

---

# Occupational Health & Safety Management Systems – When are they good for your health?

—

Kaj Frick,  
Mälardalen University, Sweden

Viktor Kempa,  
ETUI, Brussels

---

**Report 119**



# Contents

Preface .....	5
<b>What are OHSM Systems - Structuring the issues .....</b>	<b>7</b>
The basis and scope of this paper .....	7
MS are not semi-independent "systems" .....	7
The "standard" type of MS – ISRS, BS 8800, OHSAS 18001 and VPP .....	8
The ILO guidelines and behavioural safety are the two extremes of MS .....	10
An overview of the differences between mandatory OHSM and voluntary OHSM systems .....	11
<b>The risks of failure and misuse of MS .....</b>	<b>15</b>
Major aspects of voluntary management systems for OHS .....	15
External or internal motives? .....	15
The pros and cons of MS certification .....	17
MS performance – behavioural numbers or OHS effects and customer satisfaction? .....	18
Safety risks, technical health risks or even organisational ones? .....	19
Safe person or safe place – downstream or upstream prevention? .....	21
Consultation as top-down manipulation or as a way of improving the MS?.....	23
Resources, audits, learning and continuous improvements .....	24
<b>A summary of the risks of voluntary OHS management systems .....</b>	<b>27</b>
Bibliographical references.....	30



## Preface

**Laurent Vogel,**

Director, ETUI Health and Safety Department

In late October 2010, the cement company Lafarge won a prestigious award in the United Kingdom for its health and safety policy, in particular its leadership in terms of training and management systems. A week later, the same company found itself being sentenced to a massive fine for serious violations of British law on health and safety at work. As a consequence of these violations, an electrical worker had been seriously injured after an electrical explosion in October 2008.

In the course of the trade unions' debates about health and safety, some questions never fail to elicit extremely varied responses, running from indignant rejection to enthusiasm. Health and safety management systems are one of those questions.

The initial explanation appears quite simple. In practice, setting up such systems is subject to a mass of variations. Sometimes they can be a way of getting round worker representation for health and safety, driving a disciplinary approach where the vision and priorities defined by the bosses shape the prevention policy or what serves in its place. And sometimes setting up such systems is a process which recognises the potential of workplace safety issues to cause conflicts, reinforces transparency and paves the way for more systematic action by the workers' representatives. So the social way that such systems are used is very varied.

Another piece of the explanation also has to do with the concrete situation of each company within the production chains. A company issuing a contract does not necessarily see the introduction of such a system as having the same significance as a subcontractor, especially where the latter is forced to adopt a system in order to retain its market position.

The present paper seeks to help bring some order into the way the subject is tackled. It offers some criteria which are worth taking into account when weighing up the pros and cons of health and safety management systems. And shows how diverse such systems are. In that sense, it will help towards a more thorough-going analysis of the practices involved.

It has been devised by Kaj Frick and Viktor Kempa, and has benefited from the contribution of a network of trade unionists established at the initiative of our institute to explore these questions.



## **What are OHSM Systems – Structuring the issues**

### **The basis and scope of this paper**

This paper is analytical and descriptive, and even in parts prescriptive. It is mainly based on an overview of research, but also draws on union and other practical experience with OHS management systems (referred to hereinafter as "MS"), their varieties, their different political backgrounds and settings, and the little we know of their problems and successes. I will present some of the major studies in the reference list, and also try to support some of my claims with explicit references. However, the value of this paper lies in how the reader finds that it can broaden his/her perspectives of MS. I will focus more on what works in MS and what does not, and less on the practical requirements to develop an effective management system.

### **MS are not semi-independent "systems"**

The term "OHS management systems" is used to describe all kind of practices. It can cover anything from ambitious continuous improvements towards the utopian goal of no health risks at work, to corporate smokescreens for controlling workers and busting unions that deliver rather poor OHS results. It is now such a common term that it is also used, for example, to describe how small firms in El Salvador handle OHS (Ramirez et al., 2006). This means that unless you are talking about a specific management system – i.e. one known to everyone involved in the discussion – you have to specify what MS or type of MS you mean. Otherwise, you can easily end up in confusion and with less chance to promote improvements to a good MS. The need to specify the MS often also occurs within organisations. Top managers may have a very different perception of the system they are trying to implement than OHS experts or safety representatives.

The confusion is also theoretical. MS on OHS and all other management "systems" (like ISO 9000) are not really systems in the scientific use of the term (von Bertalanffy, 1968). A scientific system is an entity of interacting units and functions that is striving to survive more or less independently of its surroundings. The purpose of a management system, on the contrary, is to integrate a function (e.g. better OHS or other quality) into the general management. An integrated management system is therefore an oxymoron. Either it is integrated or it is a system. It cannot be both. MS are thus only "systems"

in the vaguer common language sense of a complex set of interacting functions for a common goal, without the scientifically essential aspects of being independent and striving to survive (i.e. without the organism analogy). This theoretical misconception also has practical misleading results. It is much too easy – and common – to talk about an MS as if it is a separate organisation, not (simply) an aspect within the general management. "We leave this OHS problem to the MS", is a common excuse used by line managers who do not (or do not want to) understand that the MS has to be an integrated aspect of *their own* management, if it is to improve OHS.

### **The "standard" type of MS – ISRS, BS 8800, OHSAS 18001 and VPP**

The issue of integrating consideration of OHS into daily management is important in the practice of all MS. However, before we go further into this and other possible risks with MS, we shall first briefly describe the management systems for OHS that are most well-known at international level (see also the comparative overview by Dalrymple et al., 1998). Early varieties of MS are safety management systems, like Lost Control, which was developed into the International Safety Rating System (ISRS; Bird & Loftus, 1976; Top, 2006). The 5 Star, or Five Star, program is an MS similar to ISRS. It is used by many employers in the likes of Australia (NSCA, 1995; [www.nasca.org.au](http://www.nasca.org.au)), North America (CAW, 2006) and South Africa (Eisner & Leger, 1988). Later, the chemical industry set up its own international guidelines for an MS, labelled Responsible Care. Since the 1990s, more and more national standards have also been issued on OHS MS. Dalrymple et al. (ibid) include standards, drafts of standards and guidelines on MS from Australia and New Zealand (AS/NZS 484), Ireland (draft), Jamaica (draft), the Netherlands (NPR 5001), Norway (draft), Spain (UNE 81900) and the UK (BS 8800). BS 8800 has also spread outside the UK. The recent US standard, ANSI-AIHA Z 10, from 2005, should also be added to this list.

In 1996, ISO failed to reach the necessary 2/3 majority to add a standard on how to manage OHS quality to the earlier ISO 9000 (on managing product quality) and ISO 14 000 (on environmental quality) (Zwetsloot, 2000). A similar attempt again failed to secure a qualified majority in 2000, but the issue has now been raised for a third time within the ISO. Yet the first failure made fourteen national standardisation bodies and auditing firms (including the BSI from UK, and DNV from Norway) unite in 1999 on an international "semi-standard" on MS, the OSHAS 18001 (OHSAS, 2006). OHSAS is the only global MS besides the ILO guidelines and DuPont's STOP (see below for these). OHSAS has also become one of the most widespread, with some 3,900 certificates in some 70 countries by the end of 2003. Several large corporations also use it in their plants, for example ABB, Akzo-Nobel, 3M and Unilever. The largest number of certified sites were in China, followed by Australia, Thailand, UK, Brazil, Italy, Japan, Iran, Korea and India (Bebek & Viages, ibid). One motive for OHSAS's popularity in poor countries with large exports may be the drive for corporate social responsibility. Large consumer corporations in the western world increasingly require their suppliers to demonstrate

conformity with minimum labour and other standards (Frick & Zwetsloot, 2007). Yet various certificates do not always assure acceptable conditions of work at the suppliers (Mathiason, 2006).

