FEA Modelling of Expandable Sand Screens

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Abstract: Expandable sand screens are a relatively novel sand control system, which are used to control the ingress of solids in oil and gas reservoirs with weak and unconsolidated formations. They combine the ease of installation of conventional screens with the borehole support of a gravel pack.

There are two different variations of expandable screens; a system based on a slotted basepipe which are easy to expand but relatively low in strength and a system based on a drilled basepipe which are very strong but difficult to expand.

FEA has been used to model the slotted basepipe type to better understand the interaction of the expanded screen with the rock formations. This type of analysis has replaced earlier, simple analytical, models based on tunneling theory. There are many advantages to using FEA. It allows a better choice of material models for the rock such as Drucker Prager and Cap models. It also allows the investigation of a wider range of configurations, such as the effect of an annulus or the interfaces between different formations.

The results from the FEA modeling compares favorably with data from earlier, large scale, experiments. This satisfactory outcome increases confidence in the modeling and has allowed us to design models for field applications.

Keywords: Constitutive Model, Critical State Plasticity, Design Optimization, Experimental Verification, Geomechanics, Wellbore.

1. Introduction

Expandable sand screens (ESS®) are a relatively new sand control system (Metcalfe, 1999). They are used to control the ingress of sand in oil, gas and water wells in reservoirs with weak and unconsolidated formations. The sand is produced due to rock failure as a consequence of the changes in in-situ stress over the life cycle of the well.

There are many different strategies available to control produced sand downhole. They range from the very simple, such as reducing production rate, to more complex mechanical restraint of

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