[Form 2 (to be reported to Committee on Countermeasures for Contaminated Water Treatment and to be disclosed to public)

Technology Information	
Area	4 (Select the number from “Areas of Technologies Requested”)
Title	Technologies for leak repair
Submitted by	UK National Nuclear Laboratory (NNL)

1. Overview of Technologies (features, specification, functions, owners, etc.)

For the management of contaminated water inside buildings at Fukushima, technologies are required to block water inside the buildings, for example water stops. However, there is high radioactivity at the reactor buildings and complicated underground structures that leads to a challenging application for technologies to block water.

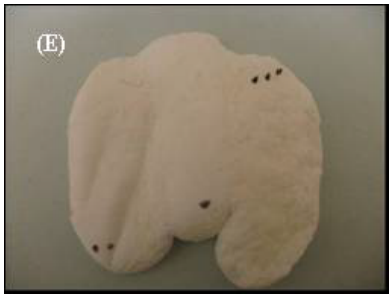
NNL has developed a methodology to investigate and enable leak repair in demanding chemical and radiation environments. This requires an integrated approach involving scientists, engineers, laboratory based experiments and computer models to define both the scope and the engineering and material solution to the problem. Within the nuclear context, there is a great diversity in the specific challenges to leak repair including interactions with chemicals and radiation that can damage the repair and limitations on the engineering in order to minimize the risks of release.

The following represent some examples of the application of these technologies:

Leak repair to radioactive liquor storage tanks

NNL is undertaking development of leak repair technology that is resistant to high radiation fields and strong acids, and can be employed in a cell with limited external access. Technology options under development include partial and full immobilization of leak sites, in the context of corrosion of storage tanks containing high level waste liquor.

Preliminary small-scale laboratory trials have been performed using a bench top test rig and have investigated the sealing ability of water-borne commercially available leak sealants, epoxy resin systems, sodium silicate solution and cement grouts in this application. A range of physical and chemical properties have been investigated, as well as leak sealing performance and durability in radiation fields. These initial trials have shown that some matrices are inappropriate for use in this application (due to difficulties with their application or with their durability within radiation fields) and have identified those matrices most applicable to this application. These matrices are being taken forward for further investigation at the larger scale.

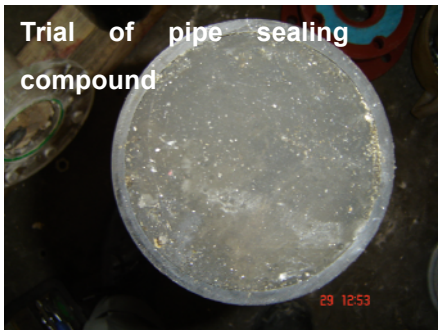


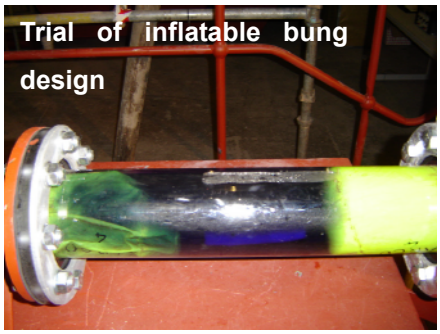
Photographs of sodium silicate samples before (A) and after ageing (E) at a dose rate of 6 $kGyhr^{-1}$.

Methods of protection of freezing damage to critical active pipe work

Heated frost-protection jackets for critical active pipe-work. The design of the jackets was optimised by trialling in order to minimise deployment times in high-dose rate environments.

Compounds and equipment for stemming and sealing pipe-leaks





Measures for rapid wall leak containment

Trialling of wall crack seal plates on test rig.

2. Notes (Please provide following information if possible.)

- Technology readiness level (including cases of application, not limited to nuclear industry, time line for application)

NNL has developed a number of possible technologies at TRL-3 or later for specific leak sealing problems. NNL has the experience and resources necessary to move rapidly from TRL-3 to an engineering solution taking account of the variability of the challenges around leak sealing in nuclear applications.

- Challenges

Sustainability of leak sealing solutions under the chemical conditions experience in nuclear sites and subject to high radiation fields are particular challenges that need to be overcome.

- Others (referential information on patent if any)

【Areas of Technologies Requested】

(1) Accumulation of contaminated water (Storage Tanks, etc.)
(2) Treatment of contaminated water (Tritium, etc.)
(3) Removal of radioactive materials from the seawater in the harbor
(4) Management of contaminated water inside the buildings

(5) Management measures to block groundwater from flowing into the site

(6) Understanding the groundwater flow