

FIRE SUPPRESSION INNOVATIONS

PFAS FREE | FOOD SAFE FIRE PROTECTION PRODUCTS FOR USE IN ALL HOT-WORK AREAS



About Us

Simply Better



GreenFire® Technology has broken the mold.

Formed to bring about change to our ever-growing Fire Protection product needs.

Offering a solution to the application (s) of harmful Fire Protection Chemicals.

We provide Non-Cancer causing, Non-Toxic, Food Safe Fire Protection Products.

Wetting Agent, Foam, Retardant, Suppressant, Protection and Heat Barrier.

GreenFire®



Utility Contractor Section



HIGH FIRE RISK AREA

GreenFire® Wetting Agent





High Fire Risk Area (HFRA) Management



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Utilities Protection

Pre-Treat brush and utility appurtenances for fire prevention. GreenFire® protects where flare-up can occur in dry seasons.

Hot Work

Pre-Treat structures and dry brush in work area when equipment can cause a spark or flame. Can be used to extinguish class A-B fires. (Portable Backpack)

2-N-1

With a Class A-B rating, this product takes the guess work out of which classification to grab. It also eliminates any fire pump fitting clogging or damage.

How To Use

GreenFire®



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GreenFire®

Mixing



The Wetting Agent can be mixed ahead of time or on site .

The Wetting Agent is very stable after mixing and will stay in a suspended homogenous form for many months (especially during warmer weather months when it's most used). ***

For cooler weather we suggest slight agitation before use (normal movement from transportation to the jobsite would be more than enough).





Transportation

- If it is transported over exceptionally bumpy or rough terrain some additional foam may form, but with properly sealed lids will be contained.
- The foam will quickly settle out again. As a powerful class A-B fire fighting foam Wetting Agent, so it's designed to create foam.
- The product universally works well in all tanks or containers used for transport and is non-corrosive.



Application

GreenFire Wetting Agent

Pressure (PSI)

 The more pressure applied to the Wetting Agent, the more foam will be produced, depending on the desired application (High foam for fire suppression, less for preventive pre-treatment).

Delivery System

We currently have
customers using large skid
mount systems for large area applications and
Milwaukee brand
backpack sprayers for
smaller, harder-to-reach
areas.

Universal

 Our Wetting Agent universally works well in a large variety of pumps and sprayers: from induction systems on Fire Engines, to Pressurized Water Fire Extinguishers and a large variety of spray wands, the fan style tips perform the best.

Cost Estimations

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Bulk Pricing Available



Coverage Estimation

Based on area of usage. [Water:GreenFire]

DILUTION

Wetting Agent: Recommended dilution for field hot-work is a 4:1-5:1 ratio. (4-5 Parts Water:1 Part GreenFire)

- Coverage rate: 90-125 sq. ft. at the recommended dilution ratio.
- Take your cost and multiply that by your ratio. That is your true cost per gallon at the recommended dilution rate.

LABOR

• Depending on the absorption and penetrating quality, the wetting agent can be applied (90-125 sq. ft.) in general conditions in 1.5 minutes or less, per gallon.

• Many variables come into play with the application (material, terrain, how porous, surface area, etc.).

CONSIDERATIONS

• The time it takes to dilute the product with water depends on your equipment and how quickly it can be pumped or flowed into the mixing tank.

• We would compare the application process to that of applying foliage spray (fertilizer or herbicide) to a landscaped area.

Container Sizes

GreenFire®











5 US GALLON

55 US GALLON

275 US GALLON

VIDEO

GreenFire® Wetting Agent

NFPA "CRIB TEST" | GreenFire® VS. PHOS CHEK





Click Here To View

NFPA "HEPTANE TEST" | GREENFIRE® WETTING AGENT





Click Here To View



Approvals

Existing and Pending



GreenFire®



Accomplishments

- On October 26th. 2018 GreenFire® obtained the first NSF Registration Mark for a food safe fire protection product as a wetting agent.
- On August 21st. 2020, GreenFire[®] was again awarded the NSF Registration Mark for the following products:
- ✓ GreenFire® Fire Fighting Foam (GFFF)
- ✓ GreenFire® Wetting Agent (second time)
- ✓ GreenFire® Pro Defense
- ✓ GreenFire® Heat Barrier
- ✓ GreenFire® OEM
- ✓ All of the above products are White Book Listed under Fire Suppression Innovations.



