# Different types of supervision and the impact on safety in the chemical and allied industries

## Literature review

Prepared by Entec UK Ltd. for the Health and Safety Executive

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# 1. INTRODUCTION

## 1.1 BACKGROUND

Research conducted by Bomel (2003) investigated the factors contributing to fatal accidents and found that supervision was considered to be one of the most significant organisational factors. Within the study, observations were made that supervisors were generally providing inappropriately low levels of supervision and guidance to workers, which was perceived to be more a result of heavy workloads rather than an overt neglect of responsibility, particularly across the hazardous industries. The report noted that it was unclear if health and safety implications have been recognised by the organisations, and highlights what can happen when supervisory responsibilities are not given sufficient time and consideration. There are also further implications for health and safety that may arise due to the type of supervision employed by an organisation.

Various initiatives within industry have led to significant changes in the way that organisations operate. These include the introduction of SMTs, delayering, multi-skilling, and increased contractualisation. One consequence is that the delivery of supervision has changed. For example, in the past a foreman may have worked within a hierarchical management structure, planning and communicating daily activities. Most organisations now use 'flatter' structures, which means the way supervision is delivered is not always so clear. Whilst benefits include enhanced team working, pro-active problem solving, and increased involvement in improving work practices; the influence on health and safety performance is not always apparent. This is partly because the relationship between supervision and health and safety performance is not fully understood, which means that organisations do not have a recognised method of assessing the impact of their method of delivering supervision.

The structure of an organisation is designed by management to achieve a number of objectives (e.g. productivity, flexibility, costs, health and safety). This includes how supervision is delivered. Alternative forms of supervision are appropriate for different situations, depending on the nature of operations carried out, the structure and culture of the organisation, nature of teams and so on. Therefore, one form of supervision is not always safer or more effective than another. Identifying the factors inherent in supervision that influence safety performance, both individual and organisational, will allow safer forms of supervision to be adopted or action taken to ensure that the method of supervision promotes safe working and minimises any potential risks. The objective of this literature review is to form the basis of a project aiming to develop a set of Safety Assessment Principles (SAPs) relating to the provision of supervision in the chemical industry. These will aid inspectors when assessing the safety of supervision delivery and help companies when designing new systems or reviewing existing ones.

This review forms the first part of a wider project that will:

- Review documented forms of supervision and factors that influence safety,
- Examine examples of the more common supervisory approaches in chemical companies,
- Develop Safety Assessment Principles (SAPs) by identifying and reviewing the factors inherent in supervision that influence safety,
- Pilot and revise the SAPs by assessing supervision in chemical companies and developing guidance for their application,
- Recommend counterbalances to the weaknesses inherent in different forms of supervision.

## 1.2 AIMS AND SCOPE

A review of the literature has been conducted to identify the current methods for delivering supervision and the factors that influence safety performance. A search has been conducted followed by review and documentation of:

- Characteristics of types of supervision and their strengths and weaknesses,
- Factors influencing safety performance,
- The impact of the different types of supervision on safety performance.

The review has focussed on the day-to-day supervision of operators and maintenance personnel. In addition, literature on the supervision of contractors has also been included.

## 1.3 APPROACH

The literature was accessed through searches of international occupational health and safety databases. The key terms used to guide the search included supervision, teamworking, teams, team leaders, self-managed teams, traditional/line supervision, chemical industry, major hazard industry, major hazard accidents, health and safety, multiskilling, delayering, contractors. The databases searched were: OSH-ROM on line by Silver Platter which includes HSELINE, MIDAS, RILOSH, CISDOC in addition to COPAC, hosted by the British Library.

Literature on the chemical industry was the main focus of the search, although some examples of supervision within other industries were included in the literature review, where appropriate. The searches primarily focussed on literature produced after 1980, although earlier literature was included where relevant. Some limitations of the literature became apparent when the research was conducted. In particular, little information was found regarding supervision of contractors and the impact upon health and safety performance. It is also noted that there is far more information reported in recent literature regarding SMTs than any other aspect of supervision.

### 1.3.1 Overview of Report Structure

The literature review begins by describing what supervision is, in addition to clarifying the differences between supervision and leadership, and defining the characteristics associated with each of the different types of team. The section concludes by providing a continuum of types of supervision, reflecting the fact that few teams represent a truly traditional or self managed structure, but a combination of both.

An overview of the factors that impact on health and safety performance is then presented, identifying the ‘success characteristics’ of health and safety and their relevance to supervision.

The section that follows discusses the links between different types of supervision and their impact on health and safety performance. Research examples of the impact of each supervision type on health and safety and the inherent strengths and weaknesses of each type of supervision are presented. Potential counterbalances are recommended to counteract the inherent weaknesses of each supervision type. Supervision of contractors and the impact of this on safety are then summarised in a separate section.

# 2. SUPERVISION

## 2.1 WHAT IS SUPERVISION?

Numerous definitions of supervision have been found within the literature. Some of the more pertinent definitions include:

'Co-ordination by someone taking responsibility for the work of others including *planning, scheduling, allocating, instructing and monitoring* actions' (Mintzberg, 1979).

'The supervisor…usually *organises or directs the work of others* by giving *direct instructions*, although subordinate supervisors may be involved as an additional layer between supervisor and worker' (Weston, Grimshaw & Norton, 1989).

'The supervisor will…

- Supervise work in the workplace, *inspect it and maintain discipline* in order that the company objectives are being preserved,
- *Allocate tasks* for his team and in turn be held *accountable* for work done' (McGoldrick, 1994).

'The supervisor is the *shop-floor face* of the organisation, the filter or lens through which management messages and attitudes are transmitted to the workforce and views and feedback from the shop-floor passed back up to line management' (Lardner & Miles, 1998).

Taken together, the definitions advocate that supervision involves; directing the work of others, allocating workload, planning and scheduling, instructing and monitoring actions, maintaining discipline, taking responsibility and ultimately being held accountable for the work done. The supervisor also generally 'acts as the interface between management and the workforce' (Anon, Offshore Research Focus, 1999). Throughout this literature review, supervision is considered to be a function that can be delivered by one or more individuals within and/or external to a team.

### *Supervision and leadership – what is the difference?*

In describing leadership, Miner & Beyerlein (1999) noted that, "leadership represents a system of guiding influences that may be embodied in people at different levels of the organisation or in the cultures and support systems of the organisation". In practice a number of people may have leadership roles, including managers, supervisors, team leaders, or even some or all team members.

Pearce and Thier (1999), presented two models of leadership:

- Traditional model of leadership: *vertical leadership*, i.e. a downward influence projected by leader on followers; and
- Emerging models of leadership: *shared leadership*, i.e. mutual influence projected *between* all team members.

Allen (1998) illustrated the characteristics of supervisors in the form of team leaders, defining: *'Supervisors, as team leaders, share information, trust others, surrender authority, and understand when to intervene. They participate in setting objectives, defining roles, and managing processes, such as time, disagreements, and change'.*

McGoldrick (1994) noted that the role of the supervisor was moving towards a leadership role, which may reflect the general trend away from traditional styles of management.

It is therefore concluded that leadership has less direct control than supervision, and is more focussed on setting direction and providing support. Hence leaders will give more autonomy to team members than supervisors.

### *Supervision and the Chemical Industry – What are the issues?*

In recent years the nature of supervision has changed across sectors of industry. As companies have reduced staff, 'delayered' and increased the use of contractors, they have introduced new concepts such as 'multiskilling' and 'self-managed teams.' In many cases team leaders, coaches, or mentors, who have different roles and responsibilities, have replaced supervisors and / or foremen. In some cases teams have had no defined leader at certain times (e.g. during nights or weekends).

Research has identified that ensuring compliance is an important factor in terms of supervision and its relation to health and safety compliance. Bomel's (2003) report, which reviewed accident data and files from a range of sectors (including hazardous industries), observed that management and supervision were considered to be the most significant organisational factors affecting accidents. It was considered that this was a result of heavy workloads rather than an overt neglect of responsibility. In addition, it was suggested that this lack of supervision may be related to the prominence of compliance failures in the review (i.e. cases of violations and bad practice were noted). The fact that such non-compliant behaviour is sometimes tolerated and not addressed by management may also be indicative of wider failings in organisations' safety culture.

