

# Digital Rock – Multiphase Flow Through Porous Media

Gaining Insight into Enhanced Oil Recovery by Means of Simulation

*“Our initial results working with the Synopsys Simpleware product have been very positive. We see a real potential in digital rock technology in the Oil & Gas sector, particularly in challenging areas like EOR. In future, we hope to extend our success into new applications (e.g. hydrology) that can take advantage of the powerful features in the Simpleware-TransAT bundle .”*

–Djamel Lakehal, Section Head Advanced Modelling & Simulation at Pöyry

Thanks to:  **PÖYRY**

## At a Glance

- Digital rock methodology optimizes both primary oil production and enhanced oil recovery (EOR)
- Synopsys Simpleware™ software enables simulation-ready meshes to be generated from 2D images of rock samples
- Pöyry's TransAT® CFD provides insights into multiphase flow at the pore level
- Proof-of-concept workflow with sandstone sample demonstrates the efficiency of the method
- Collaboration opens up new possibilities for characterizing porous media in complementary technologies

## Overview

Digital rock technology is based on high-end simulation of pore-scale multiphase flow, a key ingredient in the process of analysis and evaluation of depleted and in-production wells. Digital rock technology serves to optimize primary oil production and characterizes enhanced oil recovery using water, gas, steam, chemicals or CO<sub>2</sub>. The key outcomes of digital rock-intensive simulations include relative permeability, saturation and wettability.

The challenge in conducting such high-end simulations is twofold: (i) clean digitization of the porous media, and (ii) the solution of the multiphase flow equations within the tortuous micro-scale (10-40 Microns) rock patterns, accounting for wettability under very low capillary-number flow conditions (Ca ~ 0.001-0.0001).

Synopsys and Pöyry AMS have recently joined forces to offer a joint solution capable of treating this class of flow for a variety of rock types: sandstone, limestone, etc. Synopsys' Simpleware's™ unique meshing technology based on digitizing millions-of-pixel rock samples is combined with Pöyry's TransAT® CFD, a powerful CFD tool dedicated to capillary-driven multi-fluid flows.

