Cleaning / Decontamination, Recycling & End of Life Systems for Fire Fighting PPE

May 2023

Smoke & the Fire Fighter

Inhalation

Absorption

Ingestion

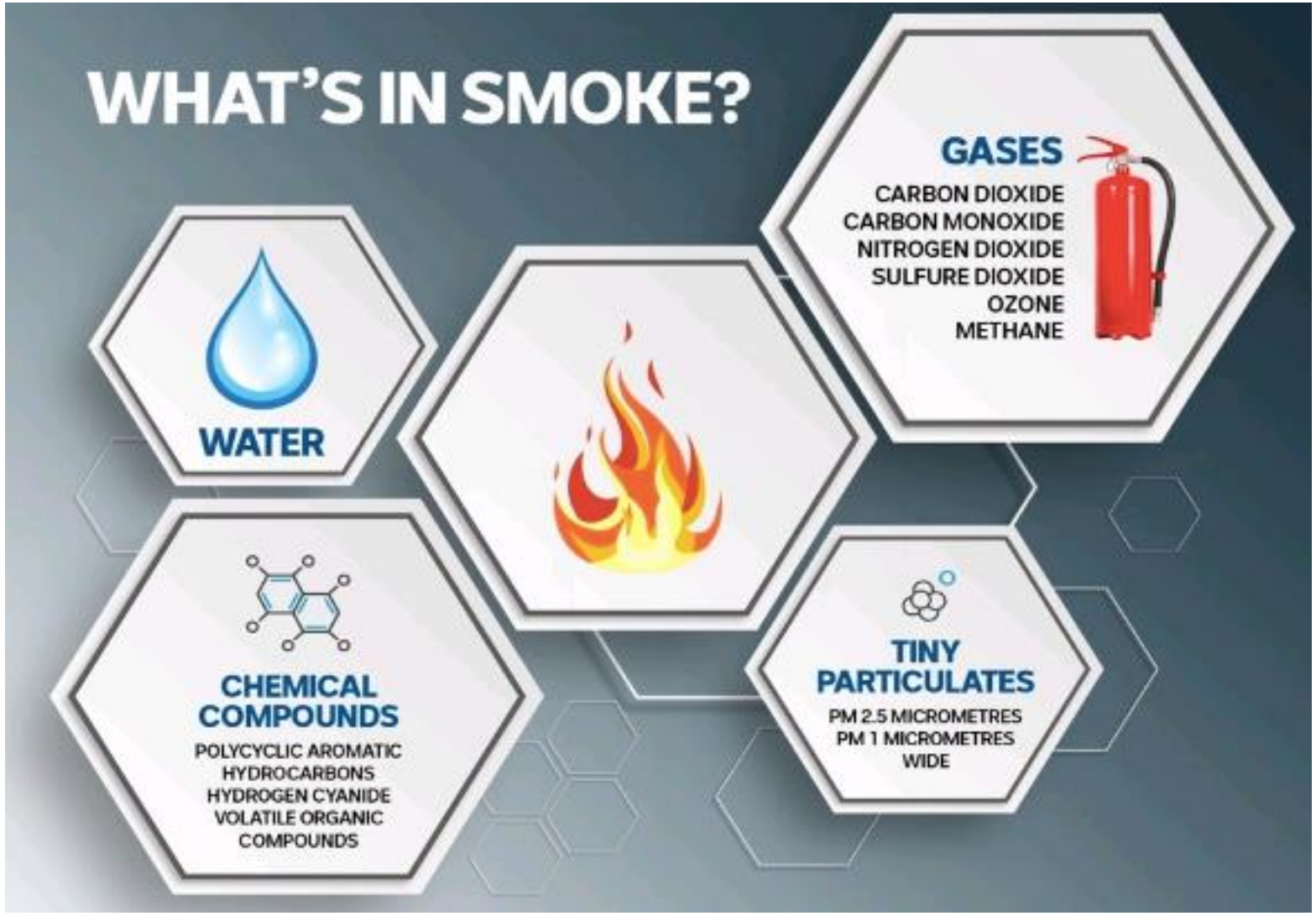
WHO: “carcinogenic at the **highest possible level** of risk”

