

ENVIRONMENTAL NEWS · **No. 64** 2002

ENVIRONMENTAL NEWS · **No. 64** 2002 MANUAL ON PRODUCT-ORIENTED ENVIRONMENTAL WORK

Manual on Product-Oriented Environmental Work

Manual on Product-oriented Environmental Work

“Manual on Product-oriented Environmental Work” offers inspiration and guidance to companies on applying life cycle principles and incorporating the product dimension in their environmental work. The manual can be read by anyone wanting ideas about how to incorporate the product dimension, both within the company and in cooperation with suppliers, customers and others.

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Manual on Product-Oriented Environmental Work

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Introduction to the series

A life cycle approach and life cycle assessments are key elements of product-oriented environmental work. Thorough, soundly based methods are needed for life cycle assessment, but they must be simple and easily accessible, and reflect a cradle-to-grave approach.

The specific method chosen will depend on various factors, including the objective, the target group, possible publication of results, etc. However, all life cycle assessments should preferably produce a robust result that provides a sound basis for the decisions that must subsequently be taken.

In the last ten years, grants have been provided for a number of projects on life cycle assessments and a life cycle approach. In continuation of that, grants are now being made for new projects under "Programme for Cleaner Products etc. 1998-2002".

The main results of the projects on life cycle assessments are being published as a "mini-series" under the Danish Environmental Protection Agency's series "Environment News".

As the projects reach completion they will supplement the results of the EDIP project from 1996. These tools and experiences, together with advice, help and guidelines, will together provide a good basis for most applications of life cycle assessments.

Life cycle assessment is such a wide-ranging area that it is hardly possible to cover all situations and uses in one book. The Danish EPA hopes that this "mini-series" will provide companies, organisations, authorities and others with the knowledge required to base their environmental work on life cycle principles.

Danish Environmental Protection Agency, September 2000

Preface

“Manual on Product-oriented Environmental Work” offers inspiration and guidance to companies on applying life cycle principles and incorporating the product dimension in their environmental work. The manual is intended primarily for environmental managers in manufacturing companies, but can be read by anyone wanting ideas about how to incorporate the product dimension, both within the company and in cooperation with suppliers, customers and others.

The manual focuses on the process of incorporating the product dimension and helps environmental managers to gain a clear picture of the environmental impacts of their companies’ products throughout their life cycle. For an actual environmental assessment of products, readers are referred to “Manual on Environmental Assessment of Products”, published by the Danish Environmental Protection Agency in the same series as this manual. In the following, the agency will be referred to as the Danish EPA.

Product orientation is a new discipline for most companies, and experience is therefore limited. However, many companies have taken the plunge in one way or another, and the manual includes examples showing their decisions and experiences.

This project, which was funded by the Council for Recycling and Cleaner Technology, was carried out by dk-TEKNIK ENERGY & ENVIRONMENT, the Danish Toxicology Centre and the Technological Institute, together with: CC Jensen A/S, TM Coating ApS, Ergonova A/S, Henkel-Ecolab A/S, Coloplast A/S and APC Denmark ApS. Other companies also helped to add reality to the many considerations, see Chapter 2 for a complete list.

The project has been followed by a steering committee, the composition of which was as follows at the end of the project:

- Christian Poll, Danish Environmental Protection Agency (chairman)
- Charlotte Thy Christensen, Danish Environmental Protection Agency
- Lars Søborg, Danish Working Environment Authority

- Dorte Buer Toldam, Danish Energy Agency
- Per Møller, Environmental Protection Agency in Copenhagen
- Dorte Bramsen Clausen, Green Network
- Anette Kromann, Det Norske Veritas
- Bernth Nielsson, CC Jensen A/S
- Frans Møller Christensen, Danish Toxicology Centre
- Henriette Øllgaard, Technological Institute, Environment
- Kirsten Schmidt, dk-TEKNIK ENERGY & ENVIRONMENT
(project manager).

Summary

In the last few years, ever-increasing attention has been paid to the environmental impacts from the manufacture, use and disposal of products. The requirements concerning documentation of these impacts are growing and so is the desire to reduce the entire environmental impact of products.

