INDUSTRIAL FIRE JOURNAL

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Draft Policy of *Management of Firefighting Foam* could be a game changer

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IWMA International Water Mist Association

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Front cover
Darren Small: www.smallphoto.co.uk

INDUSTRIAL FIRE JOURNAL FIRE & RESCUE FIRETRADE EUROPE 2013 FIRETRADE ASIA & MIDDLE EAST 2013

Editor's comment

'There is never a dull moment with foam' is something I often hear from people in the industry and just as things looked like settling down along comes the new draft Policy, Management of Firefighting Foam. Environmental protection regulators in the states of Queensland and Western Australia are currently seeking views (by 30th March) on their second draft Policy. Considering that it is undoubtedly the most comprehensive and thoroughly researched draft policy paper put together on this subject to date, it is highly likely that environmental regulators around the world will pick up on the salient points and take note of the wide range of scientific knowledge that has been referenced throughout both the draft Policy itself and the accompanying explanatory notes, which themselves contain some fascinating insight (we've picked out some examples in this issue of IFJ).

Just as environmental concerns and increasing scientific knowledge threaten to tectonically shift current attitudes to foam management, the possibilities afforded by advances in machine-to-machine communications are beginning to make themselves felt in fire protection technology. The integration of Cloud technology within fire systems adds an extra layer of safety by immediately informing safety officers that their fire protection systems are at fault or worse. In an industry that prides itself in preventing disasters, this can only be welcomed with open arms.

Jose Maria Sanchez de Muniain, Editor.

SHIPBOARD AUTONOMOUS FIREFIGHTING ROBOT

In Mobile Bay, Alabama, Virginia Tech engineering students made history during a demo that placed an adult-sized humanoid robot with a hose in front of a live fire aboard a US Navy ship.

SAFFiR the robot (short for Shipboard Autonomous Firefighting Robot) stands five feet 10 inches tall and weighs about 140 pounds. Its vision is threefold: stereo camera, stereo thermal imaging to see through smoke and detect heat, and laser rangefinder for accurate mapping.

The demo, four years in the making, is part of a new effort by the US Navy to better assist sailors in fighting fires, controlling damage, and carrying out inspections aboard ships via user-controlled unmanned craft or humanoid robots. The firefighting SAFFiR and the US Office of Naval Research envisions a future — long off, but tangible — in which every ship has a robot as a tool for firefighters.

'It's not going to replace Navy firefighters, it's going to assist Navy firefighters,' said Viktor Orekhov of Morristown, Tennessee, who graduated in December 2014 with a doctorate in mechanical engineering.

FOUR DESIGN ISSUES IDENTIFIED IN METHYL MERCAPTAN RELEASE

The US Chemical Safety Board has released an update on its ongoing investigation into the fatal methyl mercaptan release that took place at the DuPont facility in La Porte on November 15, 2014.

Four workers were killed during the release of what DuPont says were more than 23,000 pounds of methyl mercaptan, a highly toxic, flammable, and volatile liquid.

Four design issues were identified by CSB investigators.

Firstly, the process included several interconnections between the methyl mercaptan supply line and a chemical vent system, which allowed a toxic leak into an unexpected location, where workers were exposed with fatal consequences.

Secondly, the chemical vent system – which was intended to safely remove harmful vapor from process vessels – had a design shortcoming that allowed liquid to accumulate inside. This liquid regularly caused pressure buildups in the vent, and the liquid needed to be manually drained by operators to prevent safety issues from interconnected equipment, such as reactors.

Thirdly, the vent drain that operators had to use was open to the atmosphere, meaning that workers were exposed to whatever chemicals were drained from the vent system.

Lastly, the building was designed in such a way that even had ventilation fans been working on the day of the accident, they would not have protected workers from chemical exposure. 'And we found that those vents were not, in fact, working at the time of the accident,' said CSB Chairperson Rafael Moure-Eraso, adding that regulators and companies should place greater emphasis on making designs as safe and possible and updating them on a constant basis.

According to Moure-Eraso, not only DuPont 'but the industry as a whole must do much better. Complex process-related accidents with tragic results are taking place across the country at companies of all sizes.'

FIRST METHANOL-POWERED SHIP SOON TO PLY ACROSS BALTIC SEA

The world's first ship to run on methanol will soon sail international waters.

The Stena Germanica vessel will carry vehicles and passengers across the Baltic Sea, which is a Sulphur Emission Control Area with strict emissions regulations.

Many shipping companies have chosen LNG to meet these requirements and avoid gas after-treatment. Benefits of using methanol include simpler transportation and storage because the fuel is liquid at room temperature.

The fire risk assessment was performed by SP as part of the methanol conversion project at Stena, involving classification society Lloyd's Register, engine manufacturer Wärtsilä and ship designer ScandiNaos.

The new fire safety design of the Stena Germanica was approved by the Swedish Flag in January 2015.

READING LIST:

TEAM LEADERSHIP IN HIGH-HAZARD ENVIRONMENTS BY RANDY E CADIEUX HAS BEEN PUBLISHED BY GOWER

Safety performance is a complicated issue particularly in high-hazard environments where time and other constraints, as well as impacts can be exaggerated. From an organisational and business perspective, safety and production/performance are often seen as competing goals. *Team Leadership in High-Hazard Environments* recognises these difficulties and constraints and proposes an approach to safety leadership in which safety and organisational performance are inextricably linked.

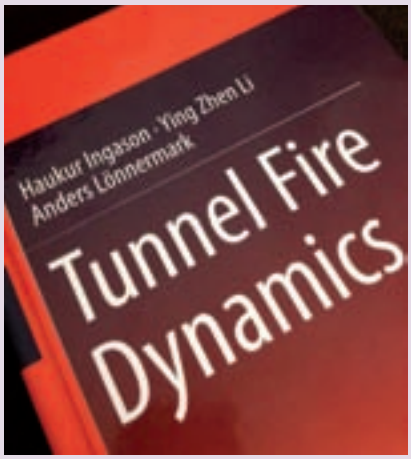
This is what William Mitchum, our guest book reviewer, had to say about the book:

'The information related to safety I found especially poignant, and I began highlighting quotes that expressed thoughts that had gone through my head on several occasions: "Safety is often measured by the mishaps that do not occur, which is intangible and extremely difficult to count. Even examining safety based on trends and accident rates is problematic and does not always accurately reflect how safe an organisation really is."'

For further details, visit www.gowerpublishing.com/isbn/9781472433534.

TUNNEL FIRE DYNAMICS AIMS TO IMPROVE THE UNDERSTANDING OF FIRE SAFETY ENGINEERING IN TUNNELS

A wide range of issues related to fire safety engineering in tunnels are covered in Tunnel Fire Dynamics by Haukur Ingason, Ying Zhen Li and Anders Lönnermark, including phenomena related to tunnel fire dynamics, the latest research, as well as detailed solutions to major issues with examples for calculations.



Tunnel Fire Dynamics is written for engineers and/or public officials with responsibility for tunnels, and according to the publishers it would also be of interest to fire protection engineers interested in evolving technical principles of fire safety.

It is available at http://www.springer.com/engineering/civil+engineering/book/978-1-4939-2198-0

BUSINESS NEWS

On January 18, 2015 Fire Fighting Enterprises officially became FFE

Known the world over as a specialist in smoke and flame detection through its Fireray and Talentum product brands, FFE used Intersec Dubai as the platform to announce its rebrand. FFE's managing director Mark Osborne commented: 'We're putting more focus on our two world-renowned product brands – the Fireray optical beam smoke detector and the Talentum flame detector.'

FFE introduced the first Fireray optical beam smoke detector over 30 years ago and in 2013 integrated the Talentum flame detector range. These products protect some of the most iconic buildings in the world, including the White House, Buckingham Palace, Dubai Airport and the Al-Aqsa mosque in Jerusalem, as well as countless industrial installations worldwide.

Bristol Uniforms installs washing and decontamination unit

In a further extension to its in-house managed services facilities, Bristol Uniforms has installed a new washing and decontamination unit for hard PPE items which will be especially suited to boots, helmets and supporting frames for self-contained breathing apparatus (SCBA). The new equipment allows items to be washed in an entirely enclosed chamber into which bagged contaminated items, such as firefighter boots and helmets which may have come into contact with blood borne pathogens or asbestos, can be opened and thoroughly cleaned and decontaminated.

Edward Shepherd, Bristol's Service Operations Director, said, 'This new facility will enable us to provide the decontamination process as an integral part of our service, where required.'

Lübeck-based Dräger marks its 125th year anniversary

Lübeck-based Dräger has marked its 125th year anniversary with a series of special anniversary events for customers and partners across the world. 20 events have been held as far afield as UAE, India, Brazil, Thailand, Mexico and China.

In the UK, delegates gathered at the National Motorcycle Museum in Solihull on 19th November to help Dräger celebrate '125 years of heartfelt dedication'. Stefan Dräger, Executive Board Chairman and the fifth generation of the family-run business, shared with guests some moments in the company's history and outlined some key milestones during the last 125 years. Among the guest speakers was world renowned expert Lord Robert Winston, Professor of Science and Society and Emeritus Professor of Fertility Studies at Imperial College London, who gave an entertaining and enlightening talk on innovation.

Scott Safety acquires Industrial Safety Technologies

IST is a gas and flame detection company that was part of Battery Ventures. The Tyco purchase price was $329.5 million in cash. The combination of IST and Scott Safety makes Tyco one of the largest global designers and manufacturers of gas and flame detection products.

IST has shown a strong commitment to innovation in industrial safety solutions with products such as wireless gas-detection technology and the first SIL3 certified triple-IR flame detector. Jeff Emery, director of Marketing, Scott Safety, commented: 'This acquisition will enable us to accelerate new product development, expand our geographic presence, deepen our technical expertise and broaden our product offerings and service capabilities.'

Local residents around **Rosenbauer's** headquarters in Leonding near Linz (Austria) have reported seeing a strange psychedelic Panther. According to Rosenbauer more will be revealed at Interschutz in the Summer, but it admits that a new vehicle is sporting a special film coated with squiggles that deceive the human eye by making horizontal and vertical lines virtually impossible to distinguish. 'Big cats in the wild are similarly well camouflaged and in the case of the brand-new Panther, as is usual with other automotive industry prototypes, this patterning is intended to hide its actual appearance. However, it should be noted that this is the first time that a prototype fire truck has been so disguised,' said a spokesperson.

The truck features a remodelled front section as well as new extinguishing technology consisting of two new high-performance pumps and monitors. The flagship vehicle will be available in both 4 x 4 and a 6 x 6 versions.

An innovative, latest-generation update to **Ramtech Electronic's** wireless fire alarm system has been designed to enhance safety on construction sites.
Described by Ramtech as the only wireless fire alarm system with a three-year battery life specifically designed for construction sites, WES+ is also unique in being specifically engineered to comply with EN54.

The system comprises a range of interconnecting radio units incorporating fire call points, active heat and smoke detection, and monitoring base stations, as well as an app that facilitates reporting and configuration. The WES+ app can be used on any Android tablet and is downloadable via Google Play.

E2S Warning Signals has gained VdS approval and CPR compliance for its AlertAlarm D112 alarm horn sounder by testing to EN54-3.
It combines the field-proven electronics of its AlertAlarm A series with a robust, corrosion resistant marine grade LM6 aluminium alloy enclosure, giving greater mechanical and UV protection. The VdS approval covers the five most commonly used fire alarm warning tones and also confirms that the units operate to specification under conditions of dry and damp heat, cold, shock and vibration.

UL approved versions for general signalling are also available with an aluminium enclosure sealed to IP66, NEMA Type 4, 4X and 3R.

BS&B has introduced its new platform of flame arrester/relief vent products and services, which will be sold under the name **BS&B FlameSaf**. FlameSaf encompasses both pressure/vacuum relief devices and flame arresters in accordance with API 2000, EN ISO 16852, NFPA 30 and 69. Mark O'Connor, General Manager for Tulsa-based (Oklahoma) BS&B FlameSaf Limited, commented: 'While working with client applications for overpressure and venting systems, we were frequently asked about deflagration and detonation flame arresters with many of our customers expressing interest in being able to procure them from BS&B. We listened; and through the natural progression of providing proven solutions for explosion protection for our clients, the FlameSaf product line of tank vents and flame arresters was born.'

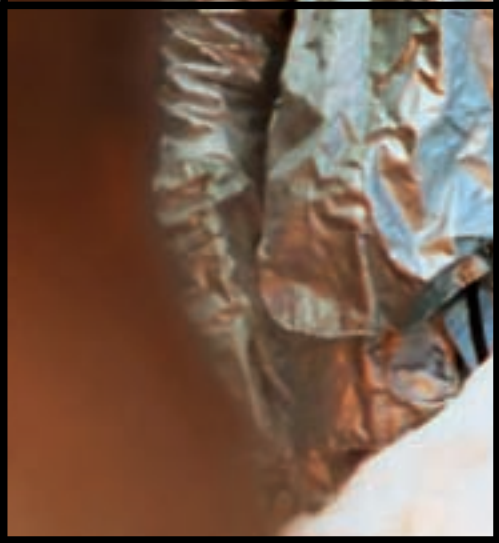
INSTALLATION NEWS

Fire detection manufacturer Patol is to supply infrared transit heat sensors to a manufacturer of glass coating machinery. Patol's 5610 sensors will be installed in Glasscoat International's glass coating machines, where glass bottles travel on a conveyor through a curtain of flames before entering the paint-coating chamber. It is at this point that the Patol 5610 is installed, connected to the line's automation system. The sensor will quickly bring the whole line to a stop if abnormally high temperatures are detected. It is ideally suited to this application as it only senses moving heat and remains uninfluenced by any stationary heat generated by the equipment in the surrounding area.

Wintershall has chosen Spectrex SharpEye 40/40I IR3 detectors for their new RAVN unmanned platform that will serve in the Danish part of the North Sea. Wintershall Holding GmbH is the largest crude oil and natural gas producer in Germany. The company, based in Kassel, Germany, is a wholly owned subsidiary of BASF. The SharpEye detectors were installed to provide high performance detection of the entire rig. IR3 optical flame detection uses three IR sensors to monitor the chosen area, where one sensor detects the infrared radiation emitted by the hot CO2 product of a fire and the other two reference sensors are sensitive to background radiation at a longer and shorter wavelengths, both analyzed to ensure that the pattern detected matches that of a real fire situation.

Exova Group has won three major contracts to conduct materials testing and fire safety engineering for the new Doha Metro in Qatar. Worth over £3.7m ($4.5m), the contracts will see Exova deliver a programme of materials testing for key infrastructure, as well as specialist fire strategy and consultancy. The new Doha Metro is currently under construction with phase one on course to open in 2019. On completion in 2026, the new system will consist of four lines, covering 132 miles and serving 85 stations.
The contracts, which range up to three years in duration, include bespoke laboratory-based and on-site materials testing. A programme of associated soil and environmental chemical analysis will also be undertaken to ensure compliance with environmental regulations. Exova Warringtonfire will also undertake concept design validation, fire strategy and CFD modelling.

Turkey's most visited attraction has upgraded its fire system. The Hagia Sofia, built in Constantinople almost 1,500 years ago and a landmark of global importance, has been protected with a fire system upgrade installed by Advanced partner D Sistem. An Advanced MxPro 4 fire system has been installed, supporting optical smoke and air sampling detection, and a range of input and output devices.
MxPro 4 is Advanced's benchmark panel and is EN54 2 & 4 approved, and can be easily upgraded in the future. Its partner Advanced's MxPro 5 is EN54 2, 4 and 13 approved and is backward compatible with the MxPro 4.



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17-19 MARCH, STOCEXPO, AHOY, ROTTERDAM, THE NETHERLANDS

StocExpo 2015, the largest dedicated event for the world's terminal operators, oil companies, traders and regulators, returns to the Ahoy, Rotterdam, with over 200 leading international suppliers, all looking to showcase their latest innovations to the wider market.
Elmac Technologies will be exhibiting its new LCA and LEA series of flame arresters, designed to prevent the spread of pipeline explosions in their initial stages, when flame velocities and associated pressures are at their lowest. The new ranges minimise the impact of using a flame arrester on the process, meaning higher flow rates are achievable with smaller flame arresters, plus they are small, light and easy to maintain. On display at the FUXS stand will be its eXess Floating Roof solution, which can extinguish tank storage fuel fires by stopping the flames, and reducing temperature and energy. It combines an aluminium mesh and fire suppression product with a high quality foam.
The StocExpo 2015 exhibition runs alongside a two-day conference programme, with 30 global authorities from the bulk liquid storage sector. Experts from companies such as TanQuid, KG, Mercon, TopTank, Oiltanking North America and Petrol Storage Broker will focus on opportunities for growth in the tank storage industry.
For more information visit: www.stocexpo.com.

15-16 APRIL, THIRD ANNUAL TUNNELS FIRE SAFETY FORUM, CROWNE PLAZA AMSTERDAM – SCHIPHOL, THE NETHERLANDS

Once again the Tunnels Fire Safety forum will bring together industry leaders as well other experts who are deeply involved in tunnels fire prevention and safety protection projects. Under one roof speakers and delegates coming from 20+ countries will meet to discuss the latest developments, regulations, research and new technology that impacts their daily work and also to gain a better understanding of the critical strategies needed in the world of tunnels. This highly interactive platform is ideal for TSOs, infrastructure operators, firefighters, safety officers, professors and researchers as well as government and municipality representatives who are looking to not only have vast networking opportunities but also gain further understanding of what safety in tunnels really means.
Key topics: ❖ Spotlight on infrastructure operators experience ❖ Presentations about latest research and development ❖ Transportation of dangerous goods ❖ Metro design safety regulations ❖ Accident management ❖ Evacuation and emergency egress ❖ Intervention of fire in tunnels ❖ Structural passive fire safety

For more information visit: http://hse.flemingeurope.com/tunnels-fire-safety-forum/program.

8-13 JUNE, INTERSCHUTZ, HANNOVER, GERMANY

The biggest fire exhibition in the world is expected to attract around 1,300 exhibitors from around 40 countries in halls encompassing a massive 90,000 m².
Staged every five years by Deutsche Messe, Interschutz 2015 will take place in Hannover, the capital of the federal state of Lower Saxony in northern Germany. Among the exciting events planned is the competition for the Toughest Firefighter Alive, which combines tough competition and athletic prowess with a spectacular show (see www.tfa-germany.de). Also on show will be the German High Rope Rescuers Championships on 13 June.
Fire prevention, disaster relief, rescue and safety and security are the four thematic cornerstones of the event.
The Fire Prevention area embraces a broad spectrum of products and services ranging from fire prevention equipment to firefighting appliances for airports.
Disaster Relief embraces a diverse range of solutions extending from special equipment for the preparation of safe drinking water to innovative software for managing operations.
Within the Rescue exhibition area manufacturers of vehicles and medical equipment will showcase their solutions alongside practitioners of emergency medical care and first aid.
For the first time Interschutz will be staging a professional forum entirely dedicated to fire prevention, while Hall 26 will house a forum for rescue professionals.
For more information visit: www.interschutz.de/home.

22-25 JUNE, NFPA CONFERENCE AND EXPO, MCCORMICK PLACE, CHICAGO, USA

NFPA's Conference & Expo is widely regarded as the most comprehensive industry event for many professionals in the US — from architects, engineers, contractors, and building managers to public and private fire service, enforcement agencies, insurers, and utilities.
More than 120 topics will be presented during the conference, covering topics that include:
▪ Codes & standards ▪ Detection and notification ▪ Fire suppression ▪ Emergency preparedness/business continuity ▪ Fire protection engineering ▪ Fire and emergency services ▪ Building and life safety ▪ Loss control/prevention

The 2015 NFPA Conference & Expo brochure is ready to download from the conference website.
New features this year include a brand-new format adopted for the Keynote Address based on TED Talks (three speakers, 20 minutes each); the introduction of a series of panel discussions that delve into the proposed changes to NFPA 13 and NFPA 72; and the inclusion of innovation sessions highlighting design advancements, performance enhancements, and emerging applications in specific product areas.
For more information visit: http://conference.blog.nfpa.org.

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For more information visit: rehealingfoam.com

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Foam in Australia

Is fire fighting foam policy in parts of Australia about to get much tougher? Comment sought by the 30th of March on the second draft of Management of Firefighting Foam Policy.

