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# **Safety Management Systems in application of the Seveso II Directive - Lessons learnt from implementation in SMEs**

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## **Abstract**

The Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances, known as Seveso II directive, requires that the operators of hazardous establishments must demonstrate that they have assessed their major risks and are managing them throughout a Major Accident Prevention Policy (MAPP) and a Safety Management System (SMS).

Because of the diminution of the threshold quantities in the Seveso II directive, a lot of establishments that were not covered by the first version of the directive must apply the requirements of the second directive. In particular, a lot of small and medium size enterprises (SMEs) that were not prepared to implement a SMS are concerned.

The paper describes first the characteristics of the SMEs which are important for the implementation of a SMS: for example the small number of employees, the difficulties to access to the new developments in technology and regulations, the multiplicity of roles for the managers... Then, the authors present the lessons learnt from interviews with safety managers and plant managers of SMEs and describe the difficulties they apprehend for the implementation of SMS, and give some advice to overcome the weakness of SMEs. Finally, some proposal are made to facilitate the implementation of SMS.

## **1. CONTEXT**

In order to anticipate the implementation of safety management systems (SMS) in the framework of the application of the Seveso II Directive, a working group was built at INERIS. Objectives were on the one hand, to measure the industrialists' level of information of concerned by the directive, and on the other hand, to highlight the difficulties related to the implementation of a SMS.

The overall objective was then to identify the needs in terms of tools, methodologies, information set to facilitate the implementation of the directive.

To be able to obtain the manufacturers co-operation, the working group has elaborated with Ref. 1 a manual with slides that were going to serve as support to the study.

Also, this manual presents :

- Observations and objectives related to SMS implementation,
- A presentation of the contents of the Seveso II Directive,
- A brief description of the documents they have and that could be part of a safety management system based on a Plan, Do, Check, Act (PDCA) model.

The manual of slides has allowed us to meet industrialists and to expose the requirement of the directive to them. These interviews have allowed us to perceive difficulties that apprehend manufacturers, notably SMEs, for the application of the directive, in particular the definition of a Major Accident Prevention Policy (MAPP) and a Safety Management System (SMS).

The working group then launched the enquiry and contacted some industrialists INERIS is working with.

Finally, the results of the described inquiry provided us with a better knowledge of the terrain and to reveal the difficulties foreseen by industrialist in the implementation of safety management systems in compliance with the objectives of the Seveso II directive. The main results of the study are presented hereunder.

## **2. SYNTHESIS OF THE RESULTS CONCERNING DIFFICULTIES APPREHENDED BY INDUSTRIALISTS**

The experience resulting from discussions with SME's operators revealed some elements that make the SMS implementation in the framework of the directive Seveso II difficult.

Thus, the following observations have been made :

- The implementation of SMS is, for most SMEs, a regulatory constraint, generating a supplementary work cost ;
- Available human resources for the implementation and the functioning of the SMS seem often insufficient ;
- It often seems to be difficult to keep oneself up-to-date about regulation and normative requirements, notably at the level of SMEs ;
- Industrialists have difficulties to apprehend major hazards of the enterprise, and to use risk analysis and management methods ;
- There exists often many documents or an oral safety culture but the formalisation and the integration in a SMS seems often to be difficult ;

- The implementation of a SMS has often a great financial impact for SMEs ;
- The perception of what is a SMS is not evident, neither the manner to make it working ;
- Enterprises have the quality reflex, sometimes health and safety but not major risk prevention ;
- Enterprises having a quality system (like ISO 9000) wish to integrate the SMS, but the persons in charge of the quality system have not always a major accident prevention culture.

This quick overview shows that difficulties on the terrain are real and that they result in many factors that can be regrouped in four categories:

- Difficulties of perception of major risk ;
- Difficulties linked to the regulation ;
- Structural difficulties specific for SME's ;
- Difficulties of SMS appropriation.

The following sub-chapters develop the origins of the difficulties mentioned above. In each paragraph, possible solutions are proposed.

### **2.1. Difficulties concerning the perception of major hazards**

If the safety at the working place is relatively well integrated in enterprises, it is not the same for the prevention of major hazards. For a long time, the notion of protection of the worker linked to the application of the work regulations is part of the safety preoccupations in the enterprise, and this under the pressure of actors such as unions and competent services of the State (Work inspection).

The notion of major risk, however, is not often well assimilated among workers. The probability of occurrence of a major accident is low compared to an accident at the work place. Thereby, the major risk is occulted because it is not well perceived.

Moreover, the perception of major risk is more difficult, because industrialists don't use easily risk analysis methods. These methods allow, by studying the installations, to identify potential hazards and to evaluate technical or organisational safety devices that are installed, and to propose improvements.

