

# Strategies for success?

Managing chemical risks in small  
workplaces:  
a review of Swedish practice

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B1717  
Nov 2007

This report approved  
2007-11-7



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<p><b>Organization</b></p> <p>IVL Swedish Environmental Research Institute Ltd.</p>	<p><b>Report Summary</b></p>
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<p><b>Title and subtitle of the report</b></p> <p>Strategies for success? Managing chemical risks in small workplaces: a review of Swedish practice</p>	
<p><b>Summary</b></p> <p>This report is part of the project <i>Strategies for Success? Managing Chemical Risks in Small Workplaces: a Review of European Practice</i>, funded by CEFIC, the European Chemical Industry Council. In this project a literature review was made of chemical risk management in SMEs in five European countries, Sweden, Great Britain, Germany, Austria and Spain was studied.</p> <p>The results from all the national studies have been analysed and discussed in a book entitled <i>Within Reach? Managing Chemical Risks in Small Enterprises</i>, to be published by Baywood Publishing Company.</p> <p>This report on chemical risk management in Sweden aims to give a broad overview of use of chemicals, risks and risk management in small and medium size enterprises in Sweden. The report also offers a background description of the structures that support and enforce chemical risk management in SMEs. Furthermore, the report discusses the development of chemical risk management in Swedish SMEs</p>	
<p><b>Keyword</b></p> <p>SME, SSE, small companies, small enterprises, chemicals, risk management, evaluation</p>	
<p><b>Bibliographic data</b></p> <p>IVL Report B1717</p>	
<p><b>The report can be ordered via</b></p> <p>Homepage: <a href="http://www.ivl.se">www.ivl.se</a>, e-mail: <a href="mailto:publicationservice@ivl.se">publicationservice@ivl.se</a>, fax+46 (0)8-598 563 90, or via IVL, P.O. Box 21060, SE-100 31 Stockholm Sweden</p>	

## **Summary**

This report is part of the project *Strategies for Success? Managing Chemical Risks in Small Workplaces: a Review of European Practice*, funded by CEFIC, the European Chemical Industry Council. In this project a literature review was made of chemical risk management in SMEs in five European countries, Sweden, Great Britain, Germany, Austria and Spain was studied.

The results from all the national studies have been analysed and discussed in a book entitled *Within Reach? Managing Chemical Risks in Small Enterprises*, to be published by Baywood Publishing Company.

This report on chemical risk management in Sweden aims to give a broad overview of use of chemicals, risks and risk management in small and medium size enterprises in Sweden. The report also offers a background description of the structures that support and enforce chemical risk management in SMEs. Furthermore, the report discusses the development of chemical risk management in Swedish SMEs

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# 1 Chemical risks

## 1.1 Chemicals used in Sweden

About 65,000 chemical products were manufactured in or imported to Sweden in the year 2000. Upwards of 12,000 products were exported that year. These products were manufactured from about 12,000 chemicals. About 25 % of the chemicals were different kinds of polymers, and around 16 % of the products were available for private consumption.

No information is available regarding the use of chemical products in companies of different sizes. There is, however, information about the use of chemicals in different trades as well as the number of products used and the amounts of these products.<sup>1</sup>

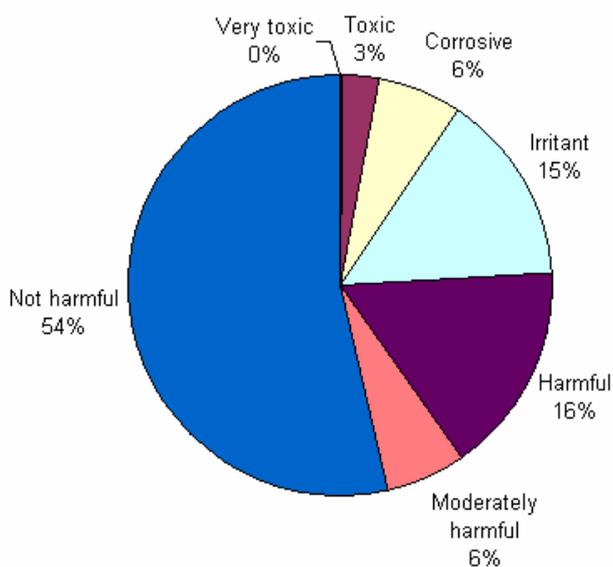


Figure 1 show the products used according to classification by danger class.

Figure 1. Chemical products used in 2000, divided according to danger class. (From the Swedish Chemicals Inspectorate's website, [www.kemi.se](http://www.kemi.se).) The figure includes the danger class 'moderately harmful to health' (måttligt hälsoskadlig), which is unique to Sweden.

According to Figure 1, the proportion of toxic products is small in relation to the number of products, but the volume of products used is large. The chemical substances used in the largest quantities are petroleum (over 18 million tonnes in 2003) and different kinds of petroleum products; Portland cement; water; nitrogen; oxygen and asphalt. More detailed information is available on [www.kemi.se](http://www.kemi.se) under 'statistics'.

<sup>1</sup> Source: The Swedish Chemicals Inspectorate, [www.kemi.se](http://www.kemi.se)

## 1.2 The Swedish perspective on chemical risks

The public discussion surrounding chemical<sup>2</sup> risks at Swedish workplaces usually centres on specific substances that are brought to the attention of the public following after some kind of alert, incident or new research findings. A few examples can illustrate such discussions.

- ✓ At the end of the 1990s a new analytical method was developed for isocyanates<sup>3</sup>. Using this method, it became possible to analyse new isocyanates and it was shown that the concentrations of these isocyanates could be very high and greatly exceed the OEL during operations commonly occurring at certain workplaces. Based on preliminary results from measurements at some workplaces, alert brochures were produced for selected sectors and professions. The vivid discussion on isocyanates led to research projects aiming to solve some of the most acute problems. One project was initiated to investigate which respiratory masks could give sufficient protection from isocyanates. Another project studied what could be done in car bodywork to reduce the formation, emission and dissemination of isocyanates. In parallel with the research activities, many occupational health services were involved in measuring exposure to isocyanates and solving workplace problems. Some of the brochures and reports published about isocyanates are also available in English<sup>4,5,6,7</sup>.
- ✓ In 2002 discussions emerged surrounding a new type of material that had been introduced as a substitute for asbestos, synthetic high temperature fibres (reinforced ceramic fibres, RCF, are probably the most harmful of the synthetic high temperature fibres). In this case again, alert brochures were produced and distributed to target groups. Research projects were carried out to investigate exposure as a basis for risk evaluation<sup>8</sup>. The campaign that started with alert brochures and articles in the papers has led to activities at many workplaces.

These two examples illustrate how chemical risks are often discovered and discussed. Focus is on one substance or a group of hazardous substances and on information and control of the risks associated with the chemicals in question. The focus on specific substances or groups of substances goes back many years. In Sweden many different groups of chemicals have been brought into focus

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<sup>2</sup> In this report, 'chemical risks' and 'chemicals' refer both to the use and the risks of chemical substances *and* chemical products. Several chemical substances usually compose chemical products. Chemical substances are sometimes used by themselves, e.g. in a laboratory but may also be formed and emitted from the use of different chemicals or through thermal degradation or other chemical reactions.

<sup>3</sup> Spanne M., Tinnerberg H., Dalene M., Skarping G., Determination of Complex Mixtures of Airborne Isocyanates and Amines – Part 1. Liquid Chromatography with Ultraviolet Detection of Monomeric and Polymeric Isocyanates as their Dibutylamine Derivatives. *Analyst* 121 (8):1095-1099 (1996)

<sup>4</sup> [Do you work with Isocyanates and Polyurethane?](http://arbetsliv.prevent.se/has/uploaded/files/eng_iso_broschyr.pdf) (199kB) Prevent 1999. [http://arbetsliv.prevent.se/has/uploaded/files/eng\\_iso\\_broschyr.pdf](http://arbetsliv.prevent.se/has/uploaded/files/eng_iso_broschyr.pdf)

<sup>5</sup> Ann-Beth Antonsson, Bengt Christensson and Klas Ancker. [Do you repair car bodywork?](http://arbetsliv.prevent.se/verktygfakta/pdf/do_you_repair_car.pdf) (138 kB) Prevent 2003. [http://arbetsliv.prevent.se/verktygfakta/pdf/do\\_you\\_repair\\_car.pdf](http://arbetsliv.prevent.se/verktygfakta/pdf/do_you_repair_car.pdf)

<sup>6</sup> Ann-Beth Antonsson. [Do you work with Isocyanates and Polyurethane, Self Diagnosis](http://arbetsliv.prevent.se/has/uploaded/files/eng_iso_diagnos.pdf) (65kB) 2000 [http://arbetsliv.prevent.se/has/uploaded/files/eng\\_iso\\_diagnos.pdf](http://arbetsliv.prevent.se/has/uploaded/files/eng_iso_diagnos.pdf)

<sup>7</sup> Antonsson Ann-Beth, Christensson Bengt, Ancker Klas. Effektiva åtgärder mot exponering för isocyanater i bilverkstäder (*Effective control measures for the reduction of exposure to isocyanates in the repair of car bodywork*). IVL-rapport [B 1501](#), Stockholm 2002 (English abstract)

<sup>8</sup> Christensson Bengt, Karlsson Annika, Ancker Klas. Eldfasta fibrer kan vara farliga! En kunskapsammanställning. (*Synthetic high temperature fibres can be dangerous! A knowledge compilation*). IVL-report [B 1531](#) Stockholm 2003.

in recent decades, for example MC 77, a fuel used for aircraft<sup>9</sup>, quartz as a cause of silicosis<sup>10</sup> and asbestos<sup>11</sup>.

The discussion seldom focuses on risk management in the terms presented in section 2 below. Moreover, focus is on early detection of new risks and action to control the risks in order to avoid the development of new problems like the asbestos problem.

Another factor that draws attention to a particular chemical substance is a change in its OEL. When for example the OEL for flour dust was reduced in 2001<sup>12</sup>, the Swedish Work Environment Authority started an inspection campaign in bakeries, most of which are small. The measurement conducted showed that more than 50 % of the measurements exceeded the OEL<sup>13</sup>.

Other examples reinforce the impression of chemical hazards as topics that are usually related to some especially dangerous substances rather than to lack of chemical risk management.

- ✓ During the 1990s, many dentists reduced the use of amalgam for dental care in favour of thermosetting acrylics. Use of amalgam in dental care has decreased in Sweden due to the environmental and working environment problems connected to mercury, which is one of the substances in amalgam. This led to new problems with allergies to acrylics among dentists and dental nurses<sup>i</sup>. This problem has attracted attention and information about the risks and protective measures has been disseminated to dentists and dental nurses<sup>ii</sup>. Now the problem with allergies in this sector has started to decrease.

Risk management has been in focus in two cases that have been described and discussed in the Swedish media.

- ✓ At the end of the 1990s, Sweden experienced problems in the construction of a tunnel for railway traffic through a huge boulder ridge called Hallandsås. A sealing substance was used to stop leakage of subsoil water into the tunnel. The substance was a thermosetting plastic, which it turned out had not been properly cured due to too low temperature in the tunnel. The result was leakage of the reactive raw materials into the environment and exposure of the construction workers to acrylamide. As a result of this exposure, the workers showed symptoms of poisoning that gradually decreased. Environmental problems were also

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<sup>9</sup> [Linnarsson, A.](#) Undersökning av flygmotorbränsle mc-77 och flygmotorbränsle mc-25 och flygmotorbränsletillsats (A study of aircraft fuel MC 77 and MC 25 and an additive) Foa report c 20094-h2, Försvarets forskningsanstalt, huvudenhet 2, Stockholm, 1976

<sup>10</sup> [Dale, Knut](#) Titel Eksperimentelle studier over virkningene av kvarts- og titandioksydstøv på lungens funksjon og vev, [Yrkeshygienisk institutt \(Norge\)](#), [Karolinska sjukhuset](#), [Yrkesmedicinska kliniken](#), [Malmö allmänna sjukhus](#). Oslo Universitet 1976

<sup>11</sup> [Roslund, K.](#) Asbesthantering - expositionsundersökning vid asbestcementindustri Examensarbete vid skyddsingenjörutbildningen vid arbetsmedicinska institutet, 1969-70, 1970

<sup>12</sup> Occupational Exposure Limit Values and Measures against Air Contaminants, AFS 2000:3 Provisions from the Swedish Work Environment Authority 2000. Available on [www.av.se](http://www.av.se)

<sup>13</sup> Sammanställning av mjöldammsmätningar under åren 2000 - 2003. (Measurements of flour dust made between 2000 and 2003.) Report 2004:7 from the Swedish Work Environment Authority. 2004

<sup>13</sup> Wallenhammar, L.-M, Örtengren, U. Andreasson, H. Barregård, L. Björkner, B. Karlsson, S. Wrangsjö, K. Meding, Birgitta. Contact allergy and hand eczema in Swedish dentists - Contact dermatitis 2000 ; ISSN 0105-1873, vol. 43, p192-199, 2000

<sup>13</sup> Annika Karlsson och Ann-Beth Antonsson. Tandvårdspersonal, minska risken för allergier och eksem. (Dental care staff – reduce the risk for allergies and eczemas), Prevent 2001.

discovered, with leakage affecting cattle. After detection of the problem there were several inspections of the construction site and the head office of the company responsible for the construction of the tunnel. A public commission investigated what actually happened and why<sup>14</sup>. This case has been in court and the focus in court was the deficient chemical risk management on the parts of the company responsible for the building site at Hallandsås, the manufacturer of the sealing substance and Banverket (the National Rail Administration), the authority purchasing the construction of the tunnel. This indicates that chemical risk management is something that has great importance in the legal investigation of who was responsible and who was not.

- ✓ In 2003, European Health and Safety Week dealt with chemical risk management. The Swedish Work Environment Authority conducted inspections of many companies, including a lot of small ones. Focus was on three aspects: that safety data sheets were available, that there was an inventory of the chemicals used at the workplace and that risk evaluations had been conducted. The results of this campaign are presented in detail below, in section 2.

