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## Methodology- Absorption of State of the Art Technology: A case study of Scorpion system integration in ONGC

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### Summary

*The Regional Electronics Laboratory, Vadodara has been established for in-house maintenance and repair of the Seismic Data Acquisition systems and ancillary equipment. In 2007, 4 nos of Scorpion Seismic Data Acquisition systems were procured for Geophysical Services. As on date all systems have successfully completed two years of operation. The journey of absorption of state of the art technology is depicted as a case study. The method of team work at different stages of technology absorption and induction like Inspection, Verification of systems and system specific features, Training, Installation & Commissioning, Taking over of systems from OEM, Knowledge sharing for sharing operational knowledge etc are described in the paper.*

### Introduction

Regional Electronics Laboratory, Vadodara provides operational support to the Geophysical Services of Western Onshore Basin, Vadodara for acquisition of seismic data for exploration of Hydrocarbons in Cambay Basin and Jaisalmer Basin. All operations and processes of REL comply with ISO 9001-2000 quality standards and certifications. The Quality policy of REL is to maximize the systems availability to the satisfaction of customers through cost-effective repair and maintenance of data acquisition systems and to develop a culture of continual improvement by effectively implementing Quality Management system.

To meet the objectives, REL has created in-house facilities for repair and maintenance of 8 nos Seismic Data Acquisition Systems, 1 VSP system and ancillary systems containing approximately a total of 22300 modules with an asset value of approximately Rs. 200 Crores. The system availability of Seismic Data Acquisition systems is more than 99 %.

To provide a cutting edge to the E&P operations, in year 2007, Geophysical Services has procured Fourteen (14) numbers of states of art Seismic Data Acquisition Systems called Scorpion from M/s ION Geophysical Corporation, USA with very high numbers of Channels relative to its previous procurement. Geophysical Services, Vadodara was provided with four Scorpion systems (Two 3000 Channels Analog system, One 3000 channels Digital system and One 4000 Channels Digital System). These systems are equipped with all required accessories in addition to channel modules.

This case study brings to fore how this state of the art technology was absorbed and adopted in field with all its features in an effective, efficient and time bound manner and also contains and recommends the methodology to be used for induction of new technology in geophysical services in the future.

Technological Advancements in System Four (Scorpion) are listed in Annexure A.



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### Touch and Feel of the Technology

The systems landed in Vadodara in 436 crates by air and sea. To inspect, verify and to get physically acquainted with the systems and its accessories a team comprising of Engineers and Geophysicists was constituted. The team was a mix of trained and untrained engineers and geophysicists. The cohesive working of the team provided members from across all the four field parties where the systems were deployed, a feel of the system, knowledge about the systems ordered & delivered and technical purpose of each and every item ordered / delivered.

The documentation prepared for each and every component at the time of inspection provided complete introduction of each component to the team as to **what, where and why it is to be used**. Learning process of system's utility of what, where and why started in the mind of team members at the time of inspection. The process of inspection and verification was completed in a month's time.

### Training

Training was divided in two parts: one at manufacturer's premises in Texas and other at site during time of installation and commissioning. A team of 4 engineers and 4 geophysicists from Baroda was sent abroad for training at the manufacturer's premises at Texas. This training helped the engineers and geophysicists to get acquainted with the system specific features. The training was completed well before the systems landed in Vadodara.

**Stand alone system:** Before the system was commissioned, a Stand alone system whose software was provided by M/s ION free of cost, was commissioned at REL. This system provided a continual training platform for the engineers and geophysicists and helped them gain a better understanding of the system. Trained geophysicists and engineers shared their training knowledge with their colleagues who were not a part of the training with the help of this system. So before the actual data acquisition systems were tested and commissioned, the stand alone system provided to be a

boon in the development of a core group of geophysicists and engineers to handle the field operations.

At site, during installation and commissioning 8 engineers and 8 geophysicists were trained with respect to practical system operations.

### Installation and Commissioning

Installation and commissioning was done within ONGC campus. All the four systems were tested along with all accessories for performance checking of all system defined features of Purchase Order. Systems were tested with the entire 6000 analog + 7000 digital stations (21000 channels) under field conditions. Engineers and Geophysicists were continuously associated with the systems along with a team of OEM experts for installation and commissioning. In first phase one analog system (# 3000 analog channels) and one digital system (#3000 SVSM) and in second phase one digital system (# 4000 SVSM) and one analog system (# 3000 channels) were installed and commissioned. The process was completed within 30 days. User and maintenance groups learnt the system very closely and used their experience of inspection to locate the various items and their position in instrument cabin and on the field.

### Creation of Repair and Maintenance facility for Scorpion system.

Because of visionary efforts of Management a new repair and maintenance facility was created at REL dedicated for handling the testing and repairs of the new state of the art systems. A new Annexe was built to accommodate the various testing and repair stations of the systems.

### Repair of Ground Electronics

The repair stations, RTS (Remote Test Station) were installed at REL for repair of the ground electronics. Acquisition units (A unit, D unit), Power Unit (BBU), Cross Line Unit(XLU) etc. Ground Electronics are units lay on the ground during Data Acquisition.



