Seismic processing of Ocean Bottom Cable and streamer data over Seligi field

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In 1998 EPMI initiated a new 3D seismic survey over Seligi field where seven platforms are presently active. The main objective of this project is to obtain a very high quality data set for development drilling and for identification of infield opportunities. A total of 14,700 km of seismic data was shot using a combination of Ocean Bottom Cable (OBC) and conventional marine streamer techniques. The main reasons for using two acquisition techniques are to collect data near to or underneath the platforms and to minimize the cost of acquisition. This dual mode of acquisition involves a higher level of technical difficulties both in acquisition and processing of the data, as care had to be taken to ensure the compatibility of the two data sets.

The two-component OBC data were recorded using a hydrophone and a geophone. The first step in OBC processing is to calibrate the geophone data to the hydrophone data in terms of phase and amplitude. The calibrated data is then summed together to remove the receiver ghost that is inherent in OBC data. After summing, the OBC data was processed using the conventional marine streamer processing sequence. A proprietary PHIFAR filter was applied to both the OBC and streamer data to dephase and convert the data into zero phase. OBC data were found to be very sensitive to velocities. A velocity error of 2% or more will produce scalloped reflections on the crosslines. Considerable time and effort was spent in velocity analysis and quality control.

The OBC and streamer data were stacked separately. The signal to noise ratio and the bandwidth of both data sets were exceptionally good with the usable frequency up to 110 Hz. The next challenge in processing was to match the OBC data to the streamer data. Analysis of the data shows that there is less than 20 degrees difference in phase and less than 2 ms time difference between the two data sets. The bandwidth of the two data sets was also very similar and matching filter was found to be unnecessary. However, a 12dB constant gain was applied to the OBC data to bring its RMS amplitude up to the level of the streamer data. The amplitude difference is due to different instrument response between the OBC cable and the solid marine streamer. The OBC data matches seamlessly into the streamer data.

Detailed quality control at every step of the processing sequence and working closely with the processing contractor is the key to producing a very high quality OBC data set for the interpreter.

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