Harris (2003) suggests that management needs to better understand their responsibility with regard to health and safety. This paper reported on an explosion at a plant, within the chemical industry, at an organisation that had a number of health and safety policies and procedures in place. After the incident investigation, the HSE prosecuted the company for failing to ensure the safety of employees. Although employees were negligent in some regard for failing to follow procedures, the HSE felt a lack of supervision at the site was a management failure.

## 2.2 DIFFERENT TYPES OF SUPERVISION

**Table 1 -** Characteristics of different types of supervision

| ***Type of Team*** | ***Characteristics of Supervision*** |
|---|---|
| Traditional, hierarchical | • Traditional supervisor responsible for the work of others, including planning, allocation of work, instructing and monitoring actions.<br>• Emphasis on a downward influence, maintaining discipline and being held accountable for the work done.<br>• Hierarchical structure. |
| Team with Team Leader | • Single leader, possibly working as a team member having team duties as well as a leadership role.<br>• May be nominated by other team member(s) or by management, depending on the culture of the organisation. |
| Team with Shared Leadership | • Mutual leadership projected between a number of team members, possibly via rotating leadership across each of the team members. |
| Team with Coach or mentor | • Generally in place to facilitate teamwork, responsible for developing teams and providing them with support to progress. A coach or mentor is not usually a team member. |
| Self-managed team | • Teams that operate without direct supervision.<br>• Team members have increased responsibility, autonomy and involvement in decision-making; mutual accountability, and monitor their own work performance.<br>• Flat organisational structure. |
| Multiskilled team | Increasing people's skills and competencies, and enabling them to carry out tasks previously or traditionally carried out by another function. |

### 2.2.1 Characteristics of traditional supervision

Traditional methods of supervision have been defined as where a *'supervisor or appointed group leader is primarily held accountable for the activity and results of the work unit'* (Cole & Stover, 1999). Or, alternatively, *'work is organised to emphasise the vertical relationship between the supervisor and each worker and to minimise co-worker interaction'* (Batt, 1999). Therefore an individual has the responsibility for delivery of all aspects of supervision to the team.

### 2.2.2 Characteristics of self-managed teams

There is no single, accepted definition of a Self-Managed Team (SMT). For example, truly self-managed teams are *"groups that operate without direct supervision"* (Yandrick 2001). However, a clearer approach is one where *"self-managing teams involve day to day control, responsibility and decision-making being devolved to front-line employees, whilst supervisors are removed, or become working team members or coaches"* (Anon, Offshore Research Focus 1999). Whilst the increased responsibility, decision-making and accountability reflect SMTs, it is argued that the presence of a working team member / leader or coach is not necessarily reflective of a team that is fully self-managed.

From the literature it appears that there is a wide variation in what is referred to as a SMT, particularly in terms of the level of supervision and autonomy given to the team. There are a number of different terms which have been used to describe the various styles of self-managed teams and these include self-directed teams, team-based working, empowered teams, self-regulating work teams, semi-autonomous work groups, autonomous work groups, and self-managed work teams.

'Empowerment' is a term often used in connection with SMTs, and has been defined as involving, *'the maximum transfer of tasks and responsibilities to workers, implying a drastic reorganisation of the management process'* (Hechanova-Alampay & Beehr, 2001). Such a description reflects the characteristics of self-management, whereby employees are provided with the means and responsibility to make decisions and manage themselves through delegation of power.

For the purposes of this review, the term Self Managed Team (SMT) will be used throughout, whilst recognising that there is still a great deal of variation in the ways in which organisations apply this term.

#### *SMTs and team leaders*

Organisations that have not fully implemented SMTs generally appoint a team leader to each of their teams (Wellins *et al*, 1991). As is discussed in Yeatts and Hyten's (1998) *'High-Performing Self-Managed Work Teams'*, the appointment of a team leader may be aimed at preventing a loss of control or reduce turmoil within the teams. Team leaders may vary in the method and length to which they are appointed, which will be reflective of the organisational environment. As observed by Yeatts and Hyten (1998), in a more advanced self-managed environment the team members determine who will be the team's leader. Variations also occur in relation to the length of appointment to team leader, e.g. in some SMTs, team leaders may step down after a certain period, allowing another member the opportunity to be a team leader. In other organisations, a team leader may be appointed as a more permanent arrangement. Alternatively, organisations may have a system of rotating (shared) leadership, where each member of the team takes a turn as team leader; others may have an election that includes only those team members interested in the position.

The selection of a team leader may be made by management or by the team members themselves. Ray and Bronstein (1995) observed that when team members are given the responsibility of selecting their own team leader, this contributes to the team member feelings of ownership and responsibility. Conversely, in situations where management selects the team leader, the assigned leader is typically viewed as being another form of supervisor / manager and the team's ability to "self-manage" suffers. In this scenario, although management may be 'preaching' empowerment, they are still maintaining control, thereby not providing meaningful support for empowerment or self-management.

As Wellins *et al* (1991) described, '*typically, a team leader spends time actually performing various production or service tasks but also helps the team accomplish its leadership responsibilities'*. Another alternative is to have a coach or mentor associated with the team and Aaltonen & Venta (1999) noted that, *'the team coach is generally somebody in the organisation who is responsible for developing teams and teamwork'*.

The different levels of supervision associated with the different types of teamworking are represented in section 2.3 of this report as a 'continuum of types of supervision' (see Figure 1). The continuum reflects that few teams represent a truly self-managed or traditional structure, but a combination of both.

### 2.2.3 Characteristics of multiskilling

The HSC (1998) defined multiskilling as, *'a way of working where the traditional divisions between work areas and separate disciplines are removed, and individuals are given the responsibility for a range of different types of task'*. Horbury and Wright (2001) researched multiskilling and noted that it can be fundamentally considered as increasing people's skills and competencies, and allowing them to carry out tasks previously or traditionally carried out by other functions.

Horbury and Wright (2001) noted that multiskilling is often introduced as part of a wider set of organisational changes, such as downsizing and Self-Managed Teams. This is highlighted by the fact that in one paper (Lardner, 1999) eight of the eleven example case studies that implemented SMTs in the petrochemicals UK process industries, also introduced multiskilling (further details of this case study, along with others are included in Appendix B of this report). The relevance of multiskilling to supervision is that it changes the identity of teams (e.g. operations and maintenance being performed by the same team, whereas in the past they would have been performed by two separate teams).

Horbury and Wright (2001) identified that recent research reports, and the majority of case study companies, had used multiskilling as part of their process of reorganisation. Reorganisation can occur through the introduction of downsizing and delayering, in order to reduce costs and improve productivity. Multiskilling equips personnel with the skills to carry out a wider variety of tasks, meaning that employment levels can be reduced. Cockrill and Scott (1998) identified that multiskilling is often a *reaction* to a reduction in personnel rather than a deliberate strategy. In such cases, multiskilling tends to be a necessary consequence of *'organisational coping'* (Horbury & Wright, 2001).

### 2.2.4 Use of contractors

Increased use of contractors throughout UK industry means that organisations now have to manage staff who are not employees of the same organisation, and this raises a number of issues regarding supervision. The Chemical Industries Association (CIA) published a report in 1993 on the UK indicators of performance, which defined contractors as *'any non-company employee who is providing a service to the company on the company's premises'*.

Hudson (1991) made the observation that, whilst company activity increasingly includes the management of third parties, this is often not reflected in a structured way within the organisation's working practices. It is therefore important that companies consider how they are managing third parties / contractors and the consequences of the method employed in terms of the effects on safety performance. Increasingly, it is the safety of contractors', rather than company personnel, which is at greater risk.

## 2.3 CONTINUUM OF TYPES OF SUPERVISION

The lack of agreed definitions for different types of supervision, and the apparent variation in terminology used means it is necessary to have a method of evaluating the type of supervision used in different circumstances. From the literature surveyed it has been possible to develop a continuum of supervision types. This is shown in Figure 1.

