# Experiences with Environmental Management Systems

Smink, Carla; Jørgensen, Tine Herreborg

*Published in:*
Tools for Sustainable Development

*Publication date:*
2007

*Document Version*
Publisher's PDF, also known as Version of record

# 6

# Experiences with Environmental Management Systems

*Carla K. Smink and Tine Herreborg Jørgensen*

Three case studies are presented in this chapter. The aim of the case studies is to analyse experiences with the practical implementation of an Environmental Management System (EMS) and to exemplify that stakeholder pressure for implementing EMS can vary significantly. The first case is a fish processing industry that has expanded their management system continuously to cover quality, environment as well as occupational health and safety. The second case study is a car production/assembly plant in South Africa where the primary environmental pressure comes from their parent company (BMW) and where the local enforcement of environmental regulations is weak. The third case study is from the Danish car dismantling trade where the business association and Danish EPA have made certified management systems mandatory.

## Implementation and maintenance of an EMS at Erik Taabbel Fiskeeksport Ltd.

In this case study, covering the period 1992-2005, the primary aim is to describe the EMS implementation process at E. Taabbel and the subsequent maintenance of the system with focus on environmental activities and organisational changes. E. Taabbel has also implemented management systems for quality and occupational health and safety. These systems are related to EMS and will also be part of the case study. The case description and analysis is based on (Jørgensen, 2001 and Jørgensen, 1995), as well as other references.

An overview of certificates for management systems obtained by E. Taabbel during the years is shown in table 1. Besides, E. Taabbel is certified according to DS 3027, a Danish standard for food safety based on HACCP, Hazard Analysis and Critical Control Points (Dansk Standard, 2002).

| Year | Certificate |
|---|---|
| 1995 | BS 7750<br>ISO 9002: 1994 today ISO 9001: 2000 |
| 1996 | ISO 14001:1996<br>EMAS: 1993, today EMAS:2000 |
| 2003 | OHSAS 18001:1999 |

***Table 1:*** *Certificates obtained and year issued the first time at E. Taabbel.*

## Presentation of Erik Taabbel Fiskeeksport Ltd.

E. Taabbel is a fish processing industry with 50-99 employees, situated in Skagen in the northern part of Denmark. The annual turnover is approximately 2,000,000 euro. They produce fresh and marinated, spiced and salted herring products, and 80% is exported to various countries in Europe. E. Taabbel is a family-run business, the owner's son is technical manager, a son in law is purchase and sales manager and a daughter in law is working in the administration. The employees on the shop floor are primarily unskilled and the management is self-taught with a good sense for business. Relationships with suppliers are built on loyalty.

The filleting process is illustrated in figure 1.

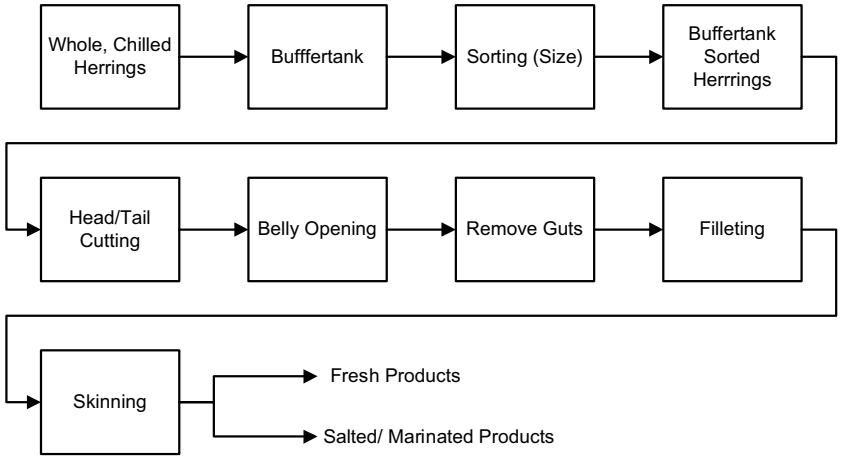


***Figure 1:*** *Filleting process of herring at E. Taabbel*

## Reasons for implementation of EMS

In November 1992 the general manager and owner of E. Taabbel decided to implement EMS according to BS 7750 as well as a quality management system (QMS) according to ISO 9002. E. Taabbel wanted to improve their environmental performance because they expected strengthened demands from the local environmental authorities. At the same time they applied for permission to direct discharge to the sea, which they knew would depend on their ability to implement cleaner technologies and to reduce the amount of pollution in the wastewater. E. Taabbel also planned to implement a quality management system because the quality demands from customers were increasing, and some customers were also implementing QMS.

## Organisation of the implementation process

Two consultants assisted with the implementation of an integrated quality and environmental management system as part of a research project with Aalborg University funded by the Ministry of Industry.

In the beginning, the organisation at E. Taabbel was characterised by an informal structure. Contacts took place in different groups and social networks were characterised by unwritten rules and contacts. The implementation of EMS resulted in a higher degree of formalisation of structures and decision-making processes.

E. Taabbel had doubled their turnover in the beginning of the 1990s and the organisation had been busy producing and expanding. The management did not have time to focus on an adaptation of the organisation to this growth. By the end of 1992 they looked forward to take at closer look at the production in connection with implementation of management systems. The employees were sceptical, and worried that they would have to write and read a lot related to the system. The manager was aware that they wanted to build up a system without too much paperwork.

