



ELECTRON BEAM APPLICATION FOR STUDIES CARRIED OUT WITH REAL DOMESTIC SEWAGE FROM SAO PAULO WASTEWATER TREATMENT PLANTS

S. I. BORRELY, M. H. O. SAMPA, AND C.L.DUARTE

Nuclear Research Institute –IPEN –CNEN/SP

Radiation Technology Center - CTR

P.O. Box 11049 – CEP 05499-970 - São Paulo BRAZIL

E-mail – sborrely@net.ipen.br

The incompatibility between industrial development and cleaning environment requires intensive search for waste mitigation technology. Since the aquatic resources have been the most impacted from the environments, improvements on wastewater treatment technologies have been considered. The Nuclear Research Institute has dedicated attention to this problem since 1990.

According to the Governmental Sewage Company, SABESP, São Paulo Metropolitan Region, RMSP, is treating 18 cubic meters of sewage per second at five stations. The throughput of each station is: ETE Barueri – 9.5 m³/s; ETE ABC – 3.0 m³/s; ETE São Miguel - 1.5 m³/s; ETE Parque Novo Mundo – 2.5 m³/s and ETE Suzano – 1.5 m³/s[5].

Real effluents from the municipalities have been submitted to electron beam accelerator for different purposes, and using batch system. The samplings were composite and the wastewater were irradiated at Pyrex vessels, 246 mL per sample. The radiation doses were defined by current variation and the energy was fixed in 1.4MeV. The conveyor velocity was 6,72 m/min.. A Dynamitron EBA, 37,5kW was the electron source.

The capability of electron beam for disinfection and for acute toxicity removal was verified and the radiation doses for each situation have already been selected. These data is presented at Table 1. Concerning sewage disinfection studies, electron radiation was applied to influents and effluents from an Australian Lagoon Sewage Treatment System, which has an anaerobic step and an aerobic one. Results demonstrated an average reduction of total coliforms from 4 to 5 cycle log for the influent and > 5 cycle log reduction to the aerobic biological effluent, after 3.0kGy. The same dose applied to the chlorinated final effluent reduced completely the coliforms contamination. When electron beam was applied to residual sludge (16% and 30% solids), 3 to 8 cycle log reduction were obtained with 10,0kGy and 15,0kGy[1,2].

Acute toxicity studies were carried out for sewage, for industrial effluents, for production water (petroleum extraction) and for complex mixture of industrial effluents and sewage. All mentioned types of effluents were selected due to the

associated high toxicity level. Electron radiation was efficient for removing toxicity from the sewage effluents even to that which received hard industrial effluents, although requiring radiation doses > 20kGy. No effectiveness of radiation was noted for produced water.

Table 1 - Wastewater Treatment Facilities whose effluents were submitted to electron radiation, purposes and suggested radiation dose

Station Number	Radiation purpose	Selected radiation dose (kGy)	Reference
01	Organic degradation and colour removal	20,0	6
02	Sewage disinfection (chlorine substitution)	3,0	1 and 2
03.a	Acute toxicity reduction and disinfection	2,0	2 and 4
03.b	Sludge disinfection	6,0	2
04.a	Organics degradation	20,0 and 5,0 (*)	4
04.b	Toxicity evaluation	20,0 and 5,0 (*)	3

(*) Dose dependence on the site where the process could be applied

The efficiency of electron radiation to decrease the toxic charge is a consequence of organic compounds decomposition and good results have been demonstrated. Important is to think about making this technology a reality in terms of costs and enhancing the efficiency.

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