



# QHSE in Seismic Field Operations

C Visweswara Rao, Sanyasirao K and Ravindra Mishra  
ONGC, Dehradun, India

## Abstract

QHSE has been an important organ in seismic operations every time. Advancements and automations in many of field utility equipment and in the advent of BIG DATA acquisition scenario, job has been increased multifold in field. Seismic field parties in general have adopted ISO standard QHSE systems for achieving the set targets by acquiring good quality data within the set time frame. The adopted QHSE systems have been key tools in continual improvement in field operations. Standard operating procedures have been redefined from time to time considering the expected risk factors at every end. Various implementation procedures of QHSE in geophysical parties are discussed in detail in the paper by the authors.

## Introduction

Quality, Health, Safety and Environment Management System was developed to improve the quality of seismic data acquired, occupational health & safety and environmental safety in Geophysical field parties.

QHSE management system is adopted with an intention to; a) enhance the confidence and satisfaction of the customers by providing quality services, b) minimize down time in production, c) increase the output with decreasing defects or decrease in compromise for quality, d) maintain consistency in output with continual improvement, e) ensure “safe and incident free” operations with no harm to the men and material during the operations.

## Methodology

Strict implementation of defined dress code to all contract workers with radium ID cards has paid dividends. Job specified dress code has made the job simple and it is easy for Field geophysics to identify the workers and monitor their performance and movements.

Implementation of standard operating procedures for explosiveloadng and shooting crew with daily counselling

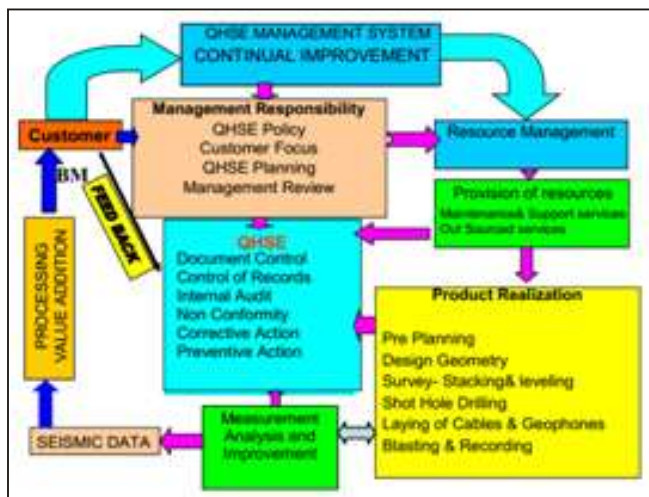


Fig. 1: Role of QHSE in the activities of a Geophysical Party

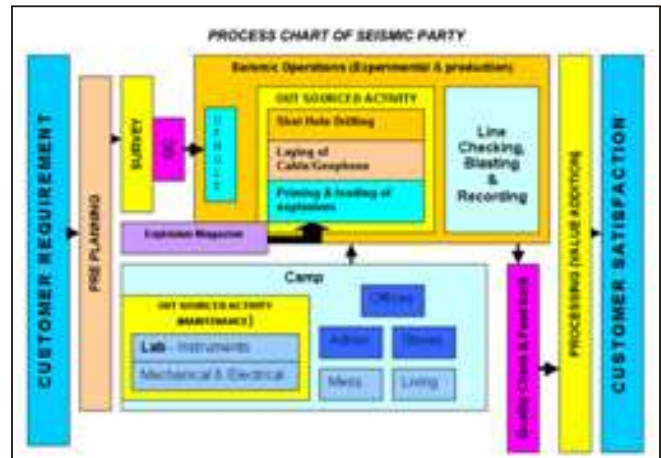


Fig.2: The processes taken up to acquire seismic data by Geophysical Party

before start of field operations was made mandatory and was implemented without fail. Daily counselling has made a specific impact and it is found even in surprise checks from other teams visiting work place recognized the impact by finding all SOPs are followed strictly by all the team members and contract workers like; dress, helmets, identity cards, shoes and gloves etc. Weekly counseling in camp result in repeating all SOPs to workers as a refresher, and regular drills, games and exercises are conducted to make the health safety and environment issues as a part of life.

