	✗	✗	✓	✓	✓	✓

✓ Safe to use   ✗ Not safe to use

### Disclaimer

These tests were conducted using individual cleaning products and disinfectants under controlled test conditions. No consideration was given to the effects of product combinations or to the influence of external factors, such as

temperature and UV. The results offer an indication of the chemical resistance of the coatings tested, but may differ from real-world conditions in cultivation environments.

## Contact

If you have any questions or require further advice regarding our test results or cleaning practices, please do not hesitate to contact Metazet. We would be happy to provide detailed test reports for each product and offer expert

guidance on the most suitable solutions tailored to your specific needs.

## Supporting your Growth.

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