Evaluation of heavy metals removal in different municipal sewage works for wastewater treatment and effluent reuse

Tareq Aqhash and Rashed Al-Sa`ed
Institute of Environmental & Water Studies, Birzeit University, POB 14, Birzeit, Palestine,
rsaed@birzeit.edu

ABSTRACT

Heavy metal pollution has become one of the most serious environmental problems today. The treatment of heavy metals is of special concern due to their recalcitrance and persistence in the environment. In addition, heavy metals may pose potential toxic impacts on the operation of wastewater treatment plants, rendering the suitability of treated water for irrigation. In recent years, various methods for heavy metal removal from wastewater have been extensively studied. The toxic elements include the metals cadmium (Cd), lead (Pb), mercury (Hg), zinc (Zn), copper (Cu), and nickel (Ni). The limits for heavy metals pertinent to biosolids and effluent reuse in agricultural sector are included in local Palestinian and regional rules as well as in EU Directive 86/278/EEC.

The removal of heavy metals from the different wastewater streams is vastly studied topic among investigators. Activated sludge process has been used for the heavy metal treatment efficiently by many researchers, since biosolids form good biosorbent for various metals. The exact removal path and fate of different heavy metals in domestic wastewater during the treatment process is still contradictory. To best of our knowledge, what operational problems are resulted from toxic elements due to high concentrations of specific heavy metals are still unknown. How different treatment systems behave under the presence of potentially toxic heavy metals? Lack of local knowledge on the limits of heavy metals and their fate in wastewater treatment warrants further research.

This research proposal explores the efficacy of heavy metals removal in different treatment technologies including large-scale extended aeration systems and one urban membrane bioreactor. The effects of various operational parameters including hydraulic retention time [HRT], sludge age, and wastewater characteristics will be evaluated. The results will help understand the efficiency of activated sludge systems in heavy metals removal, and provide optimized operational conditions, a sustainable wastewater treatment alternative for heavy metal removal, where effluent reuse schemes are planned. The possible impacts on soil and agricultural produce irrigated with heavy metals rich treated water are beyond the scope of this research study.

Keywords: Heavy metals, wastewater treatment, wastewater reuse, soil pollution