

'Smarter Together' – Enhanced Drilling Safety and Performance

Lacking or insufficient transfer of information and experience poses a familiar threat to the success of both individual employees and firms alike. Valuable knowledge gained from experience is far too seldom – and only to a limited degree – transferred between individuals, between projects, and between units. This phenomenon can be described as 'quality loss at the interface'. Quality loss at the interface is a key challenge for any sector – not least in the petroleum industry, and perhaps particularly within drilling operations.

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Drilling requires a particularly high level of specialisation and division of labour, as it draws on many widely diverse fields and areas of expertise that combine to meet the operational goals that have been set. This involves many interfaces, not only between the onshore and offshore facets of an organisation, but also between a number of sometimes distinctly different organisations, both land-based and offshore.

High levels of outsourcing mean that up to 15 different firms may be represented on a platform at any given time. Moreover, established crew and shift patterns mean limited repetition of an individual's work operations, which may contribute to what is claimed to be a substantial physical and mental gap between work and time off, as well as between planning/management personnel and the offshore crew.

Developing, "capturing", describing and sharing knowledge, or maintaining knowledge management across so many interfaces, is naturally a major challenge. The symptoms of insufficient knowledge processes in drilling are myriad. Some of them are quite obvi-

ous, such as recurrent errors and mistakes which result in near accidents, accidents and/or undesirable downtime. Other, less obvious symptoms include unclear requirements and expectations

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between operator, drilling contractor and service companies, with an ensuing ambiguity regarding roles and responsibilities as well as the level of competence and operative expertise that is required.

Consequently, a fundamental hypothesis posits that both safety level and performance rate depend on a favourable learning culture. Thus a relevant approach for increased safety and efficiency in drilling operations focuses on the scope, content and quality of the learning processes that prevail, internally and between the various

units – onshore, offshore and between the platform and onshore operations. This approach serves both to shed light on the present situation and to facilitate new processes and arenas that are conducive to learning and the transfer of experience, as well as for developing and maintaining a learning atmosphere between

operator, drilling contractor and service companies.

The user-managed project "Improved learning processes in drilling operations - Smarter Together", funded by the Research Council of Norway, Hydro, Prosafe and Baker Hughes Incorporated, aims to enhance the quality and



Installing risers demand high levels of security

the scope of learning processes within and between the three participating firms, as well as in the offshore industry as a whole. SNORRE TLP has been the operative case, with the participating firms, in collaboration with NTNU and SINTEF, working to create a safer and more efficient working day for the individual employee.

Method and underlying philosophy

The work method used in this project can be placed within the tradition of action research. It is based on a firm belief in the value of close collaboration between researchers and representatives of the participating firms. This method uses interviews; dialogue and group processes to obtain the information that is needed to develop measures for change, in co-operation with those who will be affected. This means that all levels of an organisation are considered equal partners in the process, and the researcher is just as much a facilitator as an observer.

This philosophy is based on the assumption that even when things are going badly in an organisation, many people have seen the problems that exist and have sensible ideas as to what should be done to solve them. What is often lacking are the arenas and processes for posing critical questions about existing activities, for bringing good ideas to light, and for following them through to concrete measures for improvement that can be implemented. Sometimes the processes exist but are primarily reserved for management, and when they are initiated is entirely left up to chance. This increases the probability that any measures launched may "miss the mark" because the foundation on which they were devised is too narrow. Moreover,



Participants were asked to share knowledge and experiences

the lack of involvement among the employees (and their lack of ownership of both the process and the measures adopted) may trigger anything from indifference and suspicion to active resistance in the rest of the organisation. In other cases the challenge may be that part of or the entire organisation has become "factory blind", so that there is (no longer) anyone who "sees" that there are problems to be solved. Nonetheless, it is often easier to see and perhaps try to do something about the symptoms to a problem than to address the root cause. For instance, after a crew member had slipped on a stair-like structure (built so that he could reach a high structure with his tools), an anti-skid covering was put on the "steps", a better railing was installed, and a sign was posted advising crew members to "use caution on the stairs", instead of removing the need for such "stairs".

Action research is not the "perfect method" for achieving organisational change. However, with its democratic approach, which means that it is firmly anchored

in everyone involved, it has great potential for generating effective measures for change. A contributing factor is the fact that in various ways and in different arenas this approach seeks to combine the knowledge and experience that is unique to a firm (from all levels in the hierarchy) with theory and scientifically based methods, processes and tools of analysis. Last but not least, this method focuses not only on formulating measures, but also on their implementation, follow-up and evaluation.