More and more companies are receiving environment-related enquiries from their customers, and increased public, green purchasing is pulling in the same direction. The official eco-labelling schemes (the Nordic Swan and the EU's Flower) and the Danish EPA's Green Buying Guides for Public Procurements contain, for example, a number of specific requirements that products must meet and recommendations that they should live up to.

The overall political objective of product-oriented environmental work is to foster the development of and demand for *cleaner products*. A cleaner product is a product that pollutes less during its entire life cycle than other, similar products with corresponding deliverables. Compared with environmental action that is focused on cleaner technologies and improvements in the individual company, product-oriented action requires a far greater degree of coordination and cooperation. A product-oriented approach means including in the preventive environmental work an assessment of environmental impacts and possibilities for improvement in relation to *both* the production *and* the product's life cycle - and acting on the basis of the resulting knowledge. In other words, it is a question of using a life cycle approach.

Internationally, more and more companies are working with "Product Chain Management", where the various companies in a product chain cooperate more closely, and where management and control are tighter. Today, environmental aspects are increasingly included in this cooperation.

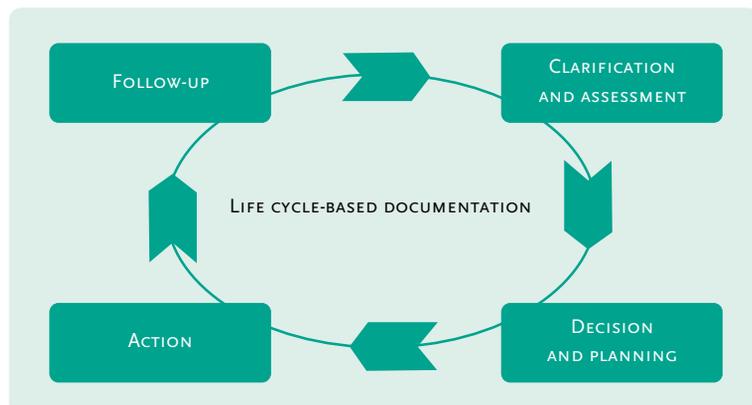
An absolute prerequisite for product orientation is sufficient knowledge about the environmental impacts of the products throughout their life

cycle and about the possibilities the individual player - which means your customers and suppliers as well - has for reducing the impacts. Therefore, before making far-reaching decisions on how you are going to incorporate the product dimension in your environmental work, you must have sufficient knowledge, both about the products' environmental and occupational health and safety impacts and about the market's expectations and potentials. It is important to include the market angle. No matter how eco-friendly a product may be, if it is not bought and thus does not replace a more environmentally harmful product, there is no benefit.

A product-oriented approach also means that the various parts of your organisation will probably be involved in the company's environmental work in a different way than they used to be. For example, the purchasing department has direct contact with the suppliers, the sales and marketing department has contact with the customers, and the development department must think about life cycle environmental and occupational health and safety impacts when developing new products or modifying existing products. It is important to clarify how all these functions can best support the company's work on the product dimension.

A continuous process

As in all other systematic work, the process is a continuous one, consist-



ing of evaluation, planning, action and follow-up, with the follow-up leading to new evaluation, decisions and action.

What does the company gain from a product-oriented approach?

Besides reducing its products' environmental impacts, the company gains a number of important side benefits from a product-oriented approach.

The benefits include:

- greater knowledge about the products, including their financial aspects
- closer dialogue and cooperation with customers and suppliers
- improvement of the company's strategic market position
- closer coordination and cooperation within the company.

What companies can incorporate the product dimension?

The target group for this manual is companies desiring inspiration and practical recommendations on incorporating the product dimension in their environmental work. Doing this will greatly affect the cooperation in the product chain and therefore also the companies' customers and suppliers, and the manual can thus also be used in the dialogue and cooperation with them. It is not necessary to have experience with life cycle assessments or to have an environmental management system in order to use the manual because the introductory chapters explain how to get going on product-oriented environmental work. It is up to yourselves whether you use the manual as a basis for systematic environmental action or to develop action that is already going on.

The manual's main recommendations

The main things to remember when you want to incorporate the product dimension in your environmental work are shown in the following ten points. These are also the main recommendations in the manual, although it also deals with a wide range of other matters as well. As in any other strategic action, the management must actively support the work and prioritise the action.

