

# Creating Covid-proof Interior Air Quality

Indoor air quality in workplace  
and public transport during  
the pandemic



Genano



## Panelists:

- Panu Wilska – CEO / Cleamix
- Niklas Skogster – CEO / Genano
- Dr. Satu Salo – Principal Scientist - Specialist in microbiology (VTT)
- Dr. Ilpo Kulmala – Senior Scientist – Specialist in ventilation (VTT)
- Juhani Tulkki – Sr. Technology Director / Genano
- Janne Kuusela – M.Sc., doctor, infection specialist / ESSOTE



## Our Service based Concepts for Clean Air cover the following areas



## Product portfolio

- Stand alone purifiers
- Industrial purifiers
- VOC plants
- Sensors & Monitoring software

**Cleamix is a new revolutionary Vaporised Hydrogen Peroxide solution for the decontamination of logistics facilities, transport vehicles & containers, sterile disposable equipment, hospitals, and packaging materials.**



## Clean Air Strategy is 3-fold:

- Cleaning and Hygiene as process and attitude
  - Reduces overall risk
  - Use of common sense
  - *Continuous Process*
- Effective Air Filtering & Decontamination
  - Reduces amount of particles & microbes in the air
  - *Continuous Process*
- Periodical or need-based deep Decontamination
  - Eliminates microbes and chemical substances from air and surfaces
  - Eliminates microbial growth on surfaces and reduces microbial emissions
  - *Scheduled process*



# **AIR FILTERING & PURIFICATION – MANY DIFFERENT APPROACHES**

## **Not everything can be called Decontamination!**

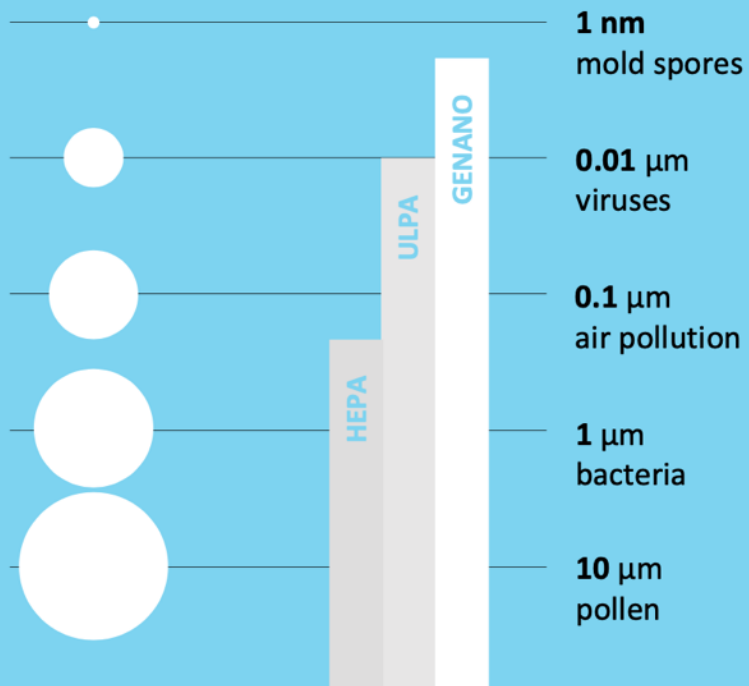
### **Indoor air quality aspects:**

- Particles & Dust of various origins
  - Industrial particles
  - Dust
- Microbes
  - Bacteria
  - Viruses
  - Spores
- VOC (Volatile Organic Compounds)
- Chemical emissions, Odour and Smell
- Humidity
- Air pressure differences

