

TOWARDS A MATURE SAFETY CULTURE

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This paper describes a novel, solution focused approach to developing maturity of an organisations' safety culture, the Safety Culture Maturity™ Model. This method involves assessing current levels of safety culture maturity, and involving all members of the workforce in identifying practical and realistic actions which will move safety culture maturity to the next level. The paper describes how this approach was implemented at BP's Dalmeny and Hound Point Asset, the process involved and the outcomes achieved to date.

INTRODUCTION

In recent years, there has been an increasing recognition of the importance of organisational, cultural and behavioural aspects of safety management in high reliability industries. Investigations into major disasters such as Piper Alpha, Zeebrugge, Flixborough, Clapham Junction and Chernobyl have revealed that complex systems broke down disastrously, despite the adoption of the full range of engineering and technical safeguards, because people failed to do what they were supposed to do¹. These were not simple, individual errors, but malpractices that corrupted large parts of the *social system* that makes organisations function.

Over the past 150 years the safety improvement has been largely focused on the technical aspects of engineering systems, and these efforts have been very successful. This success is evident in the low accidents rates found in the majority of safety-critical industries. However, it does appear that accident rates have now reached a plateau. As the frequency of technological failures in industry has diminished, the role of human error has become more apparent. Many safety experts now estimate that 80-90% of all industrial accidents are attributable to "human factors"². It seems likely that the most effective way to reduce accident rates even further is to address the social and organisational factors which impact on safety¹. Management has also come to realise that the general likelihood of an accident occurring in their plant depends not just on the actions of individual employees, but on the "safety culture" of their organisation, defined by the Confederation of British Industry³ as "the way we do things around here".

An increasing number of studies have been carried out to investigate safety culture in high-hazard industries and a number of books have recently been published discussing the factors that underpin safety culture. An even greater number of 'tools' have been developed to measure safety climate or safety culture. In parallel, individual companies and industry groups have embarked upon a number of safety culture improvement initiatives, for example the Step-Change in Safety initiative in the UK offshore oil and gas industry.

This paper provides an overview of recent into safety climate and safety culture research, and describes a new method which overcomes a number of the difficulties

encountered, namely the Safety Culture Maturity™ modelⁱ. The application of this model at BP's Dalmeny & Hound Point Asset is described, together with the benefits accrued to date.

SAFETY CULTURE - WHAT IS IT?

The term 'safety culture' appears to have arisen out of the report on the Chernobyl disaster in 1986, where the errors and violations of the operating procedures which contributed to the accident were cited as evidence of a poor safety culture at the plantⁱ. The identification of poor safety culture as a factor contributing to the accident led to a large number of studies investigating and attempting to measure safety culture in a variety of different high-hazard industries. Pidgeon⁴ suggests that safety culture provides a useful heuristic for managing risk and safety in organisations. He suggests that safety culture can be grouped under three headings; 1) Norms and rules for dealing with risk; 2) Safety attitudes; 3) The capacity to reflect on safety practices - and that it provides a 'global characterisation of some of the common behavioural pre-conditions to disasters and accidents in high risk socio-technical systems'.

The Advisory Committee for Safety in Nuclear Installations⁵ describes safety culture as 'the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine commitment to, and the style and proficiency of, an organisation's health and safety management. Organisations with a positive safety culture are characterised by communications founded on mutual trust, by shared perceptions of the importance of safety and by the efficacy of preventive measures'. Like other definitions of safety culture, it is broad-based and derived mostly from theory rather than empirical measurement. As a result, there is a danger safety culture definitions become a catch-all for social, psychological and human factor issues and the very broadness of the definition weakens its utility.

Most of the studies which have specifically attempted to measure safety culture concentrated on measuring 'safety attitudes' with positive attitudes to safety being considered to be the most important aspect of a 'good' safety culture. In the nuclear industry Lee et al⁶ assessed attitudes to risk and safety among 5,295 employees at a large British nuclear reprocessing plant. They used focus groups as a forum for workers to air their views and discuss issues concerning risk and safety. Statements from these discussion groups provided the basis for a questionnaire of 172 items which was then distributed to all those working at the plant. Lee et al found major differences in the attitudes and perceptions of different occupational groups, according to supervisor status, type of shift worked (i.e. day or night workers), sex, age and experience. Different groups of workers clearly had different perceptions, beliefs and attitudes with respect to safety. It is interesting to note that these differences in risk perception and attitudes to safety were clearly linked with prior accident involvement.

