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## Radioisotope Application for Plant and Process Inspection in Petroleum and Petrochemical

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Since discovering of radioisotope materials, scientists and engineers tried to apply them into many ways to take the advantage from its penetration characteristic. This paper aims to introduce its usefulness as an important tool for process investigation in petroleum and petrochemical plants. Mostly, petroleum and petrochemical plants are continuously operating for more than three years per cycle before a turn-around maintenance. During the operation, the malfunction could be possible and may cause the process upset, consequently, the products are out of specification. The applications can be one or more than one of three techniques, i.e. transmission technique, emission technique and back-scattering technique. Mostly, transmission and emission techniques are using gamma rays sources ( $^{60}\text{Co}$  and  $^{137}\text{Cs}$ ) while back-scattering technique used to neutron source ( $^{241}\text{Am-Be}$ ) and thermal neutron detector. The examples of gamma ray applications for transmission technique are pipe-scan, on-steam distillation column scan, scanning of heat exchanger, radiographic testing, and industrial computed tomography. Whereas the emission techniques are using radiotracer for leak detection in heat exchanger, residence time distribution, etc. The examples of neutron backscattering applications are the sludge level in vessel determination, water accumulation in concrete foundation, and water accumulation in thermal insulation materials. The petroleum and petrochemical industries in Thailand have understood the benefits of utilizing these techniques. The result from investigation can be used for preventive and corrective maintenance, process optimization, problem shooting as the result of techniques can identify the location of problem precisely. The usefulness of stated techniques has proven to have significant roles in certain applications which could not be replaced by other inspection techniques.

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