THE CATALYST

Q3 2017

JOIFF

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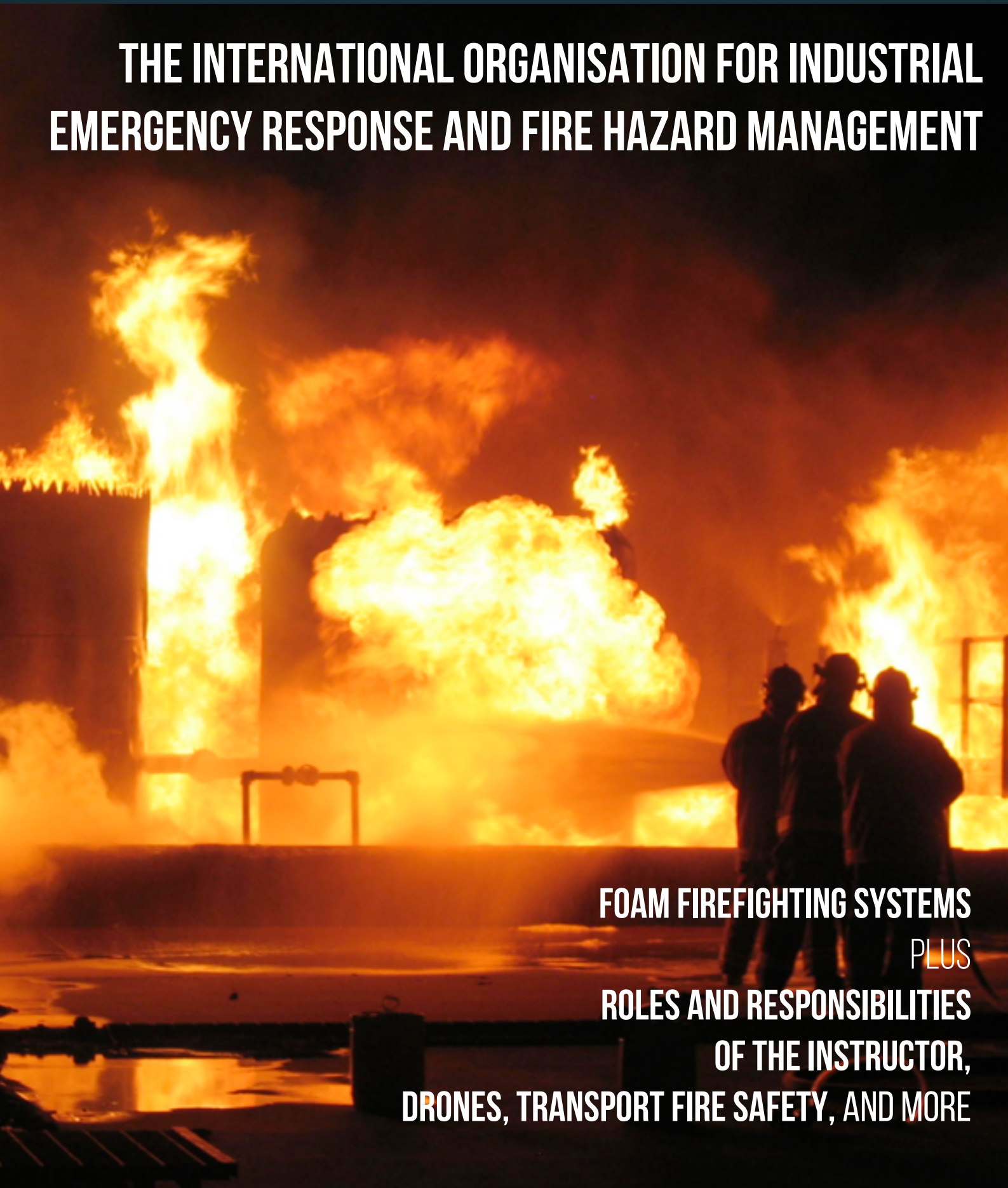
THE INTERNATIONAL ORGANISATION FOR INDUSTRIAL EMERGENCY RESPONSE AND FIRE HAZARD MANAGEMENT



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IN THIS EDITION OF THE CATALYST

REGULARS

FEATURES

ABOUT JOIFF

Full Members of JOIFF are organisations which are high hazard industries and/or have nominated personnel as emergency responders/hazard management team members who provide cover to such organisations. Corporate Members of JOIFF are organisations that do not meet the requirements of Full Membership but who provide goods and services to organisations in the High Hazard Industry.

JOIFF's purpose is to prevent and/or mitigate hazardous incidents in Industry through its 3 pillars:

- **Shared Learning** – improving risk awareness amongst our members
- **Accredited Training** – enhancing operational preparedness in emergency response and crisis management.
- **Technical Advisory Group** – raising the quality of safety standards in the working environment of High Hazard Industry

JOIFF welcomes enquiries for Membership - please contact the JOIFF Secretariat for more information.

JOIFF CLG is registered in Ireland. Registration number 362542. Address as secretariat. JOIFF is the registered Business Name of JOIFF CLG

ABOUT THE CATALYST

The Catalyst is the official emagazine of JOIFF, the International Organisation for Industrial Emergency Response and Fire Hazard Management. Our policy is to bring you articles on relevant technical issues, current and new developments and other happenings in the area of Fire and Explosion Hazard Management Planning (FEHMP). The Catalyst is published quarterly - in January, April, July and October each year.
Readers are encouraged to circulate The Catalyst amongst their colleagues and interested parties. The Editors welcome any comments – please send to fulcrum.consult@iol.ie

In addition to The Catalyst, information relevant to FEHMP is posted on the JOIFF website.

Disclaimer: The views and opinions expressed in The Catalyst are not necessarily the views of JOIFF or of its Secretariat, Fulcrum Consultants, neither of which are in any way responsible or legally liable for any statements, reports or technical anomalies made by authors in The Catalyst.

JOIFF

If you have a request for an article or advertising to be included in the Catalyst, please contact the JOIFF Secretariat, details below.

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CHAIRMANS NOTE

JOIFF members and guests,

I was pleased and humbled by the quality of the learning experiences I enjoyed at the JOIFF FEHM Summit in South Africa. I made it a point to speak to, (and more importantly, listen to) as many delegates, speakers and sponsors as I could. It was fantastic to hear such a diverse range of passionate professionals, and learn a bit about their "worlds".

What we hope to achieve through these conferences, and all the work JOIFF does, is a dynamic opportunity for professional interaction across the various response disciplines and contexts. It is easy and convenient for us to stay within the confines of our specific "bubble". Learning of the challenges and solutions that others in our profession deal with and create, both expands our perspective, and offers divergent thinking that can enhance our own understanding. Sometimes our bubbles need to be burst.

As you know, JOIFF works to hold a strong technically accurate and commercially objective perspective. We expect ourselves to challenge and inject critical thinking into all that we do on behalf of our members and industry. The Summit was a great opportunity for JOIFF and the participants to exercise that expectation and we could not have done it without Marcé and our other sponsors, the speakers and the delegates. With deepest appreciation - Thank you all.

For those of you that did not attend, we will offer information in this and the following Catalyst on some of the key presentations. Do note that as a regional Summit, some of the presentations were targeted to specific regional concerns. However, there is still much to learn from those as well. The Summit program and the Sponsors are listed in the report of the Summit in this edition of The Catalyst. This cannot substitute for being there but will still provide value to you. Please take the time to review the program and all of the articles in this issue, enhance your understanding, and enjoy the benefits. It is good to partner with you.

In your service,
Highest Regards,

Randal S. Fletcher (Randy)

JOIFF Chairman




SOME INDUSTRIAL INCIDENTS THAT TOOK PLACE DURING THE SECOND QUARTER OF 2017

Belgium
Entire Village Evacuated Following Nitric Acid Tank Leak

China
Five killed, three injured in east China factory blast

Trinidad
Bunker Fuel Oil Tank Leaking at Petrotrin Deploying Clean-Up Vessels

CCPS Process Safety Bulletin Report
corroded equipment and holes in tanks

Curacao
Fire at PDVSA Isla Oil Refinery under control

USA
One dead, three injured in Anadarko oil tank explosion

Mexico
Fire-fighter Dead, Nine Workers Injured, Hundreds Evacuated

USA
Oil tank fire witness: 'I'm really amazed that anybody lived'

Pakistan
Oil Tanker Inferno Kills At Least 123

UK
Firefighters tackle diesel blaze near Gatwick Airport

UAE
Fire Breaks Out at Sharjah Lubes & Oil Plant

Note from the Editor.

Most reports of incidents that occur, some of which are listed here, are familiar. After all major incidents, recommendations are made but how many of the recommendations are implemented. How many are forgotten over time until another similar incident occurs?

JOIFF shares valuable information with its members aimed to improve the level of knowledge of Emergency Responders and to work to ensure that members benefit from the misfortunes of some to educate against the same mistakes being repeated. Industry needs to ask is it doing enough to educate Industry so that incidents such as these will either not be allowed happen again, or if they do they can be effectively dealt with.

NEW MEMBERS // SECOND QUARTER 2017

During April, May and June 2017, the JOIFF Board of Directors were pleased to welcome the following new Members:

FULL MEMBERS:

Falck Safety Services LLC, Doha, State of Qatar, represented by Gareth J. Kirby, Training Manager and Neil Thompson, Head of Fire and Rescue. Falck Safety Services LLC Qatar delivers a comprehensive range of emergency response training courses for onshore and offshore as well as tailor-made individual courses designed to specific company requirements.

Maryland Fire and Rescue Institute, Maryland, United States of America, represented by Paul Flippin, Manager of Special Programs and F. Patrick Marlatt, Assistant Director.The Maryland Fire and Rescue Institute (MFRI) of the University of Maryland is the State's premier comprehensive training and education system for emergency services. The Institute plans, researches, develops, and delivers quality programs to enhance the ability of emergency services providers to protect life, the environment, and property. MFRI serves the entirety of Maryland's affiliated fire and emergency service community, and has been an integral part of the University of Maryland at College Park for over 85 years. MFRI is an all hazard Fire and Rescue Training Organization, which delivers quality training and consultation to local, national, and international communities by providing practical hands-on training and management skills. The Special Programs Section (SPS) at MFRI offers training programs and consulting services to unaffiliated and out of state organizations, both nationally and internationally. They include programs/ classes for business, industry, DOD, government and emergency response organizations in the areas of safety and health, management, loss prevention and control, and fire and rescue emergency response activities. Many of our fire and rescue programs lead to national certification.

Newcastle International Airport Training Academy, England, represented by John Purdy, Commercial Training Manager and Graham Reeve, Instructor. The Training Academy delivers a range of training including Offshore Emergency Response, Industrial Firefighting, Aviation Firefighting and Health and Safety

CORPORATE MEMBERS:

Emergency Safety Solutions (Ferrara Middle East), Abu Dhabi, United Arab Emirates represented by David Jackson, Managing Director and Ross Watson, Sales. ESS has almost two decades of experience throughout the Middle East and provides firefighting equipment and services to both the oil and gas and industrial fire sector. ESS with both its regional and international partners provide expertise and professionalism and skilled manpower and services to ensure the safety of their facilities, assets and personnel. ESS management system is certified to ISO 9001:2015.