- Clarify where the *significant environmental impacts* occur in the product's life cycle and what it is most relevant to work on. Carry

out a pilot project in which you build up knowledge about environmental assessments and a system for carrying them out.

- Clarify the requirements concerning the products, seen in an environmental light, and the market potentials. Consider also what advantages there might be for yourselves and your customers/suppliers from concerted action.
- “Sell” the results in the organisation so that everyone understands the benefits of a product-oriented approach. The employees must be actively involved.
- Decide at management level what the environment-related market strategy must be.
- Set targets for the product-related improvements and draw up policies for the prioritised action areas, e.g. purchasing or product development.
- Strengthen and clarify the cooperation between the environmental department and the other departments, so that everyone knows who is responsible for what.
- Give the employees who are going to work with the environmental aspects of the company’s products responsibility and the necessary authority for their work.
- Draw up rules, check lists, etc. for the environmental work, making sure that they match your level of ambition.
- Build up a suitable documentation base that is sufficiently flexible to be used in many contexts, both internal and external.
- Establish routines that ensure that both environmental impacts and market opportunities are followed up on.

Part 1: The Process



1 Introduction

The target group for this manual is companies desiring inspiration and practical recommendations on using a product-oriented approach in their environmental work. Doing this will greatly affect the cooperation in the product chain and therefore also the companies' customers and suppliers, and the manual can thus also be used in the dialogue and cooperation with them. It is not necessary to have experience with life cycle assessments or to have an environmental management system in order to use the manual because the introductory chapters explain how to get going on incorporating the product dimension in environmental work. It is up to yourselves whether you use the manual as a basis for systematic environmental action or to develop action that is already going on.

The introduction provides a short explanation of product orientation – incorporating the product dimension in a company's environmental work. You should therefore read this chapter before moving on to the rest of the manual.

Most companies are now aware of the environmental impacts that occur in connection with their production and have gained experience in preventing or reducing them. Very few companies, on the other hand, have looked into the environmental impacts of their products over the products' entire life cycle, from extraction of the raw materials, through manufacture, to use and disposal. A product-oriented approach means including in the preventive environmental work an assessment of environmental impacts and possibilities for improvement in relation to *both* the production *and* the product's life cycle – and acting on the basis of the resulting knowledge. In other words, it is all about using the life cycle approach in your environmental work.

Product-oriented environmental work means ensuring continual improvement of a product's environmental impacts during its entire life cycle.

At the same time, the market and authorities are now focusing not only on the production process but also, increasingly, on the products them-

selves. More and more companies are getting enquiries from their customers about the environmental aspects of their products, and the increase in public, green purchasing is pulling in the same direction. The official eco-label schemes (the Nordic Swan and the EU's Flower) and the Danish EPA's Green Buying Guides for Public Procurements include, for example, a number of specific requirements that products must meet and recommendations that they should live up to.

The overall political objective of product-oriented environmental work is to foster the development of and demand for *cleaner products*. A cleaner product is a product that pollutes less during its entire life cycle than other, similar products with corresponding deliverables. Compared with environmental action that is focused on cleaner technologies and improvements in the individual company, product-oriented action requires a far greater degree of coordination and cooperation.

Internationally, more and more companies are working with "Product Chain Management", where the various companies in a product chain cooperate more closely, and where management and control are tighter. Today, environmental aspects are increasingly included in this cooperation.

An absolute prerequisite for product orientation is sufficient knowledge about the environmental impacts of the products throughout their life cycle and about the possibilities the individual player – which means your customers and suppliers as well – has for reducing the impacts. Therefore, before making far-reaching decisions on how you are going to incorporate the product dimension in your environmental work, you must have sufficient knowledge, both about the products' environmental and occupational health and safety impacts and about the market's expectations and potentials (see Chapter 3). It is important to include the market angle. No matter how eco-friendly a product may be, if it is not bought and thus does not replace a more environmentally harmful product, there is no benefit.

Build up knowledge about your products' environmental and occupational health and safety impacts – and about the market potentials. Use this knowledge to decide what your environmental action is to cover and which players you want to cooperate with.

