

Coping with the Environment

Danish companies and their experiences with ISO 14001/EMAS.

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Abstract: *The implementation of environmental management practices in industrial companies has grown exponentially in recent years. In Denmark, more than 700 companies have been awarded an ISO 14001 certificate or are EMAS registered. It is often stressed that these companies, compared with the average company, are proactive and work more intensively with cleaner production and consider their production from a life cycle perspective. In a survey of the first 116 companies in Denmark, which had implemented environmental management practices by the beginning of 1998, we examined how the initial environmental review was carried out and what different environmental solutions resulted. The conclusion is that the environmentally certified companies deal with more environmental relations than environmental regulation normally envisages. This more frequently results in the implementation of cleaner production measures than in the average company. It also appears that the EMAS registered companies described the environmental problems in greater detail, managed more of them in their management system, and implemented more radical cleaner production measures than companies which have only adopted ISO 14001.*

Key Words: Environmental management systems; ISO 14001, EMAS, Cleaner Technologies, Environmental performance.

1. Introduction

More than 700 companies are now certified, and the number is continually growing which makes Denmark one of the leading countries in this respect (Toth, 1999). The companies which implement environmental management systems are normally environmentally positive and proactive (Christensen & Nielsen, 1996b, Welford, 1996). This is often documented by a number of case stories, where particular examples of the companies' good environmental activities are pointed out. However, it is also often stated that there is a lack of data that could provide better substantiation for the claim that companies with an environmental management system are „beyond compliance“ (Hillary & Thorsen, 1999). In this survey, we seek to uncover the experiences, which the certified companies have gained from their environmental work. We have tried to find out, how the companies approached this task, what results they achieved from it in relation to the implementation of cleaner technology and the adoption of broader environmental strategies, such as life cycle assessment or other product orientated environmental strategies. Through an extensive survey based on questionnaires we have obtained information from 107 of the 116 industrial companies that were certified according to ISO 14001 and/or EMAS-registered by the 1st of January 1998.

One of the prerequisites for being environmentally certified is that the firm must comply with the existing regulations and furthermore that you continue to improve your environmental conditions. This automatically means that companies which are certified or registered are ahead of ordinary companies. At least it does so in Denmark (Christensen & Nielsen, 1996a, Christensen, 2002) although evidence suggests that this is not necessarily the case in the USA (Hillary & Thorsen, 1999). Thus it must be expected that these companies have created some rather advanced environmental policies, objectives and targets and then implemented these by reducing pollution and resource use. This could happen through the implementation of cleaner technologies, but also seminally by working more systematically with the environmental impacts of their products in a cradle to grave perspective.

In this article we will focus on the companies' preparation of the initial environmental review. Among other things, the methods and tools used to make the review, the data collected and the types of environmental problems dealt with will be scrutinised. We also closely examine, how the companies organised their review and what strategies they had adopted regarding cleaner production. The aim of the survey was also to uncover other aspects of the implementation of environmental management systems and these results are reported elsewhere (Christensen, Remmen & Nielsen, 1999, Christensen 2002).

In Europe, companies can adopt ISO 14001 and/or EMAS. It is of course questionable, whether it is wise to have two different schemes or not (Steger, 1999). Furthermore, it has been argued that there are no differences between the two schemes apart from more bureaucracy and public disclosure of data in EMAS, and thus they should be used in exactly the same way although EMAS would be more burdensome (Steger, 1999). In this survey we also address some of these differences between EMAS and ISO 14001 in order to see which of these have the best environmental performance.

2. The survey

At the beginning of 1998, 153 companies were certified or registered. 37 of these were farms and were all certified in connection with a public project, where they had followed the same method, when implementing environmental management. We have therefore chosen to disregard this group of companies. The survey is specifically aimed at the 116 companies that are not agricultural. Each of the companies received a questionnaire. Out of 116 companies, 107 responded, giving a respond rate of 92%.