*Operators of SMEs need to appropriate tools such as risk analysis to rank the hazards in their establishment.*

### **2.2. Difficulties linked to the regulation**

Contrarily to the quality management system (ISO 9000 or EFQM) or to the environmental management system (ISO 14000), that are voluntary steps, the implementation of a SMS derives directly from the application of the Seveso II directive on the control of major accident hazards involving dangerous substances.

For a number of enterprises, the SMS appears first as a regulatory constraint and the commitment of the top management is not spontaneous. However, it is clear that a management system can efficiently function only if the top management is really involved in the work with a strong determination communicated to the personnel.

***Need of a tool to inform and convince top management and decision-makers concerned with risk management.***

Besides, in the spirit of the operators, the topics covered by the SMS overlap with the work condition regulations and the accident prevention at the work place. At the same time, a confusion comes up between the role of Inspectors of the work condition and the Inspectors in charge of the application of the Seveso II directive. (This problem might be specific to France).

***Need to clarify interfaces between the work regulations and the environment regulations about safety.***

The implementation of a SMS implies to keep oneself up-to-date about the regulatory system as an important aspects of the management system. But often, SMEs have difficulties to follow the evolution of the regulation and to manage it with their internal resources.

***Need to have tools to insure to follow the evolution of the regulation.***

### **2.3. Organisational difficulties specific to SMEs**

The implementation of a safety management system and keeping it up-to-date represent an important amount of work, that asks almost full-time human resources.

In a number of SMEs, the safety function is insured by the production manager or the plant manager. Only few SMEs have identified a person who is in charge of the safety management system. This fact is partly explained by the lack of financial resources, but also, as written above, by the bad perception of major risks and the bad evaluation of the impact of a major accident on the enterprise. Commercial or productivity stakes are not well perceived, and this from a financial point of view as well as in terms of image and productivity.

***Need of costs / benefits evaluation tool for safety management.***

Well often the role of the safety chief is merged with the function of the production manager, maintenance manager or even sometimes the plant manager. The top management of the enterprise has to understand that it concerns a task that cannot be sustained together with others responsibilities. Implementation and reviewing SMS necessitates not only time, but also particular competence.

***Need to encourage SMEs to employ a safety specialist, even in time shared.***

#### **2.4. Appropriation difficulties**

We have seen that the time devoted to the SMS is considerable and must be planned on the long term. If not, the SMS might be only a system that employees do not appropriate.

Even if a safety department exists within the enterprise, the SMS is implemented with the help of a technical support coming from central services of an industrial group, or of an external consultant. Because of the costs, after the short passage of the technical help, the system is in its beginning only formal, but not yet anchored in the safety culture of the enterprise and in the automatism of decision-making.

The SMS should therefore be the results of a dialogue within the enterprise and a thorough work. The choice of the system is the decision of the top management ; on the other hand, building the SMS should be the result of a collective work.

*Need to explain the approach for implementation and the review of the SMS, especially by identifying and by driving collective and federative actions in the long term.*

One key for the efficiency of the SMS resides in the choice of the referential, referential that must at least take into account the requirements of the annex III of the Seveso II directive. But to make the SMS really efficient, it has to deal with the production process. The SMS shouldn't be a system that superposes on the activity of the production, but the SMS has to integrate the production process and to modify it if necessary. The objective is to produce safely, and not to have a production activity and a safety management activity with interfaces. This penetration of safety in production can be particularly difficult in the case of existing structures.

*Need to favour the integration and the penetration of the SMS in the production activity.*

#### **2.5. Success factors**

During the interviews, success factors for the implementation and functioning of SMS appear clearly, especially, we can underline :

- Strong implication of the top management right from the beginning ;
- Existence on the site of a Quality Management System (ISO 9000) or Environment Management System (ISO 14000) or Health and Safety Management System ;
- Existence of a safety culture.

Furthermore, it seems that the good functioning of the SMS is based on some particular points. These points should have inevitably to be tackled during the SMS implementation.

The table hereafter presents our recommendations in front of the particular points we noticed. The list is not exhaustive, but is the result of our experience.

