Development of Mass Stabilisation Technique for Contaminated Sediments

SEDNET, Oslo

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History. The beginning

Mass stabilisation in Veittostensuo 1993

Mass stabilisation of dredged materials in Hamina Harbour 1996
Sörnäinen Strand in Helsinki 1998

Cross section of the coast structure
The pilot project in Trondheim Harbour

The Pilotproject in Trondheim harbour

The Pilotproject in Trondheim harbour

Unconfined compression tests – stabilized sediments

Unconfined Compression Strength (UCS) 14 and 38 days

Future regional deposit

Dredging

Deposit
New Harbour in Vuosaari 2008, Helsinki
Vuosaari Harbour, Mass stabilization of TBT-sediment, 2005-2006
The Importance of Laboratory Tests

Stabilizers:

- Lime
- Cement
- Lime-cement
- Aggregates
- Industrial by-products (fly ash, blast furnace slag, FGD-residue etc.)

Technical, economical and environmental optimizing by careful binder tailoring

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Binders to be used shall be tested beforehand in laboratory (and in field)
Vuosaari Harbour, Mass stabilization of TBT-sediment, 2005-2006

The stabilised TBT clay is deposited as a layer about five metres in thickness on a bearing fill layer. The stabilised layer is covered with a drainage layer and a surface layer, with an asphalt layer on top. The stabilised structure is surrounded by a system of drainage pipes.
Vuosaari Harbour, Mass stabilization of TBT-sediment, 2005-2006

The biggest mass stabilization project in Finland until 2006

Total area ~ 11 hectares
Mean depth was 5 m
Total volume ~ 500 000 m³
Binding agent was cement by Finnsement (CEM II/A-M (S-LL) 42,5 N); 135 kg/sediment-m³; total ~ 70 000 tons
Vuosaari Harbour, Mass stabilization of TBT-sediment, 2005-2006
Valencia in Spain 2005, Mass stabilisation for a container area is ongoing, area of 5 ha
EU-Life Stable project in Turku Harbour
Various applications of mass stabilisation filling constructions

A. Total process stabilisation
B1 Mass stabilisation on the top, max. 6,0 m
B2 Mass stabilisation and vertical drainage
B3 Mass stabilisation and column stabilisation
Stabilisation tests, industrial by-products as binders

Sediment of Aurajoki river

It is very effective and economical to use industrial by-products. In Aurajoki case, the most effective by-products together with cement are coal fly ash plus furnace slag and oil shale ash.

By using industrial by-products, the amount of cement can be reduced from 250 kg/m³ to 50 kg/m³.

Sediment of Perno fairway

In Perno case, utilisation of coal fly ash is very effective and economical.
Laboratory tests of sediments with high water content

A = sediment without binder  B and C = mixtures with various types of binders
The principle of process stabilisation
EU-Life Stable project in Turku Harbour

Prototype of the equipment for process stabilisation

The homogeneity of mass stabilisation compared to process stabilisation

Mass stabilisation in the barge
Treatment equipments

Process stabilisation

Mass stabilisation

Stack mixer
Mass stabilization- Main purposes

- Increase soil strength
- Improve deformation properties
- Remediate contaminated soil
- Save costs (transportation of masses etc)
- Save disposal areas
- Save natural aggregates and rock ballast