STEVE VICK INTERNATIONAL

# PRODUCTS AND SERVICES FOR NUCLEAR DECOMMISSIONING AND EMERGENCY REPAIR

# INTRODUCTION

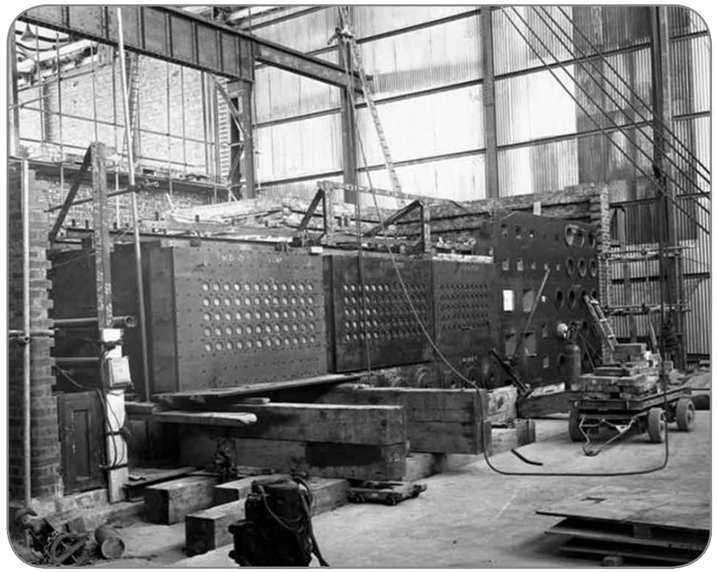
Steve Vick International has been carrying out projects in the nuclear decommissioning sector for the past 20 years. Our products and services offer bespoke solutions to permanently seal, decommission and divert all types of pipework, ducts and voids in a wide variety of contaminated areas including underground and underwater.

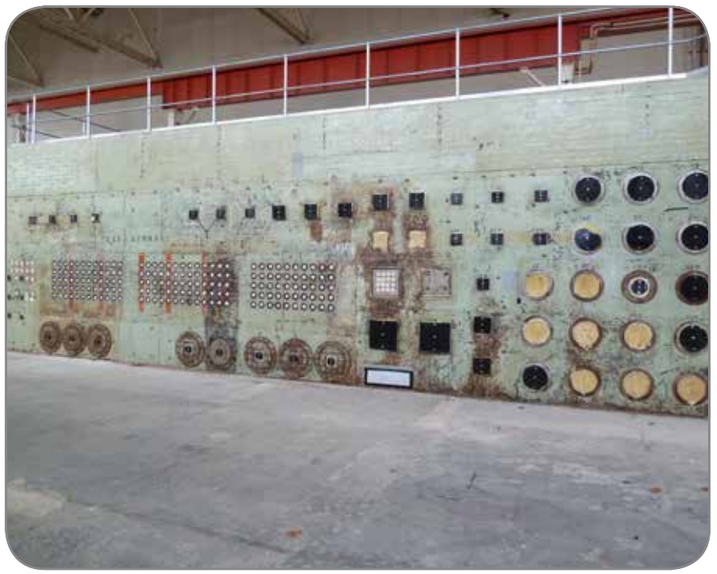
Founded in 1981 by the current Chairman, we have built a strong and positive reputation for innovation, reliability and customer satisfaction.

The company's primary market is the gas distribution sector and it is the products and techniques developed for this safety-critical industry which we have adapted for use in the nuclear decommissioning sector.

We have a team of highly experienced technicians who carry out projects around the country. Alternatively, some of our products are available in kit form for customers to perform their own sealing operations.

In 2014 the company moved to a newly renovated building in the historic town of Bradford on Avon, Wiltshire. Here we have almost 2,000 square metres with dedicated areas for production, warehousing, product development and administration.





*Original Harwell BEP0 storage block (above), on completion of Steve Vick International foam filling operation with 250 bespoke FOAMBAG™ FOAMSTOP™ (right)*



# SOLUTIONS

We offer solutions to the problems associated with decommissioning and sealing disused pipework, ducts, sleeves and ventilation shafts. Our technology can also be designed for the mass filling of large and complex voids and is a lightweight alternative to cement grout.

The techniques we offer will depend on the particular application and will be based upon our knowledge and experience. We have developed systems that can be deployed into underwater environments and from remote distances. These systems lend themselves well to the typical environment found during a nuclear decommissioning project.