Southwest Research Institute



Southwest Research Institute

Accomplishments

- On September 25th. 2018, GreenFire® completed the required testing for Wetting Agents at an NFPA / OSHA approved testing facility. This testing facility is also recognized by UL.
- ✓ NFPA 18 and UL 711 Tested.



Figure 1. GreenFire[™] Wetting Agent (Left) and 2-A Fire Extinguisher (Right).



Accomplishments

- ✓ GreenFire[®] passed the required testing for Wetting Agents under the NFPA 18 guidelines.
- The objective of this program was to evaluate the effectiveness of a wetting agent. Specifically, testing was conducted per the NFPA 18, Standard for Wetting Agents (2017 Edition).





Heptane Fuel Test

Crib Test

Underwriters Laboratory



Accomplishments

- ✓ GreenFire[®] passed the required testing for Wetting Agents per the UL 711 Guidelines.
- The objective was to evaluate the wetting agent against a wood fiberboard fire and penetration (or run off). Triplicating testing was conducted with both plain water and the wetting agent.





Fiberboard Test and Penetration



GreenScreen Certified[™]





Green Screen Certified" Bronze

certificate number 20211001

EXPIRATION DATE

GreenScreen Certified[™] Standard for Firefighting Foam: Class A Foam Concentrates, Class B Foam Concentrates, Class A Wetting Agents, and Class A & B Wetting Agents, Version 2

Fire Suppression Innovations

PRODUCT CERTIFIED

GREENFIRE® FIREFIGHTING FOAM (GFFF)

1/20/2021

SIGNATURE

Use of Licensed Marks is subject to terms and conditions of the Trademark License Agreement. GreenScreen Certified[™] is a trademark licensed by Clean Production Action, Inc. © Clean Production Action, Inc. All rights reserved.



Accomplishments

The Standard has three levels of certification and uses a combination of GreenScreen scores, Restricted Substance List prohibitions, and analytical testing for acute aquatic toxicity and total organic fluorine. GreenScreen Certified now provides buyers and manufacturers with a clear framework for communicating demand for and supply of Class A and Class B firefighting products that are both tested to be PFAS-free and screened to avoid chemicals of high concern to people and the planet.

 ✓ *PFAS-free is defined as zero intentionally added PFAS to the product and PFAS contamination in the product must be less than 0.0001 percent by weight of the product (1 part per million) total organic fluorine as measured by combustion ion chromatography.



Pending Approvals

Testing Agencies









Note: Some COVID-19 Related Delays

- Currently working with NFPA committee members to modify the current standards, NFPA 18, 11, 16 & 16A, for green products.
- Undergoing several Underwriters Laboratory testing procedures that are based on the NFPA standards to accommodate green products.
- Working with Factory Mutual, London and US, to write the new standards for Fire Fighting Foams and green products.
- GreenFire® product has been sent to the FM Global Research Campus for review.
- OMRI (Organic Materials Review Institute) is currently reviewing our product for use in agricultural applications for their approval.



Summary

- ✓ Non-Cancer Causing
- ✓ Non-Toxic
- ✓ Non-Carcinogenic
- ✓ Non-Corrosive
- ✓ Food Safe
- ✓ Easy Cleanup
- ✓ Eco Friendly
- ✓ Multi Surface
- ✓ Pre-Treat Materials

Other benefits include

- Hot-Work Areas
- Wildfire
- Fire Departments
- Home Defense
- Fire Extinguishing







