FIRE AND RESCUE INTERNATIONAL

Integrated fire, rescue, EMS and incident command technology

Volume 5 No 3

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> Not all heroes wear capes
> – *Unknown*

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Lee Raath-Brownie

We proudly present you the 51st edition of Fire and Rescue International (FRI). We spend a lot of time and effort in compiling, writing and editing the articles and trust that you find useful information and benefit from the articles in this issue. Enjoy the read!

Training

ETS Emergency Training Solutions in Vereeniging, South Africa, recently received their International Fire Services Accreditation Congress (IFSAC) accreditation as an IFSAC certification entity for approved National Fire Protection Association (US) (NFPA) levels.

Fire fighting foams

We have put together a selection of indepth articles featuring fire extinguishing foams and their environmental compatibility based on research. The articles also include product information, applications and suppliers of foam extinguishing agents.

Communication

The Cape Winelands Disaster Management Centre rolled out the Uniti system, including the FireWeb module, to the local municipalities within its district, which is designed to allow all emergency services such as fire and rescue, traffic, law enforcement and non-emergency services reporting all incidents on the same system.

Wildfires

Our wildfire feature includes part one of the impressive book written and compiled by Dr Neels de Ronde by special permission. It also showcases locally manufactured CAF systems as well as information on a wildfire origin and cause determination course.

Hazardous materials: UN Class 8 Corrosive Substances

In this issue our technical expert, Colin Deiner, continues with the series on hazardous materials, focussing on corrosive substances ie UN Hazard Class 8. Deiner details acids as well as the basis and alkalis. Included is the emergency response and health risks related to these. He highlights that incidents that include these can be very complex in nature and require specialist advice to manage successfully.

Toughest Firefighter Alive South Africa 2019

Enjoy our photo gallery of the TFA South Africa 2019 held in Cape Town.

Self-defence strategies for first responders

In the second part of a series of articles on self-defence for first responders written by Morné Mommsen of Midvaal Fire and Rescue and Warrior Combative, we look at some basic advice when facing violent crimes, when confronted by a gun, bullying, road rage and how to avoid getting into a fight.

We thank all our contributors, advertisers and readers for their continued support! Fire and Rescue International is your magazine. Read it, use it and share it!

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Publisher

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This month's FRI Images winner!

Congratulations to

André Oosthuysen for his photograph 'E-One Flametamer' taken with a Huawei P Smart on automatic settings.

Well done!

André Oosthuysen wins this months prize money of R2000!

Photo description:
Quietly hiding in her cave, she awaits the call for action, when she can show of her beauty and skills.

Best rescue, fire or EMS photo wins R2 000!

WIN R2 000 every month!

Fire and Rescue International's (FRI) monthly photographic competition is open to all its readers and offers you the opportunity of submitting your digital images of fires, fire fighters, disasters, incidents, emergencies and rescues.

Rules

- All photographs submitted must be high resolution (minimum 1meg) in jpeg format
- Allowed: cropping, curves, levels, colour saturation, contrast, brightness, sharpening but the faithful representation of a natural form, behaviour or phenomenon must be maintained
- Not allowed: cloning, merging/photo stitching, layering of two photos into one final frame, special effects digital filters
- Fire and Rescue International (FRI) reserves the right to publish (printed or digitally) submitted photographs with acknowledgement to the photographer
- Winners will be chosen on the merit of their photograph
- The judge's decision is final and no correspondence will be entered into afterwards

Entries must include:

Name of photographer
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Name of photograph
Brief description of photograph including type of incident
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All entries must be emailed to:
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>> ENTER NOW!

IFSAC accreditation for ETC Emergency Training Solutions

ETS will continuously engage with stakeholders to ensure that programmes are aligned with the needs of employers and fire fighters

ETS Emergency Training Solutions based in Redan in Vereeniging, South Africa, is an accredited International Fire Services Accreditation Congress (IFSAC) certification entity. The company had its IFSAC accreditation visit in August 2018 to obtain accreditation as an IFSAC certification entity for approved National Fire Protection Association (US) (NFPA) levels. ETS was accredited on 3 November 2018 and received its accreditation certificate at the IFSAC Fall meeting held in Saint Louis, USA.

The scope of the IFSAC accreditation visit consisted of the following

1. A review of ETS company policies and procedures to ensure compliance with South African legislation and regulations
2. Review of ETS policies and procedures to ensure that they meet all requirements of IFSAC policies, procedures and bylaws
3. A detailed review of assessment criteria for all the NFPA levels applied for
4. An audit of ETS ability to consistently test and assess NFPA levels according to IFSAC standards and criteria
5. An audit of ETS quality management systems to ensure compliance with South African and IFSAC standards and requirements
6. A review of ETS 'best practises' in compliance with internationally accepted standards
7. A review of resources available to maintain assessment standards

As part of the application process, ETS had to submit proof of empowerment within South African legislation that enabled ETS to assess standards prior to the IFSAC accreditation visit. After a very vigorous and thorough evaluation process, ETS was recommended for membership by the IFSAC Certificate Assembly Board of Governors (CABOG) and approved by the Board of Governors (BOG) in 2015.

What does IFSAC accreditation mean for ETS Emergency Training Solutions?

ETS can issue certificates with the IFSAC seals for the NFPA levels we are approved and accredited for. Candidates can be assured that the Assessments and certification meet IFSAC criteria and standards and certificates will be recognised at any entity, company, employer or country the IFSAC seal is accepted.

The IFSAC accreditation does not imply that ETS can accredit training providers in South Africa. The responsibility for accreditation as a training or skill development provider lies with the Quality Council for Trades and Occupations (QCTO) or Skills Education Training Authorities (SETAs). It is the responsibility and obligation of training providers to be accredited by the QCTO or relevant SETA. The IFSAC accreditation and certification process serves as a third party validation for internationally recognised quality assurance purposes, confirming that ETS meet recognised standards.

Within the IFSAC context, ETS is responsible to assess the requirements as listed within the relevant NFPA standard. IFSAC requirements do not stipulate on where, when and for how long training must happen but focus on the validity, currency and reliability of the assessment process and quality of control measures to ensure consistent assessments. ETS must only obtain confirmation that a candidate had opportunity to prepare for assessment and that they have a clear understanding of the assessment criteria listed in the relevant standard they are applying to be assessed for. This proof can be in the form of training programmes completed related to the standard, workplace experience or a formal aligned training programme that is presented in line with the relevant standard.

ETS can assess candidates at any venue that meet set requirements and the venue is suitable for the relevant standard that is being assessed.

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ETS

LIFE MATTERS

ETS can certify the following NFPA programs under IFSAC:

NFPA 1072

- Hazmat Awareness
- Hazmat Operations
- Hazmat Mission Specific: Personal Protective Equipment
- Hazmat Mission Specific: Product Control
- Hazmat Technician
- Hazmat Incident Command

NFPA 1001 - Firefighter I & Firefighter II
NFPA 1002 - Driver Operator
NFPA 1021 - Fire Officer I
NFPA 1031 - Fire Inspector I & Fire Inspector II
NFPA 1033 - Fire Investigator
NFPA 1041 - Fire Service Instructor

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ETS is committed to aligning NFPA standards with relevant QCTO developed qualifications

What does ETS accreditation mean for the South African fire and emergency services?

Fire and emergency response personnel and practitioners have an alternative and simplified option to access internationally recognised NFPA certification through the IFSAC quality assurance process. ETS has various means for fire fighters to qualify for access to the assessment process in order to be certified.

The rules, as agreed and approved by IFSAC, for certification are:

1. ETS cannot certify what they did not assess. In order for a candidate to be certified by ETS, they must quality assure and issue the assessment tools (knowledge and skills) for all levels that they want to certify.
2. ETS does not accredit training and skill development providers. It is the responsibility of training and skill development providers to accredit with QCTO or the relevant SETA to provide training for fire and emergency response related standards and qualifications.
3. QCTO and SETA accredited training or skill development providers can conduct the training and ensure candidate preparedness with formative assessments within the scope and abilities of the provider.
4. Training providers prepare the candidates for certification assessment and ETS will plan and conduct the assessment according to an agreed plan. Assessment can be conducted at any venue that meets predetermined requirements and have sufficient resources available.
5. ETS is committed to assist any employer or training provider, not registered with the QCTO, with the accreditation process.

Assessment requirements

In order to assist and accommodate individuals with workplace experience and various previous training, both formally and informally, ETS offers various options for candidates to the assessment process in order to obtain ETS certification with the IFSAC seal. No certificate can be issued unless the candidate was assessed by ETS. ETS cannot certify what they did not assess; they can only certify what they assessed.

ETS offers the following options for individuals, employers and skill development and training providers:

Attend a formal ETS course that is aligned with the relevant standard

ETS has aligned some of the NFPA standards with the relevant SAQA-registered qualifications. This has the benefit that a candidate can be assessed once and obtains the credits for both SAQA and IFSAC certification.

Attend a course with a registered skill development and training provider

This offer is available to QCTO or SETA-registered training providers. Skills development and training providers can enter into an agreement with ETS to conduct the IFSAC certification assessment criteria. These agreements will be based on site-specific requirements. These agreements will not require any membership, accreditation or related fees. Accreditation of skills development and training providers are the responsibility of the QCTO or SETA. The skills development and training providers are responsible to train and prepare candidates for assessment. Once the training programme is completed and candidates are prepared for assessment, ETS will conduct the assessment as agreed with the skills development and training provider.

Workplace experience

Candidates can submit a portfolio of evidence with the relevant and required criteria. Once the criteria are met, a candidate can enter the assessment process without entering a formal or informal training programme. The emphasis here is that this option allows for individuals to be assessed by attending training. To be certified, the candidate must be assessed. This option is available for candidates that submit relevant proof of experience and with endorsement through the relevant employer(s).

Self study

Some of the NFPA programmes allow candidates to enter the assessment process through self study. These programmes will be advertised with the option for self study.

Recognition of previous learning

Candidates can enter this option on submitting proof of recognised and approved previous learning.

ETS is committed to aligning NFPA standards with relevant QCTO developed qualifications to ensure learners can obtain credits for international IFSAC certification as well as national qualifications with a single assessment. They will continuously engage with stakeholders to ensure that programmes are aligned with the needs of employers and fire fighters.

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Research: Environmental compatibility of foam extinguishing agents

The history of fire fighting foams dates back to the 19th Century

With the oil production beginning in the 60s of the 19th Century and the increasing industrialisation, the requirements for a modern and safe extinguishing agent changed. In view of the particular dangers posed by flammable liquids, at the turn of the century (1900) the patent of the British researcher JH Johnsen, which had not yet been exploited, was reconsidered. As early as 1877, Johnsen had recommended a chemical foam produced by mixing two solutions, sodium bicarbonate, saponin and acidic aluminium sulphate, to combat the 'fashionable' petroleum fires. In 1914, the Austrian engineers I Stanzing and R König came up with the idea of producing extinguishing foam with the aid of a powder mixture to be added to the flowing water. Although this 'dry system' made fire fighting considerably easier, it proved to be very expensive.

In the early 1920s, in the search for new basic materials for the production of extinguishing foam, water-soluble protein products were discovered, which were obtained by chemical digestion from organic raw materials such as hoof or horn. Only in the mid-1930s was it possible to stabilise these protein products in such a way that a stable 'air foam' could be produced. It very quickly became apparent that this protein foaming agent was clearly superior to the chemical foaming agents known until then. This was the birth of modern air foam. Mixed into the flowing water stream in small doses, it can be used to produce a low expansion foam with high extinguishing intensity.

In the course of the 1950s, the first synthetic multi-grade foams based on active washing substances became increasingly important. In 1953, this included a patent for the first alcohol-resistant, gel film-forming foam extinguishing agent. The use of PFC (poly fluorinated and per fluorinated surfactants) in foam extinguishing agents began in the early 1970s when the US Navy commissioned 3M to develop a particularly effective extinguishing agent for ships and aircraft carriers. In the 1980s and 1990s, the combination of alcohol-resistant foam extinguishing agents with AFFF foaming agents resulted in the development of alcohol-resistant AFFF foaming agents suitable for universal use. The water film forming protein foaming agent 'FFFP' was also developed during this time.

Foam extinguishing agents

Foam extinguishing agents contain components such as glycols and glycol derivatives, surface-active substances (hydrocarbon surfactants for synthetic, protein hydrolysate for protein foaming agents) and foam stabilisers, as well as other components such as PFC, inorganic salts or polymer film formers.

The environmental properties of foam extinguishing agents can be divided into three areas:

- The toxicity of the products to aquatic organisms
- The biodegradability and thus the duration of the retention in the environment
- The effect of products on people

PFC-CONTAINING FOAM CONCENTRATES	PFC-FREE FOAM CONCENTRATES
AFFF aqueous film-forming foam concentrates	**P** protein foam concentrates
AFFF (AR) alcohol resistant AFFF	**P (AR)** alcohol resistant P
FP fluoroprotein foam concentrates	**S** synthetic foam concentrates
FP (AR) alcohol resistant FP	**S (AR)** alcohol resistant S
FFFP film-forming fluoroprotein	
FFFP (AR) alcohol resistant FFFP	

Figure 1: Types of fire fighting foam and their classification into PFC-containing and PFC-free

While the surfactants are mainly responsible for the first point, all ingredients contribute to the last two points. PFCs are particularly critical in terms of biodegradability because the fluorinated part of the molecule cannot be biodegraded and therefore remains in the environment for a long time. Therefore, foam extinguishing agents can be divided into two categories for this environmental aspect:
Hence, when discussing the effects of foam extinguishing agents on the environment, a distinction must first be made between two different toxicity classes. Acute toxicity is the immediate effect on an organism (human, fish, bacteria). Anyone who has ever read an Agatha Christie novel knows the acute effects of prussic acid or cyanide, which lead (in sufficient dosage) to immediate death. A recognised acute toxicity leads to the classification 'Harmful' or 'Toxic'. Chronic toxicity is a long-term effect that does not immediately lead to adverse health effects or damage.

PREMIX SOLUTION OF	SYNTHETIC CLASS A	AFFF	AFFF/AR	PROTEIN
Human toxicity	+	+	+	+
Biological degradability (acc. to OECD 301c)	+	+	+	o
Bacteria toxicity	–	o	o	+
Fish toxicity (acc. to OECD 203)	–	+	+	+
Daphnia toxicity (acc. to OECD 202)	–	o	+	+
Algae toxicity (acc. to OECD 201)	–	–	–	+
100% biological degradability of all ingredients	+	–	–	(+)*
Acute toxicity (overall evaluation)	–	o	o	+
Chronic toxicity (overall evaluation)	+	–	–	(+)*

+ = positive/good o = average – = negative/bad
* = only PFC-free protein foams, with PFC-containing foams (FP, FFFP, FFFP/AR) = –

Overview of the environmental influences of different foam concentrate classes

Environmental thinking

First of all, it has to be established: There is no such thing as an 'environmentally friendly foam extinguishing agent'. Strictly speaking, there is not even any environmentally friendly foaming agent, since the properties of water have to be changed to such an extent that they have a negative effect on aquatic organisms in order to produce foam. So when we talk about 'positive' environmental properties, it means that they are more positive than average.

Various standard parameters can be used to describe the impact on the environment:

- Compatibility for humans (human compatibility)
- Biodegradability according to international standard OECD 301c
- Bacteria toxicity (TTC test)
- Fish toxicity according to international standard OECD 203
- Crustacean toxicity (daphnia toxicity) according to international standard OECD 202
- Algae toxicity according to international standard OECD 201
- 100 percent biodegradability, ie complete return to natural, inorganic degradation products such as water, carbon dioxide, sulphate

An assessment of acute and chronic toxicity can be derived from these values.

PFC-free foam extinguishing agents
PFC-free foam extinguishers are 100 percent biodegradable to small, natural, inorganic units without leaving any non-natural residues or degradation products. This generally happens very quickly and the long-term (chronic) environmental impact can be considered non-existent.

