

## A Stepwise Approach for Chemical Risks Assessment at the Workplace

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**Abstract:** The REGETOX network aims at providing industries with practical means for assessing and managing chemical risks. To this end, a stepwise approach has been developed which involves as first level of analysis, the "potential risk" method developed by the INRS (France) and as second level of analysis the COSHH, a risk assessment method developed by the Health and Safety Executive (UK).

**Study aims.** To assess the feasibility of this approach, a study was conducted in two enterprises: a plastic foam processing plant (80 workers) and several workshops of a large (950 seats) machine maintenance firm.

**Results.** Three main observations were made in the course of the study. First the Regetox approach was not as quick and simple as expected; it involved a complex set of successive calculations and was time consuming especially for toxicological databases consultation. Second, the reliability of the products labeling and of the content of the safety data sheets (MSDS) was highly variable. Third, to be conducted in an efficient way the risk assessment requested the actual collaboration of the workers and their supervisors in collecting some basic information concerning the products. In fact the workers showed little interest in such collaboration as long as they were not fully informed about the health effects of those substances.

**Conclusions.** Regetox provides a useful approach for assessing chemical risks at work and since the completion of the study, the method has been made easier to use through the development of a software made accessible on the website: [www.regetox.med.ulg.ac.be](http://www.regetox.med.ulg.ac.be). However, to give this approach its full potential in promoting a better working environment, the workers and the supervisors should collaborate to the retrieving of the basic information. This can only be achieved using new and innovative strategies that would promote the workers involvement in the assessment process.

### 1. Introduction

Each European enterprise has to develop a prevention policy based on risk analysis taking account the hazard identification and the risk evaluation since the translation in national laws of the European directive EC/89/391 promoting safety and health at work. In this context, the REGETOX 2000 project was launched in 1998 with the support of the Belgian government to help the prevention advisers at assessing risks in their own company.

During the first part of the project, an analysis of current practices was conducted in some twenty companies of the Walloon region (French-speaking part) of the country; it showed that the chemical risks assessment rested mostly on the experience and personal judgement of prevention advisers (Balsat, 2001). The sources of information that are most often used are rarely mentioned. These observations corroborate the conclusions of a scientific investigation held in Great Britain (Topping, 1998), suggesting that companies lack the appropriate tools to make a thorough evaluation of chemical risks. In fact, generally speaking, there wasn't any structured methodology for assessing chemical risks.

The project main aim was thus to develop a stepwise approach using simple and rather cheap methods for risk assessment that could be used by the prevention advisers without the need of external experts. In order to operationalize this approach, two recently published assessment methods have been selected for use at the two first levels of the strategy:

- Level 1: the "potential Risk" developed by the French "Institut National de Recherche de Sécurité" (INRS) (Vincent, 2000);
- Level 2: the COSHH (UK Scheme) developed by the Health and Safety Executive (HSE) in the United Kingdom (Russel, 1998; Brooke, 1998; Maidment, 1998).

Both methods are using toxicological hazard information indicated by R-phrases assigned under the European Union classification for hazardous supplied products. The INRS method has been designed for ranking potential chemicals for priority setting when establishing prevention policies. The potential risk method gives for each product a priority level, either high, medium or low, based on three criteria: the hazard (5 levels), the frequency of use (4 levels) and the yearly quantities used (5 levels). By using this method for all supplied products used in the company, the prevention adviser is able to sort these products by priority order. This can help the employer to establish a list of the products for which the second step of the risk assessment has to be carried out using the COSHH method.

The COSHH method assesses the chemical risk in reference with occupational exposure limits (OEL) from simple data easy to retrieve in the MSDS and at the workplace. The COSHH model of exposure (Maidment, 1998) being calculated for pure substances, it appears desirable, when mixtures are being used, to evaluate the risks associated with each of them, the R-phrases and the boiling temperature in the case of liquids, should be known. These data have to be retrieved from certain databases. The results obtained by the COSHH method were interpreted by taking into account the OELs when they were available and the time of exposure.

*Table 1: Summary of information needed by each method and expected results*

	Ranking of potential risk (INRS)	COSHH (HSE)
Hazard	R-phrases for health / chemical product (MSDS)	R-phrases for health / chemical substance (MSDS - toxicological databases)
Exposure	- Annual used quantity / product ; - Frequency of use / product.	- quantity by operation ; - ability of being absorbed by the respiratory route: the size of dusts (fine, medium, large) the volatility for vapours (boiling point and process temperature); - control strategy level.
Results	Classification of products by priority order at the level of the workplace or the enterprise	Risk assessment in reference with OEL's for each work situation according to the worker's health safety. The method gives the control strategy required for assuring health too. The model is validated for an 8-hour exposure and for pure substances.