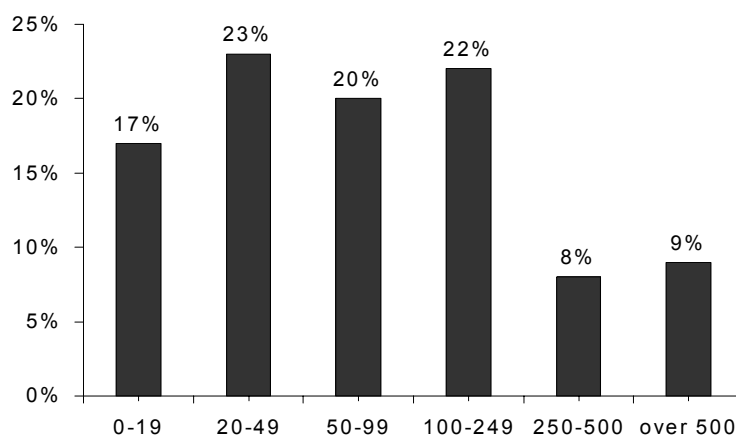


Figure 1: The companies in the survey distributed according to size.

The 107 companies in this survey range from quite small companies with 1 to 4,800 employees. Figure 1 illustrates the distribution of the companies according to size. As it appears, there are relatively many small companies. A total of 60% have less than 100 employees

When treating the data, we have tried to illuminate the possible differences between the companies caused by difference in size, trade-affiliation, and whether they are EMAS registered or not. These detailed conclusions are presented in other articles (Christensen, Remmen & Nielsen, 1999, Christensen, 2002). When analysing the EMAS registered companies, it should be born in mind that they are almost always certified according to ISO 14001 as well. Only one company has achieved EMAS registration without an environmental certificate according to ISO 14001/BS 7750. Of the companies, 38 were EMAS registered and 106 were certified under ISO 14001.

3. Experiences with environmental managements systems

From the outset, the construction of an environmental management system demands that the companies have a comprehensive view of their environmental conditions so that they know what to manage (Welford 1996, Christensen & Nielsen 1993). A description concerning the environmental conditions - the initial environmental review - can be given in various ways. Various methods of describing the environmental conditions can be used, large or short manuals can be preferred, the company can use consultants or they can solely rely on own resources. During the environmental review, various conditions can be stressed, and not necessarily all of the environmental elements have to be described in detail in the initial environmental review. As the environmental review is to form the basis for the future environmental priorities of the company decisions also have to be made, on which environmental conditions to focus in the management system.

3.1 Methods and tools in the initial review

During recent years, various methods of how to carry out an environmental review have been developed. When the environmental auditing method was introduced in Denmark around 1989, it often took the form of a „translation“ of the corresponding manual which the US Environmental Protection Agency developed for use in larger chemical companies (Christensen & Nielsen 1993, EPA 1988). In the following years, various consultancy firms produced a number of manuals. The first generation of manuals was based on methods emphasising that the environmental review should start from the „bottom“ of the company, typically by setting up an inventory of all the materials and products as well as waste at each machine, product line or department. Consequently, a picture of the environmental conditions of the company could be drawn. This method was very much characterised by its demand for large amounts of very specific data, and frequently this meant that the environmental review apart from relying heavily on support from consultants was also very expensive (Christensen & Nielsen 1993).

As alternatives to the methods mentioned above, simplified „husbandry-models“ were developed to carry out the environmental review. Typically, the large manuals were 40 to 80 pages long, while the short manuals were only 5 to 15 pages long. Most of the short manuals are based on the perspective of starting from the „top-down“ in the company by creating a more comprehensive view of the firm (Danish EPA, 1992). This method stress that data are often absent on the level of the individual machine or in the individual department. On the contrary, it is possible to draw a comprehensive picture of the environmental conditions of the company on a quite general level. This takes place, when making a mass balance of

the whole company. Afterwards, the mass balances of each department can be attempted. By doing this, it becomes clear, in which department the largest environmental problems are, and focus can be placed on this department. Thereafter, focus can be placed on the process line, and then on the individual machine to identify the actual areas, where environmental improvements can be made. So instead of having a detailed overall picture, this method is to a higher degree designed to use the data available and only to make supplementary measurements, when urgently needed. The point of this is that (only) the most obvious problems are being solved, as they are focused on in the top-down analysing process.

Among the certified companies we have found examples of both the use of the larger manuals as well as the small ones made with the mass balance for the whole company as a starting point. In that way, a wide variety of manuals from different consultancy firms and trade organisations have been used.