All pipe materials can be tackled including steel, asbestos, concrete and plastic. We are able to seal off vertical, horizontal and tapered pipes with diameters up to and even above 1000mm. Annular spaces between pipes and cables and their host pipe can be filled with our formulated closed cell expanding foams.

## ANCILLARY EQUIPMENT

The company produces a wide range of pipe handling equipment including the Under Pressure Drill, an airtight system for hot-tapping, as well as a range of pipe cutting machines for windows or circumferential cuts on pipes up to 1500mm diameter.

Other equipment available includes Pipe Coil trailers; for the safe, efficient dispensing and transport of coiled pipe, up to lengths of 500m, Pipe Handlers; for manoeuvring and inserting PE pipe up to 900mm diameter, and Pipe Crackers; hydraulic tools for the safe and controlled breaking out of cast iron mains.

## THE FOAMBAG™ SYSTEM

The FOAMBAG™ technique was initially developed and patented by Steve Vick International in the 1980's as a safe, efficient way of sealing gas mains to be abandoned in 'gas free' conditions. FOAMBAG™ has since become a well-used gas industry standard technique.

The semi-porous FOAMBAG™ is inserted into the main using a specially constructed standpipe. An expanding PU resin foam, comprising of a resin base and hardener, is mixed just prior to application and then injected into the bag via an injection tube.

The foam then expands to fill the bag which hold the foam in place as it expands; at full expansion some of the foam seeps through the semiporous material to adhere to the pipe wall.

The polyurethane foam is formulated for this particular application and if needed a high performance resin can be injected via a secondary injection nozzle.

The same method has been further developed to meet the needs of nuclear decommissioning and emergency repair engineers.

*A redundant manhole chamber filled with expanding resin foam. Chapelcross Power Station*

*Under Pressure Drill kit comprising of the drill body, three adaptors, four holesaws, hand ratchet, air ratchet and arbour*

*Cross section of a cured FOAMBAG™ inside a steel pipe showing how the foam seeps through the bag to adhere to the pipe wall*

# REMOTE PIPE SEALING, DECOMMISSIONING AND DIVERSION

The technique is used to create a permanent plug; depending on the application this can be prior to completely filling pipework, removing it, or repairing it.

It is possible to position the bag from a remote location up to 50 metres away with the use of CCTV cameras and can easily be pushed around bends.

Once the FOAMBAG™ has cured, the void may be further filled with foam or grout before being permanently abandoned.

Being lightweight, polyurethane foam is an ideal material to fill pipes which then need to be removed.

## HIGH INTEGRITY FOAMBAG™

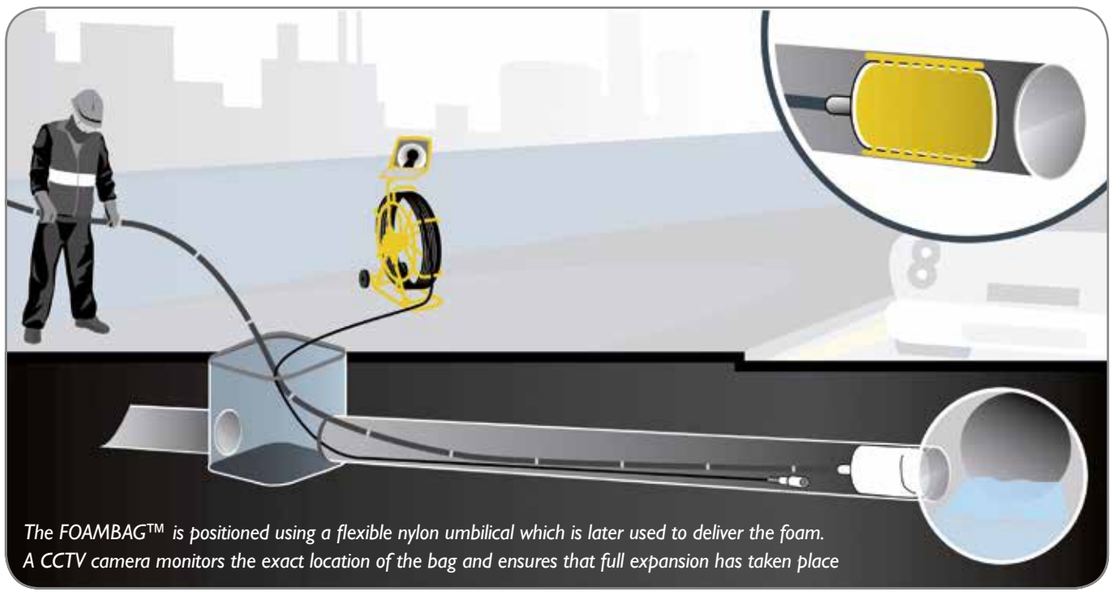
In certain circumstances, for example where a pipe is filled with media, it may be necessary to use a High Integrity FOAMBAG™. The design of this product allows a second filling operation to be carried out with a high performance resin specified to suit the application. A strong chemical bond is formed between the bag and the pipe wall allowing it to withstand higher pressures, vibration and shock loadings.