### 1.3 Statistics on chemical risks

Some statistics on the number of work-related chemical accidents and diseases in Sweden are presented below. Figure 2 shows the number of **accidents** between 1997 and 2001 and Figure 2 shows the **diseases** during the same period.<sup>15</sup>

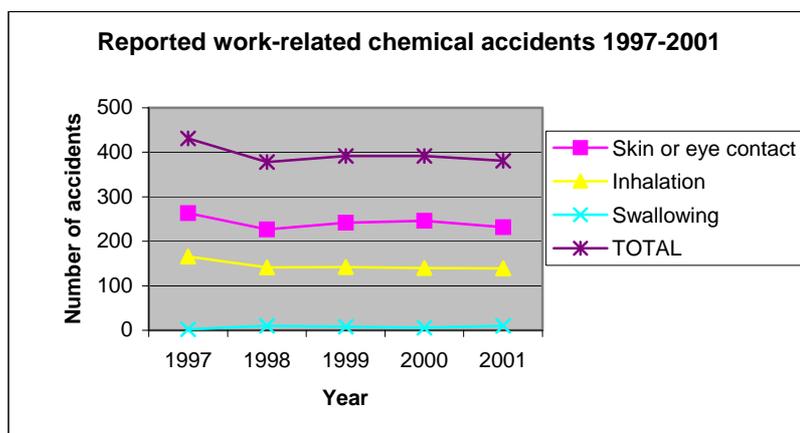


Figure 2. Statistics on work-related accidents due to chemical exposure. As can be seen from the diagram, skin or eye contact is the most frequent exposure causing chemical accidents.

<sup>14</sup> Kring Hallandsås. Delrapport av Tunnelkommissionen. (About Hallandsås. A report from the Tunnel Commission) SOU 1998:60

<sup>15</sup> The statistics presented in Figures 2 to 6 are published on the website the Chemical Guide (KemiGuiden, [www.prevent.se/kemiguide](http://www.prevent.se/kemiguide)). The statistics are based on statistics compiled by ISA especially for the Chemical Guide.

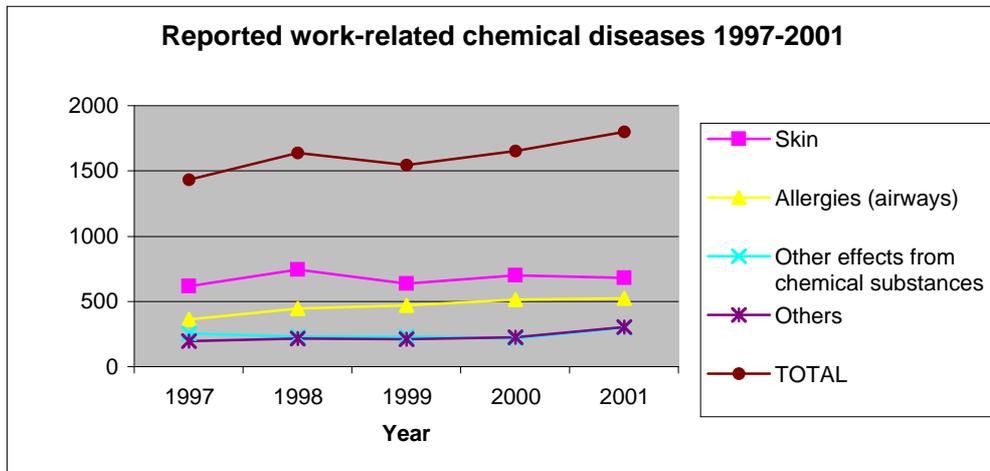


Figure 3. Statistics on work-related diseases due to chemical exposure. Skin contact often resulting in eczema and airway allergies are the predominant chemical diseases.

Figures 2 and 3 show that kind of work-related accidents and diseases due to chemicals that are reported. Among the diseases eczema (skin diseases) and allergies (airway allergies) predominate.

Figure 4 shows the number of work-related chemical diseases in the sectors with the highest numbers of such diseases. Note that sectors with many employees may have high numbers but a low frequency.

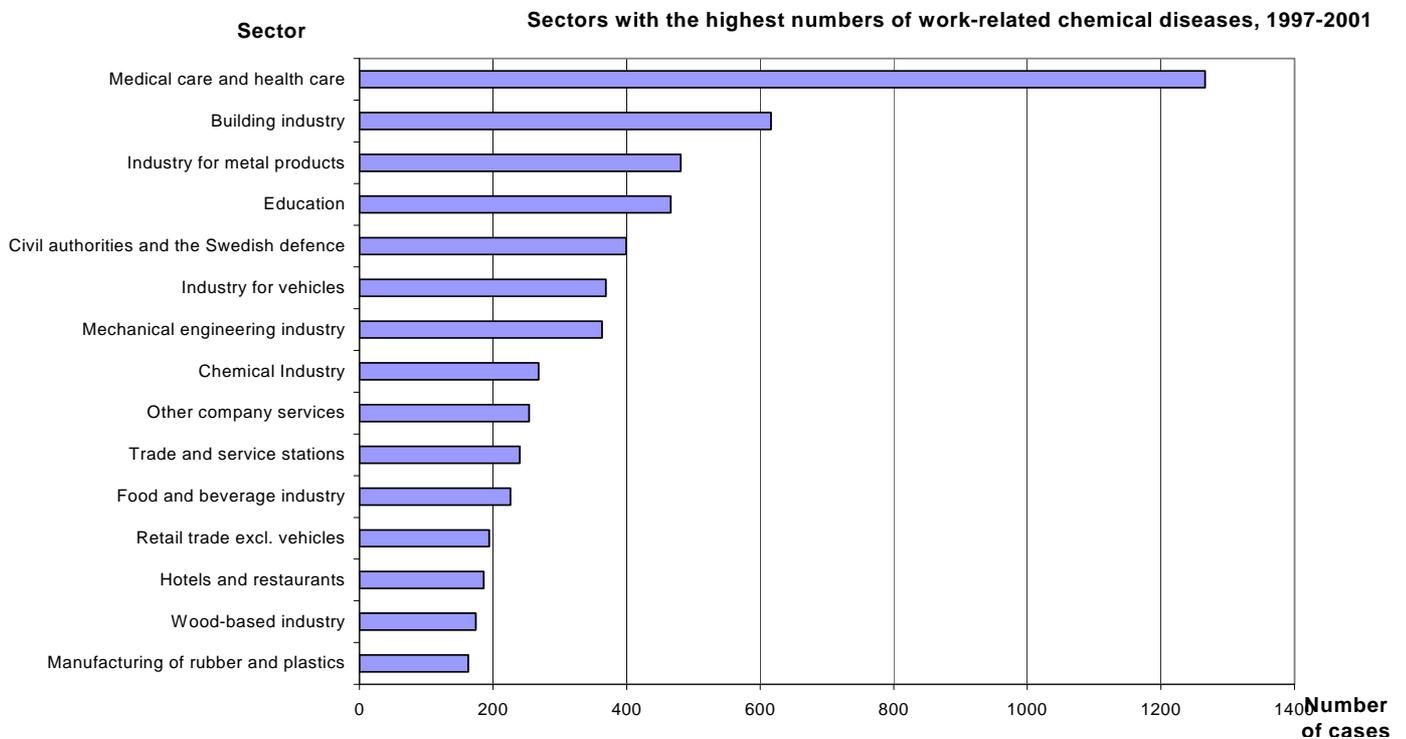


Figure 4. Statistics on the sectors with the highest numbers of work-related diseases from 1997 to 2001.

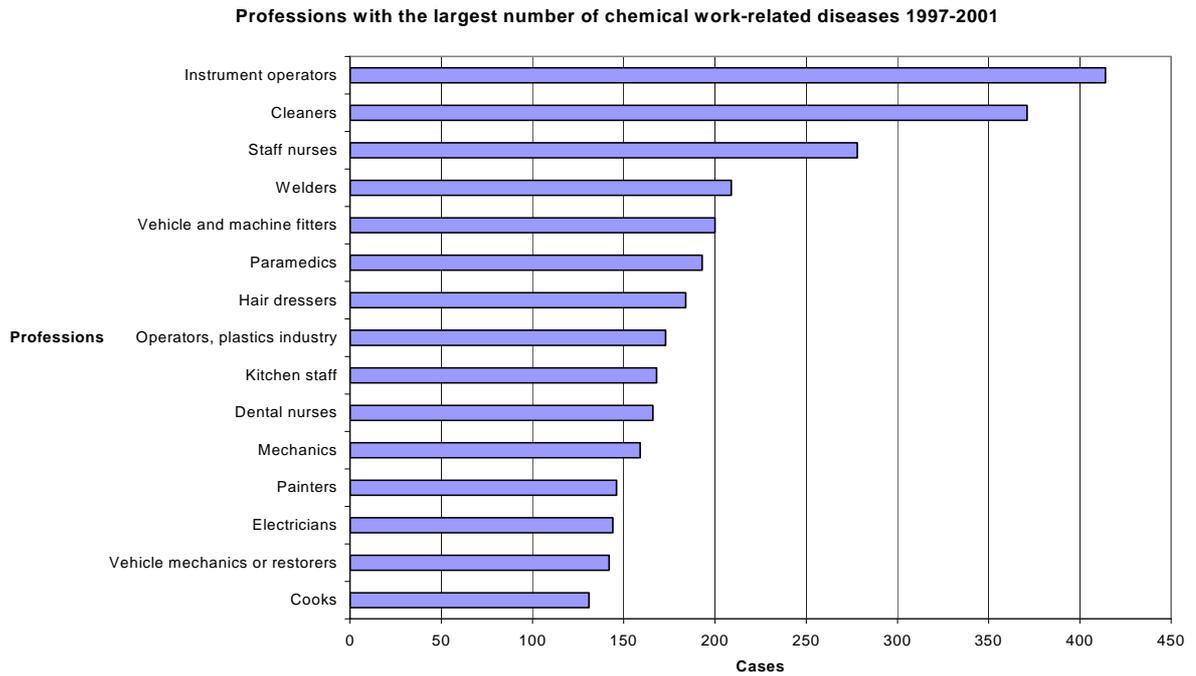


Figure 5. Professions with the largest number of work-related chemical diseases between 1997 and 2001.

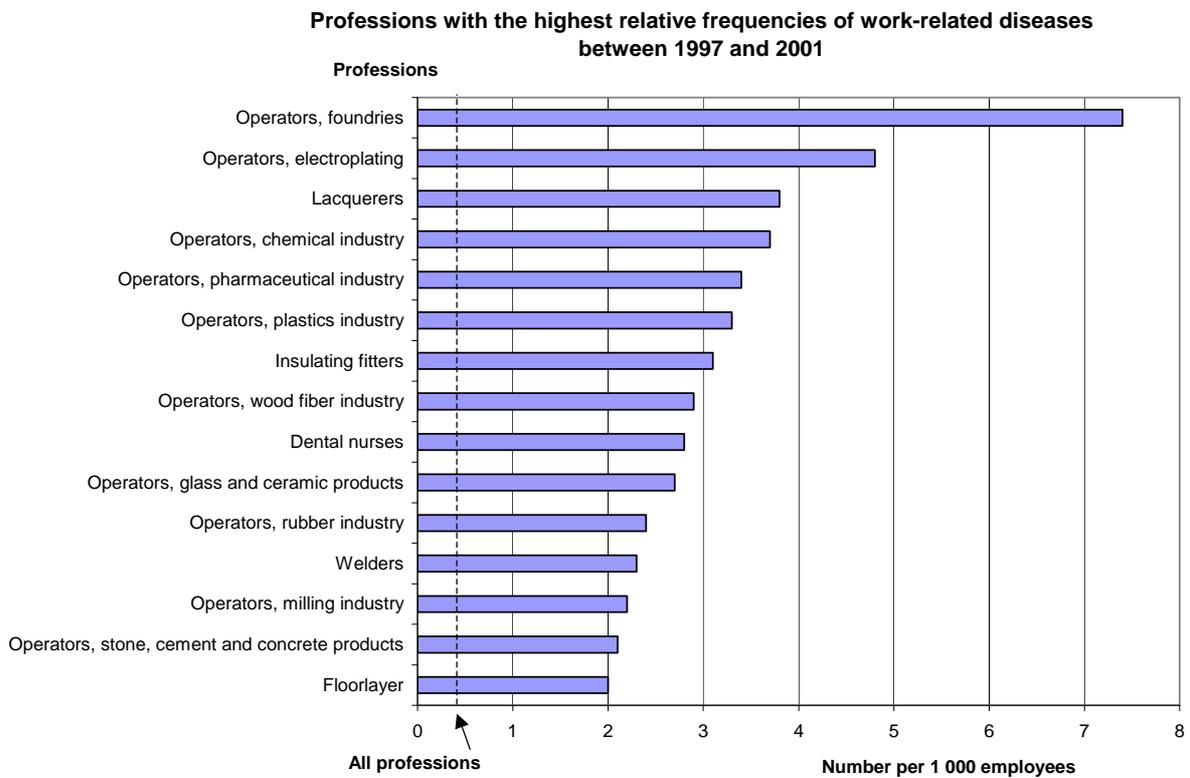


Figure 6. Frequencies (cases per 1000 employees in the sector) of work-related chemical diseases in the professions with the highest numbers.

Figure 5 shows the professions with the highest numbers of work-related chemical diseases. The medical and health care sector is a large sector with many employees.

Figure 6 shows the frequencies (cases per 1000 employees in the sector) of work-related chemical diseases in the professions with the highest numbers.

## 1.4 Chemical risks in SMEs

Chemical risks are usually not discussed in relation to the size of the company, but rather in relation to the sector or the specific chemicals used in the company. There are extensive statistics on work-related disorders due to chemical substances for different professions and trades (related to NACE-codes)<sup>16</sup>.

Few statistics are available for chemical accidents or diseases in relation to the size of the company. In a report from 2003, the Swedish Work Environment Authority and Statistics Sweden have compiled statistics from Swedish surveys on work-related exposure<sup>17</sup>. The report shows the prevalence of different kinds of exposure related to company size, see Table 1.

Table 1. Share of small company managers (in companies with 0-19 employees) and employees (%) with exposure to certain chemical factors in relation to size of company.

