

IS IT POSSIBLE TO MAINTAIN THE EMERGENCY PREPAREDNESS ORGANIZATIONAL REDUNDANCY AFTER CHANGES?

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Abstract

The Norwegian Petroleum Directorate's new rules and regulations for emergency preparedness on offshore oil installations emphasize the importance of the barriers set in order to prevent risks on offshore installations. The way of understanding these new requirements, finding and implementing the new measures, etc is different from one company to another, depending on the experience with and knowledge of the regulations, different internal organizational issues, operational and technical resources, as well as the solutions for the field emergency preparedness. A result of these requirements is a process of standardization of the emergency preparedness planning and organization that several Norwegian oil companies have started recently.

This paper tries to evaluate the measures applied in the Norwegian oil and gas industry for maintaining the organizational redundancy within emergency preparedness, according to the new regulations as well as the internal standardization processes of the companies. The focus of this paper will be set on the way the planning of the reevaluation of the solutions for emergency preparedness is initiated and carried out. Questions on the degree of personnel's involvement in the planning of the new forms for emergency preparedness, organizational charts, operational and emergency preparedness procedures and the design of training drills will also be discussed. The need of a re-evaluation of the training practice onshore as well as offshore is analyzed. The need of redundancy for training within emergency preparedness management groups will also be discussed.

Introduction

The emergency preparedness organizational redundancy depends on how the emergency preparedness (EP) is planned locally, within an industry or a country. This is changing constantly, since its dependency to the political aspects (e.g. requirements from the authorities), social factors (collaboration between companies and trade unions, or internally, by including employee democratic participation), economy (e.g. in choosing advanced measures for consequence limitation), communication (between the groups involved in an emergency situation), educational aspects (training) and constructional aspects (the planning of emergency preparedness organizations, the procedures).

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The paper considers the political and organizational aspect of the planning of the EP and its organizational redundancy, in relation to the new requirements from Norwegian Petroleum Directorate (NPD) and the internal requirements for standardization that some of the largest Norwegian oil companies have introduced recently for all their offshore installation organizations. The aim of the paper is to present a pilot study, a starting point for advanced, future studies.

The main research questions are related to possible negative effects of the changes within emergency preparedness organizational redundancy (EPOR). It is assumed that changes within the EPOR due to the standardization processes may lead to a decrease of the robustness of the organizations' reliability and robustness. The paper also discusses possible changes in the work behavior and in the previous established tradition of personnel involvement.

Background: Changes in rules and regulations

The Norwegian oil and gas industry has developed systematic methods for the petroleum operations on the Norwegian sector of the North Sea in order to achieve a higher degree of employee awareness towards risks related to the day-to-day work. These systems have been developed continuously since the Piper Alpha accident (1986), and are based on the NPD Framework Regulations of 31 of August 2001 "Regulations relating to Health, Environment and Safety in the petroleum activities" (NPD, 2001a), international standards (ISO/EN standards) as well as national NORSOK standards (supported by The Norwegian Oil Industry Association, OLF).

In the review of accidents, hazards and other undesirable events offshore for the past years, the NPD has concluded that these are not due to a lack of regulatory requirements, but rather a failure to comply with the requirements. "The risk of a major accident occurring on the Norwegian shelf is rising. The development in the number of undesirable incidents linked to gas leaks, kicks and damage to load-bearing structures provides the major cause for concern" (NPD, 2002a). Based on this, NPD identified a need to modify the regulations in a way that they would emerge as a better and more appropriate tool for the industry. The new regulatory requirements are not meant to be perceived as a straitjacket for the industry, but rather to provide room for innovation and creativity (NPD, 2003).

The new requirements initiate a change in the way risks should be observed and quantitatively analyzed, and this will influence the internal evaluation processes of safety in general and the planning of emergency preparedness in particular. The systematic evaluation of the hazards on the offshore installations will be evaluated in relationship to the technical, organizational and operational barriers, which should be as independent of each other as possible (NPD, 2001b). Barriers are to be established *in addition to* the previous defined risk reduction measures (defined in the old set of regulations) and the consequences should be seen in relation to their consequences-reducing factors.