The draft policy has been prepared by the Queensland Department of Environment and Heritage Protection in conjunction with the Western Australia Department of Environment Regulation.

The first draft of the policy was released for stakeholder comment in early 2014. The second draft includes issues raised by the first, and takes into account further research.

According to the Queensland Department of Environment and Heritage Protection, if implemented, the policy for both states would be practically the same, with differences primarily in references to specific state legislative and regulatory requirements.

The evidence-based draft has been compiled with input from a wide range of Australian and overseas regulatory agencies, researchers and experts. It has been hailed widely as the most the most comprehensive and thoroughly researched policy document of its type to date.

The draft policy – which is fully referenced and supported with scientific evidence – outlines the requirements and expectations for the handling, transport, storage, use, release, waste treatment, disposal and environmental protection measures relevant to the use of fire fighting foam.

Of particular concern regarding foams, says the draft, is the growing evidence that fluorinated organic compounds commonly used in some Class B foams pose 'significant risks to the environment through their persistence, bioaccumulation potential and toxicity.'

Outlined are a number of considerations that end users must take into account when choosing and procuring foam:

- composition of the foam and appropriate effectiveness for the intended application
- types and quantities of concentrate to be held on site
- potential volume of firewater that could be generated during an incident
- ability to manage and contain spills and firewater on site
- measures to prevent release of contaminants to soils, groundwater, waterways and air
- facility location and proximity to environmentally sensitive areas
- circumstances under which an intended or unintended release might occur
- pathways for foam and other incident contaminants to be released to the environment
- potential PBT (persistent bioaccumulative toxic) and BOD (biochemical oxygen demand) impacts on the local and wider environmental values
- on-site and off-site treatment and disposal of wastewater and contaminated materials
- remediation of contaminated soils, waterways and groundwater
- training, maintenance and testing needs and requirements.

That a prime consideration when choosing a foam is its effectiveness for the intended application in terms of providing adequate levels of performance, safety and property protection, is recognised by the draft policy.

Foams that do meet appropriate performance standards must be compared in terms of a net environmental benefit analysis 'to select the optimal combination that also best addresses the relevant environmental protection standards and overall best practice.'

Foam must be assessed in term of the foam's properties relative to:

- Environmental persistence of the compounds in their formulation and any breakdown products.
- Biopersistence, bioaccumulation, bioconcentration and biomagnification potential.
- Toxicity (both acute and chronic effects).
- Biochemical oxygen demand and biodegradability.

The draft policy divides fire fighting foams into two parts – fluorine-free and fluorinated.

Fluorine-free foams

Fluorine-free fire fighting foams do not escape the tough requirements outlined by the draft policy; management; containment; and protective measures and procedures 'must be fully assessed'. Potential impacts from acute toxicity, biochemical oxygen demand and biodegradability characteristics should be taken into account.

However, disposal of small quantities (eg equivalent to 500 litres or less of concentrate) of (non contaminated) fluorine-free foam is acceptable eg irrigation onto adjacent land; holding in on-site ponds or drains for 28 days to degrade; pumping out to sewer or wastewater plant.

Fluorinated foams

The draft policy says that users must be aware of the composition of their foam, and it makes a distinction between fluorinated foams with a 6-carbon chain (so-called 'C6 foams'); and those with longer chains, which include PFOS, PFOA, and 8:2 and higher fluorotelomers.

As regards the latter longer chain length foams, PFOS must no longer be used, and foam containing PFOA or PFOA precursors 'must be withdrawn from service as soon as practicable.'

The draft policy says that C6 foams can be used 'if it is found to be the only viable option, after fire fighting effectiveness, health and safety risks, environmental protection and property protection characteristics have all be appropriately considered'. It then sets out the following stringent requirements:

- The foam must be C6 purity-compliant foam (according to policy definitions).
- No releases directly to the environment (eg to unsealed ground, soakage pits, waterways or uncontrolled drains).
- All releases must be fully contained on site.
- Containment measures such as bunds and ponds must be controlled, impervious and must not allow firewater, wastewater, runoff and other wastes to be released to the environment (eg to soils, groundwater, waterways stormwater, etc.).
- All firewater, wastewater, runoff and other wastes must be disposed of as regulated waste to a facility authorised to accept such wastes.

The draft policy highlights that all wastes containing fluorinated organic compounds – including C6 purity-compliant foam – must be disposed through a facility that is licensed to take regulated wastes.

Training foams

The draft policy makes no distinction between fire fighting foams and training foams, but it says that training foams must not contain any fluorinated compounds – with one exception. Where there is a requirement to train with the operational foam, the foam must be fully C6 purity-compliant. Any runoff containing fluorinated compounds must be contained and disposed as regular waste.

Fire extinguishers

The draft policy acknowledges that currently hand-held and mobile plant foam extinguishers mainly contain C8 fluorine-containing AFFF, and that 'there is a high probability' that this foam is discharged directly into the environment with no control of dispersal by users. It therefore sets out the following restrictions:

- Foam concentrate must not have a concentration of PFOS or PFOA in it higher than limits set by the policy.
- Foam concentrate must not have a concentration of PFOA precursors or higher homologues in it higher than the limits set by the policy (unless there is no other fluorine-free or C6 purity compliant foam certified for the particular use).
- All discharges of foam containing fluorinated organic compounds and the associated contaminated water, soils and other materials must be collected and contained for proper disposal as regulated waste whether discharges were from operational use or from testing and maintenance activities.
- Disposal of foams and wastewater containing fluorinated organic compounds must not be by discharge to the ground, drains or waterways.
- Disposal of foams and wastewater containing fluorinated organic compounds must not be to sewer or general wastewater treatment facilities. Disposal must only be to facilities capable of properly disposing of such wastes and the facility operator is made aware that the wastes contain fluorinated organic compounds.

Environmental acceptability

Environmental acceptability of foam is comprehensively outlined by the draft policy in terms of:

- Persistence in the environment.
- Biopersistence, bioconcentration, bioaccumulation and biomagnification potential.
- Toxicity (both acute and chronic impacts).
- Biochemical oxygen demand and biodegradability.

The draft policy calls for assessments to be undertaken for the combined formulation of all the ingredients, as intended for final use, and not just the principal ingredients or selected ingredients in isolation.

The onus is on the manufacturer and supplier to undertake testing and provide results to the user in the SDS of the foam.

Implementation

According to the draft, all foam users are expected to achieve compliance 'as soon as is reasonably practicable' from the date of approval of the policy. Full compliance should be achieved within two years of approval date.

Users unable to achieve full compliance are advised to apply for approval of an implementation plan as per the Environmental Protection Plan 1994.

You can download the full Draft Policy and Explanatory Notes from:

http://www.hemmingfire.com/news/fullstory.php/aid/2391/Draft_fire_fighting_foam_policy_for_Queensland_and_Western_Australia.html

EXPLANATORY NOTES: HIGHLIGHTS

The draft policy includes over 45 pages of evidence-based explanatory notes that list the current state of knowledge with regard to the environmental issues associated with fire fighting foams, and which should be read in conjunction with the draft policy.

Here are some highlights:

'All fire fighting foams are of concern if they are released to the environment; there is no such thing as a completely "environmentally friendly" foam as espoused in some marketing brochures.'

'The casual reader could be forgiven for thinking that PFOS and PFOA are the only two compounds of concern. It is very important, however, to realise that there are thousands of possible fluorinated organic compounds, and of those in use in some fire fighting foams only about 50 have been publicly identified so far with a similar or greater number of others currently remaining unidentified.'

'From an environmental standpoint it is highly misleading to describe fluorinated organic compounds as "degradable" which implies in general parlance to the non-specialist end-user that the product fully degrades and therefore it might be assumed that there are no residual persistent end-compounds of concern. This is not the case.

'The "degradation" of fluorinated organic compounds under environmental conditions only refers to the partial degradation or loss of the non-fluorinated carbons (usually a C2 dimethylene group) from some compounds and also, under specific conditions, limited partial de-fluorination adjacent to non-fluorinated carbon atoms, ultimately (and possibly through intermediate steps) leaving behind a persistent per-fluorinated compound.'

'Fire brigades should not have on hand or intend to use any fire fighting foam containing fluorinated organic compounds that is intended for application on an area where it cannot be fully contained and the wastes appropriately collected and disposed of later. For example, roadside fuel spills or rural fire brigade use on bushfires.'

'The legacy systems in place at existing large facilities almost certainly hold stock of foams such as fluoroprotein foams (FFFP) that are dependent on long-chain fluorotelomer (8:2Ft) PFOA precursor compounds for their effectiveness. These foams are not acceptable in the medium or long term as they effectively represent a potential release of PFOA to the environment (waterways, soils, groundwater, and atmosphere).'

'The practice of releasing fluorinated foam wastes to the ground during discharge tests of mobile plant systems is not acceptable and a breach of environmental regulations.'

'Similarly, biodegradable fluorine-free foams must not be released in a way that they are likely to cause environmental harm, such as by BOD impacts and acute toxicity effects if allowed to enter a body of water or groundwater.'

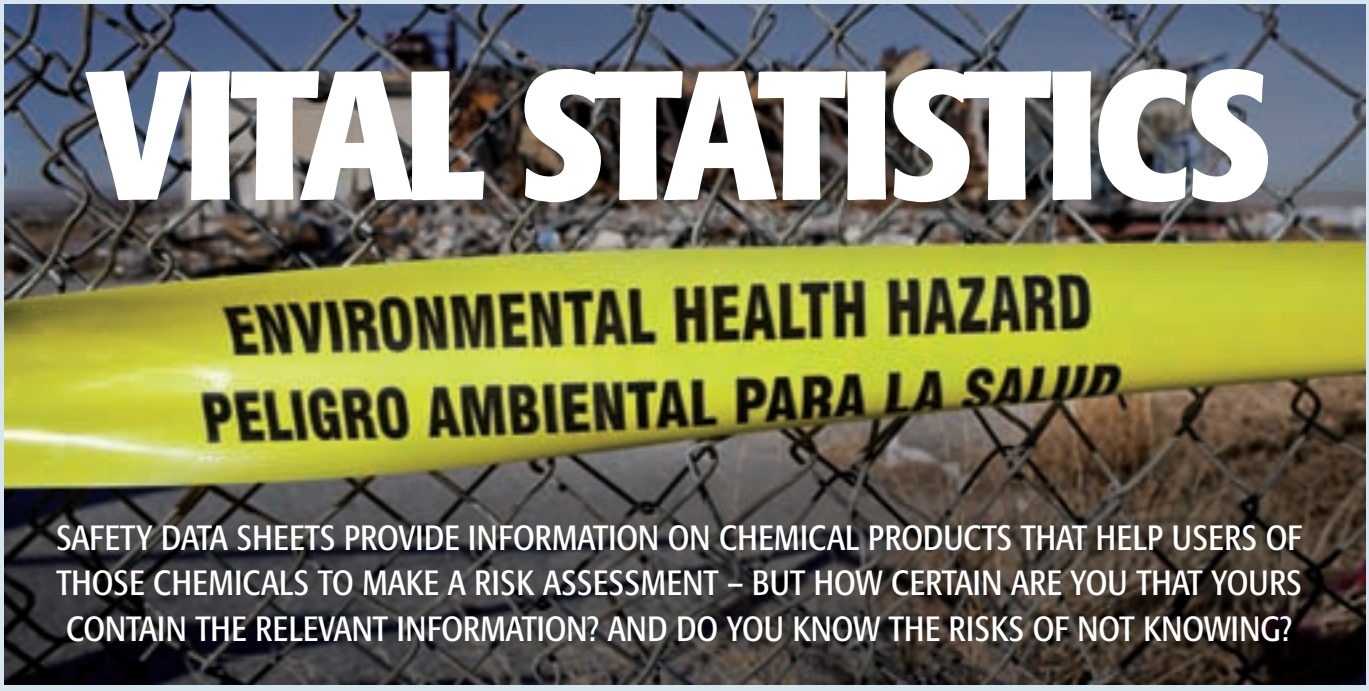
'Given the intense focus on the problems and risks identified with foams that use fluorinated organic compounds such as PFOS and PFOA in their formulations much discussion has been polarised in terms of "fluorinated" versus "fluorine-free".

'While this polarisation may be valid in terms of the differences in the underlying fire fighting mechanisms between the main foam types, the underlying issues from an environmental perspective, beyond the acute short-term toxicity and BOD effects applicable to all types of foam, are more correctly about the use and impacts of foams with:

- Persistent toxic compounds with potential to cause long-term adverse impacts.
- Non-persistent toxic compounds with short-term adverse environmental impacts.

It is quite conceivable that a fluorine-free, fire fighting foam could have long-term adverse impacts from the inclusion of persistent compounds or persistent breakdown products which may be toxic.'

VITAL STATISTICS



SAFETY DATA SHEETS PROVIDE INFORMATION ON CHEMICAL PRODUCTS THAT HELP USERS OF THOSE CHEMICALS TO MAKE A RISK ASSESSMENT – BUT HOW CERTAIN ARE YOU THAT YOURS CONTAIN THE RELEVANT INFORMATION? AND DO YOU KNOW THE RISKS OF NOT KNOWING?

Ensuring that the data that accompanies hazardous chemicals is correct is about to take centre stage at the Fire Protection Association Australia's annual two-day Hazmat conference in Sydney, 16-17, June. Here, the main theme is all about creating a safer world through ensuring required information is accurate, appropriate and available to anyone who interacts with dangerous goods and hazardous chemicals – firefighters and industrial emergency responders being likely users.

The main document that applies to foam (and other hazardous chemicals) is the Safety Data Sheet (SDS), as prescribed by the REACH Regulations, which tends to be long and complex.

There are some compelling reasons for companies that buy foam to take a renewed interest in Safety Data Sheets. The 'polluter pays' principle applies, which means that the buck stops with the end user.

Companies whose runoff foam ends up in a water course cannot put the blame on whoever supplied the foam if the chemicals are found to be environmentally damaging. There is no defence for the polluter if the data pertaining to environmental effect is missing from the Safety Data Sheet or if it is not sufficiently comprehensive; there is an obligation for the end-user to request relevant information in writing from the supplier where necessary. A potential defence may be found if the Safety Data Sheet provided by the supplier contained factually incorrect information.

The other issue highlighted below, however, is that in the vast majority of cases the data contained in Safety Data Sheets for foam concentrates is insufficient to satisfy regulators that a substance will not harm the environment. Faced with the uncertainty that arises from incomplete data, points out Roger Klein, regulators have no choice but apply the 'precautionary principle', which is basically that they assume the worst and make the polluter clean up.

So if you are a foam procurement officer and you haven't made sure you have a Safety Data Sheet that tells you what you need to know and what the regulators will want to know about the product, then you shouldn't be buying it or using it.

SAFETY DATA SHEETS – ARE THEY ENVIRONMENTALLY FIT FOR PURPOSE? BY ROGER A. KLEIN.

The structure and content of a product Safety Data Sheet (SDS, previously known as the Material Safety Data Sheet or MSDS) is prescribed by Article 31 of the REACH legislation and consists of sixteen sub-headings or sections[i]. Sections 10 (stability and reactivity), 11 (toxicological information), 12 (ecological information) and 13 (disposal considerations) are directly relevant to carrying out a suitable and sufficient assessment of environmental risk, with Section 12 of particular importance and discussed here.

The REACH Regulations[ii] requires that the supplier shall provide the recipient of a substance or preparation with a Safety Data Sheet (SDS) prepared in accordance with Annex II for materials (a) classified as dangerous (67/548/EC or 199/45/EC), or (b) satisfying either the PBT or vPvB criteria, or (c) for reasons other than (a) or (b). The supplier shall also provide the recipient on request an SDS, when not classified as dangerous (§5, §6, and §7 of 1999/45/EC), but contains substances (a) posing a hazard to human health or the environment ≥1% w/w for solids and liquids or ≥0.2% v/v for gases; or (b) present individually ≥0.1% w/w and which satisfy the PBT or vPvB criteria (Annex VIII), or that have been included for any other reason; or (c) for which there are workplace exposure limits. Articles 32 through to 36 of REACH impose various duties to communicate information up and down the supply chain, to allow access to information by workers, and an obligation to keep information. In particular it is important that formulators and suppliers of firefighting foam pass on any environmental or health warnings for individual components given by the feedstock manufacturer.

The usefulness of Safety Data Sheets for carrying out a suitable and sufficient assessment of environmental risk is compromised significantly by the let-out clauses contained within the REACH Regulations especially for complex formulations such as firefighting foams which may contain low concentrations of chemical substances or precursors for toxic pollutants that regulatory authorities would not wish to see released in a highly dispersive manner, e.g., during Fire Service operations, directly to the environment, for example, biocides, metal ions, or fluorochemicals.

Even when released in small amounts relatively low toxicity materials may exhibit long term effects and, if persistent, repeated discharge will cause an increase in concentration[iii].

It is important to stress that, from a regulatory point of view, lack of evidence for environmental harm cannot be equated with evidence for lack of environmental harm. This non-equivalence is the basis for the so-called 'Precautionary

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From a regulatory point of view, lack of evidence for environmental harm cannot be equated with evidence for lack of environmental harm.

Principle' in which the regulator errs on the side of caution in situations where either there are incomplete data covering persistence, bioaccumulation and toxicity (PBT) and/or when comparison with chemically similar compounds (either homologues or analogues[iv]) with known PBT profiles suggests a cause for concern. High environmental persistence such as exhibited by fluorochemicals and their ultimate degradation products, e.g., PFCAs, associated with unknown or uncharacterised long term effects, will trigger the precautionary principle. The EU Biocidal Products Regulations (EC 529/2012) underpin the importance of this principle '…Regulation should be underpinned by the precautionary principle to ensure that …. do not result in harmful effects on human or animal health or unacceptable effects on the environment…'.

So where does this leave us with Safety Data Sheets and the information needed for an assessment of environmental risk? What additional information is required by end-users or regulators?

It is necessary to have information on persistence, bio-accumulation, and toxicity, i.e., knowledge of the PBT profile. Data identifying environmentally persistent components, as well as their degradation products, needs to be included in the Safety Data Sheet. The trigger level for classification of a substance as persistent (P) is defined under REACH as having a half-life in marine water >60 days, in fresh or estuarine water >40 days, in soil or freshwater or estuarine sediments >120 days, or in marine sediments >180 days. Environmental persistence should not be confused with bio-persistence which has to do with biological clearance in a living organism. The criterion for vP is satisfied if the half-life in fresh, estuarine or marine water is > 60 days, or in soils and sediments >180 days. Bio-accumulation criteria are satisfied if the bio-concentration factor (BCF) is >2000 (B) or >5000 (vB). The toxicity criteria (T) rely on evidence for carcinogenicity, reproductive toxicity, or long-term chronic toxicity with NOEC <0.01 mg/l or where the classifications (T, R48) or (Xn, R48) are appropriate. Acute toxicity, although an issue with firefighting foams and frequently discussed in the technical press, may actually be environmentally less damaging than long-term effects but does need to be determined with environmentally relevant organisms, e.g., fresh or salt water, or location-specific species.

Currently REACH prescribes that only substances which satisfy simultaneously persistence, bio-accumulation and toxicity criteria (PBT) or are very persistent and very bio-accumulative (vPvB), must be listed in the SDS. This is not ideal for an assessment of environmental risk although inclusion in the SDS without all of these criteria being met can be justified based on '…reasons other than those referred to in (a) and (b)....' – see above.

All fluorochemicals in firefighting foam as well as any perfluorinated breakdown products are very persistent, with some also bio-accumulative and/or toxic. Lack of data on persistence (P), bio-accumulation potential (B), or toxicity (T) is not evidence of a lack of any environmental risk. Regulators tend to apply the 'precautionary principle' in such a situation.

Biological oxygen demand (BOD) is a measure of the oxygen requirement for microbial breakdown of the oxidisable components in a material. It is usually reported at 5 days or 28 days expressed as either mg O_2 utilised/gm or mg O_2 utilised/kg or litre, although there are a wide variety of other periods used in the industry, e.g., 7, 10, 15, 20 days.

The BOD at 5 days (BOD5)[v] is an indication of the acute oxygen stress, i.e., the initial rate of oxygen consumption, to which the receiving aquatic environment will be subjected. As such it is an important indicator of the likely damage to oxygen requiring organisms as it represents the initial rapid phase of biological degradation, which subsequently decays more or less exponentially over time finally reaching a plateau.

