# Finite Element Analysis of Weatherford Expandable Sand Screen Products

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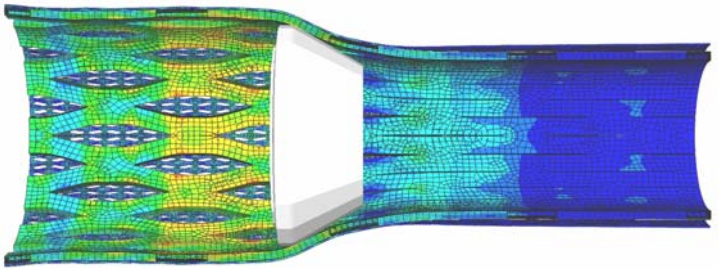
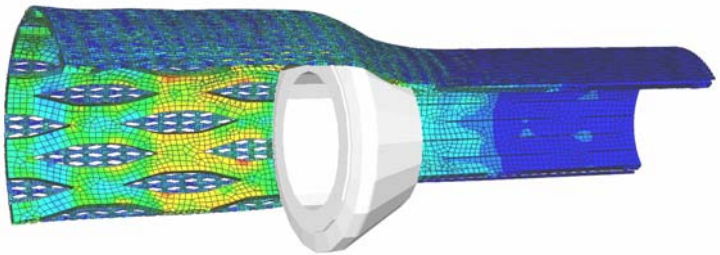
Expandable sand screens (ESS) are a relatively novel sand control system, which are used to control the ingress of solids in oil and gas reservoirs with weak and unconsolidated formations. They combine the ease of installation of conventional screens with the borehole support of a gravel pack.
FEA has been used to model slotted basepipe ESS to better understand the interaction of the expanded screen with the rock formations. This type of analysis will eventually replace 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.
This work is ongoing, recent results are presented below.

## Cone expansion showing surplus expansion





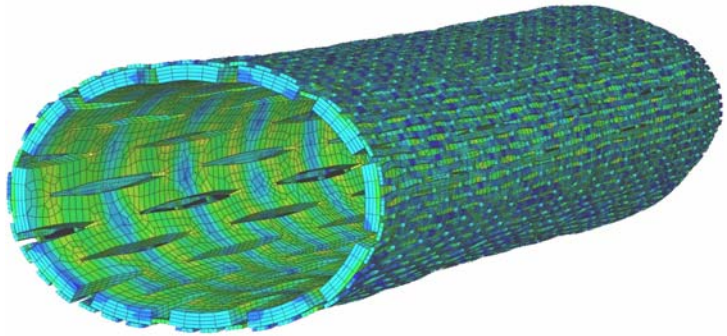
A cone style expansion tool is currently used within FEA, this gives good results when compared with empirical testing. A long term goal will be to also model the compliant expansion tools.

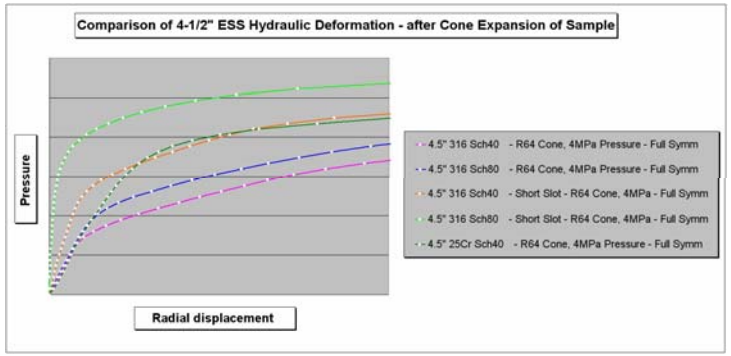
## Prediction of hydraulic collapse strength

Using FEA gives greater understanding of required expansion forces and deformation resistance.

It gives the ability to quickly assess various slot patterns, wall thicknesses and different metallurgies.

The prime consideration being ability to expand and resistance to deformation. This can be quickly established with FEA and the designs optimised prior to verification by testing.

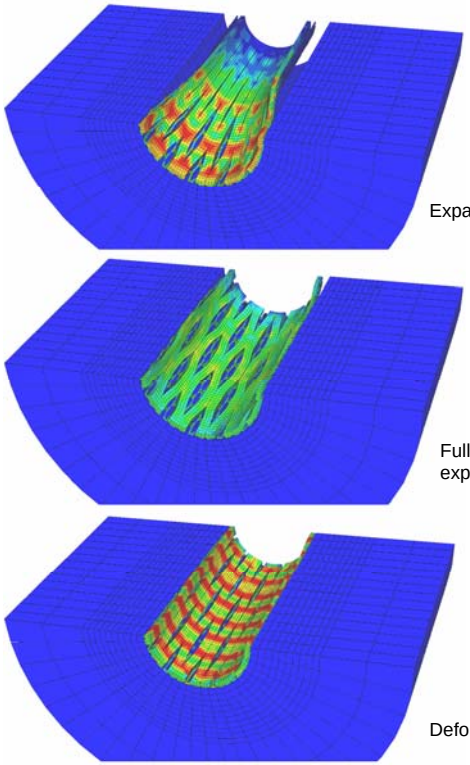





From the graph above, it can be seen that a 25Cr version of ESS would give the best deformation resistance, followed by the standard metallurgy, standard basepipe but with shorter slots. However, the required expansion forces for the 25Cr version are too high. The next strongest variation has an expansion force that is similar to the current ESS design.

## Large scale TWC experiments

Deformation simulations that include expansion of the ESS followed by collapse due to rock screen interactions have also been performed; this demonstrates the greater deformation resistance of the combined ESS/well bore with a huge increase in system collapse strength. These compare favourably to large scale testing on the ESS in rock cylinders. The predicted and measured deformations are comparable, within the uncertainties of the inputs.




**Future work;**
The next stage of the development is to use the FEA modelling for field qualification of ESS applications