Five people formed the implementation group and were given management responsibility. At the beginning of the project, the management was primarily engaged and dynamic in relation to *practical improvements* of the quality and environmental performance description follows). In the first period, a systematic approach and engagement of employees had low priority in the implementation. The informal structure, the tradition of little paperwork and the focus on the daily production made it difficult for the consultants to engage the managers in the description of the system. Six months later, few steps had been taken in order to build up the system. A new quality and envi-

ronmental manager was employed and more resources were spent on the project. At this stage, the consultants had to write drafts for procedures, but gradually the managers took on this responsibility assisted by the consultants. When procedures and instructions were formulated, the relevant employees were asked for details and later on for comments on the written drafts. The consultants found it important that the management participated in writing of the drafts. If the consultants had formulated the procedures, then the 'ownership' and the understanding among managers and workers would have been low.

The system description and implementation were divided in two phases. The last three months before certification was resource demanding, since the main part of the system was described and up-dated in this period. During the implementation a number of corrections were made in the descriptions. When the day of certification was determined, the implementation was characterised by higher commitment throughout the organisation. The attitude towards the system became more positive as the employees became familiar with the new practises.

## Practical improvements of performance

The most significant environmental impacts at E. Taabbel are discharge of wastewater and consumption of water and energy. E. Taabbel had no tradition of environmental improvements when they began to build up the management system. In the early stage of the project, two managers and two blacksmiths from E. Taabbel visited a competitor to see the experience from a demonstration project regarding cleaner technology. The Danish Ministry of Environment funded the demonstration project, and the competitor had to show the results to interested stakeholders. This visit inspired the technical manager and the blacksmiths to reduce the environmental impacts at E. Taabbel rather than describing the system. The first year they made numerous environmental improvements without formulating targets or a programme with means, timeframe and responsibility. The managers and employees are used to implementing good ideas immediately.

The first year E. Taabbel reduced their water consumption by 50% in fish filleting processing and the amount of organic material in the wastewater by 30%. These improvements were, among others, achieved by:

- Development of a system of dry transportation of herring waste (reduces the amount of organic materials in the wastewater)
- Optimisation of machines and processes in order to reduce water consumption

- Brooms to Clean line strainers leading to reduced water consumption
- Reduced water consumption by good house keeping such as cleaning floors with a broom instead of a water hose, smaller water hoses with turn-off grip and demands to the cleaning company to measure and reduce water consumption for cleaning.

These improvements were profitable. The reduced amount of wastewater discharge, for example, cut the expenses to taxes with more than euro 130,000/year. Energy consumption, however, increased during the implementation of these solutions due to higher degree of automation.

During the formulation and implementation of the system, the quality was also improved in the production steps from raw materials to the finished product. For instance by:

- Increased control and surveillance of raw materials
- Definition of different categories of quality
- Investments in grading machine and stirring system
- Tracking system back to the fishing boats

The managers of E. Taabbel considered integrating occupational health and safety management in the quality and environmental management system. Uncertainty about the ability to comply with strengthened regulation regarding noise just before certification was the reason why this was not implemented. But occupational health and safety conditions were also improved:

- Draught and cold in fillet production were reduced
- Noise from fillet machines was reduced
- Action plans to reduce monotonous repetitive work were prepared

## Maintenance of the system

The implementation of the quality and environmental management system can also be seen as organisational development. Division of responsibility and assignments was defined, and the new quality and environmental manager strengthened the management of E. Taabbel. With the system it is easier to plan and carry through the daily production as coordination and collaboration between foremen and purchase and sales staff improved. This is due to increased written information about for instance size and quality of batches, and when or where they are being processed.

The internal communication between management and employees was also improved. Information about the quality demands for each batch is now visi-

ble for the employees on a screen in the production, and it enables them to discuss whether the fish is of the right quality for the customer and contact the foreman if errors arise. In turn, the employees at the filleting machine also inspect the band conveyor in order to control the quality of the herrings. Use of management systems have resulted in more paperwork. However, nobody complains since information about the daily production is increased at the same time. Besides, use of the system has secured documentation of each batch, which has not only reduced errors, but also caused them to be found before the products are sent to the customers.

The active participation of management and employees during the description and implementation has resulted in a quality and environmental management system adapted to the characteristics of the company. The managers found that the system did not lead to unnecessary paperwork and bureaucracy, and at the same time the organisational flexibility was maintained.

In 1996 E. Taabbel obtained an EMAS registration. They wanted to show their openness and environmental ambitions by registering to the highest standard for EMS. When considering changes of production processes, quality and environmental improvements and investment in new equipment and machines, E. Taabbel is especially aware of integrating quality and environment considerations. The integration of quality and environment in one system has made E. Taabbel think about the two elements in connection when they consider changes of production processes.

After the systems certification, the quality consultant continued his work with E. Taabbel. He participates in quarterly management meetings about the status and activities related to their management system, and keeps them updated with changes of and news related to the standards. In 2003 the consultant also assisted with the implementation of occupational health and safety, OHSAS 18001.

