Reconstitution Method For Unconsolidated Oil Sand Cores

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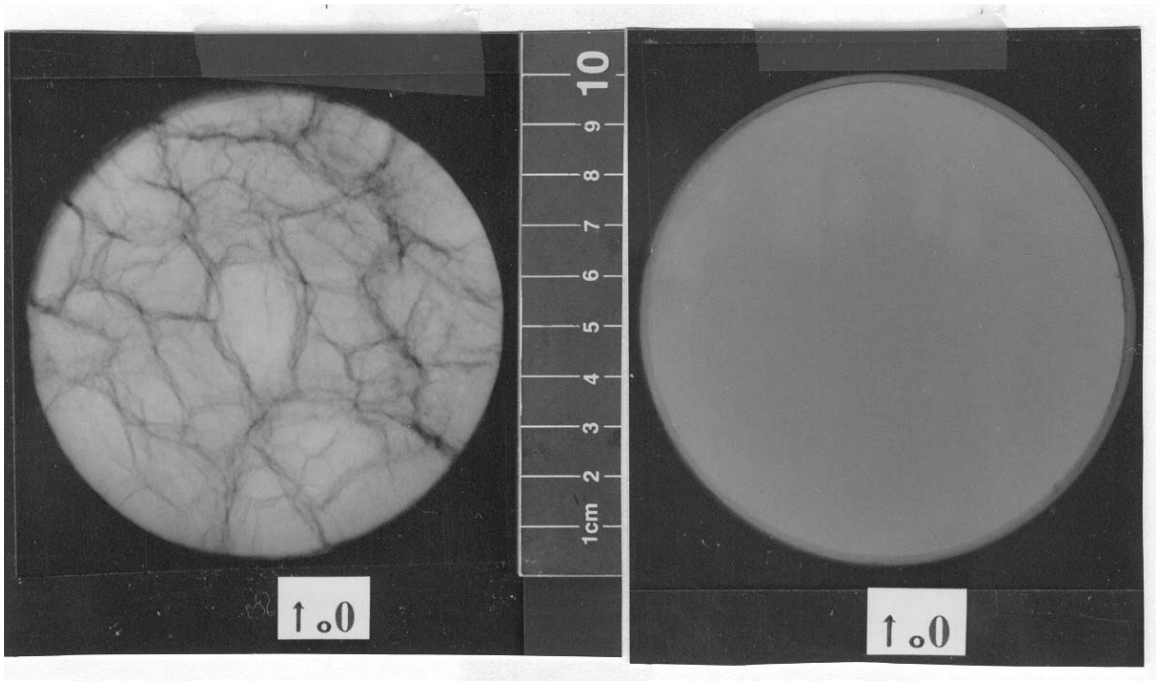
ABSTRACT

Oil sands are unconsolidated, very dense sands with locked structures at grain contacts. These locked structures not only contribute to high resistance in shear strength, but also high tortuosity factor in fluid flow. Hence, in order to obtain representative measurements from hydraulic and geotechnical tests, it is of practical importance to preserve these intact locked structures in undisturbed oil sand cores prior to any testing.

However, oil sands cores tend to expand when these cores are recovered from deep heavy oil formations from drilled wells. Computer tomography scans or X-ray images of these cores show that discrete tensile fractures are induced within the cores (*Fig1a*). Formation of these fractures is attributed to the gas exsolution process in the viscous heavy oil under the overburden stress relief in drilling and retrieval. The core dilation depends on the clearance gap between the internal diameters of the drill bit and sealed core tube.

This paper proposes a recompaction process to reconstitute these disturbed cores to its in situ state (*Fig1b*). Thin sections show that most of the locked structures at the grain contact were preserved. This paper also shows how sample disturbance can affect the measured data using intact and disturbed oil sand samples, and some corrections should be made in data interpretation.

Keywords: oil sand, reconstitution method, sample disturbance, gas exsolution, geotechnical and hydraulic properties



(a) (b)

Figure 1 X-ray images of (a) expanded core, and (b) reconstituted core