



Where Science Meets Mould

Webinar Notes

Hello everyone, thank you for joining us on this webinar to discuss this topic “Where science meets Mould” . The true ability of chemical solutions to kill and remove mould continues to be a widely debated subject.



Whilst there has been massive resources apportioned to the study of disinfectant efficacy in eliminating bacteria, viruses and bacterial spores, there has been relatively little conducted on mould. Furthermore, a significant portion of mouldicide testing done does not reflect the real-life factors involved in mould remediation on in-situ construction materials.

This is a contributing factor to the many false, misleading and simply ignorant statements made regarding the removal of mould infestations.

Actichem has invested significant resources with two NATA accredited laboratories to test the efficacy of several chemical solutions to kill mould.

Today's discussion will focus on the pertinent points relating to mould elimination, mouldicide performance testing and the compelling data from mouldicide testwork performed by NATA accredited laboratories

The result is a very enlightening picture which certainly lifts the lid on the truth of killing mould with chemicals.

What we'll discuss.



Where science meets mould

Mould (kingdom – fungi), it's thousands of species, it's implication on health and it's sensitivity to deactivation has received comparatively little resource and interest from the microbiology and health sector compared to bacteria and viruses.

- Microorganisms – an overview
- Kill Rates – understanding log reduction & percent kill
- Disinfectant efficacy testing
- Mouldicide performance of common chemicals
- Mouldicide performance of Actichem solutions

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What we'll discuss

To get us all on the same page, we'll start with a couple of key background concepts. Without which we won't understand the final discussion on whether or not chemicals make an effective mould removal strategy.

We'll start with a brief overview of Microorganisms to see where mould fits in relation to bacteria, viruses, etc. Then we'll discuss how kill rates are expressed and the significance of them.

Next is a very interesting look at how the ability of disinfectants is tested.

And finally the very enlightening results of the lab testwork conducted on a selection of chemical agents including vinegar, chlorine, hydrogen peroxide along with the Actichem mould remediation and removal chemistries.


An overview of microorganisms.

Microorganisms

Microorganisms, pathogens or simply "germs" are the microscopic cells or colony of cells which cause disease. They are not the disease itself but the microbe which causes the disease in a living being.

Microorganisms are divided into the following groups;

Type of Microorganisms	Microorganism
Prions	Creutzfeldt-Jakob Disease
Bacterial Spores	Bacillus atrophaeus
Mycobacteria	Tuberculosis
Unenveloped/Non-Lipid Viruses	Polio, Parvo virus
Fungi (Yeasts & Mould)	Aspergillus, Penicillium
Vegetative bacteria	E.Coli, P.Aeruginosa, Staph
Enveloped Virus/Lipid Viruses	SARS Coronavirus, HIV, Flu H1N1


 Most resistant
 Least resistant

Microorganisms

Microorganisms, pathogens or simply "germs" are the microscopic cells or colony of cells which cause disease. They are not the disease itself but the microbe which causes the disease in a living being.

The organisms are listed in order of their resistance to being destroyed by the 3 key inactivation factors – namely heat, UV and chemical disinfectant. Enveloped viruses are the most susceptible to inactivation whilst bacterial spores and prions are the least susceptible.

Commercial Grade Disinfectants are required to kill Vegetative Bacteria to 99.99%, which by definition would also be effective on enveloped viruses although testwork must be performed if this is claimed.

Hospital Grade Disinfectants are required to eliminate Vegetative Bacteria to 99,999%, however both suspension testing and hard surface testing is required. They would also be effective on enveloped viruses although testwork must be performed if this is claimed. Hospital Grade Disinfectants are often effective on yeasts and some moulds. However, it is not a guarantee that they will kill all mould types.

Mouldicides – as you will note, a true mouldicide needs to be a very effective disinfectant and in reality, often stronger than an average hospital grade disinfectant.

Log Rate	Percent reduction	Microorganisms remaining*
1-log	90%	1,000,000
2-log	99%	100,000
3-log	99.9%	10,000
4-log	99.99%	1,000
5-log	99.999%	100
6-log	99.9999%	10
7-log	99.99999%	1

* Microorganisms remaining from a starting quantity of 10,000,000

Understanding log reduction.