## Continuous improvements

Since the certification in 1995 E. Taabbel has continuously worked for improvements of the environmental performance. Examples are:

- Improved waste sorting system
- Reuse of marinade
- Recirculation of process water
- Reduced water consumption by development of new gill machines

- Improved methods to blend marinade resulting in more herring fillets per barrel, reduced water consumption, less barrels to wash and better utilisation of cooling facilities
- Reduced water consumption for cleaning
- Reduction of detergents

The herring waste to the fish flour factory has become much drier, resulting in increased earnings of about euro 117,000/year. Based on the yearly environmental statements of E. Taabbel, the development of the environmental performance is illustrated in table 2.

| **Environmental impact** | **96/97** | **97/98** | **99/00** | **01/02** | **03/04*** |
|---|---|---|---|---|---|
| Water consumption ($m^3$) | 91,100 | 81,400 | 85,200 | 83,200 | 85,920 |
| Waste water, COD (kilo per ton raw material) | 15 | 18 | 17 | 17 | 9 |
| Electricity 1,000 KWh | 1,448 | 1,496 | 1.570 | 1,330 | 1,547 |
| Detergents (ton) | 60 | 47 | 36 | 35 | 30 |
| Waste, incinerator (ton) | 130 | 218 | 197 | 171 | 194 |
| Waste for reuse (ton) | 25 | 16 | 13 | 17 | 20 |

* The statement for 03/04 included 15 months due to re-adjustment of accounting year. But the numbers are adjusted to 12 months.

***Table 2:*** *Development in environmental performance for E. Taabbel.*

In 1992/93 the water consumption at E. Taabbel was 212,000 $m^3$. Today, E. Taabbel has more than halved their use of water with a continuous focus on this resource (see table 2). According to the quality and environmental manager, the reason for the increase in water and the reduction of COD in 03/04 is a change in raw material from big herrings in big batches to small herrings in small batches. The bigger the herrings the less water and electricity is needed in the production processes. The smaller herrings are fresher which results in lower COD. The increase in waste in 03/04 is due to the small herrings and the building of a new cooling facility.

In 2003 E. Taabbel built their own cooling facility. Minimising the energy consumption was part of the planning of the new cooling facility and E. Taabbel has also reduced transportation of products. In 1993 the electricity consumption was 1,186,000 KWh. During the last 12 years E. Taabbel has

increased automation and thus increased use of electricity, but at the same time they have worked on reducing energy consumption. Reduced energy consumption is also the main environmental target for 2004/05 together with keeping the water consumption at 4.1 $m^{3/}$ hour in the filleting division.

### Strengthened relationship with stakeholders

E. Taabbel has established a close co-operation with the environmental authorities based on openness and dialogue. E. Taabbel finds it advantageous to participate in the development of cleaner technologies. Co-operation with a supplier gives several benefits: the technology is adjusted to the needs of the company; a detailed knowledge about the technology is build up inside the company; and E. Taabbel is the first company to introduce the new technology. Previously, E. Taabbel was a rather closed organisation; today it has become an open organisation that willingly discusses its environmental activities with external stakeholders (Jørgensen, 2000).

## Integration of OHSAS 18001

Over the years, E. Taabbel has worked towards reducing the traditional health and safety problems in the industry: accidents, noise, manual handling, climate and repetitive strain injury. In 2002 E. Taabbel decided to become certified according to OHSAS 18001 in order to work more systematically with improvements in this field. The management wanted to show their concern about health and safety conditions, to maintain a reputation of a good workplace, and be able to keep and attract good and experienced employees (Jørgensen and Busck, 2004).

E. Taabbel found it advantageous to be familiar with the quality and environmental management system: the handbook, documentation and routines. The implementation of OHSAS 18001 took 25-50% of the time spent to implement the other systems. As a result the systematic approach has improved the overview and control of problems in the field of health and safety together with a positive engagement of both employees and management. The health and safety activities has become formalised and the meetings in the safety committee have improved. Employees in production register for instance ”close by” accidents, and the safety representatives feel better prepared to make suggestions for action plans (Jørgensen and Busck, 2004).

## Future challenges

E. Taabbel plans to build a new factory within the next five years and have made drawings that take into account good conditions for quality, environment and occupational health and safety. This will be a challenge to create a modern factory integrating considerations of the three issues.

An environmental management system is no guarantee for environmental-friendly products. In general, the companies should pay more attention to the environmental impacts in the product. A life cycle assessment by Thrane shows that the most significant impact for fish products is to be found in the fishing stage (Thrane, 2004).

In general, E. Taabbel has changed their predominantly *reactive* approach towards new demands on quality, environment and occupational health and safety from customers and authorities. E. Taabbel has become more *proactive* by setting the standard for quality in the herring industry and to be ahead of demands from environmental authorities. The implementation of an integrated management system has contributed to strengthen this position via securing continuous improvements of performance to keep the reliability towards customers, authorities, employees and other stakeholders in society.

# Environmental management systems in the product chain of cars

Cars are one of the most polluting products in the world with significant contribution to deteriorated air quality, climate change, human health effects, noise, congestion, accidents, deaths and injuries. Even though, the environmental impacts of a single car have been reduced, the expanded use of cars and the rapid increase in the number of cars world wide, have neutralised these achievements (Smink et al., 2005b). OECD expects the total number of cars in OECD countries to grow by 32% from 2007 to 2020 and the total global growth is expected to be 74% in the same period (Wengel et al., 2003).

The next two case studies are from the car industry. In the first case study, focus is on a car manufacturer and the implementation of EMS in the production facility at BMW's Rosslyn plant in South Africa. In order to understand the context, a briefly description is made of BMW's environmental strategy and the regulatory framework and enforcement in South Africa. The

second case study focuses on the implementation of mandatory EMS in car-dismantling companies in Denmark.