Exposed during at least ¼ of working time	Small company managers		Number of employees							
	0-19 empl.		1-19		20-49		50-		Total	
	women	men	women	men	women	men	women	men	women	men
Acidic or basic (caustic) chemicals	2	5	2	6	2	4*	3	5	3	5
Oil or cutting fluids (skin exposure)	4	10*	2	13	2	12	3	12	3	12
Organic dust that can be seen or felt	18*	17*	13	14	13	12	12	9*	12	11
Inorganic dust that can be seen or felt	2	11*	2	19	3	18	4	15*	4	16

\* Significant differences compared to male and female employees in small companies.

The most obvious difference is exposure to organic dust, which is more common among small company managers than among male and female employees. Exposure to inorganic dust seems to be more frequent among male employees in small companies. The differences between large and small companies seem to be less than the differences between male and female employees.

Exposure to chemicals has also been analysed for four different industries: retail, mechanical workshops, construction and transport. Table 2 presents the statistics for these industries.

<sup>16</sup> See statistics published annually by ISA at the Swedish Work Environment Authority, [www.av.se](http://www.av.se)

<sup>17</sup> Arbetsmiljön i små företag. (The work environment in small companies) Information om utbildning och arbetsmarknad 2003:1. 2003

Table 2. Share (%) of small company managers (in companies with 0-19 employees) and employees with exposure to certain groups of chemical substances, in four industries.

Exposed during at least ¼ of working time	Small company managers		Number of employees							
	0-19 empl.		1-19		20-49		50-		Total	
	women	men	women	men	women	men	women	men	women	men
<b>Mechanical workshops</b>										
Acidic or basic (caustic) chemicals			18		6*		6*			7
Oil or cutting fluids (skin exposure)			34		37		23*			26
Organic dust that can be seen or felt			6		3		4			4
Inorganic dust that can be seen or felt			40		35		19*			22
<b>Retail</b>										
Acidic or basic (caustic) chemicals		8	0	7	1	4	1*	3*	1	5
Oil or cutting fluids (skin exposure)		8*	2	17	0*	6*	1	8*	1	11
Organic dust that can be seen or felt		7	14	10	11	8	16	7	15	8
Inorganic dust that can be seen or felt		6*	2	11	0	4*	2	8	2	8
<b>Construction</b>										
Acidic or basic (caustic) chemicals		0*		4		10*		3		4
Oil or cutting fluids (skin exposure)		12		11		10		10		10
Organic dust that can be seen or felt		21		19		17		11*		15
Inorganic dust that can be seen or felt		32*		47		53		42		46
<b>Transport</b>										
Acidic or basic (caustic) chemicals			0		-		1			0
Oil or cutting fluids (skin exposure)			11		-		12			19
Organic dust that can be seen or felt			9		-		12			20
Inorganic dust that can be seen or felt			10		-		18*			34

\* Significant differences compared to male and female employees in small companies.

In mechanical workshops, exposure to chemicals for male employees is higher in small than in large companies. In retail, female employees in small companies (1-19 employees) seem to be more exposed. By contrast, in transport there is a tendency towards somewhat lower exposures in small companies (1-19 employees).

One study has been conducted about risk management in SMEs<sup>18</sup>. This study does not deal with the magnitude of risk in small and large companies. The aim is rather to give an overview of the differences between chemical risk management in small and large companies.

<sup>18</sup> Alvarez de Davila, Eliana; Antonsson, Ann-Beth; Frostling, Harald. What support do companies and organisations need regarding chemicals? A pilot study. IVL-report B1511, available at [www.ivl.se](http://www.ivl.se), <http://www.ivl.se/rappporter/pdf/B1511.pdf> (In Swedish)

## 2 Chemical risk management

### 2.1 Comparison between legislation on work environment and on chemical hazards

In recent decades, there has been a radical change in the philosophy of Swedish legislation, reflected in the introduction of demands for systematic work environment management (formerly called internal control) in 1993<sup>19</sup>. These requirements for systematic and proactive management supplement earlier legislation demanding a safe working environment with a focus on the environment. In the same manner, the older requirements for safe work with chemicals were supplemented with demands for proactive chemical risk management in 1994.

If the provisions on SWEM and proactive chemical risk management are compared, the demands for chemical risk management seem to be more detailed and require more work from the companies than SWEM. This is the case, for example, with the methods for risk evaluations as discussed below<sup>20</sup>

### 2.2 Background to the Swedish legislation on risk management of chemicals

For many years, Sweden has had laws and provisions concerning chemical risk management. At EU level, demands relating to risk management were introduced somewhat later than in Sweden.

The present provisions from the National Board of Occupational Safety and Health, Chemical Hazards in the Working Environment, AFS 2000:4, are based on the previous provisions Dangerous Substances, AFS 1985:17, revised in AFS 1994:2.

In 1995 Sweden became a member of the European Union. Several years before accession, a process of adapting Swedish legislation to EU directives started.

One important feature of both EU-directives and Swedish legislation and provisions are general advice on good practice when working with chemicals. Originally legislation<sup>21</sup> focused on substances and establishing OEL and measuring exposure including biological monitoring. Demands for good practice were also included, such as:

- Cleanliness and tidiness.
- Hygiene
- Technical preventive measures.
- Information to workers about risks, e.g. through labelling and signs.

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<sup>19</sup> Introduced in the Swedish Work Environment Act in 1991 and in the provisions AFS 1992:6 Internkontroll av arbetsmiljön (Internal control of the working environment)

<sup>20</sup> In AFS 2001:1 about SWEM, risks should be judged to be severe or less severe. In AFS 2000:4 Chemical Hazards in the Working Environment risk evaluation is described in detail as a very complex process where many different aspects have to be considered.

<sup>21</sup> See Council Directive 80/1107/EEC and Swedish provisions AFS 1985:7 Dangerous Substances.

- Information to workers on protective measures needed.

The Swedish provisions of 1985 also include good practice relating to

- Premises and technical equipment
- Storage of chemicals
- Fire hazards

Proactive risk management is included in modern Swedish legislation.

- Demand for a register of chemical substances used in the workplace (this demand was introduced in AFS 1985:17)
- Demands for risk assessments were introduced in AFS 1994:2 and in Council Directive 98/24/EC. When risks were discussed in earlier documents, it was usually in relation to exposure measurements and OELs. Sweden introduced a list of OELs as early as 1969. Before 1969, Sweden used the widely spread TLVs set by the American Conference of Governmental Industrial Hygienists (ACGIH). For many substances, Sweden applied lower limits than the ACGIH.
- The requirements for a register of chemicals and risk assessment of the uses include that they should be kept up-to-date. This implies that some kind of proactive systematic chemical risk management is needed.

In parallel to these general demands there are also provisions relating to some substances or groups of substances. These provisions usually include more detailed requirements for the handling and use of chemicals. Three types of demands are often included:

- The need to conduct some kind of medical examination either before a worker starts to work with the substance or regularly.
- The need to regularly measure exposure to the substance. If measurements prove the exposure to be well below the OEL, the demands for measurements are reduced.
- Education and training related to the safe handling of the substances.

There are several Swedish provisions for substances or groups of substances, for example there are provisions for anaesthetic gases, oils, thermosetting plastics, PCB and Cadmium. Many of these provisions are quite old and have been revised several times. Today, these provisions contain demands that are also included in the more general provisions on Chemical Hazards in the Working Environment, AFS 2000:4, in more general terms. During the last decade there has been an ongoing process to reduce the number of provisions as well as the number of paragraphs in provisions. Some of the provisions for specific substances have been revoked, as the demands in them are covered by the more general provisions on chemical hazards.

Generally speaking, efforts are being made to create more general provisions, which means that provisions are merged and even repealed if the demands in the provisions are covered by more general demands.

## 2.3 Main strategy of Swedish provisions on chemical risk management

As has been described, the development in Sweden has been from detailed rules for specific substances and some general demands for tidiness etc, to a more comprehensive set of rules reflecting the demands for proactive chemical risk management, but still in combination with more specified rules for specific substances.

### 2.3.1 Basic elements of chemical risk management in companies

Swedish legislation and provisions on chemicals include a set of basic demands aimed at **manufacturers** and companies using chemicals, called **employers** below, and people using chemical products professionally, called **employees** below. Manufacturers are companies that produce chemicals or chemical products to be sold on a market. The same demands that apply to manufacturers also apply to suppliers. The basic demands for the working environment are found in a piece of legislation called Chemical Hazards in the Working Environment, AFS 2000:4 (<http://www.av.se/english/legislation/afs/eng0004.pdf>). These basic demands, which also illustrate the fundamentals of risk management, are described below.

#### **A. Provision of labelling (AFS 2000:4, section 24)**

The **manufacturer** has to put labels and risk phrases on chemical products in order to give short and easily understandable information about the risks associated with the chemicals. The demand for labelling is included in the Environmental Code, ordinances based on the code and provisions issued by the Chemicals Inspectorate.

#### **B. Understanding the labelling (AFS 2000:4, section 23)**

**Employees** have to understand the labelling of the chemicals in order to understand what potential risks there are in handling the chemicals. (As the packages are labelled, the employees will get an idea of the risks just by looking at the packaging.) The **employer** has to check that employees who handle chemicals have the required knowledge about the labels. There are no requirements for giving training, just that the employees have to have an understanding of the labels. The means of acquiring this knowledge is not specified.

#### **C. Provision of SDSs**

The **manufacturer** has to provide detailed information about the chemicals in material safety data sheets, SDSs. This requirement is included in the Environmental Code as well as ordinances and provisions issued on the basis of the Environmental Code. The requirements are equal to requirements set by EU directives.

#### **D. Understanding and use of SDSs (AFS 2000:4, section 23)**

**Employees** have to have access to and the ability to read and understand SDSs in order to get more detailed information about risks and protective measures. The manager is responsible for SDSs being used to find out if there are any special requirements for the handling of the chemical product, e.g. specific regulations that may apply or restrictions in the use and handling of the chemical product. The **employer** has to check that employees who handle chemicals have the required SDS knowledge and use the information available. There are no requirements for training, just for knowledge, which can be acquired in any way that the company chooses.

**E. Compilation of a register of chemical products used and stored (AFS 2000:4, section 38)**

The **employer** has to know what chemical products are used within the company and compile some kind of register of the dangerous chemicals (labelled chemicals).

**F. Risk assessment (AFS 2000:4, section 4)**

The **employer** has to ensure that risk assessments are made of the handling of chemicals in the company. The inherent risk of the chemicals, the way the chemicals are handled, the duration of the exposure as well as protective measures have to be considered in the risk assessment. The result of the risk assessment has to be communicated to the employees who use the chemicals. It is considered good praxis to involve the employees in the risk assessment of the chemicals they use.

**G. Measurements of exposure (AFS 2000:4, section 4)**

As a part of the risk assessment, measurements of exposure to chemicals should be carried out whenever needed. The **employer** is responsible also for this. Exposure should be compared to OELs and control measures of some kind should be implemented if OELs are exceeded. Control measures should also be implemented if OELs are likely to be exceeded. The Swedish OEL list contains OELs for almost 400 substances.

**H. Control measures (AFS 2000:4, section 5 and 10)**

The **employer** is responsible for control measures of some kind being undertaken when the risk assessment points out risks that are not well enough controlled. The strategy used when choosing between different kinds of control measures is as follows:

- If possible, substitute the dangerous chemical for a less dangerous one or for a method that requires less hazardous or non-hazardous substances.
- Control the chemical substance through measures close to the source e.g. integrated exhausts.
- Encapsulate and ventilate in order to reduce emissions from the source.
- Separate the source from other activities.
- Conduct work during hours when others will not be affected by the work.
- Use personal protective devices.

**I. Safety instructions (AFS 2000:4, section 11)**

The **employer** is responsible for the provision of work instructions. The instructions have to be written if proper working procedures or use of personal protective equipment is essential.

**Employees** have to work according to these instructions.

To summarize section A to I:

- The *manufacturer* has to provide information about the chemicals through both labelling and SDSs.
- The *employer* has to make sure that the procedures described above are properly developed and used in the company and make sure that the employees have the necessary knowledge and follow the procedures and *instructions*.
- The *employees* have to have knowledge of the risks of the chemicals they handle and the control measures needed to work safely and they have to follow safety procedures and instructions.

**J. If accidents, ill health or incidents occur, they have to be reported and followed up (AFS 2000:4, section 7)**

Whenever accidents, ill health or incidents occur, **employees** must report them to the workplace management. The employer is responsible for follow-up and ensuring that action is taken to prevent something similar from happening again.

In order to make these basic elements work properly, good praxis suggests that the following two elements are added.

**K. Sorting out of unnecessary chemicals**

In order to avoid excessive and unnecessary workloads, it is suggested that companies start by removing all chemicals that are not in use in the company. In many companies, a substantial fraction of all chemicals can be removed as they are not really needed or used. Sorting out chemicals will reduce the work of compiling a register of all chemical products in the company as well as of evaluating the risks thereof.

**L. Purchasing procedures for chemicals**

In order to enable supervision of the chemicals used in the company, some kind of purchasing procedure for chemicals is useful. A purchasing procedure ensures that:

- Dangerous chemicals are not purchased without supervision.
- Whenever new chemicals are purchased the following procedures are followed.
- Access to and use of SDSs
- Adding the chemical product to the register.
- Risk assessment of the handling of new chemical products.

**O. Other requirements**

As a supplement to these basic elements of risk management, there are regulations regarding work with some specific hazardous chemicals or groups of chemicals. Such regulations have been issued for:

- |   |  |
|---|--|
| ➤ PCB   | AFS 1985:1 and SFS 1985:837  |
| ➤ Oils and waste oils                                       | AFS 1986:3 and SFS 1993:1268   |
| ➤ Synthetic inorganic fibres                                | AFS 2004:1   |
| ➤ Quartz  | AFS 1992:16  |
| ➤ Lead  | AFS 1992:17 (changed in AFS 2000:14)   |
| ➤ Motor fuel  | AFS 1992:18  |
| ➤ Thermosetting plastics                                    | AFS 2005:18  |
| ➤ Asbestos  | AFS 2006:01  |
| ➤ Gases and gas bottles                                     | AFS 2001:4   |
| ➤ Pesticides  | AFS 1998:6, SFS 1998:947, SFS 2000:338, SJVFS, SNFS 1997:2 and SOSFS 1994:29 |
| ➤ Cytotoxic drugs and other drugs with chronic toxic effect | AFS 2005:5   |
| ➤ Anaesthetic gases   | AFS 2001:7   |

These regulations contain the same kinds of requirements as described above. Additionally there may be specific demands on

- Training or knowledge
- Measurements of exposure

Some of the provisions also demand medical examinations before starting to work with a substance and/or regularly. These demands have now been brought together in a piece of legislation about medical checks in working life, AFS 2005:6, which came into force on 1 July 2005.