We have asked the companies which methods/tools they have used to describe their environmental conditions. As is shown in figure 2, half of the companies have used the short manuals, whereas only 11% have used the larger ones. In the typical Danish SMEs, there is no doubt that the small manuals are best aligned with the existing level of knowledge in the firm, and thus the best starting point for their work with the initial environmental review.

Apart from using manuals the companies have also seized other examples of systematic descriptions of the environmental conditions of a company in order to use these as „manuals“ or „checklists“ to describe their own company. In this way many companies have used the Annex of the Standard (ISO 14001, 1996; EMAS, 1994). These annexes list which environmental conditions may be relevant to consider, when implementing an environmental management system. Even though these lists are not particularly systematic or logical in their structure, the companies have been able to use them as checklists, in order to see which issues to describe, possibly in combination with the manuals. In the same way, the environmental permit has been used as a starting point for the description of the environmental conditions of the companies.

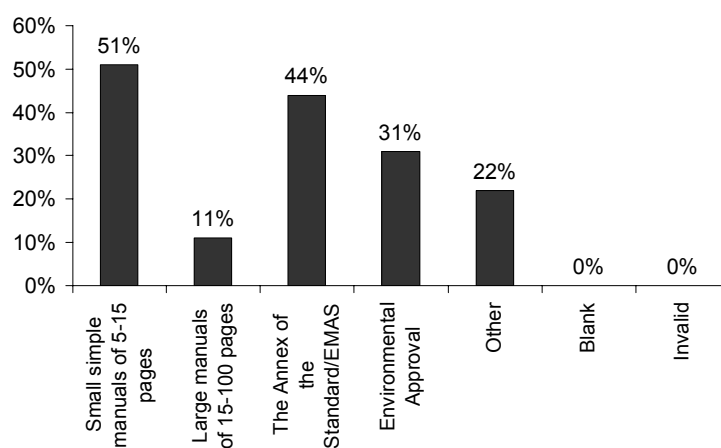


Figure 2: The methods used by the companies, when preparing their initial environmental review.

The fact that short manuals or checklists are used more often probably reflects the fact that many of the certified companies are SME's, but also that they have an interest in being able to make the environmental review „themselves“ instead of being dependent on consultants and other technical assistance.

3.2 The use of data in the initial review

During the implementation of an environmental review the companies may encounter the problem that they do not have sufficient data. If the description started from the „top-down“ by making a mass balance sheet for the company, it is in many cases possible to describe a mass balance by using the existing but scattered information from the environmental authorities (control measurements), book-keeping (invoices, utility bills) and product data sheets. Not until the review starts to zoom in on the departments and process lines does it become necessary to have more specific data, by for instance making measurements and registrations. It appears from Figure 3, new information has been obtained, especially through requesting new product data sheets and through the processing of information kept in the bookkeeping departments. One fourth of the companies obtained data through supplementary measurements. Typically, the EMAS registered companies are more thorough in their approach to the initial environmental review than companies who only use ISO 14001.

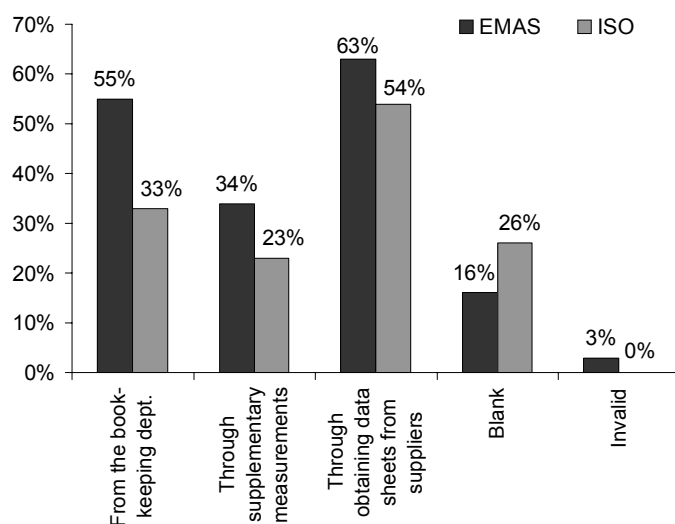


Figure 3. Various sources of data used in connection with the initial environmental review by environmentally certified (ISO 14001) and EMAS registered companies, respectively.

