



**Shepley** Engineers Ltd

# Nuclear Decontamination Services

Part of the Shepley Group



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# Nuclear Decontamination Services

In February 2016 Shepley Engineers Ltd acquired a small specialist company; Nuclear Decontamination Services Ltd, adding a complimentary and expert capability to their existing decommissioning services offer.

Each of our decontamination specialists have over 30 years' experience and delivered more than 200 decontamination and technical projects across the UK's nuclear sites and in the international arena.

We are able to offer the following technical capabilities:

- Decontamination consultancy and strategies.
- 'Hands on' decontamination operation up to C5 and R5 including mechanical methods of decontamination:
  - HP and UHP Water jetting.
  - Wet and dry abrasive blasting.
  - CO2 jetting.
  - Scrabbling and shaving.
- Chemical methods of decontamination:
  - Chemical decontamination.
  - Strippable coatings.
  - Foams and gels.
- Support to POCO studies and operations.
- Pipework and Vessel decontamination as well as pipework blockage removal.
- Sampling operations for characterisation.
- Water jet cold cutting to support hydrogen venting.
- Laser scanning service – for high dose rate and contaminated areas.
- Decontamination tooling concept design.
- Test Rig – Testing and Development for Deployment.
- Test Rig – Trialling of operations/operator training.



# **Nuclear Decontamination** **Services Team**



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**Conner Greaney**  
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# Organisation

Nuclear Decontamination Services

Site Delivery Team  
**Iain Greaney, Kevin Riley, Michael Tait, Conner Greaney**  
NDS Resource  
**Nuclear Specialists - 2**  
**Decontamination Engineers - 2**  
**UHP/HP Water Jetting Technicians - 7**

Fabrication and  
Welding  
**WCEL**

Multi discipline  
support functions  
**CE&I Mechanical**

Test Rig  
Facilities

Design Support  
**ALPHA, WYG, JFN**  
PMP/Safety Case  
**React Engineering**



Supply Chain Support



In-House Capability

## Resource Capability

The resource personnel available to deploy on site decontamination tasks are all SC cleared, they have worked on several nuclear sites across the UK. They are predominantly based on the Sellafield site where we have been delivering the decontamination framework for the Sellafield site since it was first tender externally in 2008. For over 30 years our specialists have developed a reputation for successful delivery and provision of professional advice, giving client teams across the Sellafield site confidence in the solutions and approaches they have developed and deployed. They have an intimate knowledge of the site operations and procedures, which we have found essential to facilitate a pragmatic and efficient way of working. As part of the Shepley group we have an extended array of support disciplines, all of which have extensive nuclear decommissioning experience, these include;- Project Managers, Engineers, safety advisers, E&I, Mechanical fitters, pipefitters and welders, all are SC cleared and experienced nuclear workers.



## Manufacturing Capability

West Cumberland Engineering Ltd is a well-established and experienced manufacturing company focusing on the manufacture and installation of high quality welded fabrications such as process pipework, tanks, vessels, modules, waste containers, condensers and high integrity ductwork, mainly for the nuclear and petrochemical industries. The extensive facilities at our Lillyhall works are also widely utilised for final assembly, mock-ups, testing & familiarisation training prior to the installation of equipment within the live plant environment. We have developed a very flexible and responsive manufacturing service which can be applied across a wide range of task size.

# Case Studies

## FGMSP D-Bay Pumps, Decontamination for Removal

Location:

**FGMSP Legacy Ponds, Sellafield**

Client:

**Sellafield Ltd**

Services Provided:

**Concept Design, Application Methodology, R&D Testing and Project Execution**



### Background Information

Nuclear Decontamination Services (NDS) Specialists were requested by Aktiv on behalf of Sellafield Ltd to assess the viability of cleaning three redundant sludge pumps underwater in FGMSP D bay, using High Pressure (HP) water jetting. A series of non-active trials were undertaken to appraise the performance of an initial concept methodology to clean the sludge pumps. The three redundant pumps had in the past been used to transfer radioactive sludge from D bay. In order to extract these pumps for disposal, there was a need to decontaminate and remove remnant radioactive sludge both external and internal to the pumps. NDS erected a test rig which simulated the restrictive on plant arrangement and this was used to prove the overall concept using high pressure water jetting. The objective was to decontaminate the pumps sufficiently, to allow them to be removed for disposal. Following on from the successful trial work the NDS team then carried out the work on plant; successfully decontaminating the three pumps from ILW down to LLW and suitable for disposal.