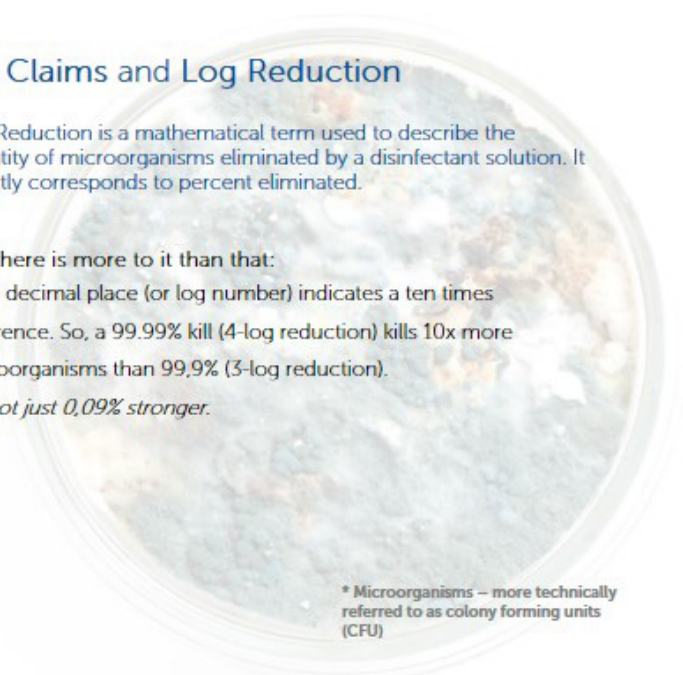
Kill Claims and Log Reduction

Log Reduction is a mathematical term used to describe the quantity of microorganisms eliminated by a disinfectant solution. It directly corresponds to percent eliminated.

But there is more to it than that:

Each decimal place (or log number) indicates a ten times difference. So, a 99.99% kill (4-log reduction) kills 10x more microorganisms than 99.9% (3-log reduction).

It's not just 0.09% stronger.



* Microorganisms – more technically referred to as colony forming units (CFU)

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Kill Claims and Log Reduction

Log reduction is a mathematical term used to describe the quantity of microorganisms eliminated by a disinfectant solution. It directly corresponds to percent eliminated. However, each decimal place (or log number) indicates a ten-times difference. Therefore, a 99.99% kill (4-log reduction) kills 10x more microorganisms than 99.9% (3-log reduction.)

The amount to note is the number of microorganisms remaining. 99.99% sounds like a lot of microorganisms eliminated however assuming there was originally 1,000,000 organisms there is still 1,000 remaining, and these are the ones that are the most difficult to kill.

Some prefer to use the log reduction terminology of discussing it because it does give a more realistic sense of the strength of that disinfectant.

Test Methods

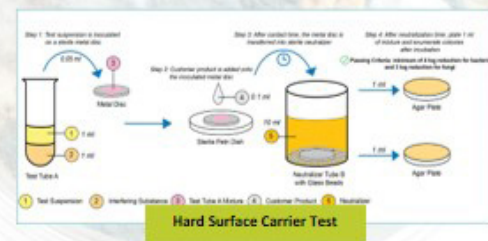
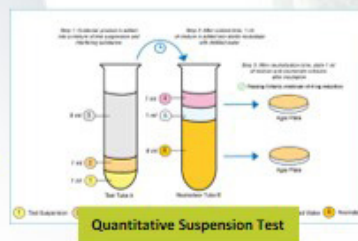
There are two principal methods of testing the ability of disinfectants to deactivate /kill microorganisms including mould.

1. Quantitative Suspension test
2. Hard Surface Carrier Test

Test Method variables

- Clean or Dirty
- Dwell Time

An overview
of test methods.



Test Methods – Disinfectant Efficacy Test

There are two principal types of testing used by NATA Accredited laboratories to evaluate the efficacy of disinfectants to neutralize a microorganism.

The base line test is the **Quantitative Suspension Test** and simply establishes if the disinfectant is effective against the target organism. The target microorganism is literally suspended in the disinfectant solution and is not a realistic reflection of hard surface disinfection in practice. Many kill claims quoted in disinfectant marketing literature is the data from suspension testing.

The **Hard Surface Carrier Test** is a tougher disinfectant challenge test and reflects the disinfectant's ability to neutralise a target microorganism when inoculated on a hard surface. This test more closely reflects real-life conditions.

Each test type is subjected to further variables to closer mimic real-life conditions.