During Q2 2017, the Directors were also happy to welcome Richard Charlton, PGCert, EngTech, FIFireE, FICPEM, CFPA(Europe) Dip, England.

We look forward to the involvement of our new and existing Members in the continuing development of JOIFF.

NEWS FROM JOIFF ACCREDITED TRAINING PROVIDERS

NEW ELEARNING SUITE RECEIVES JOIFF ACCREDITATION

Petrofac

Montrose, Scotland tel: +44 845 606 2909, bookings@petrofatraining.com

Petrofac's computer-based training business, Oilennium, has introduced the first Authorised Gas Tester (AGT) eLearning suite to be accredited by JOIFF, The International Organisation for Industrial Emergency Response and Fire Hazard Management. Developed in collaboration with oil and gas operators and service companies, the AGT suite provides users with the skills and awareness they need to safely test oxygen levels and flammable or toxic atmospheres.

The suite covers the properties and hazards of gas, the regulations and procedures designed to keep people safe, and the usage of gas detection and respiratory protection equipment; demonstrating the importance of accurately interpreting and documenting the results of a gas test. In addition, the suite guides users through the hazards of working in and around confined spaces, testing for flammable gas in preparation for hot work and meets the needs of personnel involved in safety observer and fire watch duties.

The AGT suite uses high quality animations, graphics and interactions that users can digest at their own pace at their desks.

Recognising the change in the way many people now access and consume training, Oilennium's eLearning materials complement class room learning through the use of high quality animations, graphics and interactions that users can digest at their own pace, from their desks.

Oilennium forms part of Petrofac's Competence Solutions service line which supports the full range of competency needs for the Oil and Gas industry. The AGT suite is the latest in a range of off-the-shelf eLearning materials available to Oilennium's clients as part of its library of CBT modules.

AFFF VS. FFF FOAMS IN INDUSTRIAL FIREFIGHTING SYSTEMS - TRENDS, PERFORMANCE, CONCERNS AND OUTLOOK -

BY JAN-ERIK JÖNSSON AND JOHN-OLAV OTTESEN

Fluorine-free foams (also known as FFF) have been on the market for many years, longer than AFFFs have been around. The first FFFs were developed from protein sources about 80 years ago and the first synthetic FFFs came about 70 years ago when synthetic surfactants became available. During 1960s the fluorine chemistry were developed and fluoro-surfactants became available and AFFF foams with very high fire performance were developed. At this time FFFs were mainly used for multipurpose, HiEx, and Class A foam types.

Due to the performance, AFFFs were widely spread and used in most application, including training. The foam training was not always performed in the best custom, often performed on a piece of land without any protective or containment measures. Hence, ground and water systems surrounding training areas were contaminated by fluorinated surfactants. At that time the most commonly used fluoro-surfactant was PFOS which is a well-known PBT-substance (Persistent, Bio-accumulative and Toxic Substances) and forbidden to use since early 2000.

Today, only alternative fluoro-surfactants that is based on the so called C6-chemistry or short-chain fluoro-surfactants are used in AFFFs. These have a lot better environmental profile and are not found to be toxic or bio-accumulative. However, there is still a question about the persistence of these substances, what can happen in future if released uncontrolled into the environment. Hence, there is a general reluctant from authorities to use these compounds and there has come a lot of restriction on these substances the last years. This has initiated a market driven development of alternatives to AFFFs with still high fire performance.

Looking in the mirror, the fire performance of FFFs about 15-20 years ago were not very impressive. However, since the ban of using PFOS was introduced 2001 the development of FFFs with improved fire performance comparable with AFFFs was initiated and a lot of R&D resources has been put into this. The high-performing FFFs on the market today have fire performance well in correspondence with good AFFFs under test conditions. And the development continues.

Does it mean that the problem is solved and FFFs can replace AFFFs? No, it is too early to make such recommendations since there are still weaknesses and unknowns with FFFs of today. First of all, the FFFs with high fire rating as per today are non-Newtonian liquids, meaning they have high viscosity – frequently above 3 000 mPa·s while the AFFFs for hydrocarbon fuels have low viscosity, often below 10 mPa·s. Hence, to change over from a Newtonian AFFF to a non-Newtonian FFF needs a full system makeover where the injection system and alike has to be exchanged.

Secondly, the fuel compatibility, in the sense that the foam is working on many different types of fuels, for AFFFs this is well documented and proven. It appears that the fluoro-surfactants in the foam are making it versatile. On the other hand, FFFs have shown to be more sensitive to different types of fuels and do not have this built-in enhancer for different fuels due to absence of fluoro-surfactants. As an example, a fluorine-free foam may have high fire performance on heptane but fails when Jet Fuel or kerosene is used as fuel. A foam of AFFF-type will work on both kind of fuels.

Thirdly, the fire performance FFFs seems to be sensitive to the expansion of the foam during application. A lot of fire standards are defining nozzles that always give good expansion, for example EN 1568, ICAO and IMO Circ. 1312. More or less all kinds of foam in this nozzle give expansion of about 6-10, depending on foam type. On the contrary, a lot of applications are using foaming devices that gives quite poor expansion, typically around 4-5. A high performing AFFF-foam will have good extinction properties and good burnback resistance at both high

and low foam quality, with expansion of about 7.0 and 3.5 – while situation is quite different for a FFF. The table opposite shows the difference between an AFFF and FFF tested according to UL 162 with two different foam qualities (FQ) using heptane as fuel.

	AFFF	FFF	AFFF	FFF
	Higher FQ		Lower FQ	
Expansion Ratio	6,9	7,5	3,6	4,4
Application Rate	7,6 l/min	11,4 l/min	7,6 l/min	11,4 l/min
Application Time	3 min	5 min	3 min	5 min
Time to 90% Ctrl	01:08 min	00:56 min	01:26 min	01:50
Time to Extinction	01:46 min	02:10 min	02:14 min	03:24
Burnback resistance	5% @ 5 min	Self Extinct	10% @ 5 min	Failed
Amount of foam to:				
90% Ctrl	8,6 liter	10,6 liter	10,9 liter	20,9 liter
Extinction	13,4 liter	24,7 liter	17,0 liter	38,8 liter

In UL 162 the foam quality is adjusted to fit full scale foaming devices and the test is more representative to a real situation. Note that the AFFF was applied with 7.6 l/min while the FFF was applied with 11.4 l/min in accordance with UL 162. The table above shows that when the foam quality in sufficiently high (expansion at 7.5) of the FFF-foam it pass the test without any problems. However, when the foam quality is decreased to expansion 4.4 it fails the test. It does extinguish the fire, but struggles for a long time but fails in the burnback. When the stove-pipe was lifted it took only a few second before there was a flash over the whole pan and the thin foam layer was destroyed. It is also noteworthy to point out the difference in the amount of foam used to achieve 90% control and extinction. In both cases the AFFF needed about half the amount of premix to achieve extinction compared to the FFF. The same pattern has been seen in several other investigations reported elsewhere. All in all, it indicates strongly that there is a "sweet-spot" in foam quality and application density that needs to be met for a FFF while an AFFF is not critical in this aspect. Hence, this has to be taken into account when changing from an AFFF to a FFF.

The consequence of the above is that current systems are designed with too low application rate to be used with FFFs and often with discharge devices that give an expansion far below what the FFF type foams require.

Conclusively, the fire performances of some contemporary FFFs are high and pass the international fire test standards – at least on the test fuels used in these. If necessary measures are considered such as increased application rate, sufficient expansion, FFFs can be used as alternative to or replacement for AFFFs. However, there are still concerns about their fuel compatibility and performance on really huge fires. Hence, the strong recommendation is to use well proven AFFFs when it comes to critical industrial installations, where several different kinds of flammable liquids are used and the foaming devices might deliver low foam qualities. In fixed installations, e.g. storage tank protection system, it is strongly recommended to have containment systems installed to handle run-off water – and independent if the foam type used is AFFF or FFF. The run-off water contains a lot of pollutants generated by the fire that are classified as PBTs (Persistent, Bio-accumulative and Toxic Substances), and frequently carcinogenic. Examples of pollutants are benzene, toluene, phenol, dioxins and polycyclic aromatic hydrocarbons (PAH). These are substances that should not be released into the environment, but should be contained for later destruction. In such cases there is no problem to use any firefighting foam since they will be contained and unintended release will be avoided.

Editor's note: Jan-Erik Jönsson and John-Olav Ottesen can be contacted at info@fomtec.com website address www.fomtec.com Header image courtesy of Dafo Fomtec AB, Sweden

CARBON MONOXIDE SENSOR CROSS-SENSITIVITIES

ALCOHOLS, VOCS & HYDROGEN

Cross-sensitivity to gases other than the target gas of interest is a common sensor characteristic, especially among electrochemical sensors. Cross-sensitivities are limited as much as possible by MSA sensor design and filters; however, some key interactions still occur. CO sensors do have some inherent characteristics in terms of saturation, cross-sensitivity and cross-interference that may affect sensor performance.

A typical electrochemical gas sensor contains three electrodes: the sensing electrode, the reference electrode and the counter electrode. Electrodes function as follows:

- The sensing electrode oxidizes or reduces the target gas.
- The counter electrode completes the circuit and produces an opposite reaction from that produced at the sensing electrode.
- The reference electrode acts as a reference point to ensure that sensing electrode potential is precisely maintained.

Sensing electrodes are manufactured using conductive catalytic materials that are carefully chosen to provide the best performance for the desired target gas. Proper choice of this catalyst provides selectivity for the target gas over other gases that may be present within the environment. For carbon monoxide (CO) sensors, platinum is the catalyst of choice for the working electrode, as platinum is very stable when used within the electrolytic environment and is an excellent catalyst for creating carbon monoxide oxidation. Platinum is also a very good catalyst for many other gases, including most

hydrocarbons, other volatile organic compounds (VOCs) and alcohols. To address these inherent properties, carbon monoxide sensors are typically designed with a chemical filter. Chemical filters allow CO the means to cross unhindered, while removing most interference gases from the inlet stream.

CO sensors can become saturated with target gas CO. If enough CO enters the sensor beyond maximum range (that listed in the instruction manual), the sensor is unlikely to be able to process all applied gas. When this scenario occurs, the electrolyte becomes saturated. A saturated sensor will continue to show high gas readings until the gas can be processed from the electrolyte. If saturation occurs, allow the instrument to sit powered off but charged for 24 hours. The sensor is typically not damaged, but needs recovery time.

Hydrogen commonly causes positive CO response, as hydrogen molecules are small enough and sufficiently non-reactive to pass directly through the filters of many sensors. Once through the filter, hydrogen is easily oxidized at the platinum working electrode. Hydrogen-resistant CO sensors are available, such as MSA's XCell® CO H2–Res/H2S Sensor, used with MSA multigas detectors and ALTAIR® PRO CO Steel Detectors.

