Integrated EM system boosts the search for hydrocarbons

With hydrocarbon reserves now being depleted faster than they can be replaced and finding costs per barrel increasing exponentially, an improvement in exploration efficiency and productivity is essential. Ken Feather reports.

In 1997, the founders of EMGS conceived the possibility of adapting electromagnetic (EM) technology to detect hydrocarbon reservoirs under the sea. The concept was trialled using a towed, high-power source of EM energy and a series of receivers placed at known locations on the seabed. By logging the refracted energy collected from subsurface layers, they were able to identify areas of high electrical resistivity – a direct indicator of hydrocarbons. Their technique, 'seabed logging', proved remarkably successful. A new company, Electromagnetic Geoservices – EMGS – was formed to provide the first commercial seabed-logging service.

Now, EMGS has launched Clearplay, the first fully integrated EM system. It provides seamless, end-to-end EM services in support of hydrocarbon exploration and has extended application in both development and production phases in life of field.

Each carefully-tailored service provides the combination of EM technology, products, tools and expertise needed to achieve best fit with task – yet is flexible enough to permit condition-specific adjustment. Clearplay includes three distinct offerings: Find, Test and Evaluate.

Clearplay Find provides rapid generation of leads and, ultimately, prospects over large areas. It can also validate existing leads and prospects. It is employed in early stage exploration, pre- or post-licensing, but can also be used to re-explore mature areas. Clearplay Find offers the display of EM data as 2D anomaly maps and 3D cubes. It facilitates easy integration with existing seismic and geological information. And it can provide evidence of stratigraphic traps not easily identifiable on seismic maps. Clearplay Find informs early exploration decision-making and permits rapid generation of prospect portfolios. This early delivery of quality leads gives customers a tremendous competitive advantage. Overall exploration efficiency is improved, risk is reduced and the ground is prepared for achieving performance improvements and cost reductions during the next phases of exploration.

Clearplay Test provides rapid, more accurate ranking of prospects in offshore locations, significantly reducing the likelihood of drilling dry wells. There are two possible outcomes from Clearplay Test. These are equally useful to operators as both contribute to increasing the discovery rate. A favourable test result indicates a much improved chance of success when drilling. A less favourable test result allows prospects to be confidently downgraded or abandoned. Clearplay Test offers several useful visualisations of the processed data. If the survey lines or grid have been extended beyond the edge of the identified prospect, the lateral extent of the prospect can be confirmed. Presenting resistivity data as vertical sections of the earth shows the burial depth of the prospect, and combining this data with other geophysical information can provide an improved estimation of the

Fig. 1. The concept of adapting EM technology to remotely detect hydrocarbons under the sea was conceived in 1997.

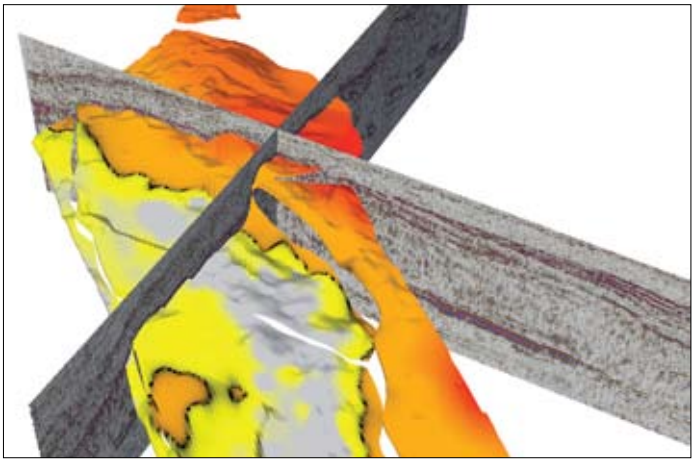

Fig. 2. Clearplay enables the integration of EM data with other geophysical information, delivering a more complete picture.

Fig. 3. A more complete understanding of subsurface enables better exploration decisions, efficiency and performance.

Fig. 4. Clearplay provides integrated EM services and products throughout the life-of-field.

total hydrocarbons volume. Without EM testing, using only traditional approaches, the average discovery rate is just 25 per cent. Customers who routinely EM test prospects before drilling achieve far higher success rates.

Clearplay Evaluate improves certainty and efficiency in appraisal and development phase decision-making. It markedly improves the assessment of a reservoir's potential following successful discovery well drilling. Clearplay Evaluate offers visualisation of the acquired data as 3D images revealing quantitative resistivity versus depth. This information is an indicator of the distribution and saturation levels of hydrocarbons within the prospect. When combined with 3D seismic, geological models and appraisal well data, the outcome of this service is an improved estimation of the volume and distribution of hydrocarbons present within the prospect. These factors enable operators to establish, with greater certainty, whether the prospect contains commercially viable reserves, and significantly reduces the economic risk of field development. It has the potential to reduce the number of appraisal wells drilled, producing significant cost savings and reducing time to first oil.

With hydrocarbon reserves now being depleted faster than they can be replaced and finding costs per barrel increasing exponentially, an improvement in exploration efficiency and productivity is essential. EMGS has been responding to that need.

Because EM reveals additional information, which is intimately related to the presence of hydrocarbons, integrating Clearplay data with other geological and geophysical information delivers a clearer and more complete picture of the subsurface. This in turn enables better decisions to be reached, more quickly, and this leads to the right resources being applied in the right place to maximise return. The ultimate effect is an accelerated improvement in exploration efficiency and performance, reduced finding costs per barrel, reduced risk and a competitive edge.

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