Where two or more High Integrity FOAMBAGS™ are installed, the pipe may be cut through the middle of the bag leaving both pipe ends sealed.

*FOAMBAG™ before and after expansion of the polyurethane foam*

*Right: A fully cured High Integrity FOAMBAG™ with central void injected with high performance resin*

*Typical technique for remotely positioning a FOAMBAG™*



*The FOAMBAG™ is positioned using a flexible nylon umbilical which is later used to deliver the foam. A CCTV camera monitors the exact location of the bag and ensures that full expansion has taken place*



## INTEGRAL FOAMBAG™ KITS

Our 'all-in-one' FOAMBAG™ kits are designed for ease of application on smaller pipes (up to 200mm diameter). The resin foam and hardener are contained within a two-part sealed sachet. By removing the central strip, the resin and hardener can be mixed in preparation for placing inside the outer zipped fabric bag. The bag is then positioned in the pipe with the help of a CCTV camera.

As the foam begins to expand, a knife, contained within the bag, pierces the sachet allowing the foam to fill the inner then outer bag. The foam will usually form a seal within 30 minutes and achieve a full cure in 12 hours.


*An 'all-in-one' FOAMBAG™ kit comprises an outer zipped bag, inner restraining bag, two-part sachet of foam and piercing knife*

## FOAMCAP™

For sealing off the ends of pipes and ducts (even when these have been inserted with a smaller pipe), we supply specially tailored fabric 'caps' which are filled with polyurethane foam.

## CUTTING EQUIPMENT

Steve Vick International provides a circumferential pipe cutting service. Capable of automatically cutting steel, iron, concrete, plastic and other types of pipe up to 1500mm diameter, the machines are driven by hydraulic power allowing the blade to track automatically around the circumference of the pipe wall-underwater if necessary.

Keel Cutters are also available for purchase.

The newest additions to our cutting range is a hand held Window Cutter; capable of cutting sections out of pipes or ducts that have already been inserted with new pipes or cables, and the Rapid Rotary Cutter; a compact circumferential cutter for diameters 4 – 8", both for use on steel or ductile iron pipes.

***NEW** Window Cutter*

*Keel Cutter—Automatic circumferential pipe cutting machine for pipe abandonment and/or diversion*

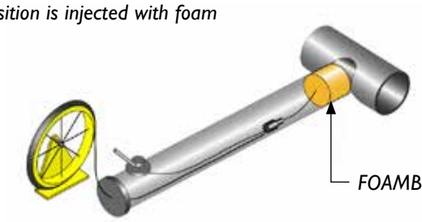
## REMOTE FOAMBAG™ INSTALLATION & BACKFILLING

*Typical example of how a section of pipe adjoining another is sealed off using a FOAMBAG™ contained within a capsule*

**1**

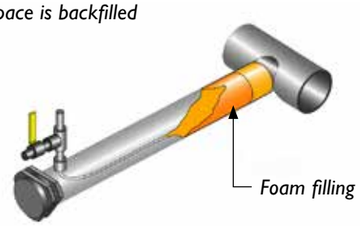

*The FOAMBAG™ in the required position is injected with foam*

**2**



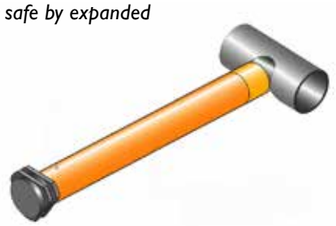

*The camera is removed and the remaining space is backfilled*

**3**




*The redundant section rendered permanently safe by expanded resin*

**4**



# PROJECT REPORTS

## SELLAFIELD NUCLEAR POWER STATION, EFFLUENT TANK REMEDIATION PROGRAMME

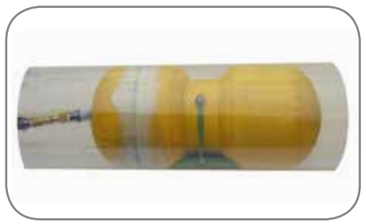
The project involved sealing two redundant sludge and effluent lines connecting the Magnox storage pond to the effluent tank. Due to the potential risk of a hydraulic 'link' between the two, the isolation or sealing of these lines was critical in order to enable work to begin on sludge and effluent removal from the storage pond. The lines were located seven metres under water within the effluent sludge sump and four metres under water within the effluent tank inlet chamber.