Given enough residence time or high concentrations, most hydrocarbons and VOCs eventually break through filters and can also cause positive sensor response. These gases or vapours tend to be caught in the filter and can saturate the filter before desorbing over time. As a result, after exposure to a hydrocarbon or VOC, a sensor may need time to stabilize and show a reading, even after the substance is no longer present. In this case, the substance works its way through the filter and is read by the sensor upon breakthrough. Therefore, positive response may be present for several hours after exposure, due to slow desorption. If a user zeros or calibrates the instrument while the filter is still saturated, the possibility exists of producing negative instrument reading when the filter clears. If this scenario occurs, the instrument must be recalibrated after recovery.

Alcohols are also adsorbed as they enter the sensor and may also create CO positive cross-sensitivity reaction. Although alcohols generally cause positive reaction, they are caught in the sensor electrolyte and diffuse to the reference electrode. This diffusion changes the reference electrode potential, and given enough time and concentration, can cause negative response. If the CO channel is part of a two-tox sensor that includes another separate gas channel, the possibility exists that exposure enters from the other channel and reaches the counter electrode first, resulting in negative shift first followed by positive shift. If these events result in negative sensor response, they can cause an under- range alarm to occur.

As with hydrocarbons and VOCs, alcohols can get caught in sensor filters and can take time to clear. Alcohols, typical hydrocarbons and VOCs will not permanently damage sensors. Long exposure times or high concentrations can result in breakthrough of alcohols into the sensor working electrode, thereby producing a signal similar to CO oxidation response. In addition, temperature increase can drive off any alcohols that are adsorbed by the filter and cause breakthrough to occur. As a result, CO sensor response to alcohols is often delayed by minutes or possibly hours after initial exposure, creating difficulties in tracing the event's root cause.

From a practical standpoint, cleaning gas detectors with alcohol should be avoided, as alcohol use can trigger some undesired responses. If using alcohol-based cleaning or disinfecting agents, it is possible that high concentrations of these agents will overload the filter. When intensive cleaning or disinfection takes place, the presence of such agents can potentially reach excessive TWA concentrations resulting in a gas alarm. Accordingly, MSA recommends removal of antiseptic products from areas in which sensors are used or stored.

In summary, CO oversaturation, exposure to alcohols, VOCs and hydrogen can result in both positive and negative instrument alarms, depending upon the situation at hand. Sensors generally do completely recover without adverse effects; however, recovery time can range from one to 24 hours, depending upon time and exposure concentration.

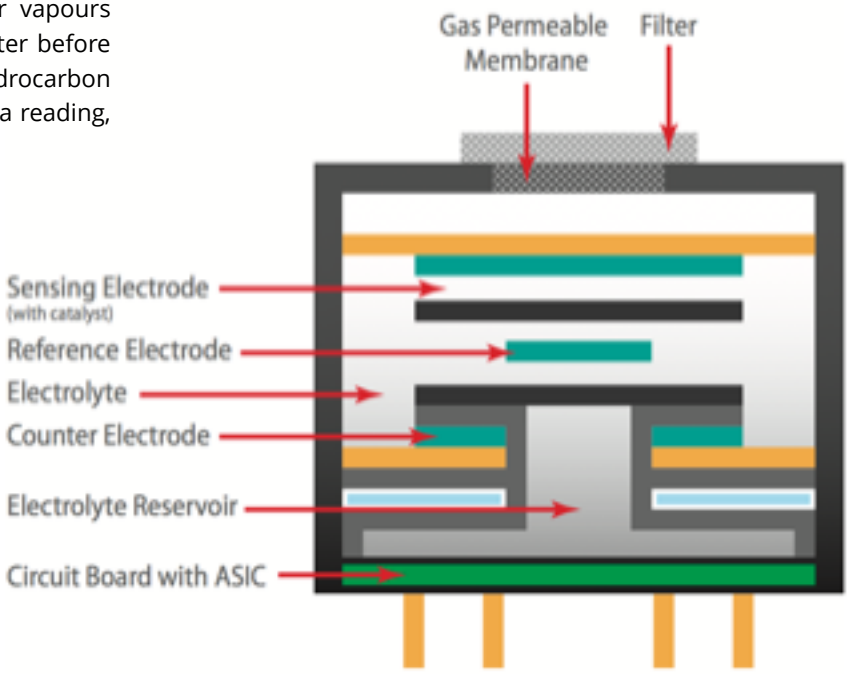

Figure 1. MSA XCell Sensor (electrochemical)

FIRE PROTECTION FOR PETROLEUM, OIL AND GAS INDUSTRIES

Foam Applications

- Chemical Carriers
- Dike Areas
- Docks / Jetties
- Drilling & Production Platforms
- Flammable Liquid Spills
- Floating Production, Storage & Offtake
- Hazardous Material Spill Control
- Heliports & Helidecks
- LNG Carriers & Terminals
- Loading Racks
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SELECTING SUITABLE FOAM CONCENTRATE FOR FIGHTING TANK AND BUND FIRES

BY DR. JEANNE VAN BUREN

This article is the first of a series of articles for the Catalyst by Dr. van Buren which highlights the considerations for selection and use of firefighting foam concentrates. This first article will show that selecting a suitable foam concentrate entails much more than ticking boxes based on information listed in codes and standards.

Image EN 1568 test. From http://www.fireengineering.com/articles/2016/02/environmental-influences-on-firefighting-foams-an-international-seminar.html

Codes & Standards versus a Performance Based Process

Prescriptive codes and standards provide criteria which can assist operators to select a suitable fire fighting foam concentrate for extinguishing full surface tank and bund fires. These codes and standards do not (yet) address all aspects to allow operators to make an informed-based decision about the most suitable fire fighting foam for their specific risks.

Going through a Performed Based Process (PFB) enables operators to make an informed based selection of the most suitable foam concentrate.

The table below illustrates the advantages and disadvantages for PFB and prescriptive based process.

PERFORMANCE BASED DESIGN PROCESS	PRESCRIPTIVE BASED DESIGN PROCESS
Advantages • (Often) custom made solutions that fit the specific requirements • Might be less expensive • All stakeholders that influence risks and development of incident are involved • Effects of incidents identified and quantified • Options for preventing the incident and mitigating and suppression of the effects are reviewed • Allows the use of new 'protection' options and solutions • Future changes implemented on informed based decision making	**Advantages** • Simple to use –just follow code/standard Tick boxes. Does not require in-depth knowledge • Often easily accepted by local authorities and insurers
Disadvantages • Requires specific and in-depth knowledge of all stakeholders involved • Not always accepted by authorities and insurers • Might be more expensive	**Disadvantages** • Without profound knowledge the risks may not be properly controlled • May cost more • Difficult to apply for 'new' protection options • Standards tend to be "behind" developments in processes and solution, which might result in not picking the most effective solution.

NFPA 11 [2016]: Standard for Low-, Medium, and High-Expansion Foam, Chapter 5: Low-Expansion System Design recognises various types of foam concentrates in § 3.3.12 and foam made using 1, 3 and 6% of foam concentrates in water in § 3.3.13. In practice there are more types of foam concentrates available for extinguishment of the fires addressed in this article. However, not all types of foam concentrates are suitable for extinguishing full surface tank en bund fires.

Information listed in NFPA 11:

A. **Recommended minimum application rates [l/min/m^2] for extinguishing full surface tank fires and pool fires like bunds fires,** for hydrocarbons with two ranges of flashpoints, crude and water miscible products with fixed fire protection installations and for a mobile response.

Considerations:

Applying foam to the fire from a fixed system is very efficient as there is no or very little distance to cover between the point of discharge and the location where the foam has to do its magic.

There will be loss of foam during transport between the foam nozzle and the location where the foam is applied when using a mobile or fixed foam monitor. To compensate for this loss NFPA provides a generic factor of 1.58 times the application rate for a fixed system. Other references also list an increase in application rates to 10.4 (factor = 2.54) and 12.2[1] (factor 3.0) depending on the distance to be covered.

A fire where water miscible products are involved, requires a gentle application of the foam on the burning liquid. It is not (always) possible to accomplish a gentle application with mobile equipment over a distance of more than 40 metres.

B. **The manufacturer of the foam concentrate should be consulted for the proper application rate** of the foam.

Considerations:

In practice, products are divided in categories like hydrocarbons, water miscible products like alcohols, organic acids, chlorinated hydrocarbons, etc.

The category 'organic acids' contains for instance formic acid, acetic acid and propionic acid. Acetic acid has the most aggressive properties towards the fire fighting foam of all acids in this category. A suitable test, like the LASTFIRE test[2], is used to determine the proper minimum application rate and required expansion ratio (discussed later) of the foam for extinguishment of the fire with this product.

Small pan tests (Ø 565 mm, height 150 mm), described in Annex I of EN1568-4[3], can be used to confirm successful extinguishment using this application rate for Formic acid and Propionic acid.

C. **Recommended minimum application time [minutes].**

Considerations:

The effect of the foam blanket depends of the foam bubbles. The life span of foam bubbles is limited under the best conditions. The resilience of the foam on the flammable liquid is affected by four factors described below. These should be taken into account when using the recommended application time.

1. Evaporation of the water in the wall of the bubble, which obviously increases when the bubble is exposed to flames. Any bubbles applied to a well-developed fire will be destroyed due to the high temperature. The proper method for a mobile application of the foam therefore starts with teasing the fire, where foam is applied in a spray by quickly hoovering over the fire. The evaporation of 94% - 99% (depending on the percentage of foam concentrate in the foam) water in the foam will cool the surface of the pool as it evaporates.

2. Drainage of the water. A foam bubble cannot exist without the presence of water. Drainage of water (from the foam) can be increased by the product involved in the fire. The speed of drainage is influenced by the difference in concentration of water in the bubble and the liquid on which the foam rests. In the case of a water miscible flammable liquid like acetic anhydride – the water prefers to leave the foam as soon as possible and join the "water loving" acetic acid.

3. Gravity causes the water in the bubble to be transported to the bottom of the bubble reducing the wall thickness of the bubble at the top, resulting in faster collapse of the bubble.

4. Foam can be blown away by wind. Some types of foam are very sticky and can only be affected by very strong winds. Other foam may be very sensitive to even a small effect of the wind.

D. **Recommended minimum application time can be reduced by no more than 30% if the application rate is increased [5.3.5.3.4]**.

Considerations:

The extinguishing process of a pool fires with foam can be split in two separate phases.

The process starts with cooling the liquid on fire by the evaporation of the 94 – 99% of water present in the foam. Insufficient cooling (phase 1) adversely affects the life span of the foam bubbles.

The cooling of the flammable liquid also reduces the amount of flammable vapour generated which results in a less intense fire, which ultimately makes it easier to extinguish the fire. Due to the reduced exposure to heat, foam bubbles can exist for a longer period and built-up the anticipated foam blanket and prevent the fire to ignite again.

It is therefore ill advised to reduce the application time when dealing with an intense fire as the cooling of the product requires time.

There is no mention of an increase in application time for such fires and no mention in the standard that a reduction in application time for intense fires is not recommended.

Summary Considerations

The information above provides additional considerations which should be used during the performance based selecting process to find a foam concentrate and determine the application rate and application time for extinguishing the fires that can occur at an operator's site.

