Overcoming structurally complex reservoirs

In a bid to understand how operators could maximise recovery from complex reservoirs structures around the world, ITF worked collaboratively with its member companies to conduct a major research programme.

The Requirement: Many of the world's remaining hydrocarbon reserves, including those in the North Sea, are contained in structurally complex and compartmentalised reservoirs. To maximise recovery, an understanding of the nature of the faults and fractures and of the fluid flow within these structures is critical.

The Solution:

To help the industry's understanding in this area, ITF initiated a major research programme in conjunction with its member companies. Five consortia, based in universities across Europe and North America, worked on interlinked topics over a three year project period to establish information that could help operators recover hydrocarbons from complex reservoir structures around the world.

The Method:

One of the projects addressed the flow of hydrocarbons within faulted turbidite reservoirs and the subsequent impact on reservoir production. Turbidite sediments form one of the most common deepwater reservoir types. The consortium was led by the Fault Analysis Group, University College Dublin (UCD), working with the Marine and Petroleum Geology Group, UCD and the Institute of Geological and Nuclear Sciences (New Zealand) as research partners.

The main study area for the project was in New Zealand's Taranaki basin, a classic turbidite succession which is exposed along kilometres of sea cliffs, and hosts two producing reservoirs on land. This geological outcrop offered a unique opportunity to walk around a real 3D structure, and gather data that could be used to produce models. These models are now generating significant value in understanding Atlantic Frontier geology - from northern Norway, through west of Shetland and all the way down the West African coast, as well as other promising deepwater oil and gas provinces.

Implementation:

With these projects now complete, results are being made available either as commercial software packages or knowledge that is being embedded in companies' internal workflows.

The Outcomes:

The most important outcome of the project has been a much improved understanding of flow within faulted turbidites, partly arising from the development of a combined modelling scheme for faults and sediments that is now embodied in prototype software. Not only does the scheme incorporate novel approaches to aspects of fault modelling, it also includes a very innovative approach to sedimentological modelling. The modelling software is now providing quantitative predictions of the flow connectivity of faulted turbidite reservoirs.

Following the success of this work, sponsoring companies committed to a follow-on project. This will address the application of the existing modelling scheme to the assets of sponsors and to further develop these methodologies to the point where flow properties can be accurately, and routinely, incorporated into reservoir simulations.

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