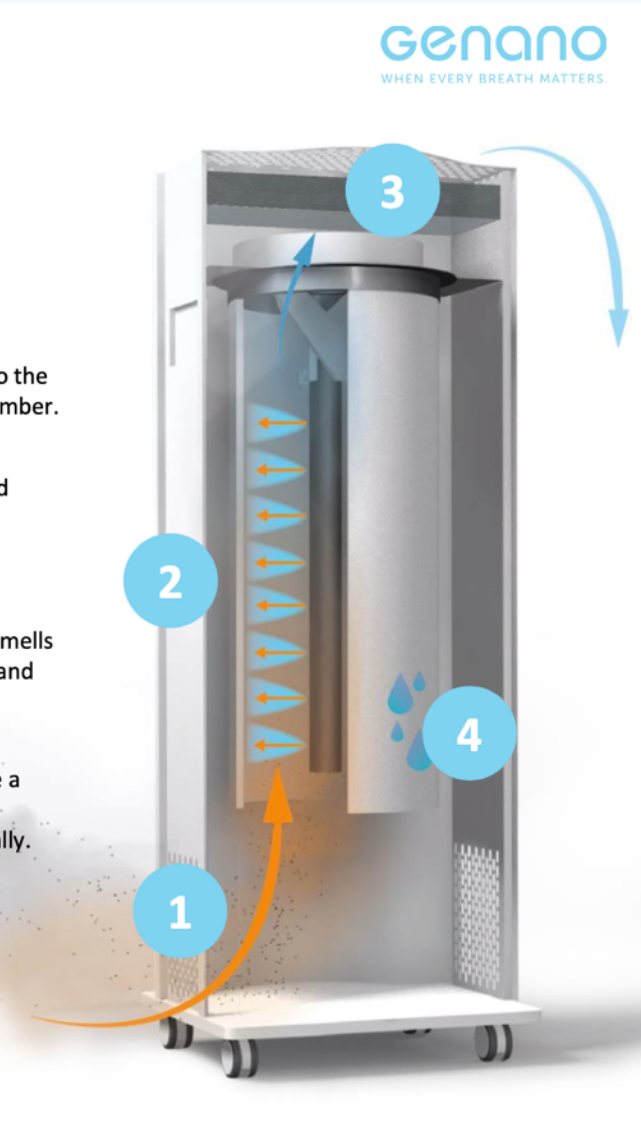
### **Indoor air purification methods:**

- UV – Light
- HEPA – filters
- Carbon filters
- Electrostatic filters
- NTP (Non-Thermal-Plasma)
- Full site decontamination
- Combination Devices & Solutions

## Genano has the capacity to remove nanoparticles



- 1 Dirty air is sucked in to the purifiers collector chamber.
- 2 Ionized electricity field cleans the ultrafine particles.
- 3 Active carbon filter removes unpleasant smells and dangerous gases and VOCs.
- 4 Air purifier stops once a week to clean the impurities automatically.



## Cleamix Decontamination:

- Cleamix was founded in 2016 after invention of new, effective and mobile method for generating vaporized hydrogen peroxide
  - 20 times more VHP gas for same weight and volume of any device in the market
  - 80% reduction in need for HP liquid
- Located in Kuopio region in Finland, Activities and partners in 15 countries
- Close co-operation with Finnish Military R&D center as well as Technical Research Centre of Finland
- Certified supplier for NATO
- Only solution in the market with ability to operate in most ambient conditions without risk of condensation
  - Vaisala sensor-suite allows real-time process control

