Application of nuclear Magnetic Resonanace (NMR) in Sudan

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Finding and producing oil has been two separate challenges for the Sudan oil industry primarily due to two reasons: 1) Conventional Archie type formation evaluation with fresh formation water of unknown salinity and presence of conductive minerals have made distinction between oil and water difficult. 2) Wide variation in hydrocarbon viscosity or API degree has also made hydrocarbon producibility some what unpredictable to the extent that water is produced where oil was expected and vice versa.

Following the latest development in the field of Wireline conveyed nuclear magnetic resonance fluid type identification, this technique has been used in Sudan for identification of the oil bearing sands independent of formation water salinity and other Archie parameters. The producibility of the sand has also been examined based on the NMR intrinsic permeability and oil viscosity measurement obtained in the same run.

Few examples from this innovative approach in formation evaluation in Sudan are discussed here. There are examples where well test and NMR results closely agree while there are other examples where they do not. The reasons are discussed.

Unlike conventional log analysis where it is widely used by petrophycisits community, NMR is generally less used. Based on the limited examples from Sudan and the lesson learned, it appears that careful and well planned application of this methodology can greatly improve understanding of the reservoir and its fluid content in places where conventional methodology does not provide sufficient sensitivity to oil and water.