Apart from the requirements described above, there are other requirements based on the Environmental Code regarding aspects other than those relating to the working environment.

- Companies using certain specified environmentally hazardous chemicals need to notify the authorities or have a permit for their business.
- A notification or permit is often required for the handling and transport of chemicals and chemical waste.
- A notification or permit is needed when importing chemicals.

There are also restrictions for the use of many chemical substances. Some chemicals are prohibited from use while some are prohibited from use in certain applications. A database of these chemicals can be found on the website of the Chemicals Inspectorate, [www.kemi.se](http://www.kemi.se). Another list of chemicals has also been made available on this website, the OBS list. The OBS list contained substances that were to be considered for substitution or reduced use, but that were not subject to regulations demanding discontinued use. The OBS list and its use and interpretation has been debated and it is no longer published.

## 2.4 Demands on small vs. large companies

Swedish legislation does not distinguish between small and large companies. The same demands apply. Demands are tailored to the risks. Increasing risks increases the demands, regardless of the size of the company.

In one provision, AFS 2001:1, demands placed on the smallest companies (less than 10 employees) concerning documentation of SWEM are reduced. These reduced demands reflect an effort to reduce the administrative burden on the smallest companies, rather than reducing the protection level.

According to Swedish legislation, chemical risk management is needed in all companies using chemical products that are labelled. Such chemicals are used in most manufacturing companies but also in many other sectors, e.g. typical small companies such as

- restaurants (washing-up detergents),
- cleaning companies (cleaning agents),
- construction (painting and many other chemical products); a large share of construction companies are small companies,
- hairdressers (hair dye) etc.

## 2.5 How do the basic elements work in Swedish small companies?

### 2.5.1 General experiences

The difficulties in developing chemical risk management in small companies are well known and documented<sup>22</sup>. Small companies are therefore often in focus when developing information, work materials and guidelines.

In 2002 a series of interviews were conducted with the authorities, social partners and a few small companies, in order to survey the chemical risk management needs of small companies<sup>23</sup>. The results of this survey showed important differences between risk management of chemicals in small companies and large ones. The main difference can be expressed as follows.

Large companies have staff members who are responsible for risk management of chemicals and related questions. They become experts and have well-developed procedures for their risk management. When they approach the authorities, it is usually because they have subtle questions about interpretation of regulations etc.

Small companies and micro-companies (with less than 50 and 10 employees, respectively) have less well-developed risk management. When they approach the authorities, they usually pose two more general questions:

- ✓ *Does this regulation affect us and what are we required to do?*
- ✓ *How should we go about fulfilling the requirements?*

Below is a summary of Swedish experiences of how each of the basic elements work in small companies. The elements mainly relevant to manufacturers of chemicals and chemical products have been omitted from the discussions or are discussed briefly, if the available information is of relevance in relation to small companies.

There is scattered experience from several sources that illustrates how the basic elements work in small companies. There is no single study that covers the entirety of risk management of chemicals in small companies, but rather pieces of a jigsaw that, when put together, will give a picture of the situation in Swedish small companies.

#### ***A. Provision of labels and SDSs***

The manufacturers are obliged to submit information about their products in safety data sheets, SDSs. A joint EU project has studied the results of inspections of labelling and SDSs provided by the manufacturers.

Correct labelling and SDSs are essential, as they form the basis of risk management in companies using chemicals. Incorrect information can cause serious mistakes in the risk assessment and in other elements of risk management. A recently published study has shown that there are many

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<sup>22</sup> Norrby Cecilia. Hur ska vi nå de minsta företagen? Kemikaliarbete (How do we reach the smallest companies? Chemical work, in Swedish) IVF report 97850, IVF 1997.

<sup>23</sup> Alvarez de Davila, Eliana; Antonsson, Ann-Beth; Frostling, Harald. What support do companies and organisations need regarding chemicals? A pilot study. IVL-report B1511, available at [www.ivl.se](http://www.ivl.se/rappporter/pdf/B1511.pdf), <http://www.ivl.se/rappporter/pdf/B1511.pdf> (In Swedish)

deficiencies in the SDSs provided by manufacturers, both in Sweden and in other countries within the EU<sup>24</sup>. Sweden has statistics of the degree of deficiencies over the last 10 years, see table 3.

Table 3: Example from Sweden about severity of deficiencies. From the ECLIPS study.

Deficiencies/seriousness	Example of deficiencies
10 % severe	Example: severe deficiencies are such that they are also reported to the police. This is the case if the toxic symbol and/or the corresponding R and S phrases are missing or when the sensitising warning is missing (R42, 43). C product not classified.
50 % middle	Example: Other R-/S-phrases missing. Xn instead of Xi, deficiencies in SDS
20 % minor	R phrases not totally correct, wrong name headings in SDSs
20 % no deficiencies	

A recent Swedish study on SDSs for degreasing agents<sup>25</sup> conducted jointly by three authorities, concludes:

- Even SDSs that were judged to comply with the regulations and thus considered to be sufficient for the authorities did not necessarily offer advice that was substantial enough to assist the user to plan for appropriate handling of the chemicals.

In this study, 21 workplaces using degreasing agents were inspected and interviewed. The workplaces ranged from 2 to 4100 employees with a mean value of 26. Therefore at least half of the companies were small companies. In the interviews, the companies commented on the SDSs.

7 workplaces were generally positive towards SDSs, two were positive with some comments, two said they had no use of SDSs and ten were critical of SDSs. The critical comments were:

- The risks are exaggerated (5 comments/10 workplaces that were critical)
- The information in SDSs is similar despite differences in hazard. (5/10)
- Facts are often missing e.g. time for eye rinsing, material in protective gloves, type of filter in respirators, pH, decomposition temperature etc (5/10).
- Not enough detailed and nuanced information to allow for good risk evaluations. (3/10)
- What to do in case of spillage and how to handle waste (3/10).
- Direct contact with suppliers gives better information (3/10)
- The terms used are too difficult (2/10).

In this study, the Chemicals Inspectorate also checked the SDSs. 29 out of 30 manufacturers or suppliers needed to improve their SDSs. Some of the deficiencies were:

- 8 of 214 products were wrongly classified.
- 9 of 25 companies used standard phrases in many of their SDSs, despite differences in classification and hazard. Therefore the information in the SDSs was not relevant in relation to the hazard.

<sup>24</sup> ECLIPS European Classification and Labelling Inspections of Preparations, including Safety Data Sheets. FINAL REPORT. Chemical Legislation European Enforcement Network, CLEEN. [http://www.cleen-eu.net/projects/ECLIPS\\_Final\\_report.pdf](http://www.cleen-eu.net/projects/ECLIPS_Final_report.pdf)

<sup>25</sup> Säkerhetsdatablad för arbetsplatsens behov. Myndighetssamverkan 2004 – ett tillsynsprojekt om säkerhetsdatablad för avfettning. (Safety data sheets that meet the needs of the workplace. – Supervision of safety data sheets for degreasing agents. In Swedish). PM 35 The Chemicals Inspectorate.

- In 21 of 28 cases there was no information on when personal protective equipment should be used. 9 of 25 (about 35 %) companies did not specify what kind of protective gloves or respirator filters were recommended.
- 23 of 25 suppliers included detailed recommendation on fire extinguishing agents.

***Clearly there are frequent deficiencies in SDSs. The basis for chemical risk management in small companies is therefore not entirely trustworthy, and this impairs the outcome of chemical risk management.***

### ***B. Understanding the labels***

B. **Employees** have to understand the labels on the chemicals in order to understand what potential risks there are in the handling the chemicals. The **employer** has to check that employees who handle chemicals have the required knowledge of the labels used.

A study was carried out in 1988, two years after a regulation on labelling came into force. The study was conducted through interviews with employees in nine companies handling chemicals. The size of the companies is not presented in the report. About 100 interviews were conducted in November/December 1987. Most of the interviewees were blue-collar workers, some were safety representatives and a few were foremen or managers. The results show that there are differences in the understanding of the symbols.



Mycket giftig  
eller  
Giftig

This symbol was usually understood correctly.



This symbol was difficult to understand.



This symbol was understood by those who had seen it before, not understood right the first time.



Extremt brandfarligt  
eller  
Mycket brandfarligt

This symbol was usually understood as risk of fire.



These symbols were implemented later and were not evaluated.

During the same period, a Danish study<sup>26</sup> investigated understanding of labelling in the general population. In a group of randomly selected people aged 16 or over:

- 80 % understood the symbol for poison.
- The St Andrew's cross was only understood by 24 %.
- 2 % understood the meaning of all the labels.
- 20 % understood all labels but one.

The understanding of three risk phrases was also checked.

- 3 % understood all three phrases correctly.
- 29 % understood two out of three correctly.

Some comments from the Swedish study from 1988 illustrate how labels were perceived. Labels are often supplemented with written risk phrases. The Swedish interviews indicated that people wanted short and concise information, written with letters that are big enough to be easy to read. They also wanted information about how to protect themselves on the packages, together with the labelling .

There is no more recent study of understanding of these labels. Furthermore, the provisions on how to label chemical products have been further developed since the study was conducted. There are, however, indications that understanding of labels is still poor. As a part of an information campaign about the Chemical Guide the author of this report has been lecturing for regional safety representatives and environmental co-ordinators. In that context it has become obvious that deficiencies in basic knowledge about the meaning of labelling is not occur among these groups.

### ***Access to SDSs***

During an inspection campaign in autumn 2003<sup>27</sup>, labour inspectors checked whether Swedish SDSs were available at workplaces. Before the inspections, the companies had received a letter informing about the campaign and what requirements were to be checked during the inspections. This gave the companies an opportunity to implement whatever procedure was lacking before the inspections. During the campaign, many labour inspectors who did not usually work with chemical hazards were inspecting chemical risk management. The labour inspectors were told not to demand high quality chemical risk management, but rather to accept activities that showed that the companies had tried to manage their risks according to the demands supervised. This has most likely affected the outcome of the inspections. The demands to improve chemical risk management ranged from 59 to 81 % of inspected companies in the districts involved.

The results of the inspection of access to SDSs is shown in table 4.

<sup>26</sup> Förstår forbrugerna – Advarselmaerkningen af husholdningskemikalier. Produktkontrollgruppen, København. Nordiska ministerrådets miljörapport 1986:7

<sup>27</sup> The results of the campaign have not yet been published. The information presented in this report is based on personal communication with Maria Cronholm-Dahlin at the Swedish Work Environment Authority.

Table 4. Companies without access to Swedish SDSs during an inspection campaign, autumn 2003.

	Sector				
	Printing industries	Construction	Engineering industry	Carpentry	All
Inspected companies	124	1140	130	427	1821
Companies without Swedish SDSs	26	411	30	138	605
% without Swedish SDSs	21,0	36,1	23,1	32,3	33,2

Even though not all the companies inspected were small ones, it is clear from the selection of sectors that most of them are small. ***An average of every third company did not have access to Swedish SDSs for all their chemical products with labels.***

Most large and well-established companies selling chemical products enclose Swedish SDSs with their products. Consequently, access to Swedish SDSs does not always require a lot of work from the purchasing company. The problem with lack of SDSs or SDSs in languages other than Swedish is most frequent when chemical products are purchased from small firms. Another factor is the procedures in the company. The enclosed SDS has to be handled by someone who puts it in the right binder and checks that everyone has access to and knows the location of the safety data sheets. The inspection campaign did not study the cause of any lack of SDSs. From courses for people working with chemicals, the author of this report concludes that it seems to be quite common that some companies do not provide SDSs as a matter of course.

#### ***Understanding and use of SDSs***

There are no studies available on how employers and employees in small companies use and understand SDSs. However, it is a well-known fact that many people who should read and use SDSs do not. People seem to have difficulties finding the right information in the SDS and sometimes get stuck on introductory information mainly written by and for chemists, such as the chemical ingredients of the product. However, the extent of this problem is unknown. Some aspects of this problem are discussed above; see section A. Provision of labels and SDSs.

One important application of SDSs is as background information for risk assessments. See below.

#### ***Compilation of a register of chemical products***

The inspection campaign in 2003 checked whether the workplaces inspected had registers and whether the registers were up-to-date. The results are shown in table 5.

Table 5. Companies lacking register of chemicals used in the company or with out-of-date register at an inspection campaign, autumn 2003.

	Sector				
	Printing industries	Construction	Engineering industry	Carpentry	All
Companies inspected	124	1140	130	427	1821
Companies with no list	34	397	60	122	583
% with no lists	27,4	34,8	46,2	28,6	32,0
Companies with out-of-date lists	39	343	26	127	535
% with out-of-date lists	31,5	30,1	20,0	29,7	29,4
% lacking up-to-date lists	58,9	64,9	66,2	58,3	61,4

More than 60% of the companies inspected did not comply with the demands for an up-to-date register. About half of them had some kind of register that was out-of-date.

To understand this requirement, it can be useful to know what is actually interpreted as a register. If the number of substances used within the company is limited, the register can be a binder containing SDSs in some kind of systematic order. There are probably many companies that collate their SDSs in a binder, without even knowing that they fulfil the requirements for a register by doing that. The binder has to be kept up-to-date in order to fulfil the requirements entirely.

### ***Risk assessment***

The inspection campaign in 2003 checked whether workplaces made risk evaluations, undertook the control measures needed according to the risk evaluations and documented the risk evaluation. The results are shown in table 6.

Companies with incomplete risk evaluations may have received one, two or three demands for improvement. If for example risk evaluation, control measures and documentation were all lacking, the company would receive three demands. This explains why the last line in Table 6 adds up to more than 100 %. During the campaign, 68 % of the companies inspected received at least one demand on their chemical risk management.

Table 6. Companies without correct risk evaluation at an inspection campaign, autumn 2003.