A product-oriented approach also means that the various parts of your organisation will probably be involved in the company's environmental work in a different way than they used to be. For example, the purchasing department has direct contact with the suppliers, the sales and marketing department has contact with the customers, and the development department must also think about environmental and occupational health and safety impacts when developing new products or modifying existing products. It is important to clarify how all these functions can best support the company's work on the product dimension.

1.1 WHY INCORPORATE THE PRODUCT DIMENSION IN YOUR ENVIRONMENTAL WORK?

A number of factors are encouraging companies to think about the environmental impacts of their products throughout the products' life cycle. However, for the individual company, there will always be special wishes and benefits. The manual gives many examples of Danish companies' experiences, wishes, criteria, etc. Chapter 2, "The Companies", lists the companies in question and includes a short description of each and references to their websites. The examples in this chapter illustrate some of the reasons for incorporating the product dimension in a company's environmental work:

Lost orders

APC Denmark ApS, which make uninterruptible power supplies, found that they lost an order because they were unable to supply documentation for the environmental impacts at both the company itself and its suppliers. APC have therefore decided to incorporate the product dimension in their environmental work, so that they also know what happens in the other phases of their products' life cycle and act accordingly.

From part of the problem to part of the solution

Henkel-Ecolab supply cleaning agents to professional users. Although they had not carried out an actual life cycle assessment, they were aware that the biggest environmental impacts related to wastewater problems in the use phase. Recognising that there was a business risk in being “stamped” as a creator of problems, Henkel-Ecolab defined their environmental strategy as “being part of the customer’s environmental solution” instead of part of the problem. That means both expanding their cooperation with their customers on proper use of cleaning agents and intensified development work, both internally and together with the suppliers, so that they make less environmentally harmful products.

The whole picture is important

Ergonova sells ergonomically correct height-adjustable desks and has agencies for other ergonomic office furniture. It has focused from the very start on supplying high quality products. The company is now experiencing growing competition from cheaper “copy products”, and that has led to a need to document both quality and environmental and occupational health and safety aspects. When building up a combined quality and environmental management system, the company therefore found it relevant to incorporate the product dimension from the start.

Headway in the market

In Sweden, public purchasers attach great importance to the environmental aspects of products and therefore ask manufacturers for very detailed product-related data. Coloplast, which makes medical disposables, chose to take the challenge seriously, and that resulted in headway in the market.

A good, overall picture

C.C. Jensen, whose products include ship propellers cast to order, has used the life cycle approach to get a complete picture of resource consumption, waste, etc., both totally and for each unit. The foundation has thereby been laid for the environmental management system that the company wishes to build up. At the same time, the company has established a better basis for estimating the real costs of each order.

The life cycle approach also helps to motivate employees to make a real environmental effort when, for example, you yourselves are not responsible for significant environmental impacts, whereas there are many possibilities for improvements at your suppliers and others.

The action makes sense

Production at Ergonova's premises in Karlstrup and Karlsunde is limited to assembly of desktops and frames. The premises also house the management and the product development and sales departments. This means very limited environmental impacts, which makes it difficult to whip up enthusiasm among the employees for special action because there is not much that needs to be done. However, with an environmental management system built up from the start to include the environmental aspects in other phases of the product's life cycle, the action makes more sense, seen in a wider perspective, and that fosters motivation.

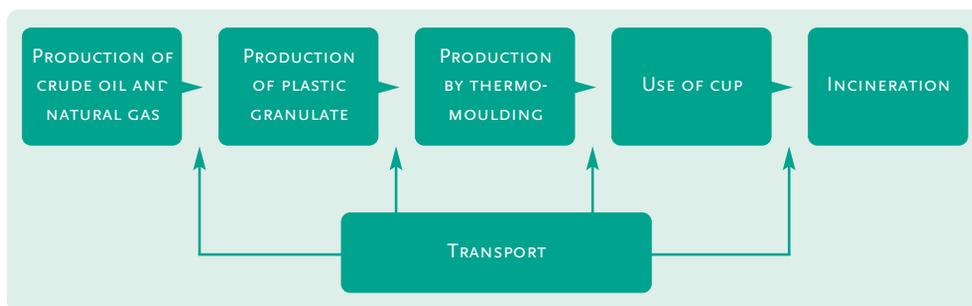
1.2 THE LIFE CYCLE APPROACH

All products have a life cycle, from production of the raw materials and semimanufactures, through the manufacture of the product itself, to use, possible recycling and final disposal. However, where in the life cycle the biggest environmental impacts occur, and where it is possible and/or most effective to take action to reduce the impacts, differs considerably from product to product.

