



KSCBRD

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KSCBRD Conference Yeosu

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Cleamix – Revolution in H_2O_2 vapour generation technology

Perfect decontamination solution for:



FACILITIES



TRANSPORT EQUIPMENT



CONTAINERS

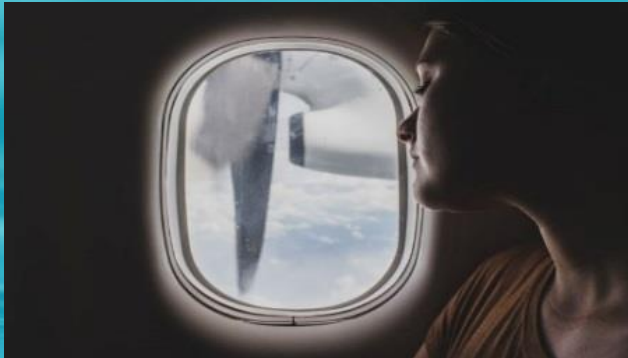


ABOUT CLEAMIX



- 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 machine
 - 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 National Research Centre of Finland
- Certified supplier for NATO
- It all started from Finnish Air Force requirements:
 - An effective method was needed for decontaminating F-18Hornet and BAE Hawk combat aircraft exposed to BC agents
 - Dry HP vapor was evaluated as most effective approach (safe for ALL sensitive electronics and surface materials)
 - No suitable system was found in the market
 - All known vendors had equipment that was too heavy, too low output, too big, consuming too much energy and HP liquid
 - Air Force approached National Research Centre, they approached founders of Cleamix as there was earlier co-op within ozone-based water purification systems

Why H₂O₂ for Bio-Decontamination



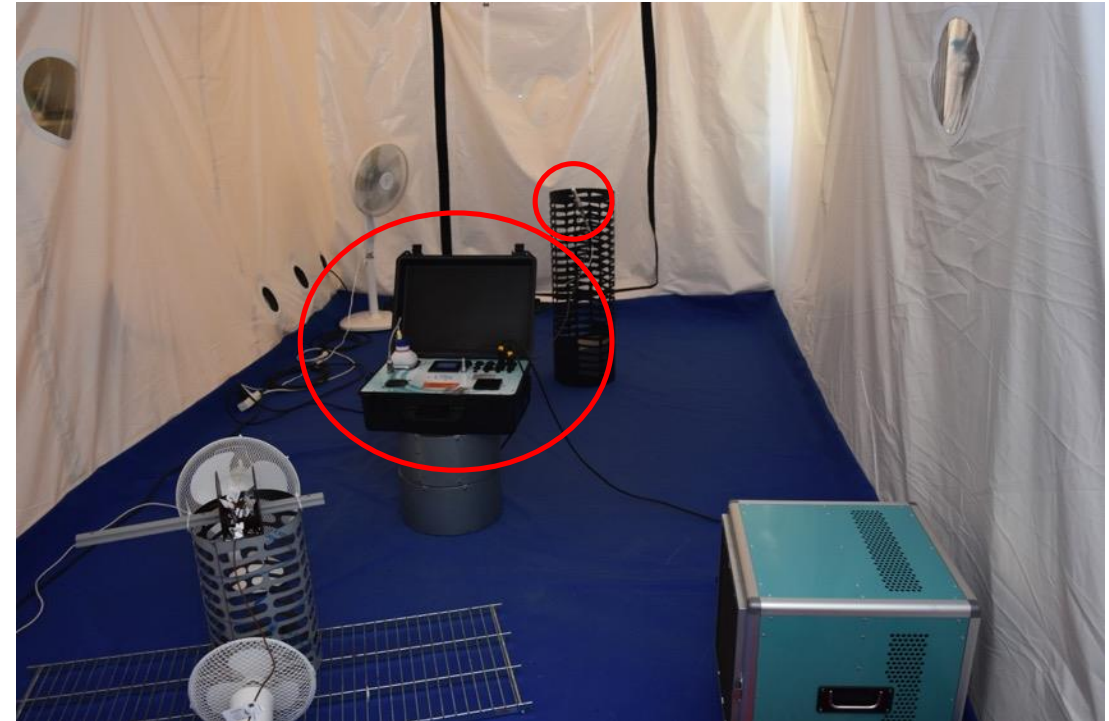
- Easy to use
- Destroys all biological and many chemical contaminants
- Works in low temperature processes
- Processes can be validated
- Compatible with a wide variety of materials
- Environmentally friendly process
- Leaves no real residues
 - only water vapor and oxygen

Cleamix VCS Series: A New Method for Generating Vaporized H₂O₂

- A powerful, portable bio-decontamination unit having the size of a briefcase.
- Performance experiments conducted in 3 different enclosures:

Size of enclosure/ m ³	ppm/H ₂ O ₂ vapor	time/min
10	> 800	15
36	> 600	30
68	> 500	50

- One litre bottle is sufficient for significant decontamination volumes.



