



Contribution ID: 149

Type: Oral

Monte Carlo Simulation and Experimental Verification of Blockages in Pipelines Using Gamma-Ray Computed Tomography

Wednesday, 26 April 2017 09:20 (20 minutes)

Blockages and material build-up in pipelines are most common problem in many types of process industries, particularly, in petroleum and chemical industries. Partial blockages may impair process plant operation whereas total blockages could lead to a shutdown. Thus, development of non-destructive methods for on-line blockages detection in pipelines is of a prime importance. In this paper, a study on Monte Carlo simulation using Geant4 code package and an experimental work using a newly developed portable gamma-ray computed tomography (CT) system, called "GammaSpider" for detecting blockages in pipeline was conducted.

The Geant4 code package provided various features suitable for simulating the geometry and required parameters of GammaSpider, the results were compared and validated by the experimental data and finally mass attenuation map of various materials was reconstructed in 2D or 3D image. Elements to be implemented in the simulation code include a highly collimated incident beam of 662 keV gamma-rays from Cs-137 radioisotope source, the transmitted radiation after traversing through a cross-section of a 20 cm diameter steel pipe containing process water and a simulated partial blockage (concrete deposit) and the transmitted intensity data were recorded by a collimated sodium iodide (NaI) scintillation detector at many different translation steps (projections) and rotation angles (views). The results of Geant4 simulation permits to optimize experimental parameters of the gamma-ray CT system. This will also provide an improvement in the resolution of the reconstructed tomographic images. Results from Geant4 simulation can be used in planning a test for the routine-used of the GammaSpider system.

Country/Organization invited to participate

Tunisia

Primary author: Ms BEN ABDELOUAHED, Haifa (CNSTN, Tunisia)

Co-author: Mr ABDULLAH, Jaafar (Malaysian Nuclear Agency, Malaysia)

Presenter: Ms BEN ABDELOUAHED, Haifa (CNSTN, Tunisia)

Session Classification: B08

Track Classification: RADIATION TECHNOLOGIES FOR MEASUREMENT