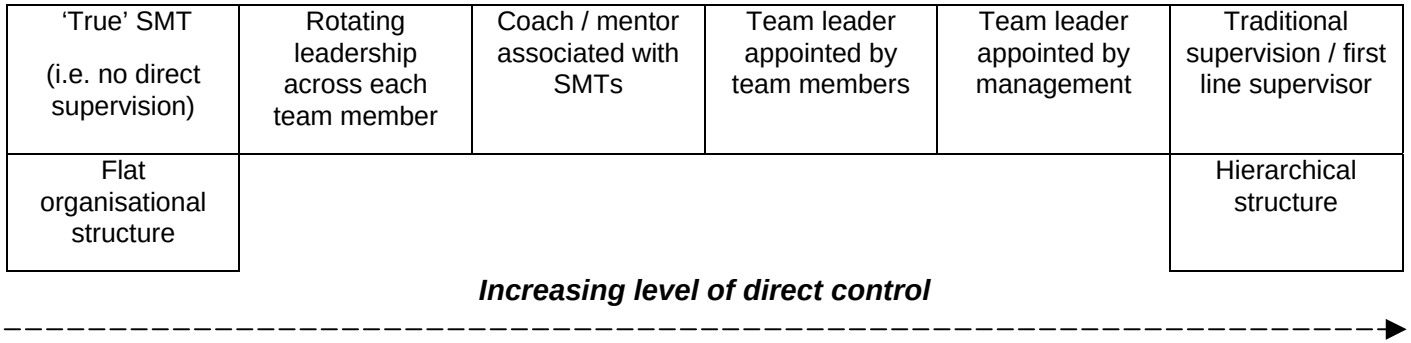


**Figure 1 -** Continuum representing the level of supervision across different types of supervision

Figure 1 illustrates a continuum ranging from a 'true' self-managed team to traditional supervision. The continuum presents different types of supervision, shifting through increasing levels of direct control, with the true SMT representing no direct supervision and traditional supervision representing the most amount of supervision. 'Multiskilling' is absent from the continuum as it is an approach that could be incorporated across all types of supervision. The continuum depicts the different levels of supervision that can be associated with teamwork and reflects the fact that few teams represent a truly traditional or self managed structure, but a combination of both.

# 3. IMPACT OF SUPERVISION ON HEALTH AND SAFETY

## 3.1 SUCCESSFUL HEALTH AND SAFETY MANAGEMENT

The Health and Safety Executive's (HSE) *'Successful Health and Safety Management'* publication (1997) sets out the Policy, Organising, Planning, Measuring, Audit, Review (POPMAR) model as the basis for effective health and safety management. It states that *'adequate supervision complements the provision of information, instruction and training to ensure that the health and safety policy of an organisation is effectively implemented and developed'*. It also makes the observation that, *'supervisors, by example and discipline, are uniquely placed to influence how well organisations achieve health and safety objectives and what standards of performance are maintained'* and that people with supervisory responsibility are not always called *'supervisors'*.

## 3.2 HEALTH AND SAFETY 'SUCCESS CHARACTERISTICS'

Within the application of successful health and safety management, there are a number of aspects that have been shown to be associated with good safety performance. HSE's *'Successful Health and Safety Management'* (1997) included senior management commitment, leadership, communication, employee involvement, clear roles and responsibilities, and training and competence as factors that affect health and safety, within the POPMAR health and safety framework. For the purposes of this review, these factors will be termed health and safety 'success characteristics'. These are summarised in Table 2 in terms of their relevance to supervision.

**Table 2 -** Relevance of success characteristics to supervision

| ***Success Characteristic*** | ***Relevance to Supervision*** |
|---|---|
| Senior management commitment | Clear and strong commitment from senior management, to pursue continuous improvement of safety, is one aspect of management that is vital for safe operation (Hudson, 1991). If an organisation's supervisory arrangements demonstrate a lack of commitment (e.g. lack of management visibility/contact with supervisors; insufficient resources invested in the safety management systems) then it is likely that this will adversely affect safety performance (HSE, 1999; Fleming, 1997; Cohen, 1997). |
| Leadership | Effective leadership strategies driving safety initiatives have resulted in improved health and safety performance (Pearce, 1998). Within supervisory arrangements, an example of a *'leaderless'* model (Vaananen, 2002), which occurred through the elimination of middle management without adequate planning and preparation, and resulted in impaired safety performance. |

| | |
|---|---|
| Communication | Effective communication between employees, supervisors and management is important within an organisation's supervisory arrangements because of the positive effect that it has on safety performance (e.g. Fleming 1997; Cohen, 1997). An organisational structure that has a high number of employees per supervisor may suffer from communication problems, if it is not clear where the responsibility for upwards communication lies (Hudson, 1991). |
| Employee involvement | Different forms of supervision lend themselves to greater employee involvement, e.g. facilitation of work group participation in decision-making / teams employing a participatory style. This greater level of employee involvement has a positive effect on safety performance (e.g. Fleming, 1997; Lefer, 1977). |
| Clear roles and responsibilities | If employees, supervisors and team leaders are not clear about their roles and responsibilities this has the potential to adversely impact safety performance, e.g. Vaananen (2002) and HSE (1999). The supervisory arrangements therefore need to make these roles and responsibilities clear. |
| Training and competence | A lack of training and competence has been linked to poorer safety performance. In terms of supervision, organisations should ensure that team members receive training and are competent in both the technical and non-technical (e.g. teamworking) skills required for their role (e.g. Lardner, 1999; Hackman, 1994). |

# 4. LINKS BETWEEN TYPES OF SUPERVISION AND HEALTH AND SAFETY PERFORMANCE

## 4.1 TRADITIONAL SUPERVISION

### 4.1.1 Traditional supervision and safety – research examples

An investigation was conducted into work injuries, as a measure of safety, and the number of first level supervisors within 140 organisations across the chemical, paper, and wood product manufacturing industries (Rinefort and Van Fleet, 1993). The amount of supervision was calculated in both the traditional manner i.e. the average number of employees per supervisor, and in terms of the cost of supervision per employee. Findings showed that those organisations with a larger number of available supervisors per employee generally have fewer work injuries. It was suggested that this might be because such organisations have enough supervisors to co-ordinate work activities and to provide communication and support, thereby assisting the reduction of work injuries.

### 4.1.2 Inherent strengths of traditional approaches to supervision

In general, the strength of the traditional, hierarchical approach to supervision is that there are clear lines of reporting. This means that:

- Everyone within and outside the team knows that the Supervisor leads the team, and hence they know who to talk to about issues that affect, or are affected by the team's actions.
- The Supervisor provides a channel of communication between the team and management.
- The Supervisor can interface with the rest of the organisation on behalf of all team members.
- The hierarchical structure means that roles are relatively easy to define, and hence everyone (including the Supervisor and team members) understands their responsibilities.
- The Supervisor is responsible for all aspects of the team performance.

### 4.1.3 Inherent weaknesses of traditional approaches to supervision

In general, the weakness of the traditional, hierarchical approach to supervision is that a large amount of the team's decision making and leadership is in the hands of one person (the Supervisor). Table 3 demonstrates some of the potential weaknesses, and the counterbalances that can be used to minimise the effects.

**Table 3 -** Inherent weaknesses of traditional approaches to supervision

| ***Potential Weakness*** | ***Recommended Counterbalance*** |
|---|---|
| Senior management may spend time with Supervisors, but much less with team members, meaning their commitment to health and safety may not be so visible. | Senior managers should ensure they spend time with all their staff, and that at every opportunity they visibly demonstrate the commitment to health and safety. It is also important that Supervisors and senior management present consistent messages, and that they 'lead by example.' |
| With the Supervisor having a key role in decision making and leadership, team members may lack autonomy and hence have reduced job satisfaction. | Supervisors should aim to delegate tasks wherever appropriate, and take responsibility for developing the skills of their team members. |
| With the Supervisor taking overall responsibility, the team members may lack accountability for their actions. | Supervisors and senior management should aim for workforce involvement wherever possible. This should ensure everybody understands what is required and expected of the team, and how their actions contribute. |
| Hierarchical structures can lead to inefficient operations caused by demarcation. | Roles and responsibilities should be based on team and individual objectives. |
| Personal development of team members may be restricted because all 'higher level' activities are performed by the Supervisor. | Team members should have training and development plans that identify where experience is needed in 'higher level' activities and the Supervisor should delegate whenever opportunities arise. |
| With the Supervisor having responsibility for communicating to team members, e.g. in terms of allocating and planning work, team members may lack the opportunity to communicate with one another, resulting in minimal co-worker interaction. | Team members should be encouraged to interact with one another. This could take the form of daily team meetings at the beginning of shifts, or taking part in problem-solving workshops. |

### 4.1.4 Summary of traditional supervision and links with health and safety

Whilst traditional supervision lends itself to clear lines of communication, a lack of employee involvement is apparent, and this may adversely impact on health and safety performance. Organisations with a traditional type of supervision tend to rely on safety representatives, rather than involving employees in health and safety issues, adding to the overall lack of employee involvement. Traditional supervision also lends itself to clear leadership and clear roles and responsibilities for employees. Although lines of communication tend to be clear within an organisation employing a traditional structure, communication between co-workers may be minimal. In addition, a lack of variation in roles within a traditional structure may mean that levels of employee competence are limited.

