

How tight are tight reservoirs: The answer comes from NMR Measurements

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(Figures courtesy EAGE)

Nuclear Magnetic Resonance well logs (NMR) have become standard measurements for petrophysical evaluations in the oil industry. In addition to determining porosity and its bound and free-fluid components, NMR logs have been applied to distinguish pore fluids such as gas, condensate, and high or low viscosity oils. The influence of hydrocarbon type may dominate the behaviour of the T2 relaxation times and unfortunately may interfere with the ability to obtain pore size distributions or permeabilities.

At the same time in the oil industry the research for hydrocarbon is pushed from conventional to unconventional hydrocarbon reservoirs, ranging from deep basin gas reservoirs to continuous oil reservoirs. The main characteristic is, that the areal dimensions can be huge, the hydrocarbon content

(eg porosity) is very low and the natural producibility (eg. permeability) is extremely low or not existent.

Studying these reservoirs is quite difficult, since a lot of conventional methods used in the formation evaluation are not applicable.

On the other hand to successfully produce unconventional reservoirs (eg tight gas reservoirs) stimulation processes have to be applied which need as their input parameters like stress regimes, fracture orientation and aperture, but also conventional parameters like lithology (mineralogy) , porosity and permeability.

To push NMR measurements to its limits, ANDRA, France's agency for radioactive waste management , studying low permeability argillites

(clay rich sedimentary rocks) as potential host formations for radioactive waste, used NMR measurements to measure permeability and pore-size distributions in basically non permeable rock.

These examples are able to show, that also in the oil industry these measurements can be used in extreme conditions.