Improving safety performance in geophysical operations: one major operator’s journey

Ian M. Threadgold, T. Richard Seaborne, Neil Cave and David J. Harrison describe a 13-year journey by a major oil and gas operator in pursuit of consistent excellence in health, safety, and environmental (HSE) performance across its worldwide geophysical operations.

This story begins in 1999 when a major oil and gas company had just merged with a significant industry competitor. The following year the merged company took over a third large oil and gas company. If other mergers and takeovers in prior years by these three companies were taken into account, the community of geophysical operations practitioners, by the end of 2000, included people from at least seven different heritage companies. This meant that initially there was no single way of managing a seismic project to completion due in part to staff with different experiences and training.

The individuals involved from different heritage companies were experienced to varying degrees in managing, by themselves, all aspects of a geophysical operation. This included designing the survey, assembling tender packages, working with contractors, planning the survey, getting the contract signed, mobilizing the crew, attending start-up meetings, working in the field, managing the HSSE issues and technical aspects of data quality to completing the survey and final reports. The relatively small groups of geophysical operations staff that existed in each heritage company before the mergers and acquisitions, using informal networks and processes, suddenly became part of a much larger organization charged with managing many more projects each year.

A paper on the client’s role in the HSE management of geophysical operations (Dolezal, 1999) described a geophysical project management process developed by Exxon in 1993. This was four years after the Exxon Valdez oil spill, after which Exxon implemented its Operations Integrity Management System (OIMS). The structured process for geophysical operations was built around four project phases of pre-bid, pre-survey, survey, and post-survey. Dolezal concluded that ‘use of a sound project management process by the client will improve contractor performance and reduce HSE incidents’.

An earlier paper by Davidson and Ranke (1994) on the topic of HSE management in seismic operations also talked about the benefits and early lessons learned from implementing safety management systems (SMS) on some of Shell’s world-wide seismic operations. The SMS development was driven by the Piper Alpha disaster in 1988, and the key aspect of the implementation was a hazard management process and the use of a safety case for seismic operations.

Both of these papers discussed changes implemented after major industry incidents, and stressed the importance of structured management systems and processes for achieving safety performance improvement in geophysical operations.

2000-2005: a drive for consistency

One early change for the major operator, after the merger, was the creation of a Seismic HSE Network to help move the geophysical operations community together towards a single culture and common process for management of seismic projects. During the first three years of operation, the Network twice held three-day face-to-face global meetings so that the community could get to know one another, discuss issues facing the community, and build a work plan. Right from its inception the membership was eager to share and learn from one another. It was given a budget so that members who had to bill out their time were able to work on identified Network projects. A leader role was funded on a part-time basis to manage the Network activities, and the role was to last for about three years before it was passed on to the next nominated individual.

One of the early tasks identified for the network was to build a website, initially called the Seismic HSE Toolbox. This was designed to capture advice and HSE information for seismic projects. A few years later this website was re-named the Geophysical Operations HSSE Toolbox (see Figure 1) so as to cover a wider range of geophysical activities. The main features of the website were six process steps to follow in planning and managing a seismic survey. These were planning prior to tender, tendering and contractor selection, pre-mobilization planning, mobilization, operations, and post-operations. Each step contained potential activities to perform in that phase, along with links to industry guidance documents and other websites. At that time, however, the six steps and the activities were only suggestions for operations geophysicists to follow. Over time, the Toolbox was expanded to include other items such as safety alerts.

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1 Threadgold Safety Management.
2 BP.
3 Corresponding author, E-mail: ianthreadgold@hotmail.com
In 2005-2007: catalysts for change
In part as a response to the 2005 incident at the Texas City refinery, operational practices at the company were reviewed, including those for the management of geophysical operations. The major operator also began the development and implementation of a group-wide internal HSE management system called OMS or Operating Management System.

During this period, with GISS meeting feedback and with involvement in joint industry safety meetings, it became apparent to Network members that there was an opportunity to more consistently use industry standards for geophysical operations.

A fatality on a seismic project in 2007, when a water tanker rolled over, heightened the focus on a long running project to develop and implement requirements for the management of geophysical operations – the so-called ‘Way to GO’, (where GO is Geophysical Operations). It was also recognized that operations geophysicists had responsibility for technical, supply chain, HSE, and project management matters. It was decided that more discrete roles should be defined in the company for seismic HSE specialists, seismic PSCM specialists, seismic acquisition specialists, and seismic project managers. In addition, the company needed to recruit and train additional staff to help fill these roles.

