NATIONAL FOAM

Universal Green™
Alcohol Resistant Fluorine Free Foam
No intentionally added PFAS

Alternative
AFFF Replacement

Jim Cottrell, Cottrell Associates, Inc. National Foam Factory Reps. since 1988

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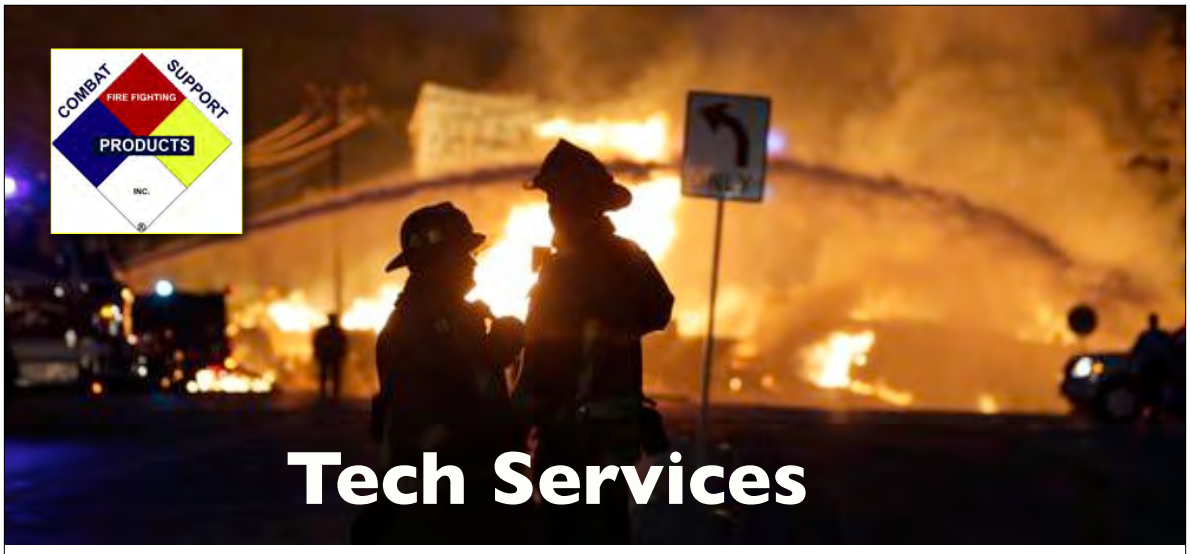
V043019

What CSP Does

2



Tech Services

F.D. risk analysis: fuel terminals - rail yards - special hazards

Foam fitness and system output evaluation (mail in)

Mobile equipment and special appliance advisory

Fire testing foam samples (NF's modeling lab.)

Fire apparatus foam system specs. review

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Tech Services Marine

Marine foam system design, evaluation testing & specs. review

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COMBAT SUPPORT FIRE FIGHTING PRODUCTS INC.

Conference room for two hrs., then out to the field for some show and tell.

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Alcohol Resistant Fluorine Free Foam
No intentionally added PFAS

COMBAT SUPPORT FIRE FIGHTING PRODUCTS INC.

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HANDOUTS

Universal Green
Program Index

Universal Green
Universal Green 3% AR-F3 Facts:

U-Green has a Underwriters Laboratory type III listing for use on Hydrocarbons and Type II on polar solvents, both at 3% proportioning using fresh or sea water.

Type III applications include those one would use on a fuel storage tank fire where over the top application is required.

Type II applications include those that one would use on foam destructive fuels such as polar solvents or some acids. Using bank-in (back-splash) off the side of wreckage or roll-on using nozzle velocity to push foam onto a fuel spill or fire somewhat gently.

Foam Lines
June, 2018 - Jim Cottrell

Can Fluorine Free Foams (F3) Be In Your Future?

There is a good possibility the petrochemical industry (refining facilities) may to switch to fluorine free firefighting (F3) agents for some applications in the coming years. As of 2020, the state of Washington will no longer allow Fire Departments to use or train with AFFF, fluorinated firefighting agents. Moreover, New York State now have introduced a Senate bill banning PFOS, PFOA and four PFAS compounds in firefighting foam and turnout gear. In fact, some European entities and two Australian states have banned PFAS firefighting agents as well.