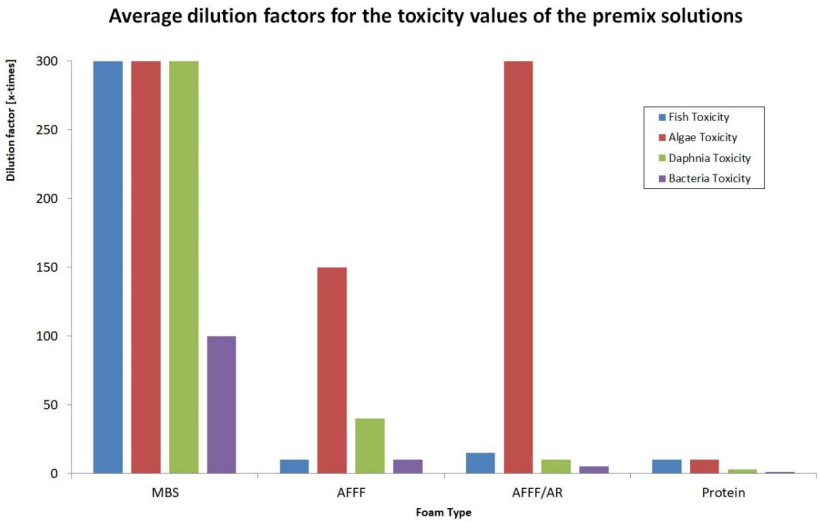
- Protein foaming agent

Protein foaming agents marked the beginning of the age of large-scale firefighting with the aid of air foam. Then as now, the foaming base used is hydrolysed horn semolina from cows, which is also particularly environmentally friendly as a natural base derived from nature. All other ingredients are also environmentally friendly so that protein foaming agent (without PFC) can nowadays be considered the most environmentally friendly foam extinguishing agent. This is particularly evident in the dilution factors, which are particularly small compared to all other foam extinguishing agents, ie only a very small dilution is necessary to reach non-toxic concentration values. The bacterial toxicity is particularly low, protein foaming agents can be introduced into a sewage treatment plant without dilution and without damaging the bacteria. Until the mid-1990s, zinc salts were added to the protein foam concentrate as stabilisers, which made the foam extremely stable but made the foam concentrate very harmful to the environment. This ingredient was, however, replaced by a more environmentally friendly substitute.

Protein foaming agents (without PFC) are 100 percent biodegradable and leave no non-natural residues or degradation products behind. The somewhat reduced biodegradability is exclusively due to the enormous size of the protein molecules. These molecules have to be degraded from 'outside' to 'inside', which takes longer than, for example, digesting many small molecules, as in MBS.

- Multi-grade foaming agent foaming agent

Multigrade foaming agents (MBS) were the first foam extinguishing agents based on synthetic surfactants. In the beginning, the surfactants were selected exclusively according to their foaming capacity and not according to environmental aspects. Some surfactants were used which were poorly biodegradable and also had a high toxic potential. In addition, the saying 'a lot helps a lot' applied, which is why the MBS formulations also contained a great deal of surfactant. With the introduction of the German Surfactant Ordinance (Tensidverordnung, TensV) in 1977, a minimum level of biodegradability for surfactants was required for the detergent industry. The foam ▸



Overview of average dilution factors of application solutions (premix) to reach viable concentrations (the greater the more toxic)

extinguishing agent industry followed the regulation even though it did not affect it. It was also known that longer chain surfactants have a greater aqua toxic potential than shorter chain surfactants. Optimisations were also carried out in this respect, as well as an optimisation with regard to the surfactant content. However, it is still the case that an MBS is characterised by the fact that it must be able to produce heavy, medium and light foam in very good quality with regard to foaming and foam service life. This requires a much higher surfactant concentration than other foam extinguishing agents. A stabiliser must also be added to optimise the foam service life, but this has a foam-reducing effect, which in turn is reflected in an increase in the surfactant concentration.

Due to these high concentrations of ingredients, MBS unfortunately still has the highest acute toxicity and thus the highest dilution factors among foam extinguishing agents.

However, the MBS are 100 percent biodegradable and do not leave any non-natural residues or degradation products. They also have some of the fastest degradation rates and in this respect are the best foam extinguishers in terms of chronic toxicity.

Foam extinguishing agents containing PFC

Special extinguishing agents for large liquid fires contain fluorinated surfactants from the PFC family as important ingredients. These give the foam extinguishing agent special positive properties with regard to water film formation and fire absorption during direct foam application. On the negative side, it should be noted that PFCs are not biodegradable and are therefore dependent on degradation by slower, chemical or radical processes. This causes a long residence time (several 100 years) in nature, which leads to an enrichment in nature, since the entry takes place at the moment faster than the degradation.

In the course of time the PFOS and PFOA based raw materials have been replaced by telomere based ones and the long-chain ones by short-chain ones. The PFCs used in modern film-forming foam extinguishing agents (AFFF, AFFF/AR, FFFP, FFFP/AR) and in fluorine proteins (FP) are Fluoro surfactants based on 6:2 telomer sulfonate, which have a minimal possible impact on the environment and still have the properties desired in film-forming foam agents. PFOS and PFOA are no longer used as raw materials.

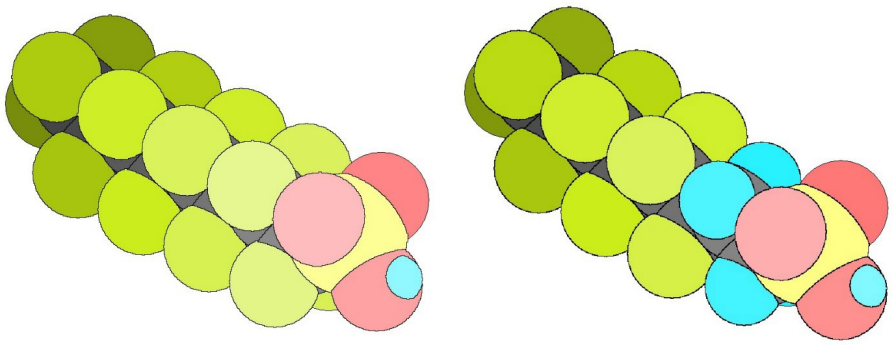
For most PFCs (apart from PFOS and PFOA) no acute risks for humans and the environment have been detected. Due to their unknown and therefore not yet assessable chronic effects and not on the basis of acute hazards, PFCs have been considered with a rather low precautionary value for drinking water compared to other substances in accordance with the principle of concern. The transfer of the drinking water value to waste water is also due to this idea, as PFCs leave the sewage treatment plant more or less unchanged into the environment.

The environmental impact on water bodies (river, sea and groundwater) as well as the impact on humans of the abstraction of drinking water from these waters should be minimised.

The acute aquatic toxicities of Fluoro surfactants are low compared to normal hydrocarbon surfactants, and the environmental problem is mainly due to the lack of biodegradability.

- AFFF foaming agent

As the objectives of AFFF foam extinguishing agents are completely different from those of MBS, the formulations and ingredients are very different. On the one hand, the



PFOS
PerFluoroOctylSulfonate

6:2-Telomer Sulfonate
polyfluorinated Octylsulfonate

Molecule model of PFOS and 6:2 telomer sulfonate (calotte model)

already mentioned PFCs are used to optimise the extinguishing effect on large liquid fires. On the other hand, very short-chain surfactants are used because they have the lowest emulsifying tendency and very little of this Because AFFF produce less bubbles and is a more flowable foam and they are usually applied with low or no expansion.

The toxicity values are accordingly better than with MBS, although the algae toxicity stands out negatively. The degradability is excellent according to the OECD test, but this is due to the fact that the Fluoro surfactant content is generally well below five percent and does not carry any weight in this test.

In spite of the rather attractive toxicity values, AFFF extinguishing waters should not be discharged into sewers or surface waters, as they contribute to chronic water pollution due to their PFC content.

- AFFF/AR foaming agents

The same applies for AFFF/AR as for AFFF, the toxicity values for the individual organisms deviate slightly from AFFF, as the amounts and proportions of the ingredients differ slightly from those of AFFF. The added polymeric film former, which makes the products viscous and alcohol-resistant, does not contribute to an increase in toxicity values. In principle, the following applies here as well: due to the PFC content in the AFFF/AR foam extinguishing agents, no spreading into nature and the sewage system should take place in order to avoid long-term accumulation in the environment, despite quite acceptable toxicity values.

- FP, FFFP, FFFP/AR foaming agents

The PFC-containing protein foaming agents are also just as positive as the PFC-free protein foaming agents when it comes to toxicity values. As the PFCs hardly contribute to the toxicity values, very small dilution factors can also be found here.

As with all foam extinguishing agents containing PFC, the difference here is the chronic toxicity due to accumulation in the environment. For this reason, the principle is that the discharge of PFC-containing protein foaming agents into the environment or the sewage system should be avoided.

Conclusion

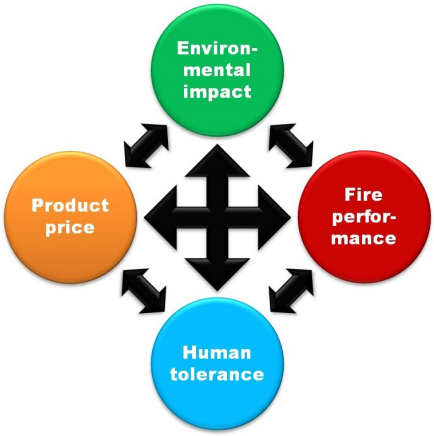
An 'environmentally friendly' foam extinguishing agent does not exist and will never exist. Wherever foam is formed (of any kind, not just extinguishing foam), the surface-active substances alter the water's properties to such an extent that there is a certain aquatic and bacteria toxic potential. The effects on humans and the environment then ultimately depend on the severity of the environmental impact of the foaming agent and on the dilution. A small amount of MBS foaming agent solution, which penetrates a large, fast flowing water body, is certainly to be regarded as uncritical, since despite the increased water toxic effect, the uncritical dilution is achieved so quickly that no environmental damage occurs. On the other hand, a few cubic metres of protein foam agent solution, which has a very low water-toxic effect, can enter a fish farm and still lead to the death of a fish due to the high concentration.

If a foaming agent solution is to be introduced into the public seal net, it is advisable to do this in consultation with the lower water authority and the sewage plant operator. The legal side is then protected and the sewage plant operator knows whether the corresponding dilution factors can be adhered to on the way to the sewage plant.

Foam extinguishing agents containing PFC should neither be discharged into the environment nor into the public sewerage system. PFCs are hardly or not changed at all in the sewage treatment plant and are released into the environment in the same way as when they are directly discharged. Due to the poor degradation behaviour, PFC concentrations increase slowly, and since the consequences of this cannot yet be estimated, everyone should ensure that the increase in PFC concentration in the environment is kept as low as possible.

Finally, it should be mentioned that properties such as environmental compatibility, human compatibility and extinguishing effect cannot be considered separately and are always reflected in the product price. In order to reduce the foaming and to optimise the extinguishing effect, more surfactant or a longer-chain surfactant can of course be used but this can have an adverse effect on the environmental properties and the price. There are also many surfactants that can be used very well and which are classified as 'harmful to health' and should therefore not be used from a humane point of view. For price and environmental reasons, a proportion of surfactant can of course also be dispensed with but this then has a negative effect on the extinguishing and foaming effect. Of course, PFC can also be omitted, which has a positive effect on both the environmental properties and the price, but the desired extinguishing effect is then no longer available and the product no longer works. Ultimately, even at a high price pressure in the market, which expects a very favourable product, one cannot expect optimal properties in the areas of environmental properties, human compatibility and extinguishing effect.

The bottom line is that 'environmentally friendly' foam extinguishing agents do not exist. The environmental friendliness of extinguishing foam can only partly come from the foam extinguishing agent concentrate itself but depends to a large extent on the user and his treatment of the extinguishing water produced.



Interaction of the various product properties of a foam concentrate

Municipal/industrial interface

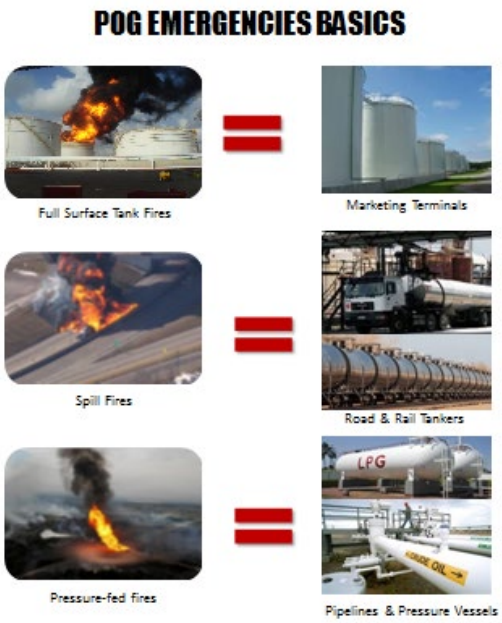
The municipal (urban and rural) fire/disaster risk has been significantly increased over the years through a dramatic rise in the flow of hazardous materials through the jurisdiction of local fire departments. Everything from tankers carrying flammable liquids to spontaneous combustible materials travel by road through many of the municipal areas in South Africa, if not all. Add to this the criss cross of gas, oil and fuel supply lines running above and underground throughout the country. Industrial type fires such as petro-chemical, oil and gas (POG) know no geographical borders so a road tanker burning in Ekurhuleni burns the same in Howick. Therefore, the strategies, tactics, equipment and materials required to control the event are exactly the same. The difference lies in knowledge, resources and preparation.

Most local authorities in South Africa are potentially faced with some of the most extreme risks relevant to industrial POG type fires, amongst others, these being:

- Gas and vapour cloud explosions (both confined and unconfined)
- Boiling liquid expanding vapour explosion (BLEVE)
- Dust explosions
- Running spill fires

All of these risks are extremely dangerous and destructive and have the ability to change lives and property in an instant.

POG fires can be broken down into three basic groups:
1. Fires at depth: These events are largely confined to storage tanks where the fuel can be pre-heated for a long period before extinguishment commences. These incidents are technically difficult to control and are heavy on resources that need to be on site before a meaningful attack can be launched. It should be noted that tank fires involving crude oil may produce several dangerous phenomena in the form of boilover, slop-over and froth-over.
2. Thin film fires are as a rule much easier to control than tank and three-dimensional fires. They do though have the potential to rapidly expand ie running spill fires or, if static, expose other risks that can result in collateral damage including BLEVEs, structural collapse or failure of pipelines.
3. Pressure-fed (3-D) fires involve fires where the fuel is fed under pressure. The fuels can be liquid or gas (liquid or gas phase). Managing these fires is best achieved by cutting off the fuel supply and allowing the residual fuel to burn off. However, if this cannot be achieved the means must be provided to knock the pressure-fed flame down and then rapidly perform leak sealing. Note that in instances where pressure-fed liquids are involved it is imperative that the spill component of the fire first needs to be controlled using foam before any consideration can be given to managing the pressure fed flame.



Most POG emergencies will have collateral effects, ie they can very rapidly transform from one phenomenon to several other, much like falling dominos. The resulting phenomena may then also be much more destructive or dangerous than the triggering event.

For example, a gas/vapour cloud release can rapidly (as within seconds) transform from a rather small and simple incident to one of the most destructive industrial emergencies known to man. This means that emergency services require an understanding of (i) How this incident may evolve and, (ii) What their options are at each step, in specific, to go offensive or defensive until the incident has transformed itself to a manageable size or the risk has reduced to an acceptable level.

The elements that are required in order to successfully manage a POG emergency are:
Effective resources: Each incident type will demand a minimum inventory of resources in order to rapidly, safely and efficiently manage it. Effective resources consist of responders ie quantity and quality, a suitable response fleet including vehicles and/or trailers, hardware and materials ie the correct quality and quantity of foam and sustainable water supplies.

Methodology is the operational 'cookbook' listing the elements and processes required to mitigate the event. While commonalities may ▶

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DoseTech celebrates 30 successful years

Specialist fire protection company, DoseTech, is celebrating its 30 year anniversary in 2020. Founded as a chemical dosing technology company for industry, DoseTech changed its focus about 20 years ago to concentrate on foam dosing for the special risk fire protection industry.

DoseTech, in partnership with FireDos of Germany, has successfully introduced advanced methods of accurate foam addition to fire fighting applications. The benefits of DoseTech solutions include reduced foam wastage, easy installation, testing and maintenance, as well as lowered operational costs.

DoseTech's most noteworthy projects include harbour fuel out-loading protection installation and refinery fire fighting fixed and mobile foam applications, including the first exclusive foam trailer for refinery use in South Africa. The company's building-top helipad special-risk fire protection project has also received acknowledgment as a new industry standard.