The first key variable is whether the test is subjected to interfering material. This is referred to as a "clean test" or "dirty test." According to TGA guidelines, if the clean test is used, the label directions must state that the surface be precleaned. The dirty test replicates what would happen if there is dirt on the surface to be cleaned, this is more relevant to real life situation as there is always dirt on the surfaces when you are removing the mould.

The second variable is the dwell time used for the test. Obviously the longer the dwell time the more microorganisms will be destroyed.

When assessing the disinfecting performance of a solution all these factors must be evaluated in conjunction with the kill rates.

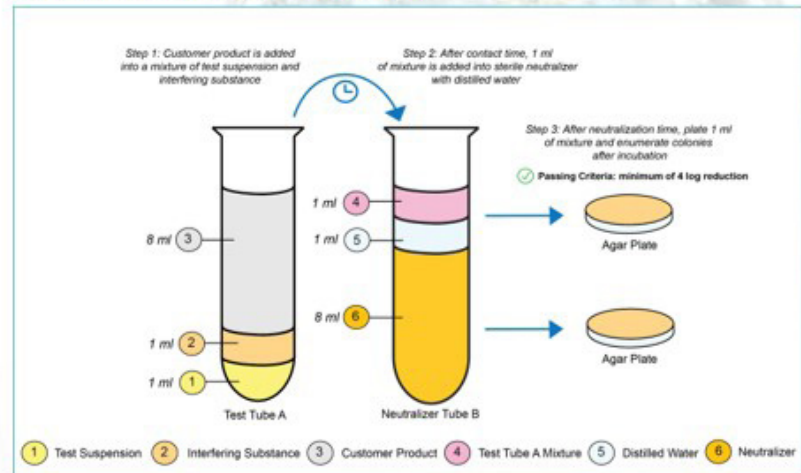
Understand the Key Variables

Clean / Dirty Test
Dwell Time

An overview of test methods.

Test Methods – Quantitative Suspension Test

Quantitative Suspension Tests for Disinfectants, measure the effectiveness of a disinfectant solution to inactivate a microorganism by suspending the target microorganism in the disinfectant solution.



Picture credits to Tecolab Global

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Quantitative Suspensions Tests

The Quantitative Suspensions Test for disinfectants measures the effectiveness of a disinfectant solution to inactivate a microorganism by suspending the target microorganisms in the disinfectant solution.

Used for initial testing to assess in principle whether the subject disinfectant will in fact be effective in killing a particular microorganism. It make very little provision for replicating real-life conditions.

The suspension test literally takes the microorganism and has it suspended within the disinfectant in the test tube. However, it does not replicate the effectiveness of the disinfectant against a microorganism on a hard surface.

Understand the Key Variables

Clean / Dirty Test
Dwell Time
Agitation

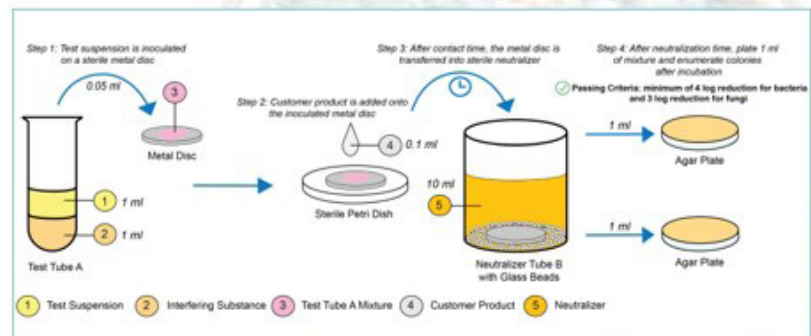
An overview of test methods.



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Test Methods – Carrier Test

Carrier Tests for Disinfectants, measure the effectiveness of a disinfectant solution to inactivate a microorganism on a hard surface and most closely simulates practical conditions of application.



Picture credits to Fercolab Global

Hard Surface Carrier Test

The Hard Surface Carrier Test is a significantly tougher test protocol than the Suspension Test. It is used for “critical application” disinfectants such as the Hospital Grade Disinfectant class and is designed to replicate the application of disinfectants in real-life circumstances.

A hard surface, namely a stainless steel disc is inoculated with the microorganism. The subject disinfectant is applied to this inoculated disc and provided the required dwell time. The applied disinfectant is then deactivated and the remaining spores are attempted to be reactivated to enable calculation on how effective that disinfectant process has been. This test allows for agitation as an option.

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* Microorganisms remaining from a starting quantity of 10,000,000

The efficacy of disinfectants.



