Mechanical and chemical factors influencing the success of stabilisation/solidification of contaminated Norwegian marine sediments for use in land reclamation

Magnus Sparrevik[1]., Espen Eek, Øyvind Kvaalvåg[1], Randi Skirstad Grini[1].

[1] Department of Environmental Engineering, Norwegian Geotechnical Institute (NGI), P.O. Box 3930 Ullevål Stadion, N-0806, Oslo, Norway Phone: +47-2202306
E-mail: msp@ngi.no

Through time, Norwegian fjords and harbour areas have received contaminants from industrial activities and urban run-off. Measures to remediate already contaminated marine sediments and to prevent further pollutant migration are therefore needed. Stabilisation/Solidification technology, S/S, in which the contaminated marine sediments are mixed with cement and other binding agents has shown to be a promising remediation technology. The method decreases the mobility of the contaminants by reducing the leachability and permeability of the material. Stabilisation/solidification technique is advantages since depositing and treating the dredged material in the reclamation area allows improvement of mechanical properties of the material and chemical immobilization in situ.

This paper summarises the main findings from two major studies using six different types of sediments combined with four types of cementious material and eighth different types of additions. The study is a part of a larger research project financed by the Research Council of Norway. The project consists of the following participants: Norcem, NGI, DNV, Rambøll, Skanska and NOAH.

The results are based on experiments with over 100 different combinations of sediment, cement and additions. The stabilised material has been tested for mechanical properties, permeability and leaching behaviour before and after stabilisation. Results indicate that water content and organic content are important factors to control in order to achieve acceptable mechanical strength and reduction in permeability after stabilisation. The leaching potential for metals in the stabilised material is strongly related to available sulphide content and elevated pore water concentrations after stabilisation may be a challenge for sediments with low available sulphide content. An overview over key factors controlling contaminant mobility will be presented.