DoseTech partnerships extend to a number of internationally-recognised manufacturers, such as Akron Brass and Mueller from the US and Delta Fire UK. Their product range include monitors for various applications, from manually operated to fully automated and remote-controlled units, end-of-line nozzles, water valves, hydrants, foam, bund pourers, tank top pourers and rim pourers. Furthermore, Akron Brass are manufacturers of a range of severe duty monitors for raw water applications such as hydro mining dump recovery and heavy vehicle washing.

A level 2 broad-based black economic empowerment company, DoseTech offers specialist advice on the selection and installation of its product ranges, as well as pre-commissioning and commissioning services, full maintenance contracts and customer training.

DoseTech prides itself on providing innovation and the latest technology to the South African market. "Our German partner, FireDos GmbH, have launched Gen III of their foam dosing FireDos units and will be exhibiting at the Interschutz Expo in June 2020 and we look forward to meeting many of our South African customers at their stand," said DoseTech managing director, Mike Feldon.

exist each incident will require its own mix of elements.

Plans and procedures provides (i) Forethought on how the events associated with a specific risk (address) needs to be managed while, (ii) Procedures seeks to standardise the methodologies (activities) that may be required to manage the full range of events. A thorough and detailed risk assessment and analysis forms the very backbone of the planning phase.

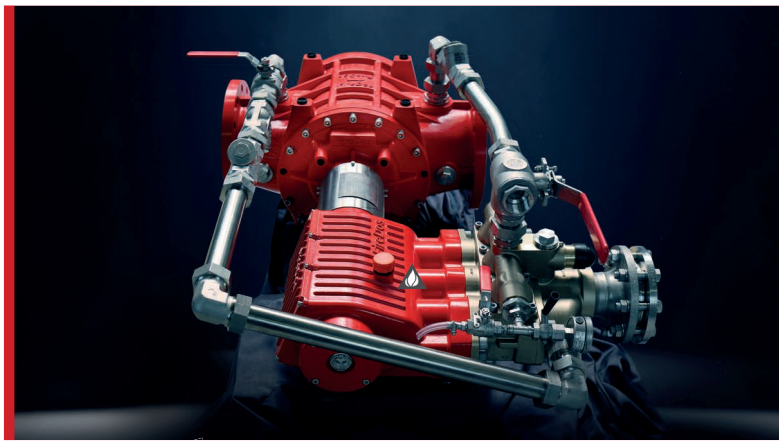
Training: All of the above elements are of zero value if the knowledge and skills of the responders that have to execute the plans and procedures as well as operate the equipment is left wanting.

The A-team is a group of professional companies that are positioned to assist with the following:

- Undertake comprehensive risk assessments as regards POG emergencies at local authority level
- Design and develop proven methodologies and strategies to deal with POG emergencies
- Assist in specification writing for required resources to deal with POG emergencies
- Assess and test foam stocks and assist with foam protocols and logistics
- Design and develop sustainable and practical plans and procedures
- Provide advanced training in relation to POG emergencies

FireDos: The next generation

FireDos, the creator and technical market leader of the globally known water-driven foam agent proportioners for firefighting is presenting the next level of evolution. The original concept consisting of a water motor and a piston pump for all types, including extremely high-viscous alcohol-resistant and fluorine-free foam agents, has been further developed. FireDos has delivered more than 12 000 units to customers worldwide. All of them value the products' quality, reliability, longevity and efficiency. We now proudly announce the new generation of FireDos proportioners:



The new generation is characterised by:

- More compact and sturdy design while reducing weight and dimensions.
- Pressure loss reduction by approximately 25 percent due to hydraulic optimisation by computational fluid dynamics simulation.
- Further improved handling of fluorine-free foam agents, through notably better suction capacity.
- Improved second generation cylinder cut-off for selecting the proportioning rate, with increased accuracy even under extreme system conditions.
- Optimised pipework layout, entirely made of seawater-resistant stainless steel as a standard feature.
- Improved accessibility of the standard fittings.
- Even easier operation.
- Made in Germany - water motor and pump by own design and own production.
- Operational safety by long-term service commitment and spare parts supply.
- ATEX type approval according to new harmonised standards DIN EN ISO 80079-36 and -37 for mechanical ex protection.

All existing advantages over other foam proportioners remain:

- Independent of external energy, driven just by the water flow.
- Suitable for all foam agents, also extremely high-viscous and alcohol-resistant foam agents, due to the specially designed proportioning pump.
- Efficient: testing the proportioning rate without generating foam or premix!
- Environmentally friendly by passing the foam agent back while testing.
- No time limits when fighting fires as the separate, unpressurised foam agent tank can be refilled at any time.
- Utmost proportioning rate precision, independent of foam agent type, water flow and water pressure.
- Highest flexibility through optional proportioning rate setting without adjusting and calibrating.
- Suitable for all extinguishing system types: sprinkler and deluge, wet and dry systems.
- No extinguishing water loss, due to water motor as a closed system.
- Worldwide product approvals.

AFFF vs FFF foams in industrial fire fighting systems: trends, performance, concerns and outlook

By Jan-Erik Jönsson and John-Olav Ottesen, Dafo Fomtec AB

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, bioaccumulative and toxic substances) and forbidden to use since early 2000.

Today, only alternative fluoro-surfactants that are 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 bioaccumulative. 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 to 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 research and development resources have 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 000mPa·s while the AFFFs for hydrocarbon fuels have low viscosity, often below 10mPa·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 ▸

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Honeydew I Gauteng
Website: www.unqondo.co.za

	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

The difference between an AFFF and FFF tested according to UL 162 with two different foam qualities (FQ) using heptane as fuel

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 to10, depending on foam type. On the contrary, a lot of applications are using foaming devices that gives quite poor expansion, typically around 4 to 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 the situation is quite different for a FFF. The table below shows the difference between an AFFF and FFF tested according to UL 162 with two different foam qualities (FQ) using heptane as fuel.

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 and fails in the burnback. When the stove-pipe was lifted it took only a few second before there was a flashover; 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 percent 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, eg 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 pollutants generated by the fire that are classified as persistent, bioaccumulative and toxic substances (PBTs) 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 fire fighting foam since they will be contained and unintended release will be avoided.

ChemSystems received another clear audit from Dr Sthamer Hamburg

Seen here at the official certificate handover is Mason Naidoo of Chem Systems, Jan Knappert of Dr Sthamer, André Schutte of ChemSystems, Dr Matthias Prall of Dr Sthamer, Gerhard Saffy, Louise Peplar and Hugo Basson from Chemsystems.

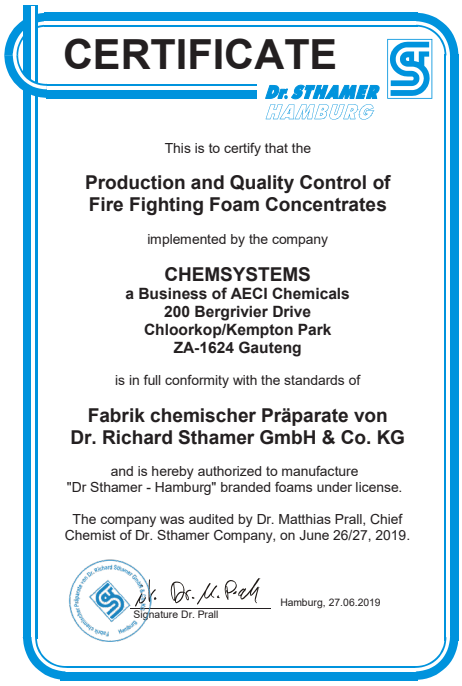
The ChemSystems manufacturing plant at Chem Park in Chloorkop, Johannesburg, has received another clear audit from Dr Sthamer Hamburg. The biennale audit took place in June this year with representatives of Dr Sthamer Hamburg facilitating the audit. ChemSystems, a division of AECI Ltd, are manufacturers of fire fighting compounds including wetting agents, synthetic class A and B as well as AFFF for polar and non-polar resistant applications since 1970.

Dr Matthias Prall of Dr Sthamer and Hugo Basson of Chemsystems

The company has been manufacturing Dr Sthamer Hamburg fire fighting foams for more than 30 years. Chem Systems is also the only plant manufacturing Dr Sthamer fire fighting foams outside of Hamburg in Germany.

ChemSystems manufactures its own range of Class A and B foams including wetting agents as well as aerial bombing foams for wildfire applications. The range manufactured under licence from Dr Sthamer includes the Sthamex range of aqueous film-forming foam concentrates (AFFF) 1, 3 and 6 percent, the Moussol APS range alcohol resistant aqueous film-forming foam concentrates

Dr Matthias Prall of Dr Sthamer with Louise Peplar of ChemSystems



CERTIFICATE

Dr. STHAMER HAMBURG

This is to certify that the

Production and Quality Control of Fire Fighting Foam Concentrates

implemented by the company

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a Business of AECI Chemicals
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is in full conformity with the standards of

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and is hereby authorized to manufacture "Dr Sthamer - Hamburg" branded foams under license.

The company was audited by Dr. Matthias Prall, Chief Chemist of Dr. Sthamer Company, on June 26/27, 2019.

Signature Dr. Prall

Hamburg, 27.06.2019

(AR-AFFF) in 1/3, 3/3 and 3/6. They have also recently introduced Moussol FF 3/6 fluorine free fire fighting foam.

Dr Sthamer is currently researching environmentally responsible alternatives for AFFF and AR-AFFF foams.

All foams manufactured under licence for Dr Sthamer are independently tested and verified by a third party laboratory, MPA Dresden GmbH, a testing, inspection and certification centre, to EN 1568 and International Civil Aviation Organisation (ICAO) standards.

ChemSystems also tests products and supplies sub-Saharan Africa.

Dr Sthamer Hamburg started in 1886 and manufactures fire fighting foams for the municipal, petrochemical, industrial and aviation industries.

Uniti system rolled out throughout Cape Winelands District Municipality

The Uniti system is an integrated information, communications and incident management platform

The Cape Winelands Disaster Management Centre (CW DMC) is in the process of rolling out the Uniti system to the local municipalities within its district. The Cape Winelands has procured the licenses for the local municipalities to utilise the application.

The Breede Valley, Witzenberg and Drakenstein municipalities went live on the Uniti system as of 1 December 2019. Breede Valley has been utilising the system for a number of years but will be migrating over to the Cape Winelands platform on 1 December 2019. Witzenberg and Drakenstein Municipalities' went through training on the system during November 2019.

The Uniti system is designed to allow all emergency services such as fire and rescue, traffic, law enforcement and non-emergency services for the reporting of burst water pipes, electrical faults to utilise the same system. FireWeb is a module in Uniti, specifically incorporating the incident types used by fire services.

Why use such a system?

The rollout of the Uniti system by the Cape Winelands District Municipality resulted from a need that the district had to obtain information from local municipalities concerning incidents in their areas. Disaster management is a secondary function that has been allocated to fire services as only one of the five local municipalities has a dedicated disaster management official. With capacity in the local municipality in short supply, the use of the Uniti system allows the CW DMC to view necessary sections of their incident reports in order to compile a combined situational report for the district. Previously, the Cape Winelands Disaster Management Centre had to telephonically contact the local municipalities for information following severe weather events or in the case of significant incidents such as the farm worker unrest or flood events resulting from cut-off low pressure systems; information had to be emailed three times a day. By now utilising the Uniti system will prevent duplication of information and frees up staff to focus on the coordination and response of incidents.

The Uniti system was first utilised in the Cape Winelands during the coordination of memorial activities across the district following the death of the Former President Nelson Mandela. Adaptations to the system to allow for the reporting from places of tributes that had been established within the five local municipalities namely Breede Valley, Drakenstein, Langeberg, Stellenbosch and Witzenberg.

Technical

The Uniti system is an integrated information, communications and incident management platform.

Uniti is an online system, meaning parties do not need expensive equipment or major capital investment to participate and can access it from any device with an internet connection. It was developed and maintained in South Africa allowing for all participating locals, districts, provinces and other services to cooperate together on incidents for example, a local municipality incident details could be shared with the district or if a local needed district assistance, you would be able to contribute on a single incident report as opposed to each capturing your own incident report, reporting two incidents, when actually just the one.

This cooperation allows for better communication during disasters, better and a wider audience in terms of dissemination of critical incident information and an overview of available personnel and resources throughout the district. From an overview perspective, you are able to see incidents matching key criteria in the situation reports ie automatically linking all social distress calls, during times of heavy rains. Communication with critical facilities such as schools, hospitals or old age homes and the ability to message these contacts with a few clicks directly out of the system.

The Garden Route in flames: Chapter 1

A book by Dr Neels de Ronde

The following article is the first in a series of excerpts from a book written by Dr Neels de Ronde, The Garden Route in flames. Dr de Ronde lives in Sedgefield in the Southern Cape, South Africa and has done extensive research in the field of land management and wildfire prevention. Dr de Ronde gave permission to Fire and Rescue International to publish the book in the magazine in separate sections for the benefit of all forestry and wildfire managers, fire protection associations and land owners in order to gain insight and an understanding of the intricacies that form the basis of such extreme fires and how it can be prevented, highlighting effective fuel management and fire prevention measures.

About Dr Neels de Ronde

Dr de Ronde, well-known and respected wildfire specialist and consultant has a life-time career in forestry, veld and forest fire ecology, management and wildfire investigations and has been building up a wealth of local experience he wishes to share, particularly as he has found a lack of knowledge about the subject in the industry. Not only has he found that incorrect fire management actions have sometimes more than doubled fire damage but he has observed (and many times investigated) the loss of life of more than 50 fire fighters and other persons.

Utilising the mobile application will send automated updates to key stakeholders via push notifications and allows responders to capture evidence such as photos, videos, voice notes, occurrence book entries as well as plot the incident area for instance a burnt area, with fire line divisions, automatically synchronised with all other participating persons on the incident, as well as disaster management via the situation report overview. The mobile application allows for offline mode capture for those without data or a connection, which can be uploaded at a later time.

The Uniti system will ensure that there is better data collation and reporting for emergency services. Utilising the system, municipalities will be able to easily determine daily, weekly, monthly and yearly statistics as well as calculate the accumulated year on year statistics. It enables disaster management to have oversight of happenings during times of disaster in a centralised manner.

The CW DMC will be able to load all role players and advisory forum members on to the system and distribute early warnings and advisories via both email and text message.

Following the conclusion of the Ward Based Risk Assessments the CWDMC has undertaken, all ward risk assessments will be loaded on to the system to allow for a dynamic risk register.

The Cape Winelands District Municipality will provide the system to the local municipalities for a period of two years as part of their assistance to local municipalities for disaster management capacity.

The Uniti system will ensure that there is better data collation and reporting for emergency services.

He is an expert in veld and forest fire investigations and specialises in wildfire reconstruction, regional integrated fire management services with emphasis on fire prevention and wildfire damage reduction.

Dr de Ronde was born in Driebergen, The Netherlands and immigrated with his parent in 1957 to South Africa. He studied at Saasveld Forestry College between 1962 and 1963 and received an MSc in Fire Ecology at the University of Natal in 1978 and a PhD in Forestry from Stellenbosch University in 1994. He has worked in forest management and forest research and has been consulting on fire-related topics since 1994. Dr de Ronde has published more than 30 articles and book chapters and presented at numerous symposiums and conferences.

Background

The morning of 7 June 2017 - when the Knysna fire started - I noticed that the Bergwind was blowing over Sedgefield with unusual strong gusts for this part of the region. This area is normally well protected against this dangerous wind by the 'highest sand dune in Africa', dominating the landscape north of the town. At that time, I also noticed a smoke column directly north of our village and I immediately realise that here was trouble brewing and coming our way.

Could this fire threaten our village? As luck had it this time, we were saved by a shift in wind direction from north to northwest, which made the fire spread more parallel to the N2 national road, missing the village by about one kilometre and 'marching the flames' in the direction of Knysna, some 15kms away as the crow flies.

A few hours later, the most popular 'tourist hub' of the Garden Route ie Knysna, was surrounded by uncontrolled wildfires from a number of fire ignition sites. When it was getting dark, the fires entered the village and burned soon into the heart of the Garden Route, with close to one thousand homesteads burned out.