BSiF
BRITISH SAFETY INDUSTRY FEDERATION

Fire Sector Federation

PCIAW
PROFESSIONAL ASSOCIATION | CLOTHING INDUSTRY WORLDWIDE

FIA
Fire Industry Association
Leading Excellence in Fire Since 1916



Definitions: Cleaning & Decontamination

Cleaning

- The process of **removing surface level substances**, such as dirt, general staining and other impurities, **from an object or environment**.
- Largely cosmetic – surface level i.e., make something visually look better / smell better

Decontamination

- The process of the "**removal of hazardous substances** (bacteria, chemicals, radioactive materials) from **employees' bodies, clothing, equipment, tools and/or sites to the extent necessary to prevent the occurrences of adverse health and/or environmental effects**." (Business Dictionary, 2020)
- More scientific - requires measurement to confirm decontamination has been completed

Cleaning & Decontamination Systems

- Aqueous Technologies
- CO_2 Technologies

- Need to work together with users and industry to understand what are the decontamination and cleaning requirements

- Specification:
  - EU Tender listed 40 chemicals needed to be removed
  - To below OEKO-TEX® / REACH / banned chemical list acceptable levels?

Water Based Technologies

- Water based with chemical detergents – use of ozone reduces washing temperature
- High temperature decontamination e.g. blood born pathogens, Covid-19
- Industrial washing machines with various spin cycles
- Dried by air and / or mechanically – drying times vary
- Nano particulates released into water system
- Limited number of wash cycles for aging PPE (under discussion!)

CO_2 Technologies

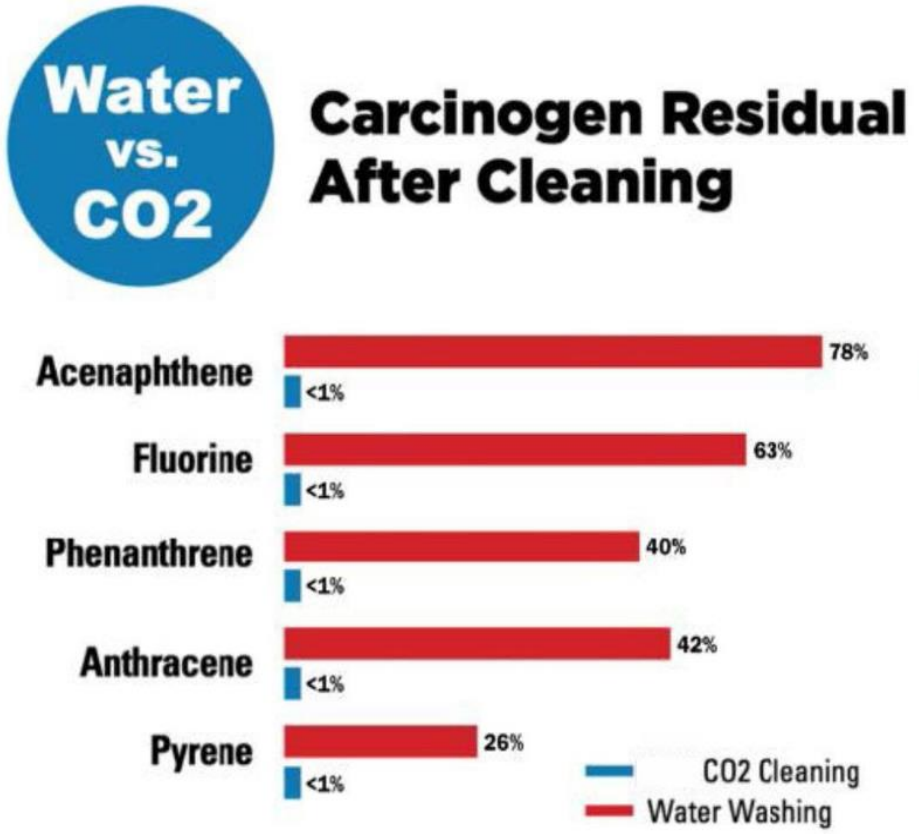
- CO_2 based with no additional detergents
- Industrial machines with low spin cycle speeds
- Nano particulates released into HAZMAT collector
- CO_2 based requires no drying time
- Maintains longer life of PPE compared to water based cleaning alone

