Case Study Beneficial Use of Sediments

Project	***Dredge Sediments for concrete blocks for jetties***
Classification	*R5A_2013_FR*
Major Function	*Resiliency*
Other Functions	*Raw Material*
Location	*Dunkirk, France*
Volume	*440 m³ of sediment reused*
Technique	*building material – valorization in concrete*
Contaminants	*Main contaminants present: TBT, PCB, heavy metals, PAH's*
Granulometry	*Silty*
Scale	*full scale*
Client	*GPMD: Grand Port Maritime de Dunkerque*
	N/A
Executor	*Consultant: n.a. ; Contractor: Envisan France*
Research program	*N/A*
Contact	*Envisan France, alain.pieters@envisan.com, sofie.herman@envisan.com, +32-477 727 839)*
Status	*Commercial*
Year Start – End	*2013*

Description of the project

In the spring of 2013 the Port of Dunkirk awarded the project for the fabrication of 110 breakwater revetment blocks (4 and 6 m³ volume) to Envisan. These blocks contain contaminated sediments earlier dredged in the Brocqaire channel and the dock 'Darse 6'. Prior to the valorisation of the contaminated sediments as partial replacement of the sand fraction in concrete, the sediments were lagooned and pre-treated with a calcium Sulfoaluminate clinker (CSA) based binders. The concrete was fabricated in the concrete plant of Unibéton based on the formulation of the concrete given by Italcementi. The actual fabrication of the blocs and installation of the blocs on the breakwater of the eastern part of the Dunkirk harbour (Digue des Huttes) was executed in September 2014.

The compression strength of the concrete obtained on full scale was largely above the required strength of 30 MPa. After 28 days the compression strength obtained on all cylindrical test pieces was above 39 MPa (a C30/37 concrete was required). On average between 12 and 20 W% of sediments was used in the concrete blocks which corresponds grosso modo to 0.5 m³ of sediment (in situ/before dredging) per cubic meter of concrete.

Graphical information

Figure 1. Concrete blocks containing contaminated sediments on the 'Digue des Huttes' in Dunkirk (Septembre 2013).

Figure 2. Pretreatment of the sediments: dewatering of sediments by lagooning (left), on site pre-treatment of lagooned sediments with a CSA additive.

Figure 3. Pouring of the concrete blocks

References/web links

1. *Sofie Herman, Alain Pieters, Daphné Glaser, Pascal Gregoire, Christophe Priez, Didier Desmoulin, David Guglielmetti. A lustrum of valorisation of contaminated sediments from the Port of Dunkirk (France). Dredge dikes conference, Rostock 2014.*
2. *Sofie HERMAN , Daphné GLASER, Alain PIETERS, Pascal GREGOIRE, Christophe PRIEZ, Didier DESMOULIN, David GUGLIELMETTI , 2014. Cinq ans de valorisation des sédiments contaminés extraits du Port de Dunkerque (France). XIIIèmes Journées Nationales Génie Côtier – Génie Civil. Dunkerque, 2-4 juillet 2014. http://www.paralia.fr – available online.*
3. *P. Grégoire, S. Herman, and D. Glaser, A. Pieters, M. Vandamme. 2008. Dunkirk project: Dredging and valorisation of contaminated dredged material in the port of Dunkerk- France. CEDA conference. Dredging days 2008.*
4. *Grégoire P., Hermans S., Glaser D., Pieters A. and Van Damme M. 2009. Dredging and valorisation: Treatment of contaminated dredged material in the port of Dunkirk, France Terra et Aqua nr. 117.*