## 4.2 SELF-MANAGED TEAMS

### 4.2.1 Self-managed teams and safety – research examples

Research evaluating the effectiveness of SMTs mostly focuses on financial returns and employee involvement and satisfaction, and rarely focuses on the effects on health and safety. However, Lardner (1999) stated that greater job satisfaction may improve the mental health of employees, whilst improved safety may be a result of better decision-making and a more committed workforce. The promotion of a more skilled, committed, independent, informed, and flexible employee might maintain or enhance health and safety within an organisation. (More detail regarding the strengths, and weaknesses, associated with SMTs is included in Appendix A of this report). Research investigating the safety implications of SMTs was conducted by Lardner (1999) at BP Oil Grangemouth Refinery Ltd[1].

#### *Summary of the implementation of SMTs in non-petrochemicals industries*

Lardner (1999) describes five published examples, across a range of industries, of SMTs and their relationship with safety. Four of the studies detailed the introduction or re-introduction of SMTs in existing organisations, whilst the fifth study referred to a start-up plant.

Findings across these five non-petrochemicals examples demonstrated that SMT implementation had either a positive or neutral effect on health and safety, whilst none recorded a detrimental effect. Such positive improvements in health and safety included fewer safety violations and reduced accident rates, and improvements in absence and stress-related illness. Cohen and Ledford (1994) indicated that specifying improvements in safety indicators as an explicit goal, when implementing SMTs, may be one key to yielding safety improvements, which may go some way to explaining the neutral effect on safety observed in this particular study. In addition, the removal of SMTs, that were fully ingrained in one organisation, led to adverse effects on safety, with its reintroduction repairing the damage (Trist Bamforth, 1951).

#### *Summary of the implementation of SMTs in the petrochemicals industry*

A review of the implementation of SMTs in the onshore and offshore petrochemicals industry (Lardner, 1999) described eight examples of SMT implementation. Of these eight examples, three included reviews of health and safety performance that demonstrated positive effects, including a decrease in absenteeism and a decrease in lost-time accidents (Parker, Chmiel and Wall, 1997). A further two case studies observed reductions in absenteeism, but presented no safety data (Anon, 1990; BP Chemical's Baglan Bay, 1992).

#### *Summary of SMT case studies within the UK process industry*

Lardner (1999) detailed four case studies that had implemented SMTs within the UK process industry. Each case study varied in terms of the type of SMT implemented, which included SMTs with a working team leader, empowered teamworking with an associated coach, and multiskilled teams.

Three of these case studies had sufficient information to determine the impact of SMTs, two of which reported no change in key health and safety performance indicators, whilst the third observed reductions in lost-time accidents, injury rates, and sickness absence. One of the organisations that observed a neutral effect *did not* have improved safety performance as a goal of the empowered teamworking initiative (Trist, Susman and Brown, 1977).

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[1] *It has been observed that, since commissioning the 1999 study into the safety implications of SMTs, supervisors have been independently re-introduced at both BP's Grangemouth and Coryton plants.*

### *Empowered teams*

Hechanova-Alampay & Beehr (2001) conducted a study in a large company within the U.S. chemical industry that investigated the relationship between empowerment and safety measures. Levels of empowerment were found to have a strong relationship to safety performance. Teams that were more empowered performed safe behaviours more frequently and had better safety records.

### 4.2.2 Inherent strengths of SMTs

In general, the strength of employing SMTs is that there are increased levels of employee involvement and autonomy. For example:

- There are less 'layers' between senior management and the teams,
- There is increased workforce involvement, e.g. participation in decision-making,
- Employees have increased levels of responsibility and greater opportunities to have a more varied role and increase levels of competence,
- The SMT approach promotes within team interaction/communication.

### 4.2.3 Inherent weaknesses of SMT approaches to supervision

Problems have been encountered with SMTs when they were implemented by consultants with little health and safety knowledge (Blackmore, 1997. In general, the weakness of SMTs is that roles and responsibilities may be less clear, and team members need high levels of competence in supervisory skills. Table 4 demonstrates some of the potential weaknesses, and the counterbalances that can be used to minimise the effects.

**Table 4 -** Inherent weaknesses of SMT approaches to supervision

| ***Potential Weakness*** | ***Recommended Counterbalance*** |
|---|---|
| Senior management may not allocate the appropriate resources needed to implement SMTs effectively, demonstrating a lack of commitment. | Senior managers should ensure that they not only allocate resources to effectively implement SMTs, but also to support any ongoing maintenance, e.g. to deliver any training required by staff who have greater responsibilities. |
| The nature of SMTs (no direct supervision) means that there may be a lack of leadership. | Teams should be provided with adequate support, ensuring that leaders are allocated according to who will take the lead for certain situations / tasks. |
| The higher level of delegation specific to SMTs may result in reduced communication between teams and management, through the absence of a Supervisor who would normally be responsible for this communication. | Communication between management and team members should be promoted, e.g. via team briefings or through team member representation on health and safety committees / other consultation groups. |
| With team members having mutual accountability within SMTs, there is a potential for a lack of clarity regarding individual roles and responsibilities. | Roles and responsibilities for teams and individuals should be clearly defined and based on team and individual objectives, rather than job/task descriptions. |

| *Potential Weakness* | *Recommended Counterbalance* |
|---|---|
| Informal hierarchies may develop within the team, thereby negating the benefit of SMTs. | Roles and responsibilities can be rotated across team members to avoid the development of a hierarchy and increase task variety. |
| Within SMTs, team members generally have wider roles and responsibilities, which therefore results in increased training needs and may be a problem if not recognised. | The identification and delivery of individual and team training needs is necessary for the effective implementation of SMTs. This includes both technical and non-technical (e.g. teamworking skills) training needs. |

### 4.2.4 Summary of SMTs and links with health and safety

The research referred to in this review appears to show that SMTs have been implemented without compromising health and safety. The research has also highlighted that having improved health and safety as an explicit goal of implementing SMTs does result in improved health and safety performance. In addition, increased employee involvement in health and safety was repeatedly demonstrated as being a consequence of implementing SMTs. The implementation of SMTs also lends itself to increased levels of communication within teams, however care should be taken that communication between teams and senior management does not suffer. In addition, there is the potential for a lack of leadership within teams and a lack of training, which may adversely impact health and safety if not taken into consideration. Organisations should also ensure roles and responsibilities are made clear now that employees have increased levels of responsibility.

## 4.3 TRADITIONAL SUPERVISION AND SELF-MANAGED TEAMS – COMPARING IMPACTS ON SAFETY

Pearson (1992) compared the introduction of SMTs within an engineering workshop with work groups that remained traditionally-organised. Findings demonstrated that, whilst accident rates remained constant in SMTs, the groups remaining under traditional supervision showed deterioration in safety performance through a significant increase in accident numbers. In terms of employee satisfaction with safety, Ondrack and Evans' (1986) found that there were no differences between traditional and SMT types of supervision. For further details of these comparisons between SMTs and traditional supervision, please refer to Appendix C.

Research suggests that traditional types of supervision do not compare as favourably with SMTs, in relation to effects on safety performance.

## 4.4 MULTISKILLING

### 4.4.1 Multiskilling and safety – research examples

Horbury and Wright (2001) conducted research, on behalf of the HSE, which identified the health and safety impacts of multiskilling. It was observed that the introduction of multiskilling within organisations was typically carried out with the aim of improving efficiency, reducing costs, improving quality and increasing production. The study focused on the health and safety aspects of multiskilling in hazardous industries, such as chemicals manufacturing and oil refineries, although it was noted that the findings and models might be of equal relevance to other sectors. The approach involved a review of the research, accident reports, audits and case studies.

