

U.K. ENFORCEMENT OF RISK AND RELIABILITY MANAGEMENT OF OFFSHORE OIL AND GAS OPERATIONS

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ABSTRACT

This paper briefly describes the Offshore Safety Division, Health and Safety Executive; discusses the Piper Alpha disaster; discusses principles of managing risk and reliability and safety; and concludes with considerations on how these principles might be applied offshore.

1. The Offshore Safety Division, Health and Safety Executive

The U.K. government agency charged with administering occupational health, safety and welfare law offshore is the Offshore Safety Division (OSD) of the Department of Energy. However we are in the process of transferring this Division to the Health and Safety Executive (HSE). This Division is responsible, amongst other things, for the making of regulations and guidance notes and monitoring and enforcing compliance with satisfactory health and safety standards.

2. The Piper Alpha Disaster

The year 1988 saw the Piper Alpha disaster in which 167 people lost their lives and a major oil production platform was destroyed as a result of a succession of fires and explosions fed from a very large fuel supply from a number of gas and oil pipelines. Piper Alpha was located in the North Sea approximately 125 miles northeast of Aberdeen on the Scottish mainland.

The most likely primary cause of the disaster was not related to hardware failures but was a consequence of human error. Both the Public Inquiry and my technical investigation concluded that the immediate cause was that condensate had been inadvertently admitted to an unsealed pipe end. The pipe end had been left in a non-gas tight condition as a result of incomplete maintenance work.

Persons on the subsequent shift, apparently unaware of the open state of this particular condensate line, opened valves so allowing considerable quantities of flammable gas to escape. The valves did not have any physical impediments in the way of secure mechanical isolation to prevent them from being activated.

Inevitably the condensate vaporized and was ignited. The source of ignition was never positively identified. Our main findings were that the ensuing explosions and fires rapidly escalated and pipelines were ruptured to such an extent that the escape routes for the installation personnel were cut off. The explosions and fires reached such a magnitude that the complete structure was destroyed.

The narrow causes of the disaster were the likely failure of maintenance personnel to effectively secure and prevent leakage of gas from a pipe end, and

the failure of the Permit-to-Work system and procedures to pass on information relating to the state of the plant. The wider causes were firmly linked to the ineffectiveness of management control. Notwithstanding the safety consciousness of the operators in the North Sea, it was clear that a new more stringent approach to the management of health and safety was required, wherein the operator has to demonstrate to the regulatory body that their safety assessments and management control of the offshore installation and all activities on it are adequate in both normal and emergency situations. This should provide for continued and progressive improvement in offshore safety.

For many years in the UK we have recognized the need for health and safety to be managed and to be subject to quality assurance procedures in the same way and with the same vigor as commercial activities. This line of thinking underpins our Mineral Workings (Offshore Installations) Act 1971 and the Health and Safety at Work Act 1974 which both apply to offshore activities. The Mineral Workings Act places health and safety duties on two critical points in the management chain so recognizing the connection between management and health and safety standards. The Health and Safety at Work Act places duties on employers to safeguard, as far as is reasonably practicable, the health, safety and welfare of their employees. There are requirements for the provision and maintenance of safe plant and systems of work, and the provision of information, instruction training and supervision. Employers have to prepare a written statement of their policy, organization and arrangements for health and safety, which again serves to emphasize that health and safety has to be managed. The crucial importance of the role of management, including that at board room level, has been reinforced by inquiries into a number of recent disasters in the UK such as the capsizing of The Herald of Free Enterprise and the London Kings Cross underground transport fire. Worldwide there are other prominent examples such as Three Mile Island, Alexander Kielland, Challenger, Bantry Bay, Bhopal, etc. All of these demonstrate the axiom that accidents are not matters of chance, but are subject to management control, and if management so determines, can be eliminated.

3. Principle of Proportionality

Another fundamental precept of the UK approach is that there should be proportionality between industrial risks and the measures taken for their control. When applying this principle offshore, because of the difficulties of escape in the event of a major incident, the precautions against catastrophic happenings must be greater and wider than those which would be required for the equivalent operation onshore.

4. Piper Alpha Recommendations

Returning to the Piper Alpha disaster, the inquiry recommended that operators should demonstrate to themselves and to a single regulatory authority, the OSD, the safety of their activities using the combined mechanism of Safety Management Systems, risk assessments and emergency rescue analysis, which together form the Offshore Safety Case.

- The Offshore Safety Case should, amongst other things, demonstrate that certain objectives have been met including:
 - (i) that the safety management system of the company and that of the installation are adequate to ensure the design and operation of the installation and its equipment are safe;
 - (ii) that the potential major hazards of the installation and the risks to personnel therein have been identified and appropriate control provided; and
 - (iii) that adequate provision is made for ensuring, in the event of a major emergency affecting the installation, a temporary safe refuge for personnel on the installation and their safe and full evacuation, escape and rescue.
- The operator should be required to satisfy itself, by means of regular audits, that the Safety Management System is being adhered to.

5. Offshore Safety Cases

Offshore Safety Cases will be required to demonstrate that the hazards have been identified and assessed, and that exposure of personnel to the hazards has been minimized.

They should be prepared primarily by the operator's own staff, although the use of consultants, particularly in the field of design and constructional integrity, will be admissible.

Our detailed thinking is still being developed, but we will be requiring the submission of an Offshore Safety Case for every installation within UK designated areas. The submissions for particular installations should extend to all related activities including diving, pipelines, the provision and conduct of standby vessels, etc. They should at least address whether or not an installation has been designed so that it is fit for its purpose and can be constructed, operated and eventually demolished safely. Many issues need to be considered under this heading. Ones that have particular relevance include:

- The location of accommodation facilities in respect of the main hazards.
- Escape routes.
- The provision of temporary safety refuges and their protection.
- The provision of Permit-to-Work systems.
- An assessment of the risks including quantified risk assessments for the major hazards.