Working in conjunction with Corus Process Engineering, SVI installed the High Integrity FOAMBAG™ without the lines having first to be drained of liquor reducing operator dose uptake.

The Sellafield Project Manager involved said "The project was very successful and represents a major risk reduction exercise for the Sellafield site. In terms of safety, the new sealing technique provides the plant with a step change in risk reduction and negates any potential fault scenarious with the effluent and sludge tank systems. "The approach taken on this project", he continued, "will realise an acceleration of the Effluent Tank Remediation Programme of about two years with corresponding cost savings."*

**Source: Process Engineering Online, published 10th March 2008*

*High Integrity FOAMBAG™ filled with expanded foam—fully cured*



*Central void filling with high performance resin via internal injection nozzle*

*Green band appears at the points where the resin has adhered to the pipe*

## CHAPELCROSS NUCLEAR POWER STATION

*One of the 43 redundant chambers which were filled, remotely, using expanding polyurethane foam*

SVI was comissioned to seal off 43 redundant manhole chambers each containing between two and six inlet and outlet pipes of varying sizes. This would secure a drainage system so that a sliplining operation could be carried out further downstream with no risk of flooding or contamination.

SV engineers devised a solution based on several of the company's techniques, taking into account that at no point were the engineers permitted to enter the manhole chambers.

The SV team inserted the fabric bags into the open ended inlet/outlet pipes using a flexible nylon umbilical which also doubled as the foam supply tube., the redundant manhole chambers were filled with the polyurethane foam stopping any egress or ingress of water.

Martin Weeks, Head of Decommissioning Projects at Magnox North, Chapelcross said, "Steve Vick offered us a competitive, engineered solution for our project and they delivered their service within the agreed timescales. We were impressed with the cooperation and flexibility that Steve Vick demonstrated under working arrangements."



## WINFRITH POWER STATION

Steve Vick International were engaged to safely seal off two 180mm underground pipes at Winfrith Nuclear Power Station. The pipes connection pits were, respectively, 43 metres and 28 metres apart. As the pipes ran under a concrete road that would have been costly to dig up and reinstate, it was decided against removing the pipes, preferring instead to completely fill them to prevent any risk of contaminated media running through and escaping.

*Access chamber showing the cured FOAMBAG™ with umbilical tube in place to foam fill entire length of 180mm pipe*

Foam was chosen as the ideal sealing material because of its lightness and, should the pipes need to be dug out at a future time, they could be easily crushed up and disposed of.

FOAMBAG's™ were installed at either end of the pipes creating a dam to prevent the possibility of contaminated material seeping out. Filler tubes were then inserted through the FOAMBAG's™ so that the cavity between could be filled with foam. The entire operation was carried out via access chambers at a safe distance from the pipes.

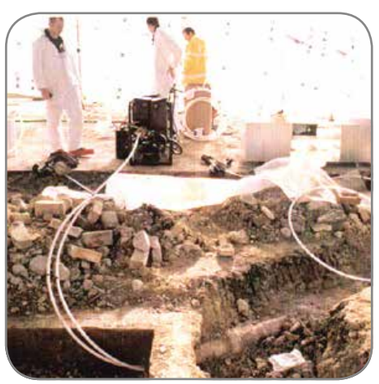
A spokesperson who watched the final trials, said, "We were satisfied that the foam sealing method devised by Steve Vick International would provide us with the long-term security we need on the site."

## UKAEA, HARWELL

This project required Steve Vick International to fill a sump and 3-4 metres of redundant 10mm diameter clay pipe that contained residual contamination from historic operations. SVI technicians made several visits to the site and carried out specific workshop trials. Based on the information gained and on previous experience of similar projects for UKAEA, the project was completed using the FOAMBAG™ technique.

