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Factors Affecting Special Core Analysis Resistivity Parameters

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Abstract : Laboratory measurements methods were undertaken on core samples selected from three different fields (A, B, and C) from the Nubian Sandstone Formation of the central graben reservoirs in Libya. These measurements were conducted in order to determine the factors which affect resistivity parameters, and to investigate the effect of rock heterogeneity and wettability on these parameters. This included determining the saturation exponent (n) in the laboratory at two stages. The first stage was before wettability measurements were conducted on the samples, and the second stage was after the wettability measurements in order to find any effect on the saturation exponent. Another objective of this work was to quantify experimentally pores and porosity types (macro- and micro-porosity), which have an affect on the electrical properties, by integrating capillary pressure curves with other routine and special core analysis. These experiments were made for the first time to obtain a relation between pore size distribution and saturation exponent n. Changes were observed in the formation resistivity factor and cementation exponent due to ambient conditions and changes of overburden pressure. The cementation exponent also decreased from GHE-5 to GHE-8. Changes were also observed in the saturation exponent (n) and water saturation (Sw) before and after wettability measurement. Samples with an oil-wet tendency have higher irreducible brine saturation and higher Archie saturation exponent values than samples with an uniform water-wet surface. The experimental results indicate that there is a good relation between resistivity and pore type depending on the pore size. When oil begins to penetrate micro-pore systems in measurements of resistivity index versus brine saturation (after wettability measurement), a significant change in slope of the resistivity index relationship occurs.

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