The effect of the consequence reducing factors and barriers should, in conformity with the new regulations, be measured using quantifiable risk indicators defined internally. The old regulations required that the risks for major accidents should be evaluated and measures should be applied in order to minimize the probability, but they neither did contain any specific information on the quantification of the risk reduction measures, nor did they mention the organizational, procedural, operational barriers. In accordance with the new regulations, indicators that can provide early identification of the risk of major accidents should be established in order to measure developments over time.

Scope and theoretical framework

The oil and gas industry in Norway has a good reputation since its safety culture is well established and the un-written rules are followed as strongly as the procedures and other formal



requirements by its personnel. The EP within the industry has been one of the key factors that focused the personnel's attention to the importance of the day-by-day safety, by following work procedures and evaluating the risks all the time during operations.

NPD annual reports are the most important reference documents for the petroleum industry in Norway, since they describe all activities on the Norwegian shelf, including an overview of resources and the status of health, environment and safety. The report of 2002 shows that the number of injuries has decreased since 2001 in the industry, but this is explained by changes in the reporting systems, where some of the accidents are not reported anymore (NPD, 2002b). The risk report from the same year mentioned that the risk level is considered to be at the same level as in 2001, but that the risk of major accidents is rising. (2002a)

The Norwegian safety culture is based on the well-established work culture that values the democratic participation and skill enhancement, considered factors for success, equal to the productivity and product quality (Ehn, 1992). Norway has legally institutionalized participation (Hatling and Sørensen, 1998) and the previous democratic participation within safety and EP work can be considered the best examples of it.

One could argue that participation is mainly a relationship between workers (or trade unions) and management (Hatling and Sørensen, 1998). The development of the offshore industry in Norway and its safety culture has been based not only on the participation between the employers and employees, and companies with each other, but also collaborations between Norwegian Oil and Petrochemical Trade Union (NOPEF), NPD and the oil companies. Seminars, conferences and other fora focused on exchanging experiences, ideas and good practices have determined a social participation that actively and continuously improved the best practices and allowed companies to introduce the best solutions available on the market.

Most of the oil and gas companies that are based on the Norwegian sector of the North Sea have a systematic way to develop EP solutions, in accordance with what is stated in Section 15, 'Quantitative risk analyses and emergency preparedness analyses', of NPD's Management Regulations (NPD, 2001b). According to this, every oil company is required to evaluate risks for all life phases of an installation by expert teams and these should be presented quantitatively and qualitatively in the Risk Analysis (RA). The Emergency Preparedness Analysis (EPA) takes in consideration major risks based on the frequencies and consequences of possible accidents presented in the RA. The EPA lists a set of defined situations of hazard and accidents (DSHAs) and describes all technical, operational and organizational measures to handle these DSHAs. Some of the measures comply internal requirements, other requirements set by the authorities.

And finally, the Emergency Preparedness Plans (EPPL) shows how the organizational issues are planned and defined, the structure of the Emergency Preparedness Organization (EPO), the role of the emergency preparedness teams (EPT) and how each of these teams should handle when accidents occur. Their actions are presented usually in relation with the other teams, external resources and with the technical solutions available.

The Emergency Preparedness Planning (EPP) within most of the oil companies that operate on the Norwegian sector of the North Sea has historically been based on a specific list of DSHAs for the installation in case, on the local consequence reducing measures (technical, organizational and operational) and on the requirements and goals set by the authorities, the company on a concern level and the installation's organization locally.

Method

The information resources for this explorative study are based on own experiences from participation in consultancy activities in the area of HES, safety management and emergency preparedness offshore, document studies, laws and regulations, internal documentation; and



informal interviews with key personnel in the area of safety and emergency preparedness planning and training, other relevant personnel.

Results and Discussions

New regulations

The new regulations (NPD, 2001a) imply that EP measures described in the EPA for the installation could also be considered a barrier, as well as elements for risk reductions. If earlier the common understanding was that EP is in itself a concept related to actions that are to be initiated after an accident, *after the failure of one of several barriers or of danger limitation measures*, the new regulations are considering EP as an element that is to be considered *before* major accidents or other hazards, a barrier in itself.

