Beyond Compliance. Environmental Management and Toxics Reduction in Practice
Verschoor, A.H.

Citation for published version (APA):

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: http://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.
Chapter 8

Summary
Summary of findings

In chapter 1.3 an inventory was given of the components of a comprehensive environmental management system.

In this thesis the following components of environmental management were studied:

* monitoring,
* Material Safety Data Sheets as an information source,
* environmental management in purchasing,
* life cycle methods in environmental management,
* toxics use reduction,
* toxics use reduction in processes.

The following results were obtained.

In chapter 2 it was found that for comprehensive improvement oriented environmental management an extensive monitoring system is needed. Such monitoring should be partly physical and partly financial.

The core of physical monitoring should consist of materials accounting based on a simplified mass balance of inputs and outputs of plants and measurements of releases. Financial monitoring should be focussing on integrating all environmental costs in product costs. In this chapter it is demonstrated by a study in seven large international companies what is monitored and why. None of the companies in our survey was using the extensive monitoring system. The financial side was the least developed, but also the physical side showed many deficiencies. Full cost accounting maybe the most important step down the path to sustainable development. The survey shows that in this respect companies may be just starting.

To account for the environmental strategy is the most mentioned reason for corporate monitoring. All companies are monitoring the substances required by law, five companies are monitoring more non product outputs than required by law. Companies are monitoring management system results infrequently. None of the companies is monitoring materials in order to calculate a (simplified) mass balance. High uncertainties are possible in several data from the locations and the corporate data. Calculation of the standard deviation of the monitoring results
should be considered to indicate the accuracy of the data. Companies should also develop uniform procedures and standards to verify the data, and the process of collection of data. None of the companies studied was using an extensive monitoring system needed for comprehensive improvement based environmental management.

In chapter 3 it was found that the eleven Material Safety Data Sheets (MSDS) covered in the study were all defective, incorrect and/or incomplete regarding the information that is relevant to protection of health and the environment. Managers and employees have to develop a strategy addressing the toxics and implement the strategy in the company. The incorrectness and incompleteness of the information given in the MSDS may give rise to inaccurate judgment and insufficient protection of employees. Furthermore it was concluded that many users of the MSDS will have difficulties in understanding the complex data in MSDS. It is recommended that an independent agency be set up to review the MSDS provided by the supplier. Moreover it should be considered to develop two kinds of MSDS, one with information for persons with expertise in workplace toxicology and one for persons that are lay persons in that respect.

According to chapter 4 purchasing departments can make a substantial contribution in a company to prevention in the field of hazardous substances, provided that a number of requirements are met. The first requirement is that the purchasing should be supported by specialists with expertise in the environmental and toxicological evaluation of hazardous substances to guide decision making. Secondly the purchasing department should be in the position to obtain the required information such as data on chemical specifications of products and Material Safety Data Sheets. This information has to be checked for correctness. Thirdly, for optimizing the use of hazardous substances, a linkage should exist with systems registering stocks and use of the hazardous compounds in the form of accounting systems and linkage with information systems for those within the company who are confronted with hazardous substances. Fourthly, there must be provisions to enable higher prices to be paid for more preferable purchases.

The purchasing department should evaluate the hazardous substances to be bought with selecting and decision systems. They may use a selecting system on a
case by case basis, or fixed decision rules for example as white and black lists. It was demonstrated that in the four companies studied only a part of the preventive potential of the purchasing department was exploited, with considerable differences between companies.

Chapter 5 focusses on life cycle methodology. Life cycle methodology is an environmental management tool to take into consideration the whole environmental impact of the production-consumption chain. The life cycle methods maybe used for environmental impact reduction from ‘cradle to grave’. The use and internalization of life cycle methods in seven large international companies was studied. The companies were using five different life cycle methods, mostly infrequently. At the companies studied use of the life cycle methodology was not internalized but rather in the early stages of internalization. Most of the companies mentioned problems gathering valid data. In five cases results of the life cycle method are used for activities which may lead to environmental impact reduction. The use of the results for purchasing purposes occured at two companies. In only one case the purchasing department was involved in the development of the life cycle method. None of the companies uses or intends to use the life cycle method for toxics reduction. In all the companies the attention to toxics was insufficient to prevent potential shifts of hazard to the working environment.

In chapter 6 it was studied why and how companies are reducing the toxics (use and releases). The study was executed in ten large internationally operating companies. Most companies are far from using the whole potential of activities relevant to toxics reduction within the company. This should consist of a comprehensive policy with clear targets, a comprehensive program for toxics reduction (including toxic use reduction) and a monitoring system extending to the corporate level. Only one company was found that met these requirements.

Integration of the environmental management and the health and safety management not only may improve the effectiveness of the environmental management but also may prevent a shift of the impact of toxics on the open environment to a risk for the working environment. Most of the companies studied had integrated their departments for environment and health and safety.

All but one of the companies studied mentioned legal compliance as one of
the reasons for toxics reduction, product (safety) was mentioned by four companies and the working environment was mentioned twice.

Six of the companies studied have substantial programs for toxics reduction. Most of the programs are directed to toxics release reduction but also three programs to toxics use reduction. Two companies have methods to prevent the substitution of less toxic by more toxic chemicals.

As to toxics reduction measures most companies mentioned more measures than process related ones. For toxics release and use reduction the measures taken were very different in complexity, varying from a black list to the execution of a complex program. For a sustainable industrialization environmental management should be extended beyond the own production chain. Three companies specified requirements about toxics to their suppliers. Companies can do more in this field using requirements for excluding or limiting toxics in supplies.

In chapter 7 five examples of process modifications given by the companies as an example of toxics reduction were analyzed. All companies mentioned environmental legislation as a reason for process modification and three also mentioned legislation aimed at the working environment as a reason. One of the companies involved used a ranking list for solvent substitution, evaluating environmental risks and risks of the working environment. Three other companies used less sophisticated lists for solvent optimalization and product development. The methods used for process modification are rather different. Three stressed input substitution and one product reformulation. These four lead to toxics use reduction. In two of the three cases that input substitution was performed the risks shifted from toxic to inflammable. In the two of the three cases that workplace legislation was mentioned as a reason for process modification, the working environment improved after process modification. Unexpectedly three of the four cases of toxics use reduction studied were said by the company to lead to increased costs. Factors to evaluate whether processes for toxics reduction are properly modified are, besides risks of processes, risks of products, substitution decisions (all risks), performance and quality of products and costs. Maybe the companies studied, as they were forced by legal requirements, focused on complying with legal requirements and not on improving the factors mentioned. Obviously one of the biggest challenges for companies addressing process modification is not
only solving the problem for which the modification was needed but improving or innovating the processes in such a way that more aspects of company performance improve.