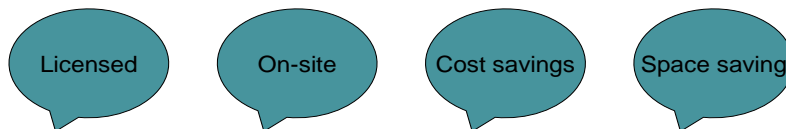
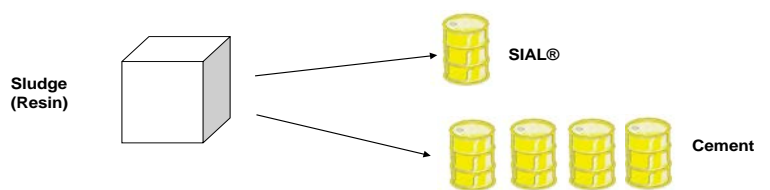


[Form 2 (to be reported to Committee on Countermeasures for Contaminated Water Treatment and to be disclosed to public)]

Technology Information	
Area	2. Treatment of Contaminated Water 3. Removal of Radioactive Materials from Sea Water in the Harbour 4. Management of Contaminated Water inside the Buildings
Title	Encapsulation of Resins, Residues, Contaminated Soils, Sludges, etc Arising from Treatment of Contaminated Water
Submitted by	AMEC
<p>1. <i>Overview of Technology (features, specification, functions, owners, etc.)</i></p> <p>The SIAL[®] Geo-Polymer technology, developed by AMEC has been proven and licensed in Central and Eastern Europe for solidification and in-situ treatment of various radioactive waste streams (containing resins, residues, contaminated soils, sludges etc.) On-site treatment and solidification normally requires the retrieval of wastes from tanks, cells and various contaminated facilities using remotely operated manipulators or specialist retrieval equipment, especially in high radiation/contaminated areas. The waste is then separated from free water and encapsulated into the SIAL[®] matrix and filled into 200 litre drums.</p> <p>The SIAL[®] technology is based on the poly-condensation of waste with inorganic matrix compounds, mainly SiO₂ and Al₂O₃. In the course of immobilization, part of the radionuclides in soluble form is physically-chemically fixed on some compounds of the matrix, the remaining part of the radionuclides present in the insoluble or liquid phase of the waste is encapsulated in the bulk of the matrix.</p> <p>After meeting the requirements for final disposal and consolidation, drums can then be transported for storage or disposal.</p> <p>Principle benefits of SIAL[®]</p> <p>The very attractive advantages and benefits of SIAL[®] are as follows:</p> <ul style="list-style-type: none"> • high compressive strength • low leachability • incombustibility • microbiological stability • thermal stability (cold resistance) • minimum volume contraction • non-toxicity • “sets” (hardens) even under water 	

- does not crack over the long term as cement encapsulants can do especially when holding ion exchange resins
- the equipment used to deploy SIAL[®] is also flexible and versatile. It is mobile and can be taken to the where the waste is located therefore minimises the need to transport loose contaminated materials such as residues, resins, etc to external facilities for treatment
- ideal for encapsulating wastes containing caesium, strontium and transuranics
- operates at room temperature
- **very importantly**, SIAL[®] is efficient in terms of cost and waste loading as it can incorporate four times as much waste as other competing encapsulating matrices such as cement

Encapsulation Technology: SIAL Matrix



Tried and Tested: immobilized approximately 170 tonne of waste with total radioactivity loading of 5.5×10^{12} Bq

18

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

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

The SIAL[®] matrix and technology is technology ready and has been licensed by the Czech State Office for Nuclear Safety (SUJB) and the Nuclear Regulatory Authority of the Slovak Republic (ÚJD). The approvals were received on the basis of suitable properties of final solidification products reported by AMEC for laboratory, part scale and full-scale experiments including industrial applications (especially on highly radioactively contaminated nuclear legacy facilities). It may need to be tailored to specific projects in Japan and we believe it would be very

successful. We would just need to confirm that we could treat recovered strontium and caesium from separated sea water. However, we are confident that this would not be a problem especially when comparing the experience we have of treating more aggressive and problematical wastes.

The following basic and additional parameters were investigated and tested for real waste solidified into this matrix: compression strength, leachability, diffusion coefficients, radiation stability, biodegradability of matrix, distribution and partition coefficients, influence of frost and water presence to the product stability, including long term physical stability in the water, dustiness, time dependence of compression strength and water reduction. The calculation was based on 300 years stability of this product.

In deploying SIAL[®] we have immobilized approximately 270t of waste with a total activity of approximately 6 TBq in various Nuclear Power Plants (NPP) in the Czech Republic and Slovakia.

The process incorporates efficient and economical energy-saving technologies with up to 50% c of dry waste in the final product. Waste can be processed in situ, or in a small facility which can be installed in the processing center. The technology is being successfully operated at NPP Dukovany (Czech Republic), where the international missions WANO and OSART evaluated it as an example of best practice, at NPP A-1 Jaslovske Bohunice (solidification of various type of waste with high contents of Sr-90, Cs-137 , Pu-238, Pu-239, Pu-240 and Am-241) and at other Czech and Slovak NPPs.

Further detailed background and technical information is included in the attached presentation.