The result of this unexpected threat was chaotic and the thousands of panicking inhabitants from Knysna were just milling around the centre of the town trying to figure out how they could escape this inferno. These refugees found the major escape routes (including the N2 national road) blocked by fire, with the exception of the road to Thesen's Island. It was this 'escape route' where fortunately many of these displaced people found a safe haven and a place to spend the night in their cars.

I am not going to discuss the urban interface problems, which cause the bulk of material damage in terms of homesteads lost as a result of the recent wildfires but rather how these fire disasters can be stopped (or at least significantly reduced) in the Garden Route area at regional level, outside the main urban areas.

I am also not going to discuss why there were suddenly a number of uncontrolled fires threatening Knysna from different directions and why these fires subsequently burned out most of the central section of the town and surrounding land. It is a known feature of these extreme wildfires, that some people simply ignite more fires when one ignition has started, for a range of silly reasons. Reality has it, that there will always be some maniacs striking a match when and where the most damage will be done as a result of such action.

At a global level, during the past few years, it was particularly in the Mediterranean zone-biome where wildfires were experienced at such frightening intensities and size, as was never observed before eg in Chile and Portugal in 2017, in South Africa in 2017 and 2018 and in Australia, Greece and the USA in 2018. However, we identified that these 'mega' wildfires are also spreading elsewhere beyond the Mediterranean and subtropical spheres, even in global zones where wildfires were never experienced before.

These wildfires confirmed the ineffectiveness of fuel management and fire prevention measures in many (if not all) regions. If we are serious in our attempts to make these preventative attempts more effective, some drastic measures will be required to achieve this in the form of applying prescribed fire to construct regional buffer zones and reducing 'hotspots' of fuel accumulation to manageable levels. These fire-protective buffer zones should be placed mainly in the form of continuous lines in the landscape and be wide enough to restrict wildfire spread effectively. Such measures should also meet fire-ecological requirements as far as is practically possible, considering all available options.

We have identified that the increase in wildfires is not restricted to the Mediterranean biomes, as is confirmed by the reports we have been receiving up to date. Closer to home, as early as during 2017/2018, the increase in wildfires has already spread into the area east of the South African Mediterranean biome, from the winter and constant rainfall climatic area into the summer rainfall area, from the Tsitsikamma region of the Eastern Cape Province, as far as the Port Elizabeth region and beyond, into the inland region of the Eastern Cape.

This is the reality, no way that we can keep fires out of a region forever, when extreme weather conditions occur. Some time, when fire hazard is at its peak, someone will ignite a fire when nothing can stop such action. Accepting this fait complis, we simply have to reduce the unchecked accumulation of the regions' vegetation fuel levels before such extreme conditions make such threats a nightmare reality, particularly when faced with the unknown future and outcome of such extreme wildfires. Then, added to this, the frightening reality that climatic change will make such a fatal reality even worse.

Yes, there is a way to counteract this terrible wildfire nightmare but we need some fire managers with a 'bold global vision'; a few experienced fire bosses who understand fuel dynamics at regional level and subsequently related fire dynamics.

The main reason why I feel so strongly about a 'fresh approach' for fire prevention is because the 'decision-

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making platform' as it is at present, is still based on visible estimations of fire protection requirements or even worse, to still base the measures taken for fire protection on the status before the two wildfires discussed here occurred, which obviously failed completely as we now know.

If the region wants to create improvements of fire protection measures as they were in the past, (i) the fuel and vegetation dynamics and levels will have to be assessed first and (ii) simulation of this in terms of fire behaviour can then be the only reliable norm for determining fresh regional fire prevention requirements.

Let us forget about the past with its mistakes and stop pointing fingers any longer, least of all at the fire fighters, who were involved in fighting the 2017 and 2018 wildfires. They were absolutely helpless and these disasters were not their fault. They were facing a number of fires burning in a region where fire exclusion had been the rule or at least the norm for a number of decades. This was the sole reason for these terrible wildfires experienced in our region!

A word of warning to the Garden Route's decision-makers: If you think you have seen the worst and that you can just carry on as usual and continue with this 'passive approach' to the region's fire hazard, you are wrong. Now is the time for some drastic action and all must stand together on this, otherwise the next wildfire could be with us sooner than we think will be possible!

With this writing I like to table the way towards solutions for the extreme mega-fires now being with us, if there is a will to improve fire prevention in the region. If four to five decades ago fire managers could "tame" the wildfires in the Outeniqua and Tsitsikamma Mountains, for what reason do we now throw our hands in the air and tell ourselves we cannot improve fire prevention? I believe we still have fire managers with the guts and experience within our midst to take some positive steps to improve our fire protection status. Led them lead the way, managed by top managers with a vision and know-how to control such a regional move towards significantly improving fire prevention in the area.

I earlier considered presenting the material in this writing by means of at least two advanced training courses but because of my age and a few health concerns, I subsequently decided to rather create a few shortcuts, by using my databases and methodology developed over the past few decades and to rather attempt to publish my vision for a new approach in some formal magazine. By not using these published guidelines, I am afraid the fire managers from the region will fall into the trap of self-satisfaction and that "all will be OK now", which is far from the truth. However, I am still available in an advisory capacity and to assist to 'train the trainers'.

Nothing has changed now with regard to fire prevention measures at regional level! Indeed, less has been done because so many areas have now burned-out. However, we are forgetting about the land still untouched by wildfires to date. Have we not learned our lessons from the Knysna fire? Did we really expect the next fire to burn 300 percent more land within a year after the Knysna fire event? No, we cannot just sit back now and fall into the same old groove because we are not there yet, not by a mile!

What the fire managers are doing now is falling simply back on the old regime of firebreak burning along property boundaries, which are mostly the worst fire prevention lines in the regional landscape. They base this mostly on Act 101 of 1998 and in the process waste a lot of efforts and energy on (many times) unmotivated ('lukraak') fuel reduction. In the process, they are producing 'prescribed islands', where wildfires will just have a 'walk in the park' in spreading right through!

Let us first of all do our homework to ensure optimum fire-use at regional level, so that we can create regional fire prevention buffer zones that can effectively reduce the impact of these wildfires by means of motivated assessment of fuel dynamics at first, before simulating expected fire behaviour, so we can calculate motivated fire prevention requirements.

The above approach to motivated regional fire prevention measures was tested successfully in the Mpumalanga and Kwazulu-Natal forest regions over the past two decades, so I do not have to prove this success story here any further; the results are there for all to see. The Garden Route region, however, requires some fresh planning and application approach, as there are marked differences between the Cape forest regions and the forest regions in the summer rainfall areas, where the Mpumalanga/Kwazulu-Natal are situated. The latter has also differed from the Cape regions because they have mainly a grassland-type of natural vegetation base, while in the Cape regions, fynbos forms the prominent shrubland natural vegetation.

The methodology for regional use I am presenting here, can, however, be applied in any region across the globe, as all that has to be done is that each regions' fuel model database has to be developed before starting the planning process. The system has for example been introduced in Portugal, where the basis for regional use has been introduced successfully in this manner, never mind the fragmentation of properties, which made this a more difficult operation.

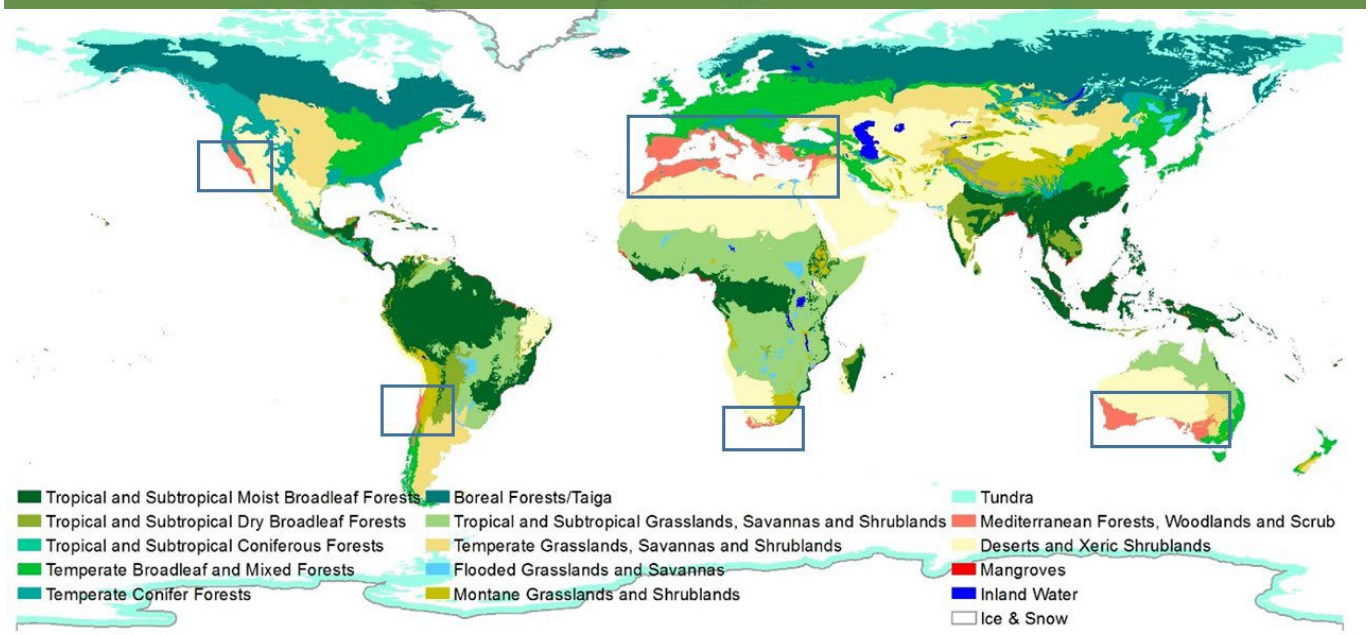
With this writing, I will attempt to present the proven methodology to prevent wildfires effectively. I have avoided detailed scientific text in this book and make this a "fire managers' handbook", with practical guidelines for direct use. However, I can still provide selected advanced training for the regions' champions, so they can maintain the regional fire prevention plan for the Garden Route for a start and then even extrapolate this to other Western Cape regions.

Chapter I: Selected prescribed fire use vs complete fire exclusion: The fight goes on

1.1 History and introduction

Many of the most serious wildfires were experienced in the Mediterranean biomes (Map 1), where the most

Changing fire regimes are observed throughout the Mediterranean Zone-biome in Europe, Africa, the Americas and Australia.



prominent natural vegetation type bases needed fire to maintain biodiversity but which was excluded from fire for various reasons over at least the past few decades. Examples are for example the coastal areas of the South Western Cape Province (fynbos shrubland), the coastal region of Western California (chaparral shrubland) and coastal zones of countries such as Portugal (arbustos) and Greece (phregana). In Chile the prominent (fire dependant) vegetation cover was exotic pine stands, mostly Pinus radiata, while their shrubland is mostly not fire dependent.

The history of wildfires along the Garden Route has been on record since the 1869 wildfires were experienced in the area, when large parts of the region between Swellendam and Humansdorp were burned out by a number of extreme wildfires. This historic event proved beyond doubt that fire was part of the region's ecology even before the significant influence of human beings became more prominent during the 20th Century, when the region was only sparsely populated.

The need for fire as an integral part of the ecology in most natural biomes in South Africa, such as montane grasslands, savanna and fynbos, has been confirmed and quantified by South African researchers, particularly over the past four to five decades (Bond et al., 2004; Booysen and Tainton, 1984). The evidence of charcoal in the forest floor of our indigenous forests confirms the reality of this fire history, even in the local Afro-montane forest biomes, although fire may only play a role here once every two to three centuries or even longer rotation, over time.

The introduction of industrial forest (mainly pine) plantations in the region only extended the role of fire further into these 'man-made pine forests', which brought the reality home that introducing pine tree seed from other fire-related ecosystems, cannot survive without fire. Establishing such tree stands from exotic seed-sources into our fire-related ecosystems, can simply not be grown without fire.

One cannot exclude fire from such plantations because of its fire ecological requirements inherited from sites of (exotic) origin as well as in their 'new' South African habitat. This is regardless resistance from some narrow-

minded conservationists, fire managers, foresters and botanists, which persist with the 'complete fire exclusion regime', even if all evidence points to fire-ecological requirements for these tree stands to survive (de Ronde, 1988; de Ronde et al., 2004).

On the positive side, many of those hardliners have by now thrown in the towel because they now realise they do not have a foot to stand on and they now also agree that fire is an integral part of these introduced tree stands. This is the reality with thousands of hectare of tree stands being prescribed-burned regularly elsewhere in South Africa, as part of their management regime, particularly in the Mpumalanga and Kwazulu-Natal provinces.

1.2 Why complete fire exclusion policies do not work in this region

The recent wildfires, as well as evidence found of fire history, in the Southern Cape and Tsitsikamma forest regions, have hammered it home that fire is a build-in requirement of the locally-introduced Acacia, Eucalyptus and Pinus tree stands, as the decades of 'fire exclusion regimes' crumbled and thousands of hectares were destroyed by the 2017 and 2018 wildfires in the Garden Route region, which swept through the area with devastating effects. However, I know some of the hardliners will still ignore the reality and will not even consider checking fuel loads within tree stands and other natural vegetation communities, regardless the growing evidence against fire exclusion.

The answers to this 'burning problem' can indeed be found in understanding the fuel dynamics within the different ecosystems, including where the natural ecosystems have been 'disturbed' by the introduction of exotic trees in South Africa for timber production purposes. Likewise, the local natural vegetation base and its fire-requirements have to be understood when some agricultural crops were also introduced, such as for sugar cane or wheat because here the same fire-use role applies to check slash after harvesting.

Fuel dynamic changes with vegetation age, will also have to be understood to predict fire behaviour. Only then can prescribed fire be applied as required by the systems' available fuel levels. It is clear that only the correct assessment of the fuel dynamic status at any time during the ecosystem vegetation's lifecycle, can lead to understanding the vegetation's fire requirements. Without such understanding, there can be no optimum fire use and this is where many fire managers 'fell out of the bus' in the recent past. Assessment of fuel dynamics assessment first and only then the correct fire application, is the answer. There is no shortcut to successful fire-use!

1.3 Dynamic montane grasslands

In the dynamic montane grassland, the fuel substances are prominently linked to the seasonal curing of grass, which is correlated with the seasonal 'drying up' of the rainfall in the summer regions of Southern Africa during the autumn season.

This is also the case when frost will change the green grass of the summer into dead fine fuel material overnight, converting this from 'non-burnable fuel' to 'available – burnable – fuel' material. In the higher rainfall climates of South Africa, this results in yearly burning requirements of

Mature fynbos shrubland vegetation on the Tsitsikamma Plateau, Eastern Cape Province, South Africa (Picture taken by Neels de Ronde)

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Grassland burning in progress, which provides added fire prevention along this public road. This burning technique, applied along public road shoulders, is controlled-burned in the summer rainfall regions, during the dry winter season, throughout South Africa (Courtesy Working on Fire).

the biomass when cured, to ensure safe wildfire prevention and also to ensure maintained palatable grazing. In the drier regions, such controlled burning can only be possible after a number of years the rotation required being correlated to the year when a continuous fuel layer can carry a fire.

1.4 Natural fynbos shrubland

This biome is prominently covered by a fire-prone shrubland (fynbos) in the mountains and along the south-western and southern coast of the Western Cape Province of South Africa. These areas are species-rich, unique, floristic vegetation communities, where fire plays a vitally-important role in the maintenance of biodiversity. Its species richness (> 8 000 species) contributed to describing the biome as a separate (though smallest) plant kingdom.

Two smaller biomes where identified as minor fynbos sub-biomes, which are (i) Renosterveld on the (mostly) sandy

Typical fire behaviour in fynbos shrubland, making prescribed burning of the vegetation correct in terms of fire intensity and fire residence time, necessary for controlled burning when optimum conditions for the maintenance of biodiversity occur (courtesy Working on Fire).

soils of the drier climate and (ii) Strandveld along the coast, having more fire-avoiding species in its floristic composition. The fynbos shrubland biome was then also the dominating vegetation in the SW Cape Province of South Africa, where the worst wildfires (2017 and 2018) were experienced.

