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GAMMA COMPUTED LAMINOGRAPHY: A TROUBLESHOOTING TOOL FOR DISTILLATION COLUMNS

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Abstract
An innovative way of performing gamma column scanning was implemented in which the results are presented as a 2 dimensional density plot. Computed laminography is used for image reconstruction using experimentally obtained data to produce a 2D image from 1D projection of the column's interior. Snark14 software, which is used for 2D image reconstruction from 1D projections was used for image reconstruction. A phantom of the object to be reconstructed was designed using the Snark14 input file. A Snark14 input file based on parallel geometry for the source and detector was created according to a specific geometry. The reconstructed image of the phantom was satisfactory and this validated that the proposed geometry could be used in the physical experiment. Preliminary experiments were performed according to the specified geometry and the results are in agreement with the simulation.

Introduction
Malfunctioning in distillation columns can seriously affect plant operations and result in low yield and product quality that will lead to heavy financial losses. When a column behaves abnormally, it is necessary to investigate the distillation column and quickly rectify the problem in order to minimize losses. Gamma column scanning is the most widely used method to troubleshoot industrial equipment in the petrochemical plants. A sealed radiation source and a detector are placed on opposite side of the column and are moved simultaneously along the column and the intensity measurements are used to generate a density profile of the column. To analyse a line profile one needs to have a blend of skills and knowledge, hence the need to find a method of acquiring data and present it in the form of a 2 dimensional (2 D) image of the object being scanned, which is easier and more informative than the line profile. In order to get a 2D image some tomographic reconstruction algorithms have to be implemented. The data collection schematic of figure 1 was adopted and simulation experiments were carried out and the results showed that the proposed data collection geometry is feasible. Physical experiments were performed and the results obtained are very promising.

Methodology
A radiation source was placed on one side of the column and a detector used to measure the attenuation of the beam at different position on the opposite side of the column. The objects to be scanned were inserted into the column. Three physical scans were performed on the concrete block, mild steel pipe and a distillation column with two trays and a standard brick at the bottom. The detector was moved up from the straight through position by 15.0 cm to make an angle of 21 degrees to the horizontal. The detector was then moved in steps of 1.0 cm from 15 cm to -15 cm until 31 detector reading were taken. The source was then moved by 1 cm to a new position down the column in a straight line until 19 source positions were measured as shown in figure 1 above.

Apply to be considered for a student ; award (Yes / No)?

yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

Primary author: CHIRUME, Witness (National University of Science and Technology)

Co-authors: DZINGAI, Caven (NUST); DONGO , Joseph (Nust); BARICHOLO, Peter (NUST); MASHINGAIDZE, Robin (Nust); MUDONO, Stanford (Nust)

Presenter: CHIRUME, Witness (National University of Science and Technology)

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