

INTRODUCING A NOVEL APPROACH TO NUCLEAR PLANT SAFETY



"Bringing Firefighting Into The 21st Century"™

FireStopper Marketing Department

WHITE PAPER

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FIRESTOPPER®
Industrial - Commercial
Government

Preface

FireStopper International Limited, a transnational Registered Company, is the developer of the most advanced and powerful firefighting and anti-explosion technology in the “World”. It devoted the first 25-years of its existence to R&D and the recipient of subsequent stand alone testing results in ratings and certifications by the most recognized and respected third-party testing and listing facilities in the world.

Moreover, this unique Technology has rendered the only available all fire class effective and anti-explosive products, which are non-toxic, non-irritant, environmentally safe and non-hazardous per the most demanding environmental and life exposure testing over all other existing and available products in the explosion, fire and safety channel of business.

In the explosion amelioration technology channel, FireStopper® branded anti explosion systems exclusively deploy **EXP FFC** and in the handheld portable fire extinguishers **PFE-FR FFC** is exclusive to FireStopper® trademarked systems. The FireStopper® FFC Technology (*Fire Fighting Catalyst*) produce the only true environmentally safe liquid formulas in the world.

In addition, *EXP FFC* is recognized as being the only product capable of suppressing hydrogen/methane explosive environments in over 20-years of search. This breakthrough discovery became apparent during its initial demonstrative testing at Gexcon¹, AS Norway.

PFE-FR FFC is additionally recognized as the only all fire class and subclass effective liquid suppressant and due its freeze resistance of -73.3°C (-100° F) this line of portable extinguishers can be deployed in all environments in the planet.

For mass application in the advent of fire, **FireStopper® XL ”PLUS FFC** is the recommended product of choice where high life, environment and infrastructure are at risk.

Having proven the former statement through the outstanding results of the products testing, rating, and certifications thus received, FireStopper®, in tandem with its novel firefighting and anti-explosion products (the “software”), developed the most durable and reliable supporting hardware and detection systems available today, which also meet and exceed the relative standards used to certify said product lines.

With the advent of this technological breakthrough, FireStopper® has expanded this technology into the Nuclear Energy channel by developing products that advance safety and protection not yet available. FireStopper® can now provide Government, Industry, and by way of innovation, the consumer with a never before wider dimension of safety and protection.

FireStopper® through its extremely versatile and novel FFC/EnviroSafe® Technology has developed a system of applications that can ameliorate by maintenance, suppression and elimination of the devastating effects brought about by imminent disaster due to the above mentioned potential catastrophic failure.

Notwithstanding the above, the FireStopper® lines of products reach across the full spectrum of safety application including environmental remediation post spills both onshore and offshore. In

¹ A world leader in explosion testing and certification

the International arena, the FireStopper® brand is the recipient of the highest certifications in all categories of Governmental requirements to market such as defined below:

Nuclear Energy Electricity Generating Facilities

FireStopper® Products By Application:

EnviroSafe® XPC & EnviroSafe® XPK²

(The above products are designed for spent nuclear rod submersion and maintenance)

Anti-Explosion:

FireStopper® EXP FFC

(This liquid media is designed to deliver fire and explosion amelioration/suppression exclusively through FireStopper® Designed Anti-Explosion Systems™)

Initial Stage Testing - Gexcon, AS (Norway)

Handheld Portable Fire Extinguishers:

(The only all fire class & sub-classes effective handheld extinguishers in the world - Full catalog available upon request)

Certifications/Approvals:

ANSI/UL711, ULC – Southwest Research Institute (San Antonio, TX)

Defense Logistics Agency (DLA) US Gov. NSN Approval #s'

EN3-7; EN3-8³ – MPA, Dresden (Germany)

CE⁴ – DNV

Firefighting Foam Concentrate Product & Certifications:

FireStopper® XL "PLUS" FFC

EN1568 – MPA Dresden

ICAO – CNPP (France)

IMO – MPA Dresden, Lloyds Registry, DNV, MED

CE

Environmental Testing:

NAMSA⁵, USA

² These products need to be tested by the intended Nuclear Facility since fissionable materials are not readily available