If your State or county follows those trends, National Foam is already there with an effective fluorine free (F3) replacement.

Universal Green

Breakthrough:
National Foam have recently developed a fluorine free (F3) fire foam compound. **Universal^{F3} Green™ 3x3** works well on polar solvents and hydrocarbons including gasoline/ethanol blends. It shows promise as a replacement for AR-AFFF for fire department use, although it is not as robust as Universal Gold®, 1x3% AR-AFFF in terms of U.L. listings, application rates and U.S. Coast Guard approval. However, I am quite confident in its performance as Dan and I tested it on E-10, winter grade gasoline at 3% using 11:1 expansion nozzle at 0.16 application rate and got better than expected results. In this regard, we are particularly keen on its use in non-fuming hazardous materials vapor suppression missions. Reason: it has a two plus hour quarter life at 3% where Universal Gold® has 24-25 minutes in fresh water @ 3%.

Universal^{F3} Green™, 3x3 use for long term vapor suppression events, which are the lion's share of Fire Department uses shows significant economic advantage over faster draining AR-AFFF's. Finally, since it's non-fluorinated and 100% biodegradable, you can train with it.

Universal^{F3} Green, 3x3; U.L. listed fresh & sea water. Available in drums and totes. Ten+ year shelf life. Priced at Universal Gold C6 cost.

Cottrell Associates, Inc. 1 of 3 www.CombatSupportProducts.com

FoamLines
Combat Support Products
Division Of Cottrell Associates, Inc.

Hew October 25, 2018

Keep The Public In The Loop

Further to the PIO (Public Information Officer) talking points we discussed during our many training sessions, I put together the following for consideration regarding public information officer's response to media and citizens questions when it comes to your agencies use of firefighting foam.

Suggested PIO Knowledge & Talking Points - (See environmental notes E on page 3)

A. Foams used for flammable liquid firefighting (class B fuels) is a mixture of 97 to 99 parts water and one to three parts foaming concentrate which produce a shaving cream-like lather or froth. Fire foam does what a frying pan cover does to smother a grease or cooking oil fire; it separates needed air from a burning liquid's fuel surface by way of a chemically treated microscopic film of water that drains from the foamy lather, much the same as beer or soda-pop looses its head. This foaming agent is known to firefighters as Aqueous Film Forming Foam (AFFF). The more popular alcohol resistant variant is known as AR-AFFF and what is used, on the whole, by most municipal firefighters in the region for dealing with class B, liquid fires or un-ignited spills. Un-ignited fuel spills require a four-inch foam blanket (lid) on the spill to prevent explosive fuel vapor finding an ignition source as it drifts in air currents.

B. Firefighters mix water and foam concentrate with special devices known as foam proportioners. Such devices supply concentrate/water solutions to commonly used, hand-held fire hose appliances at small un-ignited spills or fires. Larger cannon-type devices known as monitors are mounted on fire engines or mission specific foam firefighting trailers. The larger the appliance the further its reach. Long reach is required

AFFF Fluorine Debate

1960's through 2002

Background Story - Cancer Links

Environmental folks identified pre 2003, PFAS compounds, PFOS & PFOA fluorosurfactants used for film forming in AFFF and AR-AFFF firefighting foam as bad actors and in most cases, rightly so. These long carbon chain (C8) compounds have been detected in water wells near chemical manufacturing sites and military fire training facilities.

National Foam AFFF products never contained PFOS or added PFOA compounds

Small amounts of fluorosurfactants added to water decreased its surface tension characteristics such that it allows water to skim across jet fuel, diesel and gasoline, extinguishing fire as it spreads. It was truly a game changer in the liquid fuel firefighting world.

