

# DECONTAMINATION FIRE GEAR What? Why? How?

T. VERMINCK



# DEFINITION FIREFIGHTER RELEVANT CONTAMINATION

- **CHEMICAL CONTAMINATION :**

- VOC's – SVOC's
- PAH's
- DIOXINS
- CYANIDES
- ...

- **BIOLOGICAL CONTAMINATION**

- BACTERIA
- VIRUSES
- FUNGI

- **OTHER SPECIFIC CONTAMINATION**

- ASBESTOS
- HEAVY METALS



5-Methylchrysene



Anthracene



Benz(a)anthracene



Benz(j)aceanthrylene



Benzo(a)pyrene



Benzo(b)fluoranthene



Benzo(c)phenanthrene



Benzo(k)fluoranthene



Dibenz(a,h)anthracene



Dibenzo(a,i)pyrene



Dibenzo(a,h)pyrene



Dibenzo(a,j)pyrene



Dibenzo(a,l)pyrene



Chrysene



Cyclopenta[cd]pyrene



Fluoranthene



Indeno(1,2,3-cd)pyrene

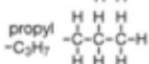
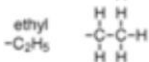


# CHEMICAL CONTAMINATION FIREFIGHTERS

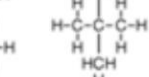
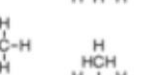
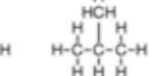
# LEUV