Any company that wants to incorporate the product dimension should start by building up a preliminary picture of the product's entire life cycle – irrespective of the kind of product action the management decides on.

A preliminary picture can be structured in the form of a flow diagram as shown in the example in figure 1.1. This will make it easier for you to focus the action on significant environmental impacts relating to the specific life cycle phases. On the basis of the knowledge you already possess or can easily obtain, you can then expand the picture with information on resource consumption and environmental impacts in the individual phases and about the associated transport in each phase. With that, you will have established the first basis for a life cycle assessment.

FIGURE 1.1:
MAIN LIFE CYCLE
FLOW FOR A
PLASTIC CUP



In connection with the product action, it is important to ensure coherence between the basis for decisions that you establish through the product/life cycle-based environmental work and the decisions you make.

When making a start on incorporating the product dimension in your environmental work, you have to consider many factors – not only environmental aspects, but also market and commercial factors. It is therefore important to create a good basis for decisions, but this is not necessarily the same as carrying out a very thorough life cycle assessment. To start with, a picture of the significant environmental impacts in the product's life cycle, possibly combined with specific aspects included in eco-label criteria, the Green Buying Guides for Public Procurements, customer requirements, etc., will suffice. What the significant environmental impacts are will, in the nature of things, depend on the composition and use of the product. For pumps and other current-consuming appliances, the energy consumption in the use phase is important, while for cleaning agents, it is the discharge to wastewater with associated environmental impacts that is important. Annex 1 contains an introduction to life cycle assessments, while Annex 2 gives an idea of the possibilities and action areas that are normally investigated in connection with life cycle work.

Knowledge about your products' environmental impacts is essential for product-oriented environmental management, but is not an aim in itself.

Building up knowledge about your products' environmental impacts does not in itself mean that you will improve the environmental performance of your products. To do that, you must go through a process that, let it be noted, is continuous, just as in traditional environmental management, and not simply a project that ultimately comes to an end. The process concerns implementing the life cycle approach by:

- creating a picture of where in the products' life cycle the significant environmental impacts and/or potential for improvement lie
- prioritising your environmental action on the basis of this knowledge and in accordance with the company's business strategy
- establishing dialogue and cooperation in the product chain with a view to getting the significant environmental impacts, seen in a life cycle perspective, reduced and to exploiting the market potentials
- developing policies and methods so that the various functions/man-

- agers can incorporate the product dimension in their daily work and ensure active involvement of the employees
- ensuring that improvements in the product, seen in a life cycle perspective, are included in the continual improvements, so that the process is a continuous one.

1.3 HOW TO USE THE MANUAL

The manual is structured to enable you to dip into the parts that are most relevant for you. This means that you do not have to read it from A to Z, but if you do, you will get a complete impression of the process from clarifying possibilities to preparing guidelines for the different groups of employees and incorporation of the product dimension in an environmental management system.

The manual is divided into three parts: *Part A*, which is the manual itself, contains chapters 1-6 and focuses on the process of incorporating the product dimension in a company's environmental work on the basis of a life cycle approach; *Part B* contains tools in the form of recommendations on how you can work with various analyses and actual types of product action, e.g. eco-labels and environmental product declarations. Chapter 3 explains where in the process the individual tools can be used. Lastly, *Part C* contains various annexes. The diagram below shows the three parts of the manual and how they relate to each other.

The manual has been written so that it can be used by companies that have no experience of product-oriented environmental work, but want to get started on it. Chapter 3: *Status and Overview* therefore focuses on assessing market expectations, your own wishes, and criteria for the environmental action, and on building up basic knowledge about the products' potential environmental impacts, so that you establish a good basis for decisions on the next steps. The chapter also offers ideas for mapping out your strategy for the product-oriented work.