While the term safety culture is relatively new, in many ways the studies that have attempted to measure it are very similar to studies of safety climate, which appear to have

ⁱ Safety Culture Maturity is a Trade Mark of The Keil Centre Ltd

begun in the 1980's when Zohar⁷ described what he called a 'climate for safety' in 20 Israeli industrial organisations. Zohar's measure of safety climate was a summary of perceptions that employees share about their work environment and more specifically, 'this climate [reflected] employees perceptions about the relative importance of safe conduct in their occupational behaviour' (p. 96). Data analysis reduced his 40 item questionnaire to eight dimensions; 1) Importance of safety training; 2) Effects of required work pace on safety; 3) Status of safety committee; 4) Status of safety officer; 5) Effects of safe conduct on promotion; 6) Level of risk at the work place; 7) Management attitudes to safety and 8) Effect of safe conduct on social status.

SAFETY CULTURE OR SAFETY CLIMATE?

There is perhaps a need to derive more specific definitions of 'safety culture' as distinct from 'safety climate'. What can we conclude from the research literature about safety culture and safety climate? First, there seems to be some degree of overlap in the definitions of the two concepts, however, those operating in the realms of 'safety culture' tend to talk in terms of the attitudes, beliefs, perceptions and values that employees share in relation to safety - a collective commitment to safety⁸. Those operating in the safety climate domain describe a set of perceptions and beliefs held by an individual and/ or a group about a particular entity.

Safety culture may therefore be defined in terms of underlying belief systems about safety which are partly determined by group values, norms and regulatory frameworks. Safety climate, on the other hand, refers to the state of a system in terms of perceptions of the current environment or prevailing conditions which impact upon safety. These can be related to the physical environment in which the system operates, the work environment and features of the work/management system. It could therefore be said that a site has a safety climate and employees share a safety culture. Whether termed safety culture or safety climate, it is clearly important to determine what beliefs or values predispose people to be involved in accidents and what perceived conditions can lead to unsafe behaviour.

THE NEED FOR A SAFETY CULTURE MATURITY MODEL

Due to the recognised links between a "good" safety culture and good safety performance, many organisations have attempted to measure or assess their existing safety culture, and thus identify strengths and areas for improvement.

In the UK offshore oil and gas industry, numerous safety culture and safety attitude surveys have been conducted, with varying degrees of success. They have been likened to "describing the water to a drowning man" – in other words, they may eloquently describe the nature of the problem, but offer little practical help or potential solutions. Moreover, such methods do not typically involve the main constituents of safety culture – the employees – in identifying specific, local actions necessary to improve safety culture.

It has also been observed that identical behavioural safety improvement initiatives have succeeded on one installation or site, but failed at a technically-similar site elsewhere in the same organisation. Why should this be so?

Research in the oil and gas industry has revealed that sites may differ in the *maturity* of their safety culture, despite being located in the same organisation. A safety improvement technique may fail if not matched to the maturity of a site's existing safety culture. Furthermore, as safety culture matures, further improvement does not necessarily involve "more of the same". The type of safety culture improvement method needed to support safety culture development differs as safety culture matures. This development concept can be compared with child development – the types of actions necessary to help an infant learn, develop and mature differ in nature to those appropriate for a young adult.

A number of limitations with safety attitude or safety climate surveys have also been identified. These include the time, cost and difficulty of using the results to identify clear actions to improve safety performance.

A recent joint Health and Safety Executive and oil industry-funded project to address some of these concerns led to the development of a Safety Culture Maturity™ Model (SCMM). The SCMM is based on the capability maturity model concept, initially developed by the Software Engineering Institute⁹, as a mechanism to improve the way software is built and maintained. The SCMM aims to assist organisations in (a) establishing their current level of safety culture maturity and (b) identifying the actions required to improve their safety culture. It is proposed that companies or offshore installations in the early stages of developing their safety culture will require different improvement techniques from those with strong safety cultures.

