

The Leading Edge Today

The leading edge today is, to my mind, epitomised by what the industry is achieving in subsurface imaging and visualisation.

Better and better reservoir understanding has pushed deviated drilling limits to many kilometres, based on reservoir top predictions of the order of plus or minus a few feet. The Engineers can drill with this accuracy and increasingly subsurface description allows them to do it effectively.

Fig 2

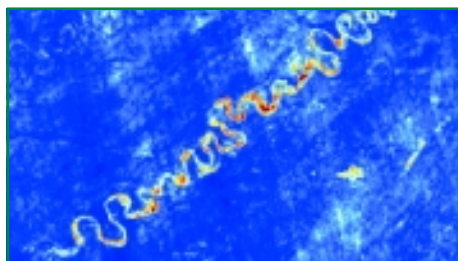


Fig 2 is an image from Angola where exploration success rate, rapid cycle time from new Province discovery to first oil, and the mapping of reservoir, fluid and connectivity are all at the leading edge of our industry. The image shows an outstandingly clear channel system, one of many stacked vertically to make the giant fields offshore Angola. Of course, this is a single static

snap-shot, but it is a good one,..... imagine developing this reservoir without this definition.

Fig 3

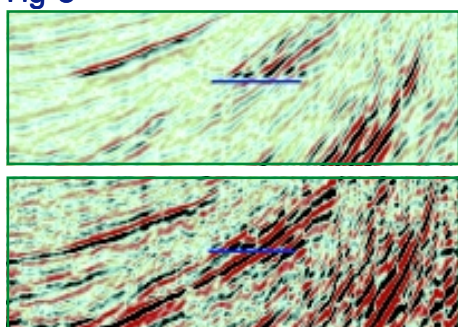
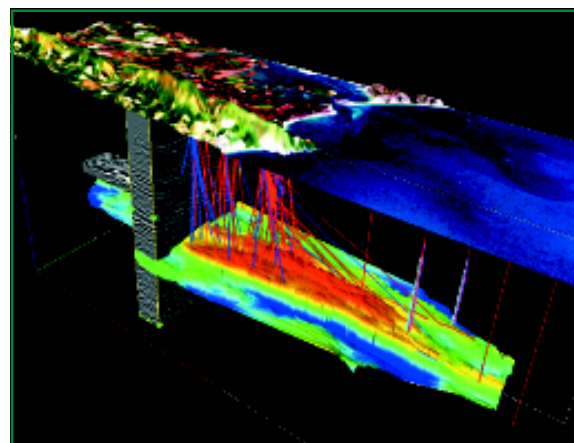


Fig 3, Secondly, we are able to take this seismic and see 4 fluids, their contacts and sand and shale variations. So not only can we see sand body geometry we can see the fluids in the sand. This is the reason for the almost 100% exploration success in the Angola Deepwater play.

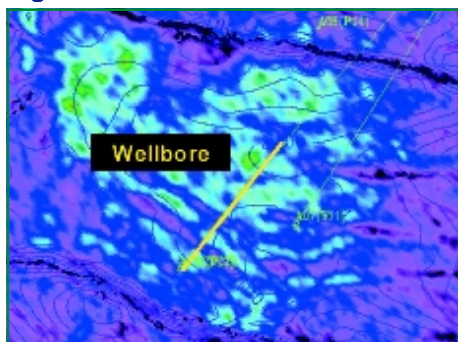
The ability to see sand and oil is not confined to Angola, nor its use to exploration and development decisions. Fig 4 is an image of the Schiehallion field in the UK Deepwater where excellent imaging is changing field management decision making.

BP has accomplished this here in the Middle East, in Qatar and Sharjah. However, one of our more spectacular applications of this technology is in the Wytch Farm field of southern England. Here we have developed the field through stepout wells of up to 11 km deviation. Driven by a desire to avoid an offshore facility in an area of outstanding natural beauty.



All these examples are the product of excellent 3D seismic acquisition and processing, allowing us to ask new questions of a reservoir and of our engineers and geoscientists.

Fig 4



Here BP was faced with a question about the effectiveness of a horizontal well bore. The conventional solution to the problem was to run a PLT. This would have involved lost production and significant cost. The New solution, enabled by our imaging capability, was to run a new 3D seismic survey and enhance the seismic response,

specifically to image pressure changes in the reservoir. Pressure drops along a well bore being a good indication of the wells inflow characteristics.

These examples point the way for what we should be expecting of our seismologists with respect to the giant Carbonate reservoirs of the Middle East. This level of definition should be possible in the future, indeed I'm aware of great progress in that direction in several fields in the Gulf already.

However, such progress also brings with it frustrating limitations. As we collect ever better data the possibilities increase. The real time examples from Schiehallion show how real time data collection can inform and change. Yet it seems we struggle on a number of counts.

Fig 5

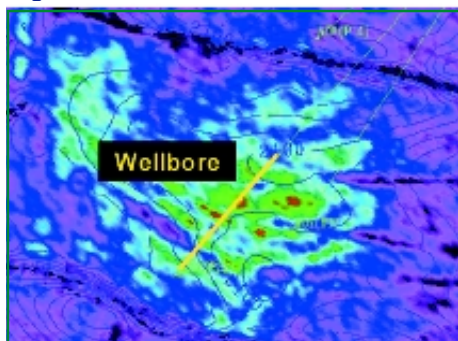


Fig 5 From this analysis a clear picture emerges. The general amplitude increase along the well bore suggests a pressure drop along the entire length of the well. This REAL TIME information over less than a year of production is hugely powerful in good reservoir management.

A further stage in this imaging potential has allowed us to undertake amazing Engineering Solutions to complex issues.

The frequency of seismic reshoots is very low. Not so long ago fields were lucky to have one 3D survey. Today some have several, but it is not yet the norm due to cost and apparent usefulness. And here we meet the technological limit that needs to be pushed over the next decade.

The trend to increase the frequency of data collection is perhaps the most powerful trend in our industry today. It will increase only with reduced cost and enhanced analytical tools to process, visualise and use it.

The full text of Dr Daly's speech is available from Paul Bryant at BP Tel: 01 211 0100