On the other hand the BOD at 28 days (BOD28) reflects the overall ultimate ability of biological organisms to degrade mainly organic components of the formulation but which may also include metal ions that can be oxidised, e.g., Fe2+ to Fe3+. The BOD28 value is used as a measure of biodegradability.

One is, however, caught between a rock and a hard place. A relatively low BOD5 is desirable in order to reduce acute oxygen stress. Equally a high value for BOD28, i.e., close to 100% of the chemical oxygen demand (COD), indicates ready biodegradability. Unfortunately one cannot have both! Either you have a relatively low BOD5 (low acute oxygen stress) associated with a low BOD28 (relatively slow biodegradation), or the opposite, a high BOD5 associated with a high value for BOD28. In many cases sacrificing 28-day biodegradability for a reduction in immediate acute oxygen stress and death of living organisms, may be environmentally the best option.

The chemical oxygen demand (COD) measures the total chemically oxidisable material, e.g., in the foam concentrate. The standard measurement involves oxidation with acid dichromate solution followed by back titration to determine the amount of dichromate consumed, and the calculation of the mg O_2 per kg or litre of material required for 'complete' oxidation. Unfortunately not all chemical compounds are susceptible to dichromate oxidation. In particular the perfluoroalkyl chains of fluorochemicals are chemically extremely stable because of the strength of the C-F bond and are not degraded. Very much stronger and non-standard oxidising conditions are required for cleavage and mineralisation to fluoride such as use of combustion in pure oxygen, catalysed persulphate, or sodium biphenyl. This means that the standard protocol COD values quoted for a foam concentrate will not include the fluorochemical component, often 10-20% of the total organic material present in a high specification AFFF. This in turn highlights the issue

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that marketing claims of near 100% degradability for fluorochemical-containing foams, such as AFFF, AFFF-AR, FP and FFFP, are quite meaningless and untrue. Moreover, a requirement for >99% degradation after 28 days for AFFF concentrates in the Australian DOD Procurement Guidelines makes no sense and is clearly in error.

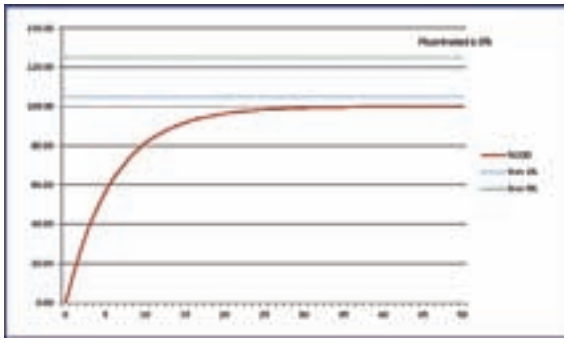
It is possible to calculate the COD for individual components of a foam concentrate. One of the most common bulk components in an AFFF concentrate is a glycol ether derivative, e.g., 2-(2-butoxyethoxy)-ethanol (C4H9OCH2CH2OCH2CH2OH; CAS# 112-34-5). The oxygen utilisation for complete breakdown to carbon dioxide and water is given by the stoichiometric equation

C8H18O3 + 11O2 ==> 8CO2 + 9H2O

Thus 162 g glycol ether requires 352 g molecular oxygen for complete oxidation to carbon dioxide and water and the COD is 2,172,840 mg O_2 per kilogram.

BOD and COD values for foam concentrate are usually given as mg O_2 per litre. The glycol derivative frequently represents the majority of the oxidisable organic material in a concentrate. With a typical glycol concentration of 20% w/w this would give a COD value, using the example above, of ~400,000 mg O_2 per litre just from the glycol component, comparable to many commercially available formulations. Recently introduced formulations from one small UK company that are described as solvent-free, i.e., contain no glycol derivatives, aim to reduce the total BOD/COD for the foam concentrate by some 40-60% to levels around or below the current lower limit for AFFFs.

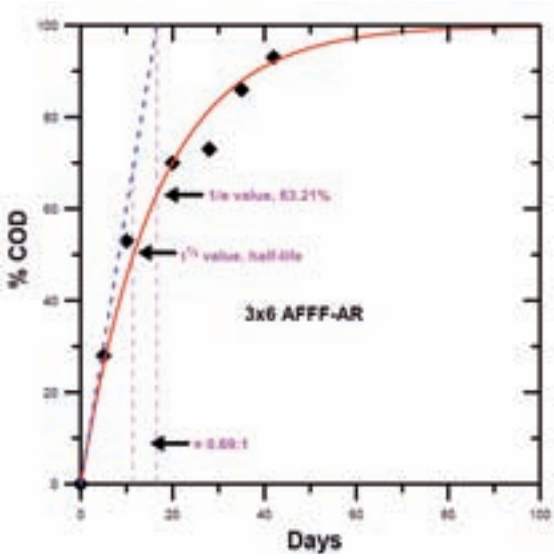
For Class A foams and fluorine-free Class B foams which contain just hydrocarbon surfactants one would expect the theoretical oxygen demand (ThOD) and the chemical oxygen demand (COD) to be essentially identical. This is not the case for fluorine-containing foams such as AFFF, FP or FFFP, as the fluorosurfactant and/or fluoropolymer content, although theoretically oxidisable, will not be detected by standard COD protocols using relatively mild (in chemical terms!) oxidation methods. Thus what appears to be complete biodegradation as evidenced by the BOD approaching 100% of the COD is an illusion since chemically resistant fluorinated materials remain, which are chemically stable and environmentally extremely persistent. This is illustrated in Figure 1 (below).



The minimum requirement for a suitable and sufficient assessment of environmental risk therefore requires both a BOD5 and a BOD28 value for the foam concentrate as sold and for individual end-user induction rates, i.e., 1%, 3% or 6%, together with COD values to be reported in the Safety Data Sheet in mg O_2/litre, as highlighted recently in the QLD/WA Draft Policy on Firefighting Foams. Additional BOD values are desirable especially if the foam biodegrades much faster or more slowly than the average. A full curve over 28 or 42 days is certainly a good idea if the degradation curve is not mono-phasic but shows multiple components.

How do current commercially available SDSs perform in this respect? It is mostly quite unusual to see both a short term BOD5 and long term BOD28 value for the biological oxygen demand. Very often the reporting period in days is non-standard (or in one recently introduced product non-existent!), or BOD and COD values are only quoted for individual components rather than for the complete formulation. This is not particularly helpful in assessing risk and should be strongly discouraged.

If one assumes to a first and reasonable approximation that biodegradation decays exponentially then it is possible to estimate the half-life for breakdown from the BOD5 and BOD28 values as shown in the figure. This has practical significance as 7 half-lives are required to reach greater than 99% breakdown (1/27 = 1/128 = 0.78% remaining). Foam formulations vary widely in their ability to degrade. Half-lives vary between about 7 days and 28 days, with BOD5 values ranging from 15% to 80% of the COD value, based on data collected for nearly 70 commercially available products. Estimation of half-life is shown in Figure 2 (below) using BOD5 (expressed as %COD) as an estimate of the initial rate. For BOD5 values not more than about 30%-40% this procedure gives a reasonable estimate for "t½": as an example, let us assume a BOD5 of 34%; the 100% intercept will be (100/34) * 5 = 14.7 days; t½ is the equal to 0.69*14.7 giving a half-life "t½" = ~ 10 days.



Greater transparency and clarity as well as disclosure of minor components in the SDS is definitely required. In particular persistent substances such as fluorochemicals need to be listed whether or not they satisfy the combined PBT criterion or are vPvB. Long term toxicity especially for these persistent substances needs to be identified even if the toxicity is relatively low. Although components of the preparation may not satisfy the REACH PBT or vPvB criteria in their own right, their breakdown products may do so and should be explicitly identified. For example, 8:2 fluorotelomers degrade to give PFOA, or biological oxidation of protein in FP or FFFP type foams produces highly toxic ammonia.

So the answer to the title question 'Are Safety Data Sheets environmentally fit for purpose?' is a qualified 'no'. This should be no surprise as one suspects that the REACH Regulations were never intended to satisfy fully the requirements for a suitable and sufficient assessment of environmental risk.

i: http://www.reachonline.eu/REACH/EN/REACH_EN/article31.html
ii: The Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulations, EC 1907/2006.
iii: Release of even non-hazardous materials to groundwater should controlled if the concentration is likely to increase over time, i.e., they substances are persistent – EU Water Framework Directive 2000/60/EC Annex VIII(i) and Groundwater Daughter Directive 2006/118/EC Article 6(b).
iv: (a) a homologue or member of a homolgous series is used to refer to chemical compounds which contain identical functional groups such as alcohols, carboxylic acids, sulphonates, etc., but which differ in the chain length and number of carbons in an alky chain, for example, perfluorooctanoic acid (PFOA, C8: C7F15COOH) and perfluorobutanoic acid (PFBA, C4: C3F7COOH). (b) a structural analogue refers to a chemical compound that either is closely related to another compound, only differing by the substitution of one or more functional groups such as, for example, a carboxylate group for a sulphonate group, or a CH3 methyl group for a CF3 trifluoromethyl group, or replacement of alky chain hydrogen atoms by fluorine, e.g., hexanoic acid C5H11COOOH and perfluorohexanoic acid C5F11COOH; structural analogues may also mimic one another in overall molecular shape whilst contain very differently bonded atoms.
v: US EPA Method 5210B - Lenore S. Clescerl, Andrew D. Eaton, Eugene W. Rice (2005). Standard Methods for Examination of Water & Wastewater (21st ed.). Washington, DC: American Public Health Association, American Water Works Association, and the Water Environment Association ISBN 0-87553-047-8.

Heading for a smart future

Fire fighting foam expert Thierry Bluteau (MSc, PhD) at the Laboratory of Expertise, Innovation & Analysis in Merseyside (UK) explains the historical route of fire fighting foam chemistry and then outlines where the next stage of the journey may take us.

In some ways it has been positive to witness how foam technology has evolved in the last ten years. In fact, a few years after 3M phased-out Light Water and the predicted end of PFOS, we could already see the market moving in two opposing directions.

On one road, one could see the continued development of fluoro-free foams. On the other, the relentless drive to continue with fluorinated foams, namely the so-called clean 'telomer' compounds.

Let's see what happened on the drive down the telomer road.

Over the years, the 'much improved' PFOA – C8 – was no longer the improvement we were promised. This deception to the end user was abandoned and replaced by another 'much improved' telomer that was nicknamed C6. This so-called 'new' product (in my opinion) is yet another attempt to convince the market that the 'fluoro' story is over and that this new product is safe. This is yet another highly misleading story given that C6 is still persistent and can be found at increasing levels in the general population. The recently published 'Madrid Statement' [IF] Winter 2014, Help to clarify the environment, p16] emphasises the risks of continuing with fluoro-compounds and asks for a complete ban of PFCs. We are still miles away from what was announced as another fluoro 'miracle of science'.

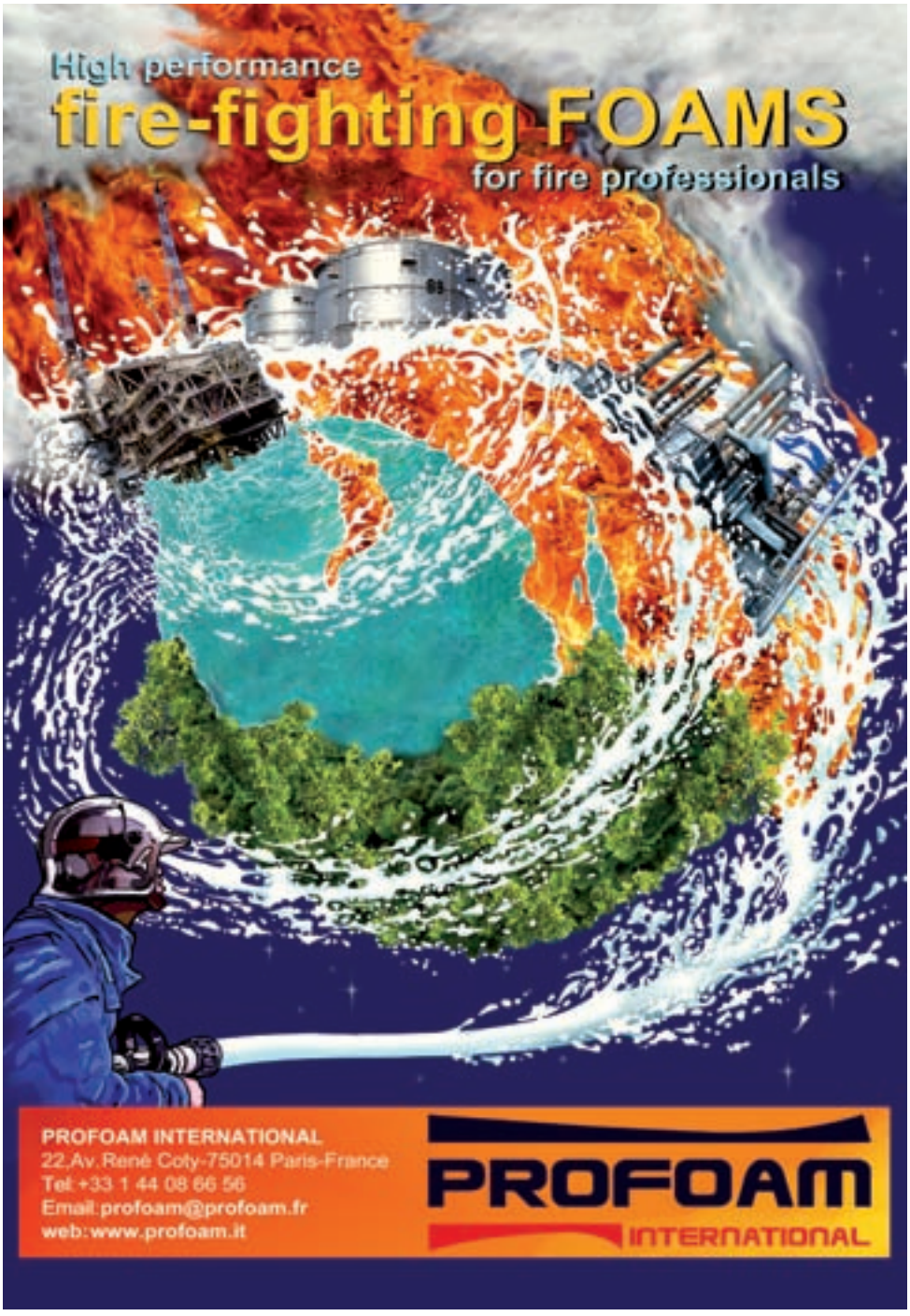
Now let's now see what happened to the pioneers in fluoro-free technology.

The original products on the market proved to be satisfactory – to some extent – but they did show their limitations. Nevertheless they have continued to improve over the last 10 years and undoubtedly will continue to do so. These foams are now complying with many standards that end users had been told that they would never achieve. Fluoro-free foams are not – and have never been – a direct 'drop-in' to replace an AFFF, but they can be used with benefits when they are applied in proper and specific conditions.

The fluoro chemicals debate has had the side effect of shading the issues relating to the many other ingredients present in foam formulations. Not all foam manufacturers are ignoring them, however. At the UK-based foam manufacturer 3F, for example, chemists have consequently attempted to broaden the focus on all environmental considerations and detrimental effects related to the use of other chemicals in foams. This is without question the smart approach. These foams do not contain solvents. They are also free of non-biodegradable synthetic surfactants, glycols and metallic salts, making them easier to biodegrade with a reduced chemical oxygen demand level of up to 50%.

ABOUT THE AUTHOR

Thierry Bluteau, MSc (Biology) and PhD (Organic Chemistry) is a fire fighting expert for Merseyside-based (UK) Laboratory of Expertise, Innovation & Analysis (LEIA). LEIA is a laboratory dedicated to the field of fire fighting chemistry, equipment and fire fighting techniques. LEIA has its own facility for carrying out fire tests and lab tests.



A sprinkle of success

Passing fire sprinkler performance tests using fluorine-free foam has posed an impossible challenge for industry – up until now. Jerry Borowski, Director of Technical Services at Solberg, outlines why the latest certification is so significant.

In the industrial market sector that uses fire fighting foam it has repeatedly been stated that while fluorine-free foams may garner some level of market acceptance, they are not capable of achieving the same level of fire fighting performance as their fluorinated counterparts.

While this type of statement may be true for some of the commercially available fluorine-free foams, blanket statements that group all fluorine-free foams into the same level of performance is not appropriate, just as grouping all fluorinated foams into the same level of performance is similarly not appropriate.

While there are many high quality Aqueous Film Forming Foams (AFFFs) on the market, there are also many sub-standard AFFFs on the market. These sub-standard AFFFs are incapable of achieving product certification to an international standard organization, such as Underwriter's Laboratories (UL). Also, while some AFFFs may be capable of passing top side fire tests, far fewer are capable of passing certification test protocols with standard fire sprinklers. Of all of the various fire tests conducted on fire fighting foams, the use of foams through standard fire sprinklers is the most difficult fire test to pass.

Solberg Re-Healing RF3, a fluorosurfactant- and fluoropolymer-free foam concentrate, has achieved multiple product certifications, listings and approvals. These include FM's approval and UL's listing as a 3% concentrate when tested to FM 5130 (Approval Standard for Foam Extinguishing Systems) and UL 162 (Standard for Safety for Foam Equipment and Liquid Concentrates). The product certification that RF3 holds with these two agencies is not a minimal certification but, rather, an extensive and complete certification requiring multiple fire tests as well as testing of foam hardware such as proportion hardware including bladder tanks, foam proportioners (ratio controllers) and in-line eductors as well as discharge devices such as foam makers, foam chambers (foam pourers) and hand-line nozzles (branchpipes).

More recently, Re-Healing RF3 (3%) achieved FM Approval and UL Listing certification with standard (non-air aspirated) automatic sprinklers at the same application rates (densities) as the fluorinated counterparts.

These sprinkler certifications are particularly significant as no other fluorine free foam on the market has been able to pass these stringent and difficult fire tests.

Both UL and FM have difficult fire tests for sprinkler application with foam. Both require five minutes of foam application (by which time the fire must be completely extinguished) immediately followed by five minutes of water-only application from the same sprinklers as a test of the strength of the foam blanket. Any exposed fuel after the water application constitutes a failure.

Assuming the foam blanket does remain intact, as a further test for the integrity of the foam blanket, a burnback test is conducted after a 10-minute waiting period following the water-only discharge. In order to successfully pass the burnback test, the foam blanket must resist an ignition source created by inserting a 12-inch diameter sleeve into the foam blanket, scooping the foam from inside the sleeve and then igniting the exposed fuel.

This exposed fuel is allowed to burn freely within the sleeve for one minute. After one minute of burning within the sleeve, the sleeve is removed from the foam blanket and the area of burning fuel is monitored for an additional five minutes.

In order to pass this burnback portion of the sprinkler test, the foam blanket must prevent the area of burning fuel from exceeding 20% of the surface area of the test pan. If the foam blanket flows in and extinguishes the burning area after the sleeve is removed this is also considered a successful burnback test. Until now, no true fluorine-free foam concentrate had successfully passed the UL and FM sprinkler test protocols using non-air aspirated sprinklers at the same operating pressure of 7.0 psi (0.5 Bar) as with AFFF. Re-Healing RF3, an authentic fluorine-free foam concentrate, is FM approved and UL listed for sprinklers having K-Factors of 5.6, 8.0 and 11.2 in both upright and pendant styles.

In addition to the FM approval and UL listing, Re-Healing RF3 3% foam concentrate is also UL of Canada listed, EN1568 approved and ICAO certified.

Figure 1: UL162 test standard, five-minute water application.

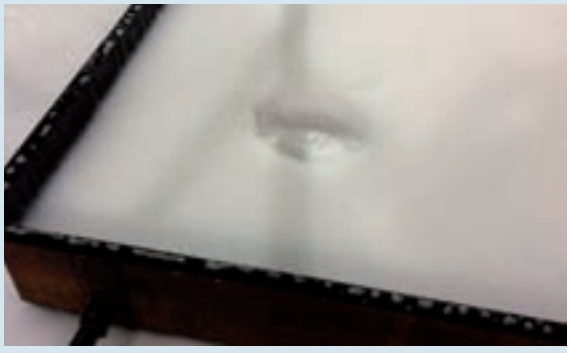


Figure 2: burnback resistance test. Note the self-sealing capability.

