

**HYSTERESIS OF THE RESISTIVITY INDEX IN  
UNCONSOLIDATED POROUS MEDIUM**

**Jun-Zhi Wei and Ole B. Lile**

Division of Petroleum Engineering and Applied Geophysics

The Norwegian Institute of Technology

University of Trondheim

7034 Trondheim, Norway

**Abstract.** Four-electrode resistivity measurements were conducted on water-wet, oil-wet, and intermediate wet beach sandpacks for 4–5 saturation directions with a steady state flooding procedure. The data from 4 runs indicated that there was a resistivity index hysteresis loop in the  $S_w-I_R$  plot during saturation cycles on each sandpack. The hysteresis behavior substantially depended on the sand surface wettability and saturation history which included saturation sequence and saturation directions. The more oil-wet, the more hysteresis in resistivity index. In the water-wet and middle-wet sandpacks, a moderate hysteresis of the resistivity index was found. In the oil-wet pack, a large hysteresis was demonstrated between saturation and desaturation. The data from the intermediate sandpacks showed that the saturation sequence only influenced the first drainage resistivity index behavior and not the style of the hysteresis loop. The recommendation from this study is that the saturation history influence should be taken into account in laboratory resistivity measurements.