## BMW: corporate strategy

BMW's corporate strategy is the mayor reason, why BMW has implemented certified EMS at all its production facilities worldwide. The BMW group has a tradition of improving the environmental profile of their products. Table 1 summarises key milestones.

| ***Year*** | ***Environmental activity*** |
|---|---|
| *Late 1980s and Early 1990s* | • Introduction of water-soluble paint technology<br>• Focussing on issues of disassembly and recycling of end-of-life vehicles<br>• Extending its management principles to include environmental guidelines |
| *Mid-1990s – present* | • Introduction of low-emission water-borne paint technology and powder clear coat<br>• Production of a natural gas powered series-production car and a small production series hydrogen powered car<br>• Committed to sustainable environmental protection<br>• Focus on cleaner production, clean energy and lightweight engineering<br>• EMS (ISO 14001) in all manufacturing facilities (1999) |

***Table 3:*** *BMW and environment (based on Toffel et al., 2002)*

The BMW Group has introduced ISO 14001 and ISO 9001 in all its production facilities. A basic foundation for this is the 'Cleaner Production Programme' of the United Nations Environment Programme (UNEP), signed in 2001. The company voluntarily undertakes the practice of preventive environmental management as a model for its own production process (BMW-web, 2005).

## BMW: EMS at the South African production facility

BMW's production facility in Rosslyn, South Africa is owned by the BMW Group and was the first foreign location. At this plant, more than 40,000 BMW 3 Series are produced a year, many of which are exported to US, Japan, Australia, Africa and Middle East (BMW, 2004a; BMW, 2004b).

In 1999, the Rosslyn plant received certification for its integrated management system for quality, occupational health and safety; and environmental protection in compliance with ISO 9001, ISO 14001 and BS 8800 (BMW-web, 2004a; BMW-web, 2004b). The main reason for implementing ISO

14001 was the requirement from their parent company. The environmental manager at the Rosslyn plant stated: "… the demand from the parent company is also the demand from the customer. (…) It took approximately six months to implement the EMS". During the implementation, an environmental manager of BMW Germany assisted the Environmental Department, which has three employees. When the system was implemented, the environmental manager left for Germany, and the system stagnated, or as the environmental manager says "it was no continuous momentum to keep it going. (…) It took approximately a year, before the Rosslyn Plant started working with the EMS again" (Smink et al., 2005a). The implementation process was based on an expert strategy with the advantage of a short implementation process but with the disadvantage of not being embedded in the organisation and not integrated in decisions and daily practises until later.

From 1998 to 2001 the Rosslyn plant has reduced its environmental impacts, risks and accidents considerably. After implementing ISO 14001, the BMW Rosslyn plant has e.g. reduced water and electricity consumption per manufactured vehicle by approximately 90% and 45% respectively, despite having switched to water-based paint technology (BMW, 2002; de Jongh and Kienaar, 2004). Furthermore, BMW recycles approximately 1900 tonnes of paper, 37,000 kg of steel, 26,260 kg of iron and 2,091 tonnes of wood per annum after implementing EMS (de Jongh and Kienaar, 2004). The improvement rates at the Rosslyn plant are much higher than for the overall improvement figures for the whole BMW group. The reason is probably that the Rosslyn Plant began implementing EMS and environmental improvements later than other BMW production facilities. During the first years with focus on environmental improvements the Rosslyn Plans has been able to pick the so-called "low-hanging fruits".

## Environmental regulation in South Africa

The environmental policy of the Rosslyn plant reflects the environmental strategy of the BMW headquarter. South African environmental regulation has not been a driving force for the implementation of EMS. In fact, a difficult part of complying with ISO 14001 was to determine the relevant environmental legislation for the company. BMW took long time to gain an overview of the legislation to comply with, as BMW has experienced that the South African law is extensive and incomprehensive (Smink et al., 2005a). The environmental regulations of industries are based on different media-oriented acts, such as the national Water Act (1998) and the Atmospheric Pollution Prevention Act (1965). Even though South Africa has been through a process of transition, environmental regulations suffer from lack of enforcement. The lack of enforcement is related to insufficient human and financial resources (Jeppesen, 2004)

The lack of overview of South African legislation caused, that the Rosslyn plant decided to use the US EPA guidelines for air pollution and the Dutch intervention guidelines regarding smoke and water pollution. The environmental department has participated in courses about environmental regulations in order to implement EMS. BMW had to contact the authorities in order to ask for specific pollution permits. Furthermore, BMW takes their own water samples; the competent authority - the municipality - does not have the resources. In other words, the demand from the parent company to implement ISO 14001 ensures that certified companies comply with regulations, rather than the enforcement of local regulation.

Transnational companies with a proactive environmental strategy have the challenge to keep up momentum in their environmental activities since there is no pressure from national regulation. Some transnational companies have implemented EMS in order to secure that emissions from a specific plant are handled in an environmental sound manner. In other words, in a developing country, transnational companies must take responsibilities for insufficient environmental governance, if the emissions from their plants are to reflect the environmental standards of industrialised countries (Smink et al., 2005a).

