Stiff Foam Drilling in High Loss Formation - A Field Case Study

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In our geological area it is a common fact to encounter formations while drilling; which are subnormally pressured, cavernous/vugular or extremely porous. In the lithological section of our field case study within two formations sequentially, highly vugular carbonates were foreseen. It has also been practised dramatically that curing losses in these formations with the usage of LCM pills or cement plugs are mostly ineffectual. As a result, total losses had occurred a while after reaching a hydrostatic pressure more than maximum allowable pore pressure during drilling with a conventional mud. Underbalanced drilling methods employs drilling fluids of dry air, gas, mist, foam and aerated mud. Among the existing low-density fluids in underbalanced drilling, stiff foam drilling is used in our case study due to many reasons. Foam drilling consists of a surfactant and air. But, stiff foam is constituted with an addition of a propping agent such as a polymer etc. In conjunction with a foaming agent, low polymer concentration provides the effective viscosity to maintain required cuttings transport capacity. The stiff foam results in a lower energy requirement and lower annular velocities as compared to mist or air drilling which was essential in our case due to drilling up to 3000 ft open hole well. This field case study covers the necessities of the application, the procedures and process which are followed, the hydraulics model calculations, the problems encountered while drilling and the proof of the success via the comparison of cost analysis against a former well having similar sections.

Keywords: Underbalanced drilling, stiff foam, foam hydraulics