Horbury and Wright noted that *'supervision, training and competence problems are associated with both multiskilled and traditional teams'*. A review of major accident reports noted that the introduction of multiskilling has been associated with a number of serious safety problems, relating to:

- Reduction in staffing leading to workload problems,
- Lack of leadership in multiskilled teams demonstrating deficient teamwork leading to loss of co-ordination, error checking and supervision,
- Lack of support (i.e. appropriate training and performance monitoring) for the introduction of multiskilling.

The study did however note that the problems could have been due to a failure to handle the teamworking, supervision and competence issues created by a new style of workforce organisation rather than by multiskilling *per sé*. As a result of the case studies and published reports, the researchers suggested that multiskilling does not necessarily pose a threat to safety. Rather, the impact on safety performance depends upon the quality of planning, assessment, implementation and monitoring (in accordance with HSE's *'Successful Health and Safety Management'*, 1997). It was observed that the problems reported with multiskilling appeared to be associated with 'peripheral' issues such as supervision, peak period workloads and long term skill maintenance. As the introduction of multiskilling is typically motivated by financial and business management factors, such as downsizing, it is understandable that such 'peripheral' issues may be overlooked, where multiskilling is one part of a wider process. It was suggested therefore that these issues might require more active management and planning.

Horbury and Wright (2001) cautioned that research inevitably focuses on the adverse safety impacts of multiskilling, due to the fact that multiskilling is primarily introduced for business reasons rather than to enhance safety performance. In addition, reports on safety impacts were typically restricted to adverse events, such as accidents, due to the lack of existing research in the exploration of how multiskilling may offer safety benefits. Furthermore, the research indicated that, when properly managed, the introduction of multiskilling need not endanger safety.

### 4.4.2 Inherent strengths of multiskilling

The strengths of multiskilling are increased employee involvement across a wider variety of tasks and increased levels of skills and competencies across employees.

### 4.4.3 Inherent weaknesses of multiskilling

Horbury and Wright's (2001) review of research, accident reports, audits and case studies identified a number of risk controls and best practice for mitigating the negative effects of multiskilling on health and safety. Examples, in terms of potential weaknesses and counterbalances, are included in Table 5.

In general, the weaknesses of multiskilling include the potential for a lack of support and a lack of clarity of roles and responsibilities due to the wider skill base. In addition, there is a need for long-term skill maintenance. Table 5 demonstrates some of the potential weaknesses, and the counterbalances that can be used to minimise the effects.

**Table 5 -** Inherent weaknesses of multiskilling

| ***Potential Weakness*** | ***Recommended Counterbalance*** |
|---|---|
| Senior management motives behind the introduction of multiskilling are often financially / business oriented | Senior managers should include enhanced health and safety as one of the goals when introducing multiskilling. |
| The introduction of multiskilling may suffer from a lack of financial commitment from senior management to appropriately train all team members. | Senior managers should ensure that they allocate sufficient resources to provide the training required to effectively introduce multiskilling (including resources for the identification and delivery of all training needs). |
| Multiskilling may result in a lack of leadership, as everyone is skilled to do the job, but there may be no one 'standing back' to gain an overview of the situation. | Teams should be provided with adequate support, ensuring that leaders are allocated according to who will take the lead for certain situations / tasks. |
| There is the potential for a lack of co-worker interaction due to each team member being able to carry out a wider variety of tasks, therefore essentially reducing the need for them to communicate with on another. | Team members should be encouraged to interact with one another. This could take the form of daily team meetings at the beginning of shifts, or taking part in problem-solving workshops. |
| There is scope for a lack of clarity of team member' roles and responsibilities due to the wider skill base across the team. | Roles and responsibilities for teams and individuals should be clearly defined and based on team and individual objectives, rather than job/task descriptions. |
| With team members having a wider skill base, there is the potential for employees to become overloaded through higher expectations of management. | Team members should be provided with adequate support, and the allocation of work should be monitored to ensure that team members are not overloaded. |
| With team members having a wider skill base, there is the potential for loss of competence through individuals not using their skills frequently enough. | Ensure maintenance of skills through retraining or job rotation to utilise team member skills. |
| A Supervisor may not be familiar with the multiple skills of his/her team and as a result may miss particular job-related problems. | Ensure that supervisors are familiar with the multiple skills of his/her team members, so that he/she is familiar with the capabilities and limitations of his/her team members. |

### 4.4.4 Summary of multiskilling and links with health and safety

Research shows that if the introduction of multiskilling is not properly managed a number of issues may emerge, which may impact adversely on safety performance. These factors include lack of leadership, poor communication and lack of clarity of roles and responsibilities due to employees having a wider skill base. Multiskilling also raises the need for long-term skill maintenance and the potential for lack of support. Research has tended to focus on the adverse safety impacts, due to the fact that the introduction of multiskilling is generally business-oriented in the first instance. However, more positively, multiskilling lends itself to increasing

employee involvement across a wider variety of tasks, in addition to increasing levels of skill and competence across the organisation. Through proper management and planning safety need not be adversely affected by multiskilling.

# 5. LINKS BETWEEN USE OF CONTRACTORS AND HEALTH AND SAFETY PERFORMANCE

Increased use of contractors, throughout UK industry, means that organisations now manage staff who are not employees of the same organisation. This undoubtedly affects supervision and may impact on health and safety performance. For the purposed of this research, contractors are defined as '*any non-company employee who is providing a service to the company on the company's* premises' (Chemical Industries Association, 1993).

## 5.1 SUPERVISION OF CONTRACTORS AND SAFETY

Hudson (1991) made the observation that, whilst company activity increasingly includes the management of third parties, this is often not reflected in a structured way within the organisation's working practices. It is therefore important that companies consider how they are managing third parties / contractors and the consequences in terms of the effects on health and safety performance. Increasingly, it contractors' rather than company personnel that are at risk.

The use of contractors varies from site to site, although typically they are employed during routine and shutdown maintenance. The HSE has for some time recognised that maintenance is the cause of a higher number of accidents than day-to-day running and that contractors are often involved in these accidents. In 1992 the HSE published an updated report examining 502 maintenance incidents directly related to chemical plant and processes. In the majority of the serious cases (75%), it was found that site managers could be held largely responsible. It was suggested that pre-planning, permits-to-work and adequate supervision would all be essential to improving this record. Where contractors were involved in maintenance accidents, the contributing factors included lack of knowledge, lack of safety equipment, lack of supervision and lack or failure of permits-to-work. It was asserted by the HSE that closer supervision of contract maintenance workers is of paramount importance (Skeldon, 1994). Literature reporting safety results for the UK chemical industry during the year 2000, stated that there were four fatalities on chemical sites, three of which involved contractors (Anon, 2001, in Process Engineering).

Hudson (1991) reported that one approach to managing contractors is to define acceptable safety requirements and standards, to audit at start-up and then leave the contractors to manage themselves. However, although this has advantages in terms of specialised contractors having better knowledge of the tasks they perform, it may cause problems through lack of communication with the company's personnel. Further observations noted that the desire to contract out might lead to problems in finding any company that meets the company's standards. Under these circumstances, it was suggested that it might be better to remove some safety management out of the contract and to provide common training for contractors, which can at least guarantee a minimal level of skill and a degree of commonality between company personnel and third parties.

As identified by Storey (1995), it is clear that the responsibility for direct safety supervision and the level of involvement of company personnel in checking the contractor's activities should be clearly defined. Furthermore, the company should demonstrate their commitment to a contractor's safe working, and verify that all safety-related procedures in the contract are being complied with. Storey (1995) suggested that company personnel should arrange regular safety review meetings with the contractor, review contractor accidents and provide reports on

contractor safety performance, review safety procedures and practices and inspect contractor safety equipment.

Beaumont (1995) reported on a case study of how a particular plant within the chemical industry managed health and safety during the use of contractors. The plant had approximately 720 direct employees, with an accident rate considerably below the industry average. At the time the plant was running four mini-shutdown periods each year (for essential maintenance and inspection purposes), resulting in the use of between 400 and 600 contractor employees. Plant management recognised that these shutdown periods, if not carefully managed, could adversely affect health and safety performance. This was due to the increased numbers of employees on site and the work being concentrated in potentially more hazardous work areas and operations, rather because it involved contractors.

