
Fluid Characterization Using 2-D Plots from NMR Logs in North Kuwait Reservoirs

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This study describes the application of NMR for fluid identification and determination of oil quality in several flank wells of the Raudhatain field. Raudhatain is a giant oil field in northern Kuwait that produces from reservoirs of Cretaceous age. These flank wells penetrated carbonate and sandstone reservoirs containing water, light (29-31 API) and heavier (12-24 API) gravity oil. NMR logs were run in the 2D MR mode enabling acquisition of both the "routine" MR porosity data and additionally fluid diffusion. Diffusion is determined using multiple, simultaneous magnetic field gradients and echo spacings. Analysis of 2D logs is adapted from the often employed log-cross-plotting technique, whereas in this case the axes are multidimensional arrays of fluid diffusivity vs magnetic relaxation spectra. Our 2D plots were analyzed to separate the highly diffusive water from oil, and to estimate oil quality. Oil quality is quantified in terms of viscosity using an accepted T2-viscosity transform. We successfully identified light and heavy oil. Fluid recovered from wireline formation tests samples and production well tests were used to calibrate and confirm the NMR interpretation.