The utilisation of such an approach soon emerged as the best means of finding solutions to the multi-faceted, complex challenge this project was facing. In selecting the researchers involved, great importance was attached to creating a multidisciplinary team, with representatives from the petroleum engineering, psychology, anthropology, quality management, safety engineering and informatics/computer sciences.

Two-phase project

The project has been conducted in two phases. During the initial

phase researchers mapped and analysed the "operational reality" of the SNORRE TLP. The members of the multidisciplinary research team familiarised themselves with the drilling organisations of the three participating firms, Hydro, Prosafe and Baker Hughes Inteq (BHI), both offshore and onshore. The analyses from the various types of mapping resulted in a working model that served as a foundation for developing measures for change in collaboration with the participating firms. Phase two consisted of designing measures and facilitating their implementation. A vital component of this phase was a series of "knowledge cruises": a total of five two-day workshops aboard the Hurtigruta coastal express. The team of researchers joined a wide range of employees from the three participating firms – from drilling superintendents onshore to roast-abouts on the platform. During the cruises the working model and various findings from the mapping phase were presented to the crews and used in different types of group sessions. The aim of these group sessions was to devise specific measures for change to be implemented on the platforms or in the onshore organisation(s). Moreover, the cruises themselves were an instrument for effecting change: a demonstration of how a well-organised, democratic, and somewhat unconventional learning arena can function by contributing to high motivation and ownership in the results, i.e. the measures for change.

Phase 1 – Mapping and initial analyses

The first year of the project (2001) was dedicated to conducting a number of different types of mapping and subsequent analyses, to pave the way for formulating and implementing measures for

change in 2002. In order to acquire the extensive understanding of the operational reality onboard the SNORRE (and the relevant onshore organisations) that would be needed to develop effective measures, the researchers did not limit themselves to one or just a few standard methods during the mapping phase. Interviews and dialogues were conducted with individuals and groups. A team of three researchers visited the platform, interviewing various categories of crew members and making observations of the physical work environment. A crew seminar was held in Trondheim under the auspices of the project. Researchers participated in the seminars for drilling supervisors in Hydro and Prosafe. A mini-questionnaire was administered by e-mail, interfaces were mapped and various qualitative analyses of the data were performed. The members of the broadly multidisciplinary research team also sup-

plemented their own findings with studies of relevant literature and experience gained from other SINTEF projects within the petroleum sector.

Results of Phase 1

The results indicated three main categories of challenges to be addressed in order to meet the goal of safer and more efficient drilling operations: a) use of information and communication technology (ICT), b) work activities and organisation (WAO): the distribution and understanding of roles, responsibilities and tasks, and c) knowledge and expertise (KE): experiential, locally-based knowledge and practice as well as more theoretical, formal professional qualifications.

However, it must be noted that these three main categories are not easily observed in isolation from one another, and there is a potential for various types of cause



Improvisation was important among the offshore workers, here demonstrated by jazz musicians Jon Pål Inderberg and Bjørn Alterhaug

and effect interaction among all of them, in both a positive and a negative sense. For instance, in many contexts ICT can serve as a valuable tool for establishing a better, more productive relationship between the individual's actual knowledge and expertise (KE), and that person's role onboard the platform (WAO), for instance by making use of e-Learning. In other cases, a lack of competence (KE) in the use of software (ICT) – or the use of software that is inappropriate – may cause the Prosafe drilling supervisors to spend too much of the working day doing unnecessary office work (WAO).

The large volume of data collected during this project reveals other, more comprehensive problems and challenges that are probably relevant far beyond the scope of this project. Despite fluctuations in oil prices, the petroleum industry has been and remains a prosperous industry. This means that the willingness (and the economic base) for adopting new technology has been great. However, the knowledge-based and organisational aspects of operational activities have received much less attention. None of the three firms

participating in this project have thus far distinguished themselves as good representatives of "learning enterprises". For instance, all three are struggling with faltering communication and transfer of experience, both internally (including the interface between onshore and offshore) and externally. As a result, mistakes are repeated time and again, and employees have to improvise, often relying on insufficient knowledge. The costs of the consequences quickly exceed what it would have cost to enable the employees in question to avoid such mistakes. Another finding was an apparent lack of interest in or ability to ask fundamental questions as to how and why "things are done". There seemed to be an emphasis on doing "things right" – in order to satisfy government regulations and bureaucracy, or because "that's how we have done it before" – rather than on doing "the right things".