VCS-100-CR MOBILE VHP GENERATOR



- Single unit can be used for spaces up to 500M³ (depending on level of contamination, desired VHP ppm concentration and structural materials), real time sensor suite controls output level
- Up to 250 units (50 set as default maximum) can be networked together thus enabling simultaneous treatment of very large spaces or simultaneous treatment of multiple separate spaces such as hospital rooms.
- Maximum output 1725 ppm / minute, automatically adjusted and maintained as per desired ppm level and time
- Controls dryer/heater(s) and catalytic converter(s) for adjusting environmental parameters and removing VHP



*) = in one minute 1M³ of clean room volume gets 1275 ppm concentration or 10M³ 127 ppm respectively

NEW USE CASES MADE AFFORDABLE AND TECHNICALLY FEASIBLE BY CLEAMIX



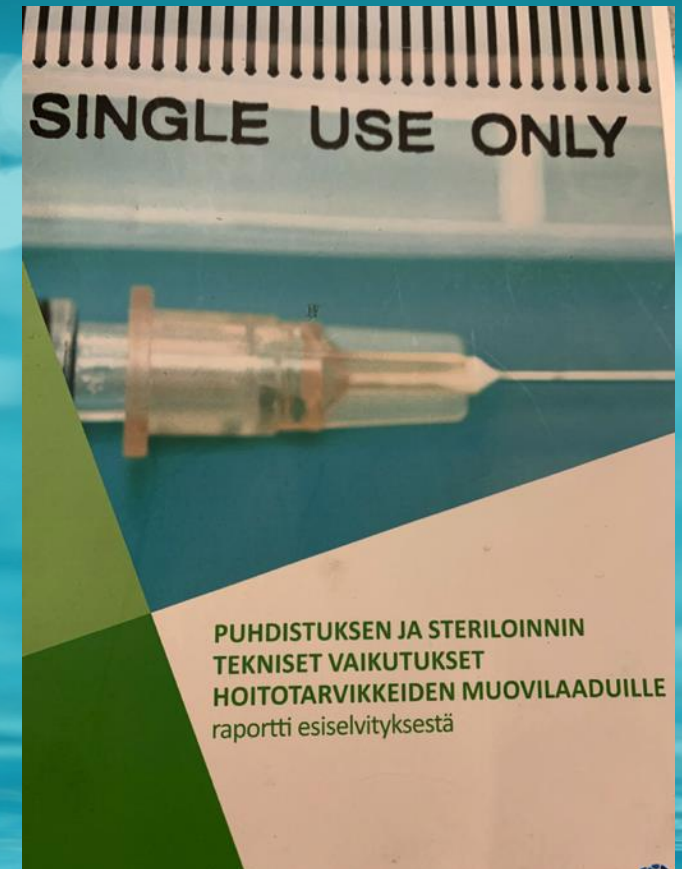
- Daily decontamination of transportation vehicles
 - taxis, buses, rail cars, ambulances
 - Perfect for disinfection and decontamination contractors
- Killing mold from surfaces and items
 - no material damage
 - long lasting effect
 - even paper, books, art can be treated without material damage
- Safe transport and storage of equipment and clothing
 - Killing bacteria, fungi and mold before storing items reduces risks
 - Safer handling of equipment at logistics centres
 - Longer life span for equipment
- Food safety on leisure industry
 - Periodic decontamination of kitchen and other food preparation areas
- Self-disinfecting clothing
 - More details to follow.... 😊

VAPORISED HYDROGEN PEROXIDE APPLICATIONS FOR CRISIS SITUATIONS AND MEDICAL EMERGENCIES



- Facts:

- VHP destroys microbes with 6-log efficiency
- Target objects can be washed in mild temperature just to remove visible dirt, after drying comes the VHP treatment
- VHP treatment does not harm target objects
- Many earlier studies have by-passed VHP as solution for medical crisis & emergencies
 - Understandable as devices have been weak in output, weighed hundreds of kilograms and have had price tags exceeding \$100.000+
 - Treatment is very fast
 - 300 ppm concentration kills typical biological indicators in 15 minutes