In fynbos, the prominent fuel layer of the Garden Route mountain ranges and foothills, the optimum fire application has been determined through research programmes at ranging between 12 and 20 years of fynbos age. This then provides the people responsible for such fire-application with a number of years to select from, to apply such fire successfully when weather conditions are favourable. I appreciate that fynbos is more difficult to burn correctly than say grassland but there is no alternative!

Once exceeding this age-window for optimum burning application of 12 to 20 years, the vegetation will become more dangerous to burn and when reaching mature age and beyond, it will not be possible to burn such fuel safely. Then only an uncontrolled wildfire can reduce such loading, when it is beyond optimum fire-use levels. Reality has it that complete fire exclusion is not what this sensitive shrubland requires, as wildfires in such old shrubland is not what is required for the maintenance of biodiversity in this species-rich plant kingdom. Such extreme fire intensities in these accumulated fuel loadings, with such a long 'residence time' when burning, will for sure damage the nutrient status/budgets/availability for the fynbos land soil's base and will then also destroy some vital seed resources.

1.5 Industrial pine plantations

A few notes about the role of the industrial pine plantations on the Garden Route plateau and mountain foothills are provided here and linked to this, also the need to maintain a very important sustainable timber industry for the region and indeed for South Africa. Although not as prominent on the Garden Route as in the Mpumalanga and KwaZulu-Natal provinces, this forestry-related industry provides some vital employment for the region.

These timber plantations provide the raw material for the timber-related industries and their existence, which should subsequently be protected effectively against wildfires. We do not have to re-invent the wheel for the use of selected prescribed fire in this area, failing of which will have serious consequences, such as what the Garden Route is facing now after the recent wildfires.

I think in South Africa we have a very important (fire-related) database, which proves beyond doubt that fire is required for our natural montane grassland, savanna as well as fynbos and other minor shrublands. Our scientists did indeed go further, optimum burning rotations were determined and seasons of burn were set, as well as optimum fire intensities successfully researched for each South African ecosystem where fire plays a role. To conclude, although some people hate the idea of fire-use, the technique will be here to stay, with as alternative, increased mega-fires that will result, with its terrible consequences.

This will be the final word about fire exclusion mentioned in this book and I hope our local scientists have finally convinced the 'fire exclusionists' that there is no alternative for the prescribed use of fire in South Africa. Indeed, fire-use formed the cornerstone for my own research in the Garden Route, the results of which confirmed the role of fire, also inside industrial pine plantations, all the way. The scientific articles describing the outcome of these studies have been published, locally and abroad.

Prescribed burning inside a Pine stand, using a safe backfiring method to keep flame heights low and so to avoid scorch into the tree crowns (Photograph taken by C. de Ronde).

Locally produced CAFS offers huge advantage to fire fighting efforts

Through the recent launch of the ANCO CAFS300, ANCO Manufacturing has responded to the cry from South African fire fighters to offer a locally designed and produced compressed air foam system (CAFS). The team at ANCO adapted existing technology into an easy to use but very effective, 100 percent South African mini CAFS system. Although the ANCO CAFS300 is one of the most recent developments from ANCO, the company continues to design, develop and produce a wide range of fire fighting vehicles and equipment based on technology that has been tried, tested and working in harsh African conditions.

CAFS is an acronym used for compressed air foam system and is a system used in fire fighting to ▸

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The photos show the ANCO CAFS300 self-contained compressed air foam system from ANCO Manufacturing being tested under real-life conditions at a brush fire and an example of the ANCO CAFS300 installed on a fast attack fire fighting vehicle.

deliver fire retardant foam onto a fire. A CAF system uses a Class A or B foam concentrate combined with water and compressed air to create a continuous supply of fire extinguishing foam that has greater fire fighting ability than the sum of its parts and has proven to be a superior fire fighting medium compared to water only.

When used as a fire fighting agent, a steady stream of compressed air foam has a very high heat absorption quality (almost ten times that of water) that will suppress a fire in a fraction of the time when compared to conventional water.

This is due to the fact that CAFS attacks and works on all three elements of the fire-triangle by penetrating carbon based fuel loads, depriving the fire of oxygen and absorbing heat. CAFS is one of the most effective methods to suppress fires and has been in use for many years in fighting virtually all types of fires and is considered an excellent force multiplier in fire fighting situations. Similar systems are currently used by US, European and Australian fire fighting agencies with great success.

"Traditional CAFS units have been available from the USA and Europe for many years but in our typical South African way we had to respond to continued demands from the local industry to come up with an effective, locally produced and more affordable system. Producing the unit locally not only allows for a reduction in cost compared to imported units but also allows us to offer better after-sales support" says André Scheepers, MD of ANCO Manufacturing and chief designer on the ANCO CAFS300 project.

The ANCO CAFS300 is a self-contained CAFS generator that can be installed onto almost any fire fighting vehicle platform, even onto a standard LWB Bakkie. According to Scheepers , "The benefits of the system lies in the fact that traditional water carrying vehicles can be retro fitted with the system or installed as part of the design and will effectively multiply the usable water load by up to ten times.

Many hours of development, pre-production experimentation, burn testing and real-life deployments have enabled the ANCO team to offer another tried and tested product that will assist the South African fire fighter in dealing with the huge challenges they face every day.

Low-severity fires enhance long-term carbon retention of peatlands

High-intensity fires can destroy peat bogs and cause them to emit huge amounts of their stored carbon into the atmosphere as greenhouse gasses but a new Duke University study finds low-severity fires spark the opposite outcome.

The smaller fires help protect the stored carbon and enhance the peatlands' long-term storage of it.

The flash heating of moist peat during less severe surface fires chemically alters the exterior of clumped soil particles and "essentially creates a crust that makes it difficult for microbes to reach the organic matter inside," according to Neal Flanagan, visiting assistant professor at the Duke Wetland Centre and Duke's Nicholas School of the Environment.

This reaction, which Flanagan calls "the crème brulee effect", shields the fire-affected peat from decay. Over time, this protective barrier helps slow the rate at which a peatland's stored carbon is released back into the environment as climate-warming carbon dioxide and methane, even during periods of extreme drought.

By documenting this effect on peatland soils from Minnesota to Peru, "this study demonstrates the vital and nuanced but still largely overlooked, role fire plays in preserving peat across a wide latitudinal gradient, from the hemi-boreal zone to the tropics," according to Curtis J Richardson, director of the Duke Wetland Centre. "This is the first time any study has been able to show that and it has important implications for the beneficial use of low-severity fire in managing peatlands, especially at a time of increasing wildfires and droughts."

The researchers published their peer-reviewed findings in the journal Global Change Biology.

Peatlands are wetlands that cover only three percent of earth's land but store one-third of the planet's total soil carbon. Left undisturbed, they can lock away carbon in their organic soil for millennia due to natural antimicrobial compounds called phenolics and aromatics that earlier studies by the Duke team have shown can prevent even drier peat from decaying. If a smouldering, high-intensity fire or other major disturbance destroys this natural protection, however, they can quickly turn from carbon sinks to carbon sources.

To conduct the new study, Flanagan and his colleagues at the Duke Wetland Centre monitored a US Fish and Wildlife Service prescribed burn of a peatland pocosin or shrub-covered wetland bog, at Pocosin Lakes National Wildlife Refuge in eastern North Carolina in 2015. Using field sensors, they measured the changing intensity of the fire over its duration and the effects it had on soil moisture, surface temperatures and plant cover. They also did chemical analyses of soil organic matter samples collected before and after the fire.

They then replicated the intensity and duration of the North Carolina wildfire, which briefly reached temperatures of 850oF, in controlled laboratory tests on soil from peatlands in Minnesota, Florida and the Amazon basin of Peru and analysed the burn samples using using X-ray photoelectron spectroscopy and Fourier transform infrared spectroscopy.

The analysis showed that the low-severity fires increased the degree of carbon condensation and aromatisation in the soil samples, particularly those collected from the peatlands' surface. In other words, the researchers saw the "crème brulee effect" in samples from each of the latitudes.

Long-term laboratory incubations of the burnt samples showed lower cumulative CO2 emissions coming from the peat for more than one to three years after the tests.

"Initially, there was some loss of carbon but long-term you easily offset that because there's also reduced respiration by the microbes that promote decay, so the peat is decomposing at a much slower rate," Flanagan said.

Globally, peatlands contain approximately 560 gigatons of stored carbon. That's the same amount that is stored in all forests and nearly as much as the 597 gigatons found in the atmosphere.

"Improving the way we manage and preserve peatlands is critical given their importance in earth's carbon budget and the way climate change is altering natural fire regimes worldwide," Richardson said, "This study reminds us that fire is not just a destructive anomaly in peatlands, it can also be a beneficial part of their ecology that has a positive influence on their carbon accretion."

Flanagan and Richardson conducted the study with fellow Duke Wetland Centre researchers Hongjun Wang and Scott Winton. Winton also holds appointments at ETH Zurich's Institute of Biogeochemistry and Pollutant Dynamics and the Swiss Federal Institute of Aquatic Science and Technology.

The importance of wildland fire investigation training: Origin and cause determination course

By Michelle Kleinhans, Dynamic Incident Management

Investigating a wildfire can seem an intimidating task as wildfires are driven by variable environmental conditions: fuel load, wind, weather, topography. Fire suppression activities, such as first responders entering the scene, backburns activities and changing fire lines, can influence the natural progression of the fire and affect fire patterns the investigator will have to interpret.

While being practiced and refined in some counties, wildfire investigation is a relatively new science in South Africa. Many people, including seasoned high-ranking fire fighters, cannot accept that trained and experienced investigators are able to find the origin and cause of destructive wildfires due to this mindset, very few investigations are requested, resulting in the failure to determine the true cause of the fire and with it, the collection of evidence that could lead to the apprehension of the offender(s).

The South Africa Police Service (SAPS) are not trained or experienced to undertake such investigations and it is the responsibility of the fire departments to determine if a malicious act was indeed the cause of the fire in question, due to the fire departments not always requesting the 'origin and cause' investigation, the registered cases end up as dead ends.

The possible causes of wildland fires are varied and unpredictable; from lightning to arson to obscure events, however, if you understand the unique aspects of wildland fire fuels, behaviour and causes and apply systematic investigative techniques, you are better prepared to determine wildfire origin, cause and responsibility.

To know what prevention strategies and programmes we should offer the community, we must first know what causes fires in our community. To know that, every fire must be thoroughly and properly documented, investigated and reported. Spending effort on initiatives to prevent what is presumed to have been the cause is in many causes a waste of valuable time and money.

The 'Wildfire Origin and Cause Determination' course is facilitated by highly experience and International registered wildland fire investigator and provides candidates with the necessary training, information and skills to be able to conduct such investigations whereby the scientific and forensic conclusion that is reached can be used for prevention programmes, civil claim litigation and/or in the procedure of prosecuting offenders.

The primary purpose of this course is to provide a consistent knowledge and skill base for the wildland fire investigator, by determining the origin, how the ignition source met the materials first ignited and identifying the responsible party. Accurate origin and cause determination is an essential first step in a successful fire investigation and successful fire investigations are necessary in preventing unwanted wildland fires.

Basic knowledge of wildland fire behaviour, fuels, topography and weather is required to attempt the training of a wildland fire investigator.

The course is a five-day training programme and include, classroom lectures, activities and field exercises. Full certification is only received after five investigation reports are completed and signed off by the facilitating agency.

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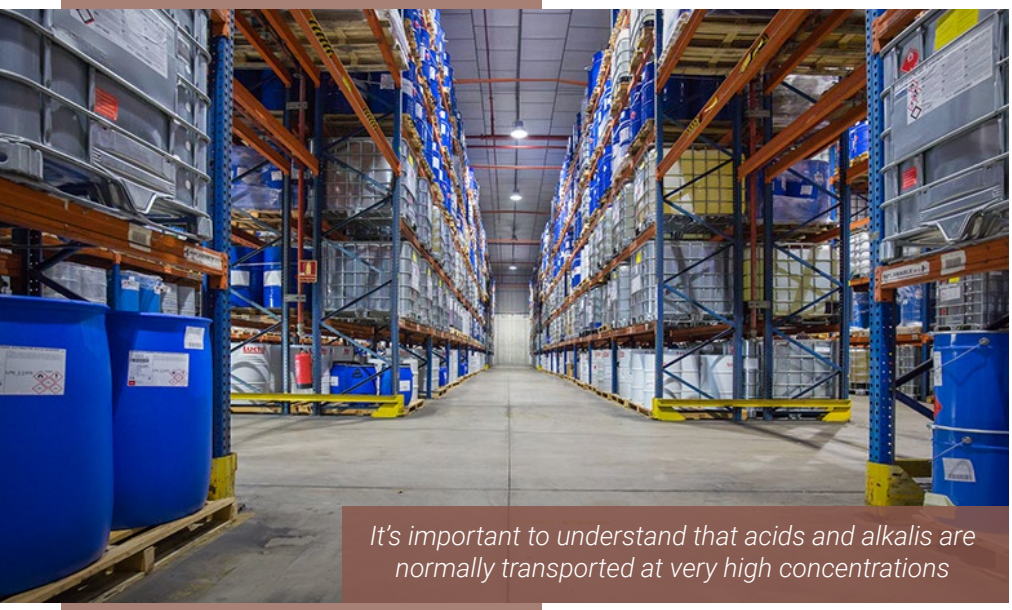
Hazardous materials: UN Class 8 Corrosive Substances

By Colin Deiner, chief director, disaster management and fire brigade services, Western Cape Government



It's important to understand that acids and alkalis are normally transported at very high concentrations

The series on hazardous materials continues this month where we will be covering corrosive substances ie UN Hazard Class 8. This covers substances that attack, through a chemical action, epithelial tissue of skin or mucous membranes, which they touch or are capable of destroying or damaging any other materials they come into contact with when released from their containment. This hazard class also covers substances that form a corrosive liquid in the presence of water or produce a corrosive vapour in the presence of moisture in the air.

Corrosives are generally either acids, bases, alkalis or salts but can also include other substances that are not necessarily classified in this class, such as chlorine or any other oxidising, toxic and corrosive gasses.

Acids

Acids will generally react with a wide range of metals and cause corrosion of these metals, which will produce Hydrogen gas. Hydrogen is lighter than air and can, in confined spaces, create a flammable or explosive atmosphere. The possibility of this happening will depend solely on the particular type of acid and the metal concerned. It will also depend on the concentration of the acid and the ambient temperature. The fact that acids are often corrosive to metal or flesh also indicates that they can present a level of toxicity. The corrosiveness of the substance and the quantities involved should be the primary considerations of any incident commander dealing with an incident involving the release of acid.

Some of the more important inorganic or mineral acids that may be encountered are:

Nitric acid (HNO3)

Nitric acid is considered a concentrated acid as it is available in a 70 percent solution Nitric acid is available in 100 percent concentrations and this is known as 'fuming Nitric acid'). The manner in which Nitric acid will behave is dependent on the concentration of the substance. A diluted solution will display typical properties of an acid; however, if it is more concentrated, it will exhibit more corrosive properties. When Nitric acid reacts to Copper it will produce Nitrogen dioxide, which is a toxic gas. Not all metals will, however, react this way. Iron, Aluminium and Chromium react rapidly with Nitric acid to form a layer of oxide. The oxide formed will be insoluble even in highly concentrated acid and will therefore prevent further corrosion from taking place. When exposed to a fire, Nitric acid readily decomposes producing Nitrogen dioxide and Oxygen.

Hydrochloric acid (HCl)

Hydrochloric acid is manufactured by dissolving Hydrogen chloride gas in water. When Hydrochloric acid is heated it releases highly pungent and irritating Hydrogen chloride fumes.

Hydrogen chloride dissolves very readily in water. Inhaling these fumes causes the formation of Hydrochloric acid in the lungs causing irritation and possible oedema. Hydrochloric acid is not oxidising but does exhibit all the characteristics of a typical acid.

Sulphuric acid (H2SO4)

Sulphuric acid can generally be found in two forms:

- 98 percent Sulphuric acid and
- Fuming Sulphuric acid, Oleum or Pyrosulphuric acid; names given to Sulphuric acid containing dissolved Sulphur trioxide (SO3)]

Concentrated Sulphuric acid it has the ability to remove and/or absorb large quantities of water and, in so doing, causes a massive exothermic reaction sufficient to boil the added water. Diluting Sulphuric acid with water is therefore an extremely risky

process and must be done under favourable conditions using great care. Should neutralisation of a spilled product not be possible large volumes of water should be added from a safe distance.