FIRE SUPPRESSION INNOVATIONS

Contact Us

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1-888-7NO-PFAS

- sales@gogreenfire.com ⊠
 - www.gogreenfire.com

ADDITIONAL INFORMATION

GreenFire®



Environmental Impact

GreenFire® Checklist

- ✓ Water Quality
- ✓ Biological
- ✓ Soil
- ✓ Aesthetics
- ✓ Agency Approvals
- ✓ Easements / Access
- ✓ Public Outreach
- ✓ Air Quality
- ✓ Application of Products
- ✓ Testing





GreenFire®

FAQ's

- Runoff: Many waterbodies within a Utility Service Territory have waste load allocations for metals, nutrients, chemicals, etc. Total Maximum Daily Loads (TMDLS) identify which waterbodies or watershed areas have limitations. Still, in general, runoff from the widespread use of fire retardant would be a concern.
- ANSWER: All of the GreenFire[®] product line ingredients quickly biodegrade (average of 95% biodegradation within 30 days), except for the natural minerals. These naturally occurring and environmentally ubiquitous minerals are classified as a nutrient in typical runoff analysis.
- Toxicity: Fate and transport of fire-retardant chemicals in soil and water.
- ✓ ANSWER: Our SDS sheet gives inferred toxicological data and environmental fate data derived from tests done on each of the individual ingredients. Note that the SDS sheet describes GreenFire[®] concentrate, which will be diluted at a 4:1-5:1 ratio for use in the field.



FAQ's

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- Drinking Water: PFAS or PFOA can be in fire retardants. Action levels in California for these in drinking water are in the ppt range. How does Greenfire measure up?
 - ANSWER: We are proud of the fact that all GreenFire® products are completely PFAS/PFOAS and Perchlorate free. Our ingredients do not contain and are expected not to be contaminated with fluorinecontaining compounds of any sort when procured. (Please see attached 3rd party "Clean Production Action" certification pending for the GreenFire® product line.)



Biology | Agriculture

GreenFire®



FAQ's

- Effects on herbaceous and woody plants: Need to determine effects of sprayed material on plant species. If it does not kill the plants, does it in any way hinder growth (e.g., withering of some leaves, blocking photosynthetic processes, affecting reproduction)?
- ANSWER: GreenFire[®] wetting agent may negatively affect herbaceous and woody plants in two ways. First, containing ordinary and biodegradable soaps, if sprayed on <u>green</u> foliage, can form an impermeable residue. This residue can block gas exchange through the stomata resulting in leaf death. <u>Avoid applying directly to green</u> foliage. Secondly, although natural minerals are essential to plant development, they can cause withering and death in some plant species in excessive amounts. GreenFire[®] ready to use wetting agent contains a fraction of such natural minerals.
- Trials and Studies: Need results of scientific field studies demonstrating potential effects on plants/vegetation.
- ✓ ANSWER: Our SDS sheet gives inferred toxicological data and environmental fate data derived from tests done on each of the individual ingredients. Note that the SDS sheet describes GreenFire[®] concentrate diluted at a 4:1-5:1 ratio for use in the field.



FAQ's



- Promote Invasive Plant Species: Will invasive plant species benefit from the chemicals in the spray more than native species?
- ✓ ANSWER: We are unaware of any invasive plant species that will gain a competitive edge over native species from the use of GreenFire[®] products. Please let us know if there is a specific test that we can run to better address this concern.

Biology | Animals | Insects

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GreenFire®

FAQ's

- Toxicity Tests: Details on ingestion for animal, in particular insects.
- ANSWER: Our SDS sheet gives inferred toxicological data and environmental fate data derived from tests done on each of the individual ingredients. Section XII of this sheet provides specific data regarding the effect on daphnia dubia. Although daphnia dubia is not an insect, it is in the same arthropod phylum as insects. It is often used to indicate the effect that a chemical will have on insects and other invertebrates. Note that the SDS sheet describes GreenFire[®] concentrate diluted at a 4:1-5:1 ratio for use in the field.
- Monarch Butterfly: How will the treatment affect milkweeds? Is it toxic to monarch caterpillars?
- ✓ ANSWER: We are not aware of any specific danger of this product towards amphibian life. Our SDS sheet gives inferred toxicological data and environmental fate data derived from tests done on each of the individual ingredients. Note that the SDS sheet describes GreenFire[®] concentrate diluted at a 4:1-5:1 ratio for use in the field.