Types of foam concentrates

A non-exhaustive list of types foam concentrates is provided below:

Fluorinated Foams

- AFFF - aqueous film-forming foam
- AR - AFFF - alcohol-resistant aqueous film-forming foam
- APS - AFFF - all-purpose foam suitable for hydrocarbon fires and fire with water miscible liquids
- FP - fluoroprotein foam
- FFFP - film forming fluoroprotein foam
- AR - FFFP - alcohol-resistant film-forming fluoroprotein

Fluorine free foams (FFF or F3)

- Protein foam
- F3 - fluorine-free foams

Selection of foam concentrate

The process for selecting a suitable fire fighting foam concentrate, for extinguishment of full surface tank and bund fires consists of the following steps:

Step 0:

Determine the quality of the water used for making the fire fighting foam.

The composition of the water used to make the foam can affect the quality and therefore performance of the foam. A standard like the EN 1568 requires the use of predefined water quality for the tests that are carried out. The predefined water quality may not represent the water used at the operator's site; hence the quality of the water used to make the foam at the actual site where the foam is used, should be determined prior to starting the foam concentrate selection process.

This is already a requirement for this in NFPA 20. However, the information in NFPA 20[4] on this aspect is very limited and is mainly focused on the corrosive properties of the water and its effects on the installations.

The quality of the foam can be affected by many components in the water. A good example is the use of the water from a basin with water from the cooling tower. This water contains all sorts of additives like anti foaming agents – making the water unfit for foam installations. Another example is the presence of Calcium salts in the water. Calcium salts reduce the capability of the foam to expand, which is conditional for extinguishment of a fire with water miscible products. Footnote 5[5] potentially provides more extensive and/or suitable information for determining the quality of the water.

Step 1:

Credible incident scenarios with the involved substance have to be identified, following step 1 to 5 of the flow diagram in Appendix 1, before the foam selection process can start.

The Safety Data Sheet (SDS) of the products should provide relevant characteristics of involved flammable substance, like:

- The product is a mixture of product with a range of boiling and flash points. The behaviour of the fire can change when the products with low boiling points have gone.
- The product is miscible with water. This product requires alcohol resistant foam. Note that the SDS of some product can recommend the use of alcohol resistant foam for a product which has low solubility in water.

Step 2:

It should be identified if a forceful[6] or gentle[7] application method shall be used to apply the foam on the fire.
This requirement reduces the options for a gentle application of foam when obstacles or considerable distances have must be overcome before the foam can be applied.

Step 3:

Divide substances in categories if an operator stores a wide range of products.

Examples of categories which can be used:

- Short or long chain hydrocarbons
- Cyclic hydrocarbons
- Aromatic hydrocarbons
- Mixture of hydrocarbons
- Alcohols (water miscible)
- Organic acids
- Ketones and aldehydes
- Chlorinated hydrocarbon
- 'Unstable' organic liquids like Propylene Oxide
- Non-water miscible products with a significant higher gravity than water. It may be possible extinguish the fire by gently applying water.

Step 4:

a) Discuss the lists and categories of flammable products with potential foam concentrate suppliers and ask them which foam concentrates they consider to be suitable for extinguishes pool fires with these products. Also share the anticipated application method (forceful or gentle) for applying the foam and the anticipated distance which has to be covered by the foam monitor, when applicable.

b) Request 'ranking' of the recommended foam concentrate based on EN1568-3 and/or EN1568-4. Illustrating examples of ranking results are shown in the table below. Please consult EN1568 standards for more information about ranking.

The ranking should be supported with video footage of the actual test and an extensive test report stating all the required information, including the name of the product used in the test, the quality of the water to make the foam, application rate, application time and expansion ratio of the foam.

Results of large scale tray test

Grade	Extinguishing performance class	Burn-back resistance level
Foam W AFFF	I	C
Foam X AFFF-AR	I	A or B
Foam Y FFFP	I	B
Foam Z FFFP-AR	I	A or B

The test has to be repeated with the most aggressive product in each of the categories of products on the operator's site (using onsite water), if product used in the test of the foam suppliers is not representative for this most aggressive product at the operator's site.

c) There is a significant difference between a pool fire which has just ignited and a fire that is already burning for 20 minutes or more.
The application rate and application determined using the test described under item b can be used for fast (starts within 10 minutes after the fire started) extinguishment of full surface tank fires with a diameter of ≤ 60 metre and net bund fires of ≤3000 m^2.

Fast extinguishment of a fire is possible when adequate fire detection and fixed fire fighting installations are present which can be activated within 10 minutes after the fire is detected. This fixed system (from the water supply to

the foam pourers) should have a reliability and availability of 99%.

Fire fighting foam shall be exposed to more severe conditions for full surface tank fires with a diameter of >60 meters, bund fires with a net surface of >3000 m^2 and any deferred extinguishment where the actual fire fighting starts later than10 minutes after ignition. The foam concentrate selected in step 4.b has to undergo the LASTFIRE test to determine the effective application rate, application time en expansion ratio of foam.

This test should be performed using the fire water used onsite if the composition of this water is significantly different that the water used in accordance with the fresh and salt water described in EN1568.

There is much more relevant information to be shared about the use of foam, which will be addressed in articles submitted to future issues of the Catalyst.

ENDNOTES

[1] EI Model code of safe practice part 19: fire precautions at petroleum refineries and bulk storage installations: Table D.2

[2] http://joiff.com/docs/GuidelineonFoamEnglish.pdf

[3] EN 1568-4: Fire extinguishing media - Foam concentrates - Part 4: Specification for low expansion foam concentrates for surface application to water-miscible liquids

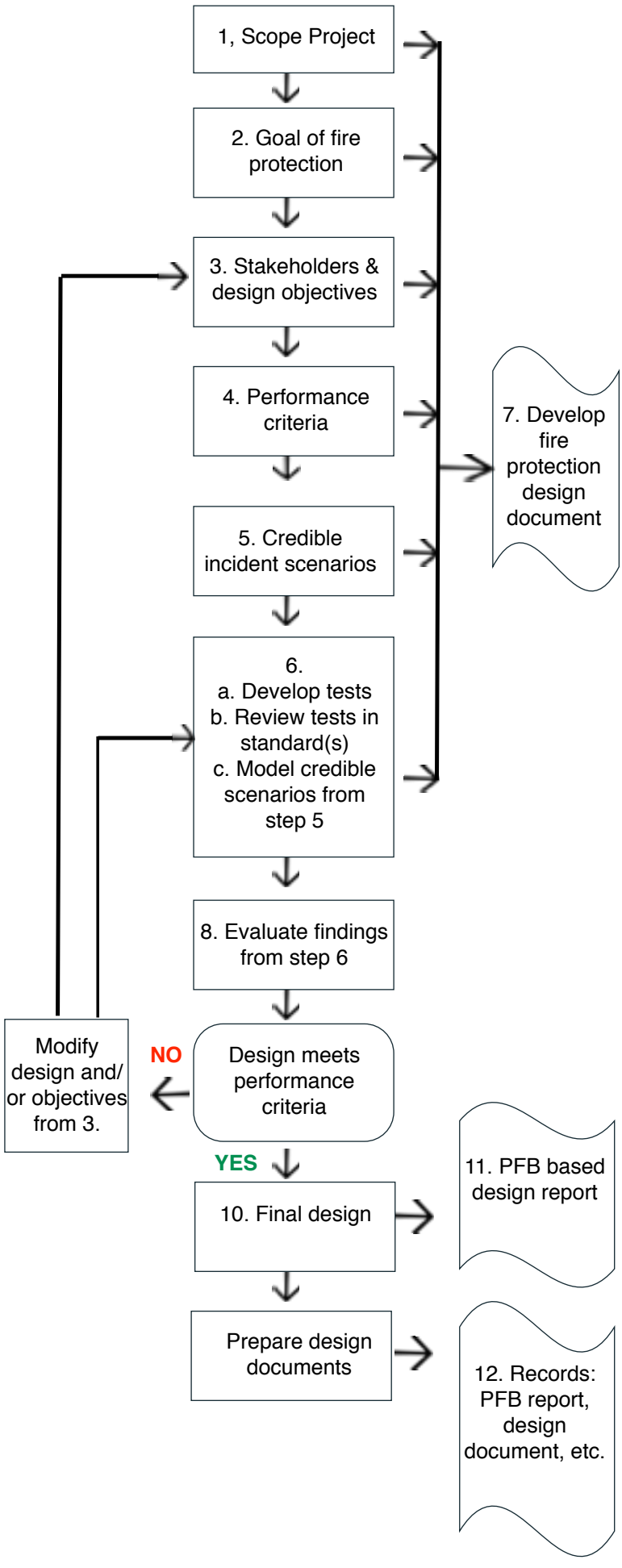
[4] Standard for the Installation of Stationary Pumps for Fire Protection [2016], section A. 7.2.7 & NFPA Stationary Fire Pumps Handbook [2016], sections 4.6.1 and A.7.2.1.1

[5] http://www.galwaywater.ie/water-testing/langelier

[6] H.3 Forceful application fire test, EN 1568-3: Fire extinguishing media - Foam concentrates - Part 3: Specification for low expansion foam concentrates for surface application to water immiscible liquids

[7] 3.9 gentle application, EN 1568-3: Fire extinguishing media - Foam concentrates - Part 3: Specification for low expansion foam concentrates for surface application to water immiscible liquids