The relationship between the operational (during normal operations) and the EP role that employees have, as well as the future established risk reducing indicators determine a transformation of the linearity of the EPP (from RA to EPA to EPPL that include EPO and EPT) to a spirally and complex evaluation of the measures. Operational, organizational and technical measures for normal operations as well as EP become a mix of independent barriers (as long as independency is possible) that hopefully will keep the hazards to an acceptable level of control.

The differences between NPD and UK's Health and Safety Executive (HSE) regulations (HSE, 1992) on the performance standards for the technical measures are becoming minimal. NPD is however much more optimistic, since it assumes that the established risk indicators or performance standards for the operational (procedural) and organizational barriers will be possible to not only quantify by also check these against a set of defined measurable goals.

Understanding the new requirements as well as applying them has been issues discussed both internally and in the Safety Forum, a forum where representatives from the Norwegian oil and gas industry and NPD met. The supposed better to understand and more easily to apply new set of NPD requirements has influenced and created new trends within the companies, which have started to plan internal processes that sometimes are hard to reverse. One of these processes that are assumed to comply and determine a better safety offshore is the internal standardization of the safety systems and of the EP (planning, organization and training).

Internal standardization

The RA for each offshore installation has previously been established by qualifying the local risks that were influenced by the design and the functions and processes on the installation. Some of the oil companies argued that while the quantification of the risks is local specific, the qualitative evaluation of the risks, as well the necessary emergency preparedness organization and its functions *should be the same for all installations* within the same classification group (e.g. exploration, production, well operations and type).

Norsk Hydro Oil and Energy (NH) is an example of the company that initiated internal EPP standardization in 2002 and this process will be implemented for all its offshore installations. The need for an internal standardization process that started on the top, at the safety management concern level, has been explained by the need of common procedures for all installations for work during both operations and EP. Many of the Norsk Hydro installations are manned by both NH employees and employees from different subcontractors companies. The last group is not always permanent on a particular installation, as for example employees responsible with maintenance, but more or less nomad. Since the time that a subcontractor employee can be limited on a particular installation, sometimes the introduction to all the aspects and measures for a specific EPP for the installation and the emergency preparedness training can be less effective.

A standardization of the procedures for emergency preparedness is assumed to give a less time and cost consuming training of all employees, including the subcontractors', as well as a better



understanding of the NH procedures and policies for safety at work. Since the process with the internal standardization is not yet finished, the expected results are not objectively evaluated yet. The experience with the planning of the standardization within NH so far is subjective; employees in various positions on different levels within NH consider the preliminary results more or less satisfactory. Informal interviews show that members of the safety management on the concern level are more positive to the standardization process than the local safety officers.

The method of the standardization used by the NH has taken in consideration the standardization of the DSHAs' list, since it is considered that the DSHAs are mainly the same for the same risks on different installations, they could have the same chosen definitions, and only the risk frequencies will be related to the local risks. The standardized list of DSHAs will include all the risks possible on an complex offshore installation, and the number of the DSHAs is kept as low as possible. Only the relevant DSHAs for a particular installation will be included in its EPA. Internal NH requirements for emergency preparedness (including performance standards) are described in a procedure and will be established in all of the specific EPAs for NHs installations. The project/installation specific requirements are not welcomed, since it is considered to interact negatively to the intentions of the standardization. The technical, operational and organizational measures that will comply with the internal and external requirements will be platform specific in the first phase of the standardization, but, because of the intention to standardize as many as possible procedures in the near future, it is expected that also these measures will be standardized after a while.

The task of a modern organization is to tightly organize and rationalize the environment by stressing work specialization and fragmentation, repetitive tasks, unified chain of command, and close supervision, direction and control (Greenberg, 1975). Therefore, useful standards need to evolve. But the planned standardization and flexibility could be seemingly opposing notions, flexibility on one level presuppose standardization on lower levels of the systems hierarchy (Monteiro and al. 1994). Most of the offshore installations have already well organized systems for procedures for normal operations and safety (including emergency preparedness) as part of their management and control system. These systems are similar from one installation to another within the same company, the lists for concern procedures are adopted and formed locally, depending on the needs that the specific offshore installation might have. A large scale coordinated work is impossible without lists (Bowker and Star, 1994). The need of coordination of the daily operative systems from a concern level hold had determined a revision of internal systems, work and safety procedures lists. This fact, together with the new requirements set by NPD, might be the primary initiating factors for the process of the re-evaluation of the safety systems, including the emergency preparedness systems and for its standardization.

