

Freeze-Dredging of Radioactive Waste - Dose Savings and Dewatering Potential

Susanne Rostmark¹, Jens Eriksson¹ and Maria Lindberg²

¹FriGeo, Kaserngatan 13 981 37 Kiruna, Sweden

²Studsvik Nuclear AB, 611 82 Nyköping, Sweden

Abstract

The innovative method "Freeze Dredging" is an environmental dredging technique performed by freezing the sediment/sludge and lift it up while frozen.

Radioactive sludge from a cooling pond was retrieved using freeze dredging. The hypothesis is that the method will make considerable time and dose savings during uptake. The two main advantages with Freeze-Dredging are that the material is lifted in a stable form and that the process alters the physical properties of the dredged material. Freezing of soil materials is a complicated process being a combination of a number of physical processes: freezing of pore water within a thermal gradient, cryogenic suction causing water migration and ice formation in the pores causing expansion and inducing frost heave. Structural changes due to increase of effective stress during freezing also take place. The freezing process also alters the structure of the sediment in a way that water is separated from the solids. Therefore, sediment/sludge removed with this technology is possible to dewater to low water content simply by thawing the dredged material under drained conditions.

The system used consists of two different freeze plates 400 x 600 mm and 200 x 200 mm big and a freeze cell of seven freeze units 33 mm, (l) 300 mm. A glycol solution was cooled by a refrigeration plant and distributed to the freeze units through a heat exchanger. The dose and time savings was evaluated by a comparison of similar work being done using hydraulic suction systems.

The use of freeze dredging in retrieval of sludges from ponds and pools as well as for environmental remediation will be described as will the possibilities of sampling in difficult environments by freezing samples instead of scooping them up.