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Characterization and Radiological Safety Assessment of NORMs in Sludge produced in Jubilee Field for storage

NORM in the oil and gas industry can cause external and internal exposure of workers and other persons during and after production as a result of accumulations of gamma emitting radionuclides, particularly during maintenance, transport of waste and contaminated equipment, decontamination of equipment, and the processing and disposal of waste. In this study sludge cleaned and collected from bottom of offspec tank from FPSO Kwame Nkrumah since the start of operations which were to be sent to a facility for management were characterized. Activity concentrations were determined using the following nuclear analytical techniques: alpha spectrometry after radiochemical separation, non-destructive gamma spectrometry and Gross alpha Beta counting. The average activity concentrations of 234U, 235U, 238U, 210Po, 230Th and 232Th by alpha-particle spectrometry and of 226Ra, 228Ra, 228Th, 224Ra, 210Pb, 234Th and 40K by gamma-ray spectrometry were determined in the sludge samples. The activity concentrations of NORMs as characterized in the sludge samples most exceeded the exemption levels and hence could not be exempted from regulatory control. The total annual effective dose to workers was calculated from the measured activity concentrations and found to be above 20 mSv.y-1 the recommended ICRP reference level for occupational exposure control. The estimated values of Raeq, Hex, and Hin were all higher than the recommended acceptable values. The results obtained pose a potential occupational exposure to radioactivity to the workers at the final disposal facility. Hence its storage or disposal should be done in compliance with the necessary clearance criteria to prevent future environmental contamination due to these NORM waste.

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