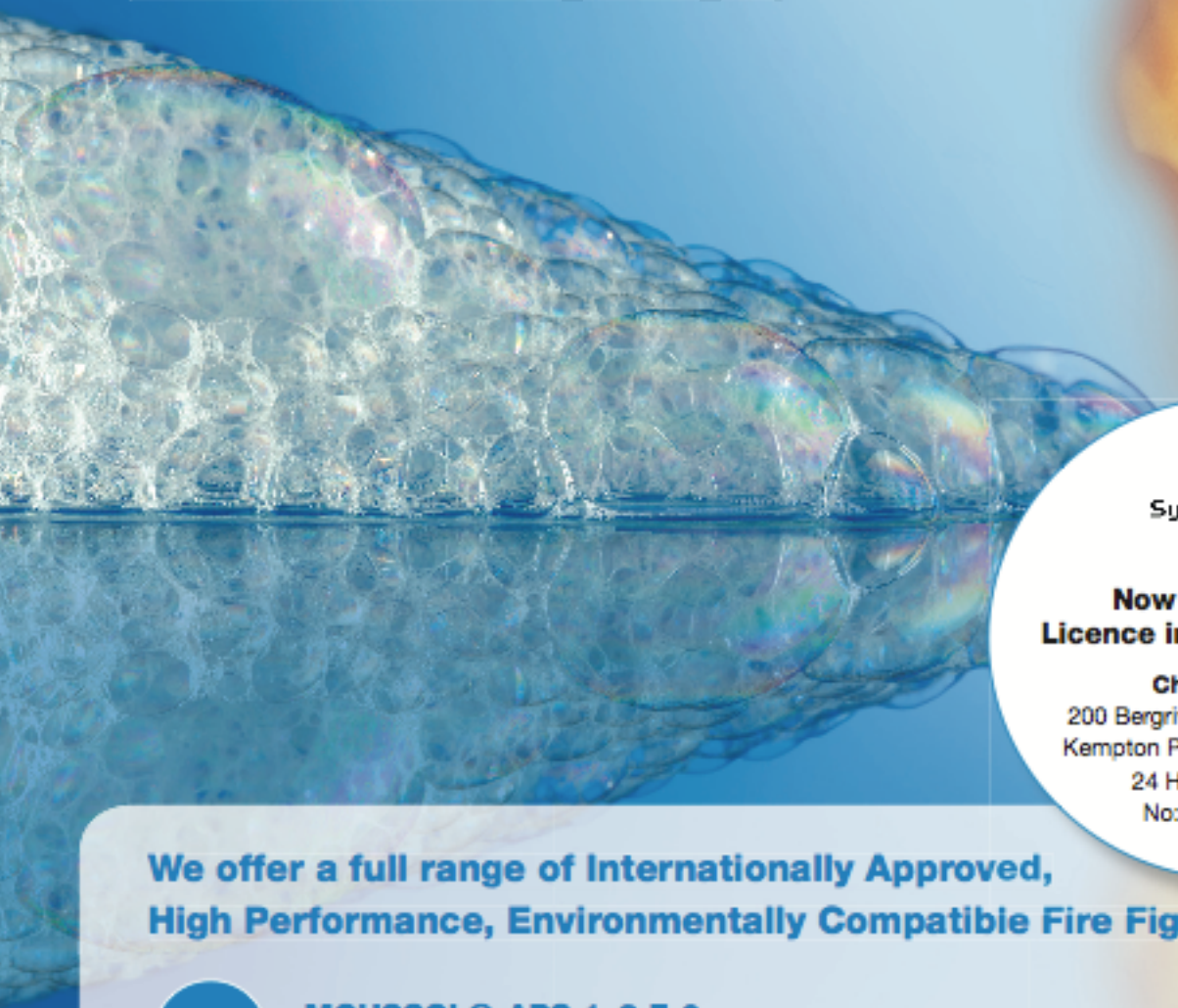
APPENDIX 1: PERFORMANCE BASED FIRE DESIGN PROCESS



Editor's note:
Doctor Jeanne van Buren is a senior consultant with Marsh Risk Consulting, based in Rotterdam and consults on specific risks related to the power, energy and (petro-)chemical industry sectors. This includes identifying potential hazards, evaluating these hazards and quantifying the associated risks and counselling on risk mitigation and control measures. She also develops and provides training courses in Dutch and English. For more information contact Jeanne van Buren at Jeanne.vanburen@marsh.com or +31 10 4060404

Dr. STHAMER HAMBURG

FOAM FIGHTS FIRE



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REPORT:
JOIFF INDUSTRIAL FIRE AND EXPLOSION HAZARD MANAGEMENT AFRICAN SUMMIT

The JOIFF Industrial Fire and Explosion Hazard Management Africa Summit 2017 took place in Secunda, Mpumalanga, on 26 and 27 June 2017 under the very capable leadership of Pine Pienaar. This was the first JOIFF conference on African soil and set a high standard for their future conferences planned for South Africa. Randy Fletcher, JOIFF Chairman and BP Global response advisor: intelligence, security and crisis management provided an overview of JOIFF and also an analysis of the difference between training and competency development and its application in the industrial response arena.

A number of highly informative presentations followed over the two day summit including presentations by Chief Tinus Pretorius of Sol Plaatje Municipality on the role of the Southern African Emergency Services Institute as the partner of the LG SETA in the assessment quality process, Nthai Monmye on the Fire Professional Council of South Africa, Kevin Westwood, technical director of JOIFF and BP Group fire advisor, who, together with Ronnie King OBE, secretary, All Party Parliamentary Fire Safety and Rescue Group in the UK, provided an overview of the infamous Milford Haven tank 11 incident and a number of other boil over incidents as well as an update on the Boilover Research Programme results conducted by the LASTFire group.

READ MORE at http://www.fireandrescue.co/news-30-jun-main.html

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CONFERENCE PROGRAMME:

DAY 1

JOIFF – Overview of the Summit

Analysis of the difference between Training and Competency development and its application in the Industrial Response arena.

Randy Fletcher: Chairman: JOIFF. BP Global Response Advisor: Intelligence; Security and Crisis Management

The Role of South Africa Emergency *Services Institute as the Partner of the LG SETA in the Assessment Quality Process.*

Tinus Pretorius: Senior Manager; Emergency Services: Sol Plaatje Municipality

Fire Professional Council of South Africa – a non-statutory body to enforce National Qualification Framework Act.

Nthai F Monnye: Chairman of FPCSA

Milford Haven Tank 11 incident.

Ronnie King: Secretary; All Party Parliamentary Fire Safety & Rescue Group; UK

Boilover incidents of note and an update on BOILOVER research programme results conducted by the LASTFIRE Group.

Kevin Westwood: Technical Director JOIFF and BP Group Fire Advisor

Tank Incidents in the Rotterdam Port area.

Raymond Bras; United Fire Services; The Netherlands

Major Hazard Installations and Process Involvement before and after incidents.

Gary McFadden: Partner: Industrial Risk; Environmental Resource Management

DAY 2

A Framework for the provision of fire services by industrial and private fire services in South Africa.

Moses Khangale: Director Fire Services - National Disaster Management Committee

Fire Codes & Workplace Risk Management.

Marius Atterbury: Senior Fire Risk & Emergency Advisor - ESCOM

Report on recent Wildland fires in Western Cape and issues around the evacuation and fire fight of the town of Knysna.

Colin Deiner; Chief Director; Western Cape Disaster Management and Fire/Rescue Services

Total Wellness of Emergency Responders : Managing Post Traumatic Stress Scientifically.

Cobus Swart, Industrial Psychologist and pastor.

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CIVIL DRONES PUT TO INDUSTRIAL USE

IN USE FOR EIGHT YEARS: REMOTE-CONTROLLED DRONES AT BASF SE IN LUDWIGSHAFEN

A field report by Siegfried Fiedler, BASF SE Ludwigshafen, Emergency Response

Drones have been put to use by the plant fire department at BASF in order to make maintenance and repair works at chemical facilities easier and safer for eight years now. The team of the plant fire department supports operations and departments on site in terms of assessing the condition of pipeline bridges or components that are difficult to reach. In terms of hazard prevention, the images made by the drone can be used to assess potential damages. The basis for this is the image material that is transferred by daylight or thermal imaging cameras via radio or light waves. For safe industrial use, strict requirements must be observed, e.g. the qualification of pilots or the necessary permits for deployment areas.

The Ludwigshafen site

With an area of some ten square kilometers, the site in Ludwigshafen is the largest integrated chemical facility in the World. Production facilities, energy flows and logistics are intelligently connected here in order to use resources as efficiently as possible.

The steamcracker, the heart of the Ludwigshafen site

The location in figures:

- About 39,000 members of staff
- About 2,000 buildings on site
- About 200 production facilities
- 230 km railway tracks for railway transportation
- 2,850 km pipelines
- 106 km streets

Well prepared for all possible deployments: The BASF plant fire department

The plant fire department of BASF SE at the Ludwigshafen site is involved in tasks such as firefighting, technical support, preventive fire and hazard protection as well as the global hazard prevention planning of the BASF Group.

In Germany, the BASF fire department is one of the 130 control centers within the framework of the Transport Accident Information and Emergency Response System (TUIS) of/ supporting the Verband der Chemischen Industrie (VCI, German Chemical industry Association). On 365 days a year, 24/7, the center can offer quick and proper aid in the case of transport and storage accidents as well as during damaging events in chemical facilities.

Some 180 employees of the plant fire department work at three fire stations. Their vehicle fleet consisting of more than 40 vehicles also includes two turbo extinguishers that can transport cooling water or extinguishing foam via the exhaust gas system of two aircraft engines up to 60 meters high and 150 meters far.

The drones in use |
Handy facts:

- Maximum speed	12 m/s
- Maximum wind load	5 m/s
- Maximum range	1,000 meters
- Maximum height	120 meters
- Daylight camera with video function	
- Thermal-imaging camera	

Drone in use

For particularly risky deployments, the team of the fire department can also make use of a robot, which e.g. can open valves or take samples from a distance.

Collecting data: Core task of the drones

With a take-off weight of max. five kilograms, equipped with a suitable camera, the remote-controlled drone has been a part of fire department equipment since 2008. The BASF drone performs inspection flights some 50 times a year. Used by specialists, it creates quick, easy and uncomplicated image and video recordings of operational areas that are difficult to access.

Typical areas of deployment of the BASF drone:

Surveying of flare and silencer systems
Flare and silencer systems are used for purposes of safety in production. For a long time, they could only be monitored, repaired or exchanged when the system was at a standstill. With the drone, inspections can now be carried out while the system is still in operation which makes maintenance easier to plan, quicker and more cost effective.

Recurring inspections of pipeline bridges and pipelines
The drone is deployed for locations that are difficult to access, e.g. pipeline bridges and pipelines for the detection of leaks.

Inspection with a thermal-imaging camera at pipeline bridges and components
The images of the thermal-imaging camera provide information on the condition of pipeline bridges and components. The drones record the entire objects, thus enabling e.g. the precise renewal heat and cold insulation.

Assessment of the quality of concrete components
The drone can always be brought into perfect position to record all components in detail. Angle-dependent faulty measurements are avoided. This makes it possible to detect any potential changes in concrete quality, such as defects or visible steel reinforcements down to the precise centimetre.

Data from the air: Efficient, accurate, safe and cost effective

Drones make it possible for instance to perform routine inspections in a time and cost saving manner without the use of a scaffold or crane or to perform energy efficiency analyses of buildings. The image material of the cameras used enable a precise analysis of the condition and therefore serves as the basis for the preparation of maintenance and repair work. The savings potential is obvious: The acquisition of mobile cranes and scaffolds or the use of industrial climbers is no longer necessary in many cases.

In the future, the areas of deployment at BASF will be extended to:

- Highly automated flights without GPS support: With automated obstacle recognition and distance measurement, flights within steel constructions are even safe in the case of weak or no GPS signals
- Sample of liquids from open reservoirs
  In waste-water treatment plants, it is often necessary to analyze comparative samples. The drone can be equipped with special systems e.g. to remove defined quantities of liquids also from open reservoirs.
- Quality assurance for concrete structures as well as for heat and cold insulation
  Stored flight routes enable multiple flights of the same object at different times and thus the precise long-term documentation of changes in components and insulation. The image material provides concrete indications as to whether, when and where further measures are necessary.