Another main variety of MS are those produced and promoted by national OHS authorities. The state of California has mandated since 1991 that all employers must run an effective Injury and Illness Prevention Program (the Program Standard; [www.dir.ca.gov/Title8/3203.html](http://www.dir.ca.gov/Title8/3203.html)). However, outside the EU, Anglo-Saxon countries in particular have tried to promote effective internal management of OHS by voluntary means instead of through mandatory regulations. Sometimes they advise employers to implement an MS based on national standards, but many OHS authorities also produce and promote MS of their own design. OSHA's Voluntary Protection Program (VPP) in the US is probably the best-known example (OSHA, 1989). Other authorities have also created their own MS, e.g. the one in Taiwan since 1994 (Su et al, 2005). The different Australian OHS authorities pursue a strategy that is a hybrid of the voluntary MS and mandatory OHSM (Saksvik & Quinlan, 2003). Formally the MS is voluntary and you may have fewer inspections if you do implement an MS. But if you do not set up an MS to handle risks at work, you still have to comply with the general duty of care, i.e. to operate a safe and sound workplace. In the US, this duty in the OSH Act is rarely used. But Australian labour inspectorates and courts refer to it more and more often. There are thus both positive and negative incentives to adopt the formally voluntary MS in Australia. And most Australian jurisdictions have produced their own MS, e.g. SafetyMap from Victoria (VWA, 2002, first version in 1995, see also Dalrymple et al., *ibid*; though more streamlined guidelines on managing OHS were issued earlier by South Australia, Blewett, 1989). All in all, therefore, the introduction of an MS is thus in practice not so voluntary for Australian employers.

Obviously there are many differences between the various MS. Yet their specifications all include that the MS – as a minimum – should comply with national OHS regulations. In nearly all countries, this entails complying with a large number of often quite strict regulations on machine safety, prevention of exposure to hazardous materials and similar ordinances on noise, radiation, ergonomics, etc. The sum of all these mandatory requirements to protect workers against OHS risks is quite challenging. Careful inspections of workplaces – which are rare, as labour inspectors seldom have time enough for this – therefore usually reveal many violations of different OHS ordinances. Where there are mandatory regulations on OHSM – e.g. within the EU, but also in Brazil and many other countries – employers also have to comply with more or less strict requirements on how to manage OHS. These OHSM systems normally require similar prevention principles to the Framework Directive, discussed below. On top of the tough requirement to comply with material OHS regulations, we must therefore add similar challenging principles of how to manage the OHS.

Yet voluntary MS – from Five Star to BS 8800 to OHSAS 18001 to VPP – do not raise this as a problem. Full compliance with these extremely challenging regulations is mentioned only as a first step, without further comment. And the

various advice and examples on how to implement the MS invariably reduce the prevention principles to something much less prominent. Safety is given much more attention than health, despite the fact that diseases cause far more ill-health and fatalities than accidents do. The prevention described more often revolves around the issuing of personal protective equipment (PPE) and behaviour control of "safe" procedures than the prescribed upstream prevention of illuminating risks at the design stage. And the worker participation described in these examples is more a top-down communication on why and how to obey management safety procedures than a genuine dialogue between management and workers on ends and means in an MS which aims to reduce OHS risks.

### **The ILO guidelines and behavioural safety are the two extremes of MS**

There are two main exceptions to this general picture of MS as being very preventive in their specification but less so in their practical examples and advice. At one end, the ILO guidelines for OHS management systems (ILO, 2001) consistently stay close to regulated OHSM. Unlike other MS (except those from OHS authorities), these guidelines have not been developed by auditing firms or standardisation bodies, which are dominated by producers and employers. What we find instead is a tripartite organisation with equal votes for representatives from governments, employers and workers/trade unions. This is one main reason why organised labour has opposed an ISO standard (like ISO 9000) on MS and instead supports development along the ILO guidelines. Many countries have formally adopted them, for example China, Indonesia, Argentina, Brazil, Malaysia and Ireland. And the guidelines have been used as templates for private corporate MS (e.g. ABB and Volkswagen) and for MS produced by non-governmental OHS organisations, such as the widespread JISHA guidelines in Japan ([www.ilo.org/safework/normative/codes/lang--en/docName--WCMS\\_107727/index.htm](http://www.ilo.org/safework/normative/codes/lang--en/docName--WCMS_107727/index.htm)).

Like all MS, the ILO guidelines are voluntary. They also embrace the major principles of the Framework Directive, i.e. legal compliance, worker participation, health and not only safety, and the prevention hierarchy. But unlike other MS, the guidelines are not ambivalent in practice, if they really support these principles. In his critical comparison between corporate standards on MS and the ILO guidelines, Bennet (2002) finds the latter to be much stronger in terms of worker participation, legal compliance as an absolute must, the specification of what to include in the MS (i.e. less chance for an employer to pick what suits him), and the audit to evaluate and improve the MS. The ILO guidelines are also more consistent, in the sense of on the one hand including health in OHS, and on the other upholding the prevention hierarchy.

Behavioural safety (BS) is in many ways the opposite to the ILO guidelines. There are many varieties. One of the most widespread is DuPont's STOP (Safety Training Observation Program; DuPont, 2007). Formally, BS systems are not MS, nor do they claim to be. Yet in practice very many employers adopting BS describe this as their MS for OHS. With its focus on downstream

worker behaviour and minimizing/measuring (only) reported injuries, BS does not claim even on paper to adhere to the prevention principles of mandatory OHSM, e.g. the Framework Directive (see further below).

## **An overview of the differences between mandatory OHSM and voluntary OHSM systems**

ILO, BS and the other MS alike share the characteristic of being voluntary and as such being separate from regulated OHSM. There is also confusion between the voluntary and the mandatory strategies to promote a more systematic management of OHS, which may be more serious than about the "systems" concept. Sometimes mandated OHSM is seen as the regulated variety of MS, i.e. with "management systems" being the general buzz-word. On the other hand, an MS is sometimes described as a special, extra complex, variety within general OHS management, which is mandatory in many countries. And sometimes mandatory OHSM and voluntary MS are treated as separate, although greatly overlapping, methods to specify how to manage occupational health and safety. There are thus overlaps in how one describes voluntary OHS management systems and regulated systematic OHS management. Nevertheless, politically/legally-based mandatory OHSM and market-based voluntary MS differ in important respects. In most countries, working life is influenced by both regulations on how to manage OHS and much marketing of voluntary MS. For example, in Brazil, there is extensively marketed voluntary MS but also regulation NR 9, which requires organisations to establish a program to manage risks (Dalrymple et al., 1998).