Concentrated Sulphuric acid contains little water and therefore shows little reaction towards metals under normal conditions. When the concentration is, however, reduced to a lower level (60 percent) the reactivity increases considerably. This creates the situation that the dilution of concentrated Sulphuric acid will cause a spike in its corrosiveness before it reaches a point where the reactivity will decrease.

Concentrated Sulphuric acid is also a highly effective oxidising agent, especially when exposed to heat and is accompanied by production of the gas Sulphur dioxide (SO2). This could cause Sulphuric acid to ignite some organic compounds, especially if also in contact with another oxidant such as Nitric acid, Potassium dichromate or Potassium chlorate.

Hydrofluoric acid (HF)

Hydrofluoric acid is classified as a weak acid because of its lower dissociation constant compared to the strong acids. It has the unique property of being able to dissolve glass and therefore it will be found in industries where the etching or frosting of glass is performed. It is generally transported and handled in polyethylene containers.

Hydrofluoric acid is by far the most toxic when compared to other acids. Inhalation of Hydrogen fluoride vapour causes severe oedema of the lungs. Due to its solubility the acidic vapour dissolves easily in the eye, which can result in permanent eyesight damage. Hydrofluoric acid also generally causes more severe and painful burns than other mineral acids. Burn injuries will occur almost immediately when skin and tissues beneath the skin are exposed to solutions stronger than 60 percent. Extremely severe burns can result from even a very mild exposure with the destruction spreading even to the bones.

Organic acids

Unlike their inorganic counterparts, organic acids are weak acids and do not dissociate completely in water. Lower molecular mass organic acids such as formic and lactic acids are miscible in water but higher molecular mass organic acids, such as Benzoic acid, are insoluble in molecular (neutral) form. Simple organic acids like formic or acetic acids are used for oil and gas well stimulation treatments. These organic acids are much less reactive with metals than are strong mineral acids like Hydrochloric acid or mixtures of Hydrochloric acid and Hydrofluoric acid. For this reason, organic acids are used at high temperatures or when long contact times between acid and pipe are necessary.

Organic acids are also used in food preservation because of their effects on bacteria. Lactic acid and its salts Sodium lactate and Potassium lactate are widely used as antimicrobials in food products, in particular, meat and poultry such as ham and sausages

Basis and alkalis

Bases can be defined as any metal oxide or as something that will react with acids to produce only a salt and water (sometimes violently).

Water soluble bases are referred to as alkalis and can corrode some metals to release Hydrogen. Strong concentrated alkalis are perhaps more corrosive to flesh than many strong concentrated acids. Sodium hydroxide (NaOH) and Potassium hydroxide (KOH) are important members of this group. Both are white solids at room temperature and all are very soluble in water. They do not affect most metals; however, they are corrosive towards Aluminium, Zinc and Lead.

Concentrated solutions are used to dissolve silk, wool and animal tissues.

Other alkalis include:

- Calcium hydroxide: Ca(OH)2 (slaked lime), which is a white solid, which dissolves in water at a very slow rate to produce a weak alkaline solution
- Calcium oxide CaO (lime, quicklime), which reacts exothermically with water to produce Calcium hydroxide.

Ammonia (NH3) is a base and dissolves readily in water to give Ammonium hydroxide, an alkaline solution of about pH10. Ammonia can be found in a pressurised liquid state (anhydrous Ammonia) and in aqueous solution. Anhydrous Ammonia is commonly found in large storage facilities where it is used as a cooling agent. Although anhydrous Ammonia is not classified as a flammable product, it does have a narrow flammable range and could react violently if it reaches an open flame. A number of incidents are on record where explosions have occurred following the release of anhydrous Ammonia and a subsequent ignition source.

Bases are corrosive and can also be mildly toxic and organic materials are flammable, we would be wise to expect these materials to be flammable, toxic and corrosive.

Emergency response

An emergency response to a corrosive materials spillage will be largely dependent on the type and volume of the product involved. Corrosive substances are non-flammable under normal conditions but may ignite flammable materials they come into contact with. Sulphuric acid, being a highly reactive, strong oxidiser will present this extra risk if involved in a fire.

In the event of a fire involving fuming Sulphuric acid, use a dry agent and gas-tight chemical protective suit in combination with breathing apparatus. For a fire involving dilute or spent Sulphuric acid, use fine water spray and chemical protective clothing with liquid-tight connections for whole body and breathing apparatus.

There are principally four ways of dealing with spillages of corrosives:

- Contain and recover by a specialist hazardous waste disposal company or the owner of the spilled product.
- Contain and absorb in some inert material (earth or vermiculite) prior to appropriate disposal

The 2002 Farragut derailment occurred on the morning of Sunday, 15 September 2002, in Farragut, Tennessee. Norfolk Southern freight train 15T derailed 27 cars, resulting in the release of oleum or fuming sulfuric acid.

The fire department used a ground monitor to suppress vapours during the 2002 Farragut derailment

A crushed tank car involved in the Farragut derailment

Corrosive substances are non-flammable under normal conditions but may ignite flammable materials they come into contact with

- Contain and 'neutralise' with soda ash (anhydrous Sodium carbonate).
- Dilute and disperse to drain using copious quantities of water. This should be regarded as a last resort if no other method can be employed and specialist advice should be taken to ensure the acid is able to be safely and effectively diluted. From an operational perspective it is well neigh impossible to determine sufficient dilution ratios at an emergency scene. It is therefore important that this should not be done in a haphazard way.

It's important to understand that acids and alkalis are normally transported at very high concentrations, for example 90 to 95 percent Sulphuric acid, 65 percent Nitric acid, 30 percent Hydrochloric acid, 50 percent Sodium hydroxide and 50 percent Phosphoric acid. At these concentrations you will be dealing with highly corrosive substances presenting a significant health risk to responders. Due to the ability of corrosives to impact many other materials such as paper, cloth and several metals, also be aware of the heat generation that may be caused. The resulting decomposition often produces heat and gasses and, in some cases, extremely flammable Hydrogen gas. Accidental mixing of different corrosive materials can in some cases lead to violent reactions, which may give off large amounts of gasses.

On another note, we must understand that it can take some time before the consequences of corrosive effects are visible. A corrosive substance leak on a structure could see the load bearing components of the structure being compromised over time and eventually resulting in a catastrophic collapse.

Health risks

The two main risks posed by acids are the burning effects on the skin and underlying tissues (as well as bone structure). In the event of a vapour propagation there will also be a significant inhalation hazard.

When it comes to strong alkalis there is a latent period before a feeling of burning on the skin is experienced. By then the damage will already have been done. With acids however the effect will be immediate. In both cases however corrosive substances can cause serious skin and eye damage.

Someone who receives a severe chemical burn may go into shock, a life-threatening condition that requires emergency medical care. Signs of shock include fainting, a pale complexion and very shallow breathing.

Indicators to seek urgent medical assistance for a chemical burn include the following:

- The burn penetrates the first layer of skin
- The burn area is more than 75cm in diameter
- The burn "encircles a limb or involves the eyes, hands, feet, face, groin or buttocks or a major joint."

When a patient is transported to hospital, it is vital that the type of substance involved is identified and made known to the medical team.

In conclusion

Incidents involving large volumes of corrosive materials are not common incidents. They can, however, be very complex in nature and require specialist advice to manage successfully. This should be an integral part of your pre-planning and standard operating procedure development. As with all other classes of hazardous materials, the expression "knowledge is power" holds true here as well.

TOUGHEST FIREFIGHTER ALIVE SOUTH AFRICA 2019

The sixth Toughest Firefighter Alive South Africa 2019 (TFA-SA) was held at Roeland Street Fire Station in Cape Town on 20 to 21 September 2019 with 106 fire fighters from all over South Africa taking part in this prestigious event. The TFA-SA is based on the international TFA competition, which will be held in Aarlborg in Denmark during the World Firefighter Games (WFG-World Championship) in 2020. The event was officially opened by City of Cape Town's mayoral committee member (MMC) for Safety and Security, Alderman Jean-Pierre (JP) Smith with Cape Town Fire and Rescue Service CFO Ian Schnetler welcoming the participants. TFA-SA organiser Mark Smith thanked all the sponsors, exhibitors and volunteers for their contributions and shared the inspiring history behind the event. Smith said that the aim of the competition is to promote a spirit of excellence and produce fire fighters who are able to compete on the international stage, to equip them with skills that will enable them to perform to the peak of their abilities, to continue to push the boundaries in delivering a better, high quality service and to boost their morale.

Toughest Firefighter Alive South Africa was officially started in 2011 with an average of 145 competitors including fire fighters from different municipalities, the armed forces, ports authority and aviation competing in the annual event held in South Africa. The competition is considered to be South Africa's premier fire fighter challenge. Not only does the TFA challenge the fitness, strength and endurance of fire fighters but it builds morale, confidence and camaraderie between the different teams and team players. The TFA, recognised as the hardest fire fighter competition in the world, is a fitness challenge specifically for fire fighters, where they can compete in various male and female age individual and team categories, with the winners becoming national champions within their age groups.
The gruelling challenge consisted of four stages with fire fighters donned in full bunker gear ie fire helmet, fire tunic, fire boots and self-contained breathing apparatus (SCBAs).

Station 1: Hose make-up and advance (hose drag)
Station 2: Obstacle course
Station 3: High-rise pack carry and hose hoist
Station 4: Stair climb (23 floors at the Civic Centre)

Results
The overall winner of this year's TFA-SA is Emile Conrad of Garden Route Municipality. Conrad walks away with the first prize for the fifth time in a row! City of Cape Town's Baigum Abrahams won the female category for the second year in a row. Congratulations!

Fire and Rescue International congratulates all the participants and especially the winners!! Compliments go to all contestants for their professional sportsmanship and camaraderie. ▸

TFA 2019 Results

Congratlulations to all the contestants and especially the winners!

Team relays

	TEAM	STAGE 1	STAGE 2	TOTAL
3	40 Lions	00:06:55	00:03:01	00:09:56
6	N1zuri	00:06:25	00:03:42	00:10:07
13	Cape Town	00:05:47	00:04:21	00:10:08
18	Cape Town Over 40	00:06:23	00:05:00	00:11:23
6	Eden	00:07:35	00:03:51	00:11:25
4	Stellenbosch	00:07:45	00:03:51	00:11:36
2	Mangaung	00:07:54	00:03:58	00:11:52
10	Drakenstein	00:07:36	00:04:18	00:11:54
9	Bloemfontein	00:09:14	00:04:14	00:13:28
15	Hesseque (2)	00:10:56	00:05:31	00:16:27
16	Cape Winelands	00:10:52	00:05:36	00:16:28
11	Bitou	00:12:06	00:04:31	00:16:37
1	Volunteer Wildfire Services	00:10:16	00:06:42	00:16:58
17	Bitou	00:12:18	00:07:00	00:19:18
7	Mosselbaai	00:13:19	00:07:15	00:20:34
14	Mosselbaai (2)	00:14:09	00:10:59	00:25:08
12	Hessequa	00:27:00	00:04:53	00:31:53

Overall individual males

NR	SURNAME	NAME	AGE	AGE	GENDER	MUNICIPALITY	STAGE 1	P	STAGE 2	P	STAGE 3	P	STAGE 4	TOTAL
1	Conrad	Emile	35	35 - 39	M	Garden Route	01:32		01:58		01:22		03:38	**08:30**
2	Gouws	Manie	41	40 - 44	M	West Rand	01:36		02:04		01:55		03:01	**08:36**
3	Mulholland	Allister	27	18 - 29	M	City of Cape Town	01:55		02:32		01:39		03:56	**10:02**
4	Wentzel	Lucan	30	30 - 34	M	City of Cape Town	01:45		02:18		01:47		04:36	**10:26**
5	Bishop	Charles	43	40 - 44	M	Transnet	01:49		02:40		01:35		04:24	**10:28**
6	Smit	Juan	34	30 - 34	M	City of Cape Town	01:56		02:53		02:04		04:23	**11:16**
7	Wozniak	Rafel	28	18 - 29	M	City of Cape Town	02:19		03:06		02:02		03:57	**11:23**
8	Stoffels	Deon	36	35 - 39	M	Garden Route	02:05		02:54		02:08		04:35	**11:43**
9	Malejwe	Gift	29	18 - 29	M	West Rand	01:57		02:53		02:37		04:32	**11:59**
10	Opperman	Ruan	30	30 - 34	M	Stellenbosch	01:56		03:51		01:57		04:27	**12:11**
11	Van Lill	Arnold	30	30 - 34	M	City of Cape Town	02:12		03:01		02:11		04:51	**12:15**
12	Molefe	Thato	26	18 - 29	M	West Rand	02:02	00:05	03:45		02:32		03:59	**12:23**
13	Grobbelaar	Lutan	42	40 - 44	M	City of Cape Town	02:01		03:17		02:00		05:07	**12:25**
14	Stander	Jaco	37	35 - 39	M	Drakenstein	01:59		03:18		02:23		04:59	**12:39**
15	Grantham	Duane	30	30 - 34	M	Msunduzi	02:20		03:27		02:01		05:00	**12:48**
16	Leppan	David	41	40 - 44	M	Private	01:53		04:15		02:08		04:36	**12:52**
17	Woolstencroft	Shayne	51	50 - 54	M	City of Cape Town	02:07		03:31		02:30		04:44	**12:52**
18	Josephs	Daniel	36	35 - 39	M	City of Cape Town	02:00		03:11		02:12		05:43	**13:06**
19	Bosman	Rikus	26	18 - 29	M	City of Cape Town	02:53		03:08		01:53		05:14	**13:08**
20	Kroon	Alno	27	18 - 29	M	City of Cape Town	01:56	00:05	02:27		01:45		07:10	**13:23**
21	Armstrong	Mark	46	45 - 49	M	City of Cape Town	02:06	00:05	03:22		02:21		05:53	**13:47**
22	Barnes	Robin	35	35 - 39	M	City of Cape Town	02:07		03:22		02:20		06:29	**14:18**
23	Benson	Ashly	28	18 - 29	M	West Rand	02:14		03:34		02:21		06:21	**14:30**
24	Khan	Shafiq	29	18 - 29	M	City of Cape Town	02:27	00:05	02:47		03:09		06:11	**14:39**
25	Brand	Rohan	29	18 - 29	M	Stellenbosch	02:23		04:11		02:32		05:47	**14:52**
26	Van Deventer	Russel	53	45 - 49	M	Manguang	02:17		03:52		03:02		05:51	**15:02**
27	Berry	Nicholas	24	18 - 29	M	Johannesburg	03:08		03:22		03:01		05:54	**15:25**
28	Fortuin	Doniel	35	35 - 40	M	Drakenstein	01:57	00:05	03:31		02:43		07:15	**15:31**
29	Van Niekerk	David	46	45 - 49	M	Private	02:21		03:50		02:29		07:07	**15:47**
30	Qoba	Babongile	26	18 - 29	M	Drakenstein	02:29		03:50		03:23		06:37	**16:20**
31	Williams	Eugene	31	30 - 34	M	Drakenstein	02:10		04:36		02:35		07:15	**16:36**
32	Le Roux	Etienne	39	35 - 39	M	Volunteer Wildfire Service	02:53		04:14		03:11		06:19	**16:37**
33	Naidoo	Machello	29	18 - 29	M	Msunduzi	02:32		04:30		03:19		06:23	**16:43**
34	Jacobs	Jason	35	35 - 39	M	ACSA - George	03:47		01:45		03:39		07:37	**16:48**
35	Khanyile	Lethukuthula	33	30 - 34	M	Msunduzi	02:18		04:59		02:47		06:45	**16:49**
36	Marias	Kleinjan	22	18 - 29	M	Stellenbosch	03:11		04:20		02:46		06:33	**16:50**
37	Nomdo	Lenestyo	23	18 - 29	M	Hessequa	02:12		04:33		03:59		06:07	**16:51**
38	Heyns	Nathan	42	40 - 44	M	Volunteer Wildfire Service	02:37		04:59		03:50		06:07	**17:33**
39	Pulumo	Ntsie	45	45 - 49	M	Manguang	02:22		04:14		03:28		07:59	**18:02**
40	Ngece	Wandisile	27	18 - 29	M	Stellenbosch	03:03		04:52		03:28		07:06	**18:28**

Overall individuals female

NR	SURNAME	NAME	AGE	AGE	GENDER	MUNICIPALITY	STAGE 1	P	STAGE 2	P	STAGE 3	P	STAGE 4	TOTAL
1	Abrahams	Baigum	25	W-18 - 29	F	City of Cape Town	02:13		03:47		02:43		05:13	**13:56**
2	Shezi	Zandile	34	W-30 - 34	F	Msunduzi	04:10		05:00	04:00	05:00	04:00	07:04	**29:14**
3	Zitshu	Lindiswa	34	W-30 - 34	F	Bitou Municipality	03:37		05:00	04:00	05:00	04:00	09:15	**30:52**
4	Ngwane	Thobile	40	W-40 - 45	F	Msunduzi	04:52		05:00	04:00	05:00	04:00	08:04	**30:56**
5	Marais	Dazell	26	W-18 - 29	F	Bitou Municipality	05:00	04:00	05:00	04:00	05:00	04:00	07:39	**34:39**
6	Andrews	Mandoline	42	W-40 - 45	F	Drakenstein	05:00	04:00	05:00	04:00	05:00	04:00	11:41	**38:41**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Self-defence strategies for first responders Part 2: Some basic advice

By Morné Mommsen, Midvaal Fire and Rescue and Warrior Combative

South Africa is known for its high rate of violent crimes. Knives, guns and batons are the most common weapons used during an attack

This is the second article in the series of articles discussing self-defence for first responders written by Morné Mommsen. Emergency service members need to get regular training in some kind of self-defence system. Mommsen represents Warrior Combative who specialises in the Krav Maga System, a National Fire Protection Association (NFPA) Self Defence Course designed for the purpose of defending yourself against the reality on the street. Please heed this advice and act on it by training regularly. Also, please share it with those in your department/company to ensure their safety.