### Repair of Fiber Optics Cable

Total length of the fiber optics cable procured with the four systems is 66500 mts (133 cables each with 500 mts length). These cables are used in open field for data transmission from acquisition units to main system in

instrument cabin. Repair of these cables is very important as these are the backbone of data transmission in the field. The repair of Optic fiber of 9 micron diameter was a technological challenge, as it was for the first time in E&P business, repair of such nature was taken up. Due to



Spread on the Ground during installation & commissioning



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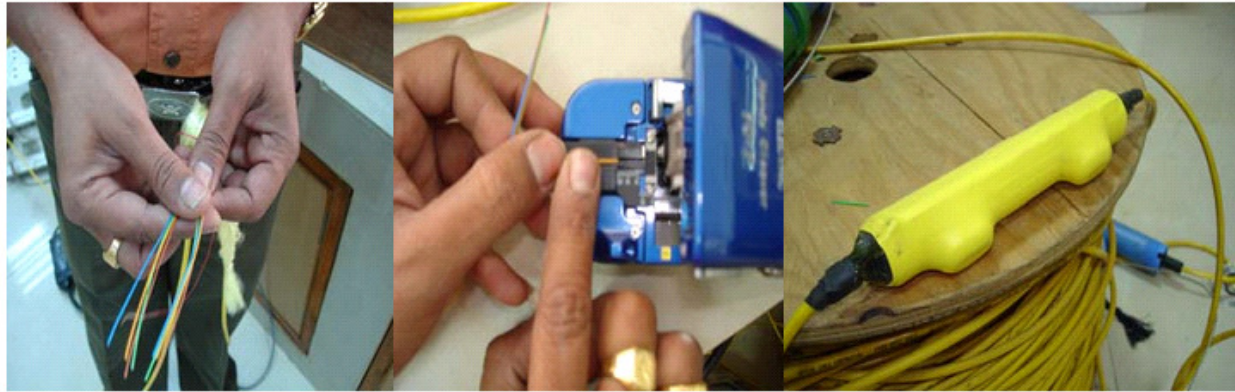


Creation of Repair and Maintenance facility for Scorpion system.



Repair of Ground Electronics





Repair of Fiber Optics Cable

dedicated efforts and infrastructure availability, Engineers of REL rose to the occasion time and again and skillfully used their acumen to repair the cables, and proved themselves worthy of the technological challenges.

### Knowledge Management

Since deployment in the field, engineers were working continuously on the systems on various problems or utilities and gaining valuable experience on the system. This rich experience of REL, Vadodara was uploaded to [www.ongcreports.net](http://www.ongcreports.net) for sharing of the system knowledge gained by all concerned in the organization.

An initiative was taken by REL, ONGC, Vadodara to organise a workshop in collaboration with M/s ION Geophysical Corporation, USA on Scorpion system for two consecutive years, 2008 and 2009, with the following Objectives:

1. Promote interaction between geophysicists and engineers across organization, associated with the system during field season 2007-08
2. Updating of knowledge on Performance of the system, Problems faced, Solutions found.
3. Impart and transfer operational expertise to personnel who are new to the system.

70 engineers and geophysicists from all regions of ONGC participated in this unique one of a kind workshop. M/s IONGEO, USA had also deputed their domain experts during workshop to interact with the participants. Major faculty of workshop was 2 Engineers and 4 Geophysicists from ONGC, Vadodara.

As an end product of workshop, the following documents were released after vetting by OEM:

- A. Best Practices for Scorpion data acquisition system
- B. Major problems encountered and solutions to those problems
- C. Frequently asked questions and their answers.

Also each participant was given technical literature covering the entire gamut of the system amounting to approximately 2 Gb.

### Customer Satisfaction:

On the scale of 1 to 10, the feedback obtained from field parties, who are the customers of REL is 10 ( highest ).



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### Conclusion

For two Field Seasons of operations, all the four systems were deployed and used extensively with all aspect of technology for Acquisition of Seismic Data in Cambay Basin. The methodology adopted for the absorption of technology had smoothened the two years of operation in the field and will be useful for coming years. This methodology can be implemented for induction of any technology in the organization.

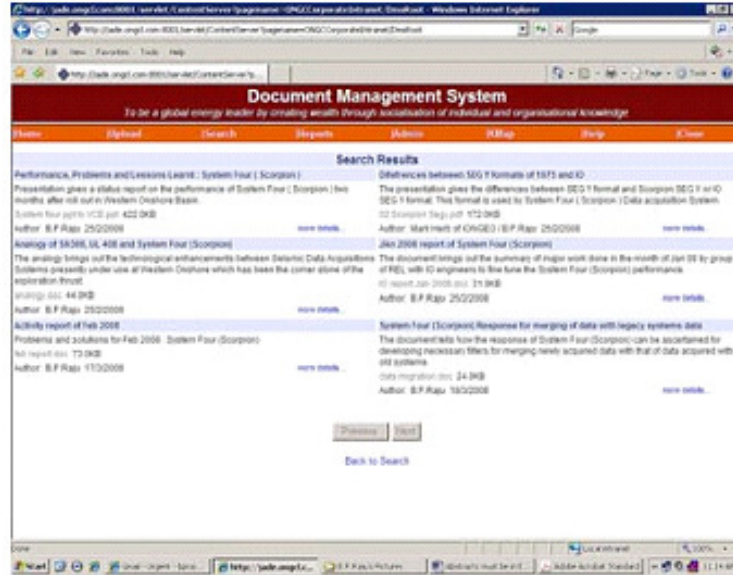
This methodology has the strategy of involvement of same user and maintenance group across various stages of system absorption in E&P operations like: Inspection & Verification; Training; Installation & Commissioning; Taking Over of system from OEM; Deployment in E&P operations; Knowledge Management for effective solutions; Knowledge sharing across organization transcending regional barriers; Development of an excellent workforce for maximum utilization of the technology absorbed.

### Acknowledgement

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[www.ongcreports.net](http://www.ongcreports.net)



Workshop in collaboration with M/s ION Geophysical Corporation, USA