Sediment trend monitoring in the Port of Antwerp

Agnes Heylen[1], Kris De Craene[1], Marc Geens[2], Ingo Sterck[2]

[1]Port of Antwerp, kaai 63, 2030 Antwerp, Belgium
[2]URS Corporation, De Vunt 13, 3220 Holsbeek, Belgium

Phone:+32-(0)3-205-24-02
Email agnes.heylen@haven.antwerpen.be

Phone:+32-(0)3-205-25-95
Email kris.decraene@haven.antwerpen.be

Introduction:
Sediments are an essential part of the dock basins. Furthermore, sediments act as a potential sink for many hazardous chemicals, especially in ports.
In the port of Antwerp, situated in the Flemish Region of Belgium, chemical analyses for the assessment of contaminated sediment are used to determine concentrations of selected hazardous chemicals and consequently compare to the available standards. In 1996 the Port of Antwerp started a monitoring program for the evaluation of the contaminant situation of the sediments in the docks. The latest monitoring round of 2010 is part of the follow-on monitoring program.

Objectives:
The aim of the present work is to give an overview of the results between 1996 and 2010, especially of the latest trend monitoring in 2010. Results, evolutions and special key parameters will be discussed.
More specifically, the project aims to provide answers on the following:

(1) the impact of the various industries operating in the harbour area on the sediment quality and the potential relation between type of industry and quality of the sediment;
(2) the impact of repeated nautical dredging activities on the sediment quality over the years.

Finally, the project will enable the Port of Antwerp to advise on a remediation program that will ensure the sediment quality meets with upcoming environmental legislation regarding the cleanup of contaminated sediments in Flanders.

Methods:
At about 54 to 100 locations, sediments have been sampled between 1996 en 2010.
The samples were collected with a Van Veen grab sampler, mixed and stored at 4°C. Physical parameters such as organic matter, clay content and grain size distribution were determined. The chemical compounds of concern that were selected for analysis at this stage are arsenic, cadmium, chromium, mercury, lead, nickel, zinc, mineral oils, PCB's, PAH's and pesticides. In addition, the project will establish the levels and ecological impacts of some very specific chemicals, including Tributyltin (TBT) and Brominated Flame Retardants (BFRs). The first is a now prohibited biocide that was used as an antifouling paint additive on ship and boat hulls. The latter is a flame retardant, which, although effective in plastics and textile applications, is increasingly limited due to concerns about risks to human health.
The above parameters were chosen in relation to national standards for water (priority substances) and sediments.

Results:
The analytical results of the 2010 monitoring sampling campaign will be compared with various reference and intervention values applicable in Flanders, in order to define the options for future remediation and/or re-use of the sediments. This will enable the Port of Antwerp to estimate the total volumes of contaminated sediments subject to future remediation and as such to estimate the total remediation costs. Based on the results of the trend analysis, recommendations will be provided regarding futures monitoring frequencies, the selection of parameters to be investigated, and the need to focus future monitoring on specific areas of concern in the docks.