Experimental device for obtaining calibration factor for the Total Count technique

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Nuclear technologies have widely been used in industrial plants in order to help solve troubles in processes/design or just to obtain information about them. Their unique properties provide real time information about the plant on-stream, without disrupting processes, and this brings - economic benefits. In industrial plants, oil and oil compounds are usually transported in closed pipelines with a circular cross-section. The use of radiotracers in oil transport and processing industrial facilities allows for flowmeter calibration, measurement of mean residence time in column crackings, location of points of obstruction or underground ducts leakage, as well as for the investigation of flow behavior or industrial processes such as the ones in distillation towers. Among the techniques which use radiotracers, the Total Count Technique for Flow Rate Measurement presents the following main advantages: the characteristic of being an absolute technique which only requires a single detector to provide the final result; the independence of the internal volume of the transport pipe; lack of restriction on the nature of the product or material to be conveyed; the fact that it is a noninvasive technique which allows real-time diagnostics. To use the Total Count Technique, knowledge of a geometric calibration factor, Factor ***F*,** is required. This is obtained in a laboratory using an experimental apparatus to faithfully reproduce the geometry of the detection system and the pipeline which is being analyzed and uses the same radiotracer [1]. This report aims to present an experimental apparatus which makes it possible to obtains the factor ***F***, shown in Fig.1. It consists of a 20" long "PVC" pipe with a 2'' diameter, which simulates a transmission line on a stationary regime, where 500 ml of oil was deposited and aliquots (50.00 ± 0.01) μl radiotracer (radionuclide photopeak energy of ^{198}Au 411.8 keV) was added sequentially by using a specific pipette for viscous fluids. The data obtained was analyzed by a detection system composed of detector NaI(Tl) scintillators 2"x2" and a data acquisition system.

Figure 1. Experimental device for obtaining calibration factor *F*.

Fig. 2 shows the graph that relates each concentration with its respective counting.

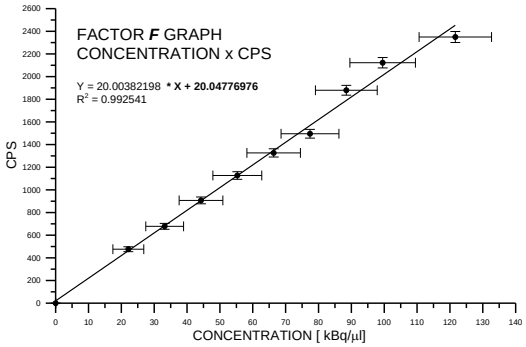

Figure 2. Factor *F* graph.

The slope from the fitted line represents the same value of factor ***F***. Nowadays, the research seeks different geometries that allows for more accuracy of the experimental data [2,3].

References

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