ABOUT THE AUTHOR

Jerry Borowski is the Director of Technical Services for The Solberg Company.

Mr. Borowski entered the fire protection industry in 1986 having worked at both the contracting and fire protection manufacturer's level in a variety of technical support positions. He has served on numerous fire industry technical committees and trade association including the National Fire Protection Association (NFPA) Standard 11: Standard for Low, Medium and High Expansion Foam where he currently serves as a principal committee member.

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Class A fact finding

The Fire Industry Association has published a free fact file on biomass fire fighting with Class A foams and wetting agents.

Fact File 61 sets out how the use of these agents can be used to reduce the extent and duration of fires involving biomass storage.

The paper has been published by the Fire Industry Association as a result of major fires involving bulk storage of biomass in the UK. These events occur in wood storage for power generation or in waste management sites involving a mixture of combustibles. Common factors include high fuel load, large heat output, large emissions of toxic smoke, significant quantities of water for extinguishment, and extensive post fire clean up.

The increase in these types of fires has been caused by electrical power generating stations converting from coal to wood, as well as the fact that waste recycling is becoming a legal requirement.

While research/test laboratory SP Sweden has identified spontaneous combustion within biomass stored in silos (as well as identified possible engineering solutions) – the problem remains for biomass storage in open air piles. Fact File 61 sets out how the use of Class A fire fighting foams and wetting agents can limit the heat and smoke produced, the quantities of water needed to achieve extinguishment; the resources to achieve extinguishment; and the overall environmental impact.

It sets out why these agents are effective on ordinary combustibles, providing test evidence of foam's effectiveness on wood fires when compared with plain water.

The key performance characteristic is that both wetting agents and Class A foam reduce the surface tension of water, thereby enabling the water to penetrate the combustibles. A major advantage is that it enables responding agencies to use less water to extinguish the fire.

The paper addresses environmental concerns, highlighting that Class A foam agents do not persist in the environment nor do they bioaccumulate – but there may be issues associated with aquatoxicity and biodegradation. 'Since Class A foam agents do not contain any persistent organohalogens, it is entirely feasible that any Class A foam agent run-off resulting from an incident, once collected could be handled by a waste water treatment plant.'

The paper also presents some case histories of Class A use by fire brigades to their advantage.

The paper concludes that Class A foam agents are effective; offer significant benefits compared to plain water when used on solid combustible fires; have no long term adverse effects on the environment; are not bioaccumulative or persistent in the environment; and (in the UK) can be disposed to waste treatment plans after the required consultation.

Download Fact File 61 from www.fia.uk.com.

400,000 sq ft up in

George Potter reports on the worst fire in 20 years in the European food processing industry.

The worst fire in the last 20 years in food processing plants in Europe totally destroyed the 400,000 square foot Campofrio ham and coldcuts plant in Burgos, Spain. The fire broke out at 06:45 the morning of Sunday, November 16th, due – according to Burgos fire brigade officers – to an electrical short circuit (the definitive cause is under investigation).

The fire was brought under control nearly 24 hours later, but continued to burn for several days in areas of difficult access to firefighters. After 11 days and nights, the fire was officially declared as totally extinguished.

The Campofrio plant was built in the mid 1990s and officially inaugurated in 1997. This facility was considered to be the most important of the company's more than 20 installations throughout Spain (plus several other facilities in other European countries). A series of major modifications had been introduced in 2002. The plant was built of steel structure with sheet metal sandwich siding and a lightweight flat roof. Inside the plant hundreds of tonnes of pork were in various stages of elaboration, from hams to pork chops and other assorted products, as well as diverse machinery for processing and packaging and more tons of packaging materials – paper, cardboard, plastics and wood.

Due to the fact that when the plant was built the existing national and regional fire protection regulations for this industrial activity did not require automatic fire sprinklers, it only featured fire detection systems, fire hose stations, manual fire extinguishers and emergency lighting and signs. Thus the plant had been built in strict compliance with that legislation.

However, seven automatic sprinkler systems plus four gaseous extinguishing systems did offer partial protection to approximately 30,000 sq. ft. of specific areas, less than 10% of the total floor space of the plant. Also, the majority of the processing area inside the plant was in open space which facilitated the spread of the fire. The only significant structural divisions and separation elements in the plant were the walls between the processing areas and annexes (offices, cold storage facilities and similar areas). In the year 2003, new national building codes did require automatic sprinklers in numerous industrial sites built or substantially modified after the date of the codes' publication, as well as fire retaining walls and similar fire resistant space divisions. The new legislation did not obligate retrofitting of improved measures into existing factories.

The city of Burgos is the capital of the province of Burgos in north central Spain, and is the home of 179,000 inhabitants, many of whom work directly or indirectly for some of the multinational firms that have manufacturing facilities in and around the city. According to some reports, a total of some 9,000 persons living in and around the city have been affected in some way by this fire, including the 1,100 employees of the plant itself.

The Burgos municipal fire brigade is a public service entity within the structure of the municipality. There are two additional full-time brigades in the province, and another 19 volunteer brigades distributed throughout the province. The Burgos city brigade operates out of one station with a total staffing of 103, including Chief, several sub-officers, fire prevention personnel and communications operators. The brigade runs the typical Spanish fire service shift structure; 24 hours on duty, 96 hours off, with an average of 18 firefighters, apparatus drivers and shift leaders on duty at any given time. The brigade has a mobile fleet of 15 vehicles including one 138 ft. telescopic/articulated aerial platform, two 100 ft. turntable ladders, four urban pumps including a 'mini pump' designed to access the narrow streets of the older downtown area, one heavy-duty tanker, a rescue van and several support vehicles.

The night of the Campofrio fire there were 17 on duty. The initial response as per brigade SOP for an industrial fire was one pump and the aerial platform, with a total of 10 firefighters. Due to the magnitude of the fire, the Incident Commander (IC), the senior responding leading firefighter, immediately requested additional resources, which mobilised one additional pump with five more firefighters. Another request for more resources mobilised numerous off-duty personnel who responded with the remaining two pumps, one turntable ladder, the tanker and several auxiliary vehicles.

Total on scene personnel during the initial hours of the fire was 44, including the brigade's chief officer who assumed overall command of the incident. During the following hours, 14 more off-duty firefighters also responded, raising the total number of brigade personnel to 60.

Over the following days, every member of the brigade responded to the incident. Several volunteer brigades from surrounding villages responded as well, some to the scene and others to the fire station to assist in maintaining protection

smoke

levels. The Spanish Military Emergency Unit (UME) dispatched material and personnel to Burgos during the initial days of the incident.

Although the plant employs just over 1,000 persons, only 20 were present on the low hours (weekend) shift. On arrival of the fire brigade, all employees had evacuated and were accounted for.

The intensity of the rapidly expanding fire made access to the interior impossible so that the initial fire attack was carried out in a defensive mode. This mode was maintained during the following days due to continual structural failure as the fire progressed through the building.

One specific operation was the protection of an anhydrous ammonia storage deposit adjacent to the plant, used as a refrigerant in the plant's extensive cold storage facilities. Damage to this deposit could have provoked an escape of toxic vapours that would in turn have created a major hazmat situation, possibly endangering hundreds, possibly thousands of people living around the industrial park. During these first intensive hours of the incident, the city's Municipal Emergency Plan was activated. In accordance with this Plan, a number of residents living close to the site were evacuated as a result of the intense, heavy smoke generated by the fire for a period of some 10 hours.

Only after several days of fighting the fire from exterior positions, the ruined structure was deemed to be in conditions that would allow firefighters to access by specific entry points in order to extinguish isolated spot fires and finally put the fire out.

Following the extinction of fire, the National Police's scientific investigation team began investigations into the actual cause of the fire. In Spain, fire cause investigations are performed by the National Police Corps. No Spanish fire services have competencies in this activity, although some major fire services do have qualified personnel who assist the police investigators. Most major insurance companies also have investigators who normally go through the fire scene after the police have performed their work.

Lesson learned: internal emergency response plan

Campofrio had an internal emergency response plan that was implemented and activated on confirmation of the fire. All personnel were evacuated and accounted for, as nothing could be done to contain the fast-moving fire by intervention teams due mainly to the fact that few members of these emergency response teams were present at the time. Nonetheless, the plan did function according to its structure and procedures.

Lesson learned: automatic sprinklers

It appears that had the plant been wholly equipped with adequate automatic sprinklers, the fire could have been contained and the velocity of propagation significantly reduced. It is likely that the project for rebuilding the plant will include full automatic sprinkler coverage.

Lesson learned: Fire Service staffing

Spanish fire services are notoriously short-handed and the Burgos municipal fire service is no exception. On the one hand, the ratio of full-time public service firefighters to population in the entire country is 1:2,040, half the international recommendations of 1:1,000. There are approximately 23,000 public service firefighters in the numerous municipal, provincial and regional fires services, another 5,000 volunteers in the rural areas, 1,700 civil aviation airport fire fighters and about 1,000 industrial brigade fire fighters. The theoretical overall ratio now is 1:1,530, still far below the ratio of 1:1,000.

The problem in Spain is that most public fire services need five shifts in order to meet national labour annual work hours of 1,750. This means that a brigade with 100 firefighters, including senior officers, administrative staff, communications, etc. will quite likely have only 85 or so operational firefighters, divided by five shifts gives 17 firefighters, crew leaders, drivers and shift officers during any given day, and with no-one down for illness, vacations, etc. The same brigade doing a four shift schedule (as in the UK) would have 21 persons on duty.

Lesson learned: pre-emergency planning

The phrase 'prepare for the unexpected' could well apply to this incident. The Burgos fire brigade leaders in fact did know the plant and the general and specific hazards present. The brigade had participated in simulated emergency exercises as required in the plant's emergency response plan. However, the magnitude of this particular fire overwhelmed the brigade's capacity.

At the time of writing the investigation was still under way. Investigators face several important roadblocks, namely the massive destruction of structure, machinery and production. Although they can access the area where the fire apparently started, finding evidence and determining the exact cause will be a slow process.

This report was written during a period several days following the fire. The information was compiled from diverse sources including insurance entities, the Burgos municipal fire service and the European Fire Sprinkler Network.

ABOUT THE AUTHOR

George Potter is a former USA fire fighter. He has been living in Spain for more than 50 years where he has been involved in numerous activities in fire protection, including fire protection installations, mobile fire apparatus design and construction and training of fire service personnel and industrial emergency responders.

Mr Potter is a Spain-certified fire service instructor, a member of the Board of Governors of the Spanish Fire Fighters Association (ASELF) and the Spanish Industrial Fire Fighters Association (APBE). One of his most extensive training programmes was precisely for the Burgos municipal and provincial fire services several years ago.

MAXED FLOW

VEHICLE SPECIALIST FERRARA HAS TEAMED UP WITH MANUFACTURER US FIRE PUMPS TO CREATE AN INDUSTRIAL FIRE TRUCK THAT CAN PUMP AT OVER 7,500 GPM – A NEW RECORD? STEVE BANNER REPORTS.

The key to tackling major blazes at industrial complexes is often the ability to bring large volumes of water to bear as quickly as possible. That means a high-capacity truck-mounted fire pump may have to be deployed – the Florida-based US Fire Pump (USFP) has come up with what it says is the largest one of its type in the world.

The new engine-driven USFP High Velocity Pump (HVP) is designed to meet the requirements of the NFPA 1901 standard at 6,000 gpm (US gallons per minute) or more. But according to the manufacturer, with sufficient engine power and enough water from a hydrant the performance will exceed 7,500 gpm. The pump has a wide operating range and can maintain over 5,000 gpm at 150 psi, over 4,000 gpm at 175 psi and over 3,000 gpm at 200 psi.

Ferrara Fire Apparatus of Holden, Louisiana, has become the first company to install the pump on its industrial fire trucks. It is being offered as an option under an exclusive agreement, as Vice President and Director of International Sales, Mark A Coley, explained. 'I guess you'd say we've become a dealer for them and that means we're offering a product that will change the industrial fire truck market. Its capacity means that you need less equipment to do the same kind of work and the agreement will certainly give us a boost in the industrial sector; a sector we've been working hard in for many years.

'What it means is that we'll be able to offer the strongest, biggest and most capable industrial fire truck in the world. It's something that's been needed for a long time.

'A typical fire truck has a capability of 3,000 gpm and you can maybe get that up to 4,000 gpm to 4,500 gpm if you're getting water from a pressurised source. The product we're talking about however allows you to go up to 8,000 gpm if a pressurised source is involved. So let's say you've got an industrial fire station with six trucks, each with a 3,000 gpm capability. If you've got this product you may be able to reduce this to three trucks and save money and manpower,' said Mark.

The high velocity pump can be mounted on a trailer or a skid unit instead of a truck chassis, as long as it has access to sufficient horsepower.

Capital expenditure, maintenance costs and the wage bill will all come down but the fire station's capability will remain the same. 'Fewer lives are put at risk too because you end up with fewer people on the fire ground,' he pointed out.

Risk is further lessened because the USFP HVP can be operated remotely if required. 'It is also worth noting that while most pumps run at an efficiency level approaching or just above 70%, this one operates at 80%,' Mark added.

Furthermore, because of its higher efficiency the USFP HVP can make use of the same fire truck engine, transmission and radiator as a less-powerful pump with no loss of performance. They do not need modifying or changing; nor do the axles or the chassis. The same 600 hp engine that drives a 3,000-plus gpm pump can drive this pump too,' he said. 'It can be dropped straight into a Ferrara chassis without any problem, the only differences being that the plumbing needed is larger than it is with a standard pump, and the HVP weighs more.'

The extra burden is, however, less than 1,000 lb (450 kg), 'It's not that big a number to overcome,' said Mark.

The HVP can be mounted on a trailer or a skid unit instead of a truck chassis, as long as it has access to sufficient horsepower and can potentially be electrically driven. 'It has been tested at a refinery in Louisiana and it's been well received. Its volume capabilities mean that it can extinguish an oil tank fire with the correct mixture of foam.'

With the correct attachments it could also be used to create a high-pressure water mist to cool pipes and gauges and take down poisonous clouds.

As well as in refineries the new pump could find a place in open-cast mines or in nuclear power stations. 'It can be used to help cool reactors if the need ever arises.'

Aside from the USA and Australia, potential markets include China ('there are a number of NFPA-style pumps in operation there') and South America.

Designed for use with engines with an output of up to 700 hp and with a single-piece pump shaft made of heat-treated stainless steel, the HVP features a 12 ins (305 mm) flanged suction inlet. It feeds an impeller eye which exceeds 10 ins (254 mm) in diameter with an 8 ins (203 mm) discharge outlet. The suction inlet has built-in pre-rotation baffles and is over sized to compensate for the baffles area.

The HVP's auxiliary drive output can power hydraulic equipment used to drive large foam systems or a flanged output to drive air compressors.

Municipal fire departments can make use of the HVP, said Mark, although it might be a little bit too big for their fire trucks. 'The majority of them tend to have a capacity of 1,250 gpm to 1,500 gpm with some going up to 2,000 gpm.' Nevertheless it could be used as a relay pump: 'It could be ideal in that role if massive amounts of water are involved.' And not solely to tackle blazes: it could also be used to pump away large quantities of flood water quickly during flood operations.

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Pumping innovation

Ensuring that pump systems work when they are needed has become a priority for Dubai manufacturer NAFFCO. Jose Sanchez met up with NAFFCO Operations Manager Manikandan Ramanathan during Intersec Dubai to find out how the latest technologies can help.

With over 2 million square feet of manufacturing space, 450 engineers and 8,500 staff NAFFCO has grown into a leading specialist in firefighting equipment, fire protection and safety engineering. Headquartered in Dubai, it aims to be a one-stop shop of fire and security-related equipment and services not only to the Middle East, but globally.

A cloud system for pumps?

Pumps and pump controllers sit at the heart of any fixed fire fighting system – and if they don't function as they should the consequences can be devastating, especially if the storage tank facility or refinery is hundreds of miles away from the nearest fire department (as can be the case in the Middle East), or the fixed system is installed in a high rise building.

To ensure that pumps are fully functional and that any fault is identified immediately NAFFCO has launched the Cloud System – a system that is putting pumps in the ether.

The physical part of the system consists of a box connected to the pump controller. NAFFCO software continually monitors the state of the pump, checking whether it is in operation or whether a fault is present. Any signal or alarm sent to the modem within the box is then transferred to the Cloud and NAFFCO's headquarters in Dubai, where an alarm is sounded.

Manikandan Ramanathan, Operations Manager (Fire Pump), explained more: 'We can monitor the state of the pumps and if there is a failure or fault, we can call and ask the site if any assistance is needed and – if it is – we can send somebody out. The idea is to provide quick action.'

The system can also be interfaced with the mobile phone(s) of a site's safety staff, so that they can quickly be alerted to a problem. 'The system is flexible enough so that a maintenance team can switch off the Cloud and avoid any signals being sent out.'

As well as revealing faults and ensuring fast remedial action, it is expected that the Cloud System may also increase awareness of best practice regarding this type of life-saving equipment. 'It has not been unknown for our engineers to be called out to fix systems that have been damaged as a result of incorrect use – for example staff using jockey pumps to wash their cars. With the Cloud the facilities person and our control room guys will be able to monitor how often the diesel or electrical pumps are being operated.'

Full pump system – in one package

The next development revealed by NAFFCO during Intersec Dubai was a packaged fire pump system that can be transported in one container and installed in a single day. The package consists of pumps (100-250 gpm), driver, controllers and accessories all mounted on a common base frame – all complying with NFPA 20.

'It is basically ready to be assembled at the site,' explained Manikandan Ramanathan: 'You just install it in the area where the water tank is, connect the suction and discharge pipes and incoming power – and it's done. Everything is set up, the controller, engine are all connected, so you just turn it on and that's it.'

All necessary wiring between controllers and drivers are done at factory prior to shipment; the automatic air release valve, casing relief valve, suction gauge and discharge gauge are mounted on fire pumps; and other accessories are mounted on pre-constructed interconnecting piping as per NFPA 20.

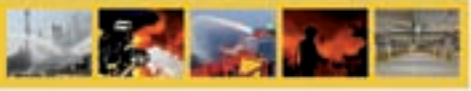
The package is being well received by facilities situated in remote areas, remarked Manikandan, because it removes the need for different subcontractors being involved in the assembly of the system. 'And operations-wise,' added Manikandan, 'If there are any faults, the site engineer just needs to contact one company to fix it.'

Diesel filtration system – removing a dirty problem

By definition a fire pump is only required to operate either when it's really needed or when it is being maintained – which means diesel is mostly sat in the diesel tank where it is susceptible to climatic changes (moisture) and the settling of dust particles within the fuel. 'If any particulates enter the fuel injector, it won't operate it,' explained Manikandan Ramanathan, 'And even NFPA clearly says that fuel in prime movers needs to be clear fuel. So that is what we have introduced a diesel filtration system.'

The fully automated diesel filtration system is programmed to self-active daily for a period of half an hour, circulating the diesel and separating it from water and dust particles. 'Although the NFPA clearly says that diesel should be clear, it does not stipulate how to do that – so this is our solution to the problem.'

SIMPLICITY



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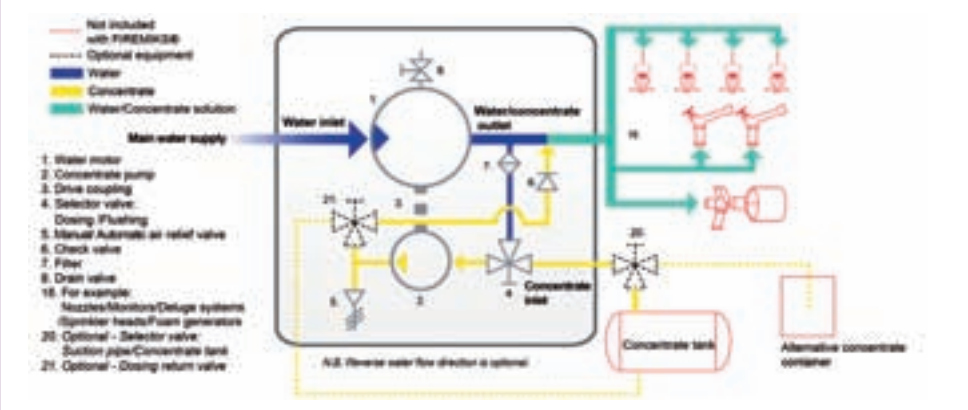
Beautifully proportioned

A foam proportioner that is simple to use and requires no power for its operation? Jose Sanchez de Muniain finds out about a simple and modern technology that is set to change the market – and it will be on show during Interschutz in Hanover, Germany, in June.