## Roles and Responsibilities

It is ensured that responsibilities and authorities are defined and communicated within the organization for effective planning and implementation of QHSE-Management system (MS). A steering committee is constituted for proper implementation of all the mandatory QHSE requirements. Respective sectional heads and the Party chief, are responsible for addressing Occupational Health and Safety, environment and Quality matters.

## Quality Management System (QMS)

QMS planning includes the following points:

1. Objective to acquire desired volume of seismic data for the set time

2. Monitoring and quantification of targets and achievements
3. Product output deliverability (Seismic data) and customer satisfaction
4. Plan for the targets set for the near future
5. Preparation for delivering quality outputs with proper resources, skills enhancement and technology adaption

In general the following are the main aspects of QMS planning for a geophysical party,

1. Quality Assurance for seismic equipment
2. Modelling Studies
3. Topographic survey
4. Preparation of Near Surface Modelling and Shot hole parameter optimization
5. Seismic data recording
6. Noise Monitoring and on Board/Field QC
7. Field operation and recovery planning
8. Project Deliverables

### Quality efforts by the Geophysical Party

Most of the new data acquisition systems are taking care of dynamic range, data storage and harvesting etc. which were the major concern in old days. Now-a-days infield QC for equipment, survey planning for regular production and onboard QC of the data recorded are given utmost priority in the quality efforts. As the data reception is dependent on surface geological and topographical conditions, concentration is to be at the reception point. Geophones or SVSM in case of 3D3C data acquisition are to be coupled with ground and this coupling has made remarkable difference in the quality particularly in the hilly, villages and trap exposed terrains in Madhya Pradesh. Field processing units for regular data reception quality checks gave the strength to talk on quality of data acquired.

The following measures were taken up for quality maintenance:

The main focus is on the coupling of the sensors with the ground which is a variable factor of the environment (area



**Fig. 4:** Sensor Coupling with Sandbag



**Fig. 5:** Sensor Coupling in Pits



**Fig. 6:** Ground Electronics Testing in Camp



**Fig. 3:** Sensor Coupling with PoP



**Fig. 7:** On board QC in instrument

specific). Different coupling techniques, like use of PoP and sand bags are needed for hard surface conditions.

Proper maintenance of recording system, ground electronics and other equipment helps in enhanced quality in production and reducing down time.

Verifying shot hole depth and proper location of the shot on daily basis for quality acquisition.

Noise monitoring while recording helps in maintaining a good S/N ratio.

Field processing units are also helping in in field QC of the data on daily basis.

### Occupational Health Management System

An occupational health and safety management system (OHSMS) promotes a safe and healthy working environment by providing a framework that helps organizations to; a) Identify and control health and safety risks, b) Reduce the potential for accidents, c) Aid legal compliance and d) Improve overall performance.

The OHSAS 18000 standards provide organizations with the elements of an effective safety management system which can be integrated with other management systems and help organizations achieve better occupational health and safety performance and economic objectives.

Identification of hazards, Assessments of Risks and Implementation of controls measures are implemented using risk matrix prepared for the hazards and risks involved in the activity and the same is recorded for future references.



Fig. 8: Camp of a Geophysical party

### Safety Management System (SMS)

Safety management system (SMS) is a comprehensive management system designed to manage safety elements in the workplace. It includes policy, objectives, plans, procedures, organization, responsibilities and other measures. Safety is a major concern in geophysical parties where explosives are used as source.

The main aim of Safety Management System is to achieve and maintain “INCIDENT FREE” operations. The corrective and preventive actions are well established in manuals and records are maintained for further assessment and action

plans. All the crew adhere to the safety guidelines. Safety counseling with the employees and stakeholder whoever is associated with the activity, ensures their participation and contribution towards achieving the safety goals of the party.