The manual can also be used by companies that already have product

If you want to:

FIND OUT WHAT PRODUCT ORIENTED ENVIRONMENTAL WORK IS

SEE WHICH COMPANIES EXPERIENCES YOU CAN READ ABOUT IN THE MANUAL

CLARIFY POSSIBILITIES AND GAIN SOME INITIAL EXPERIENCE. ESTABLISH THE PRODUCT ORIENTED ENVIRONMENTAL STRATEGY

PREPARE GUIDELINES AND INVOLVE THE ENTIRE ORGANISATION. STRENGTHEN DIALOGUE AND COOPERATION IN THE PRODUCT CHAIN

INCORPORATE THE PRODUCT STRATEGY IN YOUR ENVIRONMENTAL MANAGEMENT SYSTEM

FIND OUT MORE

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experience, e.g. by having carried out a life cycle assessment or having been granted an eco-label, and that now want to ensure good coherence with the company's other environmental work. Here, it is particularly chapters 4 and 5 that will be found useful.

Chapter 4 of the manual: *Incorporating the Product Dimension in Practice* has two main topics: firstly, how you get cooperation going in the product chain, particularly with your suppliers and customers, and, secondly, how the organisation can be geared to incorporate the product dimension on the basis of the life cycle approach. You do not have to have an environmental management system to use the recommendations given in Chapter 4, but incorporating the product dimension affects so many functions in the company that a well functioning management, where communication, decision paths and responsibilities are in place, is essential for success.

Chapter 5 of the manual: *Incorporating the Product Dimension in an Environmental Management System* explains where it will be relevant to incorporate product-related issues in a "traditional" environmental management system, exemplified by means of ISO 14001. More importance is attached to the principal differences than to preparing an answer book because each company's environmental management system is based on its own criteria and wishes. Chapter 5 is primarily written for companies that have an environmental management system, but companies that want to build one up, and that want to incorporate the product dimension from the start, can use the manual as a supplement to other guidance on environmental management systems – for example, sector-based manuals or consulting assistance. The project "Product-oriented environmental management" (see the references) provides further guidance on incorporating the product dimension in an environmental management system's procedures etc., and on involving the employees.

Each of the chapters 3-5 starts with an introduction that will provide you with a clear picture of the chapter's contents.



Most companies find it most natural to link their environmental work with their work on occupational health and safety, and it may also be sensible to think about health and safety issues in other phases of a product's life cycle. However, the working environment is directly related to the individual company, so it is difficult to include other companies' health and safety conditions in one's own life cycle assessment. Therefore, in the manual, occupational health and safety is only dealt with specifically in connection with purchasing and cooperation with suppliers.



2 The Companies

The manual has been developed in cooperation with a number of companies. The six companies mentioned in the preface have participated in a continuous process, while others have helped to clarify particular problems. In all cases, the companies' experiences are included in the manual as examples to inspire others.

The following companies have provided examples for the manual:

APC DENMARK ApS	PRODUCTION OF UNINTERRUPTIBLE POWER SUPPLIES	WWW.APC.COM
BANG & OLUFSEN A/S	PRODUCTION OF AUDIO-VISUAL EQUIPMENT	WWW.BANG-OLUFSEN.DK
BODENHOFF A/S	DISTRIBUTION OF OFFICE EQUIPMENT (COPIERS ETC.)	WWW.BODENHOFF.DK
BERENDSEN TEXTIL	LAUNDERING AND HIRE OF TEXTILES FOR SERVICE PROFESSIONAL APPLICATIONS	WWW.BERENDSEN.DK
BRDR. HARTMANN A/S	PRODUCTION OF CARDBOARD PACKAGING	WWW.HARTMANN.DK
C.C. JENSEN A/S	PRODUCTION OF METAL GOODS FOR SHIPS	WWW.CJC.DK
COLOPLAST A/S	PRODUCTION OF MEDICAL DISPOSABLES	WWW.COLOPLAST.COM
DALMOSE TRÆVARE-INDUSTRI A/S	PRODUCTION OF COFFINS	WWW.DALMOSE.DK
ERGONOVA A/S	PRODUCTION OF ERGONOMIC HEIGHT-ADJUSTABLE DESKS	WWW.ERGONOVA.DK
FDB (Co-op DENMARK)	RETAIL CHAIN	WWW.FDB.DK
GRUNDFOS A/S	PRODUCTION OF PUMPS	WWW.GRUNDFOS.DK
HENKEL-ECOLAB A/S	PRODUCTION OF CLEANING AGENTS FOR PROFESSIONAL APPLICATIONS	WWW.HENKEL-ECOLAB.COM
LEIVSON + JOHNSEN + JOHNSEN	PRINTING HOUSE	PRINTING HOUSE
SCHENKER-BTL	HAULAGE	WWW.SCHENKER-BTL.DK
TM COATING DK ApS	PRODUCTION OF ANTI-CONDENSATION COATINGS	WWW.TMCOATING.DK