³ This Standard refers to hardware durability, reliability and efficacy

⁴ This Mark assures manufacturing quality through yearly inspections

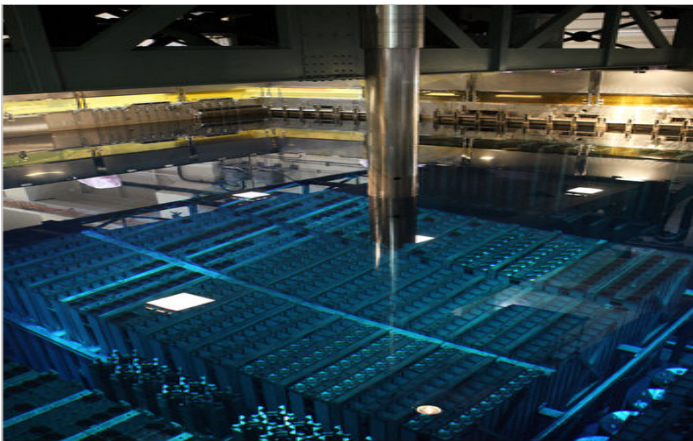
Executive Summary

Every new technology encounters barriers to new product entry. Often times these barriers are based on myth, inaccurate facts that have been presented in the media or by established competitors and some times the barriers are based on real world experience of customers using purported similar technologies, which in fact are *not*. In this instant presentation, a truly new technology is here that addresses the need for protection in a different way. In all cases, it is incumbent upon the vendor to educate the end user, technical personnel, analysts, and the press about the technology or a new approach to solving continuing problems in the industry.

In the course of generating electricity, nuclear plants create amounts of highly radioactive waste in the form of spent nuclear fuel, which constitutes a significant hazard to human safety if not properly stored and disposed. Because of the radioactivity and extreme longevity of spent nuclear fuel (half-life: approx. 156,000-yers) its management is a major policy challenge for virtually every country in the world that generates nuclear power (According to the National Academy of Sciences National Research Council, 1990, the best way to dispose of nuclear waste is in a geologic repository). This is also the common conclusion of all nations with nuclear power plants.

After nuclear fuel has been used for five to six years to furnish the power to produce electricity, the spent (or used) fuel, which is still highly radioactive, must be stored on the reactor site until it can be moved to a geological disposal site (should it be available). For example, the disposal site selected in the United States was Yucca Mountain, located in a remote desert region of the Nevada Nuclear Weapons Test Site. However, after 20 years of study, a cost of \$10 billion, and the submission of a licensing application to the Nuclear Regulatory Commission (NRC), which was nearing completion of its review, President Obama directed the U.S. Department of Energy (DOE), the responsible federal agency, to cancel the project. That decision is being appealed in the courts, and the outcome is still not clear.

Fig. 1



Every nuclear energy plant must store its spent rods onsite in massive concrete pools (generally with 6-ft thick walls) large enough to submerge said rods in minimum of 20-ft of water (usually these pools are 40-ft deep). These pools must maintain constant recycling of water in order to regulate and maintain the temperature within the safety margin.

Unfortunately, this method is no longer viable; the many events such as Chernobyl, Fukushima, 3-mile Island and others beg for active research for additional safety measures to be implemented.

⁵ NAMSA is a world leader in medical testing

⁶ The world leader in environmental testing for the Petrochemical Industry

In the past, heavy water (H₃O) was employed to keep and maintain spent rods in the storage pool; this did not prove to be either safe or economic. Saltwater became the next replacement, which generally is pumped to supply the pools at present. This current method presents various, now unacceptable, possibilities for catastrophic failure, e.g.:

- *Natural events such as:*
 - *Earthquake*
 - *Weather born disasters*
 - *Systemic failures*
 - *National emergencies*
 - *Intentionally acts*
 - *Among other potential events*

Dry Storage

By the end of 2011, the United States commercial nuclear waste inventory had reached approximately 65,000 metric tons of heavy metal (MTHM). This represents about 224,000 fuel assemblies. Roughly 50,000 MTHM are held in spent fuel pools. The remaining 15,000 MTHM have been placed in casks that are collectively referred to as “dry storage.” Roughly 2,200 MTHM are produced each year by existing nuclear reactors.

