



Contribution ID: 55

Type: Poster

Ionizing Radiation as a New Technique for Treating Sewage Wastewater and Sludge in Arid Regions

Wednesday, 26 April 2017 14:15 (2 hours)

The production of sewage water and sludge is continuously increasing as a result of population growth and industrial expansion. Utilization of sewage water and sludge without proper treatment can induce environmental pollution and human health problems. Treated sewage water could be considered as a water resource and treated sludge could be used as organic fertilizer and soil conditioner. This is particularly true in arid region, where water scarcity is a major problem for agriculture and the lack of organic matter and nutrients is the main feature of sandy soil. The reuse of treated sewage water and sludge can solve these problems.

Sewage water and sludge contain several contaminants, e.g. pathogenic organisms, toxic organic pollutants and heavy metals, high nitrate and high BOD & COD. The convention methods of sewage water treatment (primary, secondary, tertiary) are not efficient in removing such contaminants. Sewage water and sludge were exposed to gamma radiation of Co-60 and electron beam of accelerator. Analysis of pathogenic organisms, heavy metals and toxic organic pollutants, before and after irradiation, was performed according to The Standard Methods for the Examination of Water and Wastewater.

Results indicated that ionizing radiation is an effective method in treating sewage water and sludge. The potential effect of radiation includes pathogen disinfection, organic pollutants degradation and soluble heavy metals reduction. The best radiation dose for pathogens disinfection was 1 KGy and 6 KGy for sewage water and sludge, respectively. A reduction in soluble heavy metals was observed in sewage water and sludge as a result of radiation treatment. Degradation of toxic organic pollutants (PAH) in moist sludge reached 79% at 6 KGy gamma radiation dose. Irradiated sludge applied to sandy soil has increased crop yield, improved soil fertility (organic matter and nutrients), improved soil physical and chemical characteristics.

In conclusion, radiation treatment is recommended as an innovative and reliable method to improve sewage water and sludge characteristics.

Country/Organization invited to participate

Egypt

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Session Classification: P-A1

Track Classification: MITIGATING THE IMPACT OF CLIMATE CHANGE