### Key Facts

- The pumps were successfully decontaminated from ILW down to LLW for removal and disposal
- The trials proved the water jetting technique and methodology was able to remove the simulant material from both the outside and the majority (approx 95%) of the material inside the pump
- Using industry contacts, were able to source versamag simulant providing excellent Trialling experience and feedback
- Jetting lances were easily deployed through the access port.
- The jetting operations worked effectively at lower than expected pressures underwater.

# Vitrification Plant, Line 3 Decontamination and Clean Up

Location:

**Waste Vitrification Plant Line 3, Sellafield**

Client:

**Sellafield Ltd**

Services Provided:

**Rapid Response, Decontamination, Strategy Consultation & Development, Technical Input, Training of Operatives**

## Background Information

Following a significant contamination event within Waste Vitrification Plant Line 3, the NDS team was brought in to assess the situation and to develop a decontamination strategy. Providing as a rapid response to the issue as part of their Sellafield decontamination framework contract, the NDS team are the first point of call for such events. They have the required technical/specialist capabilities and previous experience to react quickly and efficiently to any contamination incident.

The NDS specialists undertook a number of initial sampling and characterisation operations to determine the extent and levels of contamination in different areas of the plant. With this information and their technical knowledge and experience they were able to develop a systematic approach to decontaminate the different substrate's and items within the facility.

They produced an overall strategy which allowed the plant to be brought back to operational status as quickly and as safely as possible. This included a methodology for tracking & logging decontaminated areas for future clearance and plant restart approval.

While the NDS team were key to the development for the overall strategy for the decontamination of the facility they also took part in 'hands on' decontamination operations to assist in getting the plant back to operational status. In order to achieve this, they also undertook the training of Sellafield and contractor operatives in decontamination techniques and the use of decontamination equipment, speeding up the process.

## Key Facts

- A 'first point of call' during the incident, providing a rapid response that allowed the plant to be assessed and the decontamination strategy to be put in place as quickly as possible.
- NDS trained 70 operators in basic decontamination techniques including rope access teams, significantly reducing the time to get the plant back to operational status.

## HAST11 Coil Capping and Hydrogen Venting

Location:

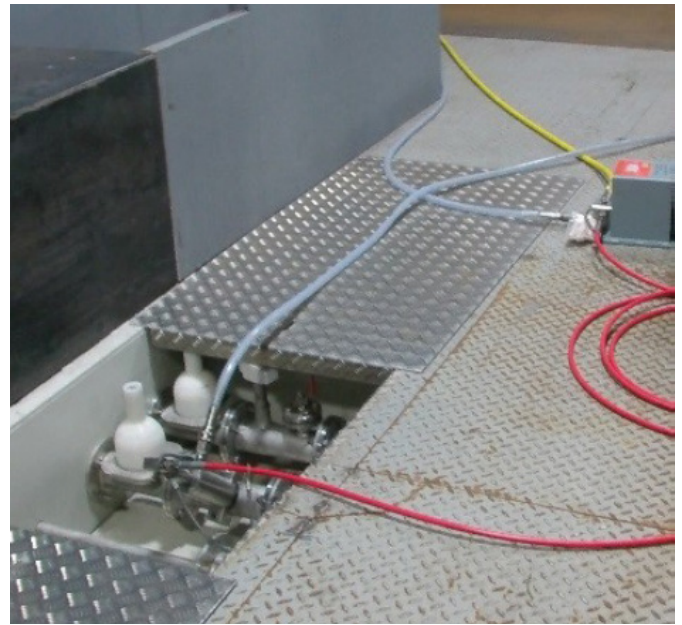
**HALES, Sellafield Site**

Client:

**Sellafield Ltd**

Services Provided:

**Application Methodology, concept design, R&D Testing and Optimisation, Decontamination and Project Execution**



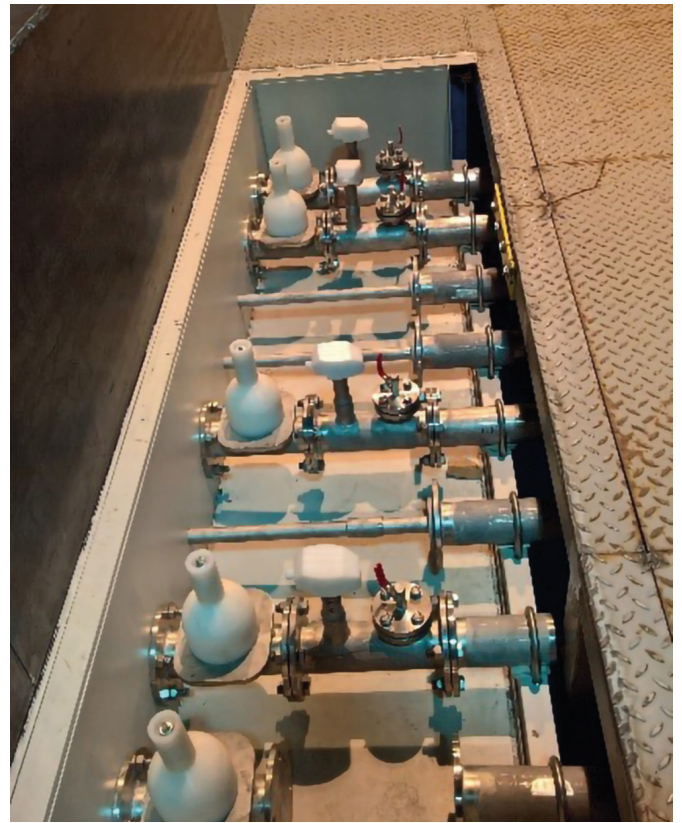
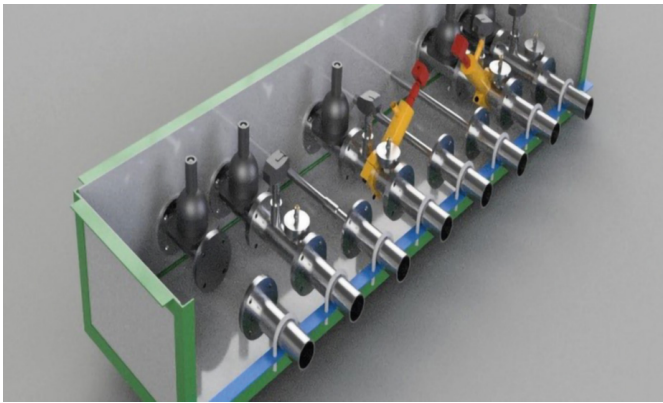
### Background Information

Nuclear Decontamination Services were approached by Sellafield Ltd to develop and optimise the use of Ultra-High Pressure Water Jetting as a method to access and safely vent pipework associated with the HAST 11 cooling coils capping and venting programme of works. Following on from this development work, NDS have been involved in the hands on manual decontamination of the floor box the HAST 11 pipework is located in before deploying the new UHP water jetting system to vent the pipework.

The NDS team designed a bespoke cutting head to clamp onto the HAST 11 pipework which was manufacture and tested. The development was completed on a test rig built at West Cumberland Engineering Ltd Workington facility. This rig was built after first taking onsite laser scans of the floor box and the creation of 3D models to ensure that the pipework represented the onsite conditions. The trialling work allowed for the proof of concept for the use of the designed UHP water jetting cutting head, as well as the optimisation and development of the cutting and venting process. It was also necessary to CE mark the cutting head tool, which was gained successfully.

The floor box was highly contaminated, making access and working conditions extremely difficult. In order to improve access conditions for future welding operations and to ensure a good seal for the UHP cutting head, the entire floorbox underwent a deep clean decontamination process. The team utilized a range of chemical and mechanical decontamination techniques within a tented enclosure, to significantly reduce the contamination levels and improve the working environment.





## Key Facts

- The work was completed successfully and safely while working flexibly outside normal working times to meet customer deadlines.
- NDS offered a complete 'turn key' package, from developing the concept design ideas through trialing, optimisation to the successful onsite deployment in the C3 area.
- NDS developed the specialist Ultra-High Pressure water jetting attachment that can be used to cold cut through the pipe work and safely vent off hydrogen.
- During trialing, the NDS team were able to use their extensive experience and knowledge in UHP water jet cutting, to optimise the cutting head system and reduce the overall development process.

# Sampling and Characterisation of Intermediate Level Waste Inventory

Location:

**Chapelcross Nuclear Power Station**

Client:

**Magnox**

Services Provided:

**Consultancy, Application Methodology, Concept Design, R&D Testing, Project Execution, Sampling and Characterisation**



## Background Information

The Nuclear Decontamination Services Specialists were engaged to undertake a series of sampling and characterisation task at the Chapelcross site as part of the site wide ILW characterisation program. These included the sampling of reactor desiccant driers, pond sludges and the internal resins of a Zeolite pond skip. This sampling work was undertaken while the skip remained in-situ 8 m under water.