2.1 THE SIX COMPANIES

C.C. Jensen A/S (called *CCJ* in the following) makes metal goods for ships. The production is carried out in three divisions: a metal-casting division, a filter division and a window division. The company has around 150 employees, 142 of whom are based in Svendborg. *CCJ* is not at present environmentally certified but wants to build up a certifiable system that incorporates the product dimension.

In the project, the focus is on the metal-casting division, which specialis-

es in ship propellers with sand casting of large items in small series. With its product-oriented action in connection with its other environmental work, CCJ expects to:

- anticipate coming environmental requirements
- achieve a basic system that can deliver the necessary environmental documentation concerning the company's products at short notice
- change attitudes and create environmental awareness among the company's employees
- attract and keep employees by creating a good environmental profile and a good corporate image.

TM Coating DK ApS (called TM Coating in the following) specialises in anti-condensation coatings and has been supplying the whole of Europe with TM ECO-THERM anti-condensation coating for 20 years. The company has six employees. It also has a division that specialises in spraying anti-condensation coatings.

The company's environmental strategy is to anticipate coming environmental requirements, and there are already today requirements concerning documentation of health and safety and environmental aspects of the company's production and products. In 1998/99, TM Coating achieved ISO 14001 and EMAS environmental certification. It plans to fully integrate the product dimension in its environmental management system.

With its product-oriented work, TM Coating expects to:

- strengthen the product profile by also being able to supply documentation concerning environmental and occupational health and safety aspects
- prepare an environmental declaration for TM ECO-THERM anti-condensation coating
- strengthen the company's environmental management system by using the life cycle approach to identify possibilities for environmental improvements and to meet the requirement concerning continual improvements.

Ergonova assembles and sells ergonomic height-adjustable office desks, with each desk adapted to individual wishes concerning shape, size, type, type of wood, etc. The company, which was established in 1990, has around 35 employees. Ergonova assembles and packs the desks, while its suppliers take care of everything else. However, the company has its own workshop, including a joinery, so it can do cutting, welding and painting itself if the desks supplied need altering or repair. Besides its own production, Ergonova has agencies for various office equipment that fits in with its business concept.

Ergonova has decided to build up a combined quality and environmental management system in conformity with ISO 9001/14001 and to seek registration under EMAS. Ergonova also wants to be able to supply environmental (and possibly occupational health and safety) documentation for its products.

With its product-oriented work, Ergonova expects to:

- prepare environmental product declarations
- incorporate the product dimension in its environmental work
- get environmental aspects included in its customers' expectations concerning quality.

Henkel-Ecolab A/S makes and sells different types of cleaning agents, mainly for professional applications. It also develops cleaning and washing concepts, including dosing equipment and recirculation of wastewater. The production itself consists mainly of mixing and tapping the chemicals received from other factories in the group. Henkel-Ecolab was established in 1991 as a joint venture with the German Henkel Group and American Ecolab. The Danish part of the company has 168 employees and gained environmental certification of the production in accordance with BS 7750 in 1994 and in accordance with ISO 14001 in 1997. The company is now working to get the rest of the organisation included in the certification.

With its product-oriented work, Henkel-Ecolab expects to:

- expand the action area for continual improvements in its environmental management work
- get the organisation to think in life cycle terms
- achieve closer cooperation with its customers on environmental solutions.