Table 1  
Recommendations on particular points

Particular points	Recommendations
Confusion between SMS with Seveso requirement and Health and Safety Management, and bad perception of the regulatory context	The intervention has to begin with the training of the top management and the team that will work on the implementation of the SMS.
Bad evaluation of the extent of the study	A technical support can help to show what is "major" so as to structure the work and to increase its efficiency by going to the essential : the SMS should be proportionate to the major-accident hazards
Identification of major hazards, of important safety elements (safety barriers) , risk management	The team in charge of the SMS has to be trained to risk analysis (methods and uses). Indeed, risk analysis is both : <ul style="list-style-type: none"> <li>• A tool for major hazard identification and help for the definition of the important safety elements (barriers) ;</li> <li>• A tool for ranking the hazards that has to be reiterated, and that constitutes the motor of the SMS.</li> </ul>
Learning from accident and historical knowledge	It is important to define a structure to collect and treat accidents and near-misses, and to share the lessons learnt in the enterprise

### 3. PROPOSALS

The experience from the interviews and the Ref. 2-5 shows in a flagrant manner that it is important to communicate to operators, to inform them and to make them aware of the major accident prevention.

It is proposed to focus on the following points :

- Improving interest in major hazard prevention ;
- Involving the personnel in the MAPP ;
- Reinforcing the responsibility of the operator ;
- Using risk analysis as a fundamental tool ;
- Taking into account the role of men in the enterprise.

### **3.1. Improving the interest in major hazard prevention**

To improve the interest in major hazard prevention, the technical support for the SMS implementation has to convince the top management, because often the decision to put in place such a system is a regulatory requirement. Therefore, in the beginning, the managers often want to do the strict minimum to comply with the law. In that case, this can be insufficient.

Some major accident case studies with heavy consequences and the presentation of statistics on disaster consequences might wake up the conscience to prevent major accidents. Major accidents are so rare nowadays, that people have forgotten what occurred in the past and think it can not happen again to them.

It can be valuable to insist on measurable and not easily measurable benefits when accident prevention is implemented :

- Reduction of financial loss in case of an accident, due to the destruction of the production equipment and the loss of production, and of market shares ;
- Preserving the image of the enterprise (media impact) ;
- Diminution of insurance costs ;
- Building a communication policy with the stakeholders for a best integration at the local level.

### **3.2. Involving the personal in the MAPP**

The Major Accident Prevention Policy (MAPP) constitutes the foundation of all Safety Management Systems in the context of Seveso II. Indeed, it reflects, on the one hand, the commitment of the top management of the enterprise with objectives in the long term generally with a continuous improvement process, and on the other hand, it outlines the structure and the means that will be implemented to fulfil these objectives. And precisely, these are the structure and the organisation of the means that are described in the SMS.

This idea appears clearly in the Seveso II directive. Indeed, the directive imposes that, both "high tier" and "low tier" establishments must define their MAPP and decline it in SMS.

The difference between "high tier" and "low tier" establishments is that the first have to produce a demonstrative document (safety report), that justifies the choice of the MAPP, while the second have to make the MAPP available to the competent authorities, in the form of a descriptive document.

Extract from the Seveso II directive :

Article 7

**Major-accident prevention policy**

1. Member States shall require the operator to draw up a document setting out his major-accident prevention policy and to ensure that it is properly implemented. The major-accident prevention policy established by the operator shall be designed to guarantee a high level of protection for man and the environment by appropriate means, structures and management systems.
2. The document must take account of the principles contained in Annex III and be made available to the competent authorities for the purposes of, amongst other things, implementation of Articles 5 (2) and 18.

[...]

Article 9

**Safety report**

1. Member States shall require the operator to produce a safety report for the purposes of:
  - (a) demonstrating that a major-accident prevention policy and a safety management system for implementing it have been put into effect in accordance with the information set out in Annex III ;

[...]

The MAPP must be defined for both establishments concerned by articles 6 and 7, and by the article 9. The MAPP must be defined in appropriate means, structures and management system. In other terms, in the two cases, the SMS materialises and structures the MAPP.

For this reason, it is important that the MAPP is the result of a thorough work on safety in the entire enterprise. Reflections leading to the definition of the MAPP should tackle the safety culture of the enterprise, and should involve all employees (for example by consulting them with questionnaires or debates).

MAPP and SMS will be established in the enterprise only if they touch all collaborators, through common objectives. Of course, the MAPP presents objectives and general principles, but it would have to be defined each year in intermediary objective, and an annual review would allow to improve the SMS. During the annual evaluation and review of the SMS, it is important to involve again all collaborators in order that they can judge the work and efforts accomplished and thus to maintain the motivation.

### **3.3. Reinforcing the responsibility of the operator**

For some years, SMS including self-control and continuous improvement become generalised.

It is clear that industrial systems becoming increasingly complex and resources for the control (in particular by public authorities) being always limited, a tendency is being developed to safety self-control in the framework of SMS. This concept appears clearly in SMS based on the Plan-Do-Check-Act principle.

In an industrial establishment, the operator has the best place, on the one hand, to identify the major hazards and, on the other hand, to allocate the means to prevent them. The Seveso II directive is there to lock the system and to guarantee that the self-control functions are correctly achieved.