Mould Kill Efficacy of Chemical Solutions

	EN1650 Suspension Test
White Vinegar	<3.3 log Aspergillus.Br <3.3 log Penicillium.Ch
Hydrogen Peroxide 8%	<3.3 log Aspergillus.Br <3.3 log Penicillium.Ch
Chlorine 6%	>4.4 log Aspergillus.Br >4.4 log Penicillium.Ch

Dwell Time – 10min
Conditions - dirty

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Mould Kill Efficacy of Chemical Solutions

Actichem had three chemicals tested by two NATA accredited bio-laboratories. These were white vinegar, hydrogen peroxide 8% and chlorine 6%. The parameters for all the testwork was a dwell time of 10 minutes and dirty conditions.

EN1650 Suspension Test Results

All three chemical show the required pass log reduction rate of 3 log. With chlorine exhibiting a superior >4log reduction

EN13697 Carrier Test Results

The test results for all three chemicals are significantly reduced on the tougher Hard Surface Carrier test.

This “real-life” test exposes the weakness of these chemicals use in their “raw material’ state. Whilst vinegar has relatively good wetting propensity, it’s mouldicide performance is relatively weak compared to other biocides and is not highly effective on killing mould in real life application

Hydrogen Peroxide and Chlorine have stronger mould kill properties but are limited in their effectiveness on hard surfaces due to their high surface tension and relative stability in their supplied form.

It is also worthwhile to note that white vinegar is only effective on approximately 82% of mould types with a notable gap in the aspergillus species. Given that aspergillus is a low moisture mould type, many non-flood mould infestations are dominated by aspergillus species. A DIYer using vinegar may only remove 20-30% of the mould in their dwelling where aspergillus is dominant.

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The efficacy of disinfectants.



Mould Kill Efficacy of Chemical Solutions

	EN1650 Suspension Test	EN13697 Carrier Test
White Vinegar	<3.3 log Aspergillus.Br <3.3 log Penicillium.Ch	1.3 log Aspergillus.Br 2.1 log Penicillium.Ch
Hydrogen Peroxide 8%	<3.3 log Aspergillus.Br <3.3 log Penicillium.Ch	2.1 log Aspergillus.Br <1.4 log Penicillium.Ch
Chlorine 6%	>4.4 log Aspergillus.Br >4.4 log Penicillium.Ch	3.0 log Aspergillus.Br 2.1 log Penicillium.Ch
Actichem AP610 Percide	>5.1 log Aspergillus.Br >5.1 log Penicillium.Ch	3.1 log Aspergillus.Br >5.1 log Penicillium.Ch
Actichem AP610 Percide + Boost	>5.1 log Aspergillus.Br >5.4 log Penicillium.Ch	>6.3 log Aspergillus.Br 6.02 log Penicillium.Ch
Actichem AP726 Mould Exterminator	>4.9 log Aspergillus.Br >4.9 log Penicillium.Ch	>5.05 log Aspergillus.Br 3.0 log Penicillium.Ch

Dwell Time – 10min
Conditions - dirty

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Mould Kill Efficacy of Actichem Solutions

Alongside vinegar, hydrogen peroxide and chlorine, Actichem also tested the three key chemistries used in mould remediation. These are Actichem Percide, the Actichem Percide + Boost and the Actichem Mould Exterminator. Of note here is that Percide contains 8% hydrogen peroxide and Mould Exterminator contains 6% chlorine which gives a direct comparison to the “unformulated versions” of these chemicals.

All three products provide outstanding kill efficacy on both mould types in both test types, proving their efficacy in real-life mould remediation applications.

Actichem Percide – when used on it’s own exhibits remarkable kill rates and explains it’s high regard in the industry. It’s potentiated hydrogen peroxide formula enhanced by super wetting agents draws a stark contrast to the base 8% strength solution.

Actichem Percide + Boost – provides unbeatable mould kill performance whichever way you look at it. It is recommended for use on severe mould infestations and in situations where there is a high volume of organic soiling. Whilst carrying across all the attributes of Percide, the addition of the Percide Boost potentiates the hydrogen peroxide creating potent hydroxyl ions. Performance is further boosted by a secondary biocide and wetting agents. The result is an unbeatable solution which is stable for over 8 hours, provides over 6 log reduction and even beats formulated chlorine products. Even on porous surfaces, this solution provides a total kill including the roots embedded in micro substrate pores.