APC Denmark ApS (APC) makes 3-phase uninterruptible power supplies (so-called UPSs). The company was established in 1942 and is domiciled in Kolding. Today, APC has around 350 employees and is a division of an international group with about 5,000 employees. APC has both quality and environmental certification in accordance with ISO 9001 and ISO 14001, and is working actively on incorporating the product dimension in its environmental work.

With its product-oriented action, APC expects to:

- optimise its environmental product declarations for selected products
- keep and preferably increase its market shares
- stay abreast of customer enquiries.

Coloplast's original business mission was ostomy products for people whose intestinal outlet or urinary tract has been surgically rerouted through the abdominal wall. Since the end of the 1970s, the company has established new business areas based on adhesion technology and the corporate mission of helping people who have to live with a physical disability. Besides ostomy products, Coloplast now makes and sells products within five other business areas: continence care, wound care, skin care, breast care and consumer products. Coloplast has 3,745 employees, more than half of whom work in Denmark. The company has both quality and environmental certification.

With its product-oriented work, Coloplast expects to:

- gain detailed knowledge about the total life-cycle environmental impacts of the company's main products
- prepare environmental product declarations for the products

- use their environmental performance and environmental documentation as active competitive parameters.

2.2 TARGETED ACTION PRODUCES RESULTS

Brdr. Hartmann and Grundfos are good examples of the fact that incorporating the product dimension is not just a theoretical exercise but reality for some Danish companies.

2.2.1 Brdr. Hartmann A/S

Brdr. Hartmann A/S (called Hartmann in the following) was established in 1917. Today, it specialises in moulded-fibre packaging made almost exclusively from recycled paper. Hartmann operates globally and has more than 2,000 employees at nine production sites and a number of sales companies in Europe, South America and Asia. The production sites in Denmark have ISO 14001 certification and are registered under EMAS. The production in Malaysia also has ISO 14001 certification. Hartmann's 5-phase environmental management system is ensuring that the other production sites also gain an environmental management certificate.

Life cycle assessments are a vital element of the Hartmann Group's environmental strategy and practical environmental work. The life cycle approach is embedded in the Group's environmental strategy with a view to developing integrated environmental management of the Group in accordance with the life cycle concept.

On the way to this objective, Hartmann is continually developing practical guidelines and tools that are based on the life cycle assessments carried out and that support the daily work on environmental management of processes and products.

The overall purpose of Hartmann's focus on life cycle thinking is to reduce the total environmental impacts from production and disposal of its products, because every time the total environmental impacts are re-

duced, Hartmann's environmental competitiveness improves. Hartmann wants to satisfy its customers' expectations concerning the company's environmental responsibility and to demonstrate that. Hartmann also wants to anticipate legislative requirements, which are expected to move from regulation of production processes towards regulation of the products' total environmental impacts.

Product-oriented environmental work must live up to two criteria:

1. The environmental knowledge base must be relevant and adequate and be used where warranted.
2. Alternative solutions must be practicable and the benefits must feed through in the company's daily work.

Quoted from Aktuelt Miljø (Environment Today) No. 6, 1996

Hartmann has therefore developed a range of tools for incorporating the product dimension in the different functions of the organisation. The tools include:

- the management's environmental strategy
- questionnaires for use by the purchasing department vis-à-vis suppliers
- documentation concerning environmental impacts and action for use by the sales representatives
- environmental profiles for selected raw materials for use by the product developers
- scenarios for planning least environmentally harmful transport.

In addition, employee training includes knowledge about the products' life cycles and related environmental impacts.

2.2.2 Grundfos

Grundfos, which makes pumps and pump systems, has production facilities in several European countries and sales offices all over the world. It has more than 9,500 employees. The production sites have ISO 9001 certification, and the Danish factories have ISO 14001 certification and EMAS registration as well.

At the beginning of the 1990s, Grundfos participated in the project Environmental Design of Industrial Products (EDIP), the purpose of which was to develop a life cycle method for use in product development. Grundfos built up detailed knowledge of its products' environmental impacts, and today, care for the environment is a principle in the development of new products. For example, all new products are specifically required to be, on average, at least 5% more energy efficient and to use at least 3% less materials than the "old" products they are replacing.

However, as can be seen from the company