## 36 RELEVANT SUBSTANCES

### Compounds



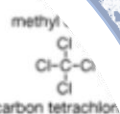
### Hydrocarbon isomers



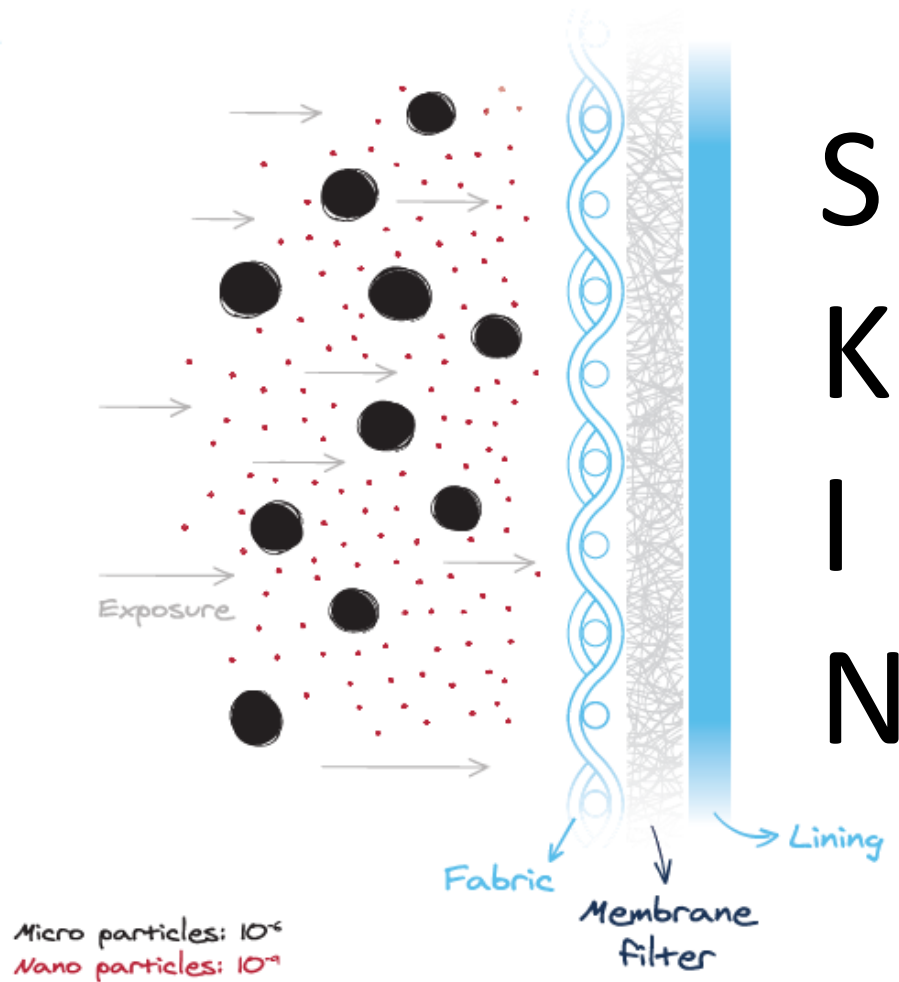
### Methane



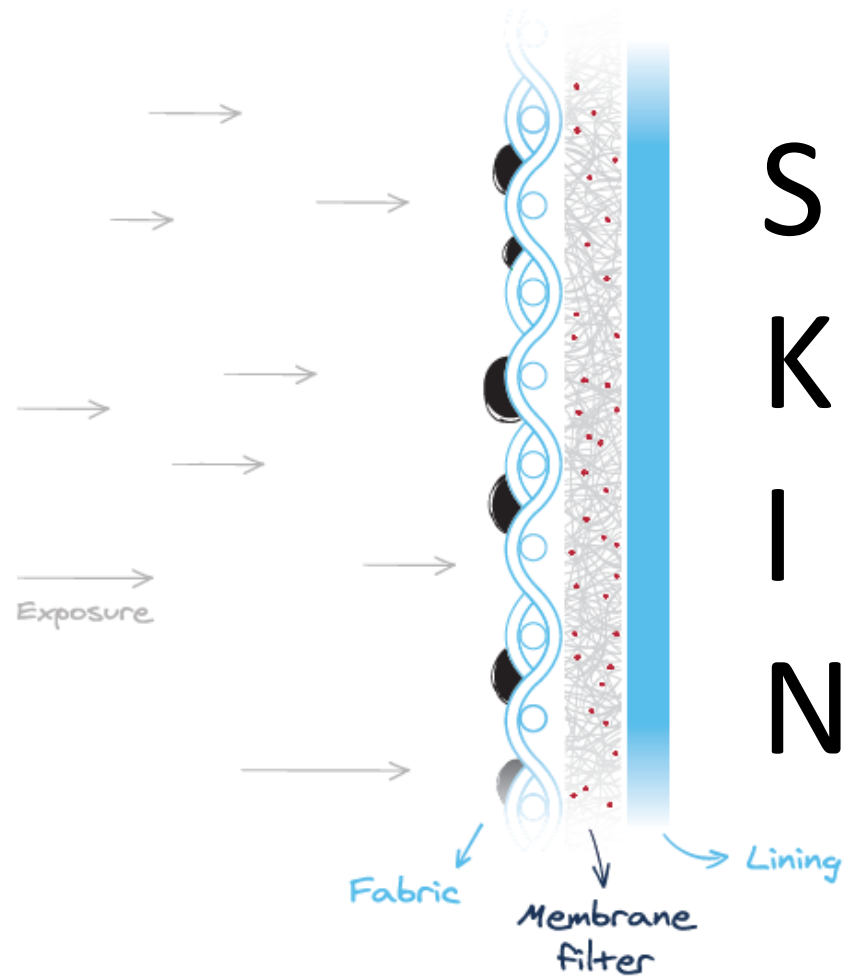
### Benzene derivatives



# PROTECTIVE CLOTHING EXPOSED TO PARTICLES

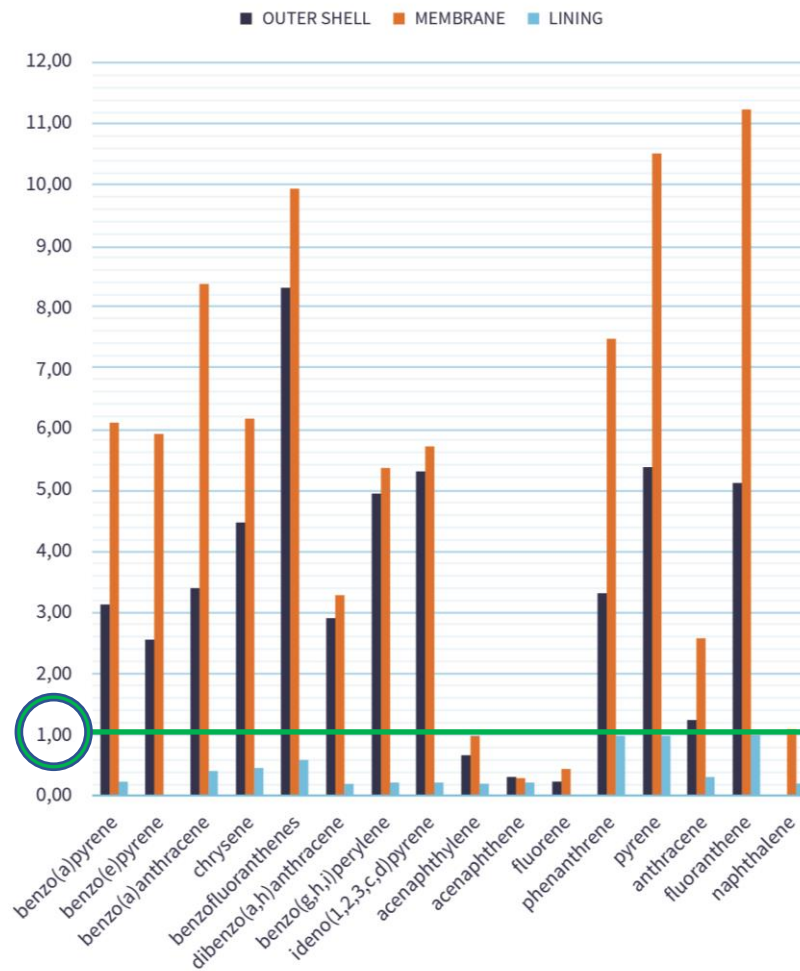
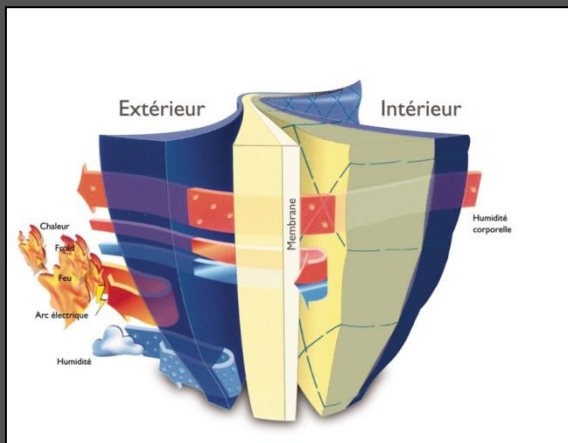


# CONTAMINATED CLOTHING



# TOXICOLOGICAL SPECTRUM FIRE GEAR

## AFTER AVERAGE 1 INDOOR FIRE



**CONFIDENCE  
IN TEXTILES**  
Tested for harmful substances  
according to Oeko-Tex Standard 100  
No 0902006  
Centobel

**CEN  
TEX  
BEL**

# DECONTAMINATION – WHY?

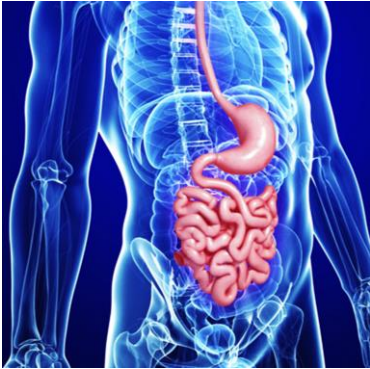


- **DIRECTIVE 2004/37/EC**  
- CMD carcinogens or mutagens at work – art. 10
- **REACH REGULATION – ANNEX VII**
- **OEKO-TEX STANDARD**
- **EU PPE REGULATION 2016/425**

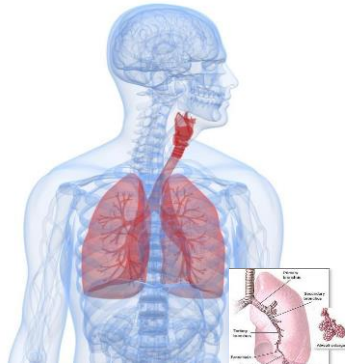


## 4 EXPOSURE ROUTES :

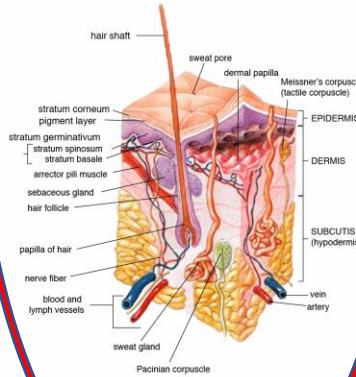
### GASTRO INTESTINAL



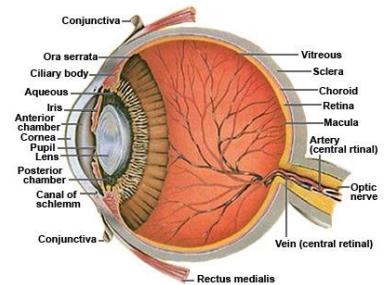
### INHALLATION



### PERCU TANEOUS



### OCULAR



## INTER UNIVERSITY RESEARCH BELGIUM

A possible explanation of the results is that a large proportion of the increase in concentration is from percutaneous absorption. **Probably the fireman are continuously exposed to PAHs through continuous exhalations of its contaminated clothing (PPE).**



# DECONTAMINATION – HOW?



Finnish Institute of  
Occupational Health



NATIONAL INSTITUTE  
FOR HEALTH AND WELFARE

WELL-BEING  
THROUGH WORK

## Contamination and decontamination of firefighting garments –Laboratory tests

Laitinen J, Tuomi T, Vainiotalo S, Laaja T, Rantio T,  
Parshintsev E, Kiviranta H, Koponen J, Pyrstöjärvi P

[juha.laitinen@ttl.fi](mailto:juha.laitinen@ttl.fi),



# CONCLUSIONS

- Cleaning with water and detergents is only able to decontaminate:
  - MAX. 40% with 2 garments in the machine
  - MAX. 15% with 3 garments in the machine
- Toxic compounds transfer from more contaminated garments to the less contaminated garments during standard cleaning : CROSS CONTAMINATION
- The clothing shows severe degradation after frequent cleaning with standard processes
- Environment !