To explain the differences between these two strategies, we can start by looking at the EU Framework Directive (89/391/EEC). It was introduced early on and now covers the working life of nearly half a billion people. It is therefore in many ways the template for public regulation of OHS management. This directive requires the member states, which currently number 27, to:

- establish the responsibility of all employers "to ensure the safety and health of workers at work", and to provide the necessary organisation and means to do so;
- mandate that employers, taking into account the nature of their activities, assess and prevent or minimise OHS risks, as the primary means of fulfilling this duty;
- make OHS competence a compulsory base for employers' OHSM;
- mandate a prevention hierarchy, in which the elimination of risks ("safe place") comes first and personal protection and/or instructions ("safe person") comes last;
- define OHS risks broadly as "the work environment" which includes, for example, the organisation of work;
- require employers to adapt OHS conditions to the varying needs of each individual worker; and
- give workers and/or their representatives legal rights to participate on all matters relating to OHS, without involving them in any costs.

(See further Vogel 1994, Walters 2002, and Frick 2006).

If we compare these requirements to voluntary MS, there are some crucial differences. The first one is their different origins. You can use the definition of regulated OHSM as "a limited number of mandated principles for a systematic management of OHS, applicable to all types of employers including the small ones" (Frick et al., 2000, p. 3). This distinguishes OHSM from the more complex and highly specified MS. These systems usually have a voluntary/private market origin, but OHS authorities have started to develop and promote their own MS. This is especially the case in Anglo-Saxon countries, such as the USA and OSHA's Voluntary Protection Program (VPP; OSHA, 1989) as the most familiar example. However, Australian OHS authorities are much more active in disseminating and promoting the use of their MS, for example the SafetyMap (VWA, 2002). Most of these voluntary MS, including those by authorities, include specifications that the MS has to comply with all relevant regulations. But while this is taken as a given, the real evaluation of the voluntary MS is how they comply with the specified procedures.

The most important difference between regulated OHSM and voluntary MS is therefore their goals. Mandatory OHSM is defined by its outcomes. Good OHSM is what works to prevent or detect and abate OHS risks. The procedures to that end are important, but if the procedures are correct and sufficient they are ultimately defined by how they help to improve OHS. An MS is instead defined by its means, by the correct introduction and application of its specified procedures. There is also a difference in structure. Mandated OHSM consists of a limited number of requirements, of principles on how to manage OHS. This is the only alternative when the regulations cover all employers (albeit usually with some differences in the formal requirements depending on size). Voluntary MS, on the other hand, contain a large number of specified procedures in a complex structure. They have usually been constructed to manage the risks for large accidents in big organisations. In such cases, the extensive specifications of the MS are usually needed to give enough rigour to an advanced OHS management. But such complex voluntary MS are not applicable to small firms in the service sector, for example. Another reason for the complexity and rigour of MS is that they often require to be open for external certification, and have been created for this purpose by auditing and certifying organisations. Mandatory OHSM, on the other hand, can never be certified. No private consultant can guarantee the final outcome of an inspection by the OHS authorities. Whether or not a mandatory OHS management complies with the regulations can ultimately only be settled in court.

These principal differences between regulated OHSM and voluntary MS are accompanied by differences in their content. These are not absolute, and should not be exaggerated. In practice, most of what is called compliance with OHSM regulations falls far short of the high ambitions in the likes of the Framework Directive. But on the other hand, most voluntary MS start to deviate from these preventive principles even in their official advice and examples. A slightly exaggerated – but not totally unfair – comparison between mandatory systematic OHSM and voluntary OHSM systems therefore gives the following table.

	<b>Public systematic OHSM</b>	<b>Private M systems</b>
<b>Basis</b>	Politics & Legal obligations	Markets & Voluntarism
<b>Application</b>	All employers	Large organisations
<b>OHSM specification</b>	Low: Principles	High: Complex
<b>Certification</b>	No: Cannot replace legal OHS inspection	Yes: Consultants evaluate procedures
<b>Goal</b>	No OHS risks	Correct procedures
<b>OHS Scope</b>	Health & safety	Safety mainly/only
<b>Evaluated on</b>	Health & safety risk exposures	Behavioural figures, e.g. of WC, LTI
<b>Prevention through</b>	Organisation & Technology	Downstream through Behaviour control
<b>Participation</b>	On ends and means in OHSM	MS may be used to control workers



## The risks of failure and misuse of MS

### Major aspects of voluntary management systems for OHS

To compare the practices of MS to the ideals of mandatory OHSM is in one sense unfair. But apart from the ambivalence in the presentation of the MS themselves, their practices have to be evaluated against the high standards of the regulations if we are to see their weaknesses and how they can be improved. Such a close scrutiny is the purpose of this section. It will be divided into discussions of the following issues:

- the motive to introduce an MS, which may strongly affect most, if not all, aspects of how it is implemented;
- the pros and cons of certification for the OHS effects of an MS;
- how to measure the MS performance, from behavioural numbers to customer dialogue;
- the OHS scope of the MS: safety, technical, health or the broad work environment?;
- behavioural safety, or upstream prevention through the prevention hierarchy?;
- consultation to convince workers or to learn from them?;
- resources, auditing, learning and continuous improvement – when you realise that a good MS is difficult and never finished.

### External or internal motives?

No management – no human behaviour – is perfectly rational. Yet MS are a forceful attempt to increase the rationality of how OHS is managed in organisations. The real motives and purposes – as opposed to rhetorical ones – for the introduction of an MS are therefore central in establishing how the MS will operate in practice. The first question to ask when one tries to evaluate – or in other ways understand – an MS is therefore *why* was it introduced? As an MS entails a development of the general management, it is likely to have complex purposes, to be based on a mixture of both external and internal motives. And the same single OHS questions can often be described both as an external and an internal issue. The difference is thus very much a question of perspective. Still the external and internal motives for an MS are different.

The often overlapping external reasons for employers to introduce an MS may be:

- the MS certificate as "proof" of good OHS management, which improves the market image to customers and investors and the labour market. The certification business thrives on firms that are keen to use certificates for public relations purposes. Sometimes small firms even need a certificate to do business with large corporations;
- firms with a certified MS may be visited less frequently by the labour inspectorate, which is an incentive in countries such as Denmark, the USA and Australia;
- if a firm has serious OHS risks, the external motive for the MS may really be to reduce the risks. Otherwise internal OHS risks may become publicly known scandals;
- larger firms in particular need societal acceptance, as a "licence to operate", and an MS may be important to that end.

The internal motives to introduce an MS may be:

- to reduce the number of reported injuries etc, to save on worker compensation costs, and – especially in the USA – also on healthcare costs;
- to protect against disruptions to production due to absence and thereby to reduce indirect internal costs for poor employee health, i.e. actual costs, also for unreported ill-health, and not only to reduce claims or insurance rates;
- a work environment that supports efficient work and reduces disturbances from poor OHS – such as accidents, noise or poor ergonomics – and thereby improves productivity, quality and profits;
- to ward off OHS litigation by improving prevention. Third-party lawsuits are conducted especially in cases involving asbestos (in the USA) but there also cases against the effects of such things as lead, PCBs and nuclear and other hazardous waste;
- to use the MS to strengthen management control of worker behaviour and communication with workers and thereby to reduce worker and union influence at the site;
- to make workers mainly responsible for avoiding injury by a focus on behavioural safety;
- management efficiency, to simplify or streamline the OHS, to spend less time and money to reach set OHS goals, and also better integration of OHSM into the general management;
- ethical motives: in a situation of complex OHS interests, managers may have an opportunity to let their personal ethics of not injuring employees influence the OHSM.

