FIRE
MIDDLE EAST

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HEALTH & SAFETY

HAZARDS & RISKS

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STORAGE TANK FIRES

FIRE STOPPING

Whilst independent testing shows an increasing number of fluorinated and FF agents achieving good performance levels with top side testing to UL 162, FM 5130, EN 1568 Parts 3 & 4, and ICAO performance standards, question marks remain over performance when used with sprinklers, or to test criteria to simulate a tank fire created by Lastfire, an international forum of oil companies developing best practice guidance in storage tank fire hazard management.

FAR FROM NEW

In firefighting particularly, CAF is not a new technology and evidence exists of CAF being used as early as the 1930's in parts of Europe on mobile devices. After the second world war when foaming of a runway prior to a landing an aircraft with landing gear malfunction was still operational practice there are reports from Sweden that their Foaming Trucks used a type of CAF. With the change to Film Forming foams in the 60's from protein foam for use on Class B fires, the aviation sector and military also moved away from the use of CAF in their operations.

Moving forward to the early 80's we see the re-emergence of CAF when Mark Cummins developed a water expansion system known as the "Texas Snow Job" and promoted the use of CAF with Class A detergents for use in municipal and forest (wild) fire applications. Through the 80's and into the 90's further development with pump manufacturers such as W.S. Darley & Sons led to the development of rotary air compressors, centrifugal pumps and direct-injection foam proportioning systems being used on mobile firefighting appliances. Municipal brigades in Germany and Australia, as well as parts of the USA and Canada have also used CAF with Class A foams and/or wetting agents for use on structural fires.

MODERN AVIATION FIREFIGHTING

The Aviation sector started to look at CAF again in the 90's and early 00's as it was believed that CAF offered "better performance" over normally aspirated foam. Copenhagen Airport, Kastrup has used CAF equipped ARFF vehicles since 2007 and Kim T. Olsen, Assistant Fire Chief, advised that because of the limited amount of water and foam agent on the vehicle for ARFF applications better performance means that they can effectively control a larger PCA (Practical Critical Area) with the same amount of agent, or achieve control in a faster time for the same size PCA. Additionally, he added that at Copenhagen, Kastrup we were very concerned with the negative environmental impact from using fluorinated foam agents and whilst we were already switching to an ICAO Level B Fluorine Free foam we did believe that Fluorine Free foam delivered as a CAF would achieve improved performance over normally aspirated foam.

Kim Olsen's beliefs were backed up by testing carried out by the UK's Civil Aviation Authority in cooperation with amongst others Copenhagen Airport and Changi Airport Group, Singapore at CNPP test facilities in France in 2012. In the Test Report PN 12 8913 dated 7th June 2012 they reported on comparative testing on an 86m2 kerosene fuel fire with normally aspirated and CAF generated ICAO level B AFFF, and Fluorine Free foam. In these tests the foam solution flow rates for normally aspirated and CAF were the same, and each of the tests with CAF showed faster control and extinguishment, as well as improved burn back resistance with the CAF performances with the AFFF and Fluorine Free foam very similar.

INTERNATIONAL STANDARDS

A quick review of EN 16327 Fire-fighting – Positive pressure proportioning systems (PPPS) and compressed-air foam systems (CAFS) indicates that this standard provides no information on fire performance with CAFS. In fact, the only mention in section 3.5 dry foam is "Finished foam from CAFS is tested as described in Annex D, which is based on EN 1568-3 principles". Annex D covers testing for Expansion Ratio, and quarter drain time which any fire performance based on fire testing of the agent as a normally aspirated agent as in EN 1568-3... No recognition of the improved fire performance of a CAF generated finished foam.

Whilst European standards are still looking at CAFS as part of a mobile firefighting unit, over in North America CAFS has moved forward as a "Engineered System". CAFS now has its own chapter (chapter 7) within NFPA 11.

Within the chapter rates of application are covered under 7.15 Discharge Density : "The design discharge density shall be in accordance with the applicable occupancy standards and in accordance with the manufacturers listing but in no case less than 1.63 lpm/m2 for hydrocarbon fuel applications and 2.3 lpm/m2 for alcohol and ketone applications". Compared to sprinkler listings with normally aspirated foams these are 70 – 75% lower rates of application.

Under 7.10.1 it also states, "Compressed air foam systems shall be designed and installed in accordance with their listing for the specific hazard and protection objectives specified in the listing."

CAF discharge onto training prop at Copenhagen airport training facility

Pump / CAF compartment on Rosenbauer Panther ARFF vehicle at CPH

These tables are from the approval testing to FM 5130 carried out by two manufacturers of "Engineered CAF Systems", Messrs. Fireflex Systems Inc. from Quebec in Canada, and Messrs. ACAF Systems Inc. from Rhode Island, USA. Both companies have developed engineered CAF systems which also include the discharge nozzles and the engineering limitations in terms of pipe sizing and lengths, spacing and height limitations for discharge devices.

FUEL	CONCENTRATE	DISCHARGE DEVICE DESCRIPTION	SYSTEM TYPE	NOZZLE HEIGHT		MAXIMUM NOZZLES PER SYSTEM	SPACING OR MAXIMUM AREA OF COVERAGE PER NOZZLE FT² (M²)	SYSTEM CAPACITY		MINIMUM DESIGN APPLICATION RATE	MAXIMUM SPINKLER DENSITY
				MIN FT (M)	MAX FT (M)	(IF APPLICABLE PER ABOVE SYSTEM DESCRIPTION)		GALLONS (LITERS)	MINUTES	GAL/MIN/FT² (MM/MIN)	GAL/MIN/FT² (MM/MIN)
Hydro carbon	ANSULITE 3x3 Low Viscosity at 2% concentration	TAR 225L Nozzle	Fixed Spray-Type System	N/A	N/A	Use as directed in design manual to provide coverage over protected surfaces according to published distribution patterns. System can support 1 to 32 nozzles.	Refer to design manual for distribution pattern figures.	Deter mined by FireFlex software	5	0.04 (1.63)	0.30 (12.2)

FUEL	CONCENTRATE	DISCHARGE DEVICE DESCRIPTION	NOZZLE HEIGHT		MAXIMUM NOZZLES PER SYSTEM	SPACING OR MAXIMUM AREA OF COVERAGE PER NOZZLE FT² (M²)	FOAM CONCENTRATE REQUIRED		MINIMUM DESIGN APPLICATION RATE
			MIN FT (M)	MAX FT (M)			GALLONS (LITERS)	MINIMUM DISCHARGE TIME (MINUTES)	GAL/MIN/FT² (MM/MIN)
Hydro carbon	Solberg Re-Healing RF3	DN-7, pendent	6	49	2	169	17	10	0.05
			(1.82)	(14.94)		(15.7)	(64)		(.20)
			6	49	4	169	28	10	0.05
			(1.82)	(14.94)		(15.7)	(106)		(.20)
			6	49	8	169	47	10	0.05
			(1.82)	(14.94)		(15.7)	(178)		(.20)
			6	49	16	169	44	10	0.05
			(1.82)	(14.94)		(15.7)	(167)		(.20)

Normally Air Aspirated discharge

CAF discharge