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## INTERNATIONAL SEMINAR AND EXHIBITION EXPLORATION OF OIL, GAS, COAL, MINERALS AND GROUND WATER MODERN TECHNIQUES AND APPLIANCES

DATE : FEBRUARY 7 – 9, 2018 • VENUE : SWISSOTEL, KOLKATA



Organised by :  
**INDIAN SCHOOL OF MINES ALUMNI ASSOCIATION  
KOLKATA CHAPTER**

in association with  
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## Synergy through integrated geophysical acquisition for geothermal & hydrocarbon exploration and production

**K. Strack**

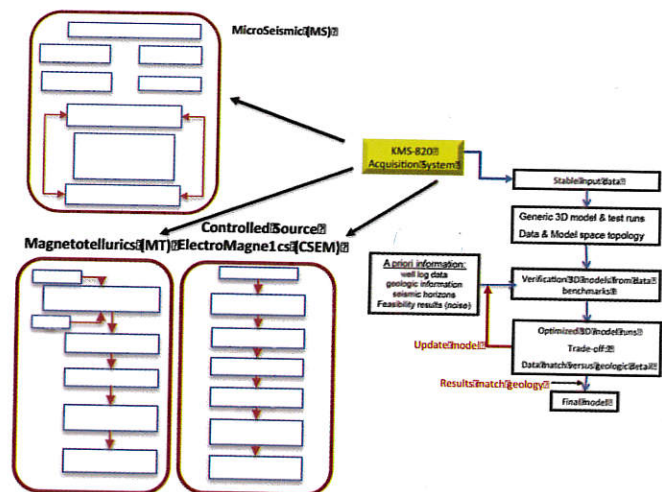
*KMS Technologies – Houston, Texas USA*

Usually geophysical methods are applied independently to exploration and production problem. We are proposing to use an array acquisition system that can be used for applying in a SINGLE layout multiple electromagnetic methods as well microseismics. This not only reduces greatly the operational cost but also provides synergy between the methods. For hydrocarbon exploration combining various methods allows one to resolve either reservoirs fluid directly or the boundaries of the host rock. In a production scenario, using multi-components in electromagnetics allows one to resolve oil and water bearing zones equally well. By adding microseismic acquisition in the same unit we can also address the issue of seal integrity at the same time, as seal breaches are known to cause microseismic events.

Over the past decade we optimized a new generation of electromagnetic hardware/software that can be used for land, marine and borehole applications that allow us to get better and denser data and thus have reduced the cost per receiver surface location. Further the optimization includes target resistivity and choice of component/sensors by selecting the appropriate electric/magnetic field components for the resistivity structure of the target. The system uses a seismic-like architecture with nodes, each of which can be expanded with sub-arrays. It combines for the first time electromagnetic and microseismics data recording in a single box on the same time base. This modular architecture allows a fit-for-purpose configuration tailored to the specific exploration / monitoring target. It is not limited by number of channels or components to-be-recorded. For geothermal applications, depending upon the user

requirements we define four different configurations suitable: Advanced MT, Broadband MT, Mini MT with AMT, and MT with TDEM. For hydrocarbon applications, the independent node concept is more efficient. System characterization and a geothermal field and monitoring examples underline the technical features.

The entire system includes for the different methods processing and 3D inversion software, streamlining the workflow significantly. When we integrate the electromagnetic processing with microseismics, we can influence the way we process the data



Case studies for geothermal and hydrocarbon applications for reservoir monitoring underscore the importance of such an approach. In India, this could be very useful also for sub-Deccan Trap exploration.