HSE recognises that the chemical industry adopts a system of 'tighter control' than does the construction industry when handling contractors (Beaumont, 1995). Accordingly, this more rigorous control, within the case study organisation, is described as follows. The policy was that contracts should not be awarded exclusively on 'low cost' grounds; rather the health and safety department would act as a balance to counterweight the strength of financial considerations in the selection of contractors. In addition, the plant was to make use of a number of long term contractors, holding monthly health and safety meetings with these contractors; insisting that all such contractors must provide health and safety training and hold regular health and safety meetings, and, that health and safety information be regularly conveyed to such contractors. However, circumstances are that the plant cannot solely use long term contractors, therefore requiring the following approach:

1. Identifying the safety element of all jobs to be performed by contract employees during the shutdown period, resulting in planning discussions with potential contractors who are asked to prepare a written method of work statement. Potential contractors may also be asked to provide proof of the technical skills and training of their employees, and, interviews with large contracting organisations concerning their internal safety procedures may take place.

2. A copy of the site health and safety rules and procedures are sent out to the chosen contractor. A start-up meeting is convened for the supervisory staff of all contractors, together with the plant people (direct employees) centrally involved in the shutdown period, concerning the running of the shutdown period from a health and safety point of view.

3. The safety manager conducts site-wide health and safety induction meetings for all contract employees. All contract employees then have to complete a written question / answer sheet. No contract employee can obtain a pass for site access until they have been through this induction stage. Passes can only be held for 6 months before this induction process is repeated.

4. Contract employees are then 'passed over' to the relevant work area supervisors, who are direct employees of the plant. These area supervisors then provide a local health and safety induction exercise, emphasising the health and safety hazards particular to that work area. These supervisors then issue the work permits for contract employees to work in particular areas.

Throughout the shutdown period all members of the health and safety department maintained a highly visible presence on the plant and all accidents and incidents were investigated as they occurred. Detailed reports were produced after each shutdown period, in order to feed into briefings held prior to the next shutdown period. The case study was conducted in 1995 and the site safety review for 1994 – 1995 was not included in the paper. However, this overall approach of planning, inducting, and reviewing has contributed to an improved ability to

manage the health and safety process in these demanding shutdown periods, providing an example approach, including closer supervision, for other organisations to consider.

Ashby, Cummins and Bentley (2000) investigated the managerial and operational characteristics of safety successful contractors in the New Zealand forest industry, which is an industry that is associated with high injury rates. The study identified the presence of factors that could be linked with effective safety practice, including good communication, management commitment and competent leadership and supervisory skills. Two-thirds of the safety successful crews of contractors reported being under close supervision and two-thirds of the group had a formal training program. Moffat (1998) conducted a training needs analysis within the logging industry, which identified a communication gap between contractors and crew members.

Wright (1996) conducted a study into business re-engineering and health and safety management, one aspect of which examined the degree of supervision and the competence of contractors. With the increased number of contractors and increased outsourcing of activities, Wright asserted that there is often a case for increasing the emphasis placed on assuring contractor competence and performance as well as upgrading contractor management procedures and systems. Wright (1996) conducted a survey of organisations and observed a balance between the emphasis placed on assuring contractor competence and direct supervision monitoring. When it became possible to assert that contractors were competent and able to take the lead in assuring their own work, the level of contractor supervision and monitoring fell.

### 5.1.1 Summary of supervision of contractors and links with health and safety

The literature exploring supervision of contractors and safety underlines the need for more stringent control, an example of which is described in Beaumont's (1995) study. Research has shown that good communication, senior management commitment, competent leadership, and closer supervision have been linked with effective safety practice in the use of contractors. Competence levels of contractors have also been demonstrated as being an important factor in the management of safety issues, thereby affirming the need for the training and assessment of contractor technical competence levels as well as the need for training in relation to safety issues.

# 6. CONCLUSIONS

Supervision is often seen as an individual's job, but changing working practices mean that it is no longer so easy to identify the Supervisor. From the literature the main supervisory elements were identified as: directing the work of others, allocating workload, planning and scheduling, instructing and monitoring actions, maintaining discipline, taking responsibility and ultimately being held accountable for the work done. Therefore it was concluded that supervision is actually a management function that can be delivered by one or more individuals within and/or external to a team.

Bomel's (2003) report observed that management and supervision were considered to be the most significant organisational factors affecting accidents, largely as a result of heavy workloads rather than an overt neglect of responsibility. However, most organisations fail to fully understand the relationship between supervision and health and safety.

Team structures have changed over recent years, largely because of 'down-sizing', 'delayering' and increased use of contractors. This has had a major affect on how supervision is delivered, with Self Managed Teams, where teams do not have a supervisor, being one of the outcomes. In reality, few organisations have made such fundamental changes, with most teams falling somewhere between the traditional, hierarchical approach and the Self Managed Team approach (see figure 1).

The traditional, hierarchical approach to supervision tended to mean that roles were well defined, with clear lines of control and communication. However, the levels of employee involvement in work planning and management were generally very low, which could to have a negative impact on health and safety. Conversely, Self Managed Teams increase the levels of employee involvement, increasing job satisfaction and resulting in better communication, clearer decision making and a more committed workforce. However, the result can be a lack of leadership and poor communication external to the team.

Organisations have to understand how they deliver supervision and the inherent weaknesses the chosen approach. Management then has to implement the appropriate counter-balances to ensure those weaknesses do not introduce risk. Other factors, such as multi-skilling and use of contractors must also be considered, as they can also affect how supervision impacts on health and safety. Overall, whatever method an organisation uses to deliver supervision, it is essential that it addresses the need to plan and allocate work, make decisions, monitor performance and compliance, provide leadership, facilitate communication and teamwork and ensure workforce involvement.

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# APPENDIX A

Supporting research for Self-Managed Teams

## SUPPORTING RESEARCH FOR SELF-MANAGED TEAMS

### Strengths

The potential benefits of implementing SMTs are summarised as follows:

- Improving productivity (e.g. Lardner, 1999; Lardner & Miles, 1998; Anon, Offshore Research Focus, 1999; Parker, Chmiel & Wall, 1997; Carr, 1992; Yandrick, 2001; Elmuti, 1997; Trist, Susman & Brown, 1977; Pearson, 1992; Halpern, 1985; Trist & Bamforth, 1951);
- Improved quality (e.g. Elmuti, 1997);
- Reducing costs (e.g. Anon, Offshore Research Focus, 1999; Elmuti 1997; Moravec, Johannessen & Hjelmas, 1997; Corderey, 1995; Anon, 1992; Anon, 1990; Trist, Susman & Brown, 1977; Walton, 1977);
- Raising employee involvement (e.g. Lardner, 1999; Anon, Offshore Research Focus, 1999; Halpern, 1985; Walton, 1977);
- Increasing job satisfaction (e.g. Lardner, 1999; Lardner & Miles, 1998; Anon, Offshore Research Focus, 1999; Corderey, 1995; Pearson, 1992; Walton, 1977);
- Higher level of employee motivation and commitment (Lardner, 1999; Elmuti, 1997; Corderey, 1995;);
- Increased innovation (e.g. Elmuti, 1997; Moravec, Johannessen & Hjelmas, 1997);
- Increased flexibility (e.g. Moravec, Johannessen & Hjelmas, 1997; Wageman, 1997; Anon, 1990;);
- High level of competency among team members (e.g. Halpern, 1985);
- Faster and better decision-making (Elmuti, 1997; Moravec, Johannessen & Hjelmas, 1997);
- Less managerial bureaucracy (Elmuti, 1997);
- Enhanced employee commitment to the organisation (Wageman, 1997);
- Increased recognition of individual employee's contributions (Elmuti, 1997);
- Lower turnover (e.g. Corderey, 1995; Trist & Bamforth, 1951);
- Fewer safety violations (e.g. Trist, Susman & Brown, 1977);
- Lower accident rates (e.g. Parker, Chmiel & Wall, 1997; Trist & Bamforth, 1951; Trist, Susman & Brown, 1977);
- Lower absenteeism (e.g. Lardner, 1999; Parker, Chmiel & Wall, 1997; Trist & Bamforth, 1951; Pearson, 1992; Anon, 1992; Anon, 1990).