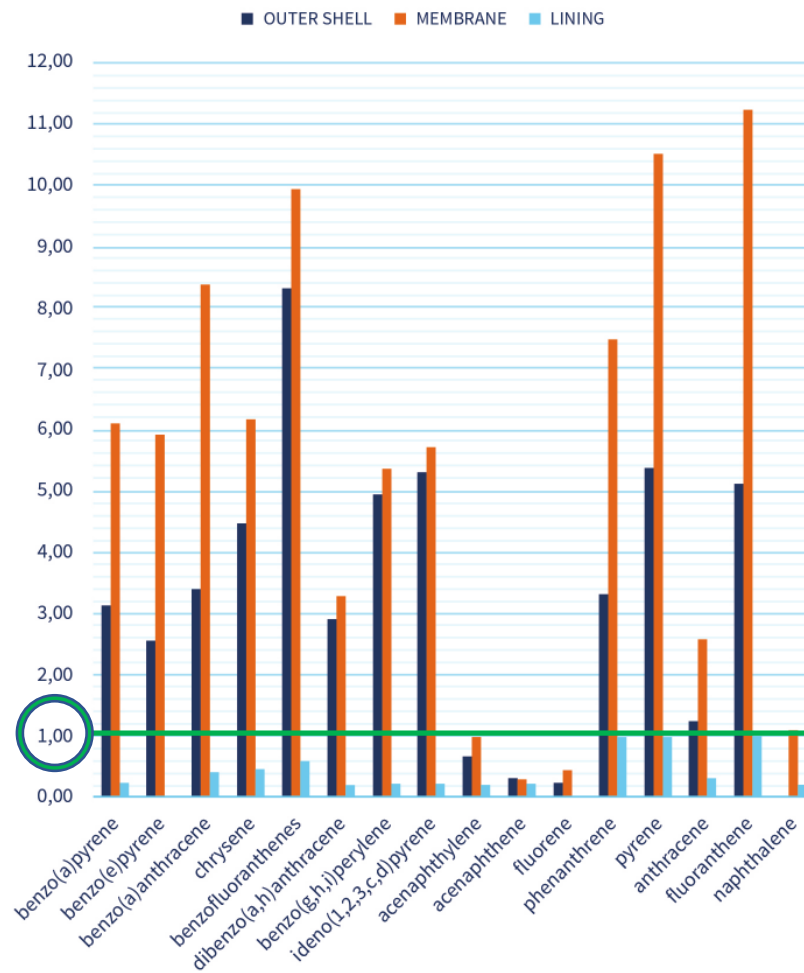
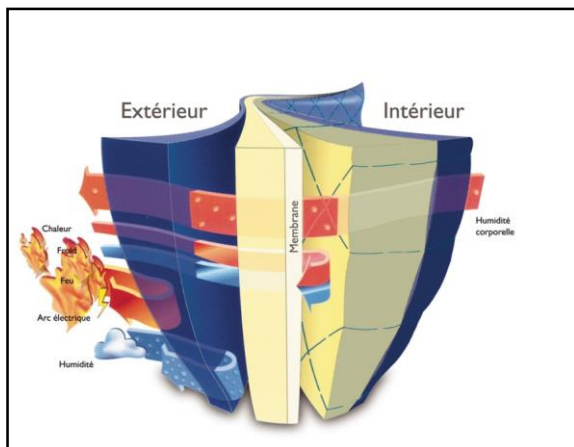
**STANDARD CLEANING TECHNOLOGIES  
BASED ON WATER AND DETERGENTS  
CAN NOT BE USED FOR THE  
DECONTAMINATION OF FIRE  
INTERVENTION GEAR**





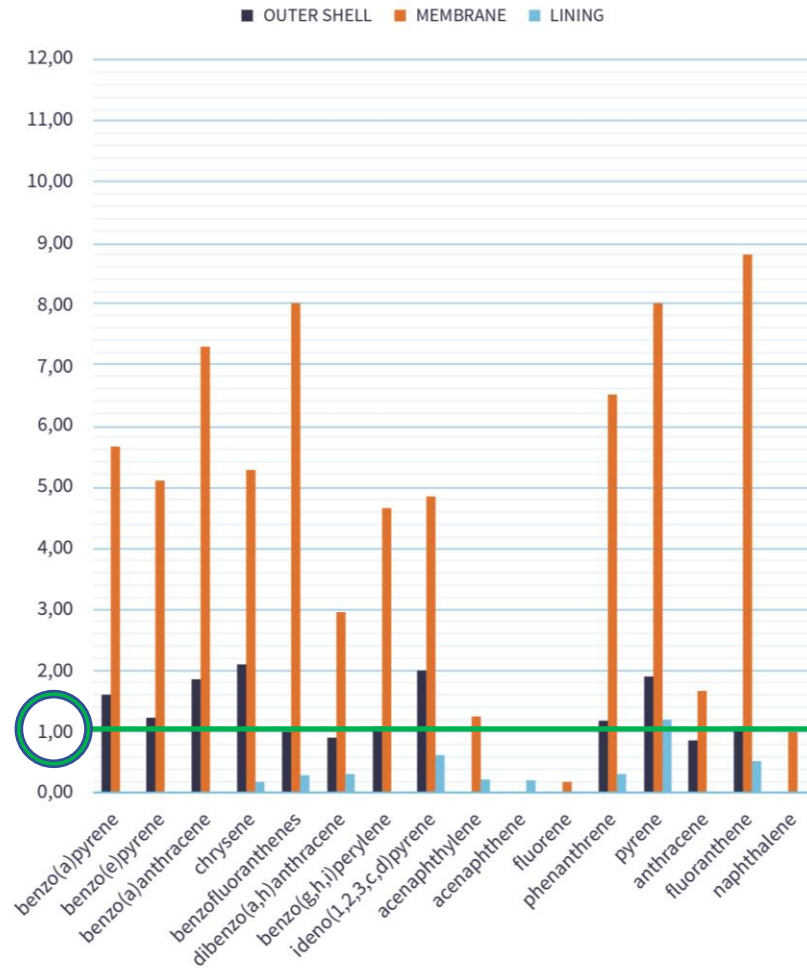
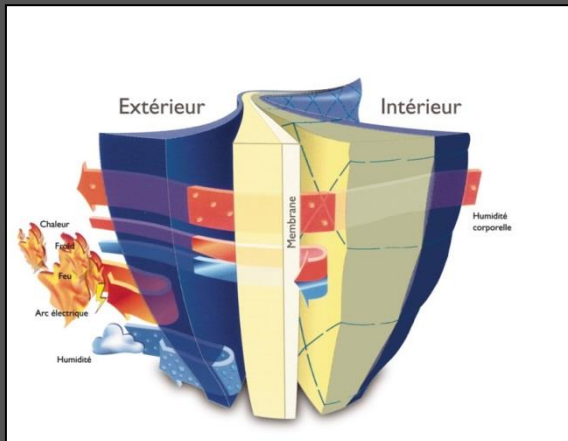
## DECONTAMINATION :

The reduction of all toxic products present in the clothing up to the legal maximum allowed quantities for this type of clothing. This without degrading the clothing and in an environmentally responsible manner.