	<b>Printing industries</b>	<b>Construction</b>	<b>Engineering industry</b>	<b>Carpentry</b>	<b>All</b>
<b>Companies inspected</b>	124	1140	130	427	1821
<b>Companies with no risk evaluation</b>	53	552	62	209	886
<b>% no risk evaluation</b>	43%	48%	48%	49%	49%
<b>Companies having to undertake control measures</b>	52	493	62	200	807
<b>% in need of control measures</b>	42%	43%	48%	47%	44%
<b>Companies with insufficient documentation of risk evaluation</b>	66	550	68	216	900
<b>% insufficient documentation</b>	53%	48%	52%	51%	49%
<b>Companies with incomplete risk evaluation</b>	171	1595	202	565	2593
<b>% incomplete risk evaluation</b>	<b>138%</b>	<b>140%</b>	<b>155%</b>	<b>132%</b>	<b>142%</b>

### ***Measurements of exposure***

There are no statistics available on the extent of measurements of exposure to airborne chemicals in small companies.

The discussion in Sweden over the last decade has been about the need for more measurements. There has been a reduction in the measurement of chemical exposure. The number of compulsory measurements reported to the Swedish Work Environment Authority has decreased by about 50 % since the beginning of the 1980s<sup>28</sup>.

This decrease in measurements is partly due to a reduced number of safety engineers with training in industrial hygiene including measuring techniques. It is also partly due to the decreased use of organic solvents, meaning that measuring exposure to such solvents is no longer as important. This goes back to 1980s and 1990s, when the Swedish OELs for organic solvents were lowered and organic solvents were substituted for water-based or high-solid formulas. The decrease in

<sup>28</sup> Presentation by Claes Trägårdh from the Swedish Work Environment Authority at the Swedish Associations of Occupational and Environmental Hygiene conference, 28 April 2005.

measurement may also be due to more effective control of the most common exposure, for example through automation. If measurements demanded in the provisions show very low exposures, companies may be exempted from further measurements. There are however no studies verifying this. Another factor that is bound to have affected the extent of measurements is the decrease in occupational health services during the recession at the beginning of the 1990s, when a considerable share of safety engineers left the occupational health services.

At a Swedish conference in April 2005, Clas Trägårdh from the Swedish Work Environment Authority concluded that in many companies it is not possible to evaluate the risk due to lack of measurements.

### ***Control measures***

Chemical risk management in small companies often seems to focus on practical control measures. For example the regional safety representatives often discuss very concrete and down-to-earth problems and solutions when they visit small companies. Small companies often want to solve problems in an effective way, undertaking control measures rather than developing procedures for risk management that require knowledge they do not have and time they do not want to spend on bureaucratic paperwork. Paperwork is an important part of chemical risk management.

The Authority has published several brochures and books on practical control measures relating to the different provisions for substances as described above.

IVL has made a qualitative study of how Swedish companies work with substitution of dangerous chemicals<sup>29</sup>. Eleven companies were visited and interviewed, six of which were small. The interviews revealed major differences between large and small companies. The small companies in general substituted dangerous chemicals based on recommendations from their suppliers. They did not themselves identify which chemicals should be substituted or seek less hazardous chemicals. Large companies were in general more ambitious, especially if they used a lot of dangerous chemicals.

There are scattered studies on the use of control measures in different trades, for example, based on the evaluation of inspection campaigns. These studies, however, do not present the results in relation to size of company, which is why they have been omitted in this overview.

As the example of substitution above shows, there is limited knowledge about control measures to reduce chemical hazards in small companies. Other control measures, such as ventilation, require expert knowledge, which is usually not available in small companies. Improved ventilation requires some kind of support from some kind of safety engineer or ventilation consultant.

### ***Safety instructions***

There is no information relating to how small companies use safety instructions. Safety instructions can be communicated verbally or in writing.

In the study of SDSs for degreasing agents<sup>30</sup>, 21 companies were investigated. 17 of them were required to improve their management of the chemical risks of degreasing agents. 8 of them were

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<sup>29</sup> Eliana Alvarez de Davila, Olof Cerne. Substitutionsarbete vid svenska företag (Substitution of chemicals – how is it done in Swedish companies?) IVL report B 1316. 1999.

<sup>30</sup> Säkerhetsdatablad för arbetsplatsens behov. Myndighetssamverkan 2004 – ett tillsynsprojekt om säkerhetsdatablad för avfettning. (Safety data sheets that meet the needs of the workplace. – Supervision of safety data sheets for degreasing agents. In Swedish). PM 35 The Chemicals Inspectorate.

required to compile written safety instructions. This indicates that it is probably not uncommon that written safety instructions are lacking.

### ***Removal of unnecessary chemicals and purchasing procedures for chemicals***

There is no information available on how these two elements of chemical risk management work in small companies.

Removal of chemicals and purchasing procedures are not required according to the provisions. However, this does facilitate chemical risk management.

### ***Knowledge***

Chemical risk management is a complex activity, requiring a lot of knowledge in aspects such as labelling, SDSs, risk evaluation and control measures. Without this knowledge, chemical risk management is likely to be ineffective.

The training on chemical risk management that is compulsory according to the provisions is mainly related to work with some specific substances such as thermosetting plastics, asbestos, pesticides, some toxic drugs and PCB.

In the general provisions on dangerous chemicals, as well as in the provisions on anaesthetic gases and motor fuels, there are requirements for knowledge of risks and protective measures. There are no demands on how this knowledge should be acquired. In practice this means that knowledge can be acquired through learning on the job. At the same time, the required knowledge contains many difficult methods and judgements. This is exemplified in the case report described in section 2.7<sup>31</sup>, where it was obvious that an occupational health service conducted essential parts of the bureaucratic element of chemical risk management when implementing chemical risk management in small companies.

Sound knowledge of chemical risk management is essential for the success of chemical risk management in small companies. At the same time, there seems to be little information on what knowledge small companies have about chemical risk management, although general opinion is that it is poor.

## **2.6 How do the basic elements work in Norwegian small companies?**

Norway conducted a campaign on chemical risk management in parallel with the Swedish one. The main goal of the campaign was to increase knowledge about chemical hazards and reduce the risk of diseases (skin and airway diseases) caused by organic solvents. The campaign also focused on risk evaluation and control measures. One part of the campaign was measurement of exposure as part of risk evaluation. Some of the results from the campaign that are relevant to small companies are summarised below.

- 772 car repair workshops were inspected. 77 % of them were required to undertake control measures to reduce chemical risks. One of the companies was reported to the police and in six companies the work was stopped. An inspector concluded that the companies were good at

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<sup>31</sup> Norrby Cecilia. Hur ska vi nå de minsta företagen? Kemikaliarbete (How do we reach the smallest companies? Chemical work, in Swedish) IVF report 97850, IVF 1997.

using protective equipment but bad at systematic chemical risk management. 75 % had not conducted a risk evaluation. In 31 % of the companies ventilation was insufficient.<sup>32</sup>

- 233 printing industries were inspected. These companies were also good at using protective equipment but bad at systematic chemical risk management. 80 % had not conducted a risk evaluation. In 35 % of the companies employees had not received sufficient information and training about risks and protective measures. Process ventilation was insufficient in 23 % of the companies. Personal protective equipment was used in 86 % of the companies.<sup>33</sup>

These figures are similar to the Swedish experience. Proactive chemical risk management works poorly, but some kind of control measures are often used.

## 2.7 How do small companies manage their chemical risks?

It is usually acknowledged that SMEs, and small companies in particular, have difficulty managing their chemical risks. This is due to several factors, including the number of laws and regulations that small companies have to follow. In total it has been estimated that small companies are affected, directly or indirectly, by about 10,000 regulations<sup>34</sup>. In addition, small companies lack specialist knowledge concerning health and safety within the company<sup>35</sup>.

Therefore some tools have been developed to support small companies' chemical risk management. The latest and most comprehensive tool aimed at helping small companies is KemiGuiden<sup>36</sup> (the Chemical Guide) developed by the Swedish Environmental Research Institute in co-operation with an IT consultancy called Happiness and published by Prevent as a free interactive tool available on Prevent's website.

The Chemical Guide is an interactive tool, designed to assist small companies in identifying the chemical risk management requirements they have to fulfil and giving advice on how to go about meeting these demands. This tool supports chemical risk management, but is not a reference book on the toxicity of chemicals. A previously developed tool, supporting risk evaluation<sup>37</sup> is in essence included in The Chemical Guide.

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<sup>32</sup> <http://www.arbodstilsynet.no/nyheter/pressemeldinger/PM0402.html>

<sup>33</sup> <http://www.arbodstilsynet.no/nyheter/pressemeldinger/PM0410.html>

<sup>34</sup> Bornberger-Dankvardt, Sten, Ohlsson, Carl-Göran, Andersson, Ing-Marie, Rosén, Gunnar. Arbetsmiljöarbete i småföretag: samlad kunskap samt behov av forskning och utvecklingsarbete. (Work environment management in small companies – current knowledge and need for research and development) Arbete och hälsa, 0346-7821 ; 2005:6 ISBN 91-7045-748-4 Arbetslivsinstitutet, Stockholm 2005. Summary in English

<sup>35</sup> Antonsson A-B. Small companies. P 466-477 in The Workplace Volume 2: Part 5.3. Ed D. Brune et al. 1997.

<sup>36</sup> KemiGuiden, [www.prevent.se/kemiguident](http://www.prevent.se/kemiguident), has been developed by Ann-Beth Antonsson and Eliana Alvarez, Swedish Environmental Research Institute in cooperation with Happiness. Prevent produced KemiGuiden.

<sup>37</sup> Antonsson Ann-Beth, Alvarez Eliana. Kemitermometern (The Chemical Thermometer) published by Prevent. A similar tool available in English is The Ergonomics Thermometer.

In the study on support needs for small companies' chemical risk management<sup>38</sup> interviews were conducted with three small companies, ranging from 18 to 32 employees. Several provisions regarding chemicals affected all of them. They all had chemical risk management in place, even though there were shortcomings in their procedures. They managed their risks by hiring consultants who assisted them in their work, with help from employees who had worked there for several years and were well acquainted with the current procedures. This indicates that at least some small companies may prefer to hire a consultant to carry out their chemical risk management work.

An occupational health service helped ten companies, ranging from 30-50 employees, to implement chemical risk management<sup>39</sup>. The companies had on average about 30 chemical products each. From the description, it is clear that the occupational health service acted as a consultant that developed the chemical risk management and partly also did what was needed. For example the occupational health service:

- Checked that the safety data sheets were up-to-date and new safety data sheets were acquired when needed.
- Compiled a register of the chemicals.
- Evaluated what chemicals ought to be limited in use.

This report also mentions that if the companies cannot keep the chemical risk management system up-to-date, for example when new chemicals are purchased, it will cease to function.

### **3 Available actors and infrastructure supporting chemical risk management in small companies**

The actors supporting small companies in questions relating to the working environment as a whole also support small companies in questions relating to chemical risk management, occasionally or on a regular basis<sup>40</sup>. These actors are

- the regional safety representatives from the trade unions,
- the occupational health service and
- inspectors from the Swedish Work Environment Authority.

The function of the authorities is inspection rather than support, and this is discussed in the next section.

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<sup>38</sup> Alvarez de Davila, Eliana; Antonsson, Ann-Beth; Frostling, Harald. What support do companies and organisations need regarding chemicals? A pilot study. IVL-report B1511, available at [www.ivl.se](http://www.ivl.se), <http://www.ivl.se/rappporter/pdf/B1511.pdf> (In Swedish)

<sup>39</sup> Norrby Cecilia. Hur ska vi nå de minsta företagen? Kemikaliearbete. (How do we reach the smallest companies? Chemical work, in Swedish) IVF skrift 97850

<sup>40</sup> Antonsson Ann-Beth, Birgersdotter Lena, Bornberger-Dankvardt Sten. *Small enterprises in Sweden - Health and safety and the significance of intermediaries in preventive health and safety.* [Arbetet och Hälsa 2002:1](#)

### 3.1 Occupational health service

According to an inquiry conducted in 2003, 42 % of employees in micro-companies and 67 % in small companies claim to have access to occupational health services. The distribution according to sector and size of company is shown in table 7. These figures are probably overestimates, as access to a medical doctor is sometimes interpreted as an occupational health service. A more reliable estimate is probably that about 30 % of Swedish small companies are affiliated to an occupational health service. Affiliation is more common among small manufacturing companies than among small trade or service companies.<sup>41</sup>

Table 7. Percentage (%) of employees in companies in different sectors stating that they have access to occupational health service. The answers are categorised according to size of workplace (not size of company). (From [www.av.se](http://www.av.se))

Sector	Size of workplace			Total
	0-9 empl	10-49 empl	50+ empl	
<b>Agriculture, hunting, forestry and fishing</b>	39	68	89	<b>45</b>
<b>Manufacturing, mining and quarrying</b>	40	71	92	<b>81</b>
<b>Electricity, gas and water supply</b>	100	92	94	<b>93</b>
<b>Construction</b>	49	81	91	<b>71</b>
<b>Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods</b>	29	49	74	<b>47</b>
<b>Hotels and restaurants</b>	14	23	55	<b>25</b>
<b>Transport, storage and communication</b>	35	67	75	<b>64</b>
<b>Financial intermediation</b>	73	85	90	<b>86</b>
<b>Real estate, renting and business activities</b>	38	64	79	<b>62</b>
<b>Education</b>	64	70	72	<b>70</b>
<b>Health care and veterinary activities</b>	47	78	78	<b>75</b>
<b>Social work</b>	61	68	66	<b>66</b>
<b>Other community, social and personal service activities</b>	35	66	83	<b>54</b>
<b>Public administration and defence; compulsory social security</b>	78	90	89	<b>88</b>
<b>Total (all sectors)</b>	<b>42</b>	<b>67</b>	<b>82</b>	<b>67</b>

An occupational health service (OHS) should be able to provide services relating to chemical risk management. Usually the safety engineer handles this kind of service. Safety engineers are usually not chemists or chemical engineers, but have about one or at best two months' education on chemical hazards. Furthermore, the number of safety engineers with training in techniques such as dust sampling has decreased from about 300 in 1985 to about 100 twenty years later. The lack of safety engineers with the necessary chemical skills has resulted in poor quality in the measuring reports. An investigation carried out by the Swedish Work Environment Authority showed that only 20 % of the reports contained at least half of all the information that should be included in the report.<sup>42</sup>

Safety engineers train staff in affiliated companies on chemicals and chemical risk management. They assist in compiling registers, making risk evaluations and suggesting control measures. Occasionally they also measure exposure to the most common air contaminants such as dusts and

<sup>41</sup> Antonsson Ann-Beth, Birgersdotter Lena, Bornberger-Dankvardt Sten. *Small enterprises in Sweden - Health and safety and the significance of intermediaries in preventive health and safety*. [Arbetet och Hälsa 2002:1](#)

<sup>42</sup> Presentation by Claes Trägårdh from the Swedish Work Environment Authority at the Swedish Associations of Occupational and Environmental Hygiene conference, 28 April 2005.

organic solvents. When it comes to more unusual substances requiring more advanced measuring techniques or the use of direct reading instruments, they usually leave this kind of measurement to other actors such as the departments for occupational and environmental medicine at the Swedish university hospitals or consultants specialising in such measurements.