Enhanced CO_2 Technologies

- Latest enhanced CO_2 systems includes additional processes to extend the cleaning & decontamination capability compared to CO_2 alone

Note on Price comparison: Cleaning & Decontamination are **different processes**, may require calculation along with **risk assessments** and **cost over useful life of PPE**

Impact of Research



Examples:

- NFPA research cited 15-40% toxin removal with a water wash using detergent.
- Increased up to 99% (“non-detectable”) toxin removal with enhanced CO_2 processes.
- US Pub Med conducted On-scene decon processes, scrubbing with soap & water that found they could reduce PAH contamination on turnout jackets by 85%

BS 8617:2019 – Cleaning & Inspection

- Introduction of routine and advanced inspections
- Recommendation that PPE is tested at least every 5 years
- **Two levels of cleaning: routine and advanced**
- Processes for both soft (washable) and hard items (helmets and boots) of PPE
- **Efficiency of advanced cleaning should be independently checked every year**
- Soiled PPE should be isolated (bagged) to prevent cross-contamination
- Soiled PPE should not be transported in driver/passenger compartments
- Soiled PPE should not be taken in private vehicles or on public transport

BS 8617:2019 – Retirement of PPE

"Items of firefighters' PPE that are worn, damaged or **contaminated** to the extent that the organization deems it not possible or cost-effective to repair them, should be retired."

Questions:

- How do you know if PPE is **contaminated** or not?
- How do you know if PPE is **decontaminated** or not? i.e. How Clean is Clean?
- Who makes the decision to retire PPE (under any condition)?
- Who is responsible for PPE once it's retired - what happens to it?

Recycling

- All FF PPE at end of life should be assessed and suitably disposed of
- Not treated as ordinary uniforms / clothing for recycling

Future Actions

- Education for processes & impacts of both systems
- Industry & FRS understanding developed for risks & solutions
- Impact of IARC research / findings through WHO
  - Risk Assessments
  - Operational Procedures
  - Cleaning / Decontamination review
- Understand the legal environment
  - REACH – can't issue kit to staff that's contaminated
  - Presumptive legislation, esp. following WHO announcement 2022
- Considering impact for tenders – what is the relative importance / weighting

Suggested Best Practice: Incident Cleaning & Decontamination

1) Complete Ensemble External brush down & spray down to remove loose surface contamination.
2) Removal of Helmet, Firehood , firegloves SCBA assisted by attendee with suitable PPE/RPE
3) Use decontamination wipes on face, neck and hands.
4) Firefighter to don P3 RPE & disposable gloves before removing Firecoat, Boots & Trousers
5) Firecoat & trousers may also be treated with enhanced decon application by spray to neutralize toxic contamination and a suitable surface cleaner to minumise significant garment staining
6) Bag all contaminated PPE & SCBA in suitable containers for safe shipment to appropriate laundry/ decontamination facilities.

Panel Discussion

Tenders

- Understanding what you need & implications: risk assessments, wearer & industry engagement
- Assessment of samples & wearer trials processes
- Quality vs Cost – Cost over Life
- Technical Assessment Criteria
- Long term contracts need long term relationships

Cleaning & Decontamination

- Differences in Cleaning & Decontamination Technologies
- Understand risks so industry can help reduce / mitigate impacts
- New Research & WHO findings
- Retirement of PPE
- Recycling / End of Life Processes
- On-scene Best Practices