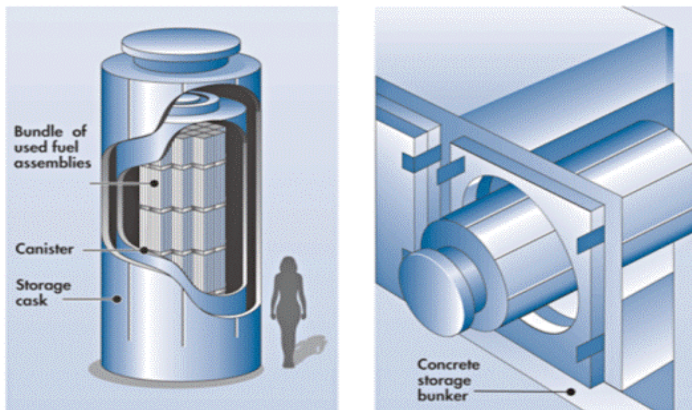
Fig.2



Spent fuel canisters are filled with inert helium gas to prevent degradation by oxidation. They are then seal welded and placed in concrete cylinders fitted with inner metal liners (which provide radiation shielding) or in separate metal enclosures.

Canisters loaded with spent fuel are moved to dry-storage facilities, referred to as independent spent fuel storage installations (ISFSIs) on the utilities' sites. ISFSIs are large, parking-lot-type concrete pads surrounded by protective fencing and under continuous security surveillance.

Fig. 3



Typical storage casks can be stored in either vertical or horizontal systems (Figures 2 and 3). Cask systems are popular among reactor operators because of their inherent flexibility. For one thing, they allow for the modular expansion of storage capabilities. For another, licensed “dual-purpose” casks can be used for both storage and transportation of nuclear waste. Some cask vendors have even developed “multiple-purpose

containers” they hope will be suitable for storage, transport, and disposal

❖ **What FireStopper® Offers:**

In the alternative to the current safety maintenance products and protocols, the newly developed branch of FireStopper®/EnviroSafe® Product Line offer the following:

- Salt/sea water in cooling pool is limited by temperature resistance to heat
 - At atmospheric pressure (1013 mbar) is 100.65 °C (213.17°F)
 - High evaporation environment
- ❖ **EnviroSafe® XPC & XPK** provide temperature resistance to heat at a far greater temperature than sea water
 - These proposed products possess both endothermic and exothermic properties
 - Produce low evaporation environment
- Salt/sea water provide minimal protection against temperature breach related fire
- ❖ **FireStopper® XPC & XPK** both offer great suppression protection against spontaneous breach by fire
- ❖ Subsequent lab testing* will determine the following:
 - Product life while deployed
 - Direct positive effect on fissionable materials
 - Other positive results

* FireStopper® suggests that potential industry users test the products sited above in their facility labs for efficacy and application.

Conclusion

As a result of political decisions, spent fuel in the United States will have to be stored either at reactor sites or in regional interim storage facilities. Given the political difficulties of finding a state and community willing to host either an interim storage facility or a waste repository, predictions of success or timing cannot be made. Here is what we do know:

- Storage at reactor sites will be necessary for a minimum of 10 more years.
- According to NRC, spent fuel can be safely stored in dry casks for at least 60 years, and evidence may show that it can be stored for even longer.
- Building an interim storage facility is currently not permitted by law. Therefore, legislative action will be necessary before such a storage facility can be considered.
- Once an interim facility has been identified and licensed, transportation to the site will require considerable additional time and investment.
- Until DOE removes the spent fuel from operating and decommissioned sites, the cost to taxpayers for the government’s failure to build a repository will continue to grow.
- The top priority for ending this costly financial obligation completely is to remove spent fuel from decommissioned sites. The obligation would continue for operating sites, however, until DOE removes all of the spent fuel, as obligated by contracts with utilities.

Facilities throughout the world will encounter similar and possibly worst Governmental scrutiny over this very serious matter. In the meantime, any new or existing nuclear plant should consider

new and effective measures to protect the functioning of the plant, the personnel and most important the environment, the general population and the planet.

This is no longer a question of economics; the responsibility lay squarely in the hands of Government and Industry to identify, test and implement novel applicable technology to deliver the most responsible safe environment for this industry.

**** FireStopper International Limited does not have access to fissionable materials to test the level of efficacy its newly developed products afford this industry. Therefore, we encourage interested parties to participate in the investigation of important technology. FireStopper® is committed provide limited assistance in this matter to the limits necessary to protect this very valuable trade secret technology.**

CERTIFICATIONS