Per Aredal is the Sales Director of Firemiks AB, a family-based manufacturer in Stockholm that has been designing and marketing water motor driven proportioners used in Europe and worldwide since 1979. In 2010, the company restarted and decided to not only manufacture its own proportioners, but also to market and distribute them under a new brand name. To this end, the company designed and built a further developed proportioner that took into account advances in engineering technologies. The end result is FIREMIKS, a proportioner that requires no supplemental energy to work – it only needs the pressure from the water to mix and discharge the foam/water mixture.

Per Aredal, Sales Director, Firemiks AB (Stockholm, Sweden).

The response from the market has been an eye opener for Per Aredal: 'The interesting thing that people have been saying is that this will become the new industry standard and we are seeing this shift too. We believe the bladder tank proportioners will disappear from the market more and more in the next five to ten years, maybe also the in-line balance pressure proportioners, which are just too complicated to function efficiently.'

In line balanced pressure foam proportioners require foam concentrate to be supplied at a higher pressure as the pressure at the water inlet. This pressure is created by an electrical or fuel driven pump. They therefore need additional equipment (eg a balance valve) which has to be pre-calibrated to the right pressure to match both the foam pump pressure and the water pressure.

Bladder tanks are another form of balanced pressure proportioners widely used in fixed fire systems throughout the world. They consist of a steel pressure vessel containing a bladder (eg made of elastomer) filled with foam concentrate. The system becomes operational when water is pumped into the steel vessel: the pressure of the water squeezes the bladder and forces the concentrate through piping into a ratio controller. As the foam concentrate pressure is higher than the pressure at the ratio controller, the foam starts flowing towards the water and mixing at a calibrated rate, which is dependant on the water flow rate. A major draw-back for this technology is that if the bladder is empty, the system has to be stopped and refilled before it can function again, a time consuming activity in a possibly critical event of a fire. Moreover, it is not possible to test a bladder tank system without consuming the concentrate.

This technology is in stark contrast with the simplicity of the FIREMIKS solution.

Top: from inlet to nozzle – FIREMIKS water flow chart.

FIREMIKS proportioner – how it works

As water is pumped into the FIREMIKS, the power of the water flow turns a rotor that is connected to a volumetric foam concentrate pump. The foam concentrate pump pushes the foam concentrate using the water's own power, and creates the water/foam solution. Because the foam pump is driven by the force of the volumetric water motor, the dosing rate automatically adjusts to the amount of water going into the proportioner. The more water that goes in, the faster the drive coupling rotates and the more concentrate is pumped through to mix with the water. And since the foam concentrate is stored in regular atmospheric containers, one can fill up or switch tank during operation, ie providing an increased safety margin should the fire extinguishing take longer than anticipated.

The FIREMIKS is available in different flow sizes, it can deal with 300 lpm up to 12,000 lpm with selectable dosing or a fixed dosing rate at 1, 2 or 3 % (other dosing rates available on request) with all types of concentrates – including alcohol resistant ones and wetting agents.

Fixed or mobile units are offered, as well as an offshore anti-corrosion version. The portable version, as well as the fixed version, can be used on the fire ground to multiple nozzles at the same time and at different heights and hose distances.

Other advantages of the system is the fact that it can be regularly tested without discharging any foam – with a dosing return valve, the concentrate can go straight back into the concentrate tank, so there is no need to store or destroy finished foam solution, as Per explained; 'No foam solution needs to go to waste during any mandatory security tests, which is good both environmentally and economically.'

In spite of the fact that the FIREMIKS is yet to receive FM/UL or LPCB approval, it is steadily gaining market share, winning contracts in competition with more established brands: 'We have sold over a few hundred units all over the world from Asia and Latin America to South Africa since re-launching in 2010, on the basis of the strength of our engineering and design, and against companies that have FM approved proportioners. We are also moving into the shipping market, where one major order has been 36 FIREMIKS in off-shore versions with water motors in bronze to the Singapore Marine. These units are DNV/GL certified. This year we will continue with certifying our product line to comply even more with the standards required by the international industry.'

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Going nuclear

Henno Schothorst, Product and Marketing Manager at BBA Pumps, writes about a remarkable order for nine emergency pump units destined for a nuclear power plant.

Following the Fukushima nuclear disaster in 2011, safety regulations at many nuclear plants have been considerably tightened, which has led to an increased demand for fire fighting pump systems.

These systems must comply with extremely strict requirements and regulations. Working closely together with the Belgian distributor Rental Pumps, we recently completed one of the most demanding projects in its history – the delivery of nine mobile disaster relief pumping systems for a large nuclear power plant.

The high pressure pump units are not only meant to fight fire – their main goal is to prevent a meltdown in a worst case scenario. In the event of a total black out, the pumps will be deployed to pump cooling water into the primary circuit of the reactor as a last resort. They can even be used to supply a boric acid solution in order to shut down the nuclear reaction completely.

Fire fighting pump systems are almost always supplied with customised features. In these situations, BBA Pumps uses the standard high head pumps from the BA series. These pumps are dry self-priming and are available with a maximum pressure of up to 25 bar/360 PSI. The specifications for this nuclear plant project were exceptionally high:

- No fewer than 132 material and safety certificates were needed for each pump vs a minimum of primary technical engine safety features;
- Each pumping system had to be supplied with storage rack, flow meters and other accessories, and be able to operate autonomously at maximum output for 24 hours;
- For logistical purposes, a 3-axle trailer with compressed air brake systems was required;
- The pumping systems had to pass a SQUG (Seismic Qualification Utility Group)test for seismic activities.

Final delivery – contents

- Four pumping systems, equipped with a high head pump type BA80H D275, powered by a Perkins four cylinder diesel engine, type 404D-22T. This pump supplies a pressure of up to 9 bar/130 psi and a flow of 130 m^3/h/572 US gpm.
- Five larger pumping sets with a high pressure pump, type BA-C150H41, powered by a Volvo Penta, type TAD952VE, with a power output of 234 kW/318 Hp and an operating point of 20 bar/290 psi at 130 m^3/h/572 US gpm.

Lieven Vijverman, CEO of Rental Pumps Belgium, commented: 'I've never seen such high demands set by any client. Nevertheless, the cooperation with BBA Pumps went off without a hitch and we have learned a lot during this project; we are very proud to be able to add a nuclear power plant to our reference list.'

Pushing the limits

As technology advances, pump controllers are becoming more than just an interface – they are pushing the limits of possibility, writes Kyle M Darley, Design Engineer (pump division), WS Darley.

WS Darley & Company has developed a pump controller called the R-Evolution PC. The pump controller provides operators with a tool that is capable of closed loop control, machine-to-machine interfacing and data logging. The closed loop control feature improves the operator's ability to monitor and control the pump by making automated adjustments. The adjustments are made every millisecond to ensure the desired delivery rate is accurate throughout the duration of the run cycle. This makes operating a pump a much simpler task, leaving the operator time to perform additional duties while the pump is running, or allowing an operator to run multiple pumps at the same time.

Some of you may think operating multiple pumps at the same time is a recipe for disaster. Fortunately, with the advancements in machine-to-machine communication it is becoming more of a reality than a desire.

The R-evolution PC has a secure web-based machine-to-machine interface. The web-based interface allows for remote monitoring and operation. With an available internet connection, the operator can log in to the secured web portal and view the pump's performance data and/or control the pump's desired delivery rate.

How does this make it easier to operate multiple pumps? Each pump can be stored in the same web portal allowing the pump operator to switch from one pump control panel to the next with a simple click of a button. Once a pump is selected within the web portal, the pump can be controlled and the pump's real time or historical data can be viewed.

The historical data logger is a unique feature which gives the fire service an automated recorder for engine and pump runtime data along with fire suppression delivery rates. For maintenance personnel, the data will serve as a tool for failure analysis which will help reduce the pumps down time caused by equipment failure. The delivery rate data will give fire service professionals the ability to fine tune their tactical approach to fire suppression.

As pump controllers continue to push the limits of possibility, it opens the door to improving the safety and effectiveness of fire service professionals around the world.

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FRYERS ON FIRE

WHEN 5,000 GALLONS OF OIL IGNITE IN AN INDUSTRIAL OIL FRYER THE EFFECTS CAN DEVASTATE A BUSINESS AND ITS STAFF, AND YET FACTORIES AROUND THE WORLD CONTINUE TO BE EITHER UNPROTECTED OR PROTECTED WITH WOEFULLY INADEQUATE FIRE SYSTEMS. ÀLEX PALAU BOSCH, PRODUCT MANAGER (WATER MIST), TYCO FIRE PROTECTION PRODUCTS, TALKED TO JOSE SANCHEZ DE MUNIAIN ABOUT A COST EFFECTIVE, FM-CERTIFIED SOLUTION THAT SETS OUT TO REMEDY THE SITUATION.

Àlex Palau Bosch, Product Manager Water Mist, Tyco Fire Protection Products.

Speaking at the International Water Mist Association annual conference in 2013, Stuart Lloyd, Zurich Insurance, UK, set out a bleak picture explaining why facilities housing large cookers for food production are considered high risk.

These fryers are unlike the commercial units seen in restaurant kitchens. They are on an industrial scale. Fully automated, with conveyors within the oil, they can be up to 20m in length and store up to 20.000 l of oil. They present a significant fire extinguishing challenge.

Fires in fryers have always had a history of generating large claims, and Zurich Insurance has seen huge losses in this sector, mainly due to the composite construction materials used in these types of buildings.

One (unprotected) fryer in England resulted in material damage of $1.5 m and business interruption of $250,000. Another in Scotland resulted in a claim for material damage of $10 m and business interruption claim of $5 m.

The value of claims has risen sharply since 2005 and they are still going up – which is leading insurance companies to avoid these risks; increase the premiums to offset losses; share the risks with other insurers; insist on sprinkler protection to protect buildings; and insist on local application systems on the inception hazard (ie the fryer).

Tyco Fire Protection Products began looking at a solution for industrial fryers around three years ago, on request from the food industry.

Today there are three types of technology supported by standards for the protection of these types of facility: CO_2, water spray, and water mist.

While CO_2 has the economic advantage over the other technologies, it has disadvantages too. Whilst the potential danger of suffocating personnel is one obvious downside, there is also a performance disadvantage, as Àlex Palau Bosch explained: 'The cooling capacity of CO_2 is low. Industrial frying oil requires a lot of energy to reach 350 °C and ignite, but when it does you have potentially 20,000 litres of oil on fire. Even if you extinguish the initial fire, if the oil comes into contact with hot metal it will reignite. So you need a protection system that does two things – first extinguish, and second cool. If it doesn't do both, you are not getting the protection because fryers are designed not to lose thermal energy.'

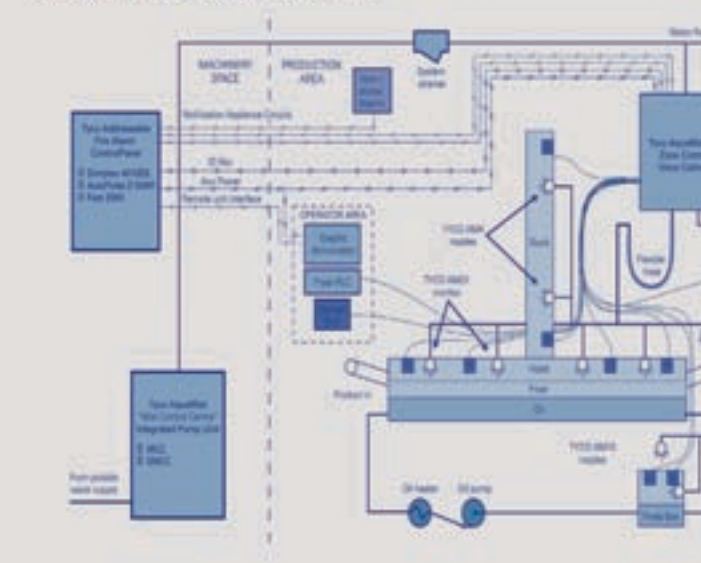
FM is no longer referring to CO_2 in its data sheets, although NFPA12 does cover the design for this type of risk.

As for water spray, it is economical but the drawbacks are secondary risk of thermal shock, not to mention flood risk as a result of the large quantities of water used. 'The water that comes out of the fryer can cause more damage and it will increase the footprint of the damage – hygiene standards are very high for this industry, so clean up is more costly. Even if the system is cheaper, you pay more afterwards,' explains Àlex.

Water mist, on the other hand, has a low water consumption coupled with a high cooling effect, which makes it the technology of choice for most insurers. Currently, however, there is only one type of accredited approval, via FM Global (although British Standards are about to adopt the same test protocol). When Tyco was looking at producing its solution for the market, it set itself the following challenge. The solution had to use water mist technology (as recommended by insurers); it had to be economically viable; and it had to have the best guarantee possible that it would work.

'After looking at several technologies in the end we went for a low-pressure water mist solution. We wanted a system with the equivalent consumption of water as a high-pressure system, but with less cost implications. When working with low-pressure systems the associated electrical equipment costs are a quarter of those of high-pressure systems, which work at 60 bar as opposed to 15 bar.'

And there are no performance differentials either. 'In all the water mist tests that I have carried out, I have never seen an instance where a high-pressure system consumed



less water than a low-pressure one – they are equivalent. I do believe high pressure systems have some applications, for example on high rise buildings due to potential loss of pressure, or above compact roller archive racking where it is necessary to use thin piping.'

The test for Tyco's low-pressure Water Mist system took place in Tyco's laboratories in Marinette (WI), USA. FM Global requires a minimum of six tests with three sizes of fryers, 2.4 m x 2.4 m, 2.4 m x 4.8 m, 2.4 m x 7.2 m.

The tests were revealing. For one, they showed lack of correlation between the length of the fryer and the time it took to extinguish the fire. 'When you have that result, FM allows you to protect fryers of unlimited length.'

Furthermore, Tyco decided to carry out 12 tests instead of the stipulated six, explains Àlex. 'One of the things we had discovered whilst visiting actual facilities is that the hoods of some industrial fryers are at an angle – they are not horizontal. The FM test stipulates that a nozzle be perpendicular to the oil – but if you change the angle you don't know how that will affect the result.' Consequently, Tyco's additional tests were carried out with hoods at an angle of 30 degrees. 'And we know it will work.'

Tyco has gone beyond the standard's requirements in other regards.

'As the nozzles are directly above oil, there is a risk that the nozzle could become blocked by particulates produced by the frying process. As a result, FM requires that consideration be given to the use of protection caps and that they be included in the fire test. The pressure of the water mist detaches the caps, but not fully as we didn't want them to drop onto the oil and cause a contamination problem. Consequently, we wanted to ensure that the spinning caps would not affect the performance of the water mist nozzle.'

Many oil cooker fires originate in the so-called 'fines box', which is where the fryer collects all the residues filtered out from the cooking oil. Tyco didn't want water mist to be discharged across the whole fryer (chimney/vent, fryer, etc) in the event of a localised fire in the fines box, so it installed an additional valve. 'The intention is that in the case a fire is detected in the hood, the system will discharge everywhere. However, if it is detected in the fines box, it will only discharge in the fines box. Otherwise there is the risk that all the oil has to be disposed of. This is something that we did in addition to the FM requirements.'

AquaMist ULF for IFP appears to tick all the performance boxes, but in the real world there is still much work to be done as regards understanding the risk and the consequences – let alone explaining to the end user how to choose the correct fire protection solution.

'We have discovered that we are competing with companies that don't have approved systems, and that they are installing systems that are inadequate to the risk. We have seen systems on oil fryers that are approved for machinery rooms on ships or restaurant fryers. Nobody can compete with a company that is specifying inappropriate, potentially dangerous systems.'

What may be termed general ignorance or even wilful disregard of correct practice is borne out by the insurance industry. Stuart Lloyd of Zurich Insurance (UK), told members of the International Water Mist Association about his experience with a company that operated 30 deep fat fryers. Zurich had requested that it install fire protection, and the company duly received five quotations, all claiming to be in accordance with NFPA 750, and all offering 24/7 protection, guaranteeing to put out a fire. 'But none had any test data to back that up,' stated Stuart Lloyd, 'And in fact when we pushed them, two were based on Kitchen Galley ISO 15371 fire protection standard, and three were based on IMO cabin tests.'

It is these types of experiences that make the insurance industry slightly wary of water mist technology. They may like it, they may specify that it be used, but it has to be used correctly.

'And this is where we think AquaMist ULF for IFP has an advantage,' explains Àlex, 'Insurance companies haven't had the historic data related to failure of components of water mist systems, whilst they have plenty related to sprinklers. Low-pressure water mist systems, however, are mostly made up of the same components as sprinkler systems, which provides some security for insurers.'

The future

A factory with five to 15 fryers would be an ideal application for the AquaMist ULF IFP system, believes Àlex, because each fryer can then share the high-cost hardware of pump and valves. The next challenge for Tyco, however, is to find a way to make AquaMist ULF IFP just as economically viable for a factory with a single fryer. The Tyco team is currently working on one such alternative, which could be revealed as soon as Summer this year.

An industrial fryer is a large cooker of food products (eg breaded meats and potato products) that uses large quantities of oil as the cooking medium. It typically comprises a conveyor-based frying region, exhaust hoods, ducts and a filtration area for crumbs (also known as a fines box). Opposite: AquaMist IFP system overview.

Solid-state sprinklers

Keith Taylor, Senior Operations Director at Tyco, explains the numerous benefits of moving to modern solid-state sprinkler systems.

Keith Taylor, Senior Operations Director, Tyco. Top right: SprinklerSense is an intelligent water flow switch that enables a sprinkler system's status to be constantly monitored and tested.

Traditional sprinkler systems have individual components and mechanical parts. Realistically, this means that there is more opportunity for things to go wrong and any hardware problems can affect the system's performance or even in the worst-case scenario – cause complete failure.

Furthermore, many will be familiar with the problems associated with the monitoring, testing and maintenance of traditional sprinkler systems. In the past this has been challenging as – in order to test mechanical based systems – the movement of water is required to activate a paddle and a micro switch for water flow to be confirmed. The water also has to be drained away, which can be difficult and costly to undertake, particularly in buildings with limited space or public buildings that are in constant use – meaning that system testing has to take place out of hours. Moreover, although reputable manufacturers and suppliers of sprinkler systems will always recommend regular service and maintenance checks, the majority of customers tend to opt for an annual check due to budget restraints. This means that problems are not identified and dealt with as early as possible.

The good news is that the industry has recognised the challenges traditional systems represent and has responded with a new generation of sprinkler systems that offer a multitude of benefits. The next generation of sprinkler systems uses solid-state sensors. With no moving parts, this significantly reduces the risk of hardware failure and helps to increase reliability. Today, systems are available such as SprinklerSense, which can be tested remotely at ground level, reducing the need for contractors to be working at height.

Monitoring and testing is far easier to complete on a more frequent basis. With the use of intelligent flow devices that offer unique features to monitor the status of the system at various levels, identifying any slow leaks as well as temperature, dry pipe conditions and flow of water. This is monitored by the system itself at routine intervals and the information reported back to a central control panel. Regular monitoring can help to make long-term cost savings. With early detection and alert, faults can be rectified before developing into far more costly repairs.

Finally, organisations all have a responsibility to lower environmental impact wherever possible and, with a solid state sensor sprinkler system, it is possible to effectively test the system without the movement of water and without the need to drain away the system.

The fire detection and containment industry has always embraced innovation, constantly developing new technology to help overcome the challenges faced and to enhance levels of fire safety. When it comes to sprinklers, the benefits of moving away from traditional mechanical systems to solid-state technology have been recognised and the next generation has absolutely arrived.