FAQ's

- Contamination/Liability What is the persistence of fire-retardant chemicals in soil / groundwater?
- ANSWER: All of the GreenFire[®] product line ingredients quickly biodegrade (average of 95% biodegradation within 30 days), except for the Boron containing minerals. These naturally occurring and environmentally ubiquitous minerals are classified as a nutrient in typical runoff analysis.
- What is the concentration of heavy metals and arsenic in the product? Long term liability of chemicals in the environment (and potential for transport of chemicals to surrounding areas).
- ANSWER: They are water-soluble and quickly leachable through ordinary soil. None of the ingredients in GreenFire[®] products contain, or are expected to be contaminated with, heavy metals or arsenic. (See "Clean Production Action" certification, which is pending for the GreenFire[®] product line.)



Agency Approvals

GreenFire®

FAQ's

- US Fish and Wildlife Service (FWS): Determine if application on federal lands requires ESA Section 7 consultation.
- Suppose the product is used in small localized areas. In that case, the rapid biodegradation and immediate dilution of the non-mineral ingredients render it unlikely that this would be necessary. On the other hand, if the product is to be used extensively over a large area or in large amounts in environmentally sensitive areas, the end-user would benefit from consulting with FWS to ensure that no endangered species could be adversely affected the product use as per ESA Section 7.



GreenFire®



FAQ's



- It appears there may be more than one formulation of the product. Can the proprietary ingredient be categorized chemically, for example a salt or a surfactant?
- ANSWER: None of the GreenFire[®] products have silicon dioxide as a component in their formula. The active ingredients are primarily composed of a proprietary blend of surfactants and naturally occurring mineral salts.
- ✓ GreenFire Products contain <u>Zero</u> VOC's.



Application

GreenFire®

FAQ's



- What concentration of the solution is necessary for fire protection on surrounding vegetation and different asset applications?
- ✓ ANSWER: The recommended dilution of 4:1-5:1 is suitable for all applications.
- Does this product concentration consider different fuel types?
- ANSWER: The recommended dilution ratio was tested with fires of such varied fuel types as grass, hay, treated lumber, twigs and branches, dry leaves, plastics, siding, diesel fuel, gasoline, heptane alcohol, etc. It is recommended that the product is sprayed through an air aspirating nozzle to create a foam that will float on the burning pooled petroleum surface.



FAQ's

What kind of testing have been done to prove the duration of effectiveness of the product?

✓ ANSWER: Our independent and internal tests have shown that it remains effective after it has become entirely dehydrated. As long as no significant additional precipitation or water is present to the surfaces treated (upwards of .25" of rain), our Wetting Agent is most useful while still hydrated inactive form.



The Problem

PFAS Family of Chemicals



GreenFire®

Ban on Products

Current Products | Unsafe Ingredients



The Status Quo

Per- / Polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that includes PFOA, PFOS, GenX, and many other chemicals. Fire Fighting Products such as AFFF Foams and Wetting Agents contain one or more of these and are currently in use or under ban.



The Problem | Cancer Causing Fire Protection Products



Forever Chemicals (PFAS)

For decades, chemical manufacturers have manufactured PFAS-containing aqueous film forming foams (AFFF) and firefighters have unknowingly been exposed to them during use in petroleum-based fires, training, and testing of equipment. PFAS use in firefighting foam has contaminated drinking water for millions of people across the planet. Today nearly every US resident and place in the world is contaminated with PFAS chemicals.



The Harmful Effects

Exposure to PFAS is associated with cancer, developmental toxicity, immune suppression, high cholesterol, and other health effects, with firefighters at particular risk from their increased and ongoing exposure to PFAS through their work. The number one cause of line-of-duty death for firefighters is cancer. Increased regulation and liability of using PFAS-containing foams, along with increasing environmental and health concerns across the globe, have created demand for PFAS-free firefighting foams.