Mould Exterminator – is chlorine based and exhibits excellent mouldicide action. It demonstrates how much additional efficacy can be gained from chlorine in this unique formulation. In addition to the inclusion of super wetting agents, the Mould Exterminator boosts the chlorine performance with a powerful activator blend which is triggered by the organic nature of the mould.



In summary:

Chemical biocides can be very effective at killing moulds; however, you have to be selective in what you use.

Raw chemicals are seldom effective.

And because the mould stain is gone, it doesn't mean that the mould roots and spores have been killed.

Please see the answers to the questions following this session.

1) Do I need to rinse after using Percide, Mould Exterminator or Biosan II?

Percide and Biosan II don't require rinsing due to the chemical residue, however rinsing is always recommended wherever possible to remove the dead mould particles and spores. This dead mould residue and accompanying soiling can contribute to respiratory irritation. There are some situations where access is limited such as crawl spaces, roof cavities and rinsing may not be possible. Some of these surfaces may be able to be HEPA Vacuumed. Certainly in internal and inhabited spaces, treated surfaces must be rinsed or HEPA vacuumed. Smooth surfaces can be wiped clean with a damp cloth or sponge. Porous and textured surfaces are better rinsed with water followed by speed drying.

2) Can you use Percide and Mould Exterminator?

Assuming the question is asking if you can mix them together – No, Percide and Mould Exterminator are two completely different types of Oxidising agents and would work against each other if mixed together or used together on the same surface. Worse than that they would react violently and release toxic gases.

Many restoration businesses use both products in their operations. Mould Exterminator, being a potentiated chlorinated mouldicide is best for exterior use and uninhabited dwellings while the hydrogen peroxide powered Percide is ideal for interior and sensitive surface applications.

3) We often hear the statement that mould cannot be killed, is that the correct term that mould is removed not killed?

Mould can be both killed and removed by select chemical agents, but it depends on the situational requirements. It is a well-researched and documented fact that several biocides are effective at killing the mould microorganism. The suggestion that mould cannot be killed but only "bleached" or "removed", possibly has its origins in the limitations in real-life application of the two oxidisers (chlorine and hydrogen peroxide) used in mould removal. These limitations are mainly due to their poor wetting ability. This means that they do not effectively penetrate the body of the mould mass nor do they penetrate into the small substrate pores inhabited by the mould roots. So, chlorine and hydrogen peroxide when used in their raw material form do not kill mould effectively in real-life situations. However, when formulated to overcome surface tension limitations, etc, they can achieve very good mould kill rates.

4) When using any of the products, especially ULV fogging, is there any surface that could be impacted causing say rust or plastic or rubber material to break down.

Of course, any surface which is not water-washable should be covered or removed. For example electronics, paperwork, etc.

Biosan diluted 30-64ml/Lt is safe in all ULV fogging applications.

Percide mixed with Boost in a ratio of 1:50 (980ml Percide : 20ml Boost), is also safe in all ULV fogging applications.

Mould Exterminator is not suitable for ULV fogging.

Also, note that some ageing or water-based paints may be affected by the Percide or Biosan solutions. Unpainted ferrous metals may rust simply due to the addition of moisture into the atmosphere.

5) Best way to rinse.

For all smooth surfaces, the best way to rinse is to use a clean damp cloth or sponge. Uninhabited spaces / rough surfaces can be water rinsed. Speed drying however must be promoted. Rinsing techniques will largely be dictated by the situation and adjoining surface types.

6) Can you please expatiate on the hazardous effects of Chlorine compared to Percide plus Boost?

Both are oxidising agents and need to be treated with caution. Chlorine, whilst giving excellent stain removal and mouldicide performance is a corrosive chemical and can emit hazardous fumes. Hence it is recommended that chlorine based mouldicides are used in uninhabited or outdoor environments and with correct PPE. The Percide is hydrogen peroxide based and has a significantly more favourable hazard profile. It does not emit any toxic vapours and is an irritant rather than causing burns. When combined with the Percide Boost, the hazard profile doesn't alter.

7) Mould Exterminator verse Hypo Enforcer log reduction.

The Hypo Enforcer is designed for use with 12,5% chlorine strength Sodium Hypochlorite (liquid Chlorine / Pool Chlorine). This makes it more than twice the strength of Mould Exterminator. Whilst we haven't had this mixture lab tested against mould microorganisms it would be expected to achieve an even higher log reduction than Mould Exterminator.