### Why H<sub>2</sub>O<sub>2</sub> for Bio-Decontamination

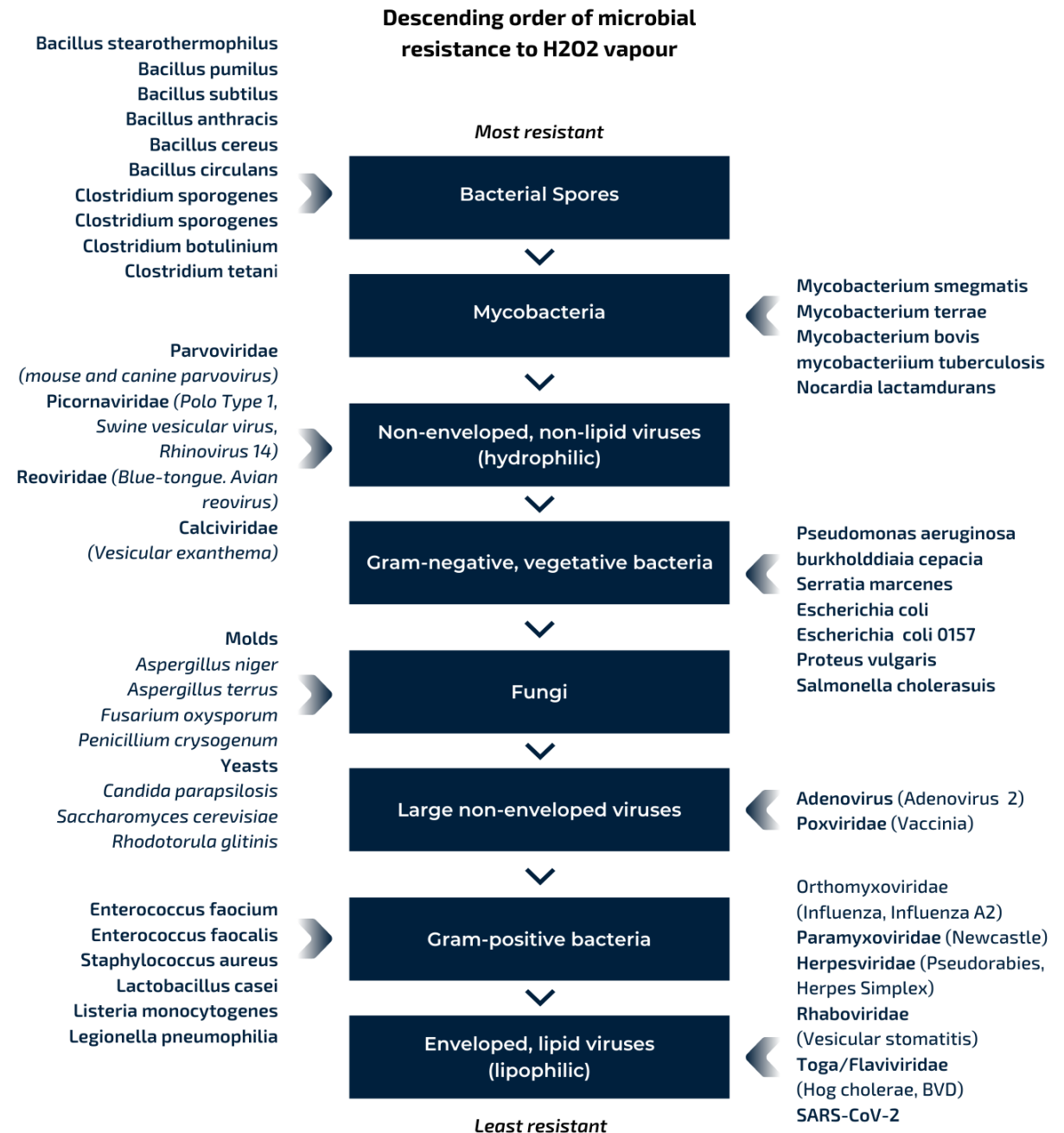


- Easy to use
- Destroys all biological and many chemical contaminants
- Works in low temperature processes
- Processes can be validated
- Compatible with a wide variety of materials
- Environmentally friendly process
- Leaves no harmful residue only water vapor and oxygen



# Vaporised Hydrogen Peroxide is effective against all biological threats, such as:

- SARS-CoV-2
  - [100ppm / 10 minutes kills SARS-CoV-2 from most surface materials]
- SARS
- MERS
- C.Auris
- Anthrax
- Fungi
- Mould
- Super-resistive bacteria
- ... and more



## SARS-CoV-19 is airborne

## SARS-CoV-19 survives on surfaces



- It is widely recognized that SARS-CoV-2 is airborne – WHO & Co. statements
- Speaking and breathing makes the virus spread in aerosols
- Virus stays in the air for hours in aerosols
- Amount of particles and CO2 in the air is in relation to the risk of viruses and COVID to spread
- SARS-CoV-2 is 60-120nm size – Genano eliminates 60-120nm particles