GUIDANCE FOR FIXED FIRE SYSTEM CONTAINER CONTENT TESTING

The Fire Industry Association has published guidance for the fire protection industry on fixed fire extinguishing system container content test, measurement and validation. The guidance defines the physical procedure and calculation methodology of content within fixed fire extinguishing system containers to enable comparison and interpretation of the results obtained against the requirements. The content encompasses CO2; liquefied super pressurised extinguishants (eg FM 200, Novec 1230); liquefied non-super pressurised (eg FE 13); and inert gases.

The guidance highlights how the correct verification of the contents of fixed gaseous extinguishing systems is essential for these systems to remain serviceable and effective. It provides detailed information on the methodology and test equipment available for each type of extinguishant, as well as pros and cons for each. It aims to help interested parties 'make informed decisions' and maintenance companies 'provide an effective service.'

The testing equipment and methodology evaluated includes radioactive devices; ultrasonic devices; thermal indicators (including TICs); weighing; capacitance siphon tube; float devices and pressure measurement.

The guidance concludes that the performance limitations identified means that results obtained from liquid level testing may be unreliable, and that the only accurate means by which container contents can be validated is by weighing, using calibrated equipment. 'However, in many cases, this is impractical.'

A number of recommendations are made to eliminate potential errors by field engineers in determining the theoretical level of a container as well as tips for enabling effective testing of systems. For more info visit www.fia.uk.com.

Excellence Award for SIV Fire Protection

In November 2014 London-based SIV Fire Protection received a coveted IFSEC Fire & Security Excellence Award for Passive Fire Protection Project of the Year. Jose Sanchez spoke with Managing Director Stan Ivanchev to find out more about a company whose list of prestigious projects includes railway and underground stations, hospitals, embassies, shopping centres, and schools – and the company has ambitions for international expansion.

Can you tell us a bit more about the passive fire protection project you won the award for?

The project was for Barratt Homes Developments, and it involved approximately 70 occupied residential developments around 15-20 years old. We were engaged to undertake passive fire protection surveys, identify areas that required fire compartmentalisation, and install passive fire protection systems.

What were the main challenges?

There were two main challenges. Firstly, the fact that each building was different – ranging from 15 floors to 5 floors, some with carpets, others with fresh paint to ceilings and walls. Next, the time scales. We had only four months to carry out the work, which included the design, supply and installation of fire protection systems such as fire stopping and fire sealing to mechanical and electrical services penetrating fire compartment floors and walls, steel/timber fire doors, roof void cavity fire barriers, and linear gap fire seals. It involved over 15,000 openings on walls and ceilings. And if that wasn't enough, the properties were occupied, so we had to work around the residents.

Any surprises?

The fire risk assessor was particularly concerned about the fire stopping work that had been carried out previously in the service riser cupboards. We checked several buildings and noted that there was no fire protection to other areas. We also found quite a bit of evidence that installers do not always work to standards.

What can companies do to prevent installations not being carried out to standard?

We are a third party accredited contractor. FIRAS is voluntary, third party certification for installation contractors of both passive and active fire protection systems, operated by Warrington Certification, and accredited by UKAS to EN45011. All our supervisors and operatives are trained and their competence assessed by a FIRAS inspector. There are 10 different disciplines for passive fire installations and we are accredited to all of them. In 2013 we had to spray cementitious fire protection to structural steel work for the first time, and we notified FIRAS in advance, who then came to the site to inspect the work along with the manufacturer. That is how we can be sure that all applications are carried out correctly.

Everyone who is involved in taking decisions related to passive fire should be aware of this type of accreditation – however, we have seen work done by accredited people that hasn't been carried out very well, so I don't know what to say!

What do you think would improve fire safety standards?

Improving the knowledge of Building Control inspectors about passive fire protection would help tremendously. I also find it bizarre that an inspector can approve a building in terms of passive fire safety after all the plasterboard ceilings are in place, when it is impossible to physically verify whether the fire stopping work has been done correctly or it has been carried out at all. I think that the solution is for the inspection of all fire stopping work to be carried out before the installation of all ceilings. This must be carried out in the presence of the fire stopping specialist contractor and the client.

What sets you apart from the competition?

Quality – and the work we did in 2014 is clear proof. We only started trading in 2011, and in 2013 reached the fire industry awards finals twice, and won outright in 2014. That is quite an achievement in three years of trading. Furthermore, in 2014 the Best Passive Fire Protection Project Award was opened to manufacturers as well as installers, so the competition was even stronger! I personally believe what sets us apart is that our way of doing business is different to our competitors. If a project is unfeasible in the time frame, or if we don't physically have the manpower, then I would rather not take it on than employ inexperienced operatives. We prefer to expand step by step, ensuring we have the right people with the right experience.

What next for SIV Fire Protection?

There are 50 of us at the moment, and we are looking to expand the team. In the next three years I would like to open another office in Europe, as well as one in the States.

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To detect & protect

Many oil and gas installations, especially oil rigs and FPSOs, are located in areas with harsh weather conditions. Ian Buchanan, European Manager of Spectrex, outlines the challenges and solutions for flame and gas detection in locations with extremes in temperature, wind, snow and ice.

Ian Buchanan is European Manager for Spectrex. Based in the UK, he has over 30 years experience in industrial fire and gas detection.

The Skarv Oil Field, located between the Norne field and Heidrun, and the Schiehallion Oil Field are both located in the North Sea where these extremes prevail. Also facing tough conditions are oil fields and facilities in the Prudhoe Bay area in Alaska.

Although a different area of the world, similar tough surroundings are faced at the other end of the spectrum, there is extreme sunlight, high temperatures coupled with occasional sand storms. In all of these locations and many other industrial areas, there is a variety of background IR or UV radiation sources, some of which may be of high intensity, and must be differentiated from radiation emitted from a fire. These environments provide difficult conditions within which optical flame and gas detectors need to operate. Extreme surrounding conditions can be directly linked to the regular triggers of false alarms. The results from a false alarm are significant due to a loss of confidence in the detection systems and the cost of initiating emergency procedures unnecessarily – it is therefore essential that flame and gas detection is not activated by surrounding environmental factors.

To meet the safety requirements of these facilities, reliable optical flame detectors can be installed to provide, even under these harsh conditions, fast and reliable fire detection, and open path flammable or toxic gas detectors can be used to detect the presence of any gas released before the concentration reaches a level which will cause fire, explosion or risk to personnel.

These flame and gas detection and monitoring systems are able to work at the highest levels in spite of extreme conditions, remaining unaffected by different climates and providing a constantly high level of performance and reliability.

It is due to all these conditions that the oil and gas industry requires detectors to be tested, certified and therefore carry the necessary approvals, to ensure that they are of the highest standard and 'fit for purpose'. Some key approvals required are hazardous area Ex approvals (FM, CSA, ATEX, IECEx, Inmetro, CU TR), functional approvals (FM, EN), and reliability approval (SIL2 TUV).

Left to right: Spectrex SafEye open path gas detector and Spectrex SharpEye IR3 optical flame detector.

Optical flame detection

There are various optical flame detection technologies which, while working on the same basic approach, detect at different optical wavelengths and therefore detect different types of fires. The two main types of optical flame detection used in the oil and gas industry are combined UV/IR and triple infrared (IR3) detection.

UV/IR Detection

UV/IR optical flame detection is dual spectrum and uses a solar blind UV sensor with a high signal-to-noise ratio and a narrow band IR sensor. UV/IR detectors are fast, especially in response to flash fires, and have good false alarm immunity. The UV sensor is a good but overly sensitive fire detector, so the IR sensor which works at 2.7 μ or 4.3 μ spectral ranges which are characteristic of a fire, complements this and provides the confirmation of a real fire. The end result is very fast fire detection with high reliability.

Triple IR (IR3) detection

IR3 optical flame detection uses three IR sensors to monitor the chosen area, where one sensor detects the infrared radiation emitted by the hot CO_2 product of a fire and the other two reference sensors are sensitive to background radiation at longer and shorter wavelengths, both analysed to ensure that the pattern detected matches that of a real fire situation. IR3 detectors can detect at very long distances and have excellent false alarm immunity. This technology, which was patented by Spectrex in the 1990s and was a major breakthrough in modern optical flame detection, allows less detectors to be employed for a specific area, saving cost. Moreover the detectors can be placed in the harshest of environments without being triggered by the extreme environmental factors. An IR3 detector can detect a standard 1 ft^2 (0.1 m^2) gasoline fire at a distance of up to 215 ft (65 m).

IR3 vs UV/IR

The choice here depends, as always, on the application. For high-risk industires, they need the most robust detector that is

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	Non-modulated IR	Modulated IR	Solar Blind UV	Window Contamination
The Interference	IR sources that are constant or vary very slowly, for example heaters, lamps and the sun.	IR sources which vary periodically or sporadically, such as flashing lights, vehicle lights, etc. Flames themselves are modulated so it is difficult to determine the real flame.	Solar radiation	Any material obstructing the detector's window or acting as an optical lens, such as sea salt, raindrops, etc.
The Solution	Detectors designed to only measure the modulated part of the IR radiation, therefore ignoring these triggers.	Measuring radiation in more than one waveband allows determination of a real flame.	Including a detection band in the solar blind UV, a part which is blocked by the ozone layer in the upper atmosphere.	An automatic self-test can determine real fires from some of these triggers. Raindrops, for example, cannot be detected this way. So detector design is the only way to ensure false alarm immunity here.

Table 1: flame detector false alarm triggers in harsh conditions.

the least susceptible to costly and misleading false alarms. The Triple IR technique has the highest immunity to such false alarms and offers much greater detection distances (for a 1 ft^2 (0.1 m^2) gasoline fire, 215 ft (65 m) compared to only 65 ft (20 m) for UV/IR type). As a result, they are widely specified for high risk applications. In addition, in large or open areas, this greater detection distance is also a means to reduce detector numbers (including cabling, control panel loops etc) and thereby the overall cost.

However, there are many other lower risk applications where distance is less of a factor, where UV/IR detectors are more than adequate for the job and where their lower cost is also an attraction .

The Spectrex SharpEye range of optical flame detectors includes a wide variety of technologies to offer a solution for any application with top performance and minimal false alarms. IR3, Multi IR, UV/IR and ultra fast response versions are among the SharpEye 40/40 range of detectors.

Open path gas detection

Also known as line-of-sight gas detection, open path gas detection is a reliable method of flammable gas detection able to measure gas concentrations at distances of up to 660 ft (200 m). Open path gas detectors are able to detect these flammable gases at low concentrations, as well as high concentrations. When a gas leak occurs, a gas cloud is formed with the concentration reducing as the edges of the cloud are reached, so any part of the gas cloud can be detected by open path gas detectors. It is important to detect a gas hazard before it causes a fire, so that neutralising agents can be deployed before dangerous concentrations are reached. Open path gas detectors allow for wide area coverage and a very high speed of response.

The detectors comprise a transmitter and a receiver, placed at a predetermined distance from one another. The transmitter projects a beam of light radiation to the receiver. When flammable gas passes through the beam, it absorbs the light radiation thereby reducing the signal at the receiver. These signals are analysed and output signals are provided to a control system. Spectrex patented the Xenon flash bulb which revolutionised open path gas detection, allowing faster response times and much greater false alarm immunity.

To ensure that background radiation sources such as sunlight, humidity, rain, fog are not confused with the detector's beam (possibly causing a false alarm) the transmitter emits short, high intensity pulses of light in a unique pattern which the receiver is able to recognise and therefore distinguish from any other background radiation sources.

Spectrex SafEye open path gas detectors provide high reliability solutions to superior gas detection in the toughest of conditions, providing, without fail, the best protection no matter what conditions are faced. The SafEye 900 is complemented by the duct-mounted detector for air/turbine ducts, and these have recently been joined by the SafEye 950/960 toxic gas open path detectors, detecting, among others, hydrogen sulphide and ammonia at ppm levels.

Summary

With all of the harsh conditions in which flame and gas detectors are used, it is important that only true fires or gas hazards are detected to prevent emergency procedures being unnecessarily initiated. At the same time, a true fire or gas hazard must be reliably detected as soon as possible to ensure that a small, controllable incident does not turn into a disastrous event. The detection methods need to function fully in spite of the harshest of conditions and therefore must be approved for reliability, performance and ability to work in hazardous atmospheres. Within the high-value, high-risk industries, every second really does count!

WHY OPTICAL FLAME DETECTORS ARE PART OF THE ANSWER TO FIRES IN THE WASTE HANDLING SECTOR

The waste management industry is a significant contributor to the global economy. In the UK alone, it has an annual turnover of £9 billion ($13.5 bn) and employs 70,000 people across 6,000 sites.

The very nature of waste handling and recycling means that fire is an ever-present danger. Every year it destroys millions of pounds worth of raw material and equipment; according to the UK's Chief Fire Officer Association (CFOA), there were 298 fires in 2013, costing the industry untold millions in lost revenue.

Not only does fire cause extensive damage and financial loss, the associated danger of injury or death to workers, decreased property value, environmental damage and bad press all have a negative knock-on effect.

New guidance for waste and recycling sites was issued on 20th October 2014 by the Waste Industry Safety and Health (WISH) Forum, providing site operators with the information and standards they need to reduce fire risk (see www.ciwm.co.uk).

The guidance aims to provide waste management operators with the guidance, information and standards to allow them to:

- Reduce the likelihood and frequency of fires occurring on solid waste handling sites
- Where fires do occur, to reduce the potential health and environmental impacts

The guidance stipulates that 'for plant and equipment (such as recycling and recovery plant) fire detection, alarm and suppression must be part of the design risk assessment.' It also recommends the use of flame detectors if necessary.

Flame detection

Optical flame detectors, such as FFE's Talentum range, are ideally suited to waste handling facilities as they can detect almost all types of flickering flames, not just hydrocarbon flames. This is extremely important in the waste industry as flames can originate from many different sources, including paper, plastic and even metals. By utilising infra-red (IR) sensing technology, flames are detected irrespective of any dust, steam or smoke present; they are also immune to the effects of wind or draughts of air. With the addition of an ultra-violet (UV) sensor a flame detector also becomes highly immune to false signals.

The way flame detectors work is straightforward: optical sensors receive the IR and/or UV radiation emitted by the flames and a processor analyses the optical sensor signal waveforms and determines if they represent flames and, if so, accepts them. If the signals do not match the internal algorithms for flames then they are considered to be false sources and rejected.

In waste handling facilities, flame detectors are usually installed as part of a complete fire detection and suppression system. If a shredder, for example, catches fire, as soon as the flame detector recognises that there is a fire, it passes a signal which automatically stops the machinery and initiates a fire suppression system.

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Gateway into Europe

A scheme that offers a single point of call for fire certification for the European Union is slowly gaining support from manufacturers, testing laboratories, certification bodies and insurers, reports Jose Sanchez de Muniain.

CertAlarm General Manager Anja Kinsky.

The Brussels-based non-profit organisation CertAlarm was founded in 2010 with the intention of creating a one-stop shop for the testing and certification of products for the fire protection and security systems industry.

A single European quality mark, based on third-party one-stop testing and certification to EN54 standards, was regarded as the answer to the myriad of local national standards that manufacturers face when intending to sell their fire products across Europe.

There is little doubt that the situation is confusing. In many countries there are local requirements or procedures that are imposed by insurers, local authorities or certification bodies. These requirements are in addition to EN standards, which means that a manufacturer wishing to sell – for example – a smoke detector in a neighbouring European country would possibly have to invest in further testing and certification by local test and certification bodies. Considering there are 28 members of the European Union, not to mention the additional members of the European Economic Area, the costs in terms of time and money are potentially substantial, creating artificial barriers in a single market that should in theory be completely open. And talk to fire manufacturers and you'll often hear tales of woe regarding long waiting times, exorbitant costs and poor customer service of certain testing laboratories and insurers.

CertAlarm scheme is today the only European certification scheme that has been endorsed by the European co-operation for Accreditation (EA), in line with System 5 ('Type testing and assessment of factory quality control, audit of factory quality control and testing of factory or market samples'), ISO/IEC Guide 67: 'Conformity assessment – Fundamentals of product certification'. This makes CertAlarm the most rigorous EU-wide scheme, providing a high degree of confidence for installers and end users that they are getting a quality product. CertAlarm encompasses all products covered by EN 54 series standards including fire alarm and detection systems (EN 54-13), smoke alarm devices (EN 14604), fixed firefighting systems (EN 12094-1 and -3), and fire protection systems (CEA 4021).

'When the concept for CertAlarm was being introduced to the market, it was one of the prerequisites in order to get endorsed by EA that the organisation should not be lead by a single interest group. As a result, stakeholders come from test laboratories, certification bodies, insurance companies and industry. End users can be part of CertAlarm too,' explained CertAlarm General Manager Anja Kinsky.

CertAlarm is not a certification body nor a test laboratory, emphasised Kinsky, it is a scheme that enables companies to secure certification for their products, once they have paid the one-off registration fee. 'They are then entered in our database, and can make use of our services such as contacting the partner laboratories that are accredited for the standards they wish to certify their products to, and ask for quotes. Right now we have eight partner test laboratory and six partner certification bodies and we are always looking for new ones.'

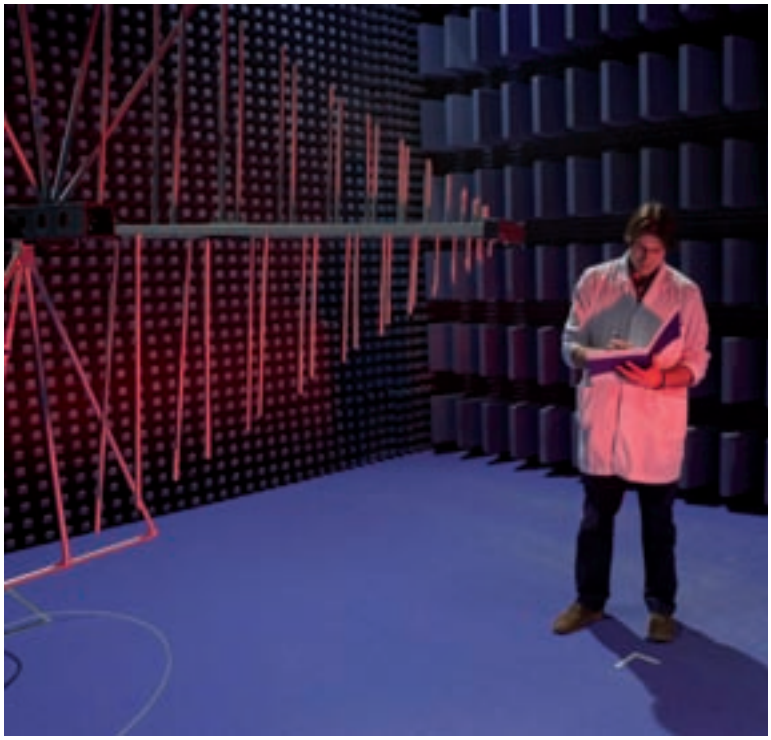
The latest test lab to join CertAlarm is Alter Technology in Madrid (part of the TÜV Nord Group), in January this year. 'The fact that certification standards and procedures are not harmonised within Europe has in the past made it hard for us to understand the differing local situations and to offer the respective services in other countries,' explained Alter Technology's CEO Luis Gómez, 'We therefore strongly support the concept of a single, independent testing scheme

recognised throughout Europe as offered by CertAlarm.'

The scheme has got some strong support from well-known names in the fire protection and security systems sector. UTC Fire & Security, Siemens, Tyco, ATEIS, and Bosch, have all used the CertAlarm scheme for some of their products.

Tyco Fire Protection Products, for example, received CertAlarm certification for its Zettler Generation 6 fire detection technology. 'We place significant emphasis and investment in ensuring our products are compliant with standards at a global and regional level,' explained Eric Tassé, Head of Product Management, Fire Detection. 'The CertAlarm scheme ensures consistent accreditation across our Zettler Generation6 fire detection product range and gives our customers confidence that they are selecting a solution which meets recognised EN54 approvals. In the fire detection industry, our customers have to be certain that the systems and products they specify, purchase and install are robust, reliable and comply with standards and recognised performance parameters. This accreditation gives us greater flexibility in terms of increasing our investments in product innovation, further enabling us to develop new solutions that integrate enhanced fire detection technology.'

