Stabilisation/Solidification of sediments and soils, overview of technologies and experience

Stany Pensaert, Process and R&D manager
Peter Van den Bossche, Area Manager DEC Scandinavia

DEC NV (DEME Environmental Contractors)
Haven 1025 - Scheldedijk 30 - B-2070 Zwijndrecht – Belgium
tel: + 32 3 250 52 11
e-mail: pensaert.stany@dredging.com

In the past 15 years DEC has built up a vast experience in the treatment of sediments and polluted soils, and this over various full-scale projects carried out over the whole of Europe.

Two problems are associated with contaminated sediments:

- As the dredged sediments always contain too much water, they are not suitable for reuse. Therefore dewatering and/or stabilisation is a necessary step to render them geotechnically suitable for reuse.
- In addition the sediments, when polluted, can cause major environmental hazard. Depending on the pollutants and the exposure pathway through which they can come into the environment the sediments need treatment prior to be reused.

Last few years DEC has been involved in various projects where contaminated sediments had to be reused. In function of the project specific requirements both experience was built up in the field of 'turning the sediments into stable material' and 'immobilisation of the pollutants'.

turning the sediments into stable materials: stabilisation.

As a first step sediments are often dewatered, as this action increases the geotechnical quality significantly. The dewatering can be done in various ways:

- Lagooning: the sediments are dried in large lagoons by wind and sun, and by regular tilling. This techniques yields the heighest dry matter content (75 to 80 %) and geotechnically good material, but requires a lot of space.
- Mechanical dewatering: the sediments are dewatered e.g. in filter presses or sieve belt presses. The result is cakes with dry matter contents between 55 and 65 %. The geotechnical quality is only sufficient for use as backfill material. The technique has a limited capacity and is not suitable for large quantities.
- Geotube dewatering: the sediments are flocculated and dewatered in large geotextile tubes, where they can consolidate further. Finally the sediment will reach about 50 % dry matter, is still very plastic, but the reinforcement of the geotube textile will give a stable mass.

As an alternative, the sediments can be stabilised immediately without previous dewatering. Most of these stabilisation techniques are based on the addition of cement or other puzzolanic materials, often in combination with absorbing materials.
It is obvious that, if possible, the sediments should be dredged 'as dry as possible' as this will avoid excessive use of additive.

The application of these additives can be done in mixing plants, in lagoons (by means of excavator with mixing head, …). An overview of the applied techniques will be given.

immobilisation of the pollutants.

In order to reduce the environmental impact of the sediments to an acceptable level for reuse, either removal or immobilisation of the pollutants can be aimed for. Removal of pollutants from sediments, in particular for large sediment volumes, is not cost-effective. Therefore DEC worked out various immobilisation recipes in order to fix the pollutants.

In case of heavy metals various possibilities exist to reduce their leachability: control of pH, fixation as sulfide, fixation-coprecipitation on zero-valent iron,… However if possible, the stabilising and the immobilising effect should be combined. This is the case for cement or puzzolanic-based recipes where both the matrix is stabilised, and the heavy metals immobilised.

Experience of DEC with stabilisation/ immobilisation.

DEC will outline various case-studies where S/S technology has been applied. For sediments in particular a technology has been developed and applied for the immobilization of TBT (tributyltin) in order to be able to reuse the sediments.