REGETOX 2000: A GLOBAL APPROACH FOR ASSESSING CHEMICAL RISKS IN COMPANIES - A FEASIBILITY STUDY

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1. Introduction

Each European enterprise has to develop a prevention policy based on risk analysis taking into account hazard identification and 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 prevention advisers at assessing risks in their own company.

In a first phase of the project, an analysis of current practices was conducted in some twenty companies of the French-speaking part of the country. This survey showed that the chemical risks assessment was mostly based on the experience and personal judgement of prevention advisers: the most often used sources of information were those mentioned in the Material Safety Data Sheets (MSDS) while the toxicological database were rarely consulted (Balsat et al, 2001). These observations corroborate the conclusions of a scientific investigation held in Great Britain, suggesting that companies lack the appropriate tools to make a thorough evaluation of chemical risks (Topping et al 1998). The project main aim was thus to develop a stepwise approach using simple methods for risk assessment that could be used by prevention advisers without the need of external experts. For designing 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 et al 2000);
- Level 2: the COSHH (UK Scheme) developed by the Health and Safety Executive (HSE) in the United Kingdom (Russel et al 1998; Brooke 1998; Maidment 1998).

Both methods are using toxicological hazard information indicated by R-phrases.

The “potential risk” method has been designed for ranking potential chemicals for priority setting ; it 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 in establishing a list of the products for which the second step of the risk assessment has to be carried out using the COSHH method. This last method assesses the chemical risks in reference with occupational exposure limits (OEL's) 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 for each of the harmful substances present, according to their weight percentage. This implies that, for 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 appropriate databases. The results obtained by the COSHH method were interpreted by taking into account the OELs (when available) and the time of exposure.

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

	Ranking of potential risk (INRS)	COSHH method (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: size of dusts (little, medium, large), 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 operation according to the worker's health and safety. The method gives the control strategy required for assuming 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 three companies: (1) three workshops of a company manufacturing plastic foam involving manual filling operations, (2) a painting workshop of a maintenance company involving filling, mixing and spraying operations, (3)

a car body repair workshop involving filling, mixing, painting and spraying. For the spraying operations, the COSHH method being not adequate for assessing the risk, the EASE model (1997) was used. Finally, the remaining needed data were collected at the workplace**.**

For data analysis, two strategies have been compared : strategy 1, the INRS method and the COSHH and EASE methods are applied independently to all the products used ; strategy 2 (the Regetox strategy), the semi-quantitative risk assessment is limited to products of high potential risk (priority 3 and 2) as determined by the INRS method.

3. Results

Some of the existing data needed to rank the potential risk (listing of products, quantities used, MSDS files) were insufficient or inadequate. The products inventory and the yearly quantities used were only available in two companies (table 2). In the plastic production company, quality control reasons for the production process requires a detailed inventory of products and quantities used whereas the car repair unit is a small enterprise where all information were available from the yearly inventory. In the maintenance company, the inventories of the data needed were only available from an order book. Unfortunately, this information didn't correlate with the actual supplied products used during a given year of activity. To retrieve the data needed in this painting workshop, the collaboration of the workers has thus been essential.

Table 2: Products inventory and yearly quantities used in each company

Company	Staff	Products inventory	Yearly quantities	Comments
Plastic	80	Yes	Yes	Production process
Maintenance	950	No	No	Order book
Car repair	29	Yes	Yes	Yearly inventory

The existing MSDS files have shown various insufficiencies: missing MSDS, not updated ones, incomplete ones or MSDS that did not correspond with the product. Table 3 gives an overview of the situation observed for the MSDS available in each company, concerning the analysed workshops: several existing MSDS could not be used because they were incomplete or presented inconsistencies .

Table 3: Situation of the MSDS files available in the companies

Company	Plastic production		Maintenance		Car repair	
	N	%	N	%	N	%
N products	39		42		50	
Missing MSDS	0	0	11	26	50	100
Insufficient MSDS	4	10	12	29		

Therefore, all MSDS have been retrieved from the suppliers to evaluate the R-phrases allocation accuracy for each of them. The information contained in MSDS correctly evaluated the hazard or over-estimated it in respectively 93%, 62% and 90% of the products used in each company. The difference can be explained by the poor level of expertise of one of the suppliers of the maintenance company. Moreover, the products labelling appeared less reliable than MSDS.

The calculation of the potential risk being easy, it took little time to list the products by decreasing order of priority. The results of the second step of the risk assessment using the COSHH or EASE methods are described in table 4 for all the operations analysed in each company.

Table 4: Global results of the semi-quantitative risk evaluation for the studied workshops

Company	Plastic	Maintenance	Car repair
Situations in line with the regulations	32	41	34
Situations to be corrected (local exhaust ventilation)	11	6	2
Further evaluation needed	3	18	48
Total	46	65	84

The majority of the operations were in line with the regulations except in the car workshop. Only 11, 6 and 2 operations, respectively, had to be improved by the installation of a local exhaust ventilation while the continuation of the risk assessment was required by the method for respectively 3, 18 and 48 operations.

When comparing data analysis strategy 1 to the Regetox strategy (strategy 2), identical results were obtained with the exception of one operation in the maintenance company; strategy 2 did not identify this situation as one requiring improvements. Nevertheless a simple examination of the working conditions in that case would have shown the need for a semi-quantitative risk assessment. These results thus suggest that the Regetox strategy restricting 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 work situations that should require technical adjustments.

4. Discussion and conclusions

Application of the Regetox risk assessment strategy has allowed the identification of the improvements to make in the studied workshops and provided information for further evaluation and medical supervision. This structured approach seems well adapted to the levels of expertise available in most companies, especially small and medium sized ones. The feasibility study pointed out however 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 and Earl, 1994).
   - No assessment of 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 used to estimate the TWA-8
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 boiling temperatures and OEL's from the toxicological databases was time consuming;

The feasibility study has also pointed out the workers demands for more information on the health effects of the products they are routinely handling at the workplace .

Those observations led the research team to consider the following improvements to the proposed risk assessment approach:

- a user's software has been designed to simplify the use of the new tools and made accessible on the web at http://www.regetox.med.ulg.ac.be
- to enhance the Regetox approach into enterprises, a "train the trainer" training program is being developed for prevention advisers (safety officer and occupational physician) with as aim to promote the participation of the workers and their supervisors to the retrieving of the basic information needed to start the risk assessment process.

5. References

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