Contribution ID: **161** Type: **Poster**

BIOOXIDATION PROCESS FOR THE TREATMENT OF LIQUID RADIOACIVE WASTE ARISING FROM THE DECOMMISSIONING OF PHORPHORIC ACID PURIFICATION PLANT OF THE GRESIK PETROCHEMICAL INDUSTRIES

Thursday, 26 May 2016 09:00 (4h 30m)

The phosphoric acid purification plant of the Gresik Petrochemical Industries (PAPP-GPI) was operated since February 1989 for uranium recovery from phosphoric acid by two cycle of extraction process using mixed solvent of di-2-ethylhexyl phosphoric acid (D2EHPA) (C16H35O4P) and trioctylphosphine oxide (TOPO) (C24H51OP) in kerosene solution on the weight ratio 4:1:16 for each respectively to obtain the result of pure phosphoric acid and uranium oxide U3O8 or yellow cake. The operation of phosphoric acid purification plant was stopped over 18 years, since 12 August 1989, considering that the facility was contaminated by radiation of uranium and its daughters so the ensure the personnel and public safeties it was necessary to decommosioning the plant by dismantling activity. Decommisioning was performed on 14 October 2004 due to the uneconomically facility operation, unmarketable “yellow-cake” product, the personel and environmental safety consideration, and the wishing of land liberation for the coal project. Decommisioning activities covers the drainning of solution and solid powder of remaining process on the equipment, decontamination of site location and equipment wall, dismantling of equipment, decontamination of equipment after dismantling, and decontamination of concrete floor and wall of building. Before dismantling of equipments, remaining solution of the process and organic liquid radioactive waste were removed from the receiving tank to collecting vessel of treatment at PAPP-GPI area, which has size 14x15x3 m3. The solution in sumpit containing the mixture of raining water and leakage of organic solvent from its tank also to be transfered to the collecting vessel of treatment. The spent chemical solution from decontamination operation as solution of alcohol 80 % in kerosene , phosphoric acid 10 %, and sulfuric acid 10 % for decontamination of equipment where transfer also to the cokkecting vessel. The sollution accumulated in the vessel has the about volume 390 m3, pH 3.48, BOD 2200 ppm, and COD 31500 ppm, activity of alpha and beta are 1200 and 2600 Bq/litre respectivelly. The waste is indicated the category of hazard and poison material containing the organing matters and radionuclides of uranium and its daugthers of Pb-210, Po-210, Ra-226, Th-228, Pu-239, etc. The waste was netralized and treated by biooxidation process using mixture of aerob bacteria of pseudomonas sp, bacillus sp, arthrobacter sp, and aeromonas sp which was performed by aeration and given the nutrision of nitrogen and phosphor. The bacteria grow to prey the organic matters and then multiply rapidly to form the biomass. The organic matters be decomposed to form of CO2 and H2O. The biomass conducts the biosorbtion of radionuclides so that the biomass active sludge and water supernatan be separated . There are detoxification and decontamination of solution. By the continuing of biooxidation process during 54 days was found 365 m3 of the clearence filtrate (liquid of clear solution) with alpha activity 0.4 Bq/litre and beta activity 2 Bq/litre, COD 51 ppm (quality standard 100 ppm), BOD 21 ppm (quality standard 50 ppm), and non-active sludge 14.4 m3, and activity 3.6 m3 with alpha activity 38 Bq/litre and beta activity 1855 Bq/litre. The non-active of filtrate and sludge ware released to the effluent canal of PAF-PKG, where the activity sludge finally was transported to the Center for Radioacive Waste Technology at Serpong to be treated.

Keywords : decontamination, dismantling, decommisioning, biooxidation treatment.

Country or International Organization

Indonesia

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YES

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Session Classification: Session 5A - Poster

Track Classification: Optimizing Waste and Materials Management in Decommissioning