2007-2010: the ‘Way to GO’
In the second half of 2007, three week-long meetings were held with participants from company offices around the world to define what activities should be considered for inclusion in a group practice for planning and managing geophysical operations – the so-called ‘Way to GO’, (where GO is Geophysical Operations). It was also recognized that operations geophysicists had responsibility for technical, supply chain, HSE, and project management matters. It was decided that more discrete roles should be defined in the company for seismic HSE specialists, seismic PSCM specialists, seismic acquisition specialists, and seismic project managers. In addition, the company needed to recruit and train additional staff to help fill these roles.

Recognizing the benefits of systematic contracting and supplier performance management, the company’s Procurement and Supply Chain Management (PSCM) organization, working closely with the Network, started work on an initiative entitled the Global Initiative for Seismic Services (or GISS), which included implementing a global model contract for seismic, with standard HSE schedules. It also included separate semi-annual supplier performance meetings with each of four major contractors involving the senior management from both the company and the contractor. The final component was the use of a seismic acquisition performance scorecard on every project, which included nine HSE metrics, amongst a total of 30, the results of which were discussed at the GISS supplier performance meetings.

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2007-2010: the ‘Way to GO’
In the second half of 2007, three week-long meetings were held with participants from company offices around the world to define what activities should be considered for inclusion in a group practice for planning and managing geophysical operations. The decision was made by the major operator to base its defined process for geophysical operations on industry standards because the contracting side of the industry based its HSE management systems typically on OGP guidance documents. OGP 291, which provides HSE management guidelines for working together in a contract environment, lays out an eight-phase project management process.
The activities identified during the three meetings were assigned to the appropriate phases as requirements. This required several iterations and additional work to integrate with existing company standards and practices regarding driving, control of work, marine operations, etc. In 2009 the company released a draft (not mandatory) of its Segment Defined Practice for Management of Geophysical Operations (or SDP MOGO) so that practitioners could begin trialing the Way to GO process. The eight phases were Initial planning; pre-qualification and tender preparation; contractor selection; pre-mobilization planning; mobilization; project execution; de-mobilization; and close-out.

The process grew to eight phases because it was recognized that it is important to keep mobilization and de-mobilization as distinct phases (rather than absorb them into the project execution phase). These can be periods of heightened risk, due to the changes taking place such as people and equipment being moved, and specific plans need to be in place to manage this risk.

During this period the company revised its global model agreement for seismic. One of the most significant updates was to add the detailed tables from OGP 317 (titled ‘HSE aspects in a contracting environment for geophysical operations’), as an appendix for specifying the company’s HSE expectations in a tender. OGP 317 had content which was designed to be used as model contract clauses for specifying both the minimum expectations for HSE management systems on a geophysical project, and the minimum expectations for the control of specific risk areas. Part of the intent of using the OGP document contents in the company global master agreement was to reduce the burden on contractors in responding to tender requests with different requirements. The contractors’ HSE staff could spend more time managing HSE rather than having to spend days responding to tender packages in completely different formats every time they received an invitation to tender. By using an industry-standard document, upon which many contractor systems were based, also meant that HSE could be managed consistently from job to job.

The company’s seismic acquisition performance scorecard was also updated after about six years of use, with fewer but more focused metrics. In the HSSE category this meant more focus on leading indicators, along with adding leadership and contract compliance measures. As the global model agreement for seismic was based on OGP 317, this document could also be used as the basis for management system audits in the field, at the vessel or crew level.

As the company was trying to actively incorporate more industry standards and guidance in its processes and contract documents, it supplied staff to participate in industry task forces and committees that were updating some of the guidance documents. In late 2009/early 2010 both OGP 291 and 317 were replaced by updated versions which became respectively OGP 423 (‘HSE Management – guidelines for working together in a contract environment’) and OGP 432 (‘Managing HSE in a geophysical contract’). The exemplary joint efforts in the geophysical industry of the client and contracting sides working together on HSE issues for many years now has contributed to industry safety improvements (Threadgold et al., 2010).