EMERGENCY TREATMENT OF MEDICAL SUPPLIES UTILIZING VAPORIZED HYDROGEN PEROXIDE



SIMPLIFIED EXAMPLE OF A PROCESS:

Stage 1: Physical cleaning/washing

- Visible dirt is washed / removed
 - Dishwasher / Laundry machine, low to medium temperature + normal washing detergent
 - Manual cleaning / wiping equally good
 - Let dry
- Visual inspection against visible dirt or use a special detector
- Repeat the washing / cleaning if needed, just avoid too high temperatures that can damage plastic materials

Stage 2: VHP treatment

- Objects are placed inside a cabinet or isolator, preferably on grating or other non-solid surface
- VHP is pumped in to the cabinet, Cleamix device can also be completely inside the cabinet
- 15 minute treatment in 10M³ or less volume results 6-log decontamination / sterilization, just in case 30 minutes is normally applied
- Treatment can be performed in normal room temperature, no need for separate air drying or dehumidification process
- There should be internal air flow inside the cabinet and some means of shaking the contents for ensured exposure of all object surfaces
- VHP can be ventilated to outdoor air as it dissolves and mixes to atmosphere or use a catalytic converter to erase the VHP

DECONTAMINATING A HOSPITAL OPERATING ROOM



A SIMPLIFIED EXAMPLE OF THE PROCESS

1. Physical cleaning and preparations
 - Vacuuming, wiping, removal of visible dirt
 - Close or seal air conditioning and ventilation system
 - Remove unnecessary materials (trash, laundry)
 - Seal off the area to 1) prevent H_2O_2 leaks and 2) to prevent unauthorized access
2. Ensure proper air circulation, if needed bring in one or more air blowing fans
 - Electrical appliances may be powered on, especially if they have cooling fan(s)
3. H_2O_2 treatment – time depends on volume of the space and amount of the materials. Typical target H_2O_2 level is 300 – 600ppm and total exposure time 2 hours.
4. Ventilation / aeration to outdoor air or use catalytic converter
5. Total treatment time including aeration 2-5 hours, depending on volume of the space and resident(surface materials) consumption of H_2O_2 concentration
 - Routine treatment can shorter! 1-2 h total time!



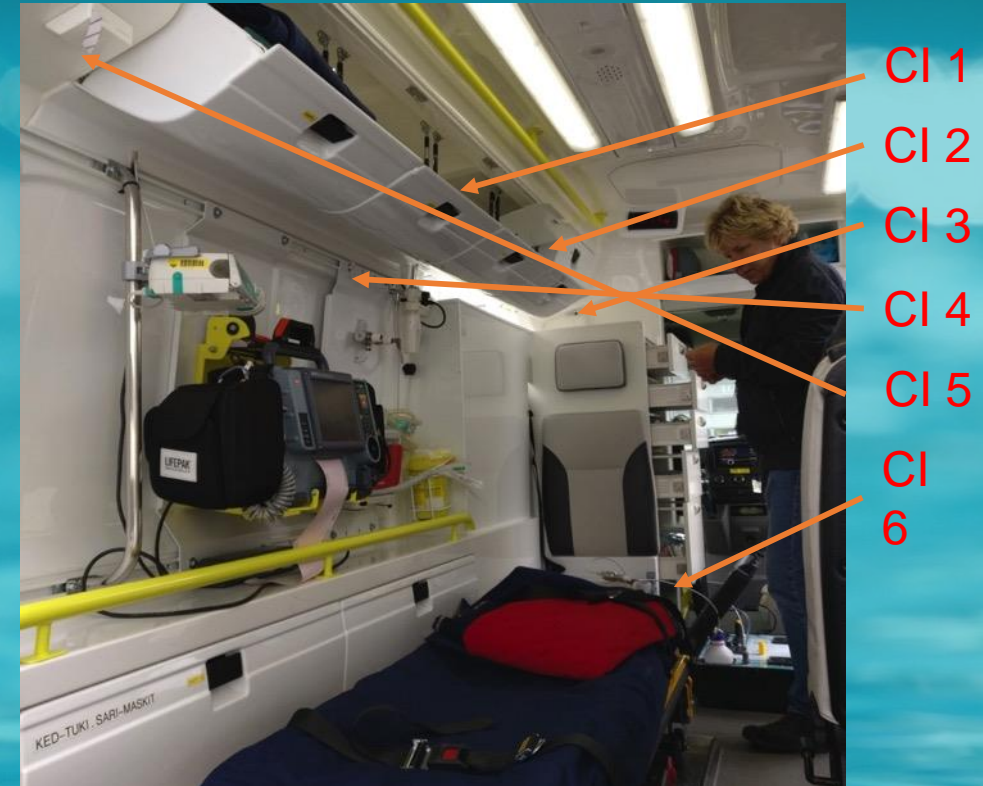
DISINFECTING OF AN AMBULANCE OR OTHER VEHICLE



EXAMPLE OF A SIMPLIFIED PROCESS

Ambulance:

1. Physical cleaning and preparation
 - Vacuuming / wiping
 - Placing of chemical indicators (CI)
 - Air conditioning is set to circulating air in closed loop or 1-2 portable fans placed inside
2. Any electronic appliances with cooling fans may and should be switched on
3. Total VHP exposure time time 20-30 minutes
4. Ventilation to outdoor air or by use of catalytic converter if the treatment is done indoors
5. Total process time under one hour!



TREATMENT OF (HOSPITAL) TEXTILES AND CLOTHES WITH VHP



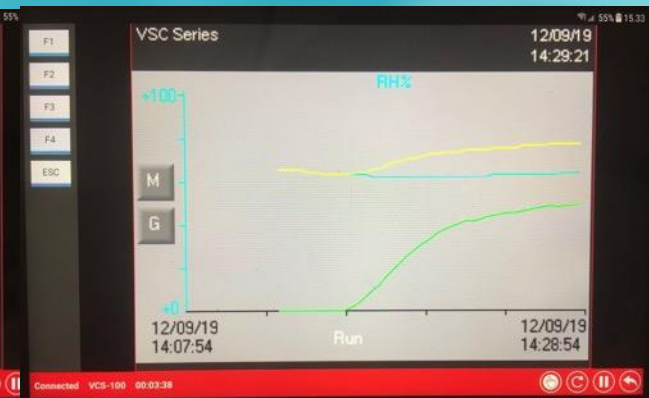
AN EXAMPLE OF A SIMPLIFIED PROCESS

Clothes:

1. Physical cleaning and preparation
 - Laundering, if possible
 - Pockets etc. are turned inside out
 - Objects are loosely put on hangers within the treatment space, which can be a tent, cabinet, room or container ... etc. ...
 - Place indicators in appropriate locations
2. Arrange proper internal air circulation by bringing in one or more air blowing fans
3. VHP Treatment process – time required depends on the volume of the space and amount of materials being treated, typical VHP target level is 300 ppm and total treatment time 2 hours
4. Ventilation to outdoor air or use catalytic converter indoors
5. Textiles will absorb small traces of VHP – it dissolves naturally and does not harm users.



SETTING UP AN AD-HOC DECONTAMINATION CHAMBER IN MILITARY BASE; TENTS EQUIPMENT CONTAMINATED BY MOLD BEING TREATED



CLEAMIX USE CASE EXAMPLES: CRISIS MANAGEMENT OPERATIONS



Equipment

- Decontamination needed for:
 - Return shipment of equipment
 - Periodically during field operations
 - Specifically when dealing within high-risk areas with contagious diseases or parasites

Vehicles

- Reducing risk of contagious diseases by frequent interior decontamination:
 - Ambulances
 - Buses and other public transportation
 - APCs, Jeeps, Trucks

CLEAMIX USE CASE EXAMPLES: BIO-DECOMPOSING PACKAGING MATERIALS AND LOGISTIC PROCESSES



• Logistics

- Storage areas and cargo holds can be easily and conveniently decontaminated with H_2O_2
- Cleamix technology provides field-portable and high capacity device for the purpose
- Reusable boxes and crates can be effectively and safely rotated at quick pace

• Packaging

- There is popular demand to replace oil-based plastics with bio-polymers and paper
- Such materials are challenging from food safety perspective; they contain biologically active element and are not easily suitable for packaging food
- VHP treatment is fast and safe as it does not harm the material and dissolves into water and oxygen

CLEAMIX USE CASE EXAMPLES: CONTAINING THE EBOLA OUTBREAK



- Hospitals

- Air-tight hospital tents or containers with filtered ventilation can be frequently treated with VHP
- Personnel can use VHP filled pass-through chambers to reduce need of disposing protective gear
- Cleamix system can maintain steady VHP level in pass-through chambers
- Clothing and possessions of patients can be decontaminated at location

- General public

- Frequent decontamination of all public transport vehicles
- Frequent decontamination of schools and other enclosed public spaces
- Offering decontamination of property in case a family member has contracted Ebola

THANK YOU!



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