Drones securely deployed

Prior to use in an industrial environment, risks must be professionally assessed and precautions taken for classic deployment. Typical aspects are:

- Sources of ignition during normal operation of the drone
- Electrostatic behavior during flight mode
- Scenarios for the failure of the radio or GPS signal
- Impact energy in the case of a crash
- Source of ignition in the case of a crash
- Possible risks for persons

The concrete hazards based on conditions on-site such as accessibility and wind conditions are examined additionally and prior to each deployment.
For industrial use, additional permits of the pertinent aviation authority and specially trained pilots are required. At BASF, ten members of the plant fire department have the "drone license". Due to the location in a tri-state area, flight permits are required from the states of Rhineland Palatinate, Hessen and Baden-Württemberg. For drones with a maximum weight of up to five kilograms, blanket permits can be granted, which have to be extended every two years. As the Ludwigshafen site borders a regional airport and a US Army Air Base, we inform the tower of the airports before the start of each flight by telephone and in writing.

Siegfried Fiedler has been a fire safety engineer for BASF SE for the past 30years. He has over 25 years in leadership experience in hazardous material technologies, Emergency response related site services and global Crisis Management Organisation. Just recently he is responsible to set up a global Emergency Response Academy for BASF Group. Siegfried can be contacted at siegfried.fiedler@basf.com

Inspection flight of a flare system

Inspection of silencer outlets

Inspection of pipeline bridges

Inspection of heat and cold insulation

Inspection of concrete components

Highly automated flights without GPS in steel constructions

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COMMERCIAL EDITORIAL

Phillip Hammond, United Kingdom Chancellor of the Exchequer visited JOIFF member organisation Rectrix Drone Services Limited on his recent tour of the North East of England looking at the new technology sector.

The Chancellor was attending attended the "Fusion Hive" technology Hub in Stockton-on-Tees where Rectrix founder and director Alex James Westwood provided insights into disruptive technologies which are saving clients cost whilst also improving efficiency and safety.

Specialising in Unmanned Aerial Vehicles (drones) Rectrix provides bespoke inspection, survey and emergency response solutions (sales, service and consultancy) to commercial operators ranging from Oil & Gas, Energy, Alternative Energy, Utilities, Emergency Response, Fire, Police, Security & Border Control.

Rectrix recently opened an office in Trinidad & Tobago in a 50:50 Joint Venture with JOIFF member organization HHSL Safety Systems Limited, where initial business prospects have been very good. Working closely with Trinidad & Tobago Civil Aviation Authority, Rectrix Drone Services Limited will be the 1st registered/ certified and authorised operator in the Country. Contracts are already in place for several customers on the Island and there are numerous discussions taking place with interest from pipeline utilities and emergency response organisations.

Rectrix also have discussion underway for setting up operations in India, Middle East and Tanzania and close to signing an agent for South Africa.

Rectrix invites applications from persons looking to introduce drone operations on their facility either as a service for inspection or for emergency services.

Contacting Rectrix Drone Services Limited info@rectrixas.com Tel: +44 (0) 1642 955615 www.rectrixas.com

EXAMINING THE ROLES AND RESPONSIBILITIES OF THE INSTRUCTOR

by Daryl Bean, Grad. JOIFF

The instructor is a conduit; a channel through which learning is transmitted from source to the student. The term "instructor" used here refers to anyone with the task of inspiring learning to someone, formal or informal. The focus of this discussion is the instructor delivering emergency response training to the adult learner using a referenced guide for expectations.

Reese and Walker (2003) identify four expectations of adult learners;

1. The expectation to be taught and learn
2. To work hard
3. The work is related to the vocation
4. To be treated as adults

One can infer from this list that an instructor is already ahead of the curve in capturing the attention of the adult learner and thus by using the expectations as the foundations for learning, an instructor can develop sound techniques to ensure immersion by the learners into the learning environment as well as a gauge to measure the quality of the output. An effective instructor will not have to try to impress the leaner by constantly qualifying one's credentials or trying to prove one's abilities. It is through meeting these expectations that the instructor will gain the respect and trust of the learner.

The formality of the learning environment varies within the industry and one can also appreciate the cultural shifts the

learning environment has undertaken over the past generations. The "classroom" isn't what it used to be, nor is the learner and in the same context, the instructor; however, whilst theories and more modern applications of learning like the "Learning Pyramid", taken from work done by Edgar Gale (1900-1985), are driving to stimulating more senses and greater involvement of the learner.

"Tell me and I forget, teach me and I may remember, involve me and I learn."

Benjamin Franklin (1706-1790)

Delivering learning involves being adept at applying the right stimulus to enable the greatest level of retention and performance. Active involvement is a primary staple of learning and serves as a form of leaning outcome measurement through all levels of emergency response (Gold/Silver/Bronze; Strategic/Tactical/Operations). The skill in utilizing active involvement will be honed through practice and the "experience roots" the instructor develops through:

1. Vocational experience in the area instructed
2. Prior training
3. Academic knowledge
4. Developmental experience; workshops, seminars, practice.

Consider an instructor at any time during one's experience who seemed so comfortable with the subject matter and delivery that it was easy to learn. No question or concept seemed out of depth and the environment was positive and engaging even when errors and corrections were being made. It is from these strong "experience roots" which has allowed the instructor that capability which should be used even for the more informal learning instances.

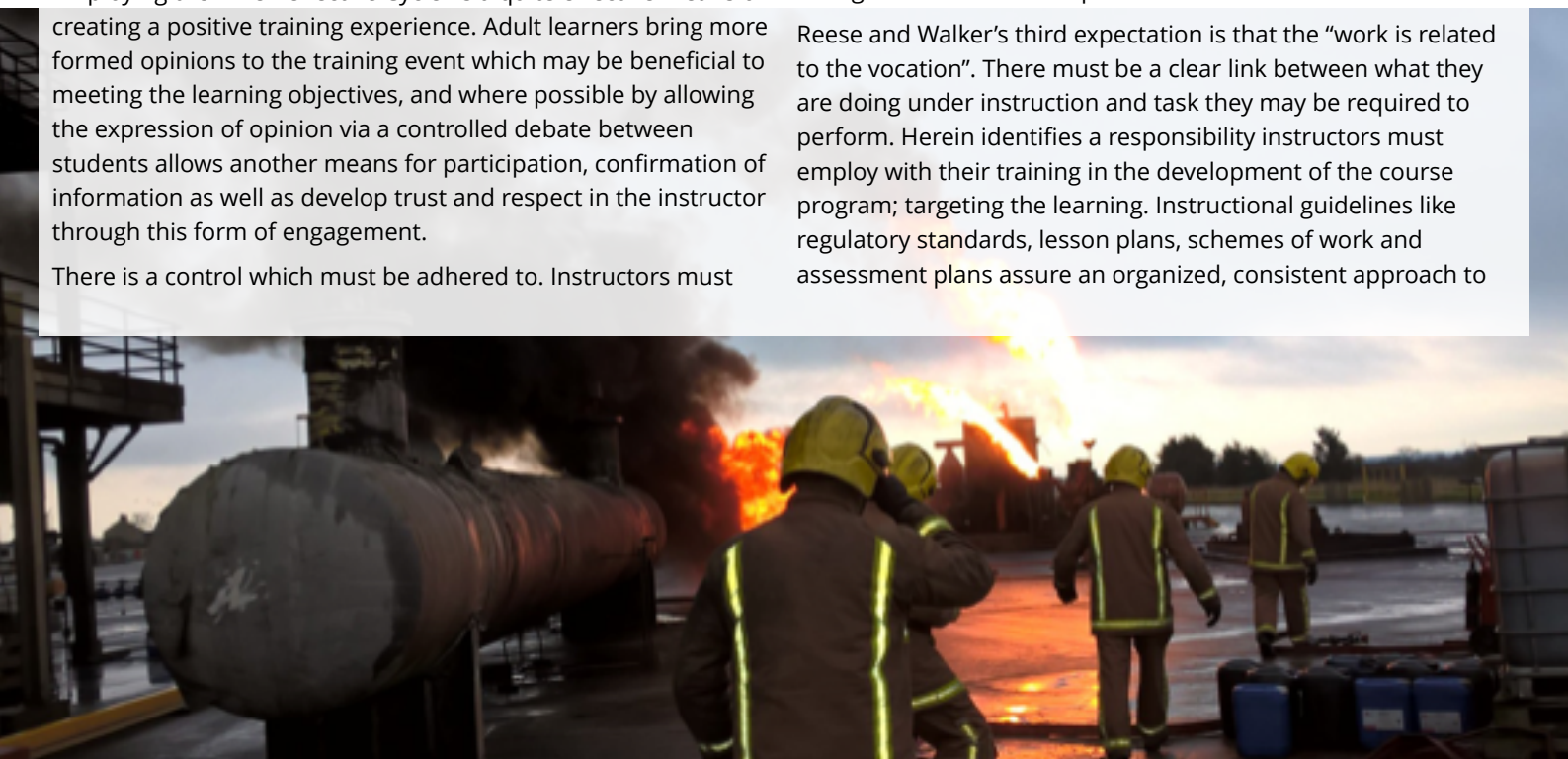
Another quality having well developed experience roots is the ability to listen objectively to the opinion(s) of the students in support of enhancing learning through confidence building. Employing the "The Reflective Cycle" is a quite effective means of creating a positive training experience. Adult learners bring more formed opinions to the training event which may be beneficial to meeting the learning objectives, and where possible by allowing the expression of opinion via a controlled debate between students allows another means for participation, confirmation of information as well as develop trust and respect in the instructor through this form of engagement.

There is a control which must be adhered to. Instructors must take themselves out of the equation in satisfying their needs and deliver the training that is expected. Not the training they want to give; especially if it wanders off the aim, learning outcomes or objectives, no matter how well intended. With training having more and more constraints placed upon it like periodicity, class times, attendees and budgets, these periods must be maximized to allow for the achievement of the trainee. This is a bold statement, contentious even; however, in the effort to promote expected performance levels, the importance of the instructor in meeting the learning outcomes and expectations of the learning event must remain priority.

An interesting expectation is that the adult learner expects to "work hard." Is that to intimate that worth of quality of training of the training experience has a relationship with a difficulty factor? From a training perspective, a general comment from responsible persons developing training is for the learners to "work hard" meaning to be "challenged" to meet the learning outcomes. Historically, having experienced marginal positive feedback from training perceived to be of value because achieving the learning outcomes was easier than expected, one can appreciate the relationship.

However, this expectation should be tempered against safe, efficient, effective work. For emergency response activities, "hard work" related to ensuring the physical demands of tasks can be met must not be disregarded; however, today's responder must be equipped with the sensibilities to "work smart". This is situational awareness to enable, safe, accurate focused effort in support of stopping loss, attempts to minimize wastage of precious resources, importantly the limited bank of personnel energy. The need to meet demanding physical stresses is not eliminated, but working smartly gives more thought to developing further tools for the responder to use operationally in conducting similar actions on the incident ground. Of course, if the learning outcome is about measuring maximum exertion then it is expected the focus will be solely on the work efforts. This is a challenge for instructors as this expectation is tightly linked to emergency response training and breaking the paradigm of "hard work" for "smart work" in many respects is still taking some time for acceptance.