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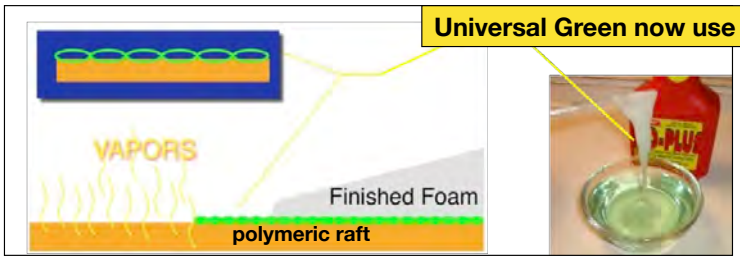
AFFF Fluorine Debate

1970's

National Foam patented an alcohol resistant variant by adding a sugar based ingredient. When foam solution drained on a polar solvent (alcohol) it created a polymeric membrane that separated the water in the AFFF foam blanket from the foam destructive solvent beneath. Another game changer in fighting stubborn polar solvent fires.

Universal Green now use a similar polymer



National Foam soon sold rights to the 3M company and others allowing them to produce alcohol type AFFF concentrates (ATC). National's AR products are still known as Universal Foams.

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AFFF Fluorine Debate

2019

C8 Chemistry vs. C6

AFFF - Film Forming Fluorosurfactants PFAS

PFAS is a catch-all acronym that encompass most things relating to fluorosurfactants, which include: AFFFs, food contact paper, textile coatings, non-stick cookware, etc. PFOS and PFOA are the known bad actors in the PFAS range of chemicals.

C8 carbon carbon carbon carbon carbon carbon carbon carbon

PFOS and PFOA is said to be persistent, bioaccummulative and toxic (PBT). Some eight carbon chain film forming chemistry that include PFOS and PFOA is said to be cancer linked and long term environmentally persistent, it is no longer manufactured.

AFFF Fluorine Debate

2019

C8 Chemistry vs. C6

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AFFF - Film Forming Fluorosurfactants PFAS

2015 C6 carbon carbon carbon carbon carbon carbon

Six carbon chain chemistry (C6) has replaced eight carbon chemistry (C8) and is considered non-biocumulitave. Is OK for now.

Some science suggests there are trace amounts of bioaccummulative components in C6 chemistry, which is why ALL PFAS compounds regardless of origin are being painted in some circles with a suspect brush; and is why National Foam patented an effective alcohol resistant, fluorine free (F3) replacement foam.

Universal Green Alcohol Resistant Fluorine Free Foam no intentionally added PFAS

AFFF Fluorine Debate

2019

Regardless of the outcome of science debates there are those who would prefer to remove all fluorosurfactant, PFAS compounds from firefighting foam. In fact, there are some states in the process of legislating the extinction of PFAS firefighting foams. NF have third party certification that their AR-F3 product is in fact fluorine free.

Class A Foam And Wetting Agents (emulsifiers)

To be clear, Class A foams are not in the fluorine fight. Their wetting and foaming ability rely on hydrocarbon surfactant foamers. Some to include National's Knockdown Class A foam have U.L. Wetting Agent listings which allow limited use on simple hydrocarbon oil based fuels such as diesel. Definitely not for use on gasoline / alcohol blends, particularly where fuel has soaked into the earth. Agent application requires the mixing of detergent solution with fuel using an otherwise unsafe plunging technique where fuel has depth and is not running. Note: Most wetting agents do not foam…

AFFF Fluorine Debate

2019

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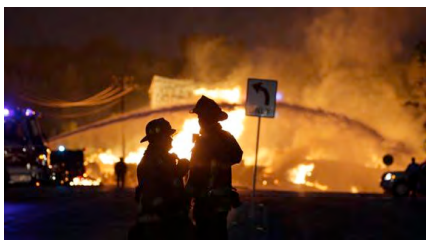
Q. Will Airport AFFF Foam, MIL-PRF-24385F(SH) Be Affected?

a - No, not at present (February 2019). The Federal Aviation Administration (FAA) still mandates all FAA controlled airports use a C6 Mil Spec AFFF.

