The trend of applying performance textile innovation to clothing and equipment for emergency services personnel continues. A a series of recent developments in this area, focusing in particular on finishing solutions, provide protection as a value-add.



Added protection

The performance textile sector is broadening its offering to first responders, the personnel who arrive on the scene of emergencies such as fires, explosions and industrial accidents. Just as in sports applications, lightweight clothing with high levels of comfort can help these professionals perform to the best of their ability and, in the arena in which they work, that can mean the difference between life and death for the people they serve.

Towards the end of 2010, it became clear that a number of textile products that had made a name for themselves in military circles were proving attractive to fire services, too, with some manufacturers claiming that engineering protection into yarns and fabrics from the outset is the best way to go. Defender M from Dutch manufacturer TenCate is a good example. As well as being engineered with inherently flame-resistant properties, Defender M, a tri-blend fabric comprising 65% flame-resistant rayon from Austrian textile technology provider Lenzing, 25% para-aramid and 10% nylon, has found favour with firefighters because of its durability; the protection it offers will not wash or wear out. First used in a range of military clothing, fire services in North America have been assessing Defender M for applications in linings for firefighters' uniforms.

Considering EM & IR

Nevertheless, not every manufacturer in the marketplace is focusing on constructing protection into fibres, yarns and fabrics from the outset; there is plenty of scope for applying these qualities afterwards as a means of adding value.

In one firefighter protection example, scientists at the Hohenstein Institute in Germany have developed what they are claiming are the world's first textiles to screen out effectively electromagnetic (EM) and infrared (IR) radiation. Until now, the research institute says, textile solutions providers have been able to offer a choice of protection, from either from the so-called 'electrosmog' caused by electronic devices, or from thermal radiation, for example from sources of fire or intensive solar radiation. But not both.

This is a pressing subject among firefighters. The trade union that represents firefighters in the US and Canada, the IAFF, issued a statement at the start of 2011 saying it has concerns about the levels of exposure that its members are exposed to because of the need for constant radio contact and the transmitting equipment and masts that most fire stations have now, meaning people are exposed even while waiting to respond to an emergency situation.

"It is the belief of some international governments and regulatory bodies and of the

The US Army's Daniel Logrosso assists a stranded motorist off Interstate 55 near Sherman, Illinois, during an extreme winter storm in February this year.

US Army/Staff Sgt Kassidy Snyder

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wireless telecommunications industry that no consistent increases in health risk exist from exposure to radiation unless the intensity of the radiation is sufficient to heat body tissue," says the IAFF. "However, it is important to note that these positions are based on non-continuous exposure of the general public to low-intensity radiation emitted from telecommunications base stations." It insists that IAFF members are concerned about the effects of being stationary directly under these antenna base stations for a considerable period of time and on a daily basis. The organisation wants more research to take place into potential health risks to firefighters.

It was with a view to improving the protection the textile industry may be able to offer to first responders that Hohenstein Institute set up this new project, which it carried out with the support of the German Textile Research Council in Berlin. In the treatment method it has come up with, fibres are endowed with the ability to screen out EM and IR dosing or by coating them with indium tin oxide (ITO), a transparent oxide compound, also used in the touchscreens of smart phones. In tests, the textile treatment proved to be resistant to washing, abrasion and weathering. It was also possible to prove that the treatment was not biologically harmful, and nor did the garments become uncomfortable to wear.

Project leader, Dr Edith Classen, believes the innovative fabric will be used primarily for occupational clothing. "These novel materials are not only extremely effective at screening radiation but they also conduct electricity so they are anti-static," she explains. "This makes them ideal for use in personal protective equipment (PPE), including for firefighters, as well as workers in foundries and welding workshops, in the semiconductor industry or for maintenance staff working on telecommunications systems."

However, Dr Classen can also see many potential applications in domestic and technical textile products. "You could imagine making roller blinds that not only screen out solar radiation in summer to keep the room cool, but at the same time offer protection from the electromagnetic radiation from mobile phone masts in the vicinity."

The Hohenstein Institute says materials made using the technique it has devised might also be of interest in military applications: if used to make uniforms for military personnel, they could make the wearer 'invisible' to infrared cameras while also offering protection from electromagnetic radiation.

Flame-retardant finishes

In another example of applying protection as a value-add, Israeli company ICL Industrial Products has launched its own range of flame-retardant textile finishes, TexFRon. These products are water-based dispersions designed to meet flame retardant requirements for a broad range of fabric finishes. The series includes four products: TexFRon 9025 and TexFRon 9020, which are flame retardant solutions for soak-and-wash-durable FR coating and back-coating formulations; and TexFRon P and TexFRon P+, which are solutions based on acrylic co-polymer emulsions with chemically-



Professional bodies representing their firefighters in the US and Canada have asked for more research into the difficulties that continuous exposure to radio waves might pose.

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A technician at the Hohenstein Institute analyses fibres that can protect first responders from electromagnetic and infrared.

Hohenstein Institute

bound bromine. They are designed to enable textile formulators and finishers to produce cotton and polyester fabrics that, according to ICL, are flame-retardant and can withstand up to 50 laundry cycles.

Gold print

For French textile finishes company HT Concept, printing is the answer. It says it can "print onto any fabric" its Gold Reflect and Silver Reflect solutions. The idea behind this technology is to incorporate into a polyurethane binder a compound based on a combination of metallic oxides. Because it can be applied to a wide range of textile fabrics, it allows manufacturers to add the benefits of bioceramics to their clothes. One of those benefits, although by no means the only one, is flame resistance. On this occasion, the starting point was an application in motorsports rather than military, but trials for fire service personnel in Europe will take place in the near future.

A parallel product that has attracted military attention (although for a different kind of protection) is HT Concept's Reflect Line, which has micro-particles of aluminium in powder form as its secret ingredient. The aluminium forms a membrane between lining and an external fabric that is 79% polyamide and 21% polyurethane, which prevents wind, rain and ultraviolet radiation from the sun from coming through from the outside, and reflects heat energy back to the body.

The company's chief executive, Thierry Haim, explains that Reflect Line, having worked well in workwear to provide heat insulation functionality for workers in cold environments, has become of interest to sleeping-bag manufacturers supplying the special forces of the military departments of a number of countries, including India. Indian soldiers have a requirement to withstand the temperatures of the Himalayas; Mr Haim says sleeping bags equipped with Reflect Line have performed successfully during trials at -65ºC. And to go with the sleeping bags, special French forces working in Afghanistan have shown an interest in combat shirts that incorporate the aluminium membrane. Military needs have driven innovation throughout the history of performance textiles. Even in times of peace, soldiers have to brave the most extreme conditions and are often among the first to respond to unexpected events such as winter storms.

The range of options available reflects a wide interest in personal protective equipment at the moment. At the start of this year, the Industrial Fabrics Association International (IFAI) responded to this increase in interest by rebranding its protective division; it's now called Safety and Technical Products (S+TP). In a similar way, testing and research centre SATRA, has launched its own online guide to personal protective equipment. The guide explains regulations and directives from the European Union in this area and makes clear what suppliers have to do to meet them. It can also help buying organisations understand the benefits of different products. With the market awash with so many PPE alternatives, the guide should prove useful.

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