Reese and Walker's third expectation is that the "work is related to the vocation". There must be a clear link between what they are doing under instruction and task they may be required to perform. Herein identifies a responsibility instructors must employ with their training in the development of the course program; targeting the learning. Instructional guidelines like regulatory standards, lesson plans, schemes of work and assessment plans assure an organized, consistent approach to



each course. Even for an informal training event, a well-founded basic plan is important to successful delivery. For more specifically focused instruction, a piece of equipment, for example a manufacturer's or operator's manual and accomplished use by the instructor is necessary. A question we may be familiar with is "Okay, but how are we going to use this?" Accomplished use includes application within the emergency response plan; for some types of equipment it is use within a mutual aid structure.

To be conversant with the instructional guidelines is the "homework" the instructor must do in preparation. Interestingly, what can be discovered by preparation may be valuable to the instructor's personal development; re-affirmation of procedures, confirmation of skills, in some cases opportunity for further research to enhance understanding. For more formalized instruction, this preparation is essential to assure the training is current to the present accepted standard and/or emergency/ operations plan. It can be quite confusing and embarrassing to happenstance on redundant material without the opportunity to correct it and integrate it into the learning event. Training processes include routine, recorded review and updating of training materials as a means of keeping current and this is highly recommended even for station training.

Considering the interaction between the instructor and learner(s), the relationship tasked with the transfer of learning is akin to a transaction. Conceptually a deal is struck between the instructor and learner and the outcome is determined on how well that deal was kept. Part of this deal is the delegate expects to be treated appropriately. This can be appreciated through using the Transactional Analysis, theorized by Eric Berne (1968) which classifies three emotional "ego" states (Parent/Adult/Child) and looks at the communications lines between them in developing effective relationships including in the classroom between the instructor and the learner. In fact, our experience in learning even at the professional level may be more of a Critical or Controlling Parent-Child relationship by which we were critically judged in a strictly controlled learning environment. Although this may be the more traditional way from which learning was applied and probably what is probably expected, this type of relationship may not be the most conducive when getting the best from adults especially when dealing with learning outcomes that are more complex and rely on a potential challenge to accepted behaviour and opinion.

If we view the progression of an emergency service provider from a team member to team, unit, group, division, branch, section leadership and further to incident commander, each successive level results in formed opinion and increased operational capabilities. The instructor must recognize the fact that delegates at these successive levels will expect to be treated with regard to their operational status.

Earlier in this article it is mentioned that adult learners can bring valuable opinion and experiences to the learning environment. As it is now mentioned at this point brings some synergy, credibility and importance to the learning expectations. This is not a reflection on the difficulty level determined by the learning outcomes, but being aware of the communication (behaviour) level(s) between the instructor and the learner and ensuring that the level(s) are commensurate to a positive learning environment. Being "tough" is not being disrespectful and condescending in one's approach to the learner at any time. By being sympathetic, empathetic yet focused on the need to meet the desired performance level will deliver the same effect.

The instructor's role and responsibilities include an awareness and increased level of proficiency in managing the aspects of learning which will affect achievement of the learning outcomes. Understanding and managing these aspects places the instructor in a learner role him/herself as this will be needed personal development to become more effective. Using the expectations of an adult learner is beneficial for delivering learning to emergency responders and with further study and application, the instructor can develop sound, positive and effective learning environments.

Works Cited;

Ian Reese, Stephen Walker. (2003). Teaching, Training and Learning, A practical guide 5th Edition. Sunderland: Business Education Publishers Limited.

Editors note: Daryl Bean Grad. JOIFF is the Offshore/Industrial Curriculum Manager at the Serco International Fire Training Centre, Darlington, UK and manages the delivery of regulated or accredited and bespoke training specifically for the offshore, industrial and maritime environments, including theory and/or practical based content and consultation. Daryl's career covers 36 years, spanning many disciplines including aviation, structural, HAZMAT, EMS and he presently maintains membership in the NFPA. For more information contact Daryl at dbean@iftc.co.uk , or by telephone UK 01325 333317. For more information on the Serco International Fire Training Centre visit www.iftcentre.co.uk.

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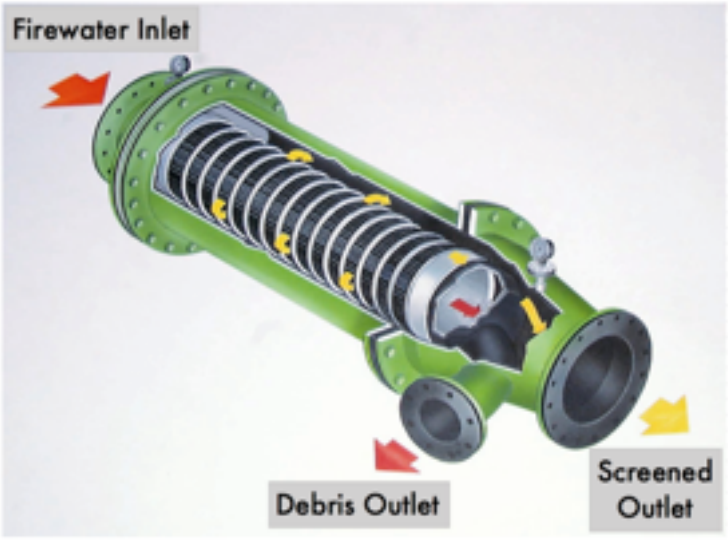
Automatic Firewater Flushing Strainer: In-line Guard Screen (ILS)



With its' Head Quarters based in Centurion, (in the province of Gauteng, South Africa), Marcé is the largest specialist Manufacturer and Exporter of Fire Fighting vehicles (ARFF and RIV) and allied supporting equipment and sub-systems in South Africa and across the African Continent.

Approached by Sasol, one of the largest refineries in South Africa, to come up with a solution for "dirty water" Marcé joined forces with PrepQuip, also a proudly South African company to solve the issue.

Marcé are delighted to announce, a brand new, innovative and mobile filter system for firewater ensuring nozzles and pumps receive filtered water without debris to eliminate clogging of nozzles!

One of the major complications on firewater systems is the blockage of spray nozzles and/or industrial fire truck nozzles. PrepQuip together with Marcé, have innovatively solved this problem by custom designing an in-line automatic flushing strainer, also known as the In-Line Guard Screen (ILS).

The ILS is installed on the firewater line, which in turn prevents any oversized material from blocking or damaging downstream equipment and nozzles. The ILS (body and filter screen) can be manufactured from mild steel (rubber lined), 304 and 316 SS, depending on the client's specifications and nature of the firewater. Manufacturing from stainless steel prevents corrosion on the ILS, which is the main cause of blocked firewater lines.

The Marcé / ILS working principle is illustrated above.

ADVANTAGES AND FEATURES OF THE MARCE' ILS

- On-line flushing without interruption or restriction of the firewater flow.
- The ILS is custom designed for line sizes of 80 – 500 mm (3" – 20").
- Can operate on pressures of up to 16 bar (232 psig) line pressure, with an acceptable slight low pressure drop over the ILS.
- Flow rate capacities per single unit range from 41 to 1590 m^3/hr (683 to 26500 liters/min or 180 to 7000 gallon (US)/min).
- Standard sc reen cartridge apertures are 0,5 mm, 1 mm, 3 mm, 5 mm and 10 mm alternatively we can be contacted if any special aperture sizes are required (Minimum 180 µm).
- Can be fully automated to integrate with the current control philosophy
- A completely separate solids (debris) outlet, to remove unwanted particles from the water line during operation

SPECIFICATIONS OF THE NEW MOBILE MARCE' FIREWATER ILS

- Number of screens 4 off
- Maximum capacity per unit 10 000 l/min
- Maximum total capacity 40 000 l/min
- Operating pressure 12 bar
- Design pressure 16 bar
- Screen aperture size 500 microns
- Materials of construction In-line screen Body - 304 SS, Screen cartridge- 316 SS

The ILS Filtration system was mounted on a suitable 4x2 freight carrier chassis that can move the unit to the required area of operations. Due to the unique nature of this application the carrier load capacity stability and reachability was taken into account. The Marcé/Prepquip team is able to customize your solution to ensure the best result for your applications.

By utilizing the Marcé /PrepQuip ILS Inline Guard System, you will ensure that only firewater reaches the incident and debris is eliminated before damage or blockage can occur.

For enquiries please contact Francois Steyn on +27 12 742 9200 or francois@marce.co.za, Website – http://www.marce.co.za

Sasol fire truck fitted with the ILS water filtration system

Stainless Steel with the ILS In-line guard screens

Marcé Fire Fighting Technology

Overview

sales@marce.co.za
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TRANSPORT FIRE SAFETY IN A MODERN METROPOLIS

By Dr Tony Cash

Fire safety standards in the rail sector continue to change in the light of technological advances and the shared experiences of train operators. The last decade has seen an unprecedented coming together of minds that has raised the bar once again.

New challenges, new technology, new processes and new lessons learned from past experiences all come together to drive the evolution of safety standards in the rail industry. The on-going process of modernisation, along with new rolling stock designs and changes to rail networks as new lines are added or existing ones are extended, mean that ensuring passengers' safety is all about tracking a moving target without letting standards slip for a moment.

The last decade has seen the approach of the industry change dramatically, as operators, designers, regulators and government agencies have come together more than ever before to discuss and define safety standards. The last ten years has seen the most joined up approach to fire safety ever. The biggest changes came in the late 1990s and early 2000s, when the industry consolidated its knowledge of construction materials and greatly improved interoperability between rail networks. There are many diverse companies operating rail networks and getting them to agree on harmonised standards is hard. It is only recently that there has been a joined up approach in Europe. The work that had been done on fire safety for buildings is not necessarily applicable to trains.

The local government body responsible for most aspects of London's transport system is known as "TfL" and was created in 2000. It took over control of the London Underground in 2003, since when it has worked hard to improve on the already laudable track record of fire safety on the "Tube" network.

At the European level, the introduction of the European Technical Standard for Interoperability (TSI) has been the most significant step. Stemming from the concept of free movement of goods and services across the European Union, it focuses on interoperability – the facilitation, improvement and development of international rail transport services within the EU and beyond, as well as the creation of an internal market for equipment and services to support construction, renewal, upgrading and operation of the region's rail system. Technical harmonisation is a key strand in this initiative.

It is creditable to have the same level of safety across Europe. Passengers travelling on a train that leaves from the north reaches of Norway and travels to southern Spain can have confidence in the level of safety along the entire journey. What does this mean for a modern metropolis like London and its Tube?

Fire safety in the underground rail network centres on the three simple components of fire hazards - fuel, a source of ignition and the nature of the surrounding atmosphere. By focussing on these core elements the industry has developed a very good safety record and high standards. In 2013, for instance, London Underground moved 1.2bn customers - more than the UK's main line rail networks combined, and the number of fires has yet again decreased year on year. This progress is partly due to internal efforts and partly to the many industry bodies that have evolved to examine safety in general – and especially fire safety – in an objective manner.