# TOXICOLOGICAL SPECTRUM FIRE GEAR

AFTER 80min.  
STANDARD H<sub>2</sub>O  
CLEANING

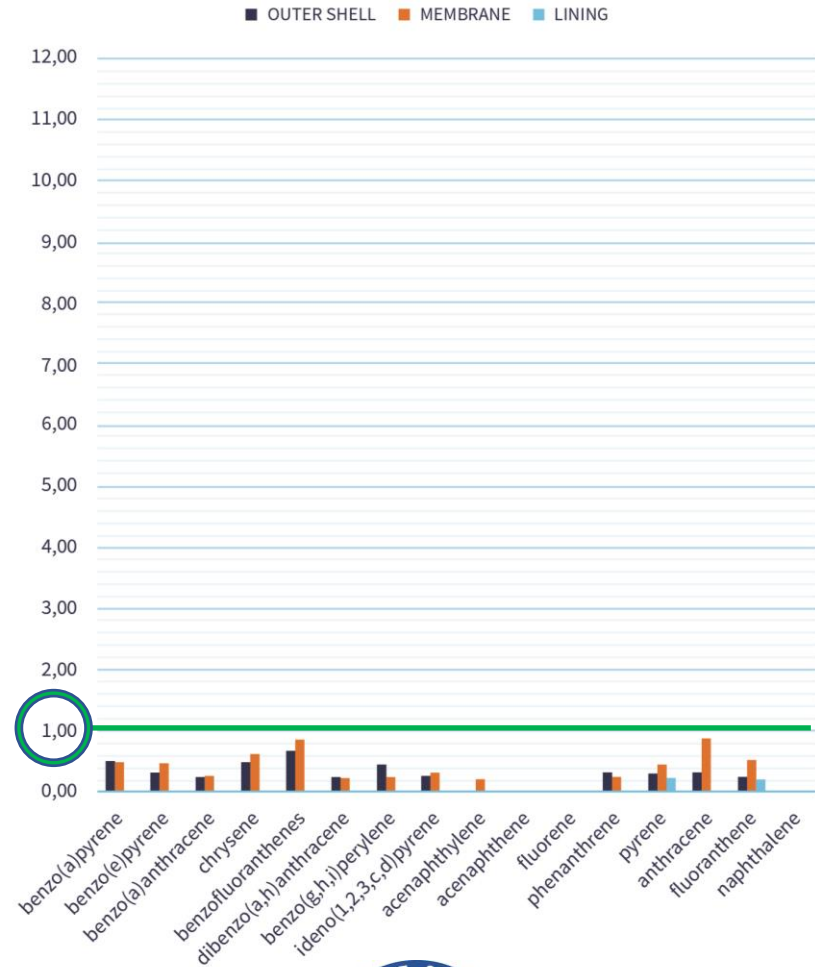
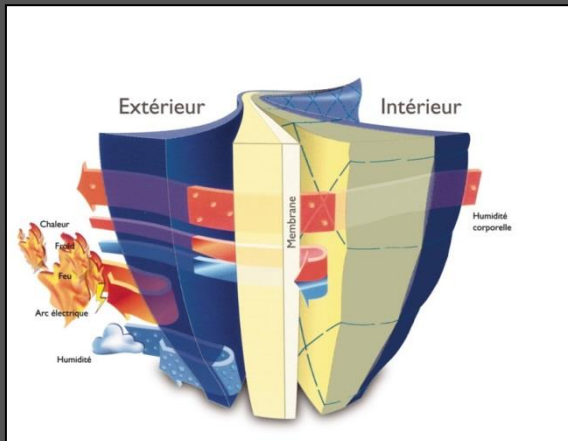


CONFIDENCE  
IN TEXTILES  
Tested for harmful substances  
according to Oeko-Tex Standard 100  
No 0902006  
Centobel

C E N  
T E X  
B E L

# TOXICOLOGICAL SPECTRUM FIRE GEAR

AFTER 27min  
LCO<sub>2</sub>  
EXTRACTION



**CONFIDENCE  
IN TEXTILES**  
Tested for harmful substances  
according to Oeko-Tex Standard 100  
No 0902006  
Centobel