- During normal daytime use, Genano real-time decontamination reduces microbes in the air.
- Viruses survive long time on surfaces.
- Office areas can be deep-decontaminated during off-hours and weekends.
- Decontamination eliminates viruses from air and from all surfaces.
- Cleamix Hydrogen Peroxide gas leaves no residuals or traces and does not harm any surfaces

## Example of positioning in office landscapes



# USE CASE: Public Transport Triangle of methods

## Cleaning and Hygiene:

- Rigorous cleaning
  - Applies to all surfaces
  - Special attention to wet dirt
  - Wiping of everything people may touch
- Use masks! Make it mandatory!
- Avoid crowds and rush hours

## Air

### Decontamination:

- Apply normal filtering of intake air (remove particles)
- Do not use closed circuit AC
- When ever possible and applicable, place efficient air decontamination system at location
- Monitor and take samples to determine risk level and magnitude of actions



## Deep Decontamination:

- Periodical H<sub>2</sub>O<sub>2</sub> gas treatment eliminates ALL biological contamination
- Depending on threat level, perform daily or weekly

# USE CASE: Hospitals

## Cleaning and Hygiene:

- Rigorous cleaning
  - Applies to all surfaces
  - Special attention to wet dirt
  - Wiping of everything people may touch
- Use masks! Make it mandatory!
- Wash Hands!

## Air

### Decontamination:

- Place decontamination devices according to intensity of use
- Special attention to admission areas & waiting rooms
- Monitor and take samples to determine risk level and magnitude of actions



## Deep

### Decontamination:

- Periodical  $H_2O_2$  gas treatment eliminates ALL biological contamination
- Depending on threat level, perform daily or weekly

# USE CASE:

## Shopping malls; very large spaces



### Cleaning and Hygiene:

- Rigorous cleaning
  - Applies to all surfaces
  - Special attention to wet dirt
  - Wiping of everything people may touch
- Use masks! Make it mandatory!
- Wash Hands!

### Air Decontamination:

- Massive air volume is creates challenges
- Best to place decontamination units where crowd density is highest; escalators, elevators, exits and entrances
- The goal is to reduce the amount of microbes in the air and thus reducing risk of spreading infections

### Deep Decontamination:

- Gaseous Decontaminating of very large open areas is not feasible
- Elevators and individual businesses may be treated
- In some cases areas may be sub-divided for the purpose by fire-doors or simply applying sheet plastic to create “decontamination bubbles”. This is naturally done during off-hours

# USE CASE: Cruise ships and ferries

## Cleaning and Hygiene:

- Rigorous cleaning
  - Applies to all surfaces
  - Special attention to wet dirt
  - Wiping of everything people may touch
- Use masks! Make it mandatory!
- Wash Hands!

## Air Decontamination:

- Massive air volumes in common areas reduce efficacy, however ships are typically subdivided by bulkheads and have multiple HVAC zones
- On new ships decontamination can be installed within the HVAC systems. With older ships devices are located at places with highest concentration of people.
- Special attention is paid to air flow directions, applying clean, filtered air to centre of the space and exhausts on sides



## Deep Decontamination:

- Gaseous Decontaminating of largest open areas, such as auditoriums is not feasible, however HVAC systems can be treated easily.
- Enveloped viruses are easiest to kill with  $H_2O_2$
- Cabins are relatively easy and quick to decontaminate
- Generally on ships all areas with volume less than  $3000M^3$  can be treated against Covid-19 within reasonable time and equipment

# FINDINGS FROM CLEAMIX & VTT DECONTAMINATION TESTING

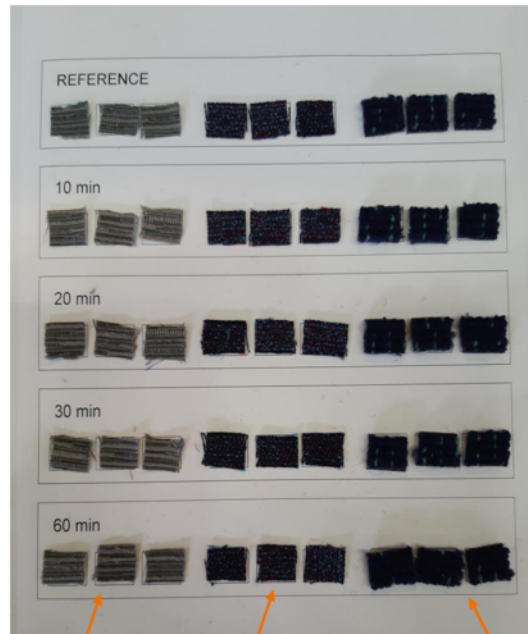
## Material samples

Sample size about 1x2 cm<sup>2</sup>

Three different materials

Three replicates

Time steps 10, 20, 30 and 60 min



Curtain material #1  
"Gray curtain"