It is not only legitimate but even necessary for firms to manage their external relations in all important aspects. This unavoidably includes their management of OHS. A good MS image may be important to attract customers and investors and avoid labour inspectorate and media scandals. Employers who do a good job of reducing risks at work also deserve positive credit for their efforts. However, there is a risk that it may be more important for them to manage the external *image* of managing OHS, than to manage the internal prevention of OHS risks to their workers. To be effective, an MS therefore

requires a strong internal motivation. Managers cannot only do it for the external reasons. They also have to believe that health and safety risks at work are bad for workers' morale, for a good production flow, for improving quality and productivity or for other important business goals. Or they may believe that the real internal OHS situation runs a very large risk of spilling over into a bad external OHS reputation.

## **The pros and cons of MS certification**

Like other methods within the broad standardisation movement, certification can be very useful in improving trade and other interaction. A certificate gives an outsider an assurance from third-party experts that the firm with the certificate has achieved a certain quality or other standard, in this case in how it manages OHS. Certification presupposes a standard with a complex set of quite strictly specified procedures, as a precise enough yardstick to audit the MS against. It is thus only possible for strictly specified and complex MS, which, however, nearly all MS are. Yet several MS have instead been formulated as guidelines and are thus not intended for external third-party certification. Certified MS are thus only possible for a small number of large worksites, which can implement (and benefit from) the likes of a standard for MS. These workplaces may employ a larger share of the workforce. Yet most workers are employed in smaller firms, which have very limited capacity to implement and certify an MS as a means to improve their OHS.

This is at best, assuming that MS certificates always guarantee good OHS conditions. In practice it is very likely that firms with a certified MS have considerably better OHS than other employers. Yet an MS is complex. Both the OHS risks and outcomes of improvements are hard to measure in quantitative terms, especially the health risks. Irrespective of this, the certificate assures compliance with the specified MS procedures, not good OHS outcomes. It is therefore not surprising that many cases have been reported of firms with certified MS that have still had severe deficiencies in how they managed OHS. For example, systematic management mistakes caused a fatal accident in a large Swedish company, which DNV had recently certified to be in accordance with the OHSM regulations (Arbetsmiljointspektionen, 2003). DNV claimed that they had nothing to do with the accident. They only audited and certified that the worksite had a system, but how the system was applied in practice was outside their remit and responsibility (Arbetarskydd, 2004). And in Australia, a major Esso plant blew up soon after the internal corporate auditors had praised its MS (Hopkins, 2000). Similarly, certified environmental MS are not always reliable (Poksinska, 2003).

Thus, while it is natural for firms to try to get the external credit for a certified MS, such a certificate is not enough for the internal purposes of reducing health and safety risks. While the motive for the employer to implement an MS is as much internal, the auditing process of certification is more important than the resulting paper certificate. The external auditing can then be used as a learning process on what should be improved and how that can be done.

Used in this double way, MS certification relates to the function of regular evaluation and improvement, which is essential for any MS (Dalrymple et al., *ibid*; see also p. 24).

### **MS performance – behavioural numbers or OHS effects and customer satisfaction?**

Why an MS is implemented thus influences whether a certificate is used mainly to promote the external image or the certification process is also used for internal learning and improvement of how the OHS is managed. But the motives behind the MS also affect how it is measured and evaluated. There is a need for some kind of performance measurement of the MS. If the main motives underlying the MS are external – such as to reduce WC premiums, keep the inspectors out, and/or improve external image – the measured goal is usually the number of workers to report injuries or diseases, or to take sickness absence.

However, reported LTI, compensation claims etc, are poor indicators of OHS risks. Not all accidents that workers experience are reported to management. Managers have also been known to keep many of those reported out of the official OHS statistics. And employers may challenge the reports – such as on the very common cases of musculoskeletal diseases – as not being work-related and thus not to be included in the measured effects of the MS. Even work-related fatalities may by definition be excluded from reported figures, such as traffic fatalities while driving on duty in the UK (Tombs, 2006). If few reported injuries is the goal, this can result in a management culture of suppressing these. Eisner & Leger (1988) found that after the ISRS safety management was introduced in South African mines, the fatality rate remained roughly the same while the number of reported smaller accidents halved. Their conclusion was that safety had probably not improved much but that there was more pressure not to report smaller accidents. Zoller (2003) describes the strong internal mechanisms, which make workers not report even considerable injuries. And Rosenmann et al. (2006) found that only a third of all work-related accidents show up in employer reports in the USA. Outright falsification of figures – with lower figures to OSHA and the world than for internal use – may also happen, even in large companies (UAW, 1987).

To measure the performance of an MS mainly on reported accidents and other such numbers may therefore be a stronger incentive for claims management – to minimise claims and other reports – than for prevention management. Yet the possibly huge gaps between reported numbers of injuries and the actual OHS risks in the workplace are rarely – if ever – discussed by those who produce and promote voluntary MS. Even OHS authorities with officially very broad OHS goals – such as those in Australia and Canada – usually evaluate the performance of an MS (and in general the OHS policies) only by numbers of reported injuries, with no comment on the poor validity of these measurements. Dotson (1996) also illustrates how broad OHS goals are reduced to one or a few figures, with more focus on safety than on health. His starting point is that "what gets measured, gets done". The corporation in which he is

the safety manager therefore manages its OHS worldwide by Corporate H&S Management guidelines, and measures its safety performance by the "total recordable injury rate". This is relatively quite low, which is achieved with an "understanding that most injuries in modern workplaces are caused not by unsafe conditions but by improper or improperly executed work procedures" (Dotson, *ibid*). When the company wanted to add a single metric to measure its occupational hygiene and other health aspects, it found that some 30% of its workers used respirators and nearly all used hearing protectors. However, Dotson did not report that this resulted in any prevention to reduce the massive exposure to health risks of chemicals and noise. The company instead measured the health effects of its MS by a figure on workers' behaviour in using the prescribed PPE.

Nevertheless, there is a need to measure the MS results. Without any idea of its OHS outcomes, we cannot distinguish between a paper MS and one which is implemented in practice. We thus have to search for better measurements than the narrow reporting numbers, which can be – and are – manipulated. As for any complex goals, we have to combine several indicators, like in a balanced scorecard (but the choice of indicators in such a scorecard is essential). The alternative indicators have to reflect the official MS goals (except in behavioural safety) of minimising risk exposure. The MS should utilise competent exposure measurements and expert assessments. Labour inspectorate notices, both formal citations and advice about what to improve, are also important indicators of the OHS situation.

However, limited resources will make such expert-based indicators the exception, even in large workplaces, with internal OHS expertise, and with repeated visits from the labour inspectorate. And organisational risks – which are very important for both somatic and psychosocial health at work – are difficult to estimate by experts. The performance of MS should therefore mainly be measured through surveys issued to workers on how they perceive the risks and their work-related (ill-)health. As workers are the customers for any MS which really aims to improve OHS, such a survey is no different from any other form of customer dialogue. Worker surveys have also been demonstrated to be quite valid in their description of the OHS, if they have carefully crafted questions (Wikman, 2006). The surveys can be combined with experts' measurements and assessment, and also with injury statistics. As long as such statistics can be validated against other data, they too are part of a broad panel of evidence on which to evaluate the performance of an MS.

