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The Need to Develop a Standardised Audit Methodology for the Safety Management System

The basic condition for the operation of plants dealing with hazardous materials is the official approval of the safety documentation, which also presents the safety management system, and its regular official inspection. There is no standardised methodology for the regular official inspection of the safety management system, so the experience and personal preferences of the person performing the inspection play a significant role in the subject matter. In this article, the author aims to analyse and evaluate the circumstances that hinder the regular inspection of safety management systems established in plants dealing with hazardous materials, based on which he proposes a methodology supporting regular inspection.

Keywords: *Seveso establishments, dangerous substance, safety management system, audit methodology, disaster prevention, industrial safety*

Introduction

The operation of establishments handling hazardous substances poses a significant risk to the surrounding population, as well as to the built and natural environment. As defined by László Földi and László Halász, "the operation of establishments dealing with various hazardous materials and technologies can be considered a potential source of environmental hazards".[2]

To control the risks arising from such potential hazards, a disaster management permit issued by the industrial safety authority is required. This permit can be initiated by submitting safety documentation, in which the operator of the hazardous establishment must – with varying degrees of documentation detail – present the safety management system (hereinafter referred to as SMS) designed to prevent major accidents. During the operational phase following receipt of the permit, the continuous maintenance and improvement of the SMS

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[2] Halász–Földi 2014.

ensures a high level of protection for the environment and human life. This is supported by an analysis from the Major Accident Hazards Bureau of the European Commission's Joint Research Centre, which states that 85% of accidents can be attributed to human error and deficiencies in the safety management system.[3] It can thus be concluded that the SMS is one of the most important tools for preventing major accidents involving hazardous substances.[4]

The continuous maintenance and development of the SMS require well-planned, complex, regular internal and external inspections.[5] These inspections not only evaluate the design of the system but also assess its implementation in practice. The commitment of individuals involved in these processes is essential for achieving adequate safety performance. If any participant lacks proper dedication to the SMS, system performance may be compromised, increasing the likelihood of accidents involving hazardous substances. Regular official oversight serves, among other purposes, to identify such shortcomings in commitment and to prevent undesirable incidents by evaluating the safety performance of the establishment.

Experience from authority inspections indicates that many operators have not fully internalised the critical role of the SMS in maintaining safety performance. Often, after obtaining the necessary permit, the use of the SMS becomes deprioritised, resulting in a decline in the desired level of safety.

Authority supervision of establishments handling hazardous substances is carried out by the territorially competent County Government Offices at legally defined intervals as part of routine inspections. These inspections are rarely targeted specifically at the SMS, and despite being well-planned, the methodology for SMS evaluation largely depends on the inspector's professional preferences. Consequently, operators often focus on ad hoc legal expectations of the authority rather than applying a comprehensive, complex and risk-based approach.

Given the above, to establish and maintain safe operations, it would be advisable to develop and implement a standardised and complex supervisory methodology for the inspection of the SMS. In this article, the author presents the challenges of external inspection of the safety management system and proposes the development of a standardised inspection methodology to support effective supervision.

Literature review on the challenges of auditing the Safety Management System (SMS)

The Safety Management System (SMS) is fundamentally intended to ensure safety guarantees in establishments handling hazardous substances. Its implementation covers a comprehensive, systematic and safety-conscious approach to the prevention of major accidents involving hazardous materials.[6] The legal background of the SMS is provided by the Seveso III Directive (2012/18/EU) and its transposition into national legislation, specifically Act CXXVIII of 2011 on disaster management and its implementing regulation, Government Decree 219/2011 (X.

[3] OECD 2008.
[4] Vass–Halász 2007.
[5] Bognár et al. 2013.
[6] Mitchinson–Papadakis 1999.

