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Risk analysis method integrating both technical and organisational factors

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Context

Safety Management Systems (SMS) are now required in a lot of establishments handling hazardous substances in Europe in application of the council directive 96/82/EC of 9th December 1996 on the control of major-accident hazards involving dangerous substances, known as SEVESO 2 Directive.

The Human Factors play obviously an important part in the effectiveness of those safety management systems. Indeed the system depends on the involvement of the people in charge of applying it.

Considering the Human Factors from this angle leads the risk analyst to look at the organisation also through its social aspect. The question raised becomes therefore how the relationships, the power plays between workers, the cultural influences can interact with the intended prevention goals of the SMS. The idea would be to allow the risk analyst to foresee the creation mechanisms of the organisational shortcomings at the origin of the major accident.

In this paper the author describes the development of a risk analysis approach that creates a focus on the link between the major accident hazards and the activities of the SMS, taking into account the real activities operated for the prevention process. This is a new approach where the individual is not the focus point, like traditionally in the formal Human Error or Human Factor approaches. The individual is considered in the context of the organisation, in its relation with others, in its relation with the processes of the organisation.

Method

First of all, the organisation is seen as the interaction of three elements, the technical (tools, equipment...), the system (activities, processes, procedures) and the people.

The safety management system is described as the structural aspect of the organisation, in other words, the traceability of the prevention system in place, called the formal side (top-down approach related). The sociological aspect, integrating power plays and cultural influences of the organisation, represents the informal side of the organisation, because what truly happens between people and the way they behave is obviously not written in a safety management system (bottom-up approach related). It is interesting to note that several types of organisations can be characterised according to the two informal and formal components.

If we consider the positive assumption that the various types of organisations can reach a high level of prevention efficiency, then we can represent them on a scale taking into account the dimensions of the formal and informal components:

- The quantity of informal prevention related activities (1) happening everyday on site for the major accident prevention and the quantity of formal activities described in the SMS. In the case of the European Directive SEVESO 2, the regulation requires that the formal side meets at least the SMS specifications described in the annexe 3 of the directive. The minimum balance between the formal and the informal would be therefore to meet those specifications and to be able to demonstrate (paper focused) that the system exists and performs.

- The informal activities must be the effective support of a real working formal structure (2). Indeed as the oil in an engine, the informal side must support the effective implementation and operability of the structure. If the oil is not appropriate, even with a good engine, the chance to reach high motor performance is low. It is the same with an appropriate oil used for a bad designed engine.
Somehow, a balance is required between a good formal activity (meeting the requirements of a good safety management system) and an informal activity (meeting the requirements of a sociological definition of the organisational effectiveness) toward a high standard prevention system.

Based on this model, INERIS has developed a risk analysis method integrating both technical and organisational factors. This method is called ATOS (Analysis of technical and organisational safety). The ATOS method is based on the concept of the organisation that integrates the formal and the informal components associated with the two dimensions - (1) and (2) - and the idea of balance.

ATOS is firstly concerned by the major accident prevention. It means that it focuses on the activities which give support to the major accident prevention. It implies therefore an identification of these activities.

The inputs needed for ATOS methodology application are the information concerning the major accident. The information can be represented according to the Bow Tie approach. The risk analyst needs to know the potential scenarios and the corresponding Line of Defence (L.O.D) in place against the occurrence of the scenario from the initiating events to its consequences.

Two alternatives are then possible:

- trying to work on the causes of the initiating events which is quite a hard task as the experience do not allow us (fortunately) to find the whole organisational shortcomings creating the event condition,

- or, better in that case, trying to work specifically on the Line of Defence (L.O.D), and see how the organisation can assure the effectiveness of them.

Thus, the method is based on the determination of the L.O.D in order to identify the organisational activities required for the effectiveness assurance of the L.O.D.

Once those activities are identified, the risk analyst must check the presence of the structural mechanisms allowing the prevention (formal side which is paper focused, first dimension of the relationship between formal and informal) and then assess the informal side with the idea of the second dimension described.

Practically the analysis is operated like following:

- a classical technical risk analysis,
- an identification of the activities required to be assured for the effectiveness of the line of defence identified through the risk analysis,
- an assessment through a quality based system audit of the management structure describing the processes of those activities is,
- a sociological analysis.

The latter is carried out using the tool called "strategic analysis", that aims at assessing the organisation effectiveness. It is used in order to assess what happens, beyond what is written, to find out what could badly interact with the intended prevention structure.

In its late development, the aim of ATOS is to build a score board for the safety managers. The methodology indeed is foreseen to be transferable to the safety managers, according to the principle "you cannot manage if you cannot measure".

Results

At the moment, the concept is developed and is intended to be applied in the forthcoming months with industrialists, particularly SMEs, working is chemical industries.