



Contents lists available at ScienceDirect

Journal of Loss Prevention in the Process Industries

journal homepage: www.elsevier.com/locate/jlp

Small enterprises and major hazards: How to develop an appropriate safety management system



Paolo A. Bragatto*, Silvia M. Ansaldi, Patrizia Agnello

INAIL, Italy

ARTICLE INFO

Article history:

Received 2 July 2014

Received in revised form

25 November 2014

Accepted 23 December 2014

Available online 24 December 2014

Keywords:

Major accident hazards

Safety management system

Safety digital representation

SMEs

Bowtie

Near misses

ABSTRACT

Many small and medium sized enterprises (SMEs) are obliged to adopt a Safety Management System (SMS) by the Directive 2012/18/EU for the control of Major Accident Hazards (Seveso III). The difficulties of implementing an SMS within a small sized work organization are well known by practitioners, including inspectors and auditors and have been discussed in many recent papers. In the present paper is discussed a new method, based on the bowtie model, to build an easy and effective SMS. The very core of this method is a "safety net model", which is able to connect in a network all the tangible and intangible elements of safety, including equipment, operating instructions, procedures and safety documents. This safety model has been used as the core of a smart application, the strength of which is the workers' contribution. The application allows the users to build step by step an SMS. It starts from a first version based just on regulations and standard codes (version 0), then it integrates internal knowledge through the bowtie paradigm (version 1). Near misses' discussion is used to transfer actual workers' experience into the system, to get intermediate improvement of the SMS (version 1.x). At the end audit may be used to a major release of the SMS (version 2). The full cycle has been tested at two small Seveso establishments: a galvanic plant and small glue manufacturer.

© 2014 Elsevier Ltd. All rights reserved.

Introduction

Since the late Nineties, operators of "Seveso" establishments, in compliance with the Directive 96/82/CE (Seveso II, 1996), have adopted a Safety Management System for the control of Major Accident Hazards (SMS-MAH). SMS-MAH is usually integrated with Occupational Health and Safety Management System (OHSMS) and reflects the same structure; but it is more demanding because the extent of accidents is much larger, the consequences much more severe and the control by authorities compelling. In Seveso II safety management requirements are regulated by art. 9, comma 1 point a) for upper tier establishments and, in a much softer way by art. 7 for lower tier establishments. In the new Directive 2012-18-CE (Seveso III, 2012), which replaces the old Seveso II Directive, art. 8 reinforces the obligation of an SMS-MAH for all establishments, while maintaining a few facilitations for lower tiers. Due to the new hazardous materials classification used by the Seveso III Directive,

many small companies are expected to fall in lower tier classification and, consequently, required to implement an SMS-MAH. Thus the issue of the SMS-MAH for the Small and Medium Enterprises (SMEs) is becoming important in Europe. For this subject the Italian experience may be interesting to share. Italian SMEs are very strong and unlike Northern Europe, SMEs control a variety of industries with higher hazard, which are involved in the Seveso Directive. In Italy there are about 1100 Seveso establishments, 52% lower tier and 48% upper tier. Some 60% of these establishments are operated by SMEs (75% of lower tier and 45% of upper tier), as may be inferred by the data provided by the Competent Authority.¹ In Italy, unlike in other European Countries, for 15 years SMS has been mandatory also in lower tier establishments. Thus, there is currently a total of 660 SMEs adopting an SMS-MAH, periodically audited on behalf of the Competent Authorities.

SMEs are featuring short time to market, innovative products, higher competition and small work teams as manufacturing industries, whilst they have higher risks and tighter regulatory

* Corresponding author. INAIL, Dipartimento Innovazioni Tecnologiche e sicurezza degli impianti, prodotti e insediamenti antropici, Via Fontana Candida 1, 00040 Monteporzio Catone, Rome, Italy.

E-mail address: p.bragatto@inail.it (P.A. Bragatto).

¹ (<http://www.minambiente.it/pagina/inventario-nazionale-degli-stabilimenti-rischio-di-incidente-rilevante-0>).

constraints as process industries. Changes in market, production, activities and people are very fast and the adaptability is essential to survive. The organizational model of these companies is very far from the typical organization of major plants, such as refineries or petrochemical plants. Organization at major plants is hierarchical and formal, whilst at minor plants organization is much simpler and flexible. The audit of SMS at the Italian Seveso plants is one of the duties of our institution. In Italy the SMEs, where Seveso legislation is enforced, include manufactures of dyes and pigments, paints, varnishes and similar coatings, printing ink, mastics, detergents, glues, essential oils, pharmaceutical products, rubber products and packing goods. To hear the auditors, which every year visit hundreds of establishments, the SMS is perceived by SMEs as heavy, bureaucratic, formal. They recognize that the system has been beneficial for the beginning, but the system that is being imposed, presupposes a hierarchical organizational model, very far from the lean and flexible organization of SMEs. This feeling, expressed informally by practitioner, is basically confirmed by a number of research papers, which analyze strengths and weaknesses of SMS (both OHSMS and SMS-MAH) at SMEs or, more generally, the difficulties of implementing SMS in more dynamic and flexible industries.

