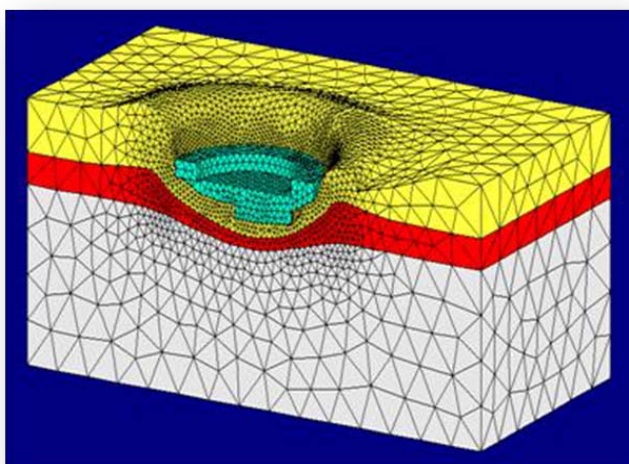


Project results join up the dots to maximise value from reservoirs

Many people in the upstream oil and gas industry will know that better integration between disciplines such as petroleum engineering, geology, geophysics, and geomechanics is required to achieve maximum value from reservoirs.

A joint industry project that aimed to improve integration of these disciplines was completed earlier this year and the results are now being applied by a number of major operating companies to address issues such as long-term well bore stability and the impact of fault reactivation on fluid flow.

The project, called “IPEGG”, received support from four operating companies following submission to an ITF call for proposals. It brought together expertise in reservoir deformation and fluid flow at the University of Leeds, the seismology group at Bristol University, and Rockfield Software Ltd – a Swansea-based company that specialises in advanced numerical analysis for geomechanical applications.



Geomechanics has, in recent years, emerged as an important area for the oil and gas industry because of the need to extract petroleum from challenging environments such as deep water, high temperature-high pressure, or structurally complex fields, as well as the requirement to drill through depleted reservoirs to extract bypassed reserves. Many reservoirs experience significant

compaction during petroleum extraction, which can lead to problems such as sea floor subsidence, and can dramatically alter reservoir permeability and create a redistribution of reservoir stresses. These geomechanical-related problems are not easily addressed by the conventional software tools used by petroleum engineers.

IPEGG aimed to create software that coupled Rockfield’s finite element-based geomechanical modelling software, ELFEN, to industry-standard production simulation

models and then use the output to estimate a range of seismic attributes. The hope is that this advanced modelling tool can eventually be used by non-specialists both to improve the accuracy of day-to-day tasks such as predicting the feasibility of 4D seismic surveys, and to address problems that have so far proven difficult for the industry such as predicting fault stability during production.

Quentin Fisher, Professor of Petroleum Geoengineering, at the University of Leeds, explains what the project has achieved: "IPEGG was probably the most challenging project that any of the researchers involved have worked on. As well as creating software to couple ELFEN to the various production simulation models, we had to undertake a great deal of background research to fill in many of the knowledge gaps that exist between the various disciplines. By the end of the project we had not only successfully coupled ELFEN to a full field production simulation model, but also used the software to address some exciting research areas".

The project partners hope that their work will be applied to a range of issues including prediction of the effect of production on fault reactivation; optimising mud weights and wellbore trajectories; enhancing production simulation modelling in stress sensitive reservoirs; estimating whether and when to undertake 4D seismic surveys and estimating the optimal timing for the drilling of undepleted reservoirs.

Prof Fisher continued "An outcome of the project that particularly pleases me is that it has increased choice in petroleum-related software and consultancy, with Rockfield's ELFEN software now being used by a large number of major petroleum companies. In addition, the relationship established between Leeds, Bristol and Rockfield is continuing - we have recently established a new project that is applying the technology developed during IPEGG to improve production from tight gas sandstone reservoirs. We are also planning to use the coupled software to assess potential leakage from CO₂ storage sites and to assess the use of seismic tools for monitoring CO₂ movement in the subsurface".

ITF technology analyst Colin Sanderson added "One of the things that ITF has tried to encourage is the formation of consortia with world class expertise to tackle fundamental industry issues. This project, is a good example of how well this approach can work – it has brought together people that not only have an excellent track record of rapidly applying research findings to meet the needs of industry but also have experience bringing software packages to the market place".

For more information about the IPEGG project and related work contact Prof Quentin Fisher
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