So, if CertAlarm is widely recognised as the way forward for harmonised testing and certification, why isn't it being used by everybody? In short, it's the market, commented Kinsky: 'It sounds so logical. From a legal point of view, as an EA-endorsed scheme, CertAlarm should be accepted throughout Europe. There are no legal reasons why it shouldn't be accepted everywhere. But in some countries, like France and Germany, the market continues to ask for VdS or CNPP – and that is what makes it so tough. It is a marketing issue.'



The test lab Alter Technology in Madrid joined the CertAlarm scheme in January this year.

Nevertheless Kinsky is convinced that all countries will eventually come round to CertAlarm. 'Some countries and their insurers still cling to their monopolistic income stream, but they all know it's just a matter of time until Europe will get harmonised standards and certification procedures applicable to and recognised equally in each member state.

Detection news

Fike launches Nimbus into the clouds

Fike Safety Technology (FST) has introduced a new solution for the monitoring and management of remote fire alarm systems over the internet.

At the heart of the system is a cloud-based database which receives data from fire alarm systems via the GPRS mobile network.

In addition to FST's own Twinflexpro and Duonet fire alarm systems, Nimbus also works with most analogue addressable control panels from major manufacturers.

The primary application of Nimbus is to log, manage and administrate the commissioning, servicing, maintenance, testing, performance and day-to-day use of the connected fire alarm systems. Data is stored in a secure database and accessed via a standard web browser on any internet enabled device. Event notifications are sent via email and/or SMS messaging. According to FST, Nimbus is the ideal management tool for service, building and estate managers who need to maintain a lifetime electronic log of their fire alarm systems. It centralises all fire alarm system activity through a single cross-platform management tool and provides a detailed electronic history of the system throughout its use and life. The Nimbus database can provide an infinite log of all data, thereby overcoming the memory limits of fire alarm control panels.

Scientists discover new detection material

A new study published in Scientific Reports has discovered that a material traditionally used in ceramics, glass and paint, can be manipulated to produce an ultra-sensitive UV light sensor, paving the way for improved fire and gas detection.

Researchers at the University of Surrey's Advanced Technology Institute (UK) manipulated zinc oxide, producing nanowires from this readily available material to create an ultra-violet light detector which is 10,000 times more sensitive to UV light than a traditional zinc oxide detector.

Currently, photoelectric smoke sensors detect larger smoke particles found in dense smoke, but are not as sensitive to small particles of smoke from rapidly burning fires.

Researchers believe that this new material could increase sensitivity and allow the sensor to detect distinct particles emitted at the early stages of fires, paving the way for specialist sensors that can be deployed in a number of applications.

'UV light detectors made from zinc oxide have been used widely for some time but we have taken the material a step further to massively increase its performance. Essentially, we transformed zinc oxide from a flat film to a structure with bristle-like nanowires, increasing surface area and therefore increasing sensitivity and reaction speed,' said Professor Ravi Silva, co-author of the study and head of the Advanced Technology Institute. The team predict that the applications for this material could be far reaching. From fire and gas detection to air pollution monitoring, they believe the sensor could also be incorporated into personal electronic devices, such as phones and tablets, to increase speed, with a response time 1,000 times faster than traditional zinc oxide detectors.

A detector that hears gas leaks

A new non-contact gas leak detector is 'a giant step forward over traditional gas leak detectors.'

The FlexSonic detector is the first non-contact gas leak detector of its kind that recognises unique ultrasound 'fingerprints'. The acoustic gas leak detector works by analysing 24 ultrasonic bands, whilst ignoring nuisance ultrasonic sources. A high-fidelity microphone continuously monitors for the distinct ultrasound emitted by pressurized gas leaks across a wide spectrum of frequencies.

Its manufacturer, the Minneapolis company Det-Tronics (part of UTC), says that the new detector has been designed to withstand the harshest environments, whether tropical or arctic. 'It's a giant step forward over traditional gas leak detectors,' said Jerry Slocum, managing director, Det-Tronics.

Unlike traditional non-contact gas leak detectors, the FlexSonic can be programmed to ignore background noises, discerning between gas leaks and environmental noises (eg metal-on-metal contact, fans, machinery or vehicles). For noisy applications, the detector learns regularly occurring and random sounds, detecting the actual acoustic gas leak 'signature.'

Upgrading fire protection at GDF SUEZ Power Station

When a 15-year old control panel that activated a series of electric and diesel pumps failed with a defect that was proving near-impossible to resolve, it became obvious that it was time to take action.

There weren't many options available to GDF SUEZ Site Services Engineer Simon Gott: 'The control panels that had been in operation since the opening of the power station used a closed protocol system which had become obsolete, so we had no option but to look for a modern open-protocol replacement.'

The Saltend Power Station in Hull, northeast England, produces around 1,200 MW of electricity, powering 1.2 million homes. The main hazard for Saltend is the natural gas that comes in at 65 bar and which is pushed into the gas turbines at 32 bar. 'The fire detection and automatic deluge system protect three large gas turbines and associated lubricating oil systems, as well as the overall building infrastructure.'

Following a competitive tender, the contract for a replacement system was awarded to Middlesex-based (UK) Chubb Fire & Security, part of UTC Building & Industrial Systems.

Over a period of eight months Chubb engineers worked around Saltend's workers, installing a PC-based fire alarm system (ControlMaster 600) with a graphical user interface that incorporates Google Maps and site layouts.

According to Simon Gott, the front-end graphics display element is one of the biggest benefits of the new system – a feature that the old system couldn't offer. 'The Chubb engineers used Google maps to overlay the whole site, adding hyperlinks to key areas, which open up CAD drawings showing where the detectors and the zones are.'

The front-end interface is displayed on a 22-inch flat screen display that replicates all the functionality of the hard control panel: 'One of the benefits is that you can link it to the system and drill right down to each individual detector and disable it, isolate it, or just see what it's doing. You can see if it's been on a fault status or fire condition. We can pull off historical alarm trends that list which detectors or call points have gone into alarm, which is critical as first line response for the site shift operations teams.'

The uploading of all the site's layouts was a project in itself, adds Simon, involving numerous wiring diagrams and locations both in CAD and paper formats. 'The Chubb engineers took them and re-engineered them and provided us with a full suite of drawings. It was a lengthy exercise.'

In addition to the installation of the new control system, Chubb replaced 20 local interface panels for deluge systems in critical areas across the site – in summary, all areas local to the plant, including the switch room, water treatment plant and stores building. Fortunately, the original detectors – manufactured by Apollo – were open protocol ones and therefore did not need replacement.

Looking back on the project Simon Gott is pleased with how smooth the installation went. 'The engineers organised implementation so that it worked in and around our operational requirements, crucially ensuring there was no disruption to the power station's productivity.'

Training for the new system has also run smoothly, with two Chubb engineers visiting each of the five shift teams over a structured period of time. 'The service provided has been exemplary, we have had no issues at all,' concluded Simon.

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A SAFE GETAWAY

A EUROPEAN PROJECT EXPLORING THE ROLE OF ACTIVE DYNAMIC SIGNAGE SYSTEMS IN THE EVACUATION OF COMPLEX ENVIRONMENTS HAS NOW REACHED ITS CONCLUSION, WRITES PAUL BRYANT.

The King's Cross Underground Station fire in 1987 changed forever the requirements for fire safety and protection in UK underground mass transit systems. Fire detection, suppression and compartmentation are all now key features of the fire strategy for the underground environment. Fire safety management has been greatly improved and passenger and staff safety considerations are always uppermost in the minds of those managing the networks. There is one aspect of the fire strategy that has not drastically changed since that time and that is the fire safety directional signage. The specification for the signage format has now been brought into line with Europe but the nature of the sign remains passive as it has done for decades.

One of the features of the King's Cross fire was that passengers were directed into the ticket hall where the fire was at its fiercest, thus contributing to many of the 31 fatalities. The story may have been very different if both the information and technology could have diverted these passengers to an alternative, safer, route.

The idea of an active dynamic signage system for complex environments such as railway stations was the basis for the European Commission-funded Getaway Project. The project that commenced in November 2011, concluded in October 2014 with a workshop that highlighted the potential benefits of the system. The project's aim was to design and trial an innovative and intelligent emergency signage system for the real-time direction of transport terminal passengers during the evacuation of a transport terminal in the event of an emergency. Experts from a range of companies worked together to help develop the system which was trialed in Barcelona at Sant Cugat Station, run by the Barcelona Metro Company – Ferrocarrils de la Generalitat de Catalunya – who were also participants in the project. Other members of the group were the Fire Safety Engineering Group (FSEG) of the University of Greenwich, Evaclite, Hochiki Europe, Vision Semantics, Kingfell Bulgaria and London Underground. The Project was managed by BMT Techmar.

During the King's Cross Fire passengers were directed to the ticket hall where the fire was at its fiercest. Photo: KingsXfire by Christopher Newberry.

The project combined a number of sub-systems that worked together to provide the Getaway intelligent active dynamic signage system (IADSS) that could provide direct benefits by improving way-finding in emergency situations within transport terminals and other applicable buildings and environments. The IADSS is intended to facilitate an emergency evacuation by providing recommendations on the selection of evacuation strategies to the emergency management based on the situational information, and enhancing the implementation of the selected evacuation strategy.

The IADSS was developed through the Getaway project to improve the current standard emergency exit signage systems widely used in buildings. Recent research has shown that the standard emergency exit signs are less effective as an aid to way-finding than they potentially could be. In addition, the deployment of standard signage systems is often inflexible and therefore unable to cope with the changing situation or to adapt to multiple evacuation procedures. Getaway tackles these problems through the design and development of the IADSS in three steps.

Firstly, through the introduction of lit, flashing and running signs, the traditional static emergency signage system is transformed into a dynamic signage system (DSS). The increased affordance offered by the DSS significantly increases the detectability of the emergency exit sign.

Secondly, by linking the DSS to the alarm system, the DSS will only be activated when needed, thereby overcoming the 'learnt irrelevance' of emergency signs.

Finally, the active dynamic signage system (ADSS) is linked to a decision support system utilising evacuation simulation, CCTV footage and fire detection system information to rank existing evacuation strategies as the incident develops, bringing 'intelligence' to the selection of evacuation strategy.

In summary, the application of the IADSS enables the terminal incident manager to direct passengers to follow an

intended optimal evacuation procedure based on available situational information by activating the appropriate dynamic signs.

The constituent parts of the system are as follows:

The active dynamic signage system

The active dynamic signage system (ADSS) is the visible part of the Getaway System. The output of the Getaway System initiates the appropriate displays to guide occupants to evacuate using the intended exit route. These signs use LED technology to actively show both where people should go and, just as important, where they should not go (see Figure 1 below) in certain cases.

(a) (b)

Figure 1: two options of active dynamic signs.

Environmental sensing and alarm warning systems

Typically, for evacuation systems one of the most important environmental sensing and alarm warning systems will be the fire detection systems (FDS). These will normally have been designed and installed to the relevant national standards (eg BS 5939 Part 1). One of the key benefits of the Getaway concept is that the IADSS can take the monitoring data from the FDS into account to assess evacuation strategies, so that the potential impact of unsafe route can be estimated when selecting a strategy. It is important in such cases that a design review is undertaken to determine – if a fire is detected – whether the rank of the strategies by the system matches the estimation by a fire engineer.

CCTV and CCTV analysis engine

The prime purpose of the CCTV analysis engine is to determine the numbers of people at any specific location of the building or environment and where they are located, in real time. As an example, for a railway stations, the Getaway system will want to understand the numbers of persons on a platform and where they are located. The distribution of occupants will have an impact on the simulation of the evacuation models by the intelligent part of the IADSS; hence affect the ranking results of the evacuation strategies.

Incident fire library and evacuation strategies library

In order to apply the IADSS concept to a building, a set of fire scenarios that require the evacuation of the entire building will need to be identified. These need to address likely fires that the building may expect to experience that will require the evacuation of the building. All the identified fires are then simulated and stored in a fire library database for later use. In addition, all the possible evacuation strategies from the building need to be identified. These evacuation strategies are then defined in the evacuation database for later simulation.

During an actual incident, live data from the fire detection system is matched against the data in the fire database. The closest fire from the fire database that matches the fire signature measured during the actual incident is then identified and used in the subsequent evacuation simulation performed by the evacuation simulation engine (ESE). In the Getaway project, the buildingEXODUS evacuation simulation software was used as the ESE and the Smartfire CFD fire simulation software was used to perform the fire simulations used in the incident fire library.

Decision engine and evacuation simulation engine

The decision engine (DE) is the intelligent part of the IADSS. In the event of a real emergency, the DE takes two sources of input from the peripheral systems:

- Live information from the fire detection and alarm systems (or other emergency sensing systems) to determine the location and spread of the risk phenomena such as heat or smoke.
- Live information on crowd numbers and locations within potential risk area(s) from the CCTV and CCTV Analysis Engine.

The live information from the fire detection system is used to identify which of the fires in the fire library most closely matches the actual incident. This information, along with the current crowd distribution is input to the ESE which then runs coupled fire-evacuation simulations for all the pre-defined evacuation strategies. The key results from the coupled fire-evacuation simulations (such as predicted evacuation times, predicted number of injuries and fatalities etc) are then used by the decision engine to rank the strategies according to the level efficiency and safety they demonstrate. The ranked evacuation strategies will be displayed to the responsible person(s) – ie those with appropriate levels of authority to initiate the evacuation sequence.

Conclusions

The system was live trialled in Barcelona in June 2014 where the following benefits were demonstrated:

- A significant increase in the numbers of people using the indicated exit (ie following the intended evacuation procedure) instead of their nearest exit (which may become unsafe or unviable due to the incident).
- A positive influence on evacuating persons in that they did not find the new signage design confusing.
- Increased confidence for evacuating persons that they were moving in the correct direction and that they had selected the correct exit.

Another key benefit of this approach may include greater flexibility for unusual building design where escape routes would have been based upon prescriptive and static evacuation signage methodologies. Furthermore, it was demonstrated that it was possible to perform all the coupled fire-evacuation simulations and identify the optimal evacuation within the time frame between the alarm system alert and alarm time scales, which in this case was around 40 seconds.

More information and the results of the research can be found on the website at www.getaway-project.eu.

The Getaway intelligent active dynamic signage system was trialed in Barcelona at Sant Cugat Station.

Not just ARFF

With 14 aviation rigs and six foam tenders the International Fire Training Centre in Durham Tees Valley Airport is well known in the ARFF world – but it is also gaining a strong reputation in the offshore, marine and industrial sectors. Business Operations Manager Gary Watson spoke with Jose Sanchez de Muniain about the latest developments.

Business Operations Manager of the International Fire Training Centre, Gary Watson.

Why do ARFF firefighters travel to IFTC from overseas?

We welcome delegates from Vancouver, Tahiti, Hong Kong, Europe, Middle East and Africa. They travel a long distance for fire training because we have a fire ground 19 acres in size and 14 aviation rigs, as well as six foam aviation tenders. We offer authentic training, and they like that we burn gas and kerosene, which burns black smoke.

Most training facilities only have one rig, and if you only have one rig you are not being tested. If you use it too much, you get to know where all the trip hazards are etc. So many firefighters come to us for revalidation every four years, because we have the facilities to change things around.

We take on novices and equip them with the skills and a certificate of competence to work legally in any UK airport. And because the UK CAA is widely recognised around the world, some people come to us from other geographies. We can also take experienced firefighters and put them through some very demanding training scenarios.

What's new in ARFF for IFTC?

A year ago this month we gained accreditation from the French civil aviation authority, so we can now deliver revalidation training to French airport firefighters. We've just had the first course of the year for guys from Beziers, Brest, and Bergerac.

Are there any major trends in ARFF training?

Some of the major changes are to do with regulatory shifts. EASA – the European Aviation Safety Agency – can now set the standards for Europe, and we have until the end of 2017 to gain compliance. While the UK exceeds that level of compliance at the moment, other European countries may have to review theirs.

The major change is that EASA is saying that an airport now just needs to demonstrate how it achieves an acceptable level of compliance. It used to be that to demonstrate the acceptable level of compliance you needed a CAA certificate from one of the five UK centres. Now you can go anywhere for your fire training, you just need to demonstrate that it's to a level that's acceptable to EASA.

While pluralism could be good, almost by definition it could also make it difficult to have a common standard. So airports are talking about how they are going to deal with that.

What other markets do you operate in?

We also diversify into oil and gas where we have relationship with Falk Safety Services, and we train personnel for skills acquisition and revalidation of competence – all OPITO accredited – prior to deployment to offshore platforms.

We also run JOIFF-accredited courses on the industrial side, and more recently we received accreditation from the UK Maritime Coastguard Agency to deliver the STCW95 basic training.

What are the main differences between the ARFF and industrial firefighting markets?

The challenge that everybody faces in the industrial stage is that in most cases there's a different level of statutory obligation to train the firefighters – in some places it's more about good practice. There are different routes to get a statement of competence to be an industrial firefighter compared to the way you do to be an airport firefighter.

Industrial courses tend to be shorter too, two days instead of six weeks, and as such, people don't want to travel too far. Saying that, we've carried out some for industrial firefighters in Algeria, but that is because they have built a landing strip next to the gas plant to increase security. They came to us because we could provide both sides of training.

Any recent major investments?

We've spent £200,000 ($350,000) on a new virtual reality suite for incident command training, including a number of virtual scenarios such as a civilian airport, chemical incidents and gas escapes. Physically it's a room with blackout blinds and a huge screen. The incident commander can shout commands to four crew commanders sitting behind him in pods.

We've also spent 850,000 ($1.1 m) on two new appliances for our aviation courses from Sides, and we've also just bought and installed a dry rig helideck. We've already got a helideck for fire training, but this one is to teach offshore workers safe helideck operations, such as how to land, fuel up etc.

We been investing on the industrial front and have bought a well head and a tank farm with a bund so we can train firefighters to contain a fire before it spreads to neighbouring tanks. We also have a chemical distribution plant rig to simulate chemical spills and casualty recovery.

How does the IFTC deal with runoff water?

The runoff water goes into an oil separator that skims off all the fuel, and we use that for dirty burn spill trays. The protein-based training foam goes into a reed bed where it is eaten up. We reuse about 95% of our water.

IFTC IN BRIEF

The International Fire Training Centre in Durham, North East of England, first opened its doors in 1981 as the official ARFF training centre for the UK Civil Aviation Authority. Since its acquisition by Serco in 1996 it has diversified into other areas including industrial firefighting, offshore safety training and incident commander training. Today the IFTC estimates it retains around 85% of the ARFF training for the UK.

Read our e-magazine at www.hemmingfire.com

Designs for the future

Training in excess of 14,000 students per year, the Fire Training Group (FTG) in Aberdeen (Scotland) is expanding its fire training ground and facilities.

In step with its aim of delivering realistic, innovative and quality assured training within a safe environment, FTG has recently replaced its ladder training tower.

To ensure the tower reflected the unique aviation training environment, the tower was designed in conjunction with Aberdeen International Airport's Fire & Rescue Service.

In addition to the standard ladder tower requirements, the unit incorporates a (rather unique) fixed wing fuselage section complete with hinged door. Also included are helicopter access/egress points. Both scenarios are built to scale and represent current modern aircraft seen in national and international airfields. The enhanced training facility, the first of its kind in the country, will be used by both the Fire Training Group for aviation courses and Aberdeen International Airport's Fire & Rescue Service.

Continued investment by FTG is delivering aviation firefighters with training scenarios that ensure the development and enhancement of their skills.

Aviation facilities encompass the requirements of both large and smaller airfields and include pressure-fed fixed wing and rotary wing simulators (LPG and class B), Jaguar GR3A military aircraft, Jetstream 31 fuselage and a Cessna 182 light aircraft.

To complement an extensive modern training centre that already incorporates 13 spacious training rooms, breakout rooms and student lounges, the fire training ground has also been extended. Included within the project was an extensive concrete training area complete with water supplies, floodlighting and additional student changing rooms to meet demand.

David O'Neill, Head of the Fire Training Group, commented: 'I am delighted to see the delivery of our latest expansion project. As part of our overall growth strategy, the project represents a considerable investment in our facilities.

'We are committed to providing students with a training environment that facilitates their development. The introduction of a ladder tower designed with the input of aviation firefighters is testament to that.'

