

## Workshop on ‘New and Emerging Technologies’, at Mumbai

The Society of Petroleum Geophysicists (SPG), India, organized a workshop on ‘New and Emerging Technologies’, at Hotel Rang Sharda, Bandra (W), Mumbai on 5<sup>th</sup> November, 2006. This workshop attracted over 170 SPG members.

Six talks were featured at the workshop. These talks were focused on advancements in the areas of exploration geophysics, keeping in line with the theme. The first talk entitled ‘*Prestack Depth Migration of Time Lapsed 3D-4C Data over Valhall Field*’, was delivered by Maz Farouki from PGS. He discussed the processing issues and workflows used in the repeat acquisition and processing of 4-component data over the Valhall field in late 2003 by BP and partners Shell, Total, and Amerada-Hess, offshore Norway, using a permanent sea-floor receiver installation. This 4D seismic exercise was designed specifically to monitor and manage the Valhall field; a baseline 3D survey and a series of six repeat monitor surveys were acquired and processed at 3-



Mr. Chris Koeninger, WesternGeco delivering a talk at SPG workshop

many years at PGS and several generations of prototype seismic equipment have been produced to demonstrate the technology. Optical 4C seafloor cables have been successfully demonstrated during a number of field operations. The optical seismic technology is an excellent fit for conventional 4C seismic operations, and would also be the preferred solution for permanently installed reservoir monitoring systems. The dense wavelength division multiplexing (DWDM) technology used by PGS offers significant flexibility in terms of large dynamic range, the use of a very small number of optical fibers to record several thousand channels, no in-sea electronics, light weight, reduced cost per channel, improved safety, and great reliability and durability.



Dr Manika Prasad being presented a memento

month intervals, in the world’s first “Life of Field” or “Life of Field Seismic or LOFS program”. The primary processing challenge involved imaging the reservoir in depth, in spite of a gas cloud, and required the development of velocity models for both the P-wave and the Converted-wave data. Subsequent 4D processing to compare the baseline survey with the repeat monitor surveys aimed to capture true changes in the reservoir.

In the *second talk*, Iain Buchan, also from PGS, talked about ‘*Optical Sensor and Accelerometer Revolution for Seismic Monitoring & Acquisition*’. He said the fiber optic seismic sensor systems have been under development for

The *third talk* was delivered by Dr Manika Prasad from Indian Institute of Technology, Mumbai (on leave from CSM, Golden, Colorado). The talk was entitled ‘*Value of Rock Physics in the Indian Exploration Environment*’. Dr Prasad promoted the use of rock physics and showed its potential in the Indian scenario. Results were presented from work conducted during her stay at IIT Mumbai on: (a) developing site-specific depth trends; depth trends that will have relevance to specific Indian reservoirs have been built, (b) clay-shale systems; modern-day analogues from the Narmada River estuary were used to evaluate the seismic response, (c) properties of carbonate reservoirs, with applications to Bombay High field - fluid substitution might not always work in carbonate reservoirs and the assessment of sensitivity of seismic to monitor fluids was demonstrated. Finally, the applications of rock physics to reservoir monitoring of fluids and pressures, heavy oil exploration and discovery, and for deep-water prospects were showed.

The *fourth talk* was presented by Tim Brice from Western Geco, Mumbai. His talk was entitled '*The Simultaneous Inversion of Seismic Data*', wherein he described how seismic offset gathers hold information on density and two elastic parameters: compressional and shear velocities (or impedances) which may be recovered by inversion. He discussed one such method of inversion which is simultaneous inversion and how multiple offset stacks are simultaneously inverted to transform P-wave offset reflection data into these parameters. From these, and by using well data, lithology, fluid and other rock properties such as Poisson's ratio and Lamé's parameters can be predicted.

The *fifth talk* entitled "Practical 3D Surface-Related Multiple Prediction" was delivered by Chris Koeninger. The shortcomings of 2D SRME primarily due to cross-line structural dip and cable feathering were illustrated. A fast and efficient method of predicting timing errors and analyzing required cross-line aperture between 2D and 3D SRME was tested on a real data example. This analysis could be used for survey design, optimal adaptive subtraction of predicted multiples and to determine, when 3D SRME is necessary. In the final part of the talk the practical issues of 3D SRME relating to the under-sampled wave field and the effect of azimuth on the predicted multiples were discussed.

The sixth and *last talk* of the day was delivered by Satinder Chopra from Arcis Corporation, Calgary on '*Seismic Attributes - A Definite Aid to Seismic Interpretation*'. Chopra demonstrated the application of curvature, coherence attributes as well as spectral decomposition and thin-bed reflectivity inversion to seismic data, for superior and accurate interpretation of such data. Next, different coherence attribute algorithms were discussed including their shortcomings. Applications on real data not only demonstrated the accurate interpretation of stratigraphic features and faults/fractures without any interpreter's bias, but the use of coherence as a QC tool in processing as well as the azimuthal coherence methodology for detecting subtle faults was also shown. He then went on to discuss the advantages of visualizing seismic data at discrete frequencies (within the frequency bandwidth of the data) that results in revealing anomalous or diagnostic behaviour not readily apparent on broadband seismic data. Finally, he showed examples of thin-bed reflectivity inversion producing high-resolution reflectivity sections, which were far superior to conventional seismic sections, in terms of resolution and interpretability.