Violent crimes

South Africa is known for its high rate of violent crimes. Knives, guns and batons are the most common weapons used during an attack. The most popular of these weapons are knives. The reason why criminals prefer knives are because they are easily concealed, readily available and deadly, thus making the knife the most commonly used weapon in a street attack.

A knife also lends the attacker the courage and ruthlessness that he ordinarily would not possess, for it gives the attacker the ability to cut you down with one thrust or to do grievous bodily harm to you while making a serious of non-committed slashing, stabbing and flicking like movements while charging you down. Within seconds you may lose your fingers, have severed tendons in your arms and be finished with a stab to your eye, throat or torso. The reality is, even a five-year old child with a knife is dangerous.

During a confrontational situation you could be faced with two types of knife attacks.

The first is committed by someone who you are arguing with and a knife happens to be handy. This person is not likely to stab or cut you but will use the knife in a threatening and intimidating manner. At this point it will be a good idea to point out to your attacker the consequences of his actions should he stab or cut you. A person who is not used to fighting with a knife may listen to reason.

The second type of knife attack involves someone who usually

carries a knife and is confident in his ability to use the knife. Should you find yourself in this situation, back down and run away if you can. However, should you find yourself in a situation where you are forced to fight, carry out the following actions:

1. Calm down, assess the situation
2. Look for a blocking object, such as a briefcase, handbag or a chair. Turn the chair diagonally, with one leg pointing to his chest and one to his groin area
3. Wrap a jacket or coat around your arm as protection from the knife
4. Stay out of range if the attacker is slashing
5. Throw sand, dirt or coins at his face. Kick him in the groin and run
6. Use a stick, broom, umbrella, bottle to attack the knife hand at the wrist
7. Never try kicking the knife out of his hand
8. Always report the incident to the police

When confronted by a gun

It has become an ever increasing reality within South Africa and around the world that people are using guns to commit acts of violence against each other. A reason for this is that guns are becoming more readily available even with stringent laws on the issue and use of fire arms. Guns are intimidating and it lends its user the confidence he would not usually have under normal circumstances. Imagine if you will, a six or seven year old picking up a gun, cocking it and pointing it at you. It will literally send shivers down your spine. With a child you could still negotiate or even bribe the child to give you the gun. With a person that has an intention of using it to hurt you or kill you, there is very little chance of negotiating.

It is very difficult to offer any form of defence against a person holding a gun on you. If a criminal carries a gun and points it at you, you have to assume that he will use it. In most cases, the criminal will have no idea how to use it, which makes him more of a threat, as a miss fire can happens at any time.

In the event that you are being threatened by an assailant holding a gun and depending on the situation, running away should be your first plan of action, if possible. A distance of 20 metres from the assailant will suffice, as a moving target is harder hit. If he starts to shoot as you're making your escape, try to run in a zigzag or another unpredictable pattern as this will increase your chance of escape.

If there's no way out, then you need to assess the situation. Most robberies end without violence, so it may make sense to cooperate with the gunman. However, if you're confronted by a criminal who is determined to hurt or kill you, then you need to fight for your life. A good idea would be for you to snatch onto the weapon with both hands move your body out of the way of danger and point the weapon towards the assailant. He will think twice about pulling the trigger. Should you wrestle the weapon of him take the weapon to the police and report the incident.

Within Krav Maga there are drills and techniques for disarming a person holding a gun on you. However, these techniques need to be practised over and over in a safe and controlled environment with special training guns designed for that exact purpose. YouTube cannot teach you the proper techniques!

Bullying

Little Johnny X thoroughly enjoys school. He is a well-mannered child with a polite disposition and he is well-liked by his teachers and fellow classmates. He does tend to be on the shy side but this all adds to his innocence and charm, he looks at the world with excitement and wonder.

As the year progresses his parents notice subtle changes in his behaviour. Suddenly he becomes very withdrawn, he cries frequently for no reason; he does not want to go to school, constantly complains about tummy aches and headaches for no apparent reason and starts referring to himself and class mates as losers and jerks. They also notice bruising on his arms and legs but assume it's from his extra mural activities. Both his parents and his teacher notice his lack of interest in school as his school work continuously gets sent home incomplete.

His parents and teacher arrange for a meeting so that they can discuss his recent behaviour and find a positive outcome. During the session the teacher asks if all is well at home. Are the parents getting a divorce? Is there anything that the school should be aware of? The parents reassure the teacher that all is well.

They eventually sit Johnny down and have a heart-to-heart discussion and reassure him that they want to help and ask if anything is bothering him. He mentions that since he has started going to extra classes the other kids have started to tease him. He tries to run away from them but he is not fast enough and they push him to the ground. He did not want to say anything because he does not want anyone to get into trouble.

Johnny is a victim of being bullied.

Unfortunately, teasing is part of growing up; almost all of us have experienced it. However, teasing becomes bullying when it is repetitive or when there is conscious intent to hurt the other person whether it is verbally, physically or psychologically. According to a study at the University of Johannesburg, bullying is rife in South African schools. Bullying has no social, economic or racial composition and its one of the biggest non-academic threats to face South African schools.

Should you suspect that your child is being bullied make an appointment with the school and report it? It is wise not to get into a heated argument with the other child's parents. Have a third party mediating like a teacher, counsellor or minister. It will also be wise to enrol your child in a good martial arts programme as this will allow the child to build up their confidence and self-esteem. Bullies pick on those who they perceive as being weaker and who will not fight back. There is a place and time to walk away but there also comes a time to stand and fight back! ▶

How to avoid getting into a fight

It has finally arrived; you have been waiting and planning for this night now for weeks. It's time to let your hair down, have some fun and catch up with some old friends. You have all decided to meet for a light meal and then go out to a cocktail bar for some drinks and maybe some dancing. The night is progressing as planned. The meal went well and now it's time to party, time to have some fun. It's time to unwind and enjoy.

You frequent your favourite cocktail bar/ night club. The cocktail bar is rather full, people are dancing and enjoying themselves the energy is electric. You make your way to the bar, you order your drinks while you are patiently waiting for your drinks and innocently observing the crowd you suddenly hear the following.... "You, hey you! What are you looking at?" You pay no mind as the person can't possibly be speaking to you. Then you hear it again, only this time it's louder. "Hey you, I'm talking to you. What you looking at?" You motion to yourself the person nods their head and shout "YES YOU!"

Now this is where the situation becomes tricky and can escalate into a full blown fist fight with both of you being escorted out of the bar by the security. This is where you need to have your wits about you and defuse the situation quickly.

This is what NOT to do or say:
You: "Nothing"
Stranger: "Are you looking at me? Do you have a problem?"
You: "No!"
Stranger: "Are you calling me a liar?"
You: "No"
Stranger: "So you are looking at me? Or are you looking at my man/ woman?"
You: "Listen, I don't want trouble" and you turn you back on the stranger.

The next thing you feel is a hand on your shoulder and as you turn around the last thing you see are stars as your face makes contact with the stranger's fist. The last thing you recall hearing is, "Well trouble has just found you".

Here is what you should do:
When asked "What are you looking at!" Here is opportunity to defuse the situation and be creative. You can answer in one of the following ways. Smile and say "Yes, I am looking at you. You remind me of someone I worked with/ went to school with etc" or "Yes, I am looking at you, I love your dress/shoes/shirt. Where did you buy it?" Be creative and in charge when answering without being cocky. Then offer to buy that person a drink and remove yourself from the situation. Best thing to do is to go to another cocktail bar but should you wish to stay there alert the bars security to what has happened and stay close to your friends. Remember there is strength in numbers. Do not make a scene.

Road rage

Your day at the office has come to an end, now all you want to do is get home, relax and recover from your hectic day at the office. You climb in your car and make your way home. As you are busy driving home you put some music on to ease the mood, you obey the rules of the road and you realise that you are in the wrong lane, so you indicate and change lanes. Suddenly from behind you hear a loud 'honking' noise. You look into your rear view mirror and see the driver in the vehicle behind cursing you while he leans on his hooter as you changed lanes. You decide to ignore the driver and put your music louder. The traffic light turns red you slow down and bring your vehicle to a halt. As the vehicle stops you feel it being bummed from behind, as you look up there is the driver, right by our window cursing and demanding you get out of your vehicle in a threatening manner and starts grabbing at your door handle.... You have just become a victim of road rage.

Road rage mainly occurs when drivers are believed not to have any consideration for other road users. That's because anyone can take offense at what they think another driver is doing. Confrontation normally occurs when one driver does something to annoy another. These confrontations can escalate into physical attacks and even death.

Tips to help you avoid inciting road rage in others:

- Drive at a safe, steady speed
- Give clear indication of your intentions in plenty of time
- Stay within the general flow of traffic
- Stay in your correct lane
- Avoid being deliberately obstructive to others
- Avoid 'cutting in'

Dealing with road rage:

- Smile and mouth the words "I'm sorry"
- Avoid eye contact if the other driver pulls up alongside you
- Do not make obscene gestures
- Try to avoid stopping or being forced to stop at traffic lights, especially at night
- Attacks can only occur if the vehicles are stopped and the drivers confront each other
- If you do get forced to stop, make sure your doors are locked and windows rolled up
- Never get out your vehicle, unless you are involved in an accident
- If you find the attacker is trying to force his way into your car, hit the horn and hold down till they lose interest
- Report the incident to the police

Travelling

Whether travelling locally or abroad on business or pleasure the appeal of new sights and surroundings is what makes the adventure exciting. Yet, for these specific reasons it could hold potential dangers for the unwary... More and more we read of women travellers being abducted, found dead or sexually assaulted, both locally and in foreign countries. The reason for this is that women, especially western women, are believed to be promiscuous; this is fuelled by magazines, movies and social media. Added to this, many Third World countries and cultures do not see women as equals but as second class citizens and that they are easy prey to the advances of urban predators, especially when travelling to countries where they have strict dress codes for women to adhere to like the Arab countries, even some African countries like Malawi.

Guns are intimidating and it lends its user the confidence he would not usually have under normal circumstances

This is sad as most people travel to enrich their lives with sights and cultures from around the world. However, a few precautions and common sense can eliminate or greatly minimise the risks associated with travelling.

Getting ready for your trip locally or internationally:

- Plan your route carefully in advance
- Use up-to-date maps
- Check in advance for any road works if you are travelling by car or bus
- Let someone close to know when you will be leaving and arriving at your destination
- Do research on the hotel and area you will be staying in ie nearest police station, hospital etc
- Should you be travelling to foreign country, research their laws, customs and traditions, crime rate etc, familiarise yourself with it
- Keep your travel documents safe, ID book, drivers licence, credit cards, medical aid card travel documents and passport (passport if going international). Should these documents get lost it becomes a headache to replace. Have additional certified copies in a safe place that can be used to assist you at the embassy or police station
- Once you there inform someone back in your home town that you have arrived and that you are safe. Arrange to call them every so often
- Should you be travelling to a foreign country learn some of their words. Example, what is their word for 'HELP', 'POLICE', 'FIRE' etc.

Once you have reached your destination, look confident and dress like the locals so you don't attract any unwanted attention to yourself such as wearing flashy clothes, jewellery or flaunting large amounts of money. By learning to blend in, you will be less of a target. However, if you look rich or as a tourist you become a far more tempting target. Most important rule to remember is, "When in Rome do as the Romans do".

Self-defence tips while jogging

Often in the early morning or late at night as I travel to and from my various classes, I see men and women of all ages jogging around the neighbourhood. Some joggers are serious; they are training towards a goal and others are just unwinding and letting off some steam. While going for a jog around the neighbourhood is an excellent way to stay in shape and calm the mind, it does present certain dangers, especially when jogging alone.

Besides being harassed or chased by the local neighbourhood dogs, one of the creepiest and scariest of all these dangers is that of being followed. This is when a sixth sense can cause you to become super alert to the foot fall, snapping twigs or other sounds that seem to keep occurring behind you, especially when it seems that nobody else is about.

You would be asking yourself the following question. Who would want to follow me and why? For starters, an angry ex or their family, a stalker, someone you managed to anger at work or on the way home and that person now wants to confront you or a criminal who has the intention of robbing or harming you.

Give and take but don't overdraw

By Wayne Bailey

Wayne Bailey

Back when I was younger and getting ready to get married, a wise man said three things that will make or break your marriage. Money, sex and religion. He said having too much need or not enough could be a deal breaker and end in divorce.

How does that apply in today's work environment? We can pull and set the reins on a horse and go nowhere or we can set them too lose and the horse gallops away.

In the work environment, the reins that are too tight, is the micro manager. Is that you? He's the boss that is always looking over the shoulder of his subordinates. This is okay if they are new and not sure of the ropes. In the 'One Minute Manager' book, the author said the boss tried to catch the employee doing something good and reward them instead of the other way around.

If the reins are too lose in the work environment, you're never seen by your staff, maybe you retired and forgot to tell someone you were leaving. This could be good and bad. The good part is if your subordinates have a clear direction of the job and there's no need to discuss the dailies. The bad part is your subordinates may think you don't care what they are doing. Get out and visit the troops often and see what's going on. It's easier for them to talk over the dinner table verses going to your office.

In the end, always be thinking what you can give the organisation. There will be times there is an "Oh heck" moment and a withdraw is made. Giving always insures you're never overdrawn and come up short.

- Safety when jogging:
  - Firstly and most importantly always go for a run with a partner. There is safety in numbers
  - Run in a familiar location where you will be able to find help quickly
  - Wear reflective or brightly coloured running gear
  - Make sure your family or friends know where you are running and when you expect to return
  - Avoid taking short cuts
  - Stick to well-lit areas
  - Trust your instincts, should you feel you are being followed cross the road several times and see who follows you
  - Don't be forced to change your route
  - Bring a cell phone in case you need to call for help

If somebody approaches you in a way that makes you feel unsafe, yell any of the following in a powerful voic,e "TELL ME WHAT YOU WANT." "GO AWAY" FIRE" "LEAVE ME ALONE" Make a scene criminals do not like attention being focussed on them.

Run away from a dangerous situation, if you are able to. Do everything in your power to escape from the assailant.

If all else fails, fight and run away and report the incident to the Police. You could use your water bottle, house keys and pepper spray and even your cell phone as weapon of self-defence.

