

FEA Modelling of Expandable Sand Screens Interactions with Rock Formations

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Abstract: Expandable sand screens are a sand control system, which is used to control the ingress of solids in oil and gas reservoirs with weak and unconsolidated formations. There are two different variations of expandable screens; a system based on a slotted basepipe which are easy to expand compliant to the formation but is relatively low in strength and a system based on a drilled basepipe which is very strong but is more difficult to expand compliantly.

FEA has been used to model the slotted basepipe type to better understand the interaction of the expanded screen with the rock formations. Initially the entire structure of the screen was modelled and the results compared to physical test data. The simulations fitted the test data very well, with run times of the order of a few hours depending on details of the simulation. The full simulations were adequate for research purposes but for routine screening of applications the models were simplified. An equivalent representation of the screen was developed to match the gross behaviour of the screen in terms of stiffness and yield. This approach was very computationally efficient and allowed rapid investigation of formation screen interactions.

The model was used to study the effects of formation screen interactions in inclined wellbores, through multiple rock layers. The model is also routinely used to study new applications for potential problems.

Keywords: include Geomechanics, Soil-Structure Interaction and Wellbore

1. Introduction

Expandable sand screens (ESS[™]) are a relatively new sand control product with approximately 800 installations worldwide over all vendors. They come in 2 different types; either a system based on a slotted basepipe or a system based on a drilled basepipe. The slotted basepipe system is the most common, with around 600 installations since 1997. The advantage of the slotted basepipe system is that it is relatively easy to expand into full contact with a wellbore which typically varies in shape and diameter, to give a truly compliant system. This has advantages both in well productivity, sand retention capability and reliability (Hembling et al 2008). The drilled basepipe

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