### **Safety risks, technical health risks or even organisational ones?**

Except for some safety-only management systems, all MS claim to manage both health and safety. All OHS research also indicates that the health risks at work far outweigh the risks of accidents. Ill-health which is mainly caused by conditions at work – such as cancers, cardiovascular diseases, and depression and suicide – results in many more lost work days and fatalities than

acute traumas or accidents. The health risks are also dominating in blue-collar work, not only in white-collar offices. However, occupational diseases are difficult to register, their etiology is a mix between conditions at and outside work, and exposures at work are more difficult to measure or assess than the safety risks. All of this makes for gross underestimations of the health risks, even when an MS tries to look for them.

Like the other aspects of an MS, its OHS scope is also influenced by the motives behind the decision to implement it. The OHS goals may be measured and/or evaluated as:

1. Minimise numbers of workers reporting accidents, LTI, absences, or lodging compensation claims etc.
2. Better safety, i.e. to reduce the risk of accidents, often large-scale disasters. If this is the goal – and not only reportable numbers – the MS also has to include, for example, a reduction of risks for traffic accidents by employees driving on duty.
3. Reduce traditional occupational health risks (and also improve safety), by reducing exposures to factors such as noise, chemicals, radiation, vibration.
4. A good overall work environment, by also reducing organisational health and safety risks and psychosocial health effects.

However, in practice MS seem to look more for accident risks than for long-term health risks, which may only show up much later in any statistics, if at all. The examples provided by the websites and other descriptions – for example of OHSAS 18001, or the UK standard BS 8800 – deal much more with accidents than with health risks. They rarely, if at all, comment on the complexity of assessing and handling risks for work-related ill-health. The attention to the broad OHS perspective is even less than to the physical/chemical health risks. At least within the EU, organisational health risks and psychosocial health effects are explicitly included in the broad working environment of the Framework Directive. This is based on more and more evidence that links such organisational issues as stress at work, shift work, conflicts at work, and excessively long working hours to things like cardiovascular diseases. Organisational factors are also important causes of accidents and musculoskeletal problems. For example, if you slip on the stairs, the issue is not only whether the stairs are non-slippery and well illuminated. Equally important is why the injured worker had to climb the stairs at all, and often why s/he had to do so very quickly? Likewise, questions need to be asked about why the organisation of work exposes workers to noise, to repetitive motions or whatever technical risk may cause injury or disease.

A general organisational perspective on the prevention of occupational diseases (and accidents) is lacking in the described MS practices. Similarly, the psychosocial health effects, with the occasional exception of stress, are not mentioned in them. For example, threats and violence pose a serious OHS problem for very many workers. And so do problems of shift work (which has long been demonstrated to be bad for your health), of long working hours and exhaustion, and of conflicts at work. Yet these health risks are not raised in the voluntary MS, despite their official claim to include the management of health at work.

## **Safe person or safe place – downstream or upstream prevention?**

Although one should not deduce too much from why an MS is introduced, there does seem to be a clear relation between the management motives and goals, and the means chosen to achieve these. If the purpose is to minimise workers' behaviour in reporting injuries, it seems appropriate to try to manage that behaviour. On the other hand, if the MS aims to minimise the OHS risks for accidents and ill-health, it has to manage these risks. There is thus a link between managers' definition of the problem and the prevention they prefer. Will their MS go up the prevention hierarchy to eliminate risks by design? Or does it go downstream, and choose behavioural safety (BS) as its main method to reduce the number of reported injuries?

This choice also reflects the basic ambivalence in the MS. On the one hand, compliance with national regulations in their specifications should make them (with the exception of BS) primarily aim for upstream prevention by organisational and technical design. And in on-going operations, they should try to eliminate risks, for example through ventilation, noise control, rearranged work organisation and technical safety. Yet the examples and advice on the various MS very often present cases of behavioural safety, e.g. how workers are issued PPE, without mentioning technical methods to reduce air pollution or noise. However, the interpretation of the MS varies with national OHS policies and cultures. British examples of companies that have implemented and benefited from OHSAS 18001 are about reducing reported accident rates more than upstream prevention or health risks (070923: [www.bsi-emea.com/OHS/CaseStudies/index.xalter](http://www.bsi-emea.com/OHS/CaseStudies/index.xalter)). In a Danish setting, OHSAS 18001 is instead presented as much more of an instrument to implement the preventive principles (Industrins Branchearbejdsmiljorad, 2005).

Behavioural safety is thus very common within MS. This is perhaps especially the case in Anglo-Saxon countries, but BS is also spreading worldwide (e.g. Krause, 1997). On the one hand, it seems to be much applied within complex formal MS, which by their specifications should focus on upstream prevention instead. On the other, managing BS is often being labelled an MS. DuPont thus has a large international consultancy business on BS, mainly STOP. But there are many other varieties of BS, including a widespread general management practice of managing safety by focusing on worker behaviour. This was described by Dotson (*ibid*, see p. 18) and in the comparative Australian study on the effectiveness of different MS, by Gallagher et al. (2001). The basis for BS is an old management belief that nearly all accidents are caused by incorrect work procedures, either in the design of these or in how workers follow them. This is why many managers in Australia (and elsewhere) prefer to manage "safe persons" and give less attention to creating "safe places" (Gallagher et al., *ibid*).

However, there are several problems with the BS strategy. For example, DuPont found that in "96% of the cases at-risk behaviours" [of workers, not managers] "- not unsafe conditions – cause or contribute to most injuries".

However, it is no surprise that human behaviour *contributes* to accidents. These occur as a last effect of a long causal chain. Humans make mistakes, but the work environment determines if this will result in an accident. If a worker pulls a piece out of a machine 10,000 times a day, s/he may just once act too quickly. With proper safeguards, no accident will occur but without them, s/he may lose a finger or more. The DuPont figures therefore provide neither information nor reliable evidence that BS works.

The BS strategy has also been criticised in many other respects (see e.g. National COSH, 2006; USW, 2005; Doyle, 1991; and [www.dupontsafetyrevealed.org](http://www.dupontsafetyrevealed.org)):

- It does not comply with the legal regulations of preventing risks before you order workers to behave safely in risky situations, i.e. the prescribed prevention hierarchy.
- The figures behind BS are flawed. The famous Heinrich (1931) statistics – that 85% of the injuries are caused by workers' unsafe behaviour – were compiled from reports by supervisors. These had little competence in analysing root causes of accidents, but much interest in blaming their companies.
- The claim that behaviour is the main cause of accidents – by e.g. Heinrich, DuPont and Dotson, and other corporations – has not been verified by independent critical studies.
- Many employers which use BS, DuPont included, suppress workers' reporting of injuries and in any case do not always register reports filed by workers. Zoller (2003) describes these obstructing mechanisms in depth.
- BS usually neglects the more serious health risks. Dotson described (see p. 18) an MS which exposed nearby workers to dangerous noise. Likewise, DuPont is noted as one of the worst chemical polluters in the US, of the environment and of its workers.
- Downstream behaviour control is considered the least effective means to achieve the intended results in quality management. Human beings are good at many things, but not at always doing exactly the same thing. For example, when Toyota want quality in their cars, they don't rely mainly on workers to create tolerance down to a hundredth of a millimetre etc. Quality must instead be designed into the construction and the manufacturing of the car.
- The comparative study by Gallagher et al. (ibid) – and other research on how to manage OHS – also supports the prevention hierarchy. Sites with a focus on "safe person" were clearly less safe than those that worked for a "safe place" (see also Hopkins, 2005 on behavioural safety).
- Two fatal accidents in corporations with heavy emphasis on BS are symptomatic. The public inquiries into the explosions at Esso-Longford, in Australia in 1998, and at DuPont in Brazil in 2005 revealed the same pattern. Although the companies tried to blame the workers, the accidents were mainly caused by systematic defects in production safety. Both companies had also tried to hide the evidence of this (Hopkins, 2000; [www.dupontsafetyrevealed.org](http://www.dupontsafetyrevealed.org)).

