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PPE Update

Firefighting gear: Is it time for large changes?

Here's a hard look at the barriers prohibiting meaningful PPE innovation

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"Don't fix what is not broken" is a common phrase used to impede change or at least to question change for change's sake. If we look at the turnout clothing industry, we actually see a product range that is relatively mature with continual, gradual improvements.

In essence, gear is pretty much the way it has been for more than two decades. Yes there are the occasional blips where something new comes along like barrier hoods, and novel improvements can bring about an interesting materials or features.

For the most part, the vast majority of the fire service seems to be satisfied with current state of technology for turnout gear. But the reality is that we live in a rapidly changing world, and we are constantly affected by new discoveries and technological developments.

The current situation leads to two questions: why are there not larger changes afoot in the industry, and what types of changes might the fire service be missing out on?

Change comes about usually because of firefighter needs or a new technology becomes available that supplants the old technology. In the early 2000s, SCBA went through a tremendous change when there was a perceived need that there needed to be chemical, biological and radiological protection as part of the SCBA.

This need drove some significant changes in how SCBA were designed and the materials used in their construction. At about the same time, it became possible to incorporate a heads up display that allowed a more effective means for firefighters to monitor their air levels.

These changes occurred for two different reasons. In the first case, there is the perception that firefighters would be the first on scene to a weapons of mass destruction event. The second change came about due to an advancement of technology.

Impediments to change

So why have there not been more dramatic changes in SCBA? Yes, some new technology has recently included different types of air cylinder options. Further, one manufacturer recently introduced a thermal imaging camera as part of its SCBA system.

But what about all the other things that we have often heard about such as liquid-air systems or low-profile SCBA? Some of these technologies made the news many years ago but never came to fruition.

The answer is that the product technology may have matured. It is also that the standards that govern these products have matured to the point that they often constrain new technology rather than encourage further development.

In the case of liquefied air system, the technology offered a weight-efficient air supply with the prospect of providing enhanced cooling technology simultaneously.

Yet, there are several requirements in NFPA 1981 that have prevented the introduction of this technology. Certainly, there were a variety of other significant issues affecting its implementation such as the need for completely different air fill stations and infrastructure changes in how SCBA are maintained.

More recently, an effort to introduce low-profile SCBA failed when it became increasingly clear that the lower profile system was no lighter or less bulky than conventional SCBA. For the low-profile SCBA, the culprit was a Department of Transportation regulation that affected the burst strength of the cylinders, thus negating some of the technological advantages of new materials that were held to pre-1960 technology requirements.

Unyielding regulations

Similar, more obvious impediments exist that discourage potential better-protective products. While NFPA 1981 addresses fire service SCBA, the same SCBA must meet the more industrial based criteria enforced by National Institute of Occupational Safety and Health.

For example, NIOSH has a maximum 35-pound weight requirement on SCBA. Now certainly 35 pounds is a lot of weight and is best that any respiratory system be kept to the lowest possible weight.

Yet, anything that becomes attached to the SCBA, such as a personal alert safety system or a thermal imaging camera, is included within that weight limit. If in the future, manufacturers want to incorporate the facepiece as part of the helmet, the helmet is included in the weight limit.

It does not matter to NIOSH if the item that is part of the respirator is completely independent in its operation and does not contribute to respiratory protection. Or more importantly, if it achieved a better distribution of weight on the firefighter — the regulation is the regulation and NIOSH is currently inflexible in its interpretation.

Another impediment to change has been the fire service culture. We have repeatedly seen how new products that deviate in appearance from what is considered traditional have slow acceptance.

One of these has been the European style helmets, which are generally more streamlined, lighter weight and sometimes offer advantages on integration of eye and face protection more efficiently than their American counterparts.

Tradition dies hard. In some cases it is just a matter of time, like the idea that dirty turnout gear was a badge of honor showing the relative experience the firefighter. Fortunately, firefighter culture is becoming less of an impediment, but it still exists.

Component mentality

So if the fire service is not seeing technology improvements that it can, what is on the forefront that should be sought out and bought into use?

The biggest problem facing the fire service in terms of its protective clothing and equipment is the lack of an integrated approach. Integrated protective approach means that the clothing items and related equipment are designed to work together as a system.

On occasion, we see attempts to integrate products in a fashion that allows for better interoperability and more consistent performance. This has been partly facilitated by some government research programs as well as private endeavors.

Right now, each individual fire department acts as its own integrator by buying separate garments, helmets, SCBA, gloves, footwear and other equipment to be worn together to provide the needed protection.

The industry is focused on the individual elements and materials of the ensemble without considering the overall ensemble itself. This philosophy leads to a breakdown in protection and often over encumbers the firefighter at the expense of emerging technology that could be better implemented.

For example, IAFF showed in its 2015 particle testing of an ensemble just how easily smoke entered the gear primarily through the different interface areas. So far, the industry reaction has been the barrier hood that, while addressing a particular vulnerable area of the body, does not solve the entire problem that can only be addressed by a full system approach.

An integrated approach can address major areas of concern such as ensuring uniform thermal protection and minimizing the stress impact of the clothing and equipment on the firefighter. It could do this by judiciously applying designs for an appropriate level of tradeoffs between protection and physiological stress and comfort created by wearing the clothing system.

As long as the fire service relies on piecemeal standards as exists today, it will be difficult for new technology to emerge. It is our hope that the fire service will move towards systems requirements, testing and a more holistic approach for the promotion of improved personal protection.

Post script

It is with deep regret that we report that passing of retired Chief Charles Soros, with the Seattle Fire Department from 1967 through 1994.

We worked with Chuck both when he was with the fire department on a number of protective clothing matters during the 1980s where he chaired a subcommittee on station uniforms and then headed the committee on fire service SCBA.

Chuck was further our alternate on the technical committee on structural fire fighting clothing and equipment for several years in the 2000s. Chuck had a forward way of thinking for the fire service and we will miss him.

About the author

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Jeffrey and Grace Stull are president and vice president, respectively, of International Personnel Protection, Inc. They are members of several NFPA committees on PPE as well as the ASTM International committee on protective clothing. Mr. Stull was formerly the convener for international work groups on heat/thermal protection and hazardous materials PPE as well as the lead U.S. delegate for International Standards Organization Technical Committee 94/Subcommittees on Protective Clothing and Firefighter PPE. They participate in the Interagency Board for Equipment Standardization and Interoperability and have authored the book, "PPE Made Easy." Send questions or feedback to the Stulls via email.

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