

Fortyfive-year sedimentary record of priority pollutants (metals, PAH, PCB) in the Hostivar reservoirs (Prague, the Czech Republic)

Lucie Doležalová¹, Dana Komínková²

¹ CTU in Prague, Faculty. of Civil Engineering, Thákurova 7, 166 29 Praha 6

Phone: +420224354348

² Czech University of Life Science, Faculty of Environmental Sciences, Kamýčká 129, 165 21 Praha 6

E-mail:

lucie.dolezalova@fsv.cvut.cz

Introduction: The paper presents result from the unique collection of the Hostivař reservoir (Prague, the Czech Republic) sediment. The Hostivař Reservoir is the largest dam in Prague. The reservoir performs number of functions, as recreation, flood protection, hydroenergy, etc. It is located on the Botič creek, tributary of the Vltava River in Prague. The reservoir was built in 1959-1963 and the filling was completed in 1964, since it has not been cleaned. Therefore sediment deposited on the bottom may provide information not only about the current pollution, but also about the historical pollution by persistent priority pollutants, as toxic metals, PAHs and PCB. The reservoir was first time completely drained in late summer of 2010 because of planned total sediment dredging. Results show historical load of the sediment by priority pollutants as metals (Cd, Cr, Cu, Ni, Pb, Zn and Al, Fe, Mn), PAHs and PCBs.

Methods: The sampling of the sediment was conducted during winter months when the upper layers of sediments were frozen and in early May, when the upper layers of sediment were dried and partially covered by vegetation. Sampling was performed by a core sampler. Analysis of toxic metals was performed by atomic absorption spectrometry (Solaar S - Flame AAS and Graphite Furnace AAS). PCBs and PAHs content was determined according to accredited methods: PCB - EPA Method 8082 A and PAH - TNV 75 8055 in the laboratory AQUATEST Inc.

Results and discussions: The results show historical load of the sediment by priority pollutants as metals, PAHs and PCB. In the case of metals different trends were observed. While Cd and Pb show decreasing trend, in the case of the other metals the trend was not so clear. The highest concentration of lead was found in the deepest layers of sediment (construction of reservoir). Significant decrease occurred in the second half of the 90's 20th century, it was caused by a gradual reduction until the termination of the addition of lead as an additive to the fuel. In established concentrations of lead, it is well evident how lead was restricted as an additive in fuels in the

Czech Republic. In the case of Ni and Cr high increase was observed in the 90th of 20 century, which may be linked to the higher utilization of these metals in electronics. The concentration of PAHs had shown decrease till the end of 90th, but since an increase has been observed (1980 - construction of panel housing estates for 50 000 inhabitants and affiliates of heating plants. Concentrations of PCB were quite variable, without any trend manifesting changes in load of the environment. Most concentrations of PAHs, PCBs and toxic metals do not exceed the environmental quality standards. Only the concentration of copper in most cases exceeded environmental quality standards. Several samples of sediment were used in chronic toxicity tests that showed their negative effects: reduced growth and decreased activity of the reference organism.

Conclusions: The total amount of 198,000 cubic meters of sediment was removed from the reservoir. This amount of sediment was load by 5,5 t Pb and 37 kg of Cd, 169 kg PAHs and 3,8 kg PCBs. Extracted sediment was used for the construction of natural acoustic wall on the outskirts of Prague. Even the sediment fulfill environmental quality standards such high amount of priority pollutants may cause potential risk to the local environment. Evaluate the horizontal distribution of pollutants is processed in the present. This distribution depends on various conditions of sedimentation. We must know the relationship between the metal content and measures in the watershed. Subsequent works will be focused on the fate of the pollutants, which were exported with sediment for the construction of a noise protection wall.

Acknowledgement: This work was supported by the project SGS12/131/OHK1/2T/11.