3.3 The products and the environmental review

For the more proactive companies it is evident that they must also work with the products and the environmental impacts they cause in their life cycles, when establishing the environmental review. In that sense the companies are preparing themselves for conditions, where green consumerism and a more product orientated environmental policy are the order of the day. But of course it has already been stressed in the standards (ISO 14001 and EMAS) that life cycle perspectives and working with the products are some of the long-term perspectives for the environmental management to consider.

We have also asked the companies, if in the environmental review they have considered the amount of polluting materials contained in the products. Sixty eight per cent of the companies have taken stock of this. The companies were also asked, whether they have assessed the environmental effects of some of their products in their life cycles. A total of 40% of the companies have done this. Almost half of the companies state that they have made a life cycle assessment, whereas fewer state that they have made a life cycle screening. From the

results that are also found in experiences with life cycle assessments in Danish industry (Broberg and Christensen 1999) these figures must be regarded as high. Life cycle assessment is a fairly new field, and it is our general experience that many companies do not yet know exactly what this concept covers. In this connection, it is presumably more appropriate to state that two thirds of the companies have acquainted themselves with which pollutants their products contain, and that approximately half of the companies have started considering environmental effects prior to and after the company. However, an earlier survey stated that only 20% had used life cycle considerations (Christensen & Nielsen 1996a), so the picture is emerging that product-considerations are increasingly integrated into the environmental management systems.

As the EMAS registered companies are more thorough in making their environmental review, it must also be expected that more often they consider the environmental effects of some of their products in their life cycles. This is definitely the case as half of these companies do so in contrast to the companies only certified according to ISO 14001, where only slightly more than a third have done so.

3.4 Prioritising the environmental problems

An essential outcome of the environmental review is the prioritising among environmental problems, so that it becomes clear, which of these, the company has to address (Welford 1996). Currently, there are several ways of prioritising the environmental problems. Some more or less scientific „scoring systems“ have been developed, which aggregate various aspects of the environmental problems, as for instance mass, dispersion and toxicity. These models are often described as „comparing pears and apples“, i.e. a comparison of incommensurable aspects of reality. On the other hand, many people advocates using other more obvious priority instruments, as for instance selecting problems, which is focussed on by the environmental authorities, using the golden rule that it (in some sense or other) reflects the politicians' priorities of which environmental problems to take more serious. This way of prioritising can be done by looking narrowly at the demands, which are placed, on the company, for instance in the environmental permit or more generally, what types of problems that are debated in society. So it is really a question of „laying the ear to the ground“ to see what problems „people in general“ think are important or in other words to use „common sense“.

Therefore, we have asked the companies, what procedure they have used in the environmental review to decide, which of the sketched environmental conditions to address. By far the most (79%) state that they have used common sense, also including taking a closer look at the environmental permit, selecting issues, where they may have had problems complying with limits and norms, as well as considering, what other companies have done. Only 40% of the companies state that they have also used a proper scoring system.

3.5 The environmental problems addressed

After the companies have reviewed their environmental conditions and selected which of these to address, a number of these problems will be managed more carefully in the environmental management system. This can either be done by laying down procedures to follow in the daily work or more specifically, as plans of action for improving specific environmental conditions. We have asked the companies, which environmental conditions; they have dealt with in their environmental management system, cf. figure 4.