20.) on the prevention of major accidents involving hazardous substances. The SMS plays a key role in ensuring safe operations, and therefore, its compliance and enforcement should be treated as a priority objective in preventing hazardous material-related accidents.[7]

Currently, no international standard exists for the design and maintenance of a safety management system specifically aimed at preventing major accidents. The operation of SMSs in hazardous establishments requires specific conditions,[8] and domestic regulations merely define the fundamental elements of such systems, which include:[9]

1. management commitment, safety policy, and objectives
2. organisational structure and assignment of responsibilities
3. risk assessment and prevention
4. operational control
5. change management
6. emergency planning
7. performance evaluation, audits and review

However, the relevant legal framework does not provide guidance on how companies should integrate the SMS into their broader corporate governance and regulatory systems. As a result, a wide variety of SMS implementations are observed in practice (e.g. as standalone systems, integrated into other management systems, or issued as executive instructions),[10] making third-party assessment a challenge that demands significant time and effort.[11]

A properly designed and operated SMS is a fundamental tool for preventing major accidents involving hazardous substances and maintaining safety guarantees throughout the company's operations. However, companies undergo numerous changes during operation – technological modifications, personnel shifts, evolving methods, or equipment wear and tear.[12] Consequently, the SMS must be continuously adapted to the dynamic nature and condition of the organisation. This continuous adaptation can only be ensured through regular, comprehensive and systemic supervisory activities.[13] The application of safety management systems extends beyond the field of industrial safety to all safety related regulations, of which fire protection systems play an important role in the health protection of those involved in disaster management rescue operations.[14]

Challenges in maintaining the Safety Management System (SMS)

Achieving the desired level of safety performance is fundamentally dependent on the operator's commitment, which must be evident both in the design of the SMS during the planning

[7] Mesics – Kátai-Urbán 2015a.
[8] Mesics – Kátai-Urbán 2015b.
[9] Vass et al. 2016.
[10] Hale–Borys 2013.
[11] ICAO 2013; OECD 2018.
[12] Mesics 2017.
[13] Stolzer et al. 2018.
[14] Kanyó–Varga 2016; Mihály et al. 2025.

and implementation phase, and in its full operation during the operational phase. If this commitment is compromised at either stage, the risk of major accidents involving hazardous substances increases significantly.

According to available information and field experience, it is not uncommon for operators to formally establish their SMS in compliance with legal requirements, yet the implementation and practical application of the system often fall short of achieving the necessary and sufficient level of safety performance. In such cases, the SMS does not become an integral part of daily operational activities. Often, internal audits conducted by the operator fail to adequately reflect changes in safety-relevant parameters.

Operators typically perform internal audits according to their own safety culture, which may not always effectively identify non-compliances stemming from deficiencies in the system. Some companies hire external experts to support internal audits; however, even when deficiencies are detected, the implementation of corrective actions largely depends on the commitment of the management. This process, if not effectively managed, may lead to a gradual decline in safety performance.

For the above reasons, increased official supervision of SMSs in establishments handling hazardous substances is essential. This serves to strengthen managerial commitment and the overall safety culture of the facility. Therefore, it is necessary to identify those establishments and provide targeted support for the practical implementation of the SMS.

Supervision of such establishments is carried out by the territorially competent County Government Offices, in accordance with legally prescribed periodic schedules and routine inspections. According to operational experience, these inspections are not sufficiently focused on SMS-specific elements and are significantly influenced by the professional preferences of individual inspectors. As a result, operators tend to prioritise satisfying the authority's ad hoc regulatory expectations, rather than adopting a holistic, integrated and risk-based approach.

This supervisory practice often leads to a lack of awareness among operators regarding the critical importance of the SMS in maintaining safety performance. After obtaining the necessary permits, many establishments tend to neglect the ongoing operation of the SMS, which can result in a deterioration of the intended safety level.[15]

However, it must also be acknowledged that from the authority's perspective, conducting a comprehensive assessment of the SMS under current practices presents a significant challenge. Given that the legal framework only defines general content requirements, the SMSs of each establishment are customised to reflect their specific operational characteristics. Furthermore, to be effective, the SMS must permeate the entire organisational structure and integrate with other internal regulatory systems – yet no legal requirement ensures such integration. As a result, each SMS varies in scope and depth, depending on the operator's discretion.

Due to these factors, the thorough auditing of SMS is extremely time- and resource-intensive and cannot be realistically achieved within the framework of the current official inspection regime. Consequently, authorities are often unable to enforce the consistent

[15] Conlin et al. 2004.

maintenance of SMS that ensure the necessary and sufficient safety performance. In such cases, safety performance depends largely on the operator's voluntary commitment. Without adequate management dedication – when operators focus solely on regulatory compliance rather than actual safety outcomes – the SMS becomes ineffective in achieving safety goals, posing a significant risk.

