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#5-209 Fast neutron imaging using D-D generator and plastic scintillator.

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Neutron radiography is a powerful non-destructive testing method that employs neutron flux to visualize internal structures and defects in materials. Our research focuses on the use of imaging techniques in combination with a deuterium-deuterium (D-D) neutron generator. The primary technique is neutron defectoscopy utilizing fast neutrons. Main advantage of this method is that it allows us for the visualization of defects that are not visible with other imaging methods, such as X-ray imaging or eddy current imaging. The objective of this paper is to examine the potential of fast neutron defectoscopy utilizing a D-D neutron generator as a compact and efficient neutron source. This paper focuses on the design of the apparatus and the method of obtaining the initial images. Moreover, this paper demonstrates the capability of plastic scintillator detectors in detecting fast neutrons and producing high-resolution images. D-D neutron generators are capable of producing fast neutrons with energies of approximately 2.5 MeV, which are particularly effective in imaging materials with low atomic number and detecting features such as voids, cracks, and corrosion in complex geometries. Furthermore, the utilization of D-D neutron generators presents the additional benefit of a portable and on-demand neutron source, which is particularly advantageous for in-field and real-time inspections. In our laboratory the apparatus consists of the previously mentioned D-D generator, plastic scintillator and an astro camera, which we utilize for imaging. This paper presents the initial findings of our research, which consist of images of an industrial mockup that have been affected by set-up defects. It is possible that these defects may manifest during the operational lifetime of the industrial component. The results of this research will demonstrate the feasibility and potential of fast neutron defectoscopy with D-D neutron generators in industrial applications, particularly in the inspection of high-performance materials and large IV-Gen. reactor components. The results may contribute to the advancement of non-destructive testing techniques for a wide range of industries, particularly those related to nuclear energy, where precision and reliability are of significant importance.

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