A recent survey of which OHS-provided services are used by small companies<sup>43</sup> shows that small companies mainly use the medical services. About 50 % had used some kind of technical service during the last years. Only a fraction of the technical services used concern chemical risk management.

In Denmark, affiliation with an OHS has been made compulsory for some trades. It is the experience of the OHSs that the time available through the compulsory affiliation (0.6 hours per employee and year) has often been used for advice concerning chemicals<sup>44</sup>.

The conclusion is that even if OHSs in Sweden are one of the constant actors in chemical risk management in small companies, they service only a small fraction of small companies. As OHSs work on a free market, they can only sell what companies want to buy. If companies do not demand assistance with chemical risk management, OHSs cannot sell such services. The problem is twofold. Small companies do not demand this kind of service and OHSs do not market services relating to chemical risk management to small companies<sup>45</sup>.

If small companies wanted to buy this kind of service, most of them would presumably prefer that someone did the job for them instead of having to learn everything they needed to know to be able to do the job themselves.

## 3.2 Departments of occupational and environmental medicine

The occupational health service gives basic support to companies regarding chemical risk management. However, they do not have expert knowledge on chemicals. If questions arise that the occupational health service cannot solve, they have access to departments of occupational and environmental medicine located at major hospitals (often university hospitals). These departments employ chemists and occupational hygienists who specialise in chemical exposure assessment and risk management.

Departments of occupational and environmental medicine examine patients for work-related illnesses, often after referral from occupational health services and specialists. The occupational hygienists give their expert opinion about exposure in relation to the work-related illness. This might include visiting the work place, measuring current exposure and evaluating the connection between exposure and effects. Teaching is also an important part of the occupational hygienist's work. They also conduct research with a focus on exposure measurements and exposure

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<sup>43</sup> Antonsson Ann-Beth, Schmidt Lisa. Småföretag och företagshälsovård – ska berget komma till Muhammed eller Muhammed till berget? IVL-report B 1542, available at [www.ivl.se](http://www.ivl.se), <http://www.ivl.se/rapporter/pdf/B1542.pdf>

<sup>44</sup> Personal communication with Lone Wibroe, project leader and pharmacist at the OHS JobLiv Danmark, via mail 2005-07-12

<sup>45</sup> Antonsson Ann-Beth, Schmidt Lisa. Småföretag och företagshälsovård – ska berget komma till Muhammed eller Muhammed till berget? IVL-report B 1542, available at [www.ivl.se](http://www.ivl.se), <http://www.ivl.se/rapporter/pdf/B1542.pdf>

assessments in epidemiological studies and evaluating dose-response relationships and risk assessment of exposure to certain substances. Research is carried out in close co-operation with medical staff. The chemists and hygienists also develop methods for measuring and analysing air and exhaled air contaminants. In recent years exposure in the environment and at home is also included in research.

The occupational hygienists mainly focus on exposure assessment and the health effects rather than on proactive risk management at a company level, even if this can sometimes also be a part of the industrial hygienist's work.

### 3.3 Social partners

The study on chemical risk management in small companies describes the activities of social partners in this field<sup>46</sup>. Employers' organisations and trade unions alike have employees dealing with work environment issues. Usually those responsible for the working environment on behalf of the social partners have limited knowledge of chemistry and chemical risk management. The knowledge they have is often gained through working with the issues raised. The people from the employers' organisations also gain knowledge from contact with experts at their member companies<sup>46</sup>. Results from this study are described in detail in the following two sections below.

#### 3.3.1 Employers' organisations

The employers' organisations regularly inform their member companies, through circular letters, e-mail newsletters and their websites. In these contexts general questions relating to chemicals are sometimes dealt with. Chemical risk management may also be dealt with in training courses arranged by the employers' organisations and as part of different information campaigns.

Small companies sometimes contact employers' organisations regarding chemical risk management. Often they want to discuss interpretation of the demands in the provisions on chemicals and how they should go about fulfilling those demands. The following topics are the most frequent ones.

- ✓ How can risk evaluation be conducted in a simple way?
- ✓ How should the information in SDSs be interpreted and used?
- ✓ How should waste be handled?
- ✓ How should environmental reports to the authorities be drawn up?
- ✓ How should specific chemicals such as asbestos, glue, isocyanates, organic solvents, thermosetting plastics and products treated with pesticides be handled?

In general, the employers' organisations have relatively little contact with small companies, although the frequency may vary between different sectors and organisations<sup>21</sup>.

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<sup>46</sup> Alvarez de Davila, Eliana; Antonsson, Ann-Beth; Frostling, Harald. What support do companies and organisations need regarding chemicals? A pilot study. IVL-report B1511, available at [www.ivl.se](http://www.ivl.se), <http://www.ivl.se/rappporter/pdf/B1511.pdf>

### 3.3.2 Trade unions

The trade unions' main purpose is to represent their members' interests, not to assist in solving working environment problems, even though most ombudsmen try to do that if they have the time and the opportunity. Often this is done by directing the member to another person or organisation that can assist in solving the problem.

When the trade unions are contacted in questions relating to chemical risk management, it is usually by elected representatives. Members in sectors with limited use of chemicals rarely contact trade unions about chemical hazards. Even trade unions in sectors with a more extensive use of chemicals are rarely contacted. The trade union representatives interviewed claim that elected representatives and members instead turn directly to the authorities.

The trade unions appoint regional safety representatives whose main aim is to reach out to small companies and act as safety representatives. Regional safety representatives deal with many different kinds of working environment problems and may also deal with chemical risks.

According to the results of a recent project as well as earlier studies<sup>47,48</sup>, regional safety representatives tend to focus on targeted activities dealing with hazardous operations and means of reducing the risks. Proactive chemical risk management is quite complex and usually there is not enough time during their visits to small companies to discuss this. Additionally, many regional safety representatives find chemical problems difficult.

## 3.4 Sector organisations

In 2001 the Confederation of Swedish Enterprise was established through a merger of the two former organisations for employers and for sectors. Consequently, the Confederation and most of its member organisations now acts both as social partner and sector organisation. The description of the employers' organisations in section 3.3.1 is therefore also valid for sector organisations.

## 3.5 Training

Several actors offer chemical risk management training to (small) companies.

- ✓ Occupational health services
- ✓ Prevent
- ✓ Consulting firms
- ✓ Training institutions
- ✓ Social partners

For example, the Association of Swedish Engineering Industries, a large and active employers' organisation, arranged four one-day courses on chemicals in engineering companies between May and October 2005. Not all organisations have such courses.

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<sup>47</sup> Birgersdotter L, Schmidt L, Antonsson A-B. Systematiskt arbetsmiljöarbete i småföretag – vad kan externa aktörer som regionala skyddsombud och företagshälsovård göra för att få SAM att fungera? IVL Report B 1589

<sup>48</sup> Frick Kaj. De regionala skyddsombudens verksamhet. Arbetslivsrapport 1996:22.

There is no information readily available on the scope of the education and training these actors offer and accomplish, nor on the number of participants from small companies that take part in this education and training. Based on studies of small companies' participation in education and training on the work environment, it is likely that the majority of small companies probably only have very limited knowledge on chemical risk management.

## 4 Which other actors are involved in chemical risk management

### 4.1 The European Union

At the moment the most important topic in the EU in relation to chemical risk management is Reach. In Sweden several actors have been involved in different ways in discussions about Reach. So far, however, Swedish actors have mainly taken part in the discussion trying to influence the development of Reach. For example the Association of Swedish Engineering Industries has pointed out the problem of downstream users of chemicals, as many of their member companies are such downstream users. They want the manufacturers to take more responsibility for communication with the companies that use the products they manufacture. This issue has also been discussed through UNICE. In the draft versions of Reach, the majority of the proposal deals with substances and manufacturers. Roughly 100 pages out of about 1100 deal with the downstream users, many of which are small companies.

The debate surrounding Reach has scarcely reached the small companies. The issue of small companies in Reach as downstream users is discussed by actors such as the umbrella organisations for small companies.

### 4.2 The authorities

The definition of chemical risk management is highly regulated by the authorities. They define what requirements have to be fulfilled by companies and they inspect the companies to check whether their chemical risk management is good enough.

In Sweden several authorities are involved in the supervision of chemical risk management.

**The Swedish Work Environment Authority** decides on regulations that aim to protect the worker during the use of chemicals.

The Swedish Chemicals Inspectorate, KemI is a supervisory authority under the Ministry of Sustainable Development. KemI has a focus on chemical products and the companies that produce them. KemI deals with both health effects and eco-toxicological effects from chemicals. KemI promotes legislation and rules that

- ✓ contribute to achieving the environmental quality objective of "A non-toxic environment"
- ✓ keep a products register
- ✓ approve pesticides

- ✓ assess the risk of chemicals
- ✓ check companies compliance with applicable regulations

**The Swedish Environmental Protection Agency** is a central environmental authority under the Swedish Government, with the main tasks of coordinating and promoting environmental work on both a national and international level.

**The Swedish Rescue Services Agency** promotes practice that improves emergency prevention and response, and in the event of an incident/accident limits injury and damage. This is achieved by disseminating information, by running training courses and holding exercises, and through supervision etc. The objective of the municipal fire and rescue services is to ensure that the general public is provided with a reasonable degree of safety in relation to local risks. In practice, the fire and explosion hazards of certain chemicals are dealt with by the municipal fire and rescue services.

The **county administrative board** and the **municipality** ensure that companies follow the demands on chemical risk management according to environmental laws.

There are no statistics available regarding the extent of supervision according to working environment laws or environmental legislation. Even though the main task of the authorities is supervision, they also inform and help the companies under scrutiny to some extent. The balance between supervisory and advisory roles is often discussed.

### 4.3 The supply chain

The supply chain is of utmost importance in chemical risk management, as it is the supplier that has to submit SDSs to the user of the chemicals. This is regulated in detail in the law and regulations concerning chemicals. Suppliers are also important in their role of providing information about chemicals, such as which chemicals to use, how to use them and what chemicals that should be substituted<sup>49</sup> for less hazardous ones.

As shown in section 2.5 and Table 3, there are problems with the information provided by the supply chain. There are shortcomings in the SDSs and small companies mention problems even getting SDSs from some suppliers.

Reach puts heavier demands on suppliers to collaborate with their customers in identifying uses of their products and measures that will control the risks.

### 4.4 Research organisations

There are several research organisations active within the field of chemical risk management. The most important ones are the National Institute of Working Life (which was shut down in 2007 following a governmental decision) and IVL Swedish Environmental Research Institute.

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<sup>49</sup> Eliana Alvarez de Davila, Olof Cerne. Substitutionsarbete vid svenska företag (Substitution of chemicals – how is it done in Swedish companies?) IVL report B 1316. 1999.

## 4.5 Consultants

Besides the occupational health services, there are other consultants supporting chemical risk management in (small) companies. Some small companies hire consultants to assist this management in practical ways. There is no information available on the extent to which consultants are involved in small companies' chemical risk management.

Swedish studies have shown that in general small companies are reluctant to hire consultants, as they are perceived as too expensive. This is very much a question of price. One study indicated that only a few companies were interested in consultants for business development if they had to pay market prices. More were interested if the price was reduced, and many more if their only cost was their own time in the business development process<sup>50</sup>.

## 5 Strategies

There are rarely any publicly documented strategies for improving chemical risk management in small companies. The strategies for chemical risk management are largely the same as for work environment management.

### 5.1 Governmental strategies

#### 5.1.1 General strategies

The Government has introduced three main laws covering different aspects of chemical risk management. These laws are

- ✓ The Swedish Work Environment Act
- ✓ The Environmental Code
- ✓ The Civil Protection Act, which deals with fire safety.

Based on these laws, the authorities (the Swedish Work Environment Authority, the Chemicals Inspectorate and the Swedish Rescue Services Agency) issue more detailed provisions. Sometimes the authorities also supervise companies (the Swedish Work Environment Authority and the Chemicals Inspectorate). Municipalities and county administrative boards sometimes carry out inspections. Below the focus is on the strategy of the Swedish Work Environment Authority.

The Authority's task is to ensure compliance with working environment and working hours legislation and also, in certain respects, with the Tobacco Act and the Environmental Code on certain issues relating to genetic engineering and pesticides<sup>51</sup>. The Authority is also required to provide advice, respond to inquiries and publish information. The Authority has a Lay Board consisting of seven members. Informal meetings together with representatives of the labour market parties precede the meetings.

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<sup>50</sup> Lindholm P, Maier JC. RITTS Western Sweden. Stage 1 report. Existing and latent needs of SMEs vs. the offering provided by existing support organisations – a regional analysis. IVF 2000.

<sup>51</sup> See [www.av.se](http://www.av.se)

The Swedish Work Environment Authority issues regulatory amendments and new rules for the working environment. Today there are some 130 provisions relating to technical, chemical, organisational and psychosocial factors. New provisions are published in the Statute Book of the Swedish Work Environment Authority (AFS). At least one of the chemical provisions is revised each year.

The Authority also publishes leaflets to inform companies of the requirements they have to fulfil. They have produced several leaflets and brochures about different aspects of chemical risk management.

Within the authority, there is a continuous discussion about the balance between its supervisory and advisory roles. The general opinion is that small companies receive more advice than large ones. There is also a rule stating that inspectors should be careful about giving too detailed advice, as the authority does not want to be held responsible if the inspectors give poor advice.