**CEN  
TEX  
BEL**





# DECONTEX TECHNOLOGY

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# DECONTEX

CLEAN TEXTILE SOLUTIONS



DECONTEX SMALL EXTRACTOR



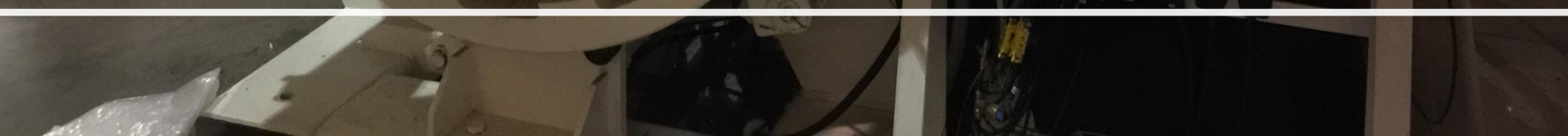
DECONTEX MEDIUM EXTRACTOR



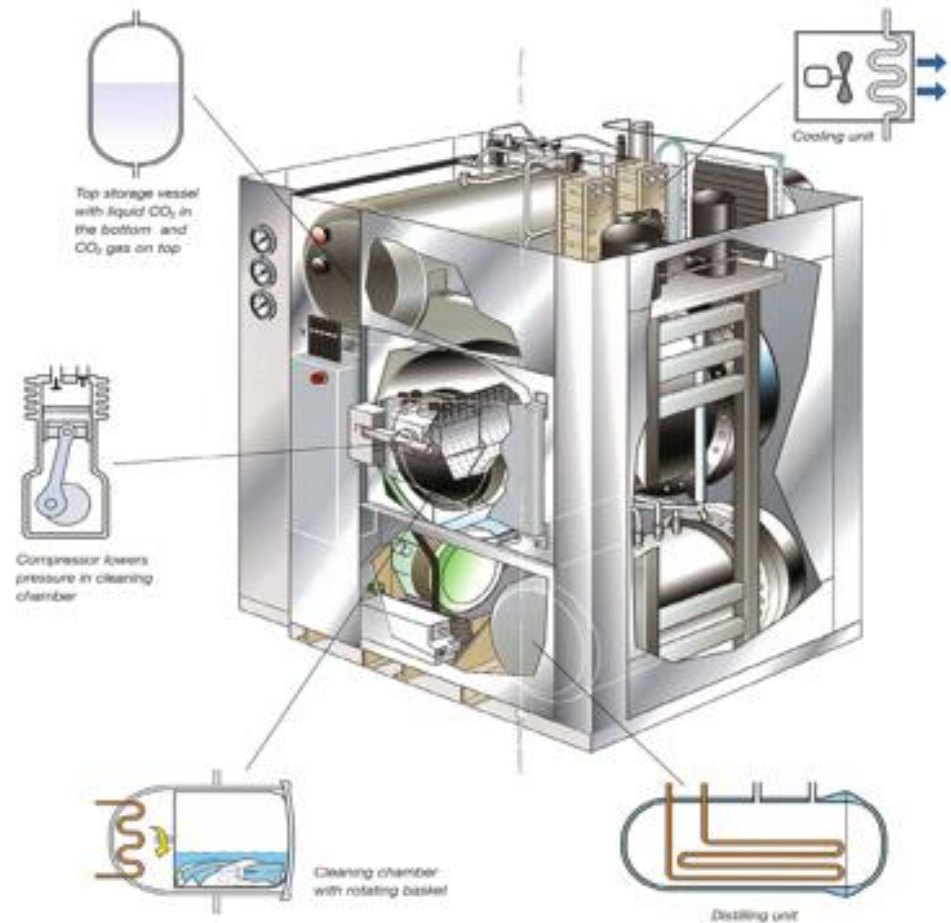




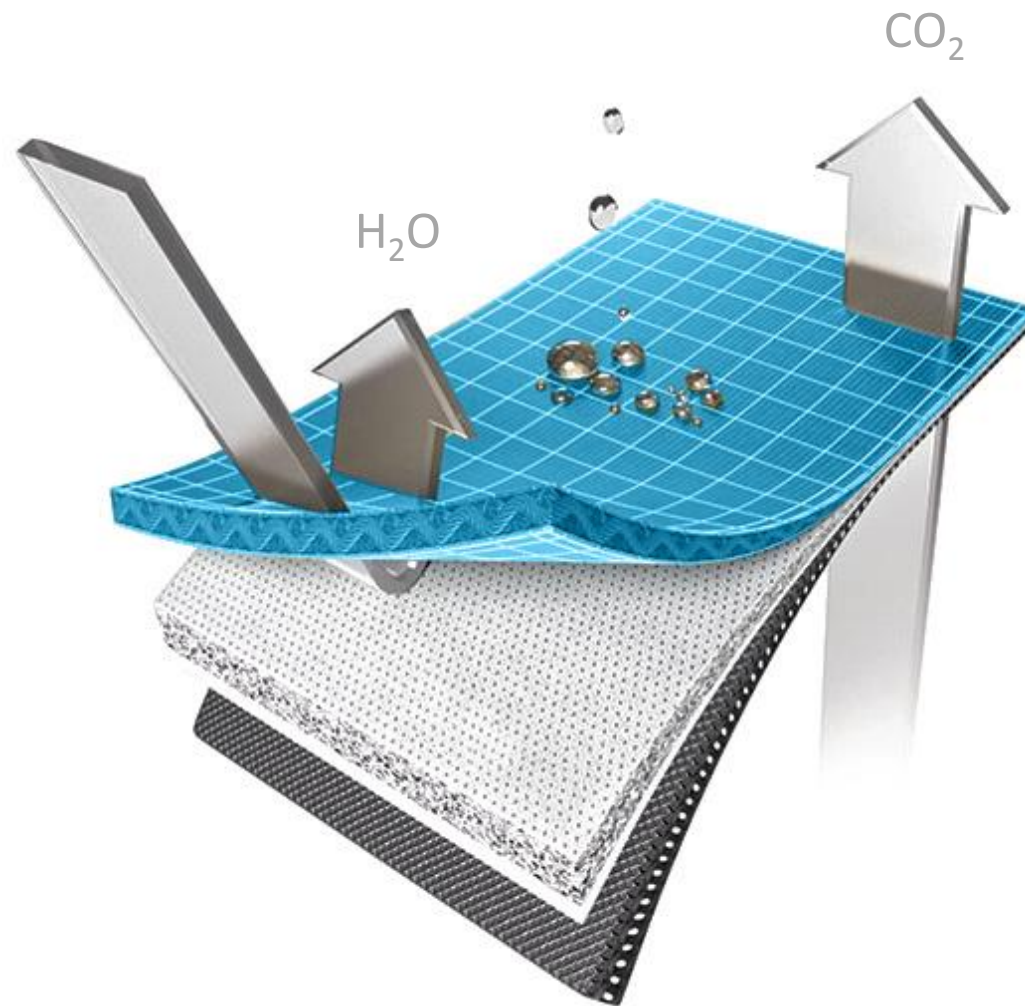
DECONTEX LARGE EXTRACTOR



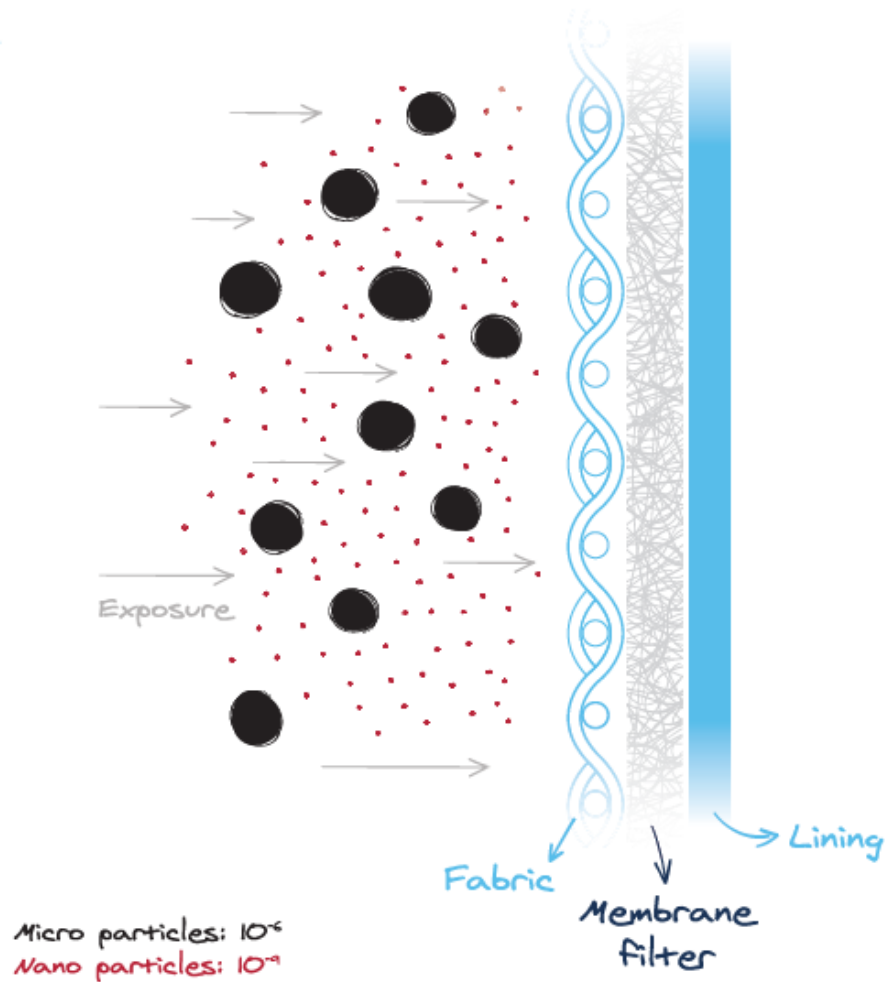
# LCO<sub>2</sub> - EXTRACTION TECHNOLOGY