Staffing changes in the company related to geophysical operations were significant during this three-year period, especially in HSE roles. In 2007 the position of Segment Technical Authority (SETA) for geophysical operations was established at a time when many other key technical authority roles were being created in the company. At first this was a part-time role requiring 20% of the person’s time. In 2009 it became a full-time role, with the post-holder responsible for setting policy and owning the management of geophysical operations or ‘Way to GO’ process. In 2008 the company hired its first dedicated seismic HSE specialist. Another major change in 2010 was to establish the position of seismic delivery manager (or SDM) in every business unit or region. This was a new role, not included in any previous organizational model, providing a focal point for accountability for all aspects of seismic within a geographic region. The role covered acquisition, processing, and the analysis of all seismic data. While some of the selected managers came from an operations background, others had occupied processing or interpretation roles previously. However, the key aspect was that every acquisition project now had to include a project manager who reported to the SDM, and the project manager had to include an acquisition technical specialist and a seismic HSE specialist at a minimum on his team.

Harrison (2009) showed how the greatest impact on an operation’s risk management is actually achieved during survey planning, especially during the pre-mobilization planning phase. Figure 2 shows the eight phases of the contracting process laid out in OGP 291, and adopted in the SDP MOGO. Three schematic profiles show the client’s and contractor’s abilities to influence project risk management (in green and blue respectively) and in red the overall level of safety risk during the eight phases. It is evident that the pre-mobilization planning phase is the critical stage for influencing risk management on a project, as the company and contractor work together managing the risk and finalizing project specific plans. The company introduced minimum time periods for pre-mobilization planning that could only be shortened by a management of change (MOC) with the approval of the SETA and the accountable VP. This sought to ensure that sufficient planning time was allowed for all the necessary planning and risk management activities on a given project. The minimum time periods varied by type of geophysical survey recognizing that what worked for a 24-hour VSP operation was not sufficient for an 18-month land seismic survey.
Harrison (2009) also talked about changes the company has implemented in terms of both designing surveys for safety and a new emphasis on safety cultures and behaviours. The holistic approach to land acquisition safety started a decade or so earlier with the frequent calls (e.g., Jack, 2003) by company staff and others for industry to develop lighter and more portable equipment, with lower associated HSE risk, and at the same time to be able to provide a significantly higher channel count, and make a step change improvement in productivity. This equipment together with new acquisition techniques such as high-productivity vibroseis allows for many more design options to be considered, thus enabling the “safest design” to be selected.

A safety culture survey and assessment process was adapted for company geophysical operations, based on the five-rung safety culture ladder that reaches from pathological to generative, discussed by Hudson et al. (2002) and adopted in 2005 by the OGP in Report 368. This has been implemented on a number of projects with some success. The value in these projects has been in having independently facilitated focus groups discussing the survey questions and providing their anonymous concerns to the crew management for discussion and action where necessary. The process has proved a great way of identifying issues for potential strengthening of safety performance.

2010-today: continuous improvement

In April 2010, the Macondo incident occurred in the Gulf of Mexico. After this incident, all sectors of the oil and gas industry, and not just drilling, began looking at what could be done differently to prevent low probability high consequence events from occurring. Within the company a safety and operational risk (S & OR) group was established to provide an independent check on risk management activities. S & OR is independent of the line management, and has the ability to intervene and escalate to cause corrective action. The SETA for geophysical operations position moved into this organization.

After a detailed gap analysis was performed and then actions taken and closed, the SDP MOGO was updated to align with the current version of the company’s OMS. The practitioner community also provided significant feedback on the content, based on experiences during the trial period. Feedback on the value of the process itself from practitioners had been overwhelmingly favourable, especially from those who were newer to the company. They liked the idea of having a company-defined process to guide them. The document was subsequently re-issued as the Upstream Defined Practice for Management of Geophysical Operations (or UDP MOGO) in mid-2011, now with 122 requirements. The intent was to implement this in each region under an MOC, identifying any remaining gaps (e.g., staff resourcing issues) as actions, with an agreed period to close the gaps.

Several other significant changes came with the issuance of the UDP MOGO. These included requirements for MOGO review meetings for all projects, an annual SETA review of the company’s geophysical projects with the highest risk profiles, a competence assurance programme, a risk management verification process, and an annual review meeting for the ‘Way to GO’ process to drive continuous improvement.

The management of geophysical operations reviews, or MOGORs, is a series of meetings in the pre-qualification and tender preparation, pre-mobilization planning, project execution, and close-out phases. Each MOGOR is led by a SETA-approved review team leader with a team of PSCM, seismic HSE, and acquisition specialists, who have had no involvement in the project. The purpose of each review is to examine the implementation of all the requirements from the UDP MOGO in the relevant phases of the project, identify potential non-conformance with the requirements, and make recommendations to assist the project team with remedial action before the next
stage gate. A stage gate meeting is a formal meeting with the accountable manager to allow progression to the next phase.