Phase 2 - Formulation and implementation of measures

Traditionally the individual crew has been the target group for processes and measures for

Background

Ever since offshore activities were launched on the Norwegian continental shelf in the late 1960s, SINTEF has been involved in various types of projects in the petroleum sector. At present SINTEF is engaged with a number of firms in the project "Smarter Together". The petroleum sector, with its cutting-edge technology, is known for its high level of knowledge and expertise. However, the challenges facing the offshore industry are numerous and in many ways identical to those confronting the industrial sector on land. Measures to enhance safety and performance have focused primarily on technical and technological improvements. The attention devoted to human and organisational challenges has been modest in comparison.

Co-operation among individuals, groups and organisations represents a particular challenge for the offshore industry in the interface between onshore and offshore activities. Losses at the interface impair the quality of the products and services supplied, resulting in higher costs and diminished safety. In recent years the interfaces between people, technology and organisations have emerged as key areas of interest. The project "Smarter Together" was initiated as a participant-based research and development project to map, analyse and propose measures for improved utilisation of the resources within each firm and to reduce losses at the interface, in order to achieve safer and more efficient drilling operations.

change. This project has chosen instead to target what we have called "focal groups" - groups with a joint focus for their work. Thus the members of a focal group represented different crews, various jobs and all three participating firms. This gave researchers access to a broader range of operations and corresponding positive and negative experience, in order not only to produce concrete proposals for improvement, but also to enhance the individual's learning there and then. In this case the focal groups were "drilling", "offshore management" and "onshore management". The two first categories were operative in drilling activities, and the last category was responsible for planning and facilitating operations so that the operational goals for offshore activities could be met.

Measures for Change

As a result of the project, five sets of measures have been adopted for SNORRE. These include measures which target planning, reporting, new job descriptions for offshore management, Baker's co-operation with Hydro and Prosafe, and Prosafe's co-operation med Hydro and Baker. These measures are a result of collaboration between SINTEF and the participants on the knowledge cruises.

Target Planning

This is a set of measures consisting of four components to ensure that drilling plans and programs will be available for involved personnel well in advance of operations. The plans should be more easily approved by Hydro and the Norwegian Petroleum Directorate (NPD) and be more comprehensible to users. The result of the measures should be safer and more efficient operations. The first component, a "What we should do" programme, aims to produce

a brief document that meets the requirements of Hydro and the NPD and that be approved quickly. The second component is the production of a "Section recommendation/How" programme. This is a document describing in detail how the drilling plan (or parts of the plan) are to be carried out, what procedures to apply, where they are to be found, and who is responsible for them. The third component is the formulation of a "Why" programme, or a document explaining to users why solutions have been chosen. The fourth and final component in this set of measures is to "optimise offshore planning" by including relevant offshore personnel in the planning of operational safety and efficiency.

Reporting

Two sets of measures will be implemented with regard to reporting. The joint aim of these measures is to reduce the time and resources spent on offshore reporting. The first component is to improve efficiency when compiling "daily drilling reports". Only one version of nearly identical reports will be produced in future. The second component aims to reduce the time spent registering and following-up incidents in Synergi.

Offshore management

This set of measures contains three components. The overall aim is to reorganise the positions of Rig Manager, Tool pusher and Drilling Supervisor and Superintendent in order to increase the time available for operational management and better follow-up of operations.

Baker: Co-operation with Hydro and Prosafe
This set of measures seeks to improve internal relations within Baker, as well as to enhance co-



Sintef researchers Jostein Sveen and Helge Langseth conducted research at Snorre TLP on information and communication technology in practise



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operation with Prosafe and Hydro in order to contribute to safer operations and increased uptime. The first component is an internal measure within Baker, where pre-shift crew meetings are to be held for all Baker offshore personnel. The second component commits Baker to co-operate with Prosafe in the training of Prosafe crew members on Baker's equipment in order to ensure safer operations and to avoid the improper use of and damage to equipment. The final component in this set of measures, the "dedication of senior rig personnel to SNORRE", aims to improve the quality and safety of drilling operations through a commitment to expertise and experience.

Prosafe: Co-operation with Hydro and Baker
This set of measures, consisting of three components, seeks to improve internal relations within Prosafe, as well as enhancing co-operation with Hydro and Baker in order to contribute to safer operations and increased uptime. The first component is an internal measure within Prosafe which seeks to improve the planning of offshore operations under the management of Prosafe. The intended result is more efficient operations through awareness of the time spent on each part of the operation. The second component, co-operation between Prosafe and Hydro, targets the possibilities for increased uptime on offshore cranes. Improvements in this area would mean savings for both Prosafe and Hydro. The final component commits Prosafe to co-operate with Baker in the training of Prosafe crew members on Baker's equipment. This measure will be co-ordinated with Baker's measure addressing the same issue. ■