## 2. Methods

To assess the feasibility of this approach, a study was conducted in some areas of two enterprises: three workshops of a company manufacturing plastic foam involving manual filling operations and a paint workshop of the maintenance company involving filling mixing and spraying operations. For the latter, the COSHH method being not adequate for assessing the risk, the EASE model (See reference) was used. Finally, the remaining needed data were collected at the workplace.

## 3. Results

The existing MSDS files and the content of the MSDS have shown various insufficiencies: missing MSDS, not updated MSDS, incomplete MSDS or MSDS that do not correspond with the product, incoherent information.

Concerning the allocation of R-phrases, the products labelling appears less reliable than MSDS. Moreover, the information contained in MSDS evaluates correctly the hazard or over-

evaluates it in respectively 93% and 62% of the products used in each company. This difference can be explained by the poor level of expertise of one of the suppliers of the maintenance company.

To retrieve the product inventory and the yearly quantities used in the painting workshop, the collaboration of the workers has been essential.

The calculation of the potential risk is easy and only takes little time. Products are listed by decreasing order of priority. For the semi quantitative evaluation of the risk (COSHH, EASE), table 2 shows the global results of the semi quantitative risk assessment for all operations made in each company.

**Table 2:** *Global results of the semi quantitative evaluation of risks for the studied workshops*

	Plastic Company	Maintenance Company
Situations in line with the regulations	32	41
Situations to be corrected	11	6
Continuation of the evaluation	3	18
Total	46	65

The majority of operations are in line with the regulations. Only 6 and 11 operations, respectively, must be improved by the installation of local exhaust ventilation and the continuation of the risk assessment was necessary for respectively 3 and 18 operations.

The Regetox strategy proposes to limit the semi quantitative risk assessment to products of high potential risk (priority 3 and 2) as determined by the INRS method. For each company, the conclusions reached by applying the COSHH and EASE method for all the products used (strategy 1) have been compared to those obtained by limiting the semi quantitative risk assessment to products of high potential risk (strategy 2). The final results did not change whatever the strategy used except for the maintenance company. In this case, strategy 2 did not allow us to identify one work situation that needed improving. Nevertheless this later should have been subjected to a semi quantitative risk assessment from a simple examination of the working conditions. This suggests that the strategy aiming to limit the semi quantitative risk assessment to the products of medium and high potential risk makes it possible to identify in a more economic way most harmful work situations that require technical adjustments.

#### **4. Discussion and conclusions**

The strategy has identified improvements to make in the studied workshops and provided information for the continuation of the risk assessment and medical supervision. Using a structured and exhaustive approach avoids basing the risk assessment on an empirical approach and on the personal judgement of prevention advisers. It is particularly adapted to levels of expertise to which companies, particularly small and medium sized companies, have access. The feasibility study pointed out a number of limitations of the approach that could be classified in four categories:

1. Limitations linked to the collection of the basic data and their reliability (MSDS, etc);
2. Structural limitations linked with the chosen tools
- Gases and products with no risk phrase are not taken into account;
- Overestimation of the exposure using the semi quantitative risk assessment methods for mixture and aqueous solution (Harris, 1994).
- The strategy does not assess the risk incurred by the worker when the same solvents are present in many products and operations. Nevertheless, the data needed for the use of the COSHH and EASE model can be exploited to estimate the TWAS.

3. Limitations linked to the use of the tools
- the use of the tools on a *printed form* requiring a lot of time ;
- checking the risk phrases and downloading the boiling temperatures and TLV (Threshold Limit Values) and STEL (Short Time Exposure Limit) values from the toxicological databases is time consuming;

The feasibility study has also revealed one particular element: workers expressed to the research team when visiting the worksite some needs in terms of information on toxicological effects.

The lessons from the feasibility study led the research team to implement the following improvements:

- A user's software has been developed to simplify the use of the new tools and made accessible on our web site <http://www.regetox.med.ulg.ac.be>.
- To give this approach its full potential in promoting a better working environment, the workers and the supervisors should collaborate to the retrieving of the basic information. To this end, a new research was started in 2001 in order to identify worker's needs about chemical risk using focus group methodology in three companies. The first results showed that workers expressed little interest in collaboration into risk assessment strategy as long as they were not fully informed about the health effects of those substances. We conclude that to promote the workers involvement in the assessment process, it is necessary to meet their information needs about chemical risks using innovative strategies. A special training program of the train-the-trainer type is currently developed for the prevention advisers.

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