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Employing Fast Neutron Radiography (FNR) to determine the Hydraulic Conductivity (k) of sand via Darcy's Law and Gardner's Equation

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This investigation highlights the use of fast neutron radiography as a technique to determine the intrinsic properties of sand with a primary focus being determination of the sand's hydraulic conductivity. The hydraulic conductivity is the ability of the sand to transmit water, the knowledge of which is of importance when planning earth storage leakages and water control structures. The constant head method is applied, using the PTB cyclotron as a fast neutron source and the TRION detection system to image the water absorption. The attenuation of the fast neutrons by water, shows the evolution of the water front with time and from the radiographs the parameters required to determine the hydraulic conductivity are obtained. These parameters are employed into Darcy's law and Gardner's equation for the calculation of the sand's hydraulic conductivity. Fast neutron radiography is shown to yield unique information of the live process of water absorption through sand and the hydraulic conductivity (k) is determined.

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