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Geohorizons is published by the Society of Petroleum Geophysicists (SPG), India. **Geohorizons** welcomes your contribution and articles on the latest researches and investigations in the field of petroleum geophysics, related geoscientific and engineering disciplines. News items about the Society, announcements and other features containing information of interest to the members of the Society are also welcome.

Editor's Page

Acharya, the great teacher in the Epic *Mahabharata*, once asked his princely disciples, Pandavas on one hand and the Kauravas on the other, to fetch hundred pots of dew each by next morning. The Pandavas devised a technique and spread thousands of clothes all over grass meadows, trees and shrubs in the night and well before dawn they picked up the clothes one by one and squeezed the dew drops out collecting it in pots and brought them before the teacher. The proud Kauravas, on the other hand, slept overnight and set out early in the morning to collect pearls of dew from trees and plant leaves but couldn't collect more than half of a pot. They filled up the remaining pots with water, thinking the teacher would not know the difference. The Acharya looked at both the teams and the pots they had brought. Now Pandavas were looking tired whereas Kauravas were energetic and mischievous. Then the real test began. Acharya subjected the two hundred pots of 'dew' to the sun light. Soon all the pots containing dew became empty leaving behind the Kauravas' pots of water.

Message is clear for us geoscientists; there is no short cut to harvest oil from the subsurface. The geoscientist who is engaged in oil exploration has to toil hard distilling vast amounts of geo-data to bring that drop of oil to surface.

Out of all the geophysical prospecting techniques seismic has been playing a dominant role. One reason could be that we are still to mine all the information that is contained in seismic data. Thanks to advancement of science and innovative technologies in computing, communication and signal processing, just as we feel that we have squeezed out everything from our seismic volumes something new comes up, offsetting the earlier understanding. Those seismic waves are the only witness to all the sub-surface; having seen it at least twice (two way times) if not more (multiples). Despite some obvious weaknesses of frequency bandwidth, and layered models *Seismics* still carries a lot more yet-to-mine information.

But mining of this information is not a simple task to be left to tools, technologies, machines and accessories. The geoscientist analyzing the data is the one who has to develop a sort of symbiotic relationship with it. That is possible only when he spends more and more time with it. A passive mechanical analysis will only yield passive products. Geoscientist today has to understand what the given data set speaks in the given geological environment and for doing so, has to understand the language it speaks in. No tool and no technology will help if he is unable to communicate with the given data set. But then it is not the interpreter alone who has to converse with the data but the *imager* and the *analyst* as well. Human interaction has to be built into each and every step of the data chain. Of utmost importance is that action of *jug-hustler* who attends to the ground coupling of the 'snuff box', also known as the geophone.

Looking back, the seismic has grown from mapping of velocity layers to reservoir level boundaries, from structural mapping to fluid detection to geo-hazard prediction. But there are uncertainties in everything. Understanding the heterogeneous nature of mother earth is not so simple and there are surprises every time and everywhere. What is fitting in one place does not hold well in the very next place. Things are tricky and trivial. But we don't accept defeat. We survived tsunamis and storms. We are not down yet. We try to win over. We put in our efforts to mitigate the uncertainties - by perseverance, by innovations, by scientific and technological advancements…..and most of all by sharing of knowledge base and human intellectual inputs.

In tune with the theme "Geophysics for mitigating exploration risks" of the 6th international conference on Petroleum Geophysics "Kolkata 2006" organized by the Society of Petroleum Geophysicists, India, this special edition of GEOHORIZONS focuses on Reservoir Characterization issues. I am sure it will be a useful compendium to the geoscientific fraternity.

(R.T. Arasu)

President's Page

India is facing a growing problem of its energy requirement, which is mainly fulfilled by huge imports since the indigenous production is inadequate to fulfill the increasing demand of petroleum products. The government has, therefore, given the impetus to accelerate exploration and production activities to bridge the gap between demand and supply of oil. In this effort national and international oil and gas companies operating in India have intensified their exploration and production activities to find more oil and gas. Significant discoveries in East Coast deep water of Krishna Godavari (KG) Basin are the examples of successful efforts.

In this scenario, where oil has been a dominant energy source, natural gas is also becoming a preferred fuel inspite of growing consumption; the world reserve to production ratio for natural gas is increasing , while it is declining for the oil. This has been made possible by a much greater level of oil and gas discoveries through confluence of creative geological thinking, geophysical technologies and engineering advances. Geophysical industry and seismic industry, in particular, has been impressively dynamic and creative during the last few decades. Although, it is relatively a small sector within the oil and gas industry at large, it has made the most significant impact on increasing proven reserves and reserves-production ratio worldwide. Exploration and production challenges have been attaining greater complexities with evolving time and have been driving the oil industry to invent new technologies and processes to discover the hidden oil. Transformation of seismic technology from exploration to reservoir management has seen a phenomenal success during the last five years or so.

As we move into the new era, the hydrocarbon industry faces two major challenges; cost reduction and risk management. On the one hand, we see a real demand for higher production, higher quality, reduced turnaround and improved HSE performance. On the other hand, everybody wants the best technology at cheaper price. Emphasis is, therefore, on more effective oil recovery from the producing fields with key technology challenges from integrated reservoir uncertainty management, direct fluid imaging, permanent Sensors and smart wells. Earlier, geophysics used to be a necessary cost element as an exploration tool, it has now become a key reserve recovery tool, and hence, an integral part of reservoir projects.

Complete reservoir characterization includes structural and stratigraphic analysis, delineation of reservoir boundaries, fluid content and contacts analysis, estimation of porosity, hydrocarbon saturation net pay or net sand thickness, permeability, understanding of connectivity/flow units, aquifer/drive mechanisms and heterogeneities present within the reservoir. Data sources for reservoir characterization are seismic and borehole surveys, well logs, core samples, geological informations and reservoir engineering data. All the data sets used for reservoir characterization have different vertical and lateral resolution , which ranges from megascopic and mesoscopic to microscopic scales. The high-resolution data obtained from cores and logs provide very detailed vertical information about the reservoir but it gives poor spatial information due to sparse sampling. On the other hand, seismic surveys provide lower vertical resolution but very dense horizontally sampled data in comparison to wells. Thus, to analyze the lateral variations of reservoir properties, away from the boreholes and in interwell regions, it becomes necessary to integrate reservoir properties derived from cores and logs to seismic attributes (Microscopic to Macroscopic scale). Thus, integration of various geoscientific data of different scales becomes a challenging task in reservoir characterization. Various mathematical techniques such as cross-plots, geostatistics, clustering, fractals, and neural networks are evolved to address the problem of integration.

Keeping this in view, a special issue of Geohorizons on "RESERVOIR CHARACTERIZATION" has been brought out by the Society of Petroleum Geophysicists, India on the eve of "Kolkata 2006". I am sure this issue will be very informative, value adding and good reference material for all the readers and experts of the geoscientific community.

(Apurba Saha)