It is noted that not *all* the above benefits will necessarily be expected, or realised, by any one organisation (Lardner, 1999). It may be observed that only the last three bullet points explicitly refer to a health and safety improvement through implementation of SMTs.

### Weaknesses

In implementing SMTs there are a number of issues that often surface and although they have been termed as 'weaknesses' here, if the organisation implementing SMTs is aware of these

potential consequences, and takes these into account, the strengths of SMTs may be more fully realised.

Potential ‘weaknesses’ are summarised as follows:

- Likelihood of some degree of resistance from the workforce (Moravec, Johannessen & Hjelmas, 1997);
- Greater likelihood of error (e.g. Lardner, 1999);
- Mental overload (e.g. Lardner, 1999);
- Stress (e.g. Lardner, 1999);
- Increased training time (e.g. Lardner, 1999; Oldham, 1996).

# APPENDIX B

Self-Managed Teams and Safety – Research Example Case Studies

## SELF-MANAGED TEAMS AND SAFETY – RESEARCH EXAMPLE CASE STUDIES

Research investigating the safety implications of SMTs was conducted by Lardner (1999) for the HSE and BP Oil Grangemouth Refinery Ltd[2] and found that, when properly implemented, SMTs are no barrier to improved safety performance. Moreover, having improved health and safety as an explicit goal of implementing SMTs, was associated with improved health and safety performance. The following examples of SMTs provide detail of these findings across the non-petrochemicals, petrochemicals and UK process industries.

### *Implementation of SMTs in non-petrochemicals industries*

Lardner (1999) described five published examples, across a range of industries, of SMTs and their relationship between SMTs and safety. Four of the studies detailed the introduction or re-introduction of SMTs in existing organisations, whilst the fifth study referred to a start-up plant.

1. UK Mining Industry (Trist & Bamforth, 1951). This application demonstrated that the removal of SMTs, that were fully ingrained in the organisation, led to adverse effects on safety, with its reintroduction repairing the damage i.e. improvements in absence, accident rates and stress-related illness.

2. US Mining Industry (Trist, Susman & Brown, 1977). Improvements in safety were one of management's goals in the implementation of SMTs. In addition to improvements to other organisational outcomes, safety improvements consisted of fewer safety violations, and a lower overall incidence of reported accidents.

3. US Telecommunications Industry (Cohen & Ledford, 1994). Safety was not a goal in the implementation of SMTs and improvements in safety did not occur, suggesting that the adoption of SMTs does not automatically improve safety (Lardner, 1999). However, safety did not suffer either.

4. Australian Heavy Engineering Industry (Pearson, 1992). Accident rates remained relatively constant but increased in the comparison traditionally organised work groups. SMTs took ownership of the safety issues, whereas the traditional groups relied on safety representatives.

5. US Manufacturing Industry (Walton, 1977). This was a new plant that implemented SMTs right from the start-up of the plant. Amongst other organisational outcomes, good safety performance was measured through 3 years and 8 months without a lost-time accident.

### *Implementation of SMTs in the petrochemicals industry*

A review of the implementation of SMTs in the onshore and offshore petrochemicals industry (Lardner, 1999) described eight examples of SMT implementation. Of these eight examples, three detailed the organisational outcomes in relation to measures of health and safety. One case study considered effects on safety in terms of employees' satisfaction with safety. Four therefore did not present data on any of the organisational outcomes of the implementation, or did not explicitly describe the effects on health and safety.

The three case study examples that all observed improvements in health and safety, were as follows:

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*[2] It has been observed that, since commissioning the 1999 study into the safety implications of SMTs, supervisors have been independently re-introduced at both BP's Grangemouth and Coryton plants.*

1. Parker, Chmiel and Wall (1997) examined SMT implementation as part of a wider human resource strategy to manage the negative consequences of downsizing in an UK chemical plant. The strategy consisted of an "empowerment" initiative, which included an increased emphasis on multiskilling and removal of management layers. In addition to a marked increase in productivity and higher levels of job satisfaction and commitment, findings showed a substantial decrease in absenteeism and a decrease in lost-time accidents.

2. In 1986, SMTs were implemented in ICI Australia's Botany chemicals plant (Anon, 1990), which involved the acquisition of multiple skills. In addition to employees working smarter, more flexibly and more co-operatively, absenteeism dropped by 80% with resultant cost savings on overtime payments. No safety data were reported.

3. In 1992, self-regulating work teams were formed in BP Chemicals' Baglan Bay plant. Workers received formal training as multiskilled 'production technicians' and accountability and ownership were devolved. One team member was selected as a team leader, with a co-ordinating role in the team. Approximately 10 months after implementation, absence levels had fallen resulting in cost savings on overtime payments. No data on safety performance was presented.

### *SMT case studies within the UK process industry*

Lardner (1999) detailed four case studies that had implemented SMTs within the UK process industry. Each case study varied in terms of the type of SMT implemented, which included SMTs with a working team leader, empowered teamworking with an associated coach, and multiskilled teams, as follows.

### *Working team leader – BP Chemicals, Baglan Bay*

The site implemented SMTs, supported by a team leader, who is a working team member and has additional responsibility for emergency response. The team leaders did not have responsibility for the appraisal, discipline, staff development and training – the responsibility for these were held by the day shift Production Superintendent. The team members were multiskilled and teams were assigned safety objectives. Non-safety organisational outcomes included greater job satisfaction, low turnover, improved morale and motivation, cost reductions. In terms of health and safety, site sickness absence rates declined steadily and key safety indicators have improved via reductions in lost-time accident and injury rates.

### *Day-based manager supporting SMTs – Industrial Colours Ltd*

SMTs were introduced, supported by a day-based manager. The nature of the process operators' jobs was changed, increasing responsibility and introducing multiskilling. Tasks considered unsuitable for delegation to team members included formal discipline and long-term plant modifications or changes to process conditions, in addition to more complex maintenance work. Non-safety related organisational outcomes included increased productivity, reduction in workload, greater job satisfaction and increased quality. In terms of safety, no changes were observed in hard safety indicators. However, it was noted that positive organisational outcomes had been achieved without any adverse effects on health and safety performance. It was also observed that team members' sense of personal responsibility for safety had increased and there was greater employee involvement in safety issues.

### *"Hands-off" coaching style of management – Shell UK Exploration & Production, CADA platforms*

Implementation of SMTs meant that each team had a supervisor assuming a "hands-off" coaching style of management, but is available to help with non-routine problems. "Empowered teamworking" was implemented and this included a significant change in management style,

with the supervision stepping back to assume a more strategic, coaching role. Responsibility for execution of accountabilities moved from supervisors to team members.

Staff within shell were split 20% employees and 80% contractors. The operations group was reported as being a semi-autonomous team. The 'integrated service contract team' comprised contractors' staff who provide maintenance and it is the maintenance team that was reported as being most effected by empowered teamworking. Non-safety related organisational outcomes included financial gains, improved productivity and efficiency, improved job satisfaction and involvement. In terms of effects on safety, safety indicators neither improved nor declined during the initiative. However, achieving improved safety performance was not a goal of the empowered teamworking initiative.

### *SMTs for maintenance contractors personnel – AMEC Process and Energy*

Offshore maintenance personnel were re-formed into platform-focused multiskilled SMTs. AMEC's employees work as maintenance contractors for Shell. The teams became largely self-managed during the execution phase of maintenance work, and did not operate under direct supervision. The organisation had not accumulated enough experience to determine the impact of SMTs on organisational outcomes, including health and safety performance. However, improved health and safety performance was an explicit aim of the implementation of SMTs, which has been identified as being associated with improved health and safety performance (e.g. Trist, Susman & Brown, 1977).

### *Empowered teams*

'Empowerment' is a term often used in connection with SMTs, and has been defined as involving, 'the maximum transfer of tasks and responsibilities to workers, implying a drastic reorganisation of the management process' (Hechanova-Alampay & Beehr, 2001). Such a description reflects the characteristics of self-management, whereby employees are provided with the means and responsibility to make decisions and manage themselves through delegation of power.

Hechanova-Alampay & Beehr (2001) conducted a study in a large company within the U.S. chemical industry that investigated the relationship between empowerment and safety measures. Level of empowerment was found to have a strong relationship to safety performance. Teams that were more empowered performed safety behaviours more frequently and had better safety records.