The new training tower features a unique fixed wing fuselage complete with hinged door.

Top CABA kit guaranteed

The Fire Service College in Moreton-in-Marsh (UK) has opened a new state-of-the-art breathing apparatus (BA) training school at its incident training ground.

The facility will provide training on the full range of compressed air breathing apparatus (CABA) and will be run in partnership with Dräger.

The partnership aims to ensure that the College's training curriculum is delivered using the latest equipment. Up to 200 delegates will be able to undergo training at any one time, expanding the College's ability to deliver assessed, accredited and assured training to fire and rescue services across the UK and internationally.

The new facility houses four networked briefing rooms, in which delegates can learn how to service and prepare BA equipment. Improved delegate facilities include three new drying rooms and an expanded provision of showers and changing spaces, incorporating an innovative sealed 'dirty room'. The room has been specially designed to minimise the spread of contaminants during the removal and changing of personal protective equipment.

Peter Dartford QFSM, president of the Chief Fire Officers Association and Chief Fire Officer of Staffordshire Fire and Rescue Service, opened the facility in January. Speaking at the launch, Peter said, 'The opening of this facility is a fantastic step forward in the transformation of the Fire Service College and the investment in state-of-art equipment and facilities is another tangible demonstration of the progress that is being made to develop a true centre of excellence of firefighter training. The Chief Fire Officers Association is fully supportive of the transformation that is taking place at the College and to our partnership which is delivering benefits to firefighter training and safety across the UK and beyond.'

The facility is the first result of a new strategic alliance between the Fire Service College and Dräger, and follows a long period where both parties have worked together, with Dräger providing safety equipment, specialist trainers and servicing.

According to a College spokesperson, the partnership will in the future result in both parties working together to develop new products and expert training – whilst testing and showcasing the latest in fire safety equipment.

It's all in the detail

What type of fire truck would suit an airport that not only offers travellers plenty of culture but also the opportunity to play golf, ice skate and even visit a spa and casino?

The award-winning Incheon International Airport (IIA) is not only one of the world's largest airports but it is also one of the most active.

Located 70 km from Seoul, the capital and largest city in South Korea, IIA serves as a hub for international civilian air transportation and cargo traffic in East Asia. It is a main hub for Korea Air, Asiana Airlines, Juju Air, and Polar Air Cargo. The airport features three parallel runways, two of which are 3,750 m long and one that is 4,000 m long.

For nine years in a row (since 2005) the Airports Council International has rated IIA as the 'best airport worldwide' – it is a gem that stands apart from other airports.

IIA boasts state-of-the-art amenities that include a golf course, a spa, an ice skating rink, a casino and even private sleeping rooms.

And that's not all. It houses the Korean Cultural Museum, Traditional Culture Experience Zone, Traditional Craft Gallery, and Arrival Hall Culture Street, making Korean arts and culture easy to access and experience by visitors.

In 2010, the airport purchased and placed a pair of Oshkosh Striker 6 x 6 vehicles into service. In 2014, when the airport's growing traffic and footprint required the addition of two larger ARFF vehicles, IIA again turned to Oshkosh Airport Products and its largest Striker 8 x 8 configuration.

New additions to the fleet

The matching pair of Oshkosh Striker 8 x 8 vehicles for Incheon International each features a 950 horsepower engine with electronic fuel management, Oshkosh TAK-4 all-wheel independent suspension for ride quality, a rear steering system (to articulate the rear wheels for enhanced maneuverability), and a 30-degree angle of approach and departure. The wheelbase is 6,782 mm and the overall length is 13,589 mm.

Inside the cab is seating for five firefighters, a tilt-telescoping steering wheel column, centre console-mounted turret controls, heated and power adjustable outside mirrors, air conditioning, and 7.2 square meters of glass area with overhead mounted windows for unmatched outward visibility.

The firefighting system includes a 10,000 lpm single stage pump, a 17,033 l water tank capacity, a 2,385 l AFFF concentrate tank, and a 250 kg dry chemical system delivered through a dry chemical hose reel mounted in the upper right side compartment.

The vehicle offers a structural firefighting control panel and two 64 mm discharge lines, one on each side of the truck.

The vehicle's primary turret is a roof mounted, electric joystick controlled unit that can rotate 135 degrees on either side of centre and elevate 45 degrees above horizontal. A secondary turret is mounted on the front bumper, and five undertruck nozzles protect the underside of the vehicle.

A third Panther for Mozart

The latest delivery to Austria's second largest international airport brings the combined fire fighting technology to 33,600 l of water, 4,700 l of foam and 1,000 l of powder.

The Panther-S 6x6 was delivered to Salzburg's airport at the end of 2014, ten years since the last Panther delivery. It replaces an FLF 5000 dating from 1987, also supplied by Rosenbauer.

All three vehicles share the same high-tech core, which consists of an ingenious combination of pump (R600) and a three-level foam proportioning system (Foamatic RVMA) that can prepare a water-foam mix at speeds of up to 6,000 l per minute.

The extinguishing agents are delivered via electronically controlled monitors on the roof and at the front of the trucks.

The roof monitor offers outputs of 5,000 l/min (Panther 8 x 8) or 6,000 l/min (Panther-S 6 x 6), while the front monitor has a capacity of 1,000 (8 x 8) or 1,500 l/min (6 x 6).

These capabilities exceed the requirements contained in ICAO directives for Category 9 airports such as Salzburg, which stipulate that the three vehicles must emit a combined volume of 9,000 l of extinguishing water/foam mix in one minute. In fact, Mozart Airport meets the second highest safety level demanded by the ICAO directives. The monitors' power enables firefighters to attack the fire from a distance of over 80 m with full output and in continuous operation using all types of extinguishing water and foam quality.

The powder carried in the payload can be integrated into the flow of extinguishing agents from the roof monitor. The new Panther-S is equipped with its own powder extinguishing unit.

Thermal imaging cameras in the vehicles help to pinpoint hidden fire sources, and ground spray nozzles protect crew from the heat of burning kerosene.

The Panther-S's low 2.5 m width means it is suitable for public highways, allowing firefighters to deploy beyond airport boundaries eg to nearby emergencies. To this end the new Panther will carry standard number plates and receive an additional license for public roads. A special 'steered' rear axle has been specified on the Panther-S for ease of handling on public highways and roundabouts.

MOZART AIRPORT'S PANTHER-S 6 X 6 – SPECIFICATION

- On Volvo D6, 700 hp (515 kW), Euro 5
- 9,100 l water, 1,200 l foam, 250 kg powder
- R600 with 6,000 l/min + Foamatic RVMA foam proportioning system (1, 3, 6%)
- RM60C roof monitor with 6,000 l/min + RM15C front monitor with 1,500 l/min
- Thermal imaging camera on the front monitor
- Powder extinguishing system with quick-attack unit in the superstructure
- L x B x H: 11.8 x 2.5 x 3.6 m.

ARFF MATTERS

THE 14TH ANNUAL AIRPORT FIRE OFFICERS ASSOCIATION CONFERENCE HELD IN DUBLIN IN JANUARY BROUGHT TOGETHER ARFF PROFESSIONALS FROM ALL OVER THE WORLD. ANN-MARIE KNEGT WAS AT HAND TO REPORT THE HIGHLIGHTS OF AN EVENT THAT IS GROWING IN PRESTIGE – AND ATTENDING DELEGATES – EVERY YEAR.

Barry Alderslade, Deputy Airport Fire Manager and Interagency Liaison Officer for Gatwick Airport Fire & Rescue Service (London) kicked off the conference by welcoming all 164 delegates and the main sponsor Terberg DTS. Barry also highlighted that while 2014 might have seemed like a disastrous time for ARFF due to several high profile incidents, it was actually the safest year in recorded history for aircraft-related accidents.

AFOA going from strength to strength

MD of UK-based company Terberg DTS, Alisdair Couper then took over the helm. He applauded AFOA for becoming one of the strongest groups in its industry, and he highlighted that the Airport Fire Officers Association was at the cusp of something great. 'AFOA is very close to becoming a recognised body that can create benchmarks and standards,' he said.

Alisdair emphasised that recent multiple-location attacks, such as the Charlie Hebdo and kosher supermarket shootings in Paris, highlighted that security and fire services could no longer be seen as separate entities, and that the two were intrinsically linked. He continued that currently there were no such things as airport police services, and he wondered how long it would be before there were.

Airport Fire Services (AFS) not only respond to aircraft incidents but they also have the task of protecting airport buildings and the complex physical infrastructure around these, and with this increasingly stringent task in mind, Terberg DTS is looking to set up hub meetings across the UK where these challenges could be discussed.

Another initiative the company is getting involved with is setting up a working group on aerial platforms. Alisdair said: 'At the moment there is no standard for this type of equipment. There is a requirement to develop a tactical agreement on the use of high-reach technology. We would like to offer the opportunity for all interested parties – manufacturers, airport fire services – to take part. Dallas/Fort Worth Airport is already supporting this initiative. Standardisation is key to our industry, and hopefully this initiative will result in the first industry standard in one or two years.' The new working group will be launched in the first quarter of 2015.

Airport Operators Association – challenges ahead

Ed Anderson, the Chairman of the Airport Operators Association, delivered the keynote address. He highlighted that aviation was the lifeblood of the world – 58 million people worked in this industry worldwide, and it provided global supply chains, prosperity, social benefits, and – moreover – it brought people together.

'The challenges in our industry have become very apparent. It is clear that businesses in our sector have to be financially sustainable. It has become a struggle to keep revenue above costs, and there is a global consolidation to drive down these costs,' he commented.

Ed explained that the picture on airport profitability was mixed. Most airports were now privately owned with significant private shareholderships. The competitition between small and medium-sized airports was constantly increasing, putting additional pressure on resources.

'The second challenge is safety, which is the number one priority. The overall safety record is excellent, with only 3.2 accidents per million flight movements. The Malaysia Airlines MH370 disappearance has highlighted the requirement to

The Airport Fire Officers Association's annual conference was held 21-22 January 2015 once again at the Raddisson Blue, Dublin Airport, Ireland.

improve tracking capability.'

Ed continued that not many things had changed over a period of 25 years, apart from the increasing costs. Even though airport operators regarded Airport Fire Services as essential, it was felt that they were very expensive to staff and to equip, especially since airport fire appliances were bespoke. There also tended to be an inflexible approach on part of regulators and people who worked in these types of operations.

'However, the winds of change have swept through our industry. Regulators now allow the fire service to staff according to risk. Capabilities of the equipment have been improved, and the relationship between airport operators and the airport fire service has improved considerably. Airport CEOs now see a fire service that is customer focussed and efficient in its operations. There has been a real leadership change,' he commented.

Ed emphasised that the security issues would remain with us because aviation would always be a major target for terrorists. 'We need to outsmart those who wish us harm so our measures need to be proportionate, while based on risk at the same time, as well as compliant with legislation.'

Ed also highlighted that Europe and its airports in particular were experiencing an infrastructure shortfall compared with the Asian and Middle Eastern airports, which were growing rapidly. The Rukatski whitepaper issued in 2003 identified that major runway capacity expansion was required in the UK.

'The 2013 Aviation Policy Framework did not cover major airport expansion, as this was left to the Independent Airport Commission. Airport expansion is required in London and the south east of England, and a final report on this matter has been promised after the election. The Airport Operators Association has consistently urged political parties to provide

The AFOA Conference provided excellent networking opportunities for the delegates.

UPDATE – CAA AND EASA REGULATIONS AND STANDARDS

During the AFOA conference a regulatory update was provided by Neil Gray (Principal RFFS Inspector – Civil Aviation Authority).

CAA priorities for 2015 include a transition process that sees in-scope aerodromes moving from compliance with the requirements of CAP168, to compliance with Commission Regulation (EU) 139/2014 (EU Rules).

At the time of the conference, eight of the 50 in-scope aerodromes had successfully completed the process. CAA is also going through a process of transformation to become a performance-based regulator, with better regulation principles (proportionality, accountability, consistency, transparency, targeting).

Guidance for Aerodrome Rescue and Firefighting Service (RFFS) task and resource analysis (TRA) has been reviewed and updated in the form of CAA Information Notice 141/2014. CAA has also worked with the Chief Fire Officers Association (CFOA) to ensure that aerodrome operators and their local authority fire and rescue service partners fully understand the conclusions of the TRA process, and the associated risks. CFOA provided guidance to Chief Fire Officers through its Directorate Programme.

Following the tragic crash involving a Super Puma helicopter on its approach to Sumburgh Airport in August 2013, Air Accident Investigation Branch (AAIB) made some safety recommendations within their report regarding the provision of rescue resources, and the associated risks, for such incidents.

Whilst the focus of the safety recommendations was the accident near to Sumburgh Airport, CAA has taken a wider view and, with the support of the aerodrome operator, has conducted a difficult environs survey with the aim of providing guidance to all aerodrome operators on the planning for emergency response to such areas.

The implementation of Commission Regulation (EU) 139/2014 has introduced some potential changes to the requiremenst for RFFS training. The EU rules do not specifically require RFFS personnel to hold a certifcate of competence as required by CAP168, and no provision is made for the accreditation of RFFS training providers by CAA.

Working with the Airport Operators Association (AOA) RFFS working group, it has been agreed that the current framework for the training and assessment of RFFS personel, including the occupational standards contained in CAP699, are well embedded and understood, and can be seen as a means of compliance with the EU rules.

A working group will be established to review and update CAP699 and consider alternative arrangemenst for the accreditation of training and training providers.

Following the update provided by CAA, Graeme Day, who has represented Airports Council International (ACI) on the EASA RMT, delivered a presentation.

In May 2014 EASA established and nominated the membership of a Rule Making Group for task RMT.0589 Rescue and Firefighting Services at Aerodromes. The RMT Group comprised members from Competent Authorities and aerodromes and was formed to review the RFFS Remission Factor, Cargo Operations and Medical and Fitness Standards for RFFS personnel. The RMT Group met four times in 2014 to discuss these matters and drafted Acceptable Means of Compliance (AMC) and Guidance Material (GM) covering the Remission Factor and Cargo Aircraft Operations.

Supported by three doctors the Group has also written an Implementing Rule (IR), AMC and GM covering Fire Fighter Medical and Fitness standards.

A Notice of Proposed Amendment (NPA) and Regulatory Impact Assessment(RIA) covering the Remission Factor and Cargo Operations will be published by EASA by the end of March 2015. The NPA and associated Comment Response Document will enable all concerned to make comment regarding the content of the draft AMC and GM. An NPA and RIA covering Medical and Fitness Standards will initially be considered by the European Commission for publication at a later date.

Key elements of the NPA covering the Remission Factor and cargo Aircraft Operations include:

- Worked examples.
- Clarification of the term 'unforeseen circumstances'.
- Inclusion of RFFS vehicles in EASA's reference to maintenance programmes.
- Reference to Q3 when making Critical Area Concept calculations.
- Reference to performance Level C foam when considering media substitution.
- The level of RFFS provision for all cargo aircraft will be aligned to ICAO requirements.
- The provision of medical/ambulance services by RFFS personnel and the use of Nominated Diversion Aerodromes are out of scope for EASA, and the imminent publication of the EASA NPA covering the Remission Factor and Cargo Aircraft Operations represents a crucial opportunity for all concerned to make comment and influence the outcome of the EASA opinion regarding these topics.
- The consultation period will run through Q2 of 2015 and EASA and the RMT Group membership urge everyone to take the time to take part in the consultation when it is published.

Senior Airport Fire Officers presented several incident case studies.

the UK with sufficient world-class hub capacity in order to keep competing in the global race.

'We have made enormous strides when it comes to customer requirements, and from the UK alone there are around 50,000 routes for customers across the whole world. Low-cost carriers have increased the potential for people to travel. Even Michael O'Leary [CEO of Ryan Air] has seen the light, since he now realises that customer service is important as opposed to just being price-driven,' commented Ed.

He further highlighted that airports were striving to improve passenger experience with an intense focus on service standards. He also urged a reduction in red tape and regulations – the regulations coming from the European Union were proving to be a massive cost for the industry especially. Aviation was also carrying national security costs, and Ed pointed out that the Air Passenger Duty (APD) in the UK was higher than anywhere else in Europe. AOA is campaigning for a reduction in Air Passenger Duty on the long haul APD band as well as for the abolition of APD for children under twelve – extending it to 16. Ed concluded: 'The level of APD in this country is unacceptable. The Scottish will be halving APD soon, and the levels need to be evenly matched across the UK. As an industry we are facing plenty of threats, so we need to become as sustainable as possible, and minimise our environmental impact. As an organisation we have plenty of work to do so we do not slide down the global aviation league table.'

Ground support equipment – knowing the risks

Alisdair Couper from Terberg DTS explained that ground support equipment (GSE) present at all airports presented its own set of safety challenges. He asked whether firefighters knew how to operate GSE and how to rescue someone from it. He highlighted that certain exhaust particulate systems could pose problems, and that the new generation of ground support vehicles presented a number of challenges.

'Some ground support equipment, for instance, is powered by lithium ion batteries, which can pose a fire hazard,' said Alisdair. 'There is currently no control and situational awareness about the different types of vehicles used at an airport, so there is a requirement for familiarisation for the fire service.

'Aircraft catering trucks, for instance, have bodies made out of a type of polyester that flashes over at 1,000 degrees °C. There are many other trucks in and around the airport which contain hazardous chemicals, including spraying vehicles.

'As manufacturers, airport operators and fire services we have the responsibility to familiarise ourselves with the specialist vehicles around the airport, the chemicals used in them, the types of plastics in the bodies and other hazards. Added challenges are that maintenance on grounds equipment is typically poorly executed, while driver abuse is a large problem as well. This means that an aircraft with grounds support equipment attached to it presents a massive risk. Therefore it is important to assess the risks related to this type of equipment and to engage with airfield licensees, because GSE is as critical as any other part of the infrastructure of an airport,' concluded Alisdair.

Aircraft Investigation Branch

Sid Hawkins, Head of the Aircraft Investigation Branch (AIB), pointed out some of the challenges faced by his organisation and how it was overcoming these by increasing cooperation with other agencies.

Sid explained that a team from the AIB was currently involved with the search for MH370. Sid's risk analysis did not deem it safe for his team of investigators to go to the wreckage of MH17 in Ukraine, since it was located in a hostile zone, and because civil air crash investigators should not be deployed in war areas.

'As apart of our response strategy, it is extremely important that we have the right processes in place, and deploy our staff effectively and in a safe manner. We have to make sure that everyone in our team is well protected. I review constantly how we work in order to improve our organisation so we can help the airport fire service and other relevant agencies in the future. The information process is continuing to be improved in the UK. Four to five years ago our number of field deployments was up to about 80, but now this has dramatically dropped to 30.'

However, a large percentage of these 30 incidents were far more significant than the events of four of five years ago. Sid therefore called for increased collaboration between the AIB, emergency services and airport fire and rescue services.

'I rely on you, as airport fire officers, to be my point of contact on the accident site, and as a source to provide good information about the emergency.'

Sid explained how the AIB had investigated several aircraft incidents that had recently occurred in the UK, including the Heathrow Dreamliner incident in 2013, in which a Boeing 787 caught fire due to the combustion of lithium ion batteries and the Vauxhall helicopter crash, when an experienced helicopter pilot flew into a crane in a busy urban area.

The AIB will investigate any aircraft-related incident where there has been a fatality or serious injury, as well as when an aircraft has gone missing or where an aircraft has suffered major damage.

Lessons learnt from previous accidents included that there was still very little knowledge on composite materials as used in the new generation of aircraft, and not much data on how composite components behaved when exposed to fire.

Sid also said that he was involved in research with the UK Ministry of Defence, the University of Manchester and the UK fire and rescue services looking at the dangers of lithium ion batteries. The final results would be published in around 18 months. 'Lithium ion batteries are a massive issue in the aviation industry, not just as cargo, but they are also prevalent in many items that people take onboard an aircraft.

'It is now standard during our investigations to seize all electrical items from the wreckage. The number of devices that contain lithium ion batteries is incredible these days.'

He concluded his presentation by praising the good relationship between the AIB and the fire and rescue service, and the improvement in the interoperability between emergency services. 'The events that we have attended highlight how much the airport fire service has moved forward in the last five years. Everybody seems to have accepted the change in their remit, and the planning and the cooperation has been very effective, making my life particularly easy.'

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