However, FAA reauthorization legislation, HR 302 of Oct. 2018 includes wording that will allow airport fire departments to substitute MIL-PRF-24385F(SH) with an approved foam (U.L / NFPA 403) fluorine free (F3) agent, qualified by ICAO within three years of HR 302 becoming law, which could be 2021-2.



AFFF Fluorine Debate

2019

Q. What are ICAO (International Civil Aviation Organization) Foam Standards Why Should I Care?

a. European aviation firefighting performance products are guided by International Civil Aviation Organization (ICAO) regs. and may soon be so in U.S.

In the U.S., NFPA 403 Standard for Aircraft Rescue and Firefighting is the airport firefighting guidance document. NFPA does not approve or test but rather sets performance standards, which are tested under Underwriters Laboratory 162 Standard for Foam Equipment and liquid Concentrates, ICAO performance standards and or as is now (6/3/19) the U.S. Navy MIL-PRF-24385F(SH), AFFF Mil Spec. formulation.

At this point in time it is not clear what firefighting performance standard FAA will adopt, NFPA 403 has recognized ICAO Level A, B & C, fluorine free foams.

AFFF Fluorine Debate

2019

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Q. Does National Foam have a AFFF replacement for use by the U.S. aviation community?

a - Yes, National Foam have a third party certified, ICAO level C fluorine free product called, Avio^{F3} Green KHC 3%. This product has been specially formulated for the Aviation industry wherever ICAO performance is required. Should it be approved for use by U.S. FAA, it is now NFPA 403 compliant, and available through authorized National Foam dealer channels.

Note:
ICAO allows self certification through three levels of performance. Level C is highest performing status. National Foam has third party certification for conformity to ICAO level C on Avio^{F3} Green KHC 3%

AFFF Fluorine Debate

2019

U.S. Mil. Spec Vs., F3

It's pretty much a forgone conclusion that U.S. Mil Spec AFFF is the world gold standard in terms of ARFF user safety and passenger survivability. There are no fluorine free foams that can match its speed of fire knockdown and security, although National Foam's Avio^{F3} Green KHC 3% is pretty close.

If U.S. Mil Spec AFFF is abandoned, ICAO performance level C, fluorine free foams are as good as it gets in terms of firefighting performance.

ICAO performance levels A and B foams are not nearly as effective as ICAO level C. All things being equal, the down side of ICAO A or B products is reduced safety and survivability for firefighters and passengers.

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Universal Green
Alcohol Resistant Fluorine Free Foam

Universal Green F3 3% x 3%
Synthetic Alcohol Resistant Foam

Fluorine Free Product Talking Points

No intentionally added PFAS

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NATIONAL FOAM

Universal Green
Alcohol Resistant Fluorine Free Foam

Universal Green 3% AR-F3 Facts:

No intentionally added PFAS

U-Green has a Underwriters Laboratory type III listing for use on Hydrocarbons and Type II on polar solvents, both at 3% proportioning using fresh or sea water.

Type III applications include those one would use on a fuel storage tank fire where over the top application is required.

Type II applications include those that one would use on foam destructive fuels such as polar solvents or some acids. Using bank-in (back-splash) off the side of wreckage or roll-on using nozzle velocity to push foam onto a fuel spill or fire somewhat gently.

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Universal Green 3% AR-F3 Facts:

No intentionally added PFAS

Universal Green 3x3 has no systems viscosity restrictions.

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Universal Green
Alcohol Resistant Fluorine Free Foam

Universal Green 3% AR-F3 Facts:

No intentionally added PFAS

Must be used with aerating nozzles at minimum of 10:1 expansion on hydrocarbons to include E-10 gasoline/ethanol blends and polar solvents (alcohols).

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Universal Green 3% AR-F3 Application Rates

Application rate is foam/water solution flow per square foot of fire. A 1000 sq.ft. gasoline (hydrocarbon) fire requires 160 gpm solution to achieve extinguishment (0.16 gpm / sq. ft.).

A 1000 sq. ft. isopropyl alcohol (IPA) requires 280 gpm (0.28 gpm / sq. ft.)