As there was no line of sight in the pipe to be sealed off, Steve Vick technicians deployed CCTV cameras to position four FOAMBAG's™ at strategic positions. The resin foam was then pumped into the bags, via tubes, from a mix-and-inject machine located at a safe distance.

Once the FOAMBAG's™ had cured, the remaining voids in the pipe and sump were filled with foam. Due to the lightness of the cured material, it was then easy for UKAEA operators to break up and remove the abandoned structures.



*SVI Sealing Operations at Harwell*

*Access chamber showing the cured FOAMBAG™ with umbilical tube in place to foam fill entire length of 180mm pipe*

A spokesman for Harwell Projects Department, who witnessed the onsite filling operations, said, "The pipe and sump were both successfully removed following Steve Vick International's work and the hole backfilled. We were very pleased with the job."

# PROJECT REPORTS

## CHAPELCROSS NUCLEAR POWER STATION

SVI was commissioned to design a method of safely removing one metre lengths of ducting without contaminated particles becoming airborne, and to subsequently carry out onsite trails and supply necessary application equipment and sealants. SVI were also responsible for training Sellafield operatives to use the equipment.

The methods devised by SVI involved using the company's patented FOAMBAG™ technique, whereby a specially tailored fabric bag is inserted via an airtight gland system, into a void and injected with a calculated quantity of closed-cell expanding resin foam. The technique was so quick and efficient that exposure times were not an issue.

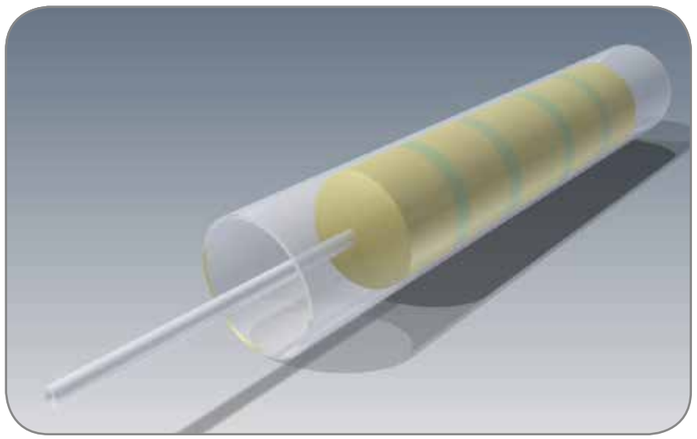
Once the FOAMBAG's had fully expanded and cured, an operative was then able to cut through the ducts at the point of injection. The airtight seal provided by the foam made it safe to remove and transport the pipe.

*A cured SVI FOAMBAG™ in Perspex pipe representing the bespoke application designed for Sellafield, Including air tight valve and gland system.*

## SELLAFIELD NUCLEAR POWER STATION, PIPE SEALING IN HIGH RADIATION AREA

SVI were involved with the decommissioning of a 60 year old First Generations Magnox Storage Pond. The work involved the removal of redundant pipework and cleaning and sealing a contaminated wall.

SVI were responsible for supplying FOAMBAG™ kits to effectively seal off the pipes enabling them to be safely removed. A bespoke robotic arm, supplied by specialist contractors SA Robotics, was used in the application where radiation would pose a significant risk to operatives.



*SVI High Integrity FOAMBAG™ showing high performance resin pockets which provide a secondary seal*

Preparation for the project included the construction of a full scale mock-up of the facility in Whitehaven. This enabled us to test the equipment, techniques and safety of the procedure and to provide a low risk environment in which to train the operatives.

"The operation demanded surgical precision in an industrial context", said Paul Farran, Head of Projects FGMSP. "The completion of this vital piece of work helps us to get on with the job of retrieving nuclear wastes from the pond", he continued.



## HARWELL, FOAM FILL AND SEAL THE BEPO STORAGE BLOCK

Tubes inside the Harwell BEPO storage block were found to contain higher than expected levels of radiation; SVI were approached to find a way of encapsulating any loose contamination so that the storage block could be demolished safely.

This project would prove to be the most technically challenging foaming operation SVI had attempted. Once RSRL gave the go ahead for SVI to design, supply and install a system to fill the storage tubes, SVI worked hand in hand with Aurora Health Physics to install over 250 FOAMBAG™ and FOAMSTOP™ bags.