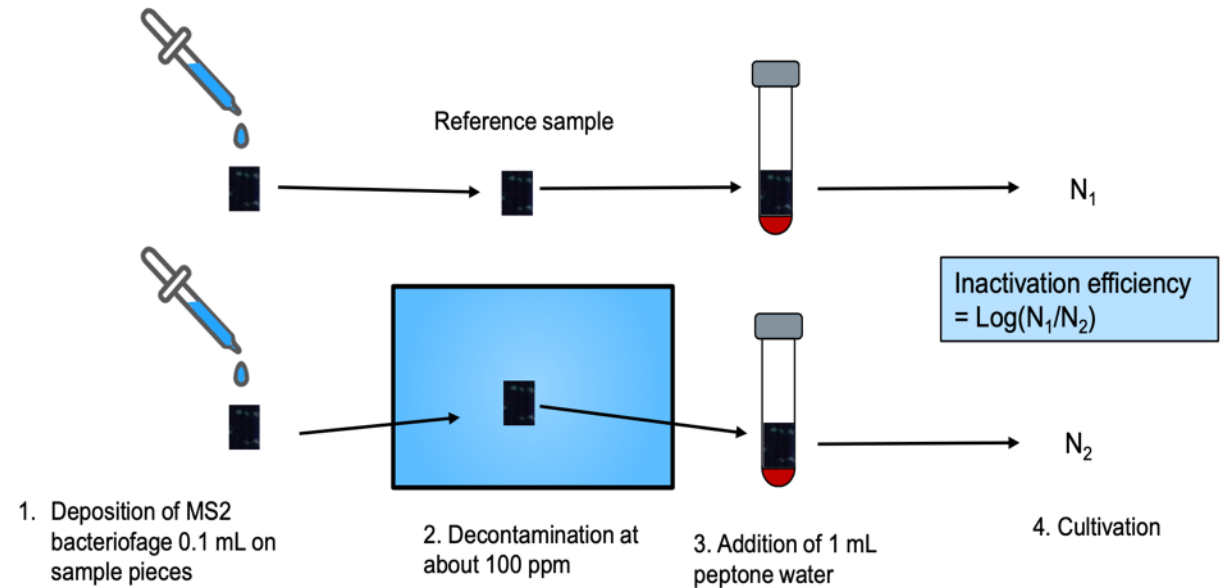
Curtain material #2  
"Blue curtain"

Carpet  
"Blue carpet"