The internal requirements to standardize as much as possible the EPP give less opportunity to use the local knowledge in order to establish local specific EPAs and EPPL. While the flexibility in this case is obtained by the number of the EPTs, the size of the group and the functions its members have is intended to become standardized. The solutions for previous organizational structures and hierarchies have been based on the response and the planned actions for the EPT locally. The planning of EPT was primary based on the assigned positions and activities during normal operations. The offshore industry has flagged out that in many cases the number of the people involved in the EPOs is considered to be too large in comparison to the total number of the people onboard. This is one of the basis arguments for standardizing also the EPOs, the emergency organizational charts and, finally, the number of the people within each team for a particular type of installation.

Most of the installation's EPT are formed by choosing personnel only employed by the operator (also in the case of NH). Future plans for standardization of the emergency training might include also subcontractors' employees. This could open the possibility of using these in



the EPOs. Could be the standardization process actually only a first act that will legitimate future possible reductions in the personnel's number and initiatives/salaries?

The success of innovations is only made possible by constantly maintaining the entire succession of accumulated elements (Latour, 1991). The standardization process of EP for all installation within the same company could be considered innovative but the process itself could result in major accidents, casualties and severe material damages. It seems that the idea of standardization could become an institutionalized fashion (Czarniawska and Joerges, 1996), new practice for EP can be tried out and disposed of. Are the Norwegian oil and gas companies' emergency preparedness management groups willing to achieve a trail period and take the risk of major accidents in consideration? A disposal of standardization could come too late, when the alteration of the employees' safety culture and behavior would be already a fact.

'Management fashions are methods for constructing realities' (Kieser, 1997), it seems that several oil and gas companies create the need for standardization based on the bench mark effect of the planning processes instead of the results of these processes. NPD has not implied that the standardization is a necessary solution for re-evaluating the emergency preparedness by establishing new systems for complying the new requirements.

Personnel Involvement in the Reevaluation of the Emergency Preparedness

Traditionally, during the projects for re-evaluation of the EP, the employee involvement is manifested by the participation of various groups in the planning processes. The process of planning involves representatives from the EPT (leaders as well as members), offshore installation managers, safety officers, union trade representatives, safety deputies and sometimes external experts. The methods used for EPP is similar to the planning of the normal operations work, and include the employees in all phases of the project, from brainstorming to establishing the EPPL and implementing it in practice.

Participation of the users, that can be found in the EPO, in the modeling of the EP legitimates the projects of planning, training and procedures (Hatling and Sørensen, 1998). However, most of the oil companies on the Norwegian sector of the North Sea have previously seen the two main roles of their employees, the role of worker during normal operations and member of EPT during emergency, independently. Employees have earlier been asked if they want to have any EP responsibilities and initiatives were given in order to recruit personnel to the EPT. The role within the EPT was based on the particular individual and his or hers wishes.

Recently the EP roles have become more or less mandatory for the particular positions in the normal operations chart. Employees that might not have the necessary physical and psychological attributes had been included in the EPT more or less independently of their personal desires. The standardization process for the design of the EPO has been actually carried out for several years, but not official declared by the EP planners.

The standardization process of the EP minimizes personnel involvement locally, and creates in many cases frustration and anger. The idea of supporting work without becoming a key actor in this work is a chimera (Berg, 1999). The reasons for standardization are not explained to the employees, or the arguments for changes are not good enough. Trade unions representatives or safety deputies are still participating at the EPP meetings, but it seems like the communication between these and local safety officers and EPT is not as fluent as it should. In the absence of a comprehensive strategy, no single organization fully succeeded in exploiting the opportunity to informate (Zuboff, 1998). The lack of information could determine a change in the attitudes towards risks during an emergency and a passive action from the members of the EMT involved in response.