## Diffusion of EMS in the product chain

In 2000, the Rosslyn Plant integrated a supply chain management programme into its EMS. One of the major reasons for this was that BMW had recognised that suppliers collectively bring more than 70% of the value of each car to the line, and that supply chain failure impacts directly on the BMW reputation. In order to maintain the integrated environmental compatibility of their processes, BMW expected suppliers to introduce and maintain effective EMS (de Jongh and Kienaar, 2004). The initial target was that all suppliers should have a certified EMS according to ISO 14001 in order to improve the environmental performance. Most suppliers to the Rosslyn Plant are local, for example from the steel and plastic industry. The few overseas suppliers are mainly BMW's own component manufacturing plants. The latter group was already certified due to BMW's corporate environmental strategy (Smink, et al., 2005a)

The supply chain management programme was designed to provide key suppliers, which are a total of 48, with support to implement an EMS. In July 2002, 28 suppliers were certified according to ISO 14001. By the end of 2002, the Rosslyn Plant expected 70% of its suppliers to be ISO 14001 certified (BMW, 2002). In the course of implementing this programme, BMW realised that aiming at an EMS for all suppliers was too high an ambition. For some small suppliers EMS was too complicated and too expensive. Therefore, small suppliers should have an environmental audit, which was

just as effective in ensuring the environmental performance (Smink et. al, 2005a). If suppliers fail the audit, they will be excluded from the supplier group. However, some suppliers are the only ones in the country. "So our hands are kind of tight if [our suppliers] are not performing, because they know we need them". (…) "At the moment, the only stick BMW has to encourage these suppliers to improve their environmental performance is by giving a lower price for the product" (Smink et al., 2005a).

BMW has taken a new role related to the local community with their initiative of a waste club including the major industries in the area. They discuss and inform about environmental issues. Next step for BMW is to get a government representative and local environmental authorities to participate. BMW wants to provide guidance to companies regarding improvements of environmental performance. For instance, it is difficult for individual companies to get access to all new laws, and therefore, BMW are willing to share their knowledge. They do not want to be a company with high environmental performance while neighbour industries still dump waste onto the road. BMW has put their own resources into organising the waste group caused by lack of enforcement and resources from the environmental authorities (Smink et al., 2005a).

## EMS in car dismantling trade - A mandatory approach in Denmark

In contrast to BMW in South Africa, regulatory demands are the reason why Danish car-dismantling companies since July 2000 have to have a certified EMS or a certified Quality Management System (QMS). The first part of this case study gives an overview of the development and content of the regulation of car dismantling companies in Denmark. The second part presents the response to the mandatory EMS from car dismantling companies with focus on their attitudes towards and practical experiences with EMS.

## End-of-Life Vehicle regulations: a brief history

Danish End-of-Life Vehicle regulations can be divided in to two phases: 1980s and 1990s onwards. Table 3 gives an overview over these regulations.

| *Year* | *Environmental regulations* |
|---|---|
| *1980s* | • The Danish EPA publishes a policy document on "End-of-Life Vehicles – the Environmental Agency's statement on the End-of-Life Vehicle Problematique in Denmark" (1979)<br>• Hardly any regulations of car-dismantling companies<br>• Very few car-dismantling company has an environmental permit<br>• Lack of enforcement<br>• Focus on local environmental problems (e.g. noise, dust, smell and smoke) |
| *1990s* | • Implementation of Scrap Vehicle Bonus (1994)<br>• Voluntary agreement with the Business Association for car-dismantling companies to provide security for expenses for transport and destruction or depositing a company's waste (1998)<br>• Scrappage Package (1999): mandatory EMS for car-dismantling companies; scrapping fund, dismantling requirements |

***Table 4:*** *Overview over End-of-Life Vehicle regulations in Denmark (based on Smink, 2002).*

## Mandatory EMS for car-dismantling companies

In 1999, the Danish Environmental Protection Agency implemented new ELV-regulations, the so-called Scrappage Package. Forthcoming EU regulation on ELVs (EU Directive 53/2000/EC) was a major driving force for implementing the Scrappage Package. Main elements are:

- Annually, car-owners have to pay € 12 to a scrapping fund.
- A Statutory Order informs car-dismantling companies of which materials and products have to be dismantled.
- Car-dismantling companies have to implement a certified EMS (ISO 14001 or EMAS) or a certified QMS (ISO 9001).

The first two aspects of the Scrappage Package are covered briefly, since the focus is on experience with mandatory EMS in car-dismantling companies.

## Scrapping fund

In 1999, the Act on 'Environment Premiums and Reimbursement in connection with Dismantling and Scrapping of Vehicles' Act number 372 of June 2, 1999 (Lov om Miljøbidrag og Godtgørelse i forbindelse med Ophugning og Skrotning af Biler)was adopted. The purpose of the act is to provide a financial basis for reimbursement to car owners to deliver their ELV to a car-dismantling company for waste treatment. This act has to prevent people

from abandoning their ELV, as they don't have to pay for delivering their ELV to a car-dismantling company. Besides, car-dismantling companies are henceforth obliged to take in all ELVs regardless the make and its condition. In order to finance this system, all car-owners have to pay an annual environmental premium of € 12. This environmental premium is part of the compulsory liability insurance. Car-owners, who deliver a vehicle for recycling to an authorised car-dismantler, receive a certificate of destruction and € 237 from the recycling-fund. In other words, it pays to deliver your ELV to a car-dismantling company.

## Materials to be dismantled

Danish car-dismantling companies have to dismantle various products and materials. In the Statutory Order on 'Handling of waste in the form of engine driven vehicles and waste factions of these' (Statutory Order 480 of June 19 2002. Bekendtgørelse nr. 480 af 19. juni 2002 om håndtering af Affald i form a motordrevne køretøjer og affaldsfraktioner herfra. This Statutory Order has replaced Statutory Order nr. 860 of November 29 1999), these products and materials are divided into two categories: hazardous wastes such as oil, brake fluid, coolant, battery, etc. and non-hazardous waste e.g. tyres, glass and airbags.