## **Consultation as top-down manipulation or as a way of improving the MS?**

OHS management is by law – and by function – mainly the duty of employers and their managers, since they create the conditions of work that produce the possible OHS risks. The employer's responsibility and managerial prerogative have – in combination with authoritarian management traditions, and with antagonistic industrial relations – often been translated into authoritarian forms of MS. Managers, with advice from their own experts, define what to do in OHS and how to do it. Despite the fact that worker consultation is often emphasised in the MS specifications, its practice seems more to be a method to persuade workers to obey management orders, and less a genuine dialogue on ends and means in the MS.

However, the customers of MS are the workers (see p. 18). It is their health and safety that is at stake. The effects of worker influence on OHS are difficult to demonstrate conclusively (as are most interventions/actions in the management of OHS). Nevertheless, all available research indicates that extensive and strong worker participation is essential for an efficient and effective MS. In their overview and analysis of this research, Walters et al. (2005) found that:

- worker participation is good for solving OHS problems;
- if this participation is also supported by elected safety representatives (or similar, such as members of joint committees), the OHS results improve further; and
- if workers and safety reps are helped to formulate and present their own views on OHS through training and other support from a trade union, an MS achieves the best OHS effects.

Consultation/participation is therefore not a choice between talking with workers (direct participation) or with their elected delegates (representative participation). A good MS needs to define the problems, to develop the most cost-efficient solutions and to implement these well in practice (Walters & Frick, 2000). However, like "safe person" (behavioural safety) versus "safe place" (upstream prevention), the issue of worker participation is not one of what is known to be the most effective to improve OHS. There is thus overwhelming research – and regulations – to support the idea that the management of OHS needs both to prioritise its methods according to the prevention hierarchy, and to have a strong input from workers and their representatives.

The fact that in practice, MS focus more on behaviour and a top-down consultation to convince workers of management decisions, is instead due to factors outside the MS. Consultation is heavily influenced by national industrial relations, and how managers accept a genuine dialogue with workers on anything (see Quinlan, 1993), which, again, shows up in how the consultation in MS is presented in various countries. Likewise, there seems to be a strong relation between managers' motives and purpose with an MS, and their consultation with workers. If managers want to improve the real OHS – for any of the motives discussed above – they need a dialogue with those who know and experience the conditions at work.

But if the main purpose is to reduce workers' behaviour in reporting injuries, and "prevent" accidents via behavioural safety, there is not much sense in discussing this with the workers. On the contrary, BS may instead be a threat to worker and union influence, on OHS and in general. Employers have long used safety management and its prescribed work procedures to control workers as much as their safety (Taksa, 1993). This power aspect is important to take into account in the evaluation of an MS. In an extensive interaction between managers and workers, management may use its superior information and its control over the forms of the interaction to increase its mental and cultural control of the workforce. Such a manipulative model of "participation" may also be used to get rid of the unions (Frick, 2004b; Grenier, 1988).

### **Resources, audits, learning and continuous improvements**

OHS management systems are thus enmeshed in, and dependent upon, other company policies and management practices. An MS with the ambition to reduce both safety and health risks is therefore challenging. To approach this goal, a voluntary MS has to go beyond what is required in most OHSM regulations. For example, the Framework Directive simply commands employers to implement an OHS management that is capable of complying with all of its ambitious requirements (see p. 11). But to even strive for the utopian goal of zero risks at work requires quite thorough organisational development of the general management of most firms. Also in this respect, the management of OHS quality is no different from any other (equally challenging) quality management (Frick, 2004a).

To be effective, an MS thus not only needs to be oriented towards broad OHS goals, with upstream prevention and a genuine dialogue with workers. It also needs enough resources. Like any other ambitious goal, an improved OHS does not come for free. Funding to pay for OHS improvements – technical and organisational changes, and not only behavioural procedures – is the most noted resourcing issue. There are many conflicts around how much various improvements may cost. Yet the time and competence of both managers and workers involved are equally important. You cannot achieve good quality management of OHS without a considerable effort, and without knowing what you are doing. And as the MS is about the OHS of the workers, these also have to be given enough time and training to be thoroughly and constructively involved (as discussed above).

This need for competence is sometimes mentioned in the official regulation and information on OHSM. It is one of the points in the Framework Directive, but neither this nor the need to allocate enough management time is much discussed when it comes to mandatory OHSM (Frick, 2006). The Norwegian and Swedish (AFS, 2001) OHSM regulations are exceptions. They specify that the employers have to allocate enough persons, with enough time, competence, funding and authority to deal with all OHS risks. However, the literature on voluntary MS in general has a more realistic perspective on the difficulties

involved in managing OHS. Dalrymple et al. (ibid) emphasise that in order to be an MS, OHS management has to include a secondary learning loop of auditing, learning and continuous improvement of MS. Again, this is the same as in other quality management systems (such as ISO 9000).

We discussed performance measurement of the MS above. However, measuring the OHS outcomes of the MS is also the basis for evaluating its effectiveness as a management system. Improved ventilation is not the same as the quality cycle to act against air pollution. Yet this process is only good insofar as it results in such improvements. An evaluation – be it external auditing or internal review – which only looks at the MS process, without relating this to its results, may therefore be more misleading than helpful in improving the MS to reduce OHS risks. And as with measuring the OHS effects, a systematic and thorough input of the workers is essential for this feedback and continuous improvement of the MS itself.

Nearly all MS recognise the need for auditing and improvement in principle. Yet in this respect, too, their practical description is much more limited. The ILO guidelines state that workers and their representatives shall be involved in all aspects of the MS, including the selection of and instructions to those who audit the MS. OHSAS 18001, on the other hand, says that such auditors shall be selected for competence and objectivity, as if this would be much more guaranteed when management decides this alone than when workers also have a say. Equally serious is that the effectiveness is very often evaluated against the narrow – and manipulable – numbers of workers' behaviours in reporting injuries. This also goes for MS by OHS authorities, with expressed goals of reducing health risks at work (Frick, 2004b; OSHA undated).



