

Mixed Wetted Carbonate Reservoir: Origins of Mixed Wettability and Affecting Reservoir Properties

I. Matyasik, G. Lesniak, and P. Such

Oil & Gas Institute, Poland

Bryozoan reef buildups show generally good reservoir properties in the Main dolomite sediments. They create single porosity – double permeability, reservoir rocks showing mixed wettability. Mixed wettability is a result of basin history. The main dolomite sediments were sealed very quickly between salt and anhydrite sediments in a scale of the whole basin. So reservoir rocks were also source ones. It caused that residual organic matter is still present in the main dolomite rocks. Reef structures were strongly granulated and washed during sedimentation. Finally these types of reservoir rocks facially form high energetic carbonate sands. These sands are mixed with residual organic matter. Presence of organic matter and its way of mixing are factors affecting wettability of rocks. There are no evident correlation between content of residual organic matter and wettability index. Main role plays a process of mixing carbonate grains and organic matter. Rock Eval analyses and several experiments of sample extractions were conducted to determine a type of organic matter. Additionally, saturation with water under vacuum was applied to indicate a type of oil wet part of pore space. It was shared that oil wet pores occupy the range from the smallest to the greatest pores. Oil and water paths of fluids migration are practically independent. Great part of samples (70) are predominantly oil wet, 17 shows predominant water wetting. There was no pure oil or water wet rocks.

Such type of wettability produces irreducible oil and water in all samples. The content of irreducible oil in the function of capillary pressure was estimated. Also relative permeabilities and residual oil saturations were examined.