Industrial Impact

Even though invisible and largely unnoticed, synthetic chemicals play an important part in our lives. Used as integral parts in millions of different manufacturing processes and everyday products, they make our lives easier and better. The downside is that a majority of these chemicals are toxic to health and the environment, and unfortunately legislation can't keep up. **49**

GreenFire®

The Solution

GreenFire®



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GreenFire®

GreenFire®

The Food Safe Fire Protection Solution



Proven safe for Humans, Animals, and the Environment

✓ GreenFire® is the only fire protection product ever to be certified with the National Sanitation Foundation.
✓ No hazardous clean up necessary.





GreenFire

- Our products can be used in any agricultural or food service location without fear of massive contamination or extraordinary clean-up measures. Besides the direct application to use in food preparation areas, this certification clearly shows third party verification that GreenFire® is more than safe for use in homes, offices, and other areas where people may be concerned about their exposure to fire fighting chemicals.
- Fire fighters have enough dangers to face in the field. We take pride in the fact that when using GreenFire® their health is not at risk from their own fire suppression agents.
- NSF international recommends simply using a mild cleanser and water to make any surface covered with GreenFire® safe for food preparation. This obviously has an unparalleled advantage when considering its use in facilities such as schools, hospitals, care facilities, universities, and other institution that have cafeterias or break rooms.





Unique Properties

- Unique fluid properties allow it flow cleanly and easily through pumps and hoses while simultaneously clinging to target surfaces.
- Remarkable cooling and penetrative capabilities.
- GreenFire® belongs to a unique class of fluids called non-Newtonian fluids. These fluids can change viscosity depending on their circumstances. In the case of GreenFire® it is called a shear-thinning fluid. What this means is that when it is in a high shear environment (such as passing through a hose or a pump) the viscosity drops, nearly to that of plain water. This allows it to flow easily with minimal pressure loss. After it exits the hose and lands on its target surface the viscosity increases again to become closer to that of maple syrup. This allows for greatly enhanced extinguishing capabilities while minimizing runoff.



Unique Properties-cont'd

 The Leidenfrost effect is a phenomenon in which a droplet of water is unable to make physical contact with its target surface due to a steam barrier that forms between them. The proprietary blend of wetting agents contained in GreenFire® allow it to break through this steam barrier and provide immediate cooling to even the hottest surfaces. These properties allow for much faster fire knockdown and use of up to 90% less water.







Durable Capabilities

- Creates a strong durable foam.
- Excellent retardant capabilities.
- The proprietary blend of surfactants in GreenFire® allow its foam to be stable and effective under a wide range of circumstances. Not just in backyard 'fair weather tests" but in the actual scalding conditions of a fire.
- While there are many products on the market that create foams and help break through the steam barrier, GreenFire® is unique in its ability to provide retardant capabilities as well. When sprayed onto wood, cloth, paper, or other combustible material, Greenfire® provides protection from ignition for weeks, months or even years into the future. The cooling effect of GreenFire® removes heat from the fire triangle, the foam generating capabilities remove oxygen from the fire triangle, and the retardant capabilities are able to render the fuel itself unburnable: effectively eliminating the third leg of the fire triangle. This retardant capability functions even long after all the moisture has evaporated away.



Additional Benefits

- CANCER CAUSING FREE: Greenfire has never and never will contain any synthetic ingredients, such as the PFAS family of Forever Chemicals.
- VOC: We are completely free, as in Zero, of any VOC's. Volatile organic compounds (VOC) means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions.
- NON-TOXIC: It's a good thing if the ingredients in your dish soap are nontoxic it means the suds washing down the drain won't be harmful to the environment, and the residue left on your dishes won't hurt you, either. You can use the adjective nontoxic to distinguish something from its more dangerous, toxic variation. Toxic waste poisons the groundwater or makes nearby animals sick, but nontoxic waste tends to break down without any negative consequences. Containing boron ingredients, like soap, GreenFire products are nontoxic.
- ✓ NON-CARCINOGENIC: Something that is not known to cause cancer : A substance or agent that is not a carcinogen. GreenFire products are non-carcinogenic.







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