The goal of this research is to find answer to the criticisms coming from industrial practitioners and propose a practical solution to facilitate the implementation of an efficient SMS, suitable for occupational and major accident hazard. The paper is organized as follows: in chapter 1 the SMS at SMEs and the main criticisms coming from practitioners and scholars are discussed, stressing the suggestions suitable for Seveso industries. In chapter 2 scope and objectives (and non-objectives) of the research are discussed and in chapter 3 the model underlying the proposed method is detailed. The method has been implemented by a software, which has been experimented at a small factory producing polyurethane based goods and at a galvanic plant (chapter 4). The last chapter discusses on the potential of the proposed method for SMEs.

1. The safety management system at small medium sized enterprises

SMS is a formalized system, addressing all the technical, procedural and organizational measures aimed to prevent accidents. The “real” safety system is made by equipment, materials, instruments, instructions, procedures, documents, plans and (of course) workers with their knowledge and experience. The formal system is a way to control, share, evaluate, improve and demonstrate to the regulatory bodies the “real” safety system. In SMEs the SMSs are perceived as too bureaucratic. Many practitioners, using the slang, say that the “*paperwork is too far from the iron*”, to mean that there is a gap between the formal safety system and the shop floor. The safety system is based just on “intangible” items, such as rules, documents, certificates, forms, in a single word the “paperwork”, whilst the workers are definitely focused on physical “tangible” items, such as equipment, materials and instruments. In a single word the “iron”. The importance of the tangible items is definitely clear for all workers, whilst the intangible ones are perceived as unnecessary. This misperception jeopardizes the effectiveness of the overall safety system.

1.1. Short literature review

Surely there are many benefits by the adoption of an SMS in all industrial sectors. These benefits are evident especially in the beginning, when, to implement the management system, the working procedures are documented and the roles within the organization are defined (Bottani et al., 2009). The limitations and

difficulties of the SMSs in different industries are well known and subject of many scientific papers. It is important to understand whether the informal feeling of the practitioners is reflected in the scientific literature.

As discussed by Hasle and Limborg (2006) most SMEs have to fight for survival, with the owner as the responsible person, who has to handle many different issues at the same time. The owner–manager is the key figure in many SMEs. Management style may be ego-centric and action-oriented. Suspicion towards regulators and external consultants is a typical characteristic. A formal structure, such as the SMS, is difficult to sustain because the informal culture of SMEs. Duijm et al. (2008) reported that in SMEs available safety management standards are considered to be costly but of no practical value to the organization.

Reiman and Rollenhagen (2011) say that the SMS is not able to acknowledge the inherent change of socio-technical systems. At SMEs, everyday work requires many adaptation and improvisation then the system is unstable and the management of change tends to be inadequate. A further criticism is on Blewett and O’Keeffe (2011), who discussed the general problems of audits and the limitations of OHS audits, and suggested that the current demand for auditing distracts organizations from the primary organizational (and legal) goal of safety. That may be said also for “Performance indicators” that may divert attention away from more important issues. Even Zwetsloot et al. (2011) criticized the formal regimes (e.g. certification or regulatory inspections) associated with the SMS, that increase the cost to businesses and become an aim in themselves. According to a colorful sentence of Kristensen (2011), the SMS tends to be placed in a ‘side-car’ position from which it is difficult to achieve effective influence on the firm. He observed that, in the global market, operators are urgently needed to deal with constantly changing and novel competitive situations, while the activities related to the SMS may stick to bureaucratically ordained tasks, which are repetitive and easily ignored. Grote (2012) stressed that particular approaches developed in one industry cannot be generalized, as the differences within and across industrial sectors be taken into account when industries try to learn from each other. According to the paradigm proposed by that paper, larger companies are stability oriented whilst smaller companies are flexibility oriented and used to cope uncertainties. Most practices, which are assumed suitable for all Seveso industries, were developed in Oil&Gas sector. Small chemical factories, featuring highly specialized and innovative batch productions, are very far from large refineries, characterized by continuous operations and highly standardized products.

McGuinness et al. (2012) proposed an innovative guidance for SMEs, where a step-wise approach to the implementation of the SMS has been proved advantageous to an organization, rather than its whole definition at the beginning. Kristensen (2011) argues that the new form of organization, their procedures and processes can be seen as opportunity for increasing space for the participatory influence of employees. The SMS constitutes a quite powerful system of learning by monitoring both problems and improvements.

In essence, for SMEs a collaborative work environment is essential, where all employees contribute to the safety management, including the development of procedures and other documents where practical knowledge is formalized. In this context, the analysis of failures and near misses has a different meaning. Whilst at major companies incident reports are a source for stricter controls, at an SME they may be a source of knowledge for pooling and mutual help. The SMS is too rigid, not only for SMEs but also for larger companies, which adopt more flexible models, such “lean manufacturing” or “agile manufacturing”. As discussed by Gnoni et al. (2013) also leader manufacturing factories, that adopt flexible models, are developing new approaches to improve the SMS by

Download English Version:

<https://daneshyari.com/en/article/586181>

Download Persian Version:

<https://daneshyari.com/article/586181>

[Daneshyari.com](https://daneshyari.com)