Commenting on the success of the project, Jon Blackmore, RSRL, Senior Project Manager said "I have been really pleased with the work carried out by Steve Vick International in conjunction with Aurora Health Physics Services Ltd. From our initial discussions, through the trials and on to the implementation, the approach has always been positive and helpful. The way that the various issues that came up during the implementation phase were addressed was great, with practical solutions developed, discussed amongst the project team, and then put into action with minimal fuss."

*Technicians injecting FOAMSTOP™ bags at the BEPO Storage Block—Harwell*

*Fully cured bespoke Foam Caps*

# PROJECT REPORT

## HUNTERSTON A. FOAM FILL AND SEAL THE ACTIVE DRAIN SYSTEM

Back in 2009, Steve Vick International (SVI) was asked by Magnox North to foam fill and seal the redundant active drain system at Chapelcross nuclear power station. The work was carried out to prevent the rainwater and ground water entering the system and becoming active waste. The project was carried out successfully and achieved all of its primary objectives.

Years later, Magnox once again contacted SVI to enquire about the possibility of carrying out a similar operation on some particularly troublesome active drains and chambers at the Hunterston A site in West Kilbride. After a brief site visit it became apparent that SVI technology would once again be a suitable solution to the problem and SVI technicians began designing a suitable Foambag™ system.

In late April 2014 SVI technicians went onsite at Hunterston A to begin the process of sealing the active drain system and its associated manhole chambers around the active effluent treatment area. In just 3 days they were able to seal the annular spaces surrounding the primary active pipe that connected all of the chambers together.

*Access chamber showing where the FOAMBAG's™ were installed in the active drain system, using umbilical line to remotely foam fill entire section*

*Foam filled manhole chamber*

This prevented any ground or rainwater transferring from chamber to chamber and becoming active as well as preventing the flooding of the active effluent building's basement. Once the annular spaces between the primary and secondary containment was sealed, SVI carried out mass void filling of the associated manhole chambers. Technicians used a combination of high density 4:1 and a 10:1 polyurethane closed cell foam which together provided a sturdy, non porous sealing solution to prevent large amounts of water building up within the chambers.



### FOAMBAG™ DEPLOYMENT

Due to the nature of the site, a three man Steve Vick technical team were used to carry out the work. One technician entered the C2 restricted area while the second technician remained outside in the RC area. Both technicians remained under the supervision of an SVI project manager and a Magnox engineer throughout the operation. The technician inside the C2 area was responsible for the positioning of the Foambags™ and the umbilical lines used to fill them. The technician who remained in the RC area was responsible for the operation of the SVI Mix & Inject machine that supplied the mixed foam from a remote distance. The Mix & Inject machine is capable of pumping mixed polyurethane foam over distances of up to 75m and lends itself extremely well to situations regularly encountered on radioactive sites.

*Foam filled manhole chamber with cured foam encapsulating loose debris and sludge*

### CHAMBERS

The chambers themselves still contained a small amount of active water and sludge that could not be removed prior to the operation. To combat this SVI used a 4:1 expanding closed cell PU foam that formed a good base layer of dry foam to build upon. The cured 4:1 foam successfully encapsulated any loose debris and sludge so that a second, third and fourth fill could take place to fully fill the manhole chambers using a 10:1 expanding closed cell PU foam. The largest of the chambers was around 1m³ and was filled to a level above the crown of the highest pipe.

### FOAMBAG™ DESIGN

The patented SVI Foambag™ system proved very well suited for filling not just full bore pipes but annular spaces between primary and secondary lines. A pancake shaped Foambag™ was designed that would allow the foam to take the shape of the annular space as it expanded along the pipe's length.

The system proved itself to be safe, reliable and adaptable to suit any unknown pipe dimensions.

*Manhole chamber filled with expanding PU resin foam with bespoke FOAMBAG's™ remotely installed into active drain system below ground.*

# TESTING

The Steve Vick International Foam products and systems, have passed a 50 year lifecycle test in the gas distribution industry.

The National Nuclear Laboratory has carried out tests on the cured foam used in Steve Vick International's FOAMBAG™ and associated systems and have rated it as having a 8-10 year lifespan in an area with a background radiation level of 7–9Sv.

STEVE VICK INTERNATIONAL

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UVDB Verify empowered by Achilles

ISO 9001 BUREAU VERITAS Certification UKAS

SBWWI

A member of the BRITISH SAFETY COUNCIL

INVESTORS IN PEOPLE

UKSTT

IGEM

Supply Chain Charter for Nuclear Decommissioning Sites Signatory