Concept tooling was designed and an extensive trialling and test rig development program was conducted using a full scale test rig at our facility in Workington. This proved the methodology and customer acceptance and safety case trials. Once the methodology and tooling had been trialled, the team carried out the underwater sampling of the Zeolite skips. A sample was retrieved and packaged underwater, before the skip was re-sealed.

We also sampled the CO<sub>2</sub> reactor desiccant driers. A specialised blister bag arrangement was positioned by the NDS team wearing a breathing air system. This allowed access on a number of desiccant drier towers to be opened in a controlled and safe manner. The desiccant was then sampled, packaged and sent for analysis and characterisation. Additionally a number of samples of sludges were taken from Skips and sludge detention tanks.

## Key Facts

- All work completed successfully and safely, with all samples collected and packaged.
- NDS developed a successful method for sampling the skips 8m under water, sludge's in the delay tanks and fuel ponds and also sampling the reactor desiccant driers.
- Completed within agreed budget and programme

## Astute Class Submarine Rectification Work

Location:

**BAE Systems,  
Barrow-in-Furness**

Client:

**MoD, Royal Navy**

Services Provided:

**Application Methodology,  
R&D Testing and Project  
Execution**



### Background Information

Nuclear Decontamination Services were approached by BAE Systems Limited to undertake a tranche of work to assess the viability of cleaning two sections of pipe work associated with the astute class submarines vent system. Following initial contact, stakeholder meetings were held with the MOD and Vice Admiral Simon Lister, Head of Submarines for the royal navy; to outline the scope of work. A proposal was put forward by Nuclear Decontamination Services to use Ultra High pressure water jetting to clean the VSB vent system. Due to the possible consequences associated with getting the deployment mechanics wrong, it was advised to develop the deployment methodology on a test rig prior to its deployment on Boat 2 VSB vent system. These inactive trials were undertaken at the BAE System works in Barrow. Following on from the successful development work a methodology was developed and this was subsequently very successfully applied on Boat 2 while in wet dock. The NDS team were also asked to undertake further work on the 3rd, 4th and 6th Astute class submarines, this work was also completed safely and to schedule.

### Key Facts

- The work was completed successfully and safely.
- NDS were able to conceive, develop, test and deploy bespoke equipment quickly producing significant savings in both time and money.
- NDS were able to work flexibly outside normal working times to meet customer deadlines, working 16 hours per day and weekend working to complete the task safely which allowed the customer to meet key project milestones.
- NDS team were able to work flexible on job tasks to enable the work to progress, i.e. assist with the installation of pond equipment.
- The bespoke equipment performed as per trials and produced better than expected cleaning efficiency to meet the delivery criteria.
- The NDS team were highly commended by the Royal Navy, Ministry of Defence and BAE System from whom they received a presentation vase for their services

### Project Leader's Comments

On behalf of BAE, I would like to thank you and your team for the successful completion of the VSB Vent paint removal/rectification. This was another significant milestone following on from the boat 2 rectification work, for which BAE are very appreciative of your support

# Medium Active Salt Free Evaporator (MASFE) Decontamination

Location:

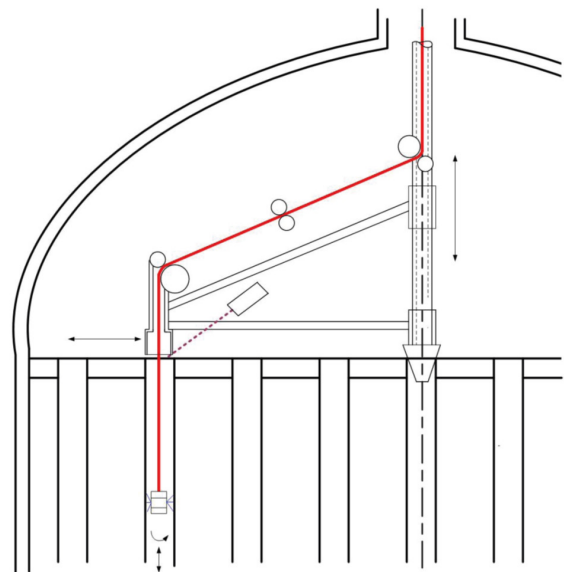
**THORP Reprocessing  
Plant, Sellafield**

Client:

**Sellafield Ltd**

Services Provided:

