

Interpreting X-ray Images of Sediment Samples for Offshore Site Investigations

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Offshore site investigations collect a large number of soil samples, commonly sealed in tubes or in wax to preserve the natural moisture content. There is increased interest in running X-rays and CT scans on these samples before geotechnical testing to confirm the sample material, assess the sample quality and to identify material or structures that could have undesirable effects on advanced laboratory tests, such as large gravels. After geotechnical engineers use the X-ray images to specify tests, the images are given a second life by geoscientists looking for evidence of depositional environment and deformation structures that reveal details of the geological history of a site.

In this case study, we evaluate X-ray images from an Offshore Wind Farm site investigation and highlight the benefits to both geotechnical engineers and geoscientists. We acquired X-ray images (radiographs) at three angles: 0°, 45° and 90°, to give a complete, high-resolution view of each sample. We present images of a diverse catalogue of Quaternary sediments, with depositional environments including marine, glaciolacustrine, subglacial and more. Details such as laminations, variations in density, and the size, shape and frequency of gravel all provide clues on depositional environment that geoscientists can use in the development of conceptual ground models.

X-ray imaging, along with CT scanning, is a valuable, non-destructive testing method providing information on sample quality and origin. While geophysical and geotechnical data can be integrated to create quantitative ground models, the geoscientists' contribution in developing the conceptual ground model is perhaps the most fundamental.