## A summary of the risks of voluntary OHS management systems

The reality is much more complex than the simple posit that mandatory OHSM is good and voluntary MS bad. The negative picture above of voluntary management systems is an artificial worst-case scenario, assembled from the problematic aspects of various OHSM systems. It is important both as a basis for further discussion and as a warning of possible problems in actual voluntary systems. However, there is also much good in voluntary systems. They usually emphasise that top management has to commit itself to OHS and to monitor both the behaviour and the results of line management and workers in improving OHS. And the complex specifications of how to organise OHS management – for example in various MS standards – are necessary in large or high-risk organisations. And on their side, mandatory regulations may be too short and general to provide effective guidance in many practical instances. The implementation of the theoretically good mandatory OHSM is also in practice more or less deficient. Law on the books is seldom fully applied as law in practice. In both mandatory OHSM and voluntary MS, the local interpretation and implementation is therefore more important than what formal OHSM or OHSM-S one starts from.

The need to evaluate an MS mainly on its results does not mean that there may not be several aspects of these which tend to deviate from the preventive principles of instruments such as the EU's Framework Directive. Except for behavioural safety, this is less the case in the specifications of the MS, but more in how their practices are explained and exemplified. We can summarise these differences between the MS practices and the requirements of regulated OHSM (but which in practice are also much less well implemented), as follows.

- 1. Application:** voluntary MS are mainly marketed and promoted to large organisations, i.e. only to a small fraction of all employers which have to comply with OHSM regulations.
- 2. Specification:** nearly all MS consist of a complex structure of a large number of requirements, often modelled on ISO 9000. OHSM regulations instead have to be understood and possible to comply with also by small employers. They are therefore usually limited to a smaller number of principles for systematic OHS management (e.g. AFS, 2001). There are simplified forms of MS, for use also in smaller organisations. Yet when Ramirez et al. (ibid), for example, look at the MS of small firms in Central America,

they use the term in a quite different and much simpler form than for example in OHSAS 18001.

- 3. Certification:** a formal certificate or other document of recognition and approval by an external auditor is a primary aim for nearly all MS. But legal compliance with OHSM regulations can never be assured in advance. It can only be tested through labour inspections and ultimately decided in court.
- 4. Goals:** MS may be certified if they pass an audit as having correct procedures. The goal of mandatory OHSM is instead to eliminate or at least minimise OHS risks. Their procedures can therefore never be evaluated in themselves. These are only good insofar as they improve OHS.
- 5. OHS scope:** most voluntary MS require compliance with national regulations, which nearly everywhere define OHS fairly broadly to at least also include factors such as chemical and ergonomic risks. At least within the EU, this also includes organisational risks and psychosocial health effects. However, the explanations and examples of how voluntary MS should be implemented tend to narrow their scope into a main focus of safety against accidents.
- 6. Performance measurements:** MS are very often evaluated on accident rates, lost-time-injury reports and/or workers' compensation cases – often relative to the rates of others in the same industry. What their OHS prevention actually is measured against is thus workers' behaviour in registering injuries, claims and/or absences, due mainly or entirely to accidents. Mandatory OHSM can only be measured and evaluated against its stated goals, against the level of exposure to the broad spectrum of possible health and safety risks at work.
- 7. Prevention strategies:** except for behavioural safety, the specification of MS says that they should prioritise upstream prevention through engineering and organisational controls, mainly to eliminate risks by design. Yet they rarely explicitly prescribe the prevention hierarchy of the Framework Directive, e.g. not in OHSAS 18001. And their described practice often amounts to a strong focus on "prevention" by controlling workers "safe" behaviour.
- 8. Workers' representation and participation:** the MS are ambivalent also on this, between their specifications and their described practices. In the latter, participation/consultation is partly a means for management to get OHS information from workers, but there is often an emphasis on top-down communication and motivation, in order to persuade workers to comply with management decisions and measures on OHS. And the MS do not include rights for workers to influence the design and evaluation/improvements of the MS.
- 9. Auditing and continuous improvement:** voluntary MS go beyond most mandatory OHSM – e.g. the Framework Directive – in this respect. They use quality management principles and recognise that such

management will always be imperfect and in need of improvements. However, a major problem is that self-critical auditing and improvements are very often limited to reducing workers' behaviour to reporting and being absent after accidents. There are hardly any references to continuous improvements in reducing exposures to health risks.

## Bibliographical references

- AFS (2001) *AFS 2001:1. Systematic Work Environment Management Provisions of the Swedish Work Environment Authority on Systematic Work Environment Management, together with General Recommendations on the implementation of the Provisions.* [www.av.se/inenglish/lawandjustice/provisions/](http://www.av.se/inenglish/lawandjustice/provisions/) [Accessed 26.11.2010]
- Arbetsarkydd (2004) [Articles on the fatal accident at Stena Gotthard, and on DNV's certification of its OHS management system] (in Swedish), *Tidningen Arbetsarkydd*, (2), 22; (4), 7; (12), 20-21.
- Arbetsmiljöinspektionen (2003) *Inspektionsmeddelande: Besked om resultat av inspektion - Stena Gotthard Atervinning AB* (Notice on the inspection of Stena Gotthard recycling; i.e. the inquiry after the fatal accident), Gothenburg: The Labour Inspection.
- Bebek, E. and M. Viegas (2005) "A healthy business", *Quality World Magazine*, 31 (1), 10-14.
- Bennet, D. (2002) "Health and safety management systems: liability of asset?" , *Journal of Public Health Policy*, 23 (2), 153-171.
- Bird, F. and R. Loftus (1976) *Loss control management*, Loganville, Ga.: Institute Press.
- Blewett, V. (1989) *Managing health and safety at work*, Adelaide: WorkCover Corporation.
- BSI (1996) *BS 8800:1996. Guide to occupational health and safety management systems*, London: British Standards Institute.
- CAW (2006) *Occupational health and safety. Loss control - 5-Star program.* [www.caw.ca/en/7208.htm](http://www.caw.ca/en/7208.htm) [Accessed 26.11.2010]
- Dalrymple, H., C. Redinger, D. Dyjack, S. Levine and Z. Mansdorf (1998) *Occupational health and safety management system: review and analysis of international, national, and regional systems; and proposal for a new international document*, IOHA report to International Labour Office, Geneva: International Labour Office.
- Dotson, K. (1996) "An international safety and health measurement strategy: corporate programs, systems and results" , *Journal of Occupational Health and Safety - Australia and New Zealand*, 12 (6), 669-678.
- Doyle, J. (1991) *Hold the applause: a case study of corporate environmentalism as practiced at DuPont*, Washington, DC: Friends of the Earth.
- DuPont (2007) [www2.dupont.com](http://www2.dupont.com) [Accessed 09.12.2007]
- Dwyer, T. (ed.) (2006) *Occupational safety and health in Brazil*, Stockholm: Swedish Association for Occupational and Environmental Health & Development. [www.ufa.se/publikationer/OSHD8.pdf](http://www.ufa.se/publikationer/OSHD8.pdf). [Accessed 26.11.2010]
- Eisner, H.S. and J.P. Leger (1988) "The international safety rating system in South African mining" , *Journal of Occupational Accidents*, 10 (2), 141-160.
- Frick, K. (2004a) "Organisational development for occupational health and safety management" , in E. Bluff, N. Gunningham and R. Johnstone (eds.) *OHS regulation for the 21st century*, Sydney: Federation Press, 43-67.
- Frick, K. (2004b) "Too much ambivalence in Australian OHS policies?" , *Journal of Occupational Health and Safety - Australia and New Zealand*, 20 (5), 395-400.
- Frick, K. (2006) "EU's legal standard on risk assessment" , in W. Karwowski (ed.) *Handbook of standards and guidelines in ergonomics and human factors*, Mahwah, N.J.: Lawrence Erlbaum Associates.
- Frick, K., P.L. Jensen, M. Quinlan and T. Wilthagen (eds.) (2000) *Systematic occupational health and safety management: perspectives on an international development*, Amsterdam: Pergamon.