The maturity model concept is new and therefore it was unclear if it could be effectively applied to safety culture improvement. An initial draft SCMM was developed based on safety culture research and maturity model literature. The components of the SCMM were based on the safety culture features listed in the Health and Safety Executive's human factors guidance document HS(G)48¹⁰. The initial model was tested by interviewing safety experts, operational managers, safety representatives and frontline staff about their company's safety culture development and the applicability of the SCMM. This led to the definition of a Safety Culture Maturity™ Model, with five levels of maturity (described below) and ten elements, namely:

- Visible management commitment
- Safety communication
- Productivity versus safety
- Learning organisation
- Health and safety resources
- Participation in safety
- Shared perceptions about safety
- Trust between management and front-line staff
- Industrial relations and job satisfaction
- Safety training

SAFETY CULTURE MATURITY™ MODEL ASSUMPTIONS

Cultural or behavioural approaches to safety improvement are at their most effective when the technical and systems aspects of safety are performing adequately and the majority of accidents appear to be due to behavioural or cultural factors. The Safety Culture Maturity™ Model is therefore only of relevance to organisations that already fulfil a number of specific criteria. These include (a) an adequate Safety Management System, (b) technical failures are not causing the majority of accidents and (c) the company is compliant with health and safety law.

FIVE LEVELS OF SAFETY CULTURE MATURITY

The SCMM presented in Figure 1 below is set out in a number of iterative stages. It is proposed that organisations progress sequentially through the five levels of maturity, by building on their strengths and removing the weaknesses of the previous level. It is therefore not advisable for an organisation to attempt to jump or skip a level.

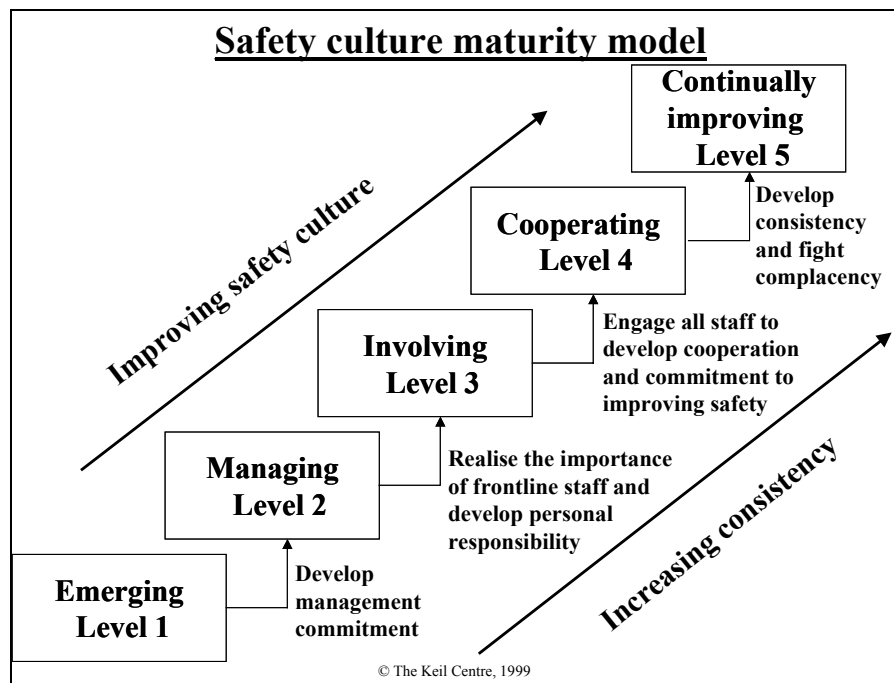


Figure 1: Safety culture maturity model

Note that the actions linking levels differ in their nature, and build upon the level of maturity established when moving to the previous level.

SAFETY CULTURE MATURITY DEVELOPMENT & IMPLEMENTATION – CASE STUDY

The Keil Centre has since developed the Safety Culture Maturity™ concept further and now provides an assessment tool to measure ten key elements of Safety Culture Maturity™. An interactive workshop process allows employees to identify current levels of Safety Culture Maturity™ and what needs to happen to move towards a more mature safety culture. The first application of this novel method was conducted in late 2000 at BP's Dalmeny and Hound Point asset.

BP's Grangemouth petrochemicals complex is one of their largest operating assets. It comprises an integrated crude oil stabilisation plant, oil refinery, chemicals plant and crude oil export terminal, and employs over 2000 people. BP's Forties Pipeline System transports 40% of oil output from North Sea offshore production platforms to BP Grangemouth for processing. The bulk of the crude oil is then pumped to BP's Dalmeny & Hound Point Asset on the Forth estuary, and onto crude oil tankers for export.

BP Dalmeny is regarded as having a relatively strong safety culture, and acceptable levels of safety performance. However, Dalmeny management are not complacent, and wished to identify realistic, practical actions that could be taken to further enhance their safety culture and performance. Dalmeny wished to focus particularly in the behavioural, human and organisational factors which influence health and safety, as they had experienced two recent incidents where unsafe behaviour was the most significant causal factor.