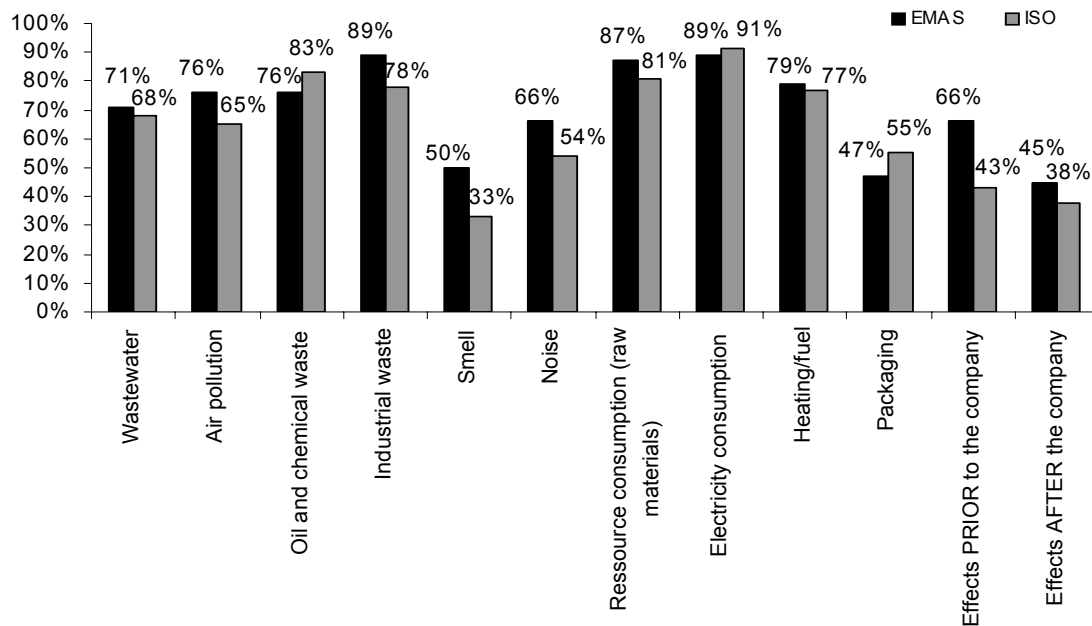


Figure 4: The frequency with which various environmental problems are dealt with in the environmental management system of certified (ISO 14001) and EMAS registered companies.

By taking a closer look, we will see that most companies manage resource consumption and energy consumption (electricity and heat), water/waste water and solid waste and a smaller fraction even addresses environmental conditions prior to and after production. Of these environmental problems the use of electricity and heat as well as environmental conditions prior to and after production are not normally addressed in the companies environmental permit so obviously these companies are ahead of traditional regulatory demands.

The EMAS registered companies do not only make a more detailed review, but they also manage more environmental problems, than the companies who are only certified according to ISO 14001. As mentioned earlier, this especially goes for air pollution, solid waste, smell, noise, and environmental conditions prior to and after the production.

We have also asked the companies, whether the working environment and the companies' implementation of cleaner technology have been influenced by the management system established. In 57% of the companies, the working environment conditions are included in the environmental management systems. With respect to this we also find that most EMAS registered companies manage the working environment (81%) more often than the ISO 14001 companies, where less than half of them do so (46%).

As stressed above, it is fundamental that environmental management aims at continuous environmental improvements and preventive actions. In Denmark, this is often understood, as a request to implement cleaner technologies. One of the decisive criteria for the success of environmental management is that these companies far more often than other companies implement cleaner technology. A total of 82% of all the companies have implemented some sort of cleaner technology. Figure 5 illustrates, what kind of cleaner technologies have been implemented.

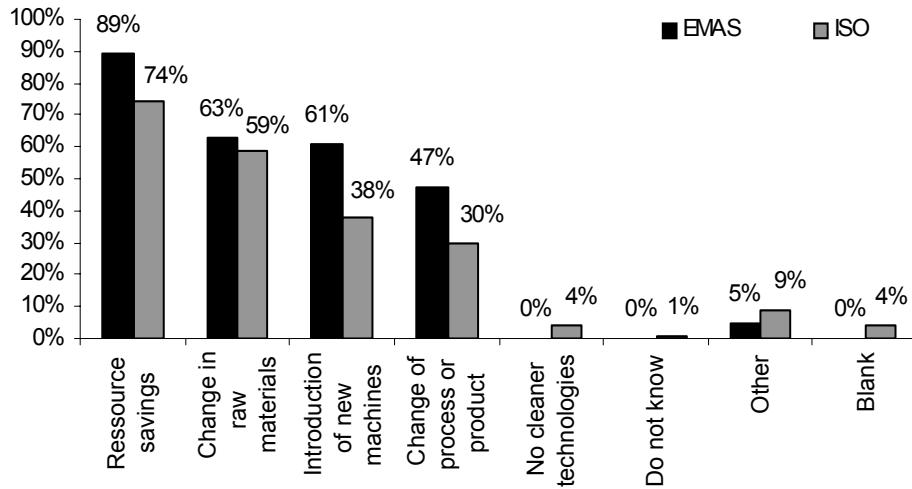


Figure 5: The introduction of various types of cleaner technology in the companies that have adopted ISO 14001 or EMAS.