Warrior Combative focusses on Krav Maga styles. If interested in any form of assistance please contact us via email:

Gauteng:
dnaemergency@gmail.com
Meyerton:
davidkies.dk74@gmail.com
Cape Town:
pvogts1@gmail.com

Fire hydrants: a 220-year old invention

A fire hydrant is a pipe with a valve that controls the water flow from a water main in order to quench a fire; a connection point by which fire fighters can tap into a water supply and is a component of active fire protection. Fire hydrants may be underground and above-ground. The underground fire hydrants were in use in Asia and Europe since the 18th Century while pillar-type hydrants are a 19th-Century invention.

The change from random to strategic water supply systems

Historically, fire fighting was not as systematic as today's effort. At best, ancient cities deployed cisterns to strategic areas to provide quick access to water in case of fire. Before piped mains supplies, water for fire fighting had to be kept in buckets and cauldrons ready for use by 'bucket-brigades' or hand pumping systems to get the water to extinguish fires and later brought with a horse-drawn fire-pump. Wherever it was hard to supply large quantities of water, bucket brigades needed to keep whole neighbourhoods safe from fire.

However, buckets weren't enough to confront the infernos of larger cities. From the 16th Century, as wooden mains water systems were installed, fire fighters would dig down the pipes and drill a hole for water to fill a 'wet well' for the buckets or pumps. The fire fighters would pass buckets of water from the hole along a line of fire fighters to help get water to the fire. The term 'fire plugs' began to be used since the newly dug holes had to be plugged up after the fire call. A marker would be left to indicate where a 'plug' had already been drilled to enable fire fighters to find ready-drilled holes.

While fire plugs were useful during the 16th and 17th centuries, alone they were not enough to prevent disaster. The fire of London in 1666 showed that random placement of fire plugs were not enough to put out massive fires. After this, London and other European cities created new water mains with pre-drilled fire plugs placed at street level. This way, mains were more accessible to wider parts of the city.

Frederick Graff Sr, who patented a post-style fire hydrant in 1801

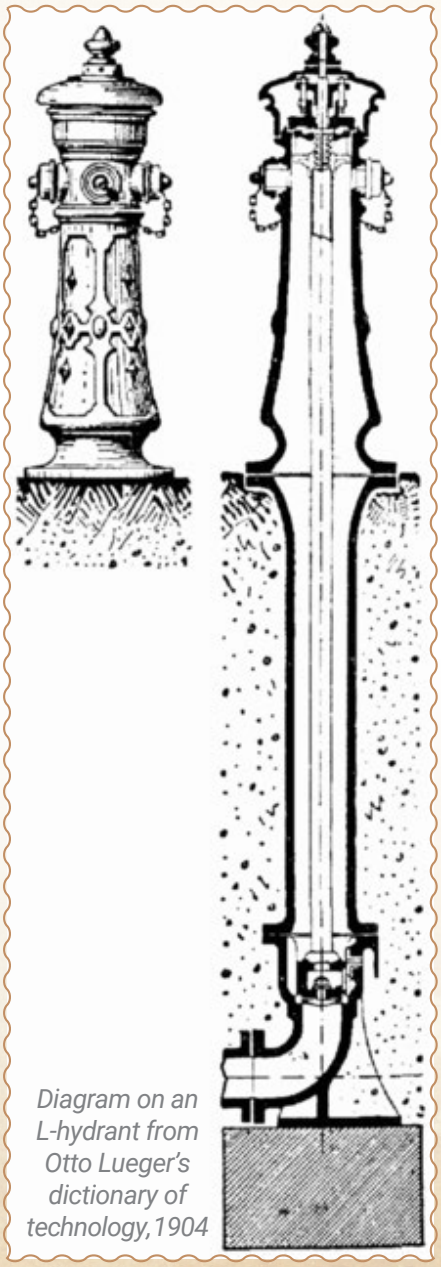
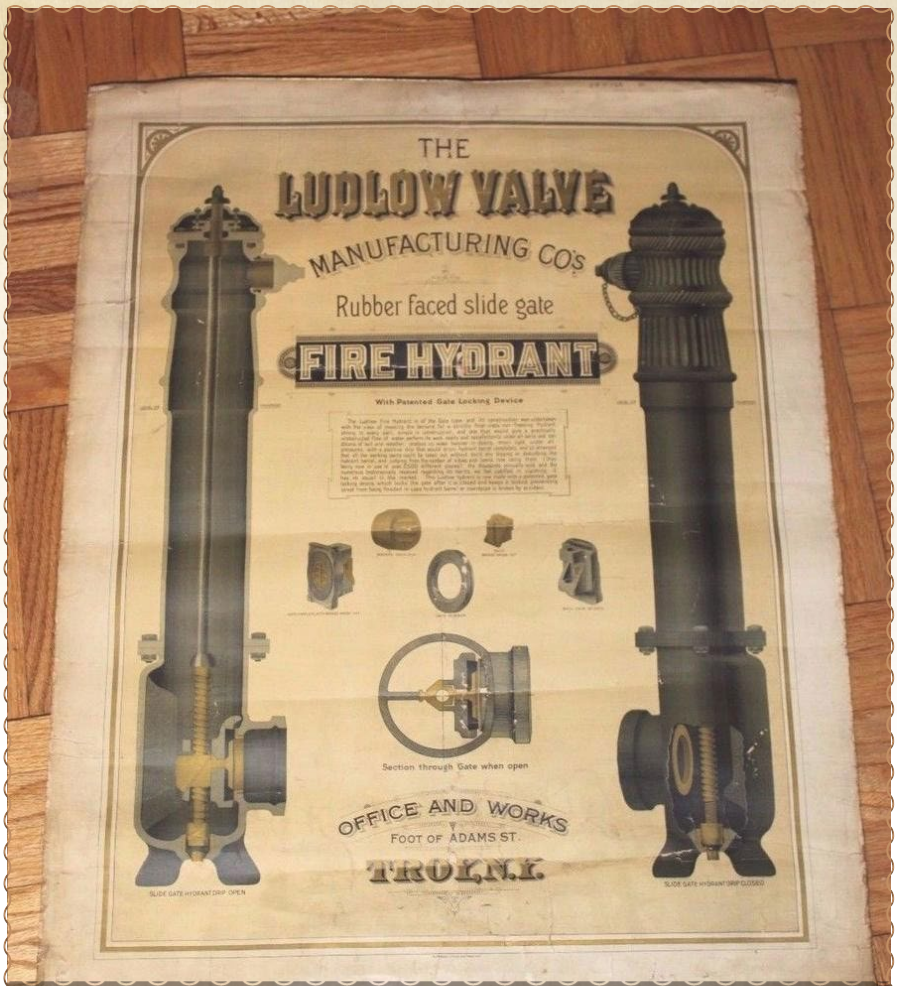


Diagram on an L-hydrant from Otto Lueger's dictionary of technology, 1904

Hydrant sign in Cork, Ireland, dated 1858. The letters 'FC' indicate the old name for a hydrant, firecock

Photo: www.usstranquillity.blogspot.com



Ludlow fire hydrant advertising wall hanging. This is a later 1800's or early 1900's piece that is printed on paper and applied to a linen backing.

Photo: Terry Pinnegar

Victorian fire hydrant

Later, wooden systems had pre-drilled holes and plugs. When cast-iron pipes replaced the wood, permanent underground access points were included for the fire fighters. Some countries provide access covers to these points, while others attach fixed above-ground hydrants.

First hydrant

Tradition has it that in 1801, Frederick Graff Sr, chief engineer of the Philadelphia Water Works, patented a post-style fire hydrant resembling what we use today. Graff, a hydraulic engineer, was born on 27 August 1775 in Philadelphia, US and died on 13 April 1847 at the age of 71. A former carpenter, Graff's team's original design was a simple wooden barrel filled by the city's water supply with a valve fitted to it. The build-up of water in the barrel provided the required pressure to fill a simple fire hose to deliver water to the base of the fire. Although now we would regard this system as archaic, the team had created a system that highly exceeded the manned bucket chain system implemented at the time. Ironically, the original patents registered by the Philadelphia Water Works appeared to have been lost in a fire!

In 1803, Frederick Graff Sr introduced an improved version of the fire hydrant with the valve in the lower portion. These were inserted into wooden mains with a tapering joint. In 1811, Philadelphia claimed to have 230 wooden hydrant pumps and 185 cast iron fire hydrants. When hoses began to replace the city's bucket brigades after 1803, the hydrants were outfitted with suitable nozzles.

In the winter months, these essential weapons in the battle against fire were under constant assault by ice. On the coldest nights, watchmen inspected the hydrants hourly, releasing small amounts of water to prevent freezing. Water won't freeze as long as it stays inside mains buried below the frost line. An obvious but mechanically difficult solution was to keep water out of the hydrants until it was needed. The predecessors of today's 'dry barrel' compression hydrants appeared as early as 1812, according to Thomas Ingalsbe, a hydrant salesman and the owner of a website for hydrant aficionados. In dry-barrel hydrants, water enters through a valve located below the frost line and then drains from the barrel when the hydrant is not in use.

Ingalsbe, who became interested in fire hydrant history while attempting to scrounge parts for clients with very old hydrants, says that it wasn't until the 1850s that dry-barrel hydrants became truly practical. The basic configuration of most American hydrants has changed

A modern day fire hydrant in Berlin, Germany

History of City of Calgary fire hydrants

little since. A stem nut, usually on the top of the hydrant, opens a valve to admit water into the hydrant. Closing the main valve automatically opens a drain valve, allowing the hydrant to empty. In areas where freezing is not an issue, many municipalities use the 'wet barrel', which is less expensive and simpler in construction and can be activated more quickly because it is filled with pressurized water at all times. The practice of using a separate system of high-pressure water mains just for fire fighting began in Rochester, New York, in 1874 and has spread to most major cities.

Other sources say that first fire hydrant was invented by George Smith, a fire fighter, in about 1817, when he realised that Manhattan, where he lived, was running out of water for citizens to use, not just for fighting fires but for every day uses as well. He reasoned that with the installation of water mains, Manhattan would have more water for drinking as water could be pumped to the city from outside its boundaries and there would also be enough water readily available for fighting fires.

Storz coupling

Carl Storz patented his quick coupling in Switzerland in 1890 and shortly thereafter the Storz coupling became the norm on hydrants in many parts of Europe. But it took nearly a hundred years before Storz started becoming common on hydrant steamer ports in the USA.

The fire hydrant adapts to the modern world

While hydrants have stayed mostly the same for the last hundred years, new improvements have developed to increase security and efficiency. New fire hydrant designs delivered more water when needed. They became crucial instruments in putting out fires fast and efficiently. Security has always been a concern for fire hydrants. With the popularity of cars, fire hydrants faced a unique challenge. Collisions could lead to geysers of wasted water and supply problems in local systems. In response, dry barrel compression hydrants added an extra valve protection under the hydrant, while the base of hydrant was manufactured with breakable components to protect the water main.

As threats of metal theft, vandalism and even terrorism increase, manufacturers have introduced new protection systems that make unauthorised use of hydrants more difficult.

2020

January

19 - 21 January 2020
Intersec 2020
For major brand manufacturers, newcomers, local or international, Intersec, with its unique product diversity, is one of the most important industry meeting points and a source of technologies for wholesale and retail trade as well as for corporate buyers and the government
Venue: Dubai, UAE
For more information visit: https://intersec.ae.messefrankfurt.com/dubai/en.html

February

10 February 2020
JOIFF Foam Technical Summit
There is a clear need within the industry for an impartial, independent and authoritative Technical Summit to discuss the current issues relating to fire fighting foam. JOIFF, as a truly independent organisation that has no commercial interest in foam but that has a major interest in informing and educating its members, are ideally placed to host a full spectrum, truly independent Technical Foam Summit
Venue: London, UK
For more information visit: http://joiff.com/events/

March

19 - 20 March 2020
Institution of Fire Engineers (SA) General Meeting
The Institution of Fire Engineers (SA) will be holding its general meeting together with a seminar and workshops. Among the highlights, the seminar and workshops will discuss challenges faced by fire services and Bruce Varner, International IGA President and ex fire chief from the US, will present a paper addressing the latest ideas
Venue: Tyger Valley, Cape Town
For more information visit: www.ife.org.za

21 - 25 March 2020
Wildland-Urban Interface (WUI) Conference
The International Association of Fire Chiefs (IAFC) Wildland-Urban Interface (WUI) conference offers hands-on training and interactive sessions designed to address the challenges of wildland fire. If you're one of the many people responsible for protecting local forests or educating landowners and your community about the importance of land management, then this is the conference for you
Venue: Reno, Nevada, US
For more information visit: www.iafc.org

April

7 - 9 April 2020
North Africa Health Exhibition and Congress
The 2020 edition will highlight five key industry areas, imaging and medical devices, laboratory, SME and innovation, medical tourism and national pavilion
Venue: International Exhibition Centre, Cairo, Egypt
For more information visit: www.northafricahealthexpo.com

May

4 May 2020
International Fire Fighters Day 2020
International Fire Fighters' Day is observed each year on 4 May. On this date you are invited to remember the past fire fighters who have died while serving our community or dedicated their lives to protecting the safety of us all. At the same time, we can show our support and appreciation to fire fighter's worldwide who continue to protect us so well throughout the year

12 - 14 May 2020
Africa Health 2020
Africa Health is the largest platform in the African healthcare market for international and local companies to meet, network and do business. Africa Health provides an opportunity for you to see the latest healthcare technologies, products, equipment and services, as well as the chance to network with more than 10 000 of your healthcare industry peers
Venue: Gallagher Convention Centre, Johannesburg
For more information visit: www.africahealthexhibition.com

June

2 - 4 June 2020
Securex and A-OSH Expo
Securex will be the largest and most comprehensive show of its kind in Africa and the only show exclusively dedicated to the very latest developments in security, safety, fire and protection
Venue: Gallagher Convention Centre, Johannesburg, South Africa
For more information visit: www.securex.co.za

4 - 7 June 2020
International Hazardous Materials Response Teams (Hazmat) Conference
The Hazmat Conference is a four-day event offering hands-on training across a range of essential topics, including: biothreat response and sample collection, incident management best practices, chemical and physical properties of hazardous materials; and recognising and responding to commercial explosive incidents
Venue: Maryland, US
For more information visit: www.iafc.org/events

15 - 20 June 2020
Interschutz 2020
Originally conceived as a trade show for the fire services, Interschutz has grown to become the world's leading exhibition for fire prevention, disaster relief, rescue and safety and security
Venue: Hanover, Germany
For more information visit: www.interschutz.de/home

29 June - 2 July 2020
55th Annual GSSA Congress
The 55th Annual Grassland Society of Southern Africa Congress will be held in the Eastern Cape. The vision of the society, advancing rangeland ecology and pasture management in Africa embodies the mission of the society and has become the central theme of the annual congress
Venue: Eastern Cape
For more information email: info@grassland.org.za

The Rescue

Whatever was the cause of the accident?
T'was never meant to happen, and yet it did.
Similar events, all drivers must try to prevent
'Safety First' must always take the lead.

Somebody has called for help and the bells begin to ring.
All of a sudden, fire fighters start doing their thing
They call their buddies as they put on their gear, mounting the rig
Within minutes - on the road and driving, better than The Stig

The officer decides on the response route, based on time of the day
Which lanes must they take, the shorter byway or the quicker highway?
The long sirens, the short wail and the blaring horn
The kind motorist, the scared motorist and the stubborn one

The scene size-up
And the traffic build-up
The motor-vehicles have crashed
We have one critical patient who is trapped

Bring the oxygen and let the poor man breathe
Whatever you do, it must be in kindness indeed
Let the crowds stand a bit back please
We have to do our job with ease

The vehicle is balanced, rescue motor is running and the spreader is in
The shears cut through the metal, the glass and the tin
The sun is too hot and the tools are too heavy
Hurry up! but remember be steady.

With unbearable pain, closes eyes and grits his teeth.
Ask him what his name is and he tells you, it's Keith
Are you feeling the sadness, tears trickling down his face?
Try to calm him down, as you pick up your pace

Put up the drip, let the man feel better
If there is a need also put the catheter
Follow all your actions right down to the letter
Please don't forget to check his blood pressure

He is out and now you must transport him
Make sure your lights are not always on dim
I mean they must also be on the bright beam
Well done all of you for working as a team

Clear up the scene and don't leave anything behind
Hold a debriefing session to clear up your mind
Remember that you are the only one of your kind
Another one we will never be able to find.

By Lindsay Z Mnguni