The Keil Centre used the Safety Culture Maturity™ Model to help senior managers plan and design a safety culture improvement initiative appropriate to their local needs and circumstances. The SCMM tool provided a systematic process to help senior managers understand key organisational and behavioural aspects of safety, prioritise areas for improvement, and plan how to make improvements.

At BP Dalmeny, this involved:-

- An initial orientation session for the management team, to explain the SCMM, its benefits and applications.
- Running a series of two-hour SCMM workshops to capture the views of all significant occupational groups within the Dalmeny workforce, including the management team, shift teams, fitters, marine teams and contractors. This involved approx 75 staff in total, comprising 50 BP staff (15 managers, 35 other) and 25 contractor personnel, a total of 75% of the total workforce.
- Thereafter running a half-day feedback & planning workshop for the management team, to (a) compare and contrast the maturity levels identified and (b) prioritise and plan tangible & realistic actions to improve safety culture maturity.

The assessment of Dalmeny Asset's safety culture maturity was conducted over a two-month period in the fourth quarter of 2000, and found that the maturity of most safety culture elements were at level 3 "involving", moving towards level 4 "cooperating". The safety culture was therefore relatively mature. Differences in levels of safety culture

maturity were found between major occupational groups, with the craft and marine teams assessing the maturity to be at a lower level. This was an important finding, as it enabled tailoring of improvement actions to the needs and maturity of the group, rather than adopting a “one size fits all” approach.

All occupational groups were able to identify practical actions to improve the maturity of their safety culture.

Common themes identified, which required action, were:

- a desire for more two-way, face-to-face communication about safety between management and front-line staff, with less reliance on e-mail
- a need for a mechanism to engage all staff, including management, in observing unsafe acts and conditions, taking action to encourage safe behaviour and positive attitudes to safety, and giving a receiving prompt feedback
- an absence of an effective, user-friendly system for reporting near-misses and minor incidents
- lack of follow-up and close-out of safety issues raised, leaving people with the impression that nothing has happened, and demotivated from reporting their concerns again
- a wish for increased recognition for participation and involvement in safety.

Several Dalmeny staff commented that a behavioural safety program was required. It is likely that a well-designed and implemented program could successfully address many of these issues, whilst enhancing the maturity of the existing safety culture. Such a program should be designed for the Asset, include a near-miss reporting system, and be integrated with the existing safety management system.

A number of team-specific issues were also raised, which were examined and addressed by the relevant managers.

BENEFITS OBTAINED TO DATE

Three months after completing the project, Phil Joyner, the Asset Manager reviewed progress which had occurred. At an organisation level the following actions had taken place:

- Asset staff had designed and implemented their own simple near-miss reporting system, which had already resulted in the reporting & correction of unsafe conditions which had existed for a number of years. Approximately three near-miss reports were being submitted daily
- More face-to-face communication, both formal and informal, was taking place between management and shift teams
- Regular shift team leader meetings had been re-introduced to talk about process and safety improvements. These meetings had been livened up by asking guests to talk on specialist production or safety issues

- Shift safety teams, which had been dormant for a number of years, had been revitalised by the team members themselves who now realise that they can make a difference to safety and were taking ownership for important safety improvement actions.
- Safety issues which had been reported were now being consistently ‘closed out’
- Increased recognition was being provided to members of staff who made a positive contribution to improving safety.

In addition, Phil has noticed some unexpected benefits of the Safety Culture Maturity™ workshops. The SCMM workshop process had been conceived as a means to assess levels of safety culture maturity, and identify improvement actions. It has become apparent that an additional educational benefit has been realised. Workshop participants have learned about the nature of safety culture, its main components, and how they can personally contribute to enhancing its maturity. Phil Joyner observed “people now possess a clearer understanding of the importance of their individual behaviour in improving safety performance, and demonstrate a greater willingness to take ownership of safety improvement actions”.

CONCLUSION

The Safety Culture Maturity™ model is a participative, solution-focused safety culture assessment and improvement method, which has exceeded the expectations at the first site where it was trialled. Since then the process has been rolled out in BP’s Bruce and Miller offshore production platforms, and will shortly be extended to BP’s Forties Pipeline System business. The Safety Culture Maturity™ process has also been implemented in Singapore, Norway and with a group of Venezuelan managers. What makes it different from other safety culture assessment processes is that it has a strong focus on solutions, involves a high degree of workforce participation, and provides an opportunity for staff at all levels to learn more about key elements of safety culture, and their role in its development and maturity.

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