# DECO<sub>2</sub>FIRE<sup>®</sup> TECHNOLOGY

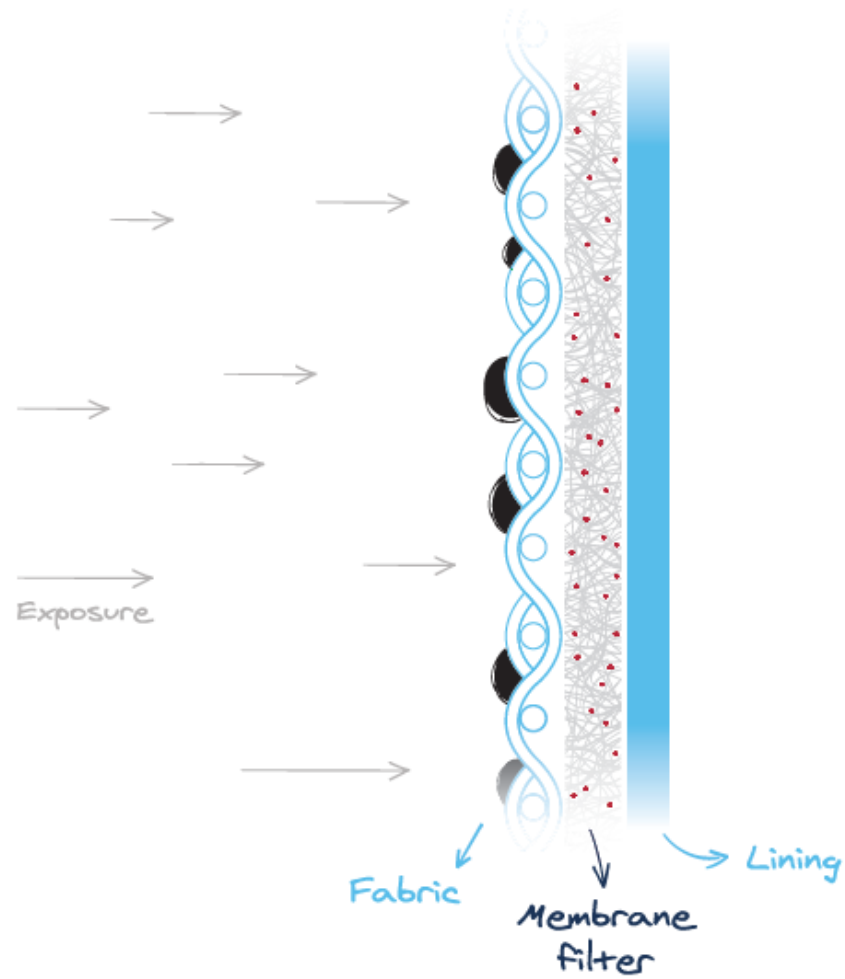


# PROTECTIVE CLOTHING EXPOSED TO PARTICLES



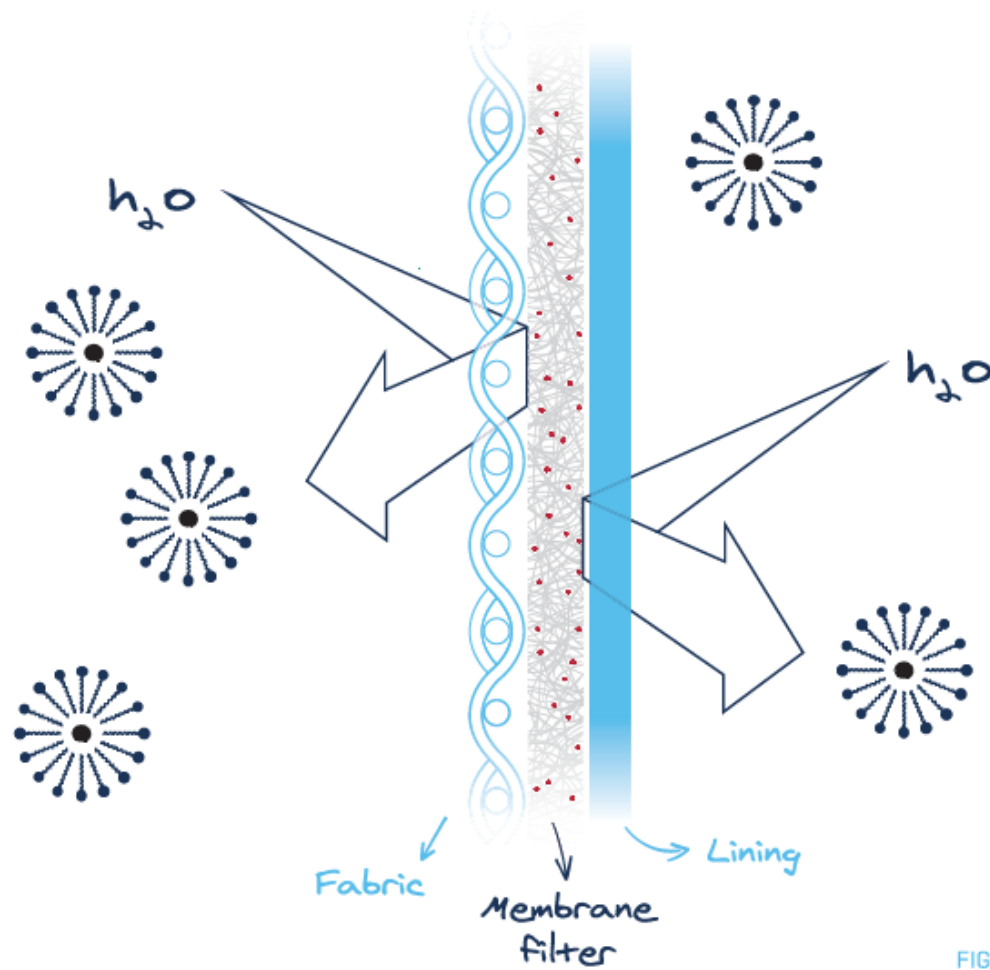


# CONTAMINATED CLOTHING



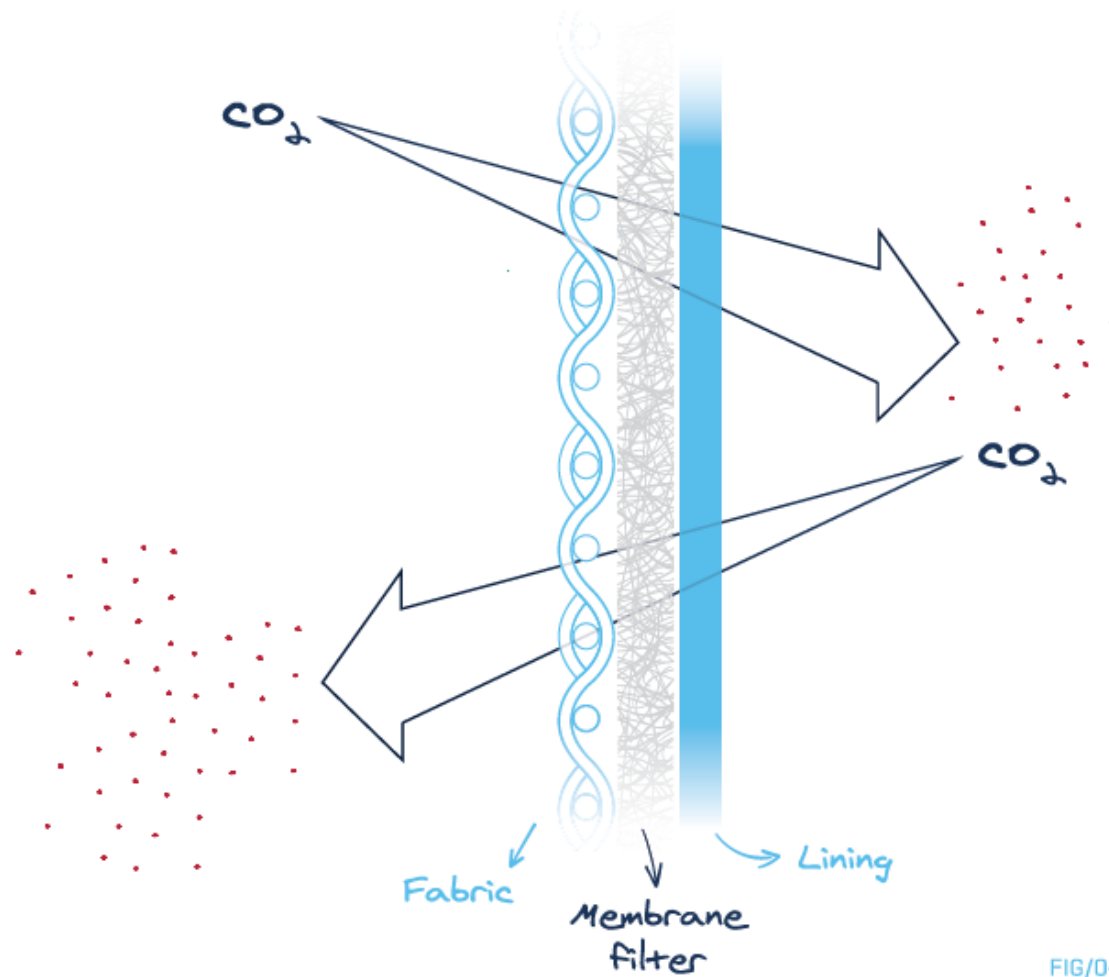


## AFTER H<sub>2</sub>O CLEANING



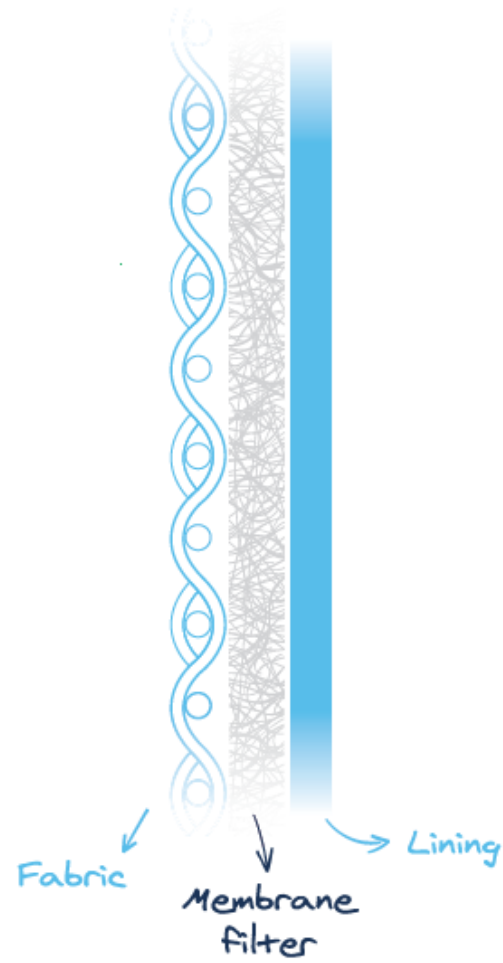
FIG/03

# CO<sub>2</sub> DECONTAMINATION



FIG/04

# AFTER CO<sub>2</sub> DECONTAMINATION



FIG/05

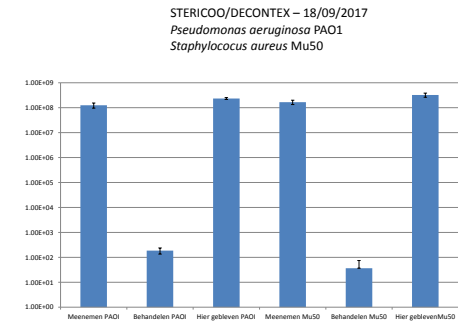
# BIOLOGICAL CONTAMINATION

**From most resistant to most susceptible :**

- Prions (Creutzfeldt-Jacob)
- Bacterial spores
- Mycobacterium tuberculosis
- Nonlipid viruses (polio, coxsackie)
- Fungi (aspergillus, candida)
- Vegetative bacteria (S. aureus, P aeruginosa)
- Lipid viruses (HIV, herpes, hepatitis B)



RESULTATEN DES-infectie CONTROLLER				KT4-6
Testorganisme : <i>Enterococcus faecium</i>		Serienummer : 160068		
Gegevens proces				
Machine	:	Electrolux L002		
Programma	:	03		
Datum meting	:	05-12-2016		
RESULTAAT PER UITGANGSWAARDE [kve/cm <sup>2</sup> ]				
10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
AFDODINGSFACTOR:		10 <sup>6</sup>		
Opmerkingen:				



Data zijn het aantal overgebleven bacteriën na behandeling (log schaal)

DECONTEX LCO<sub>2</sub> technology kills bacteria, viruses and fungi between factor 10<sup>6</sup> and 10<sup>7</sup>

## SPECIFIC CONTAMINATION



ἀσβεστος

### ASBESTOS DERIVATES

- Serpentine
  - Chrysotile
- Amfibole
  - Amosite
  - Crocidolite
  - Tremolite
  - Actinolite
  - Anthophyllite



### HEAVY METALS (>5,0 g/cm<sup>3</sup>)

- Lead
- Cadmium
- Zinc
- ...