It appears that most companies have introduced savings in resources and decreased levels of pollution through simple changes in work procedures and by increasing the environmental awareness of the employees, i.e., what could be called „good housekeeping“. However, it is more noteworthy that many companies have implemented substitution of raw materials. Furthermore, almost half of the companies introduced new machines, which cause less pollution, and more than a third have actually made changes in their production processes or in the products to improve the environment. By comparing the frequencies, with which the average Danish companies introduce cleaner technology, we can establish that companies with environmental management do so far more frequently. In an earlier survey carried out in 1997 which included a broad section of Danish companies, it was found that 55% introduced one or another kind of cleaner technologies (Christensen et al. 1997) compared to the present 82%. The introduction of resource savings takes place twice as often in companies with environmental management as in the average companies, cf. figure 6. Changes in raw materials happen three times as often, whereas almost twice as many companies introduce machinery which is cleaner or which changes their processes or products.

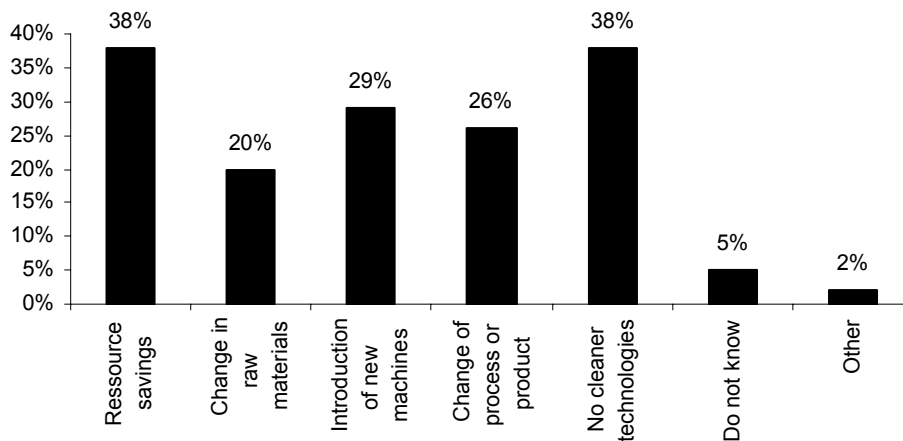


Figure 6: The introduction of various types of cleaner technology in the average Danish company (redrawn from Christensen et al., 1997).

The EMAS registered companies are also well ahead of the environmentally certified ones, when it comes to the implementation of cleaner technology. Not only do they more often introduce resource savings and good housekeeping, but they also create more advanced changes in processes and products. Furthermore, these companies more often introduce new machinery.

As the survey clearly demonstrates the EMAS companies are ahead of the ISO 14001 companies but both types of companies are ahead of the average Danish company. It is of course debatable whether the reason for this is the environmental management system as such or simply that we are comparing frontrunner companies with average companies. Are there in general any differences between frontrunner companies and frontrunner companies relying on environmental management systems? A survey of this kind can hardly answer this question as no comparison has been made with this type of companies. But from our experiences there are differences among the frontrunner companies as we know that companies adopting environmental management systems often elaborate on how this whole process have provided information that led the companies to realise resource savings and minimise environmental impacts. The systematic way of working with the environmental problems definitely has some advantages that other companies, frontrunners or not, can hardly exploit.

4. Conclusions

In this survey of the first 116 Danish companies which have implemented environmental management we have analysed how they handled the initial environmental review, and what kind of environmental results came out of it.

The companies who have introduced environmental management are obliged to be beyond compliance. When scrutinising the empirical findings from the 107 companies participating the picture clearly emerges that these companies are ahead of regulatory demands. The companies go further than the average companies, when it comes to analysing the environmental conditions and selecting the environmental parameters, which they subsequently choose to manage in their environmental management system.