# APPENDIX C

Traditional Supervision and Self-Managed Teams – Comparing Impacts on Safety

## TRADITIONAL SUPERVISION AND SELF-MANAGED TEAMS – COMPARING IMPACTS ON SAFETY

### *Changes in supervision type between traditional supervision and SMTs – safety impacts:*

1. Self-managing autonomous teams were introduced on a pilot basis into a traditionally-organised mine within the US mining industry (Trist, Susman & Brown, 1977). This change in supervision type resulted in safety improvements of fewer safety violations and lower overall incidence of reported accidents.

2. BP Chemicals, Baglan Bay employed first-line, traditional supervision until 1992 when the organisation introduced SMTs. After this change in supervision type, site sickness absence rates declined steadily and key safety indicators improved, via reductions in lost-time accident and injury rates (Lardner, 1999).

3. One organisation in the UK mining industry established methods of supervision consisting of multiskilled SMTs, however, a change in supervision was implemented whereby management assumed responsibility for organising production, with a consequence being loss of autonomy for miners. Amongst the results of this change towards a more traditional, first-line, style of supervision, outcomes included an increase in absence levels. The organisation subsequently reintroduced a modified version of SMTs and witnessed improvements in absence, accident rates and a reduction in stress-related illness (Trist & Bamforth, 1951).

4. SMTs were introduced within a traditional organisation design on one manufacturing site (Farias & Macy, 1999). Safety performance within the organisation was already described as being 'excellent' and this was maintained after the move away from a traditional style of management.

Three of these research examples (one in the chemical industry and two in the mining industry) found that the implementation of SMTs, in place of traditional types of supervision, resulted in improvements in safety performance, including fewer safety violations, reductions in accident numbers (lost-time and injury rates) and decreases in sickness absence. A further research example in the manufacturing industry already reported having high levels of safety before the implementation of SMTs, which were neither improved or adversely affected as a result of the change effort, suggesting that the implementation of SMTs had a neutral effect on safety performance. These research findings therefore support the observation that implementation of SMTs is associated with either a positive or neutral effect on health and safety performance.

### *Studies comparing implementation of SMTs and traditional supervision – safety impacts:*

1. Pearson (1992) detailed the implementation of SMTs within an Australian heavy engineering workshop. 15 work groups were randomly allocated to become SMTs, whilst another 15 work groups remained traditionally-organised. Safety indicators showed that, whilst accident rates remained constant in the SMTs, they increased significantly in the traditionally-organised work groups.

2. Alternatively, Ondrack and Evans (1986) compared three types of plant: (1) a petrochemical plant with participative management, semi-autonomous work teams, multiskilling and skill-based pay; (2) a traditionally-organised petrochemical plant; and, (3) a traditionally-organised non-petrochemical plant. No significant differences in employees' satisfaction with safety were found between these three types of plant.

Pearson's (1992) study demonstrated that, although SMTs produced a neutral performance in relation to safety performance, traditional supervision showed deterioration in safety performance. In terms of employee satisfaction with safety, Ondrack and Evans' (1986) study, found there were no differences between traditional and SMT types of supervision.

# APPENDIX D

Different forms of supervision - inherent weaknesses and possible counter-balances
(repeated from main text of the report)

**Inherent weaknesses of traditional approaches to supervision**

| ***Potential Weakness*** | ***Recommended Counterbalance*** |
|---|---|
| Senior management may spend time with Supervisors, but much less with team members, meaning their commitment to health and safety may not be so visible. | Senior managers should ensure they spend time with all their staff, and that at every opportunity they visibly demonstrate the commitment to health and safety. It is also important that Supervisors and senior management present consistent messages, and that they 'lead by example.' |
| With the Supervisor having a key role in decision making and leadership, team members may lack autonomy and hence have reduced job satisfaction. | Supervisors should aim to delegate tasks wherever appropriate, and take responsibility for developing the skills of their team members. |
| With the Supervisor taking overall responsibility, the team members may lack accountability for their actions. | Supervisors and senior management should aim for workforce involvement wherever possible. This should ensure everybody understands what is required and expected of the team, and how their actions contribute. |
| Hierarchical structures can lead to inefficient operations caused by demarcation. | Roles and responsibilities should be based on team and individual objectives. |
| Personal development of team members may be restricted because all 'higher level' activities are performed by the Supervisor. | Team members should have training and development plans that identify where experience is needed in 'higher level' activities and the Supervisor should delegate whenever opportunities arise. |
| With the Supervisor having responsibility for communicating to team members, e.g. in terms of allocating and planning work, team members may lack the opportunity to communicate with one another, resulting in minimal co-worker interaction. | Team members should be encouraged to interact with one another. This could take the form of daily team meetings at the beginning of shifts, or taking part in problem-solving workshops. |

**Inherent weaknesses of SMT approaches to supervision**

| ***Potential Weakness*** | ***Recommended Counterbalance*** |
|---|---|
| Senior management may not allocate the appropriate resources needed to implement SMTs effectively, demonstrating a lack of commitment. | Senior managers should ensure that they not only allocate resources to effectively implement SMTs, but also to support any ongoing maintenance, e.g. to deliver any training required by staff who have greater responsibilities. |
| The nature of SMTs (no direct supervision) means that there may be a lack of leadership. | Teams should be provided with adequate support, ensuring that leaders are allocated according to who will take the lead for certain situations / tasks. |
| The higher level of delegation specific to SMTs may result in reduced communication between teams and management, through the absence of a Supervisor who would normally be responsible for this communication. | Communication between management and team members should be promoted, e.g. via team briefings or through team member representation on health and safety committees / other consultation groups. |
| With team members having mutual accountability within SMTs, there is a potential for a lack of clarity regarding individual roles and responsibilities. | Roles and responsibilities for teams and individuals should be clearly defined and based on team and individual objectives, rather than job/task descriptions. |
| Informal hierarchies may develop within the team, thereby negating the benefit of SMTs. | Roles and responsibilities can be rotated across team members to avoid the development of a hierarchy and increase task variety. |
| Within SMTs, team members generally have wider roles and responsibilities, which therefore results in increased training needs and may be a problem if not recognised. | The identification and delivery of individual and team training needs is necessary for the effective implementation of SMTs. This includes both technical and non-technical (e.g. teamworking skills) training needs. |

**Inherent weaknesses of multiskilling**

| ***Potential Weakness*** | ***Recommended Counterbalance*** |
|---|---|
| Senior management motives behind the introduction of multiskilling are often financially / business oriented | Senior managers should include enhanced health and safety as one of the goals when introducing multiskilling. |
| The introduction of multiskilling may suffer from a lack of financial commitment from senior management to appropriately train all team members. | Senior managers should ensure that they allocate sufficient resources to provide the training required to effectively introduce multiskilling (including resources for the identification and delivery of all training needs). |
| Multiskilling may result in a lack of leadership, as everyone is skilled to do the job, but there may be no one 'standing back' to gain an overview of the situation. | Teams should be provided with adequate support, ensuring that leaders are allocated according to who will take the lead for certain situations / tasks. |
| There is the potential for a lack of co-worker interaction due to each team member being able to carry out a wider variety of tasks, therefore essentially reducing the need for them to communicate with on another. | Team members should be encouraged to interact with one another. This could take the form of daily team meetings at the beginning of shifts, or taking part in problem-solving workshops. |
| There is scope for a lack of clarity of team member' roles and responsibilities due to the wider skill base across the team. | Roles and responsibilities for teams and individuals should be clearly defined and based on team and individual objectives, rather than job/task descriptions. |
| With team members having a wider skill base, there is the potential for employees to become overloaded through higher expectations of management. | Team members should be provided with adequate support, and the allocation of work should be monitored to ensure that team members are not overloaded. |
| With team members having a wider skill base, there is the potential for loss of competence through individuals not using their skills frequently enough. | Ensure maintenance of skills through retraining or job rotation to utilise team member skills. |
| A Supervisor may not be familiar with the multiple skills of his/her team and as a result may miss particular job-related problems. | Ensure that supervisors are familiar with the multiple skills of his/her team members, so that he/she is familiar with the capabilities and limitations of his/her team members. |