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The Technology of Magnetic Subs for Downhole Inorganic Scale Mitigation

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Abstract : Inorganic scale is a relevant cause for production losses in offshore operations. In the development of pre-salt fields calcium carbonate crystallization, especially when the flow is submitted to abrupt depressurization, often cause problems in reservoir selectivity and production string obstruction. The conventional strategy for this kind of problem is to continuously inject chemicals to prevent precipitation. The low reliability of injection devices, which frequently fail, and the possibility of adopting downhole completion configurations which do not allow injection at the lower zones stimulated the industry to search for alternative mitigation strategies. The use of magnetic fields to help in minimizing the adhesion of calcium carbonate crystals to downhole surfaces. The proposed mechanisms include the effect of the magnetic field in generating fewer adhesive polymorphs (vaterite) in relation to the more stable ones (calcite). A discussion on this topic has been widely addressed in the literature. The goal of the present article is to describe the construction of real scale prototypes of a magnetic sub, a device to be attached to the production string to generate the necessary magnetic field to achieve the scale mitigation requirements. The strategy for magnetic and mechanical design is described. In addition, a protocol to establish the strategy for field installation in a field development project is detailed. The focus is to equip a given well with several subs and compare the production records with a correlation well with no subs installed. Finally, an update of the status of field installations is presented, with the proposed evaluation methodology customized for each field.

Keywords : magnetic subs, downhole, scale, inorganic, mitigation
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