

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

Technology Information	
Area	1,4,5,6 (Select the number from "Areas of Technologies Requested")
Title	SUSTAINABLE AND LONG-TERM SEALING
Submitted by	TRIODEV AB (Ltd)
<p>1. Overview of Technologies (features, specification, functions, owners, etc.)</p> <p>Our competence is inside the geotechnical area, but also in building material. The technique to stop leakage of water through cracks, in both soils, rock and concrete have been used, documented and tested in many years. The material we use is a light weight concrete with hydrophobic properties that do not mix with water. With use of cement types with small grain-sizes, even small concrete cracks can be sealed. It is used in rock grouting as well as in soil stabilisation, and together with Vattenfall (a major nuclear plant company) we have a number of projects inside the nuclear plant with documented result.</p> <p>About the material</p> <p>The material is a concrete, made of cement, water, optionally ballast and a special type of surfactant that together with the special mixer creates a material that contains up to 75% of air.</p> <p>The special properties of this material that has an impact on the use of the application mentioned below</p> <p>Hydrophobic – though it contains a lot of water the material does not dissolves in water ones it is ready-mixed. It floats on water, and is possible to cast on water. When grouting, it pushes the water front ahead of itself, or as it has been done in several rock grouting situations, travel with the water-flow to the inner parts of the crack-system, and as displayed before, when the pores with the cement-grains on the surface reaches a narrow crack it collapses leaving a mass with compact cement which hardens and stops the flow / leakage.</p> <p>Compressible – The air is compressible and as this is a big part of the mass, especially in the lighter densities, it gives the same possibility to the mass, it can be compressed and "store" a pressure in for example a grouting situation, so when the valve is closed there still is pressure</p>	

inside the hoses and in the crack system. This gives other possibilities to run a grouting work, you can for example pump in a number of hoses from one pump and let the pressure work in the disconnected hoses.

Pumpability - It is not a liquid nor a gas but a combination, and has a pressure intermediation that is also a combination of them. The result is that the pressure reaches out in the whole grouted volume using much lower pressure gradients and a penetration ability in very small cracks.

One example: In an ordinary cement-grouting they are using constantly about 40-50 bar, when using Senad you can achieve the same result or better already at 8 bar (*normal pressure*) or max 14 bar. In soil-works the normal grouting pressure is 3-5 bar.

Density – The density is naturally directly connected to the air-content. The density is controllable between about 400 up to 2000 kg/m³. In this type of work the density must be even throughout the volume, and in this material the fluctuation is inside $\pm 5\%$ between the batches, most often better.

The density has also an impact on the forms, when using it to cast in forms. When the density is lower naturally the form pressure is lower, though one have to use tighter forms due to the high penetration ability.

In different situations it is important to use a cement which is adapted for the work, when grouting fine cracks one must be able to use the finest cements, sometimes it is more important with fast setting. This material is tested with a number of different cements, which also will influence the produced mass, but seems to be possible to adapt so it does not affect the other special properties.

As with all cement based materials there is the cement-water ratio (wcr) this is very much the same in this material. With this you are able to change the mass thickness and rheology properties, the rheology is also dependent on the type of cement and other possible additives that is possible to use. Besides the density there are other ways of changing the mass to adapt to the conditions at site.

Grouting in general – stopping groundwater and storm water from going through soil and cracks in the rock and flush contaminated particles out of the area. The special properties mentioned earlier makes it possible to apply the grout so that it follows the water flow to where it leaches into the areas. Combining this with a careful pumping of water in selected points when grouting, will guide the grouting to wanted areas.

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

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

This technology is ready to use and also used in similar situations.

See the reference from the Swedish nuclear plant Forsmark in Sweden, and more at <http://triodev.se>

- Challenges

- Others (referential information on patent if any)