The Statutory Order describes in detail which materials and products have to be dismantled. The objective of the Order is that the environmental burden of waste has to be reduced and that re-use and recycling of waste components have to be increased. There is some evidence that the recycling percentage of ELVs has increased. Approximately 80% of an ELV is recycled in Denmark in 2000 (Smink 2002: 299). Compared to 1997, this is an increase of 5% (in absolute numbers approximately 46 kg more.

## Authorisation of car-dismantling companies

The Statutory Order also regulates the authorisation of car-dismantling companies. All car-dismantling companies have to have a certified EMS (ISO 14001 or EMAS) and/or a certified QMS (ISO 9001) in order to be able to register at the Danish Environmental Protection Agency. At least three reasons can be mentioned why the Danish EPA has chosen this approach. First, in the late 1990s, the EU was working on a Directive on End-of-Life Vehicles, which would require authorisation of car-dismantling companies. The Danish Scrappage Package is closely shaped by the Directive proposal in an attempt to minimise the adjustments to be made when EU regulation came into force. Secondly, authorisation of car-dismantling companies aims at strengthening existing regulation, in such a way that harmful waste is dealt with in an environmental sound manner. Finally, an expected effect of the

Scrappage Package was a reduction in the number of car-dismantling companies. The Danish EPA estimated that 100-150 car-dismantling companies would meet the needs for car dismantling in Denmark. This would mean a reduction of about 250-300 companies. However, by May 2005, Denmark counts 212 authorised car-dismantling companies. All the car-dismantling companies have chosen to become certified according to ISO 14001.

## Experience with certified EMS

The Danish car-dismantling companies were interviewed at a time, when they were working on, or had just implemented a certified EMS. This means that the experiences described in this paragraph are the early experience with the new system. The described advantages and disadvantages are experiences that are highlighted by car-dismantling companies, the business association for car-dismantling companies, external certifiers and the competent authorities (municipalities).

The disadvantages of a certified EMS are (based on Smink, 2002):

- Certification makes the system unnecessary expensive
- Free riding
- Limitations of third party certifications

### Certification makes the system unnecessary expensive

EMS certification of car-dismantling companies is seen as unnecessary expensive. One company stated: "we have got a lot of extra work. We have always taken care of the environment, but since we have implemented a certified EMS, we have got a lot of paperwork. We did not change anything in our daily life routines" (Smink, 2002). The extra work is writing out the certificate of destruction and deregistration of the ELV. Deregistration has to take place at the police station, which takes time: "I have to go to the motor vehicle registration office every day. I cannot wait, as this would imply that the last owner has to pay the vehicle excise duty for every day I wait. It would be nice, if I could deregister ELVs by computer or telephone" (Smink, 2002).

Car-dismantling companies also believe that the costs of implementing a certified EMS can be disproportional high because of investments and control. For example, a one-man company that dismantles about 200 ELVs a year had to invest more than € 16.000 in the company. Besides, both the municipality and the certifier ask around € 1.000 a year for inspection. Many

car-dismantling companies have also got permanent help from environmental consultancies, which makes EMS even more expensive.

## Free riding

OECD defines free riding as: "one or more companies in an industry are able to benefit from self-regulatory standards (e.g. in terms of the good publicity which the whole industry might benefit from) without making any real contribution themselves" (OECD, 1998: 35). The introduction of a mandatory EMS in the Danish car-dismantling trade has decreased the possibilities to free ride considerably (Smink 2002: 240-241). The main reason is that the last owner of a car needs the certificate of destruction, which is only issued by authorised car-dismantling companies. Possibilities for free riding arise, when a non-authorised car-dismantling company has an agreement with an authorised car-dismantling company and can continue his practice. The non-authorised company does not have to invest a lot of money in his company, which might be the incentive for free riding (Smink, 2002).

## Limitations of third party certifications

Third party certification can bring along various disadvantages. In the first place, third party certification represents a substantial added business costs for certification services. This is also true in the car-dismantling trade. Especially small companies are confronted with disproportional high costs (see above). In the second place, third party certifications require clear and objectively verifiable standards. Even though the standards which car-dismantling companies have to comply with are verifiable (e.g. goal for re-use), big differences exist in controlling the standards. One certifier used one to two days controlling a car-dismantling company, whereas another certifier finished his job within approximately two hours and reasoned that, when you need more time, the car-dismantling company should not be certified (Smink, 2002). Besides, even though the standards are in principle verifiable, as stated above, the Danish Environmental Protection Agency does not have methods to calculate exactly the re-use and recycling percentage of ELVs.

Certification of car-dismantling companies does have advantages as well. The advantages that can be distinguished are (based on Smink, 2002):

Improvement of environmental performance:

- Decrease in number of car-dismantling companies: competitive advantages
- "Less" enforcement
- Third party expertise

## Improvement of environmental performance

All car-dismantling companies have chosen to implement ISO 14001. A reason for implementing ISO 14001 instead of QMS (ISO 9001) is that car-dismantling companies more and more care about their image (Smink, 2002). Generally, car-dismantling companies have had a bad reputation, which is a tradition of dismantling processes and environmental behaviour in the past, and in some cases in the present (Smink, 2002). For example, for many years car-dismantling companies have operated with hardly any equipment. ELVs were stacked in high piles, waiting for scrap metal prices to be high enough to be sold. From time to time, oils and other fluids leaked into the ground, partly because the tanks and pipes that contained such fluids were broken due to the stacking of the wrecks in piles, partly because the cheapest way to remove these liquids was to drain them onto the ground (Den Hond, 1996).