RTIFICATIE  
ODER



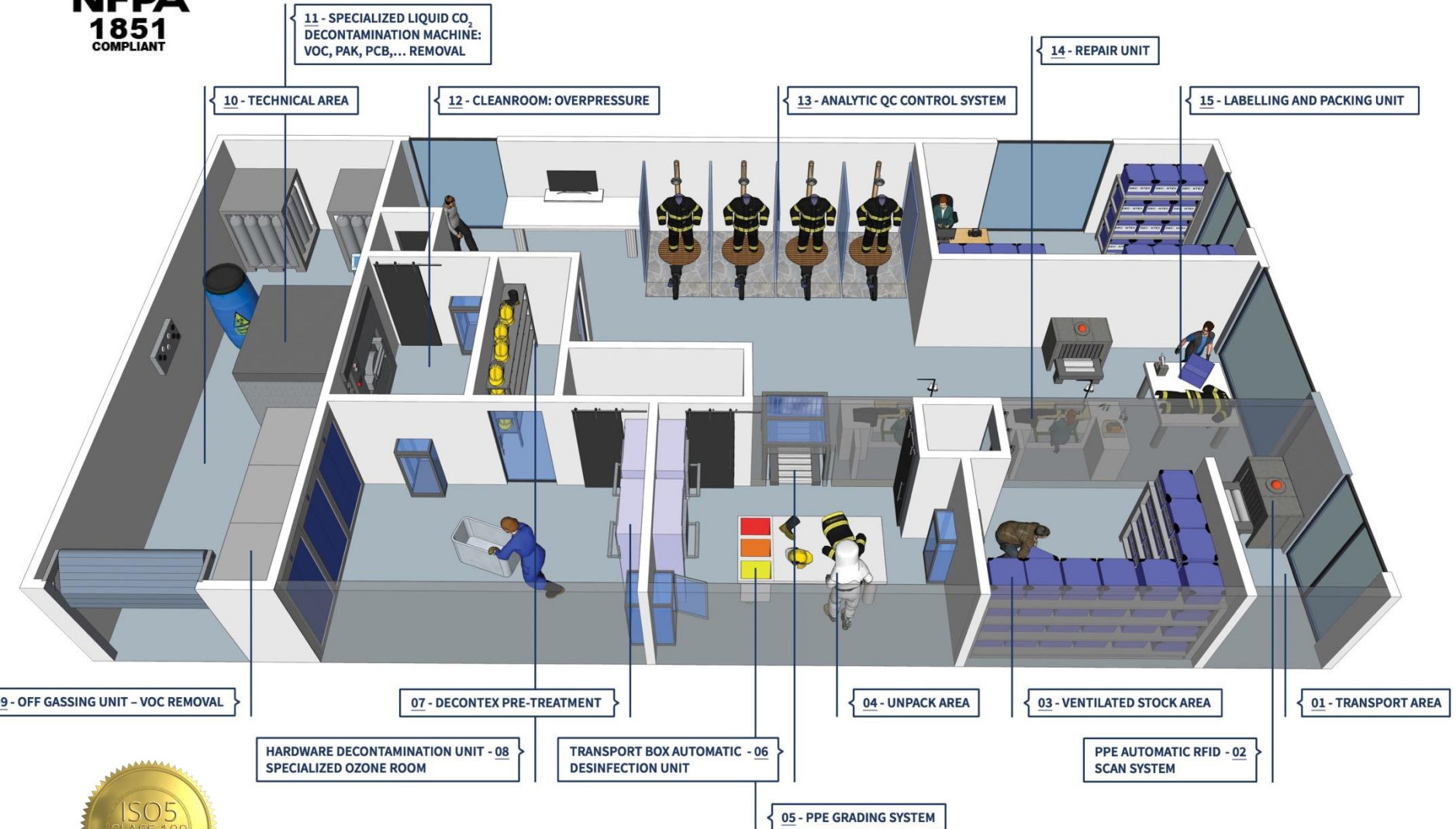
# SPECIFIC DECONTAMINATION

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DECONTEX TECHNOLOGY CERTIFICATION  
20/12/2017 – KIWA COMPLIANCE



# DECONTEX CLEANROOM FOR FIREFIGHTER PPE



PREMIUM CLEANROOM FOR FIREFIGHTER PPE



**DECONTEX**

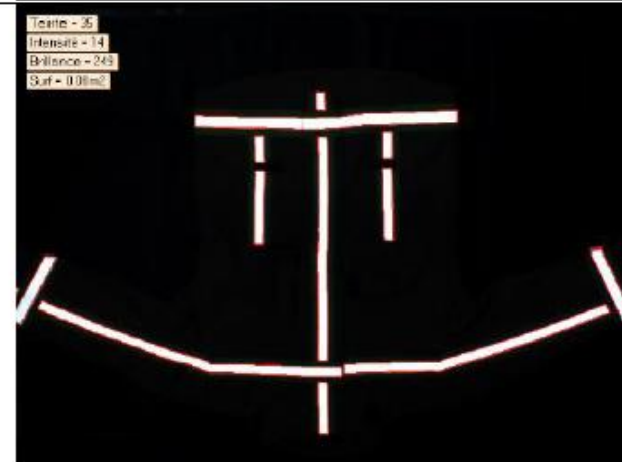
CLEAN TEXTILE SOLUTIONS



QC

- VISIBILITY
- MEMBRANE TEST
- REPELLENCY

# EXAMPLE VISIBILITY REPORT







△  
VOOR

✓  
NA

CLEANING

DECO  
CLEAN TE

WWW.DECONTEX.COM



# REÏMPREGNATION



EN 469



## FINAL CONCLUSION DECONTAMINATION

Fire suits that are in regular use must be subjected to maintenance (incl. complete decontamination) at least twice a year, for reasons of :

- emptying the filter for toxic compounds and thus avoid breakthrough to the skin
- the killing of all micro-organisms, both for hygienic and health reasons
- applying the water/chemical-repellent after-treatment as prescribed in European Standard EN 469
- control of the general functionality (visibility, protection, rescue system, ...)

**note:** suits that have been exposed to very serious contamination must be decontaminated immediately



# PROJECT : PERSONAL DECON

1 STRONG DECONTAMINATION WIPE

FOR THE FACE, NECK AND HANDS

# DECONWIPES



ON-SCENE DECONTAMINATION



CLEANSES AND REMOVES HARMFUL TOXINS FROM THE SKIN

[www.mydeconwipes.com](http://www.mydeconwipes.com)

# DECONWIPES

## INSTRUCTION MANUAL



Wipe whole face. Pay attention to eyelids and nostrils.  
Avoid direct contact with eyes.



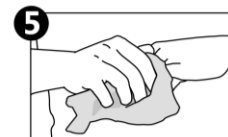
Wipe inside and outside the ears.



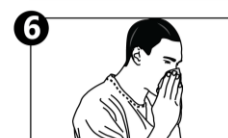
Wipe entire neck.



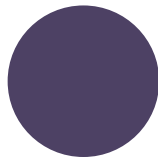
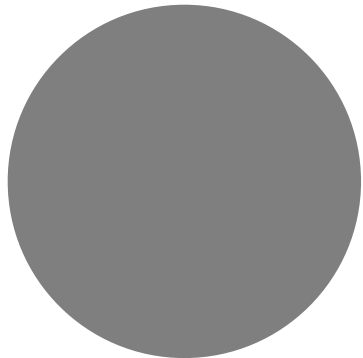
Wipe the head and hair. Use multiple wipes if heavily stained.



Wipe arms and hands.



Blow your nose.



# NEXT PROJECT FIREFIGHTER BIOMONITORING



# THANK YOU!!!!!!

QUESTIONS ?  
[tve@decontex.com](mailto:tve@decontex.com)