The Swedish Work Environment Authority is well aware of the deficiencies in the chemical risk management of small companies. The responsibility for obeying the provisions lies with the companies. The Authority is of the view that bodies such as the social partners could have an important role in supporting the companies through the development of different kinds of guides, training material, working materials etc.

The strategy used during inspections and when demanding improvements in chemical risk management in small companies is to start by demanding parts of what is required and then continuing. In this way, small companies are not overwhelmed with work and it should be possible for them to start implementing at least some kind of chemical risk management.<sup>52</sup>

At the moment, the Authority has no plans for new campaigns on chemical risk management. Its main objective is a discussion about merging several provisions on chemicals, such as the two main provisions on Chemical Hazards in the Working Environment and Occupational Exposure Limit Values and Measures against Air Contaminants and some provisions for specific substances. There are also discussions surrounding risk evaluations, such as what is required for risk evaluations to be adequate.<sup>53</sup> When the discussions have advanced, the question of new campaigns will be discussed.

### 5.1.2 Problem-based strategies

When it comes to more identifiable problems relating to chemical risks in certain sectors or with certain substances, there is often a more detailed and clearly expressed strategy. The case of isocyanates from thermal decomposition may serve as an illustrative example<sup>54</sup>.

When the problem of low-molecular isocyanates (such as methyl isocyanate and isocyanic acid) from thermal decomposition was acknowledged, the Authority decided to act. Several activities were conducted, including:

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<sup>52</sup> Report to be published by IVL: Antonsson Ann-Beth, Axelsson Ulrik, Birgersdotter Lena, Cerin Pontus. Miljö- och arbetsmiljötillsyn i små företag. En inledande studie (Supervision of Environment and Work Environment – an Introductory Study, in Swedish)

<sup>53</sup> Personal communication with Maria Cronholm-Dahlin, Swedish Work Environment Authority, December 2004.

<sup>54</sup> Information about many of these activities can be found on [www.av.se](http://www.av.se), under “ämnessidor” (Topics), Isocyanater (only available in the Swedish part of the homepage).

- The Authority initiated and took part in a Nordic collaboration with authorities in the Nordic countries.
- The Authority informed the SLIC (senior labour inspectors committee, a group within EU) about the problem of isocyanates from thermal decomposition.
- A project started within the Authority to measure the exposure to isocyanates from different operations. In this project, many districts of the Authority participated actively and conducted measurements.
- The Authority kept in touch with other actors, such as social partners and researchers, and also took part in reference groups in order to continuously follow the development and discuss the results.
- There was lot of discussion about the extent of secondary exposure to isocyanates. To investigate the extent of secondary exposure, the Authority ordered a study of secondary exposure in car bodywork repair workshops. The measurements indicated that secondary exposure was usually quite low.
- Inspection campaigns started in several districts with a focus on inspection of car bodywork repair workshops.
- After some time, it became clear that the districts applied different interpretations of the regulations and there were different requirements on companies depending on the district in which they were situated. The Authority developed a guide that described how the provisions should be interpreted and also included some of the results from ongoing research projects.
- It became clear that the provision covering isocyanates (with the title AFS 1996:4 Thermosetting plastics) was not up-to-date in all aspects, and a revision of the provision started. The social partners were very active in the revision process and submitted a lot of comments that affected the wording of the provision. At the same time a new OEL for monoisocyanates was discussed and was introduced in 2005.

The result of the work put into the isocyanate problem by the Authority and others is that isocyanates from thermal decomposition have gained a lot of attention in the workplace. People who work in a sector or with operations where isocyanates may be formed through thermal decomposition have usually heard about the problems relating to isocyanates. A project was set up to evaluate the effects in terms of changes in practice, especially in car bodywork repair workshops, a sector consisting mainly of small companies. The results of this project suggest that some improvements have been made but also indicate problems in disseminating advice on good control measures<sup>55</sup>.

The example discussed above shows the complex activities conducted regarding one group of chemicals. As can be seen, the activities are very much adapted to the needs of the workplaces but also reflect the initiatives taken and interests of different actors. There are activities in relation to other substances as well, such as ceramic fibres and acrylates.

In Denmark a website has been developed ([www.catsub.dk](http://www.catsub.dk)) to give ideas and information about substitution of chemicals.

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55 Antonsson, Ann-Beth; Birgersdotter, Lena; Christensson, Bengt. Varför vidtas (inte) arbetsmiljöåtgärder? En systemanalys av åtgärder mot isocyanater i bilverkstäder. (Why are control measures (not) implemented? A system analysis of control measures that reduce exposure to isocyanates in car bodywork. IVL-rapport B1668, 2006 (In Swedish)

## 5.2 Joint strategy for social partners

The social partners have an important influence on small companies' risk management through the different activities they initiate and support. Many of these initiatives are handled through Prevent ([www.prevent.se](http://www.prevent.se)), which is owned jointly by the employers' federation and the two main trade unions, LO and PTK.

Several tools have been developed to support small companies' chemical risk management. These tools have been developed with support and funding from the social partners. The latest and most comprehensive tool aimed at helping small companies is KemiGuiden<sup>56</sup> (the Chemical Guide).

Some other examples of other initiatives are:

- ✓ The study material Chemical Hazards (which also is available in an English version), developed for study of chemical hazards at workplaces. This material is probably used more by large companies than small ones.
- ✓ Chemical Substances - an interactive register of chemical substances with physical data, risk and safety phrases, hazard symbols, instructions for handling and storage, transport instructions for the sender and the transport organiser, and more. Chemical Substances is available on CD-rom and in an online version.
- ✓ Allergy Forum, a website developed to raise awareness of allergies in professions where there is a high risk of developing allergies. As part of this website, brochures giving sound advice on how to reduce the risk of allergy in high risk professions were developed. The Allergy Forum recently merged with the Chemical Guide.
- ✓ A series of leaflets on new risks relating to isocyanates in different trades. The leaflets were developed on the initiative of the social partners in order to draw attention to a newly-discovered risk posed by the thermal degradation products formed from materials containing polyurethane.
- ✓ A series of leaflets about the recently acknowledged cancer risks of reinforced ceramic fibres.

These are just a few examples of the results of joint initiatives relating to chemical risk management. One interpretation of this overview is that it is likely that mainly large companies use many of the more advanced tools requiring knowledge and time, e.g. Chemical Substances and the study material Chemical Hazards. The more simple and practical leaflets are mainly directed towards small companies, focusing on control measures rather than risk management. The Chemical Guide is all about risk management and it is also widely used by small companies, see table 8. By 2 May 2005, 52 % of the registered users had 50 employees or less.

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<sup>56</sup> KemiGuiden, [www.prevent.se/kemiguident](http://www.prevent.se/kemiguident), has been developed by Ann-Beth Antonsson and Eliana Alvarez, Swedish Environmental Research Institute in cooperation with Happiness. Prevent produced KemiGuiden.

Table 8. Registered users of interactive website the Chemical Guide, developed to support chemical risk management in SMEs. (figures from the administration site for the Chemical Guide)

Users of the Chemical Guide, distributed by company size 02/05/2005		
No of employees	No of companies	% of companies
1-10	279	19%
11-20	187	13%
21-50	301	20%
51-100	214	14%
101-200	170	12%
201-500	161	11%
>500	164	11%

963 companies have not registered number of employees

### 5.3 Strategy of sector organisations

In Sweden and in other European countries, the Swedish Plastics and Chemicals Federation promotes responsible care within its member companies.

Several sector organisations develop information concerning chemicals. One such example is a book from Grafiska miljörådet, a cooperation body between social partners for the printing industry. The book, Chemicals in the printing industry and newspaper sector<sup>57</sup>, deals mainly with the risks associated with chemicals frequently used in these sectors. The book also includes some forms supporting risk evaluation, testing of new products and contact with suppliers regarding presence of restricted chemicals in their products.

In Denmark there are also examples of activities from the sector organisations. A website, [www.bar-web.dk](http://www.bar-web.dk) gives basic information about working environment issues including chemical risk management. There is also a website with information for carpentries, [www.reneprodukter.dk](http://www.reneprodukter.dk).

### 5.4 Discussion of strategies to improve chemical risk management in small companies

In Sweden there are several activities underway to improve chemical risk management. The strategies seem to have had limited success in implementing chemical risk management in small companies according to the results from the inspection campaign in autumn 2003 mentioned above.

Since 2003, there have been scattered activities relating to chemical risk management. The present strategy includes the following parts.

- Chemical risk management is considered as a part of work environment management. Therefore chemical risk management is included in most of the regular inspections conducted by the Authority.
- Written information about the requirements via short brochures from the Authority. Several of the brochures often deal with substances and have a targeted approach rather than the proactive risk management approach as described in section 2.
- Personal contact and support come primarily from occupational health services and consultants. These contacts are often based on initiatives from companies.

<sup>57</sup> Kemikalier i grafiska branschen och tidningsbranschen. Grafiska miljörådet 2002.

- Several actors offer education and training on chemical risk management.
- There are a few tools supporting chemical risk management, such as the Chemical Guide, which is a comprehensive tool developed to suit small companies.

To summarise the present strategy, there is information available for companies that actively look for it. However, there are no broad campaigns aimed at reaching companies that are unaware of the requirements of proactive chemical risk management.

What about this strategy – is it adapted to small companies? Generally speaking, to succeed with small companies, there have to be some kind of activities marketing the idea of chemical risk management and methods to implement it. In Sweden today there are some activities of that kind. Below the activities are discussed in terms of how well they suit the needs and culture of small companies.

### 5.4.1 Tools

There are several Swedish tools especially developed to support chemical risk management in small companies. The materials can be roughly divided into three categories<sup>58</sup>:

- Working materials to guide the companies through some kind of decision process about what to do at their workplace. Checklists, interactive websites and different kinds of guidelines and forms are examples of working materials, which are called tools in this report.
- Information, conveying some kind of knowledge about a problem, but without giving support to the decision process at the workplace. Information leaflets are common examples of information.
- Study materials are more elaborate materials used to train people, for example in school or at workplaces.

This section deals with tools (working materials) developed to support chemical risk management in small companies.

The website the Chemical Guide and the brochure the Chemical Thermometer have been developed for use by any company, regardless of sector, but with a focus on small companies. The Chemical Guide gives tailored advice to companies based on the answers to a set of questions investigating in detail both what provisions and requirements the company has to comply with, what procedures are present in the company and what control measures are needed. Both the Authority and the social partners have assisted in the marketing of these tools, especially the Chemical Guide, and the Authority and several of the social partners have a link to it from their website.

The experience thus far is that the Chemical Guide is used by a large number of companies including many small ones and even micro-companies. The tailored advice that is given by the Chemical Guide is kept as short and pertinent as possible. Despite this, the advice tends to be quite extensive for companies that have few of the required procedures in place. This is due to the extensive demands in the regulations. This may discourage small companies from starting to conduct chemical risk management.

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<sup>58</sup> Eurenus Carina. Verktyg för småföretagens arbetsmiljö. Behov, Marknadsföring, Utformning, (Tools for the improvement of small companies' working environments. Needs, marketing, design. In Swedish with English summary) IVL-rapport B 1373, Stockholm, May 2000.

One important advantage of the Chemical Guide is that it covers not only requirements related to the working environment, but also requirements from other authorities. In this way the Chemical Guide is a holistic tool, which corresponds to the needs of small companies in many ways.

The Chemical Guide serves as a good tool to learn chemical risk management by doing it. Learning by doing is a strategy well suited to small companies.<sup>59</sup>

### 5.4.2 Information

There is a lot of information available on chemical hazards and means of reducing them. This kind of information is often part of targeted activities concerning specific chemicals. The Authority also publishes books and leaflets about chemical risk management as a means of providing information about the requirements in the provisions.

Information is important as a way of attracting attention to chemical hazards and communicating what can be done to reduce the risks. One comment from the manager of a small company about one such piece of material indicates the limitations of pure information. "I have read the book (about the demands on chemical risk management) but I still do not know what to do. It is difficult for me to understand what is actually required of us."<sup>60</sup>

Information is important, but small companies may have problems interpreting the general and specific demands that they have to fulfil in their company. General recommendations on how to go about chemical risk management may be difficult to put into practice in the company. This is also reflected in the common question to the authorities from small companies as described above. Small companies want to know "How do we go about fulfilling the demands?"

### 5.4.3 Management systems

Many companies, including many small companies, have implemented management systems for quality or the environment over the last decade. Management systems often require good control of the chemicals that are used in the company both for quality and environmental reasons.<sup>61</sup>

The Chemical Guide was tested on six small companies, some of which had management systems. Several of these companies mentioned the difficulties that they had encountered when developing their chemical risk management. They described how difficult it was to understand the requirements and find methods of fulfilling them. Nevertheless, in the end they managed to get some kind of order in their chemical risk management. This indicates that management systems have a positive effect on chemical risk management, but also that the risk management is perceived as difficult by the companies. These companies were very positive about the Chemical Guide and

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<sup>59</sup> NUTEK Företag i förändring. Sammanfattning och benchmarking av lärandestrategier för ökad konkurrenskraft. NUTEK 2000. Available at [www.nutek.se](http://www.nutek.se) (Companies in transition. Summary and benchmarking of strategies for learning and increased competitiveness.) NUTEK 2000.

<sup>60</sup> This comment was given by a manager testing the Chemical Thermometer. He appreciated the Thermometer, which gave more practical advice adapted to his company on how to evaluate the risks.

<sup>61</sup> ISO 14000 and ISO 9000 require that the laws be followed. Some of the legal requirements often checked concern chemical risk management. In Sweden it is common that the register of chemicals used in the company is checked in the certifying revisions.

regretted that they had not had access to the Guide earlier. The Guide would have facilitated their work substantially.<sup>62</sup>

## 6 Evaluation and discussion

### 6.1 The need for chemical risk management in small companies

From the statistics, it is clear that work-related chemical diseases occur in some professions and sectors and relate to certain chemicals. There are strong indications that these problems are larger in small companies than in large ones. This produces a need for a strategy to control chemical exposure and improve chemical safety.

