# DEEP-WATER CHALLENGES FOR SEAFLOOR SEISMIC TECHNOLOGY

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Four component seismic data ·(offshore 4C, onshore 3C) represents as significant advance at this time as 3D was in the mid 70 ' s. It represents the latest step forward in seismic technology involving the extra knowledge obtained from acquiring shear (S) wave as well as pressure (P) wave data. This presentation brings this conference up to date with the latest advances with the offshore technique ( 4C). Many impressive data examples are displayed, and the conclusions are equally relevant onshore.

All tasks that can be performed with ]component data (normal P wave surveys) can be performed with 4-component ( 4C) data plus much more. With l-component or surface seismic one can make structural and stratigraphic interpretations as well as perform interpretive processing, such as AVO, trace inversion and seismic attribute calculations. With 4C one can a) see through gas domir.ate~ overburden (gas chimneys), b) map reservoirs that have low P wave acoustic impedance, c) predict changes in reservoir lithology and fluids, especially away from well control and d) gain improved sea bed multiple attenuation. For drilling purposes 4C seismic data assist with drilling hazard evaluations and rock strength predictions.

Offshore the shear wave data recorded are converted waves generated at rock boundaries using the normal P wave source. Such recording requires the recording of the full wavefield using receivers on the sea bed. The technique for 4C2D and 4C3D recording will be explained. Clearly such techniques are more expensive than their streamer equivalents, and we will show how the success of such a survey can be predicted from processing well log data if a shear wave log has been acquired. Such a feasibility study can then justify the expenditure commitment.

Like any new technology, there is a need for it to be used and used wisely. One remembers the fiascos associated with "Bright Spot" technology in the late 70's and 80's. One of the greatest pitfalls today is the lack of knowledge. This is changing rapidly, thanks to papers such as this. In the early 90's, many questioned the possibility of recording converted wave energy. Today, it is accepted that converted waves are generated, and the technique has been established by success stories, several of which are presented here.

You will see direct evidence of direct detection of hydrocarbons from seismic data and the successful prediction of improved sandstone reservoirs and reservoir fluids. If used carefully this is becoming one of the most valuable and cost effective tools in the industry.