These risk factors influencing SMS performance are illustrated in the Figure 1.

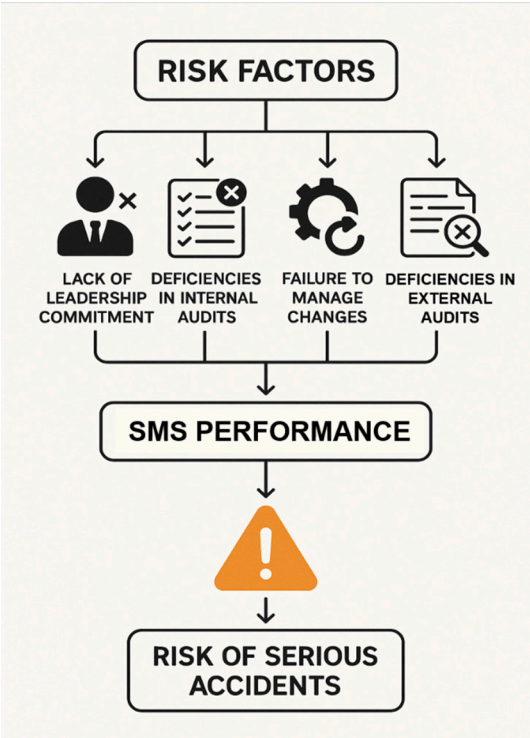

Figure 1: Risk factors affecting SMS performance
Source: compiled by the author

Identifying these establishments and enforcing the desired safety standards are essential to ensuring a high level of protection for both the environment and nearby populations.

Considering the aforementioned challenges in conducting inspections, it becomes evident that there is a need to develop a methodology capable of identifying underperforming establishments and enforcing the desired level of safety performance.

Proposed audit methodology

As outlined above, there are multiple reasons why a safety management system (SMS) may not be properly established and/or maintained within a given company. One reason may be

that the operator lacks awareness of the knowledge required to ensure the safety performance necessary for an establishment handling hazardous substances. Alternatively, the operator may possess this knowledge but is either not motivated or not compelled to implement it. Given the potential risks to public health and the environment, such behaviour is unacceptable, and robust measures must be taken to ensure operational safety.

In Hungary, the inspection of such establishments is carried out by the territorially competent Government Offices. These authorities currently lack a standardised methodology for auditing SMSs or identifying facilities with inadequate safety performance. Consequently, inspections tend to reflect the personal preferences of the inspectors, which limits the comparability of inspection outcomes. Therefore, it is necessary to develop a standardised supervisory methodology capable of objectively assessing SMS implementation.

Regardless of the cause, any deficiency compromising the safety guarantees within a hazardous facility must be addressed promptly. From the authority's perspective, this first requires the identification of such underperforming establishments. With focused inspection efforts, a structured corrective process can be initiated. Several indicators may be used to identify these facilities, including but not limited to:

1. inadequate identification of risks during risk-based activity assessments
2. a decreasing trend in safety performance based on inspection results
3. lack of initiative toward developing or improving safety culture and SMS
4. frequent or serious regulatory violations observed in past inspections
5. detected deficiencies related to the SMS framework
6. recurring or serious accidents involving hazardous substances

These indicators may be supplemented by additional criteria that, while not definitive on their own, could suggest weaknesses in safety culture or justify increased scrutiny. Examples include public complaints, or lessons learned from accident investigations at similar establishments. In such cases, the competent authority may consider placing the operator under enhanced supervision.

To apply enhanced official oversight consistently, it is recommended to define a unified set of criteria nationwide. These criteria should include thresholds that prevent unnecessary attention to minor or irrelevant cases, thereby avoiding excessive administrative burdens. The threshold values should also be communicated to operators, reinforcing the authority's increased attention.

Identification can be based on available documentation and regular inspection results. For this purpose, a standardised form is recommended, including the basis for identification, justification, target performance indicators and other key data. This form can be updated with findings from subsequent inspections and measures taken to improve safety performance. Additionally, it can serve as a schedule for corrective actions, especially if the operator documents these activities along with target deadlines. These records should be maintained regularly until the predefined performance goals are achieved, at which point enhanced oversight can be lifted, and standard regulatory inspection procedures can resume.