**Application Methodology,  
R&D Testing and Project  
Execution**



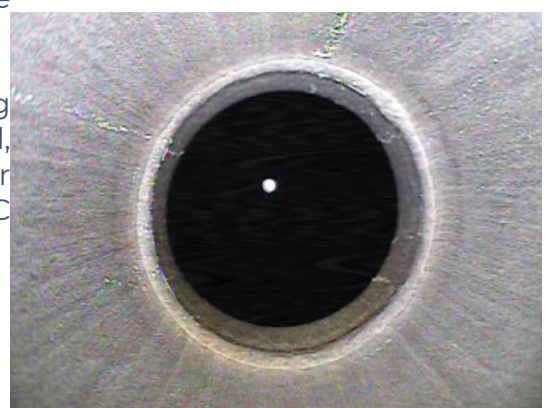
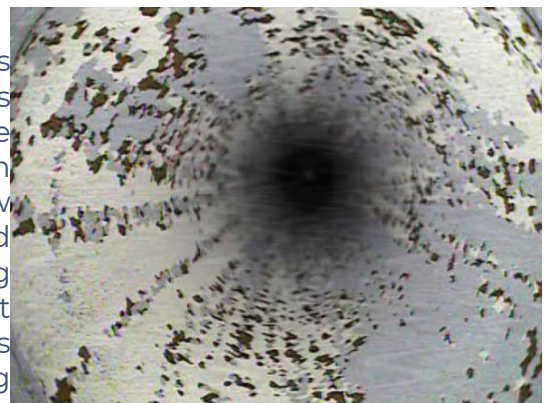
## Background Information

The Thorp MASFE Evaporator requires its evaporator tubes to be cleaned to enable a thorough inspection of the tubes to take place. Nuclear Decontamination Services were contracted by Sellafield Ltd to high pressure water jet clean the internal bores of the evaporator tubes. This was to allow for the detailed inspection of the tubes to take place and also extend the operational life of the evaporator. Cleaning of the evaporator tube internals removes deposits that have built up during past operations. Selective inspections were undertaken both before and after water jet cleaning of the tubes, to allow for comparison in order to assess the cleaning efficiency of the process.

The cleaning process consists of High Pressure water jetting system using a self spinning and propelled jetting head, which is capable of cleaning the bores of the evaporator tubes. The scope of the work requires long periods of PVC working using specialised high pressure water jetting.

## Key Facts

- All the MASFE tubes were successfully cleaned.
- The water jetting equipment and methodology performed well and the jetting equipment was easily deployed.
- No activity was observed in the C3 Enclosure during jetting operations.
- NDS were able to work flexibly and provide non anticipated weekend working at very short notice to enable the work to be completed.



# Peabody Scrubber Decontamination

Location:

**Sellafield**

Client:

**Sellafield Ltd**

Services Provided:

**Consultancy, Application  
Methodology, Concept  
Design, R&D Testing,  
Project Execution**



## Scope - Actinide Removal Plant

The 'Peabody' scrubber column is a stainless-steel fabricated column containing packed beds of ceramic 'Berl saddles'. The column was approximately 3.0m high and diameter 0.45m and with an internal volume of approximately 470L. Various stubs connect into the column at different levels. The column has been used for approximately 30 years to scrub the vessel extract air taken from the Neutraliser and Treatment vessels, situated within the actinide removal flocculation plant. The column is known to be contaminated with alpha activity to levels greater than 20 Kcps.

Chemical decontamination was the preferred technique to decontaminate the scrubber column, but before any decontamination could take place an estimate of the Plutonium and alpha content of the column was required. It was decided the best way to estimate the plutonium content was to take out some of the ceramic 'Berl saddles' from the column and subject them to radiometric analysis. The results of this analysis was used to determine the total plutonium inventory of the column. This information was used by Plant Safety Criticality assessment team to determine if the column could be chemically decontaminated or if it had to be emptied very carefully by hand.

The total plutonium content was deemed as not a critically issue and therefore chemical decontamination was acceptable. Decontamination trials were performed within the active labs on the 'Berl saddles'. Dilute Nitric acid was found to be the best decontamination reagent tested and was compatible with the waste and effluent streams from the plant.

The nitric acid decontaminated the packing saddles to a level which meant they could be safely removed by hand and disposed via the site Low Level Waste (LLW) route. Thus, re-categorising the waste from Plutonium Contaminated Material (PCM) to LLW and the associated saving in disposal costs.

## The Decontamination Process

The Nitric acid decontaminant was pre-diluted in an IBC and was pumped into the scrubber column, using an air operated chemical resistant plastic diaphragm pump.

Stainless steel braided plastic lined flexible hoses were used to deliver the acid to the column and collect the spent contaminated acid. The spent acid was then re-introduced into the reprocessing plant effluent stream at a suitable point upstream for treatment.

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