The initial environmental reviews are often carried out by the companies themselves, usually by using simple manuals, or by being inspired by the Annexes of the Standards or their environmental permit. More than 60% of the companies have undertaken this task without any help from consultants. Therefore, it can be concluded that environmental management is a task, which most of these companies can easily manage on their own.

When drawing up the initial environmental review, the companies include both the working environment, as well as aspects of the life cycles of their products. In other words, in this connection environmental management guarantees a wider and more comprehensive environmental performance. The companies investigated have also implemented far more cleaner production measures than the average Danish companies.

We can conclude that the environmentally certified companies deal with more environmental relations, than the environmental regulation would normally envisage. This means that these companies more frequently implement cleaner production measures, than the average companies. It also appears that when comparing EMAS registered companies with companies who have only adopted ISO 14001 a higher number of the EMAS companies have described and managed different environmental problems as well as implemented more cleaner technologies. Future research should aim at establishing the actual progress in environmental

performance of these companies and not only relying on how the managers describe their efforts in a questionnaire.

If we compare the two schemes, ISO 14001 and the EMAS scheme, from which we have collected the data, there is no doubt that the EMAS registered companies have achieved more from an environmental point of view. They describe more environmental conditions in their initial environmental review, and similarly they deal with more environmental problems, when they implement their management systems. In addition, they introduce cleaner production measures more frequently. Thus the EMAS scheme seems to be the „Cadillac“ among the environmental management systems.

References

- Broberg, Ole & Christensen, Per (1999): LCA Experiences in Danish Industry. Results of a Survey. *International Journal of Life Cycle Assessment*. Vol. 4, no. 5. Pp. 257-62.
- Christensen, Per (2002): The use of environmental management systems in Danish Industry. (Forthcoming).
- Christensen, P. & Holm Nielsen, E. (1993). Environmental Audits, Clean Technologies and Environmental Protection in Denmark. *European Environment*. 3, part 2. pp. 18-22.
- Christensen, Per & Nielsen, Eskild Holm (1996a) : Implementing Environmental Management Systems in Danish Industry : Do We Go Beyond Compliance? *Eco-Management and Auditing*. Vol. 3. No. 2. pp. 56-62.
- Christensen, Per & Nielsen, Eskild Holm (1996b) : *Benefit or Burden ? Some Danish Experiments with Environmental Management Systems*. pp. 431-41. in Ulhøj, John P. & Madsen, Henning (eds.)
- Industry and the Environment. Practical Applications of Environmental Management Approaches in Business. Proceedings of the 3rd Conference of the Nordic Business Environmental Management Network. March 28-30, 1996, Aarhus. Denmark.
- Christensen, Per, Holm Nielsen, Eskild & Remmen, Arne : Miljøstyring og miljørevison i danske virksomheder. Midtvejsevaluering. (Environmental Management and auditing in Danish industries. Midterm-evaluation of the programme). Erhvervsfremmestyrelsen & Miljøstyrelsen. 1997.
- Danish EPA (1992): Miljøstyring – en håndbog i praktisk miljøarbejde (Environmental Management – a handbook in practical environmental performance). Orientering fra Miljøstyrelsen, nr. 6, 1992
- EPA (1988) *Waste Minimization Opportunity Assessment Manual*, United States' Environmental Protection Agency.
- Harrison, Kathryn (1999): Talking with the Donkey: Co-operative Approaches to Environmental protection. *Journal of Industrial Ecology*. Vol. 2, No. 3, pp. 51-71.
- Hillary, Ruth (1994) *The EU Eco-management and Audit Scheme as a Vehicle to Promote Cleaner Production*, UNEP Expert Seminar, Imperial College, London.
- Hillary, Ruth & Thorsen, Nils (1999): Regulatory and self-regulatory measures as routes to promote cleaner production. *Journal of Cleaner Production*. Vol. 7. No. 1. Pp. 1-11.
- Steger (1999): Will New benefits and Incentives Save EMAS? *Business and the Environment's ISO 14001 Update*. Vol. V. No. 3, pp. 2-3.
- Toth, Gergely (1999): „ISO 14001 speedometer“ Offers Fresh Look at the Certification Derby. *Business and the Environment*. Vol. X, No. 8, pp 3-5.
- Welford, Richard (1996): *Corporate Environmental Management*. Earthscan Publications.