After identification, corrective actions – or a combination of actions – must begin as soon as possible to restore the required safety performance. Before initiating these actions, the operator's capacity and willingness to comply should be assessed, and the selected measures tailored to the specific facility. The chosen approach must effectively motivate the operator while ensuring that the scale of intervention is proportionate to the severity of deficiencies and the operator's attitude and objectives. Simultaneous enhancement of both safety performance and safety culture is essential. The following tools can support this process:

- consultations between the operator and the authority
- joint discussions between the operator and the authority or expert involvement to identify best practices
- increased inspection frequency and duration
- unannounced inspections
- documented evidence for critical SMS elements (similar to critical infrastructure documentation)
- development of an action plan with prioritised tasks and deadlines (especially in complex cases)
- enforcement actions such as fines or legal proceedings

It is crucial to emphasise that the primary aim is to restore the desired level of safety performance and to improve the operator's overall safety culture. Corrective actions can only succeed if the company's leadership is genuinely committed. Therefore, collaborative, communication-based measures should always be the first step. Sanctions should only be applied as a last resort. These interventions must be approached with sensitivity, as they could potentially put the operator at a competitive disadvantage. Hence, corrective strategies should be developed in cooperation with company leadership, including deadlines acceptable to both parties. This ensures that corrective measures can be implemented effectively without jeopardising business continuity. The results of such action plans can be documented and verified during follow-up inspections.

Effective coordination and implementation of this methodology depend heavily on the competence of the authority's case officers and the independence of all participants in the inspection and support process. To ensure these conditions, the establishment of a support unit under the National Directorate General for Disaster Management (NDGDM) is recommended. This unit would be responsible for developing the criteria for a unified methodology, training staff from both the Government Offices and the relevant companies, and assisting in the formulation of corrective action plans. Each action item should be assigned to a responsible party and a deadline to ensure verifiability. Follow-up inspections should be carried out by trained officers, thus ensuring impartiality. With this structured supervisory framework, it would be possible to identify underperforming hazardous establishments and continuously improve their safety performance. Once the desired safety level has been achieved, the operator's enhanced supervisory status can be revoked, and regular inspection protocols re-applied. This proposed supervisory model aligns with the principles of a 'service-oriented'

public administration and reflects the recurring demand for standardised methodologies often voiced in professional forums and conferences.

Conclusion

The primary safeguard for hazardous establishments lies in their Safety Management System (SMS), which is subject to official inspection along with the safety documentation. The current legal framework defines only the main components of the SMS but does not provide specific requirements regarding its structure or detailed content. As a result, many operators of hazardous establishments remain uncertain about the exact expectations related to the SMS. Typically, they attempt to develop an SMS that fits their own organisational structure and operational context, which leads to significant variability in both the form and content of the systems across operators. Due to this ambiguity, in many cases the SMS appears merely as a formal element of the safety documentation – lacking the underlying safety culture. In such scenarios, although the SMS may be reviewed and approved together with the safety documentation, it is either not implemented or only partially applied in practice, ultimately impairing safety performance. Especially in these establishments, the dynamic nature of industrial operations is often not matched by a timely reassessment of the SMS's relevance and applicability, leading to outdated content and a further decline in already insufficient safety performance.

Auditing SMSs that differ significantly in both form and content requires substantial effort from authorities. Currently, there is no unified methodology for the official inspection of SMSs, and the areas of focus are heavily influenced by the inspector's individual professional preferences. Moreover, the time available for routine on-site inspections is severely limited, offering only restricted capacity to thoroughly assess both the documentation and the practical implementation of the SMS. As a result, the comprehensiveness and effectiveness of the SMS are shaped predominantly by the operator's leadership commitment and prevailing safety culture. Where such commitment is lacking, the gradual degradation of safety performance often goes undetected and cannot be corrected through existing oversight mechanisms.

Given these limitations, the development of a standardised and complex audit methodology is advisable to enforce the expected level of safety performance across all hazardous establishments in the country. According to the proposed approach, operators whose SMS deficiencies indicate a persistent safety risk must first be identified. Following identification, these establishments can be targeted for intensified official control and continuous monitoring. However, this supervisory activity can only be effective if it is based on improving the operator's internal safety culture and is supported by active collaboration with the authorities.

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