By improving their environmental performance car-dismantling companies expect that their image will improve. The business association for Danish car-dismantling companies (DAG) made in 1994 a voluntary agreement with Danish EPA that all DAG members are obliged to implement a mandatory, certified management system, as they expected this to improve the performance of the trade as a whole since car-dismantling companies are forced to *think* about their environmental goals, to *plan* how to achieve these goals (i.e. who, where, when, what), to *implement* the plan, to *measure the success* or failure of implementation and to *think* about how to improve success and to avoid failures (Smink, 2002).

DAG had already in 1994 developed a trade specific EMS manual similar to ISO 14001 in order to improve the environmental performance of car-dismantling companies. In other words, the Danish EPA and DAG had tried to generate environmental improvements in the car-dismantling trade on a voluntary basis for some years. DAG represents mainly large car-dismantling companies, which were responsible for recycling of approximately 30 percent of all cars (Danish Competition Authority, 1998).

Car-dismantling companies could also have chosen to implement EMAS. One company argued, "*I did not choose EMAS, because then I had to publish a public environmental statement"*. In other words, EMAS would imply even more paperwork to the companies (see above). The company who made this statement was a small company dismantling approximately 200 ELVs a year.

## Decrease in number of car-dismantling companies: competitive advantage

One car-dismantling company explained that there was a keen competition in his area. He states that the Scrappage Package has contributed to a decrease in the number of car-dismantling companies, which has improved competition. '*In the northern part of the province of North Jutland, the number of car-dismantling companies has decreased from 19 to 8 after the Scrappage Package was implemented. I expect the number will decrease again, when re-certification has taken place, because it is expensive to do all the necessary investments. For example, soon, we have to put in place floors proof against liquids, which is quite expensive. Small companies cannot afford these investments and will probably go out of business. I hope the municipalities will actual closedown these companies, there are three illegal car-dismantling companies in our municipality*' (Smink, 2002).

As mentioned, the environmental performance of car-dismantling companies is expected to improve, when they have a certified EMS. Because of this, their market might expand as well. Other actors in the recycling-, use and disposal chain might be interested in strengthening the business relations with car-dismantling companies. For example, some car-dismantling companies in North Jutland are working on coding dismantled car-parts. On basis of the code given to a car-part, e.g. damage repair shops will know how much time it will take to revise the part and to use it when repairing a car. This development requires a certain quality of the dismantled car-parts, but also skills to code dismantled car-parts (Smink, 2002).

## "Less" enforcement

Government can regulate companies with a certified EMS 'at a distance'. This means, as one municipalities stated, that they will not visit certified companies that often as they believe that certifiers do a decent job: the certifiers will visit the companies once a year and check if all the paperwork is in order, which is more than the municipalities ever would have done. This is an advantage for municipalities as enforcement of car-dismantling companies has been a problem for many Danish municipalities. Two certifiers (BVQI and Det Norske Veritas) believe that they have better skills to check whether a company has successfully implemented an EMS, and that this can save time for the authorities (Smink, 2002).

## Third party expertise

Many car-dismantling companies have had help from an environmental consultancy to implement the EMS. Some companies did not get any "owner-

ship" to the system. In other words, the companies could not state their environmental goals, how they plan to achieve these goals, etc. The environmental consultant played an important role in the certification process, by explaining the environmental goals of the company, how the goals could be achieved etc. The role of the consultant is often not finished after the certification, as some companies have employed an environmental consultant permanently to take care of the administrative part of the EMS. An environmental consultant sends regulatory updates to a large number of car-dismantling companies on a monthly basis (Smink, 2002).

## Future challenges

The car-dismantling trade is the only trade in Denmark that has had to implement a mandatory, certified management system. However, more trades can be demanded to implement a certified EMS, based on experience from the car-dismantling trade e.g. other types of waste handling and recycling companies. If its effectiveness has been proven in practice, the Danish Environmental Protection Agency can choose to implement mandatory self-regulation in other trades. This implies that car-dismantling companies are not 'unique' (Smink, 2002).

Environmental management systems with strong commitment of managers and employees and with focus on continuous improvements are able to reduce environmental impacts in production processes at a specific plant and in the product chain to some extent. However, more radical approaches towards reducing the pollution of cars are needed. The expected rapid increase in number of cars the next 15 years (about 75%), increased mobility, globalisation of trade, creation of wealth, etc. will result in an increase in environmental impacts from the product life cycle of the car from raw materials over production phases, use and dismantling. EMS is only a small part of the wide range of methods and incentives necessary to reduce the environmental impacts from cars radically.

# References

Aalders, M. (1993), Regulation and in-company environmental management in the Netherlands. Law & Policy, 15: 75-94

ARN-web (2005a). Results: materials. Retrieved: June 3, 2005 from: http://www.arn.nl/engels/3resultaten/33.php

ARN-web (2005b) Results: achieving recycling targets. Retrieved: June 3, 2005 from: http://www.arn.nl/engels/3resultaten/34.php

BMW (2002), 2001-2002 Sustainability Report. Making a Decision for the Future. BMW, Pretoria, South Africa.