During an inspection of the SMS, the review should be carried out with interviews with employees, in order to perceive the safety culture and the level of co-operation between the employees, who reveal the level of appropriation of the SMS. It shouldn't be only a formal review. But the safety depends clearly on the efficiency of the SMS implemented by the operator.

### **3.4. Using risk analysis as a fundamental tool**

To put in place a MAPP and a SMS, such as required by the Seveso II directive, the risk analysis is a fundamental tool.

So as to lighten the purpose, the risk analysis can be defined as a process that uses information (input data) to identify potential accidents (hazards), to evaluate their likelihood and the gravity of their consequence, so as to reduce their occurrence or their effect.

Also, for all SMS, risk analysis is both the input of the system, for hazard identification, and its motor. Indeed, risk analysis is used at the beginning of the implementation of the SMS to identify the hazards on which preventive actions will be set up. Risk analysis allows on the one hand, to create a safety culture by putting around a table different persons involved in the functioning of the enterprise (people involved in the conception, operation, maintenance, quality, safety...) to exchange and imagine harmful situations, and on the other hand, to guarantee a certain exhaustiveness and homogeneity of preventive measures. The hazard ranking that is carried out at the end of the risk analysis, allows to define priorities for actions to lead at short, medium and long term.

Then, revisions of the frequency and severity of identified accidents by taking into account preventive and protective measures (barriers) allow to build, by successive iteration, plans to improve the safety level of the plant. Risk analysis is therefore a good tool for safety improvement, which is the goal of the SMS too.

Eventually, to the level of SMEs, the lack of information and the idea that risk analysis methods are not adapted to the small structures are the main brakes to a more widened use of these methods. Indeed, often SMEs hesitate to launch such risk analysis by fear of the heavy process and costs. The accompaniment by an external organism expert in these methods is often very fruitful.

### **3.5. Taking into account the role of men in the enterprise**

During the implementation of a SMS, there is a great risk to superpose a formal safety system on the production system without taking account of the specific characteristics of the enterprise, that they are technical issues (specificity of the products, complexity of the installations) or human issues (history of men in the enterprise, specific activities of some personal).

If the objective of SMS is to modify (by improving it) men's behaviour to avoid that "human errors" do not lead to a major accident, it is important to know the initial state of the organisation. Knowing the initial state consists in, on the one hand, knowing the real situation, the daily work accomplished by men at all levels of the organisation and, on the other hand, knowing the representation and the perception that have the workers of their work.

For a SMS, the path to cover can be traced only if the starting point is known. Furthermore, knowing the initial state allows to adapt the speech, in according to the level of perception of each collaborator in the enterprise.

By having a good knowledge of the initial state and actions to implement, the SMS will be able to act on men's behaviour, and lead to safe production systems (with the integration of the safety in the production process).

## **4. SMS : FROM A REACTIVE SYSTEM TO A PROACTIVE SYSTEM**

The SMEs are generally structured and organised for a well precise goal: to produce.

It is not natural for a SME to anticipate means, especially when they are limited, to face drifting situations or crisis that appear only rarely. All identified difficulties show that the actions led by the operator were conceived to produce. To face the unforeseen, enterprises that have no SMS count on their reactivity : to react in order to avoid the drifting to a catastrophic situation. The reactions are often curative. Especially, a lot of SMEs are structured without insuring their defence, as a sportive team that would have very good attackers but poor defenders. In order that the team wins, it is necessary that all players have a good level. In the same manner for safety, it is preferable that all collaborators know the tactics of the enterprise (policy), have the level to implement it and have a capacity of anticipation to avoid even the appearance of drift situation.

The well known message that illustrates this purpose could be the following: "Safety is the affair of everyone ". But in order that the work on safety is the most efficient, it is necessary to be capable to anticipate by constructing a proactive system. This goal required an in-depth work on the employees who are the enterprise.

## 5. PERSPECTIVES

INERIS has noticed the new occurrence of so called 'post SEVESO accidents' which involved failure of safety devices [6], that suffered from non appropriate maintenance and testing, which are parts of the SMS.

Aware of the difficulties apprehended by SMEs' operators, INERIS has just launched a project with industrialists to build a methodology evaluating the efficiency of SMS. The methodology is based on the development of safety performance indicators that might be used by the operator for monitoring the safety management system in the long term. The indicators that will be developed will reflect the formal aspects of SMS as well as the level of appropriation link with the safety culture. The final objective is to take into account the prevention carried out by the operators in the evaluation of the risk level of an industrial establishment as suggested in Ref. 7.

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