A 1000 sq. ft. ethanol fire requires 100 gpm (0.10 gpm / sq. ft.)

Fifty square foot U.L.162 fire test pan.

Hydrocarbon Fire Listings

Spill at 0.10 gpm / sq. ft. - needs 5 gpm (AFFF)

Spill at 0.16 gpm / sq. ft. - needs 8 gpm (F3)

Fuel In Depth (tank fire)

0.16 gpm / sq. ft. - needs 8 gpm (AFFF)

0.16 gpm / sq. ft. - needs 8 gpm (F3)

Alcohols AR-AFFF

0.20 gpm / sq. ft. needs 10 gpm - IPA

AR-F3

0.28 gpm / sq. ft. - needs 14 gpm - IPA

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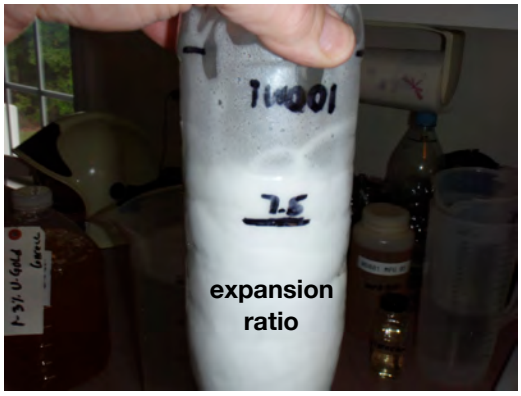
Alcohol Resistant Fluorine Free Foam
No intentionally added PFAS

Universal Green 3% AR-F3 Facts:

Quarter life is two + hours with fresh water. One + hour with sea water.

100 ml. 3% solution shaken to full expansion - Time it takes to drain 25% solution



U Gold +/-23 min

U Green +120 min

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Universal Green
Alcohol Resistant Fluorine Free Foam

ECONOMY OF USE

Municipal Fire Service

About 80% of fire department foam use is in securing hazardous spills. Here increased quarter life can contribute to significant savings in terms of foam replacement cost as well as lowering the environment impact of water use, which is always in short supply at highway crashes.

In the event of unexpected ignition, Universal Green AR-F3 has a U.L. pedigree showing it a fairly strong AFFF replacement.

See the table for cost comparisons where foam is reapplied at quarter life.

Universal Green
Alcohol Resistant Fluorine Free Foam

ECONOMY OF USE - TWO HOUR EVENT

Aerated (10:1) Foam Reapplication At Quarter Life

20ft. x 25ft. (500 sq. ft.) un-ignited spill - 100 GPM - 1 Minute To Cover

3% Proportioning	One Minute Applications	Foam Used Gal.	Foam $ Per Gal.	Water Used Gal.	Cost $
All AFFF Mil. Spec.	24	72	32	2328	2304
5 min 1/4 life					
Brand X AR-AFFF	10	30	36	970	1080
12 min 1/4 life					
Brand Y AR-AFFF	10	30	36	970	1080
12 min 1/4 life					
NF U-Gold AR-AFFF	5	15	45	485	675
25 min 1/4 life					
NF U-Green AR F3	1	3	45	97	135
120 min 1/4 life	Universal Green				

Example assumes a 500 sq. ft., un-ignited gasoline spill using a 100 gpm, aerating (10:1) nozzle for security at foam's quarter life during a two hour event. **Safety Note: Reapply foam when gas detector indicates flammable range vapor or material's odor returns.**

22 **Fluorine Free = No intentionally added PFAS**

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Universal Green™
Alcohol Resistant Fluorine Free Foam
No intentionally added PFAS

Universal Green 3% AR-F3 Facts:

You can train with it with no fluorine complications.

Doubles as a class A wetter at ½ to 1%. Per NFPA 18

Freeze - thaw stable.

Twenty-five year shelf life (sealed, factory packaging)

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NATIONAL FOAM

Finish

Universal Green™
Alcohol Resistant Fluorine Free Foam
No intentionally added PFAS

Now available at stocking National Foam Dealers

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Questions / Comments