DEVELOPMENT OF A GAMMA RAY COMPUTED TOMOGRAPHY TECHNIQUE FOR RANDOM PACKED COLUMNS ANALYSIS

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For the last years, industrial computed tomography (CT) in Brazil has had its application in non-destructive testing, for scientific studies. Today, the interest of a wide range of industries, such as chemical and oil sectors in the use of computed tomography for multiphase analysis began to appear in large number, for improving design, operation and troubleshooting of industrial processes. Computerized tomography for multiphase processes is now a promising technique and has been studied for advanced research centres. To follow this trend, at the Radiations Technology Center (CTR) of the Energy and Nuclear Research Institute (IPEN-USP), a computed tomography (CT) gamma-ray scanner has been developed for multiphase analysis.

Scanners for transmission tomography employ radiation sources, such as an encapsulated gamma ray source, positioned on one side of the object to be scanned, and one or a set of collimated detectors arranged on the other side. In the scanners of the first generation, one detector facing a single source moves around the object and provides a number of projections. Generally, the objects analyzed in industrial tomography field have high density and large dimensions, consequently, high energy radiation source is required in order to be capable to cross the material. Commonly, a dense detector material or a large detector is necessary to absorb the photons from the source.

In this work, the first generation parallel beam computed tomography (CT) scanner system consisted of a 5.08 cm diameter NaI(Tl) detector and an encapsulated ^{137}Cs radioactive source located opposite to the center of the detector was developed and studied as a tool for the analysis of the spatial distribution of gas, liquid and solid phases in different types of packed columns such as absorption columns to obtain quantitative 2-D images of the phases (solid, gas or liquid) holdup distributions in these devices. This study has demonstrated that the porosity and its spatial distribution in a packed column can be measured with adequate spatial resolution using the gamma ray tomography technique.