BMW-web (2003), Environmental Protection. BMW Group Environmental Guidelines. Retrieved: May 30, 2005 from: http://www.bmwgroup.com/e/0_0_www_bmwgroup_com/5_verantwortung/5_2_verantwortung/pdf/BMWGroup_Umweltleitlinien.pdf

BMW-web (2004a), BMW plants – where the ultimate machines are made. Retrieved: November 26, 2004 from: http://www.bmwworld.com/bmw/plants.htm

BMW-web (2004b), BMW Group, manufacturing facilities: the Rosslyn Plant. Retrieved: November 29, 2004 from: http://www.bmwgroup.com/e/nav/index.html?http://www.bmwgroup.com/e/0_0_www_bmwgroup_com/9_produktion/9_2_agiles_netzwerk/9_2_1_produktionsnetzwerk/9_2_1_13_montagewerke.shtml

BMW-web (2005), Environmentally friendly, cycle oriented automobile production. Retrieved: May 26, 2005 from: http://www.bmwgroup.com/e/nav/?/e/0_0_www_bmwgroup_com/homepage/0_home.shtml

Dansk Standard (2002): *HACCP Management of food safety based on HACCP (Hazard Analysis and Critical Control Points) - Requirements for a management system for food producing companies and their suppliers.* Denmark.

Danish Competition Authority (1998), Dansk Autogenbrug tilbagekalder anbefaling af gebyr for miljøbehandling af biler. Retrieved: August 15, 2000 from: http://www.ks.dk/konkuromr/afg/1998/11-25/pkt13.11.htm

DEPA (2000), Skrotmodne biler er miljøfarligt affald. Retrieved: December 12, 2000 from: http://mstex03.mst.dk/nyheder/09160000.htm

DEPA (2002), Evaluering af bilskrotordningen. Report no. 660.

Glazewski J. (2000): Environmental Law in South Africa. Butterworth, Durban South Africa, 2000.

GMSA (2005), Key GMSA company facts. Retrieved May 31, 2005 from: http://www.gmsa.com/statistics.jhtml

Hond, den F. (1996), The 'similarity' and 'heterogeneity' theses in studying innovation: evidence from the end-of-life vehicle case. Technology Analysis & Strategic Management, 10, 529-543.

Jeppesen, S. (2004): Environmental Practices and Greening Strategies in Small Manufacturing Enterprises in South Africa – a Critical Realist Approach. PhD Series 11. Copenhagen Business School, Copenhagen. 2004.

Jongh de. D. and Pienaar, K. (2004). Introduction to corporate citizenship and defending the business case. Retrieved: May 30, 2005 from: http://www.jse.co.za/sri/presentations/SRI%20Index.topicalseminar.CCC%presentation.ppt

Jørgensen, T. H.; Busck, O. (2004): *Occupational Health and Safety Regulation and Management Systems - Experiences from Denmark*. Working paper 8. Division of Technology, Environment and Society, Department of Development and Planning, Aalborg University. Denmark.

Jørgensen, T. H. (2001): *Miljøledelse - systemer, standarder og praksis*. [Environmental Management – systems, standards and practise]. Ph.D. dissertation. Skriftserien nr. 277. Division of Technology, Environment and Society, Department of Development and Planning, Aalborg University. Denmark.

Jørgensen, Tine H. (2000): "Environmental Management Systems and Organisational Change". *Eco-Management and Auditing. The Journal of Corporate Environmental Management.* Wiley Inter Science. Vol 7, no 2, p. 60-66. June 2000.

Jørgensen, T. H. (1995): *Kvalitets- og miljøstyring på E. Taabbel Fiskeeksport A/S. Integreret kvalitets- og miljøstyring i levnedsmiddelindustrien.* Institut for Samfundsudvikling og Planlægning, Aalborg Universitet. Skriftserien nr.177.

MOB (2002), Bilordning. Retrieved: March 21, 2002 from: http://www.bilordning.dk

Smink, C.K. (2002), Modernisation of Environmental Regulations. End-of-Life Vehicle Regulation in the Netherlands and Denmark. Ph.D.-thesis. Department of Development and Planning, Aalborg University.

Smink, C.K., Nielsen, E.H. and Jørgensen, T.H. (2005a), Process and product-oriented environmental policy within the car chain – with examples from BMW and General Motors. In: Nieuwenhuis, P. (ed.), The Business of Sustainable Mobility. Greenleaf Publishing. (forthcoming)

Smink, C. K., Nielsen E. H., Jørgensen, T. H. (2005b): Coherence in product-oriented policies and Environmental Management Systems in the car industry - cases of BMW and Opel. Paper submitted for the special issue of *the Journal of Cleaner Production* on the automobile industry and sustainability. August 2005. Forthcoming.

Toffel, M.W., Hill, N. and McElhaney, K.A. (2002), Designing sustainability at BMW Group: The Designworks/USA Experience. Paper presented at the BMW homepage. Retrieved: May 30, 2005 from: http://www.bmwgroup.com/…/5_verantwortung/5_5_partner/5_5_2_global_compact/Gccasestudydesignsustainability.pdf

Thrane, M. (2004): *Environmental Impacts from Danish Fish Products.* Ph.D. dissertation (main report). Aalborg University, Department of Development and Planning, Aalborg, Denmark.