- A statement of the Corporate Safety Policy and how this links into the overall company strategy.
- The system for implementing the Safety Policy and for managing health and safety.
- Methods to be adopted for controlling the risks including physical and management techniques.
- Procedures for keeping the Offshore Safety Case current.
- Revision dates.

6. Principles of Management

The basic concepts of management are the same no matter what activity is being undertaken. The main ingredients of any management scheme are:

- setting and agreeing on measurable objectives;
- preparing an operating plan with identifiable milestones on which progress can be measured;
- establishing mechanisms for achieving the plan and meeting the objectives;
- monitoring progress towards meeting the plan;
- making adjustments to the objectives, the plan or the mechanisms in the event of progress veering from the plan;
- carrying out further monitoring and adjustments.

7. Managing Health and Safety

The principles involved in managing health and safety are no different to those outlined above. Objectives have to be set and progress monitored to ensure that these are realistic and are being achieved. Just as for other management areas, applying the principles in the health and safety field is no easy matter and much effort and commitment are required at all levels within an organization.

Promoting acceptable health and safety standards depends upon having a clear policy that starts with a corporate acceptance of responsibilities which aims to cultivate positive management attitudes towards improving standards. A good starting premise is that all accidents and incidents of industrial ill health are avoidable and all are the responsibility of management. The policy should then go on to specify objectives that align with the overall company strategy and define the organization to meet these objectives. These should include the responsibility for the protection of people, plant and the environment. It is sometimes suggested that these can be pursued separately, but all form part of a coherent whole. Specific postholders should be named together with their

health and safety duties. At least some of the objectives should be in a measurable form, e.g., reductions in accident rates, lost time accidents and dangerous occurrences, carrying out a set number of safety audits each year. However, for major injury accidents, fatal accidents and disasters, it must be recognized that numbers are too small to be of statistical significance. In these areas the aims have to be couched in terms of reducing their long-term probabilities. To be successful, the policy has to have the positive support of the main board.

The management structure for implementing safety policies should include:

- Corporate Commitment - Perhaps the most important element in managing health and safety is that the most senior level of management and the most senior individuals make time and effort to demonstrate that health and safety performance is an important issue for the company concerned. Too often companies are willing to spend much money on developing schemes but do not give them sufficient status to allow them a chance of success. How many chief executives make time to get involved in safety presentations?
- Line of Accountability - A line of accountability for health and safety performance must extend from the board room to the lowest level of supervision within an organization. This should embrace the activities of contractors. Circumstances offshore demand that operators, in their dealings with contractors, reserve overall control to themselves. Therefore it is necessary for the accountability line to extend into the organizational structure of contracting bodies. Success is felt on rigorous application of management control, and each level of management should be held accountable for health and safety performance. How many annual performance reports have a relevant section on a person's achievements in the field of safety? Particular attention should be paid to the links between the management elements based ashore and those that are installation based, and to the problems of handovers at crew changes and shift changes.
- Safety Procedures - Details of the safety procedures to be followed will depend upon the identified hazards, and will include procedures for the control of safety critical activities. It goes without saying that Permit-to-Work Schemes should cater for secure isolation of equipment, for situations where more than one task is being carried out on one piece of equipment, and for shift change handovers. A more difficult question to address is when should they be used. Certainly they should be used to control all nonroutine work activities, but there may be some routine activities where the degree of risk warrants the formalized control afforded by a Permit-to-Work Scheme.
- Competence of Staff - The management system should align the competence and temperaments of individuals to the tasks which they are being expected to perform. Information, training and supervision needs to be according to the individual requirements.
- Communications - Attention should be given to establishing clear communication systems wherever these would be of benefit to health and

safety. Special care should be taken with the links between shifts and between operators, their contractors and other contractors. Also the benefits of having a command center that can be used in emergencies should be considered.

- Emergencies - The operators' formal command organization which is to function in the event of an emergency should be defined and well understood by all concerned. Emergency drills should be undertaken periodically.
- Monitoring - It is not sufficient to have written safety procedures that deal with every conceivable set of circumstances. Arrangements must be made to monitor their implementation and to report back any shortcomings to the line manager concerned and to senior management. Senior managers need to know, and should be very interested in whether or not their safety policies are being implemented. Unfortunately there is no easy calculus that can be applied to measuring health and safety standards. In lots of situations the objective is to reduce what is already a very low level of residual risk. There are a number of proprietary audit schemes on the market which can help with this task, but there is no reason why a company cannot generate its own system. A home-grown solution with all its shortcomings, but with which people can readily identify can often be more acceptable than an expensive system imported from outside. Any system should incorporate some elements that compare what actually happens on the ground with what is expected to happen. Periodic thorough scrutinies of plant and operations can help identify shortcomings.

8. Summary

Managing health and safety costs time and money. However, operators should make realistic appraisals of the costs that are avoided and the other benefits that accrue by ensuring good standards. Apart from the tragic loss of life, not much was left of the Piper Alpha platform following the disaster. There is growing evidence to show that health and safety not only makes good social sense, but also good commercial sense. This becomes particularly clear when the property damage costs that usually accompany accidents are added into the equation. Firm control over health and safety equates to control over other matters such as quality, wastages, manpower deployment, and so forth, and perception of control of these issues by outsiders can result in improved business opportunities. There is much truth in the adage that good business is safe business and safe business is good business.