- Frick, K. and G. Zwetsloot (2007) " From safety management to corporate citizenship: an overview of approaches to managing health" , in U. Johansson, G. Ahonen and R. Roslender (eds.) *Work health and management control*, Stockholm: Thomson Fakta, 99-134.
- Gallagher, C., E. Underhill and M. Rimmer (2001) *Occupational health and safety management systems: a review of their effectiveness in securing healthy and safe workplaces*, Sydney: National Occupational Health and Safety Commission.
- Grenier, G.J. (1988) *Inhuman relations: quality circles and anti-unionism in American industry*, Philadelphia: Temple University Press.
- Heinrich, H.W. (1931) *Industrial accident prevention: a scientific approach*, 2nd edition, New York: McGraw-Hill.
- Hopkins, A. (2000) *Lessons from Longford: the Esso gas plant explosion*, Sydney: CCH Australia.
- Hopkins, A. (2005) " What are we to make of safe behaviour programs?" , Working Paper 36, Canberra: Australian National University. National Research Centre for Occupational Health and Safety Regulation. <http://dspace.anu.edu.au/bitstream/1885/43176/1/hopkins36.pdf> [Accessed 26.11.2010]
- ILO (2001) *Guidelines on occupational safety and health management systems, ILO-OSH 2001*, Geneva: International Labour Office.
- Industriens Branchearbejdsmiljøråd (2005) *Klar til DS/OSHAS 18001. Arbejdsmiljø i træ- og møbelindustrien [Ready for OHSAS 18001. Work environment in the wood and furniture industry]*, København: Industriens Branchearbejdsmiljøråd.
- Kogi K. (2006) " Advances in participatory occupational health aimed at good practices in small enterprises and the informal sectors" , *Industrial Health*, 44 (1), 31-34.
- Krause, T. (1997) *The behaviour-based safety process: managing involvement for an injury-free culture*, 2nd edition, New York: John Wiley & Sons.
- Mathiason, K. (2006) " Clean bill of health or whitewash?" , *The Observer*, 11 June 2006.
- National COSH (2006) *Workplace health and safety dirty dozen report*, The National Council for Occupational Safety and Health. [www.coshnetwork.org](http://www.coshnetwork.org). [Accessed 26.11.2010]
- NSCA (1995) *The NSCA 5-star health and safety management system*, version 2, Mascot, NSW: National Safety Council of Australia.
- OHSAS 18001 (2006) *OHSAS 18001 Occupational health and safety zone*. [www.ohsas-18001-occupational-health-and-safety.com](http://www.ohsas-18001-occupational-health-and-safety.com). [Accessed 26.11.2010]
- OSHA (undated, but by latest of 1996) *Voluntary Protection Programs (VPP): self-assessment checklist*, Washington, DC: Occupation Safety and Health Administration.
- OSHA (1989) *Voluntary Protection Programs*, Washington, DC: Occupation Safety and Health Administration.
- Poksinska, B. (2003) *Behind the ISO 9000 and ISO 14000 certificates: an investigation of quality and environmental management practices in Swedish organisations*, Linköping Studies in Science and Technology, Thesis 1032, Linköping University.
- Quinlan, M. (1993) " The industrial relations of occupational health and safety" , in M. Quinlan (ed.) *Work and health, the origins, management and regulation of occupational illness*, Melbourne: Macmillan Education.
- Ramirez, L., S. Peraza and N. Pettersson (2006) *SALTRA: Workshop on OHS management systems*, El Salvador, February 5-8, 2006, Stockholm: National Institute for Working Life.
- Rosenman, K., A. Kalush, M. Reilly, J. Gardiner, M. Reeves and Z. Luo (2006) " How much work-related injury and illness is missed by the current national surveillance system?" , *Journal of Occupational and Environmental Medicine*, 48 (4), 357-365.

- Saksvik, P.O. and M. Quinlan (2003) "Regulating systematic occupational health and safety management: comparing the Norwegian and Australian experience", *Relations industrielles / Industrial Relations*, 58 (1), 33-59.
- Su, T., W. Tsai and Y. Yu (2005) "An integrated approach for improving occupational health and safety management: the voluntary protection program in Taiwan", *Journal of Occupational Health*, 47 (3), 270-276.
- Taksa, L. (1993) *All a matter of timing: the diffusion of scientific management in New South Wales prior to 1921*, unpublished PhD thesis, Sydney: The University of New South Wales.
- Tombs, S. (2006) "Why work-related deaths don't count", *CCA Corporate Crime Update*, summer 2006.
- Top, W. (2006) *Safety and loss control management and the international safety rating system*. www.topves.nl [Accessed 26.11.2010]
- UAW (1987) "Occupational health and safety. Right to know - Right to health: falsification of injury reports, a national scandal", *Newsletter*, June 1987, Detroit: United Auto Workers.
- USW (2005) *Not walking the talk: Dupont's untold safety failures*, United Steelworkers, September 2005.
- Vogel, L. (1994) *Prevention at the workplace: an initial review of how the 1989 Community framework directive is being implemented*, Brussels: European Trade Union Technical Bureau for Health and Safety.
- von Bertalanffy, L. (1968) *General system theory: foundations, development, applications*, New York: George Braziller.
- VWA (2002) *SafetyMAP: auditing health and safety management systems*, 4th edition, Melbourne: Victorian WorkCover Authority.
- Walters, D. (ed.) (2002) *Regulating health and safety management in the European Union: a study of the dynamics of change*, Brussels: P.I.E.-Peter Lang.
- Walters, D. and K. Frick (2000) "Worker participation and the management of occupational health and safety: reinforcing or conflicting strategies?", in K. Frick, P.L. Jensen, M. Quinlan and T. Wilthagen (eds.) *Systematic occupational health and safety management: perspectives on an international development*, Amsterdam: Pergamon.
- Walters, D., T. Nichols, J. Connor, A. Tasiran and S. Cam (2005) *The role and effectiveness of safety representatives in influencing workplace health and safety*, Research Report 363, Sudbury: HSE books. <http://www.hse.gov.uk/research/rrpdf/rr363.pdf> [Accessed 26.11.2010]
- Wikman, A. (2006) "Reliability, validity and true values in surveys", *Social Indicators Research*, 78 (1), 85-110.
- Zoller, H. (2003) "Health on the line: identity and disciplinary control in employee occupational health and safety discourse", *Journal of Applied Communication Research*, 31 (2), 118-139.
- Zwetsloot, G. (2000) "Development and debates on OHSM system standardisation and certification", in K. Frick, P.L. Jensen, M. Quinlan and T. Wilthagen (eds.) *Systematic occupational health and safety management: perspectives on an international development*, Amsterdam: Pergamon.