The UDP MOGO now includes a requirement each year for a minimum of four company geophysical operations projects to be audited and reviewed by the SETA. The projects to be audited are selected based on their complexity, risk profile, and magnitude of exposure. This field visit is sometimes performed in conjunction with the project execution phase MOGOR.

The MOGO competence assurance programme covers 16 different roles in seismic acquisition in the company from field representatives, auditors, vessel inspectors, SDMs, project managers, technical, and HSE specialists, the SETA, etc. It covers four different aspects of competence which are qualifications/education; formal experience; skills or the ability to do; and training or formal learning needs. For example, since the start of 2012 a company requirement is that all SDMs, project managers, seismic HSE specialists, and HSE field representatives must have the National Examination Board in Occupational Safety and Health (NEBOSH) International General Certificate (IGC) or an equivalent qualification. The programme includes the assessment and verification of the defined competencies also.

The risk management verification process (RMVP) is designed to ensure that documented control measures are continually being implemented in the presence of risk exposure and that they are effective in mitigating the identified risk. When a control is found to be absent, or in some manner deficient in its application, there is an obligation and expectation to take corrective action. RMVP is carried out by field representatives jointly with in-field crew supervisors or managers. It is different from previous risk assurance efforts in that it ensures that controls are being effective versus just being in place.

The SETA is now required to lead the UDP MOGO annual review process in January of each year. Amongst other things the meeting looks at incidents, trends, and lessons learned from geophysical operations in the previous year, both internal and external to the company, and looks for changes necessary to the UDP MOGO, the global master agreement, industry standards, and internal staffing for geophysical operations as well as the overall effectiveness of the ‘Way to GO’ process.

By 2012 staffing increases had continued, driven also by the demographic shifts with large numbers of experienced staff retiring and leaving the industry. There are now multiple experienced seismic HSE specialists in the company, a centralized seismic PSCM team of specialists, regional seismic delivery managers, in addition to an increased number of project managers and acquisition geophysicists, and the fifth successive community of practice or network leader. An accelerated development programme (ADP) for operations geophysics has also been put in place for early career individuals who want to move into a geophysical operations role.

On a final note, a new vessel inspection protocol is being used in the industry, created by the Oil Companies International Marine Forum (or OCIMF). This process is called the offshore vessel inspection database or OVID. The company is moving increasingly towards use of this new protocol.

Discussion

The information presented in the paper has described a number of discrete steps taken to strengthen performance in geophysical operations that, in our opinion, have proven successful. Some of these changes have come from attempts to improve consistency of implementation and some from a drive to continuously improve the company’s safety performance in geophysical operations. The company’s lost time injury rate (LTIR) and total recordable injury rate (TRIR) for geophysical operations over the 13-year period have declined significantly. Both metrics are lower than those published by the International Association of Geophysical Contractors (IAGC) for the industry. TRIR is predominantly a reflection of personal safety and so while the authors are reluctant to use this, there is currently no standard geophysical industry metric for operational safety that can be used in its place. While lagging indicator metrics have gone down there has been a correspondingly significant increase in the leading indicator metrics.

In terms of resourcing, over the 13-year period, there has been a significant move away from an operations geophysicist handling everything, to a multi-disciplinary project team supporting a dedicated project manager for each project. The multi-disciplinary team comprises the project manager, a PSCM specialist, an HSE specialist, and an acquisition geophysicist. There is also now in place a central PSCM team, a central group of seismic HSE specialists, and additional management positions accountable for seismic acquisition projects. This full project team approach allows individuals in the team to spend more time on their core discipline activities for the project.

Conclusions

- Improvements can be made in safety performance by involvement in the development and implementation of industry standards, and by striving for continuous improvement. Using relevant industry standards can increase understanding of what may be appropriate, reduce management effort, reduce risk, and enhance compliance with contract requirements.
- A multi-disciplinary project team helps to safely deliver a geophysical operation, rather than having a solitary operations geophysicist handle HSE, procurement, technical aspects, and project management all by themselves. Full time HSE professionals, who are experienced in geophysical operations, are beneficial team members, especially in the planning stages.
- For any kind of geophysical survey a minimum period of time is needed for the pre-mobilization planning phase.
This can help to reduce surprises and manage risk once the operation commences. Investment in increased planning time and pre-mobilization resources can underpin the delivery of reduced risk during project execution.

The information presented in the paper includes examples of discrete steps taken to improve safety performance in geophysical operations that we think have been successful.

References


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