

CBRN protection – Change is in the air



Chempak[®]

PRODUCTS

Developments in materials and new concepts offer radical improvements in CBRN PPE and it is now no longer necessary to trade-off personal comfort for protection, says **Denise Tracey** of WL Gore & Associates

IN THE PAST the options for CBRN personal protection required a choice. The first option was comfortable, air permeable systems that protected against chemical warfare agents, but had limited, if any, protection against liquids, toxic industrial chemicals or the weather. The alternative was for broader protection delivered by impermeable systems with excellent protection against a large number of threats, but which were uncomfortable, hot, sweaty and could potentially cause heat stress.

Personal protective equipment (PPE) should protect the wearer, but must also allow safe and effective working; when uncomfortable or not well suited to the task, it could actually increase the hazards the wearer faces.

The situation is changing and developments in materials and new concepts offer radical improvements. WL Gore & Associates has an extensive history of providing waterproof, windproof, breathable materials both to protect and maintain physiological comfort. It has now brought this expertise to bear in the field of CBRN protective materials with a range of protective fabrics that can deliver both comfort and protection.

New materials

These new materials are collectively known as Gore Chempak fabrics. To deliver different performance levels, three different technologies allow the user to select the level most suitable for their environment.

Gore Chempak Sorptive fabrics are membrane carbon systems in which the attributes of traditional carbon materials are enhanced by adding a specially developed membrane. This increases the protection level to include liquids, aerosols and wind driven particles, including bacteria and viruses, as well as the usual chemical warfare agent protection.

Gore Chempak Selectively Permeable fabrics use a moisture vapour permeable membrane to protect against chemical warfare agents, liquids, aerosols, particles and some toxic industrial chemical vapours, all in a breathable, extremely lightweight system.



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Gore Chempak Ultra Barrier fabrics deliver a high level of protection against chemical warfare agents, liquids, aerosols, particles and toxic industrial chemical vapours in a flexible, conformable material. Despite the membrane's impermeable nature, the material is still comfortable to wear and has a significantly

reduced physiological burden compared with traditional impermeable systems.

Applications

Gore Chempak Sorptive fabrics are being used by the UK Police and a group in Scandinavia. For the past two years, the UK Police has been using the CR1 ensemble, produced by Remploy Frontline; it has been issued to a substantial number of police officers and is in regular use in the UK. A Scandinavian team has recently purchased a garment designed and produced by Taiga for use in civil defence applications.

With both these end users the chemical warfare agent requirements were influenced by the local military experts, toxic industrial chemical requirements were determined by local factors and physical performance needs were based on available standards such as EN943.

Gore Chempak Ultra Barrier fabrics have been used in the development of a Multi-Threat suit designed to protect USAR teams. This suit utilises a durable chemical/biological protective fabric material with abrasion and tear resistance, vertical flame resistance, and anti-static features. The garment – TACTIX MT94 – is currently being produced and sold in the US by Lion Apparel and federal and major metropolitan departments have, or are in the process of, purchasing the garment.

US based Special Operation teams within law enforcement, fire service, and SAR have selected the Multi-Threat garment as the preferred personal PPE for dealing with weapons of mass destruction and other HazMat emergencies. In addition, the garment has been trialled by a number of European end user groups with very positive subjective responses on the flexibility and drape of the material.

These latest materials from Gore open up new possibilities for future protection when faced with chemical and biological threats. The ability to obtain broad protection in comfortable garment systems means that the compromises which need to be made when choosing PPE are significantly reduced. The wearer can now feel protected while also being able to focus on the task they are required to undertake.



Testing

Swatch testing of material samples is used to determine performance. There are a number of ways these tests can be conducted. Chemical warfare agent tests are generally carried out by placing a number of droplets of the agent on the material surface and measuring the agent's passage through the material over time.

Performance against toxic industrial chemicals is measured in two distinct ways, both of which give important information on the material's performance – liquid penetration tests and vapour permeation tests. The level of threat expected, the activity and location of the wearer relative to the incident and the time that the wearer is required to work, will all affect what degree of protection to liquid penetration and vapour permeation is required.

Testing the effectiveness of an ensemble's design is carried out in one of two ways. A mannequin can be dressed in the ensemble and exposed to a live agent or a stimulant such as methyl salicylate. In the MIST test, volunteers are dressed in the ensemble and exposed to simulants such as methyl salicylate or corn oil aerosol. In both tests the amount of material reaching the inside of the garment is measured and a protection factor is calculated.