Standardization could mean a change in the way people act, following a general set of rules, combined with the lack of personal involvement and creativity during an emergency could



diminish the role of the EPO in the future. The intended simplification given by the standards for EP could accelerate the fragmentation and simplification of the work (Greenberg, 1975) and the transformation of the worker into a pre-set robot, which does exactly what it had learnt during the training sessions.

The organizational redundancy

The organizational redundancy within EP is present in the various stages of the planning of the EP work as well as during the emergency itself; either the emergency is a part of a drill program, or during real hazardous situations or accidents. The omnipresence and simultaneity of agendas of organizational change tend to reduce the competitive edge for the given organization (Czarniawska and Joerges, 1996). One could say that the parallel agenda are given by the wish to elaborate RA, EPA and EPPL in concordance with the new NPD rules and the standardization processes itself, and these could result in an impairment of the offshore installation's EP robustness in case of an accident. Practice is considered to be central for understanding work (Brown and Duguid, 1991). The internal standardization initiatives from concern level hold are delimiting the manifestations of local conditions in the EPP.

The new requirements give the operators a higher degree of freedom to set their acceptance criteria for major accident risk (NPD, 2001b) and therefore the respective performance standards and acceptance criteria for the EP. But the organizational redundancy of the EPO is threatened by the wish to minimize as much as possible the number of the EPT as well as the number of the members within each team. The loss of organizational redundancy can be one of the first mechanisms leading to increased risk if an organization with previous good safety performance is downsizing (Rosness et al. 2001).

NPD suggested that the petroleum communities in other countries to a greater degree focus on safety behavior and safety management, where each individual is responsible for his/her actions than in Norway (NPD. 2003b). But personnel involvement from planning activities of EP to action in an EP situation as well as the importance of redundancy within the EPO seems to be forgotten both by the new requirements set by the authorities (NPD) and the planners of the EP on the concern level.

Emergency Preparedness Training and its Effects

One of the arguments for the new, standardized, EPO is based on the assumption that training of employees will be more effective and less time consuming, that the transfer of employees from one installation to another will be less risky from an organizational point of view. Another argument is based on the fact that team members will get more or less the same training and their judgment on scene will be based on the knowledge and experience achieved during training drills, and not so much on the personal evaluations, discussions or judgments on the group level during the emergency.

A basic EP course is required to every person that wants to work offshore in Norway. The course is build to influence the understanding of the need and the importance of the EP, and the training instructors' flag out the primary behavioral elements that will lately contribute to the creation of the safety culture of the personnel.

The importance of evaluating the variance between a major organization's formal description of work both in its training programmers and manuals and the actual work practices performed by its members (Brown and Duguid, 1991) is underlined of the accident investigation reports. The requirements set by the ISO 9001 standard is many times delimited to the internal quality control alone, the re-evaluation of the actual measures for the safety and EP are many times a result of personnel initiatives or requirements set by the organs of control of the industry.

There is a complex interaction between individual and organizational learning (Argrys and Schön, 1996) and the standardized training is trying to achieve the connection between the



personnel course training on land (which is more or less individual) and group training during the drills offshore. Practices for training the personnel in various positions within an emergency organization on an installation are usually changed by the firms that organize the training courses. The training centers are considered knowledge-intensive organizations and their trainers are well experienced fire-fighters, nurses and so on. The expectations that the oil companies have towards the training centers are high, since it is assumed that they train the EPOs exceptionally good through outstanding expertise. However, the idea of training centers seen as knowledge-intensive service organizations has little to do with their image of providers of narrow expertise and more to do with their ability and experience adapting to new situations (Alvesson, 1993).

