

Analisis Resistivitas Listrik Batuan dalam Mengidentifikasi Karakteristik Reservoir Formasi Ngrayong, Jawa Timur = Electrical Resistivity Analysis of Rocks for Identifying Reservoir Characteristics of the Ngrayong Formation, East Java

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Abstrak

Sifat kelistrikan batuan banyak digunakan dalam mengkarakterisasi batuan reservoir karena kemampuannya dalam mengidentifikasi jenis fluida dan tingkat saturasinya. Penelitian ini bertujuan untuk mengidentifikasi dan menganalisis resistivitas listrik pada sampel batuan yang didapatkan dari pengukuran laboratorium dan perhitungan Digital Rock Physics, serta korelasinya terhadap saturasi air. Penelitian ini menggunakan tiga sampel untuk pengukuran resistivitas listrik yang diinjeksikan larutan brine dengan konsentrasi NaCl sebesar 6% pada tingkat saturasi 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, dan 100%. Sampel tersebut didapatkan dari Formasi Ngrayong, Jawa Timur. Didapatkan nilai porositas berkisar 39,72% - 40,11%. Sedangkan untuk nilai resistivitas berkisar 57,56 m - 12240 m untuk sampel A, 55,02 m - 12206 m untuk sampel B, dan 54,9 m - 9938 m untuk sampel C. Berdasarkan nilai tersebut bahwa nilai resistivitas listrik pada sampel batuan yang didapatkan dari pengukuran laboratorium dan perhitungan Digital Rock Physics saling berkorelasi sangat kuat, ditunjukkan dengan nilai koefisien korelasi diatas 0,9. Hasil menunjukkan bahwa nilai resistivitas listrik batuan dapat dipengaruhi oleh saturasi air. Nilai resistivitas listrik batuan akan semakin turun seiring dengan meningkatnya saturasi air. Nilai resistivitas listrik batuan sudah tidak dipengaruhi oleh saturasi air ketika sudah mencapai titik kritis yang mana nilai resistivitas listrik akan cenderung konstan. Selain itu, hubungan antara resistivitas listrik batuan dengan saturasi air dapat memenuhi Hukum Archie, yang mana nilai a berkisar 0,847 - 1,4404 serta nilai n berkisar 1,571 - 2,356. Melalui penelitian ini, karakterisasi sifat listrik batuan dapat juga dilakukan melalui Digital Rock Physics yang memberikan perkiraan waktu lebih efisien serta hasil identifikasi yang lebih rinci.

.....The electrical properties of rocks are widely used in characterizing reservoir rocks because of their ability to identify fluid types and saturation levels. This study aims to identify and analyze the electrical resistivity of rock samples obtained from laboratory measurements and Digital Rock Physics calculations, as well as their correlation to water saturation. This study used three samples for measuring electrical resistivity which were injected with brine solution with 6% NaCl concentration at saturation levels of 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, and 100%. The sample was obtained from the Ngrayong Formation, East Java. The porosity values obtained ranged from 39.72% - 40.11%. Meanwhile, the resistivity values ranged from 57.56 m - 12240 m for sample A, 55.02 m - 12206 m for sample B, and 54.9 m - 9938 m for sample C. Based on this value, the electrical resistivity values in rock samples obtained from laboratory measurements and Digital Rock Physics calculations are very strongly correlated with each other, indicated by the correlation coefficient value above 0.9. The results show that the electrical resistivity of rocks can be affected by water saturation. The value of the electrical resistivity of the rock will decrease as the water saturation increases. The value of the electrical resistivity of rocks is no longer affected by water saturation when it reaches a critical point where the electrical resistivity value will tend to be constant. In addition, the relationship between the electrical resistivity of rock and water saturation can fulfill Archie's

Law, where the a value ranges from 0.847 - 1.4404 and the n value ranges from 1.571 - 2.356. Through this research, the characterization of the electrical properties of rocks can be solved through Digital Rock Physics which provides more efficient time estimates and more detailed identification results.