But this is not the entire truth. It is primarily the diseases that are well-known and caused by well-known substances which are reported. Risks associated with new substances are probably under-reported. In addition, there is probably an under-reporting in small companies. There may also be risks with chemicals that are used in small quantities or by a few companies.

This leads to the conclusion that chemical safety has to be improved in small companies.

### 6.2 Two main strategies

In Sweden there is very little debate about chemical risk management in small companies. Rather, the focus is on the more general issue of systematic work environment management, SWEM, in small companies. Chemical risk management is part of SWEM and the methods used are similar to the methods used in SWEM, including risk identification, risk evaluation, improvements and documentation.

As can be seen from the examples of strategies given above, there are two main strategies for chemical risk management. In practice, these strategies are often mixed. These strategies are:

- ✓ To implement a broad **proactive chemical risk management**, where a lot of information is provided by suppliers (labelling, SDSs) and collated and used by the small companies using the chemicals (register of chemicals and risk evaluation) and conclusions are drawn about what control measures should be implemented.
- ✓ A **targeted approach**, where hazardous operations or chemicals are identified and control measures targeted to the most important hazards are proposed to the sectors or companies concerned.

These strategies are analysed below from the perspective of small companies and small company circumstances and culture.

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<sup>62</sup> Personal communication with Eliana Alvarez, IVL, who conducted testing of the Chemical Guide.

## 6.3 Knowledge

The **proactive approach** requires more knowledge than the targeted approach. Interviews with the people working with working environment for the social partners and at the authorities<sup>63</sup> reflect that small companies often lack the knowledge required to be able to manage their chemical risks in a proactive way. There is a lack of knowledge about the basic methods for chemical risk management.<sup>70</sup>

Employers as well as employees do not always understand the orange labels on the packages, see section 2.5.

Employers as well as employees sometimes have difficulties understanding and interpreting the SDSs, see section 2.5.

Employers and employees perceive risk evaluation as difficult and want advice on how to go about it.<sup>64</sup>

These three tools, labels, SDS and risk evaluation are essential for good risk management and lack of awareness of them will heavily impair chemical risk management.

The **targeted approach** requires less knowledge, as the target is narrower and the advice and demands in terms of control measures can be more detailed and precise. The advice and demands carry a lot of the knowledge that has to be used in the implementation of control measures. The targeted approach requires less knowledge, but one of its limitations is that it is more static. Only chemical problems and control measures that can be foreseen can be covered by the targeted approach. The targeted approach is therefore best suited for problems that are common and occur in many companies.

An essential **success factor** for chemical risk management is how much knowledge it requires. Small companies usually prefer simple methods that require less knowledge.

### ***Inspections***

Since the campaign in 2003, the Authority has not had any more campaigns on chemical risk management. This is supposed to be an integrated part of all inspections, apart from directed inspections and campaigns. The inspectors, however, have difficulty inspecting areas in which they do not have expertise<sup>65</sup>. A comment from many of the inspectors after the campaign in 2003 to the coordinator of the campaign was that they appreciated learning more about chemicals and chemical risk management.

### ***Lack of knowledge is a problem not only in small companies but also among the authorities.***

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<sup>63</sup> Alvarez de Davila, Eliana; Antonsson, Ann-Beth; Frostling, Harald. What support do companies and organisations need regarding chemicals? A pilot study. IVL-report B1511, available at [www.ivl.se](http://www.ivl.se), <http://www.ivl.se/rappporter/pdf/B1511.pdf> (In Swedish)

<sup>64</sup> Alvarez de Davila, Eliana; Antonsson, Ann-Beth; Frostling, Harald. What support do companies and organisations need regarding chemical?. A pilot study. IVL-report B1511, available at [www.ivl.se](http://www.ivl.se), <http://www.ivl.se/rappporter/pdf/B1511.pdf> (In Swedish)

<sup>65</sup>Antonsson, Ann-Beth; Axelsson, Ulrik; Birgersdotter, Lena; Cerin, Pontus. Miljö- och arbetsmiljöinsyn i små företag. En inledande studie. IVL-rapport B 1638, 2005

## 6.4 Education and training

There are training courses offered by bodies such as the occupational health services, Prevent, and social partners. Of course some small companies participate in such courses. However, in general, small companies attend working environment courses less frequently than large companies<sup>66</sup>. Small companies are heavily underrepresented at almost all work environment courses<sup>67</sup>.

In general, small companies may attend courses they perceive as important to them. Most companies use chemicals that are not perceived as very dangerous and many companies use chemicals occasionally. There are a limited number of sectors with extensive use of chemicals or use of very hazardous chemicals. People from these sectors would probably attend courses. People from companies occasionally using less hazardous chemicals will seldom attend courses. There are however no studies on this.

The **conclusions** are that

- ✓ Given the importance of knowledge, there is a huge need for education about proactive risk management, in order to make it work.
- ✓ Given the culture of small companies, education on chemical risk management does not reach out to small companies well enough today, due to the low prioritisation of such education by small companies.

The **targeted approach** requires less education than proactive chemical risk management. It is fairly simple to develop targeted approaches for different kinds of problems in a way that reduces the need for education. If demands are presented in a fairly detailed manner, the need for education is often minimal. Most small companies appreciate low demands for education and practical advice on what to do. However, the problem of disseminating this advice to companies still exists.

An essential **success factor** for chemical risk management is how much education it requires. Small companies will usually prefer methods that are very simple to understand and use, which they can learn just by applying them. Learning by doing is a method especially suited for small companies.<sup>68</sup>

## 6.5 Time

It is clear that the **proactive strategy** requires a lot of the companies' time. It is also clear that small companies have time constraints that govern what they choose to do and not to do. In a small company, the number of employees is limited and there are several other tasks beside the daily core tasks that would be useful to the company. In this competition surrounding the limited time that can be spent on tasks other than core tasks, there is an obvious risk that time-consuming work will not be prioritised if it is not considered as essential to the company.

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<sup>66</sup> Ann-Beth Antonsson. Hållbar tillväxt i små företag: omöjlig utmaning eller möjlig utveckling? (Sustainable growth in small companies: impossible challenge or possible development?) IVL-rapport B 1466, Stockholm 2002. (Summary in English) <http://www.ivl.se/rapporter/pdf/B1466.pdf>

<sup>67</sup> Personal experiences from lecturing at a lot of open courses where I usually check what size of companies the participants come from.

<sup>68</sup> NUTEK Företag i förändring. Sammanfattning och benchmarking av lärandestrategier för ökad konkurrenskraft. NUTEK 2000. Available at [www.nutek.se](http://www.nutek.se) (Companies in transition. Summary and benchmarking of strategies for learning and increased competitiveness.) NUTEK 2000.

The **targeted approach** requires less time than the “bureaucratic” management. Time is instead spent on implementing the required measures. Small companies usually appreciate activities aimed at solving problems much more than planning and investigating activities, especially if those activities concern a problem that is difficult and requires expert knowledge that the company does not have.

An essential **success factor** for chemical risk management is how much time it requires. Small companies will usually prefer fast methods.

## 6.6 Proactive work and the culture of small companies

There seem to be some basic problems with the proactive strategy. These problems relate to what small companies consider possible or important for them to do. There are two main limitations for small companies’ chemical risk management.

- Proactive chemical risk management is often perceived as **difficult** or even very difficult as the companies do not have the required knowledge and it takes time to learn.
- Proactive chemical risk management is often perceived as **taking too much time** for paperwork that does not result in improvements of the chemical safety. Administrative paper work is something small companies usually avoid<sup>69</sup> <sup>70</sup>.

These two limitations are directly linked to the circumstances and culture of small companies which are

- **Reactive** rather than proactive<sup>69</sup>. Proactive work means that potential problems are identified and control measures are implemented to prevent future accidents or diseases, before any accident has happened and before anyone has fallen ill. One company manager expressed this in the following way: “Why look for new problems? Isn’t it better trying to solve the acute ones first?”
- Focusing on **solving problems** rather than on **bureaucratic management**. This is why small companies often want sound and practical advice on how to do chemical risk management<sup>56</sup>.
- The managers of small companies have **no access to expert staff**. In companies with less than around 20 employees there are no managers other than the owner or executive director<sup>71</sup>. They have to solve all problems and do all work themselves or with the help of some employees.<sup>72</sup>
- **Consultants** are usually considered to be **too expensive**<sup>73</sup> and are **hired only if there is no alternative**, e.g. when the authorities demand chemical risk management at an inspection.

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<sup>69</sup> Ann-Beth Antonsson. Hållbar tillväxt i små företag: omöjlig utmaning eller möjlig utveckling? (Sustainable growth in small companies: impossible challenge or possible development?) IVL-rapport B 1466, Stockholm 2002. (Summary in English) <http://www.ivl.se/rapporter/pdf/B1466.pdf>

<sup>70</sup> Eurenus Carina. Verktyg för småföretagens arbetsmiljö. Behov, Marknadsföring, Utformning, IVL-rapport B 1373, Stockholm, May 2000. (Tools for improving the working environment in small companies. Needs, marketing, design. In Swedish)

<sup>71</sup> Antonsson A-B, Nilsson M, Hansén O. Internkontroll i små företag. Verklighet och visioner. IVL-rapport B 1291, Stockholm 1997. <http://www.ivl.se/rapporter/pdf/B1291.pdf>

<sup>72</sup> Antonsson A-B. Small companies. P 466-477 in The Workplace Volume 2: Part 5.3. Ed D. Brune et al. 1997.

<sup>73</sup> Lindholm P, Maier JC. RITTS Western Sweden. Stage 1 report. Existing and latent needs of SMEs vs. the offering provided by existing support organisations – a regional analysis. IVF 2000.

Do small companies work proactively at all? Yes, of course they do. Small companies, as well as large ones, have to anticipate potential problems and take action to avoid those problems. Such proactive work is often essential for the survival of the company. The difference between small and large companies would be that:

- Small companies can work proactively with fewer issues than large ones as they usually have time constraints and do not have access to expert staff. They have to prioritise more.
- Small companies often work less formally and with less documentation etc, due to time and knowledge constraints.

**Success factors** for proactive work in small companies could be to limit the chemical risk management to those aspects that can easily be perceived as important to the company and the most important ones constituting hazards, and to develop methods for proactive risk management that can be used in a fast and effective way.

## 6.7 The sustainability of support to small companies' chemical risk management

The current support to small companies' chemical risk management can be concluded to be insufficient. There are many actors in this field but the scattered activities do not seem to suffice, partly due to lack of prioritization both from the actors and from the small companies. Proactive chemical risk management is not highly prioritised. At the same time, chemical risk management requires a lot of resources as the methods used are quite complex and require a lot of knowledge.

There are methods developed as a support for chemical risk management in small companies and these can be used without cost. These methods are known or used by some but far from all small companies. (There is much information available on the Internet).

There are actors that could contribute substantially to supporting small companies' chemical risk management. The basic problem is that these actors do not prioritise this issue. In addition, the resources available are probably not sufficient to reach out to all small companies.

Another problem is that chemical risk management as interpreted from the provisions is so complex that it is difficult to grasp for small companies and even more difficult and tedious to implement.

## 7 Conclusions

The public discussion about chemical risks at Swedish workplaces is usually based on specific substances that are given attention after some kind of alert, incident or new research findings. Chemical management is also discussed but in other contexts, often related to inspections or as in the case of the acrylamide after the emissions at the Hallandsås in the legal process.

The legislation and provisions contain both proactive chemical risk management and targeted demands. In recent decades, the proactive risk management principles have been implemented in Swedish legislation both for the working environment as a whole and for chemical risks. Proactive chemical risk management has been brought in focus and the use of measurements and exposure effect evaluations has decreased. In parallel to proactive risk management, there are still detailed

demands for technical and organisational measures related to certain substances or groups of substances.

From the inspection campaigns, it is clear that proactive chemical risk management works poorly in small companies. There are tools and methods developed for small companies. Some small companies use these tools, but they are not widely used. This is due to three factors:

- Limited information has been available to small companies about the demands for proactive chemical risk management.
- Proactive chemical risk management is contradictory to the culture of many small companies, as it requires proactive rather than reactive work as well as time and knowledge of how to manage chemical risks, resources that are limited in most small companies.
- The motivation for small companies to implement proactive chemical risk management is weak. The benefits of working proactively are not obvious compared to the required input of resources. The cost of not implementing chemical risk management is low. There are no fines for companies not having chemical risk management. They are presented with requirements they have to fulfill and usually get several months to fulfill the demands when deficiencies have been discovered during an inspection. Additionally, small companies are rarely inspected. On average, small workplaces are inspected once every 14 years and many small workplaces are part of large companies or organisations.<sup>74</sup> There are however fees, that companies have to pay if they do not follow a few specific requirements, for example on labelling of products.

There are many different ways to interpret the situation and draw conclusions on what is needed. Based on Swedish experience there is no obvious approach that will solve the problem of poor chemical risk management. There are, however, several questions that can be discussed.

- ✓ What kind of measures are the most important ones in reducing work-related chemical accidents and diseases?
- ✓ How can the implementation of these measures be promoted as effectively as possible?
- ✓ Is the present balance between the targeted and proactive chemical risk management approaches the best one for small companies?
- ✓ Should the same basic demands on chemical risk management apply for companies handling a few not very hazardous chemicals as for companies handling a lot of hazardous chemicals?
- ✓ What can reinforce the motivation for small companies' chemical risk management?
- ✓ What tools and methods for chemical risk management are simple enough to be used by the majority of small companies?

There are no obvious answers to these questions. Instead there are a lot of experiences pointing at the problems. There are also limitations as to what can be achieved. Some of the limitations are:

- ✓ The resources (time and knowledge) available in small companies.
- ✓ The resources (time and money as well as knowledge) available from the authorities for inspections and information.
- ✓ The companies' prioritisation compared to other needs of the company.
- ✓ The authorities' prioritisation of chemical risk management in compared to other areas.

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<sup>74</sup> Antonsson Ann-Beth, Birgersdotter Lena, Bornberger-Dankvardt Sten. Small enterprises in Sweden - Health and safety and the significance of intermediaries in preventive health and safety. *Arbetet och Hälsa* 2002:1 [http://ebib.arbetslivsinstitutet.se/ah/2002/ah2002\\_01.pdf](http://ebib.arbetslivsinstitutet.se/ah/2002/ah2002_01.pdf)