23/10/2020 VTT – beyond the obvious

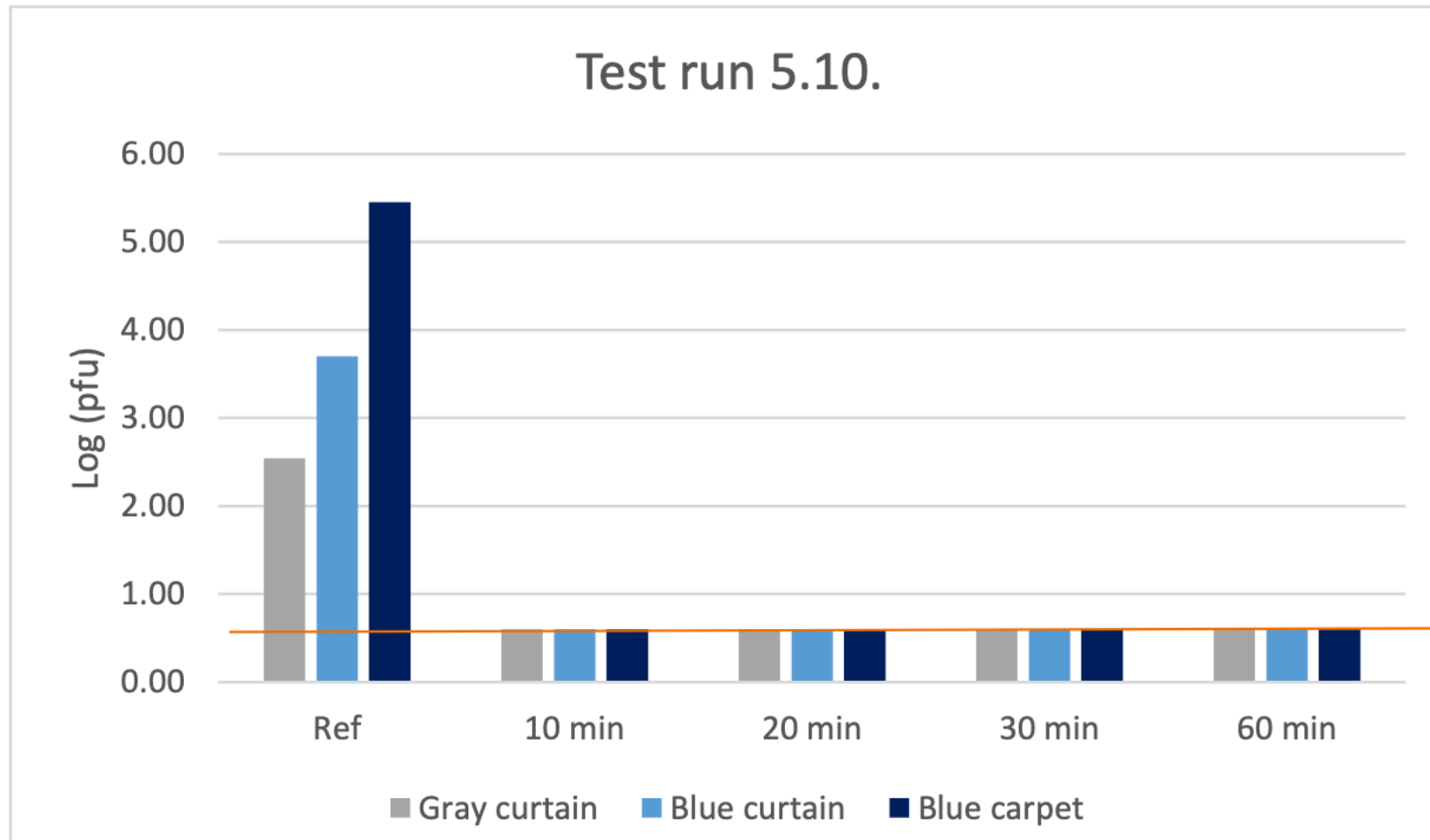
**VTT**

## Determination of inactivation efficiency



**VTT**

# FINDINGS FROM CLEAMIX & VTT DECONTAMINATION TESTING



Average H<sub>2</sub>O<sub>2</sub> conc 102 ppm  
Average temp 22.3 °C  
Average RH 69 %  
Average RS 81 %

Detection limit

## Clean and safe indoor air is a combination of many factors:

- Overall hygiene, cleanliness, and cleaning procedures
- Use of applicable and reasonable personal protection
- Reducing amount of microbes from the air – this also reduces the amount of microbes absorbing or sticking to surfaces
- Based on use case – applying deep decontamination at scheduled intervals and whenever there is an elevated risk of infection
- Your clean air strategy only works if people commit to its success!

## Choose the right portfolio of methods ! :

- Think the big picture – if one key element is missing, the strategy may fail
- Listen to the experts and follow the news on latest technical and medical developments
- If it sounds too good it probably is so, there is no universal single recipe for tackling the pandemic risk
- Once you apply a policy – make sure everyone acts accordingly!
  - Example: Use of masks in public transport and public spaces should be mandatory. As business owner you can require responsible behaviour!

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**Thank You!**