

Evaluation of Compatibility between Produced and Injected Waters and Identification of the Causes of Well Plugging in a Southern Tunisian Oilfield

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Abstract : Scale deposition during water injection into aquifer of oil reservoirs is a serious problem experienced in the oil production industry. One of the primary causes of scale formation and injection well plugging is mixing two waters which are incompatible. Considered individually, the waters may be quite stable at system conditions and present no scale problems. However, once they are mixed, reactions between ions dissolved in the individual waters may form insoluble products. The purpose of this study is to identify the causes of well plugging in a southern Tunisian oilfield, where fresh water has been injected into the producing wells to counteract the salinity of the formation waters and inhibit the deposition of halite. X-ray diffraction (XRD) mineralogical analysis has been carried out on scale samples collected from the blocked well. Two samples collected from both formation water and injected water were analysed using inductively coupled plasma atomic emission spectroscopy, ion chromatography and other standard laboratory techniques. The results of complete waters analysis were the typical input parameters, to determine scaling tendency. Saturation indices values related to CaCO_3 , CaSO_4 , BaSO_4 and SrSO_4 scales were calculated for the water mixtures at different share, under various conditions of temperature, using a computerized scale prediction model. The compatibility study results showed that mixing the two waters tends to increase the probability of barite deposition. XRD analysis confirmed the compatibility study results, since it proved that the analysed deposits consisted predominantly of barite with minor galena. At the studied temperatures conditions, the tendency for barite scale is significantly increasing with the increase of fresh water share in the mixture. The future scale inhibition and removal strategies to be implemented in the concerned oilfield are being derived in a large part from the results of the present study.

Keywords : compatibility study, produced water, scaling, water injection

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