Practice and experience with organizing safety courses, discussions, briefings and planning of the courses in collaboration with offshore and onshore personnel from different organizational and safety cultural backgrounds, visiting installations previous courses etc. give the safety instructors a special understanding of what the safety reality on a local plan can be. This understanding or knowledge is in many cases subjective, not only because of the quality of the information provided, but also because of the background that the safety inspector has, primary from previous positions on land (e.g. fire fighting, nurses, etc), and less from offshore related work. Previously, the courses that training centers offered were based on the description of the position that the employees had within the installation's EPO and independent to their normal operation job description. Internal changes given by the emergency preparedness standardization process gives the oil and gas companies the opportunity to standardize all the training planning also, as a further step to the already standardize job-specific training course. The employees' EP roles have become a part of their work descriptions during normal operations and the courses are tailored to the particular work description.

The standardization of EPO and the EP procedures will change the traditional training. Training offshore will be organized on different installations in the same way. The interactive computer based coursing is replacing already some of the traditional courses. The experience exchange between the instructors and the participants to the courses disappears. The exams at the end of the courses are based on the theoretical understanding of the roles and practices. It is assumed that practical training will give the necessary understanding of the team work.

Training onshore is normally organized in well controlled areas in order to achieve the given scope (one or several scenarios based on the previously defined possible hazard for the installation). The risks connected to the training itself are evaluated by the training centers based on the safe environment that courses on land give. Most of the participants are assuming that things cannot have dramatic consequences; they play roles in a pre-set arena.

Training offshore is more or less given by the framework set by the company for it, depending on its goals for safety, internal safety culture and economy. Offshore installation EP managers wish to achieve a high degree of awareness and an effective handling of hazardous situations by organizing drills, but they also are pressed to continue the production also during the drills sessions. Economical social and political goals for the oil and gas industry could be considered locally as determinative, and therefore, full scale drills, involving external field emergency preparedness organizations or other authorities on land are organized seldom.

Risk acceptance for emergency response offshore is also lower than before, the emergency management is more and more concerned not to send EPT in dangerous rescue missions that could increase the number of people injured. Are all these factors an initiation of a new trend? Becomes this trend, combined with the fact that the training courses in Norway are hold by a limited number of training institutions, a delimiting factor for a better evaluation of the goodness of the emergency preparedness courses?



Research needs

The theoretical framework outlined in this paper needs further elaboration. The lack of written documentation on the experience with the standardization processes and the application of the new requirements, as well as the subjectivity of the people interviewed concerning these issues, might determine a discussion based on previous experiences within other industries and countries. Further research work, including a large scale interview project within some of the most known oil and gas companies in Norway will determine the goodness of the assumptions presented here. However, this pilot study has revealed some other research questions that should be answered to in the future work:

- Is the impact of standardization on organizational redundancy initiating processes of change in the work behavior?
- Is the focus on barriers in the new regulations becoming a threat for the future emergency response in the hazardous or accidental situations?
- Are the solutions for the operation organizations becoming too independent of the solutions for emergency preparedness teams?
- Is the new requirements' influence on the evaluation of the consequences of failures reluctant to the basis principles for emergency preparedness planning?
- Will the factors initiating changes really contribute to a better emergency preparedness? Or are the changing processes initiated in order to create a basis for future reductions in the work force?
- Are the emergency preparedness planners less interested in the organizational redundancy and more interested in barriers and costs?

Conclusions

Traditional personnel involvement, a healthy safety culture and industry experiences have created the basis for robust organizations in Norwegian offshore oil and gas industry, and these, due to their organizational redundancy have survived major technical, structural and other changes in the past. It is questionable that the standardization processes will create a better EP. The standardized EPO might lack the overlapping tasks and responsibility on the managerial level (EPT's leaders) especial in the emergency situations where inaction is a safer state than action.

Learning could be considered a bridge between working and innovating (Hatling and Sørensen, 1998). The standardization of EP and training will delimit the innovative contribution that offshore employees as well as training institutions. Standardization could result in creativity stagnation especially if the planes for revisions of the new standards are delayed.

Removing 'functions rather than positions' (Rosness et al. 2001) within the EPO will possible determine a gradual disappearance of the preconditions for organizational redundancy in the future. Therefore, rescuing injured people during or after a major accident on offshore installations will be only a matter of a calculation of risks and acceptance criteria on the EP management level, and not the main goal that an EP is built for. The same experiment can lead us from a laboratory to a world and from a world to a laboratory (Latour, 1991).

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