8) When using Percide we find that paint bubbles, is there a way in which this can be avoided.

This can occur on some water-based paints which are either old or compromised from the mould itself, previous cleaning methods or environmental conditions. To avoid this, reduce dwell time to 10 minutes or you can also use Percide diluted 1:1 with clean water and do two washes.

9) What product should be used to rinse a ceiling after cleaning with Percide?

Well, the end goal is to effectively remove the dead mould and Percide solution. So, there would be many correct methods. Wiping, sponging or spraying with clean water is acceptable but keep focused on minimising residual moisture. It is a somewhat situation-dependent consideration. Also, consider allowing the Percide solution to dry completely and HEPA vacuum it.

10) When treating surface moulds when there is no insulation on ceiling. Ten minutes dwell time will dry all Percide. Would that be okay to clean and rinse after?

Assuming this is in the ceiling cavity – yes, 10 minutes is fine to then follow with a clean. However, if there is significant dust, dirt debris then this first Percide application should be treated as a “knock-down” treatment. Once the surface is cleaned a follow-up Percide treatment should be performed.

11) Is HEPA vacuum needed prior? And after? I'm refer HEPA sandwich treatment

In principle a HEPA sandwich treatment (HEPA vacuum at the start and a HEPA vacuum at the end) will always give the best results. However not all situations may require it. Where soil/mould loading is high, removing as much as possible of this mould material and entrapped dirt whilst dry will make the mouldicide treatment much more effective. Where a HEPA vacuum has been initially done, Percide can be applied and left to dry and then followed with a HEPA vacuum treatment.

12) Having told clients severally that mould is usually on ceiling or wall surface. Some clients still ask about mould in cavities. What advice can be given to put their minds at rest?

It's difficult to give a single answer on this because depending on the moisture source and the air flow characteristics in the building the mould could be restricted to the "seen" walls and ceiling but may also in fact be found in the cavities.

13) Would it be right to say that using Percide+Boost on all cleans will give best results?

Yes absolutely. Whilst Percide in fact produces amazing results on it's own, the addition of the Percide Boost not only further activates the oxidising power of the Percide but also includes a secondary biocide. It also introduces powerful cleaning activity which is a great advantage as dirt and grime is often trapped within the mould mass.

However, on many light to medium mould infestations and also painted or low porous surfaces, the Percide alone makes an easy solution. It also has the advantage that it's not obligatory to rinse with clean water on painted or low porous surfaces.

14) Are we able to remove mould from gyprock using either of the products?

Mould can be effectively removed from painted gyprock using Percide (or Mould Exterminator). Where the paint has been broken through and the mould is growing on the paper lining of the plasterboard it is difficult to guarantee a complete mould kill. The mould will use the paper lining itself as a food source. For many mould infestations the mould roots can go right through to the inner gypsum plaster and the board will need to be discarded.

15) Is it ok to use Biosan II use as fogging solution?

Yes, Biosan II diluted 30-64ml/Lt makes a good ULV fogging solution.

16) Natural treatments including Thymol and other oils, what are your views on these? Cheers

Thymol shows good mouldicide performance and can be invaluable in circumstances involving delicate materials or sensitive individuals. The recently introduced Actichem Thymox is a superior thymol based product with an impressive array of credits. However, the performance of Actichem Percide still provides quicker and more dependable results in mould remediation work across the whole spectre of applications.

17) Is there any adverse effects on sprayer seals (O rings), as some tend to wear out over a short period while using Percide+Boost?

Whilst Percide + Boost is not a corrosive solution as such, damage to rubber seals can occur especially if the solution is allowed to dry on them. As with ULV foggers, significantly increased lifespan of all equipment components can be realised by rinsing with clean water at the end of each job. Do not store chemical solution in the sprayers if possible. It is also worthwhile to explore the chemical resistance of the different seal material types.

18) What is the ideal product for treating timber frames where replacement is not an option. When the staining remains is there any product where encapsulation is within acceptable practices

Timber frames can be very effectively treated using Percide + Boost or Mould Exterminator (strip-outs only). Whilst killing the mould organism on timber frames can be achieved successfully sometimes the staining is a challenge to remove as mentioned. Mould Exterminator provides superior stain removal. Agitation (even briefly) can significantly increase stain removal with both Percide + Boost and Mould Exterminator. Using an encapsulating paint is certainly an option to overcome severe staining issues.



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