London Underground's record is something of which the UK capital can be rightly proud. The underground rail industry is seen as having almost maniacal control over fire safety; flammability, smoke and toxicity are limited in ways that won't be found anywhere in mainland UK buildings. The only other places to find these types of controls are on ships, submarines and aircraft. Materials are very carefully chosen and, most important of all, the cost of compliance is neither over-emphasised nor neglected. Safety is viewed as something beyond commercial pressures. The focus is always on prevention. If a stalled train in a tunnel were to have a significant fire, which is very unlikely, the consequences could be catastrophic and the societal impact huge. A great deal of time is spent examining different scenarios such as a fire on a train or in a station or on the surface. Careful attention is paid to how passengers can be safely evacuated. Equal, if not more, time is given to preventing stalled trains in the first place and the European TSI recognises this in its "running capability". All the concerns of the industry regulator and the fire authorities have to be assuaged in these regards.

It is vital, however, to maintain constant research and testing to preserve such a good track record. London Underground has, for example, previously staged full-scale evacuations at Heathrow Terminal 5, which included extensive smoke tests to prove that safety intervention points in tunnels can be kept clear of smoke during evacuation procedures. It has conducted operational trials at Tottenham Court Road and Victoria new ticket halls before opening those to the public and earlier at Farringdon, while in the construction phases, to check that the Fire Strategy was realistic. Modelling techniques are very subjective and there is little science behind them, so full-scale exercises like these have been and will

remain very important.

It is equally important to accept the hard truths that emerged from previous incidents, such as the King's Cross fire of 1987. Once again, London Underground has performed well in this regard. Looking back at disasters in other industries the effects on the operating companies can easily be seen. After the Herald of Free Enterprise ferry sank in 1987, the company went out of business. When the British Airtours aircraft caught fire on the runway at Manchester Airport in 1985 the company name was soon changed. Disasters like the King's Cross fire of 1987 and the Oxford Circus fire in 1984 have, unfortunately, been consigned to history but the name "London Underground" remains synonymous with the highest levels of rail fire safety.

The challenge to cope with 21st century passenger expectations using 19th century infrastructure remains but with new trains, a lot of work done on signalling and rights of movement, UK Rail has a very good safety record - one of the best in terms of the least collisions followed by fire. At the Rail Industry Fire Association, "RIFA", information is broadcast on accidents and incident via Twitter and readers will often see the summary, with the suffix "no fire", or "fire". There have been very few uses of the suffix "fire" and the frequency is diminishing.

There have been many changes in station design, fire prevention technology and rolling stock design over the years and the industry is good at coping with such innovations.

The aviation industry responded to the aftermath of post-crash fire fatalities like those sustained on the runway at Manchester with changes to aircraft cabins in the late 1990s. Rolling Stock manufacturers have taken a similar approach with trains, which means that we use readily available materials that meet our needs in terms of ambience, comfort and safety. They have a very good relationship with their suppliers, who work very closely with fire scientists. There is a great coming together of minds. The key is to give equal priority to every aspect of safety.

It is important to give equal attention to the construction of trains, the design of stations, the training of staff and the properties of new materials. Since the King's Cross fire, automatic smoke and heat detectors and automatic sprinklers have been installed to stop small, incipient fires from escalating. The safety of the public is also assured by competent staff, so training them to make decisions about when to evacuate and how to keep evacuation routes clear is as important as starting an evacuation promptly.

Editor's note: Tony Cash BSc PhD CChem FRSC EurChem FIFireE Interim CEng is Infrastructure Director, Trenton Fire Ltd. Fire Safety Consultants where he is engaged in consolidating and developing Trenton's abilities within the rail, aviation, oil & petrochemical, marine and military sectors. Tony has been involved in fire safety for many years and before joining Trenton Fire Ltd., he was Fire Complaince Manager at London Underground (LU), focussing on Stations and Infrastructure Engineering and some aspects of the fire protection of rolling stock. Prior to joining LU Tony was employed by United Kingdom Civil Aviation Authority dealing with Aerodrome Fire and Safety Projects and Safety Risk Assessments. Tony may be contacted by email on tony.cash@trentonfire.co.uk

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JOIFF ROLE OF HONOUR

JOIFF is delighted to congratulate the following people who were awarded JOIFF qualifications between April and June, 2017.

DIP JOIFF

QUEENSLAND FIRE AND RESCUE SERVICE TACTICAL TRAINING UNIT, AUSTRALIA

Kevin White Dip.JOIFF

Mat Quinn Dip.JOIFF

SASOL SECUNDA EMERGENCY MANAGEMENT, SOUTH AFRICA

Gerald Engelbrecht Dip.JOIFF

Sakkie Joubert Dip.JOIFF

PHOTO: Sakkie and Gerald being presented with their Diploma certificates at the recent JOIFF Industrial Fire and Explosion Hazard Management Summit in Secunda South Africa. *Left to right: Sakkie Joubert Dip.JOIFF. Alec Feldman FJOIFF JOIFF Director. Randal Fletcher FJOIFF JOIFF Chairman. Gerry Johnson FJOIFF JOIFF Director. Gerald Engelbrecht Dip.JOIFF*

JOIFF ROLE OF HONOUR

JOIFF FELLOWSHIP

Photo courtesy of Fire and Rescue International
Left to right: Pine Pienaar FJOIFF. Alec Feldman FJOIFF Randal Fletcher FJOIFF

Randal (Randy) Fletcher

BP Global Response Advisor
Intelligence, Security, and Crisis Management

Randy has a deep passion for Emergency Response in High Hazard Industry and an extraordinary track record of effective leadership in promoting professionalism, driving excellence and building positive momentum in challenging environments. He sees JOIFF as a powerful vehicle for driving Good Industry Practice and for being the leading authority for setting the standards that provide a unifying influence to a very diverse business. He is a passionate believer in the message of JOIFF - sharing knowledge, professionalism and competence - and in his 6 years as JOIFF Chairman has revolutionised all aspects of the operation of JOIFF.

Gerry Johnson

Director
Fulcrum Consultants Ltd.

In 1999, Gerry was appointed to a team set up to develop the first JOIFF training courses and he has been engaged in the development of the system of JOIFF accredited training from when the first of these courses took place in December 2000. JOIFF accredited Training is one the key pillars of JOIFF and in the years since 2000, through his leadership, knowledge and experience, Gerry has been instrumental in building JOIFF accredited training into the Internationally recognised system of training that it is today.

Photo courtesy of Fire and Rescue International
Left to right: Pine Pienaar FJOIFF. Alec Feldman FJOIFF Gerry Johnson FJOIFF

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JOIFF QUALIFICATIONS

The JOIFF Diploma is a competency programme for personnel who respond to emergencies. It covers necessary key skills, learnt and demonstrated by the student in practical training and exercises that allows them to deal competently with site emergencies.

The JOIFF Technician programme is to allow the emergency responder to enhance their knowledge and skills having already demonstrated their competence in Key Skills.

Graduate of JOIFF is awarded to a person from any JOIFF Member Organisation who has a minimum of 5 years full time service in an emergency response role and has shown professional attainment in Industrial Hazard Management activities.

JOIFF Member is awarded to a person from any JOIFF Member Organisation who has a minimum of 10 years full time service in an emergency response role, has demonstrated competence and shown significant professional attainment in Industrial Fire and Explosion Hazard Management activities and has been successfully assessed as competent through recognised training in the range of activities in Industrial Fire and Explosion Hazard Management.

The highest award that JOIFF can bestow is FJOIFF JOIFF Fellowship. This is awarded by recommendation of the JOIFF Board of Directors to an individual who has made an outstanding contribution to Industrial Hazard Management activities in support of JOIFF.

For further details contact the JOIFF Secretariat joiff@fulcrum-consultants.com

JOIFF TRAINING NOTES

"Train as if your life depends on it - because someday, it might!"

JOIFF accredited training is within a Competency Based Training framework and involves course content, instruction and the facilities of the training provider/training establishment.

All students who successfully complete a JOIFF accredited course/programme are issued with a JOIFF Certificate of Competence which has its own unique number.

"...confident people tend to be more charismatic, extroverted, and socially skilled– which in most cultures are highly desirable features. .....in virtually every culture, and especially the Western world, we tend to equate confidence with competence. So we automatically assume that confident people are also more able-skilled or talented.

In reality however, there is a very big difference between confidence and competence. Competent people are generally confident, but confident people are generally not competent. There are just good at hiding their incompetence and their insecurities– mostly because they are self-deceived themselves, so they generally think that they are much better than they actually are."

TOMAS CHAMORRO-PREMUZIC, From the Harvard Business Review

JOIFF ACCREDITED COURSES

Course	Dates	Venue/Organiser
Fire & Safety Foundation (4 x 1 Day Modules) Incident Controller 2 or 4 Days SCBA Initial & Refresher Confined Space Entry Confined Space Train the Trainer (with SCBA for High Risk)	As required.	**Arc Fire Training** United Kingdom On your own site. Subject to Risk Assessment & Facilities. arcfiretraining@ntlworld.com
Site Forward Controller (SFC) Site Incident Controller (SIC) Site Main Controller (SMC) Silver representative at Tactical Command Group (TCG) Crisis Leadership Crisis Risk Radar Crisis Spokesperson	As required.	**Eddistone Consulting** United Kingdom On your own site or at Eddistone Training Suite. opportunities@eddistone.com Tel: +44 1433 659 800
Industrial Fire Brigade Incident Commander Course (IFBIC) 5 days	4 - 8 Sept 13-17 Nov 11-15 Dec	**Falck Fire Academy,** Rotterdam, Netherlands fireacademy@falck.com Tel: +31 181 376 666
Pipeline Emergency Response Officer (PERO) Course 3 days	13-15 Sept 15-17 Nov	**Institute of Fire Safety & Disaster Management Studies** Vadodara, Gujarat, India Email : inquiry@ifdmindia.org / marketing@ifdmindia.org Tel: +91 98250 96033
Emergency Response Training for Lube plant personnel 2 days	18-19 Sept 20-21 Nov	
Integrated Fire Safety of Intermediate Bulk Containers (IBC's) and Intermodals 2 days	31 Oct - 2 Nov	**H2K Netherlands** p.deroos@h2k.nl Tel: + 31 174 414 872 +31 651 588 089
Industrial Safety and Emergency Response Course 2 days	15-17 Nov	

The dates offered here have been provided by JOIFF accredited training providers. If you wish to find out any information or make a booking, please contact the training provider direct, contact email addresses provided.

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- Fast knock-down and extinguishment - 1A/1A approval ratings (EN1568 part 3 & 4)
- Low viscosity, low corrosion for easy induction and storage

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DIARY OF EVENTS

September

7 - 9	Securexpo East Africa, Nairobi, Kenya
20 - 21	Emergency Services Show 2017, Birmingham, UK
20 - 21	International Water Mist Conference, Rome, Italy

October

28-3 Nov	SAESI 2017, Johannesburg, South Africa

November

7 - 9	Firexpo East Africa, Nairobi, Kenya

2018

March

20– 21	Securex West Africa , Lagos, Nigeria

June

4 -7	NFPA Conference and Expo, Las Vegas, U.S.A.

Please contact the JOIFF Secretariat with details of any event that you think that JOIFF Members might be interested in attending.

Note: The Catalyst is not responsible for the accuracy of dates and / or venues announced. This is based on information given to the Editors and is published in good faith.

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