The following are some safety points which helped in making the difference in safety aspects,

1. Proper usage of PPE (Personnel Protection Equipment) while working
2. Dress code to the contractual workers for easy identification
3. Conducting mock drills and safety counseling at regular intervals
4. Installation of proper fire fighting equipment at strategic locations and training for their usage in case of fire
5. Practice of following Standard Operation Procedures
6. Safe Handling, storage and transpiration of explosives
7. Implementation of standard operating procedures for loading and shooting crews with daily counselling before start of field operations was made mandatory and was implemented without fail.



Fig. 9: Crew with proper PPE



Fig. 10: Safe Guarding line cable with road mats



Fig. 11: Secured explosives magazine



**Fig. 12:** Safety mock drill at camp



**Fig. 14:** Water pots arrangement for birds



**Fig. 13:** Morning safety counselling

## Environmental Management System (EMS)

EMS refers to the management of an organization's environmental programs in a comprehensive, systematic, planned and documented manner. It includes the organizational structure, planning and resources for developing, implementing and maintaining policy for environmental protection.

Roles and responsibilities are defined for the implementation of EMS in the camp and operational area.

Proper disposal of biodegradable and non-bio degradable waste is implemented.

Party had planned to minimize damage to the flora and fauna in the operational area.

## Audits

- Internal and external audits conducted at regular intervals to check the effectiveness of the QHSE-MS
- Scope and objective of work done by party are defined.
- A check list is given prior to the audit process and the findings or suggestions are documented.

## Management Review

The performance and status of the QSHE management system is reviewed at regular intervals (twice annually) in MRM headed by the Chair Person of the Steering Committee (HGS). The minutes of the latest MRM are circulated to the members and areas of improvements are discussed and the conclusions and minutes of the review are documented.

## PDCA or PDSA Cycle

PDCA (plan-do-check-act, sometimes seen as plan-do-check-adjust) is a repetitive four-stage model for continuous improvement (CI) in business process management.

The PDCA model is also known as the Deming circle/cycle/wheel, Shewhart cycle, control circle/cycle, or plandostudyact (PDSA).



**Fig. 15:** Four Tier PDCA Management System for Continual Improvement

The model is implemented to improve the quality and effectiveness of processes within product lifecycle management, project management, human resource management (HRM), supply chain management (SCM) and many other areas of business.

**Plan:** Define the problem to be addressed, collect relevant data, and ascertain the problem's root cause.

**Do:** Develop and implement a solution; decide upon a measurement to gauge its effectiveness.

**Check:** Confirm the results through before-and-after data comparison.

**Act:** Document the results, inform others about process changes, and make recommendations for the problem to be addressed in the next PDCA cycle

Geophysical parties are adhered to every single aspect of QHSE with PDCA approach. Every activity of QHSE is planned, applied and updated in due course as a part of PDCA cycle.

## **Conclusions and Recommendations**

HSE guidelines to be followed are to be monitored and

regular counseling makes major difference. Implementation of all SOPs by field crew resulted in achieving major HSE success thereby leading to "No INCIDENCE" field operation. HSE management of both Men and Material in the camp and field is to be in the best possible condition and all out efforts are to be made by following all the norms defined.

Implementation of standard operating procedures for loading and shooting crew with daily counseling before start of field operations is made mandatory and is implemented without fail. This has made a specific impact and it is found even in surprise checks from other teams visiting work place recognized the impact by finding all SOPs are followed strictly by all the team members and contract workers like dress, helmets, identity cards, shoes and gloves etc.

Implementation and regular monitoring QHSE practices is mandatory for getting safe and best output. It is required to make that as a part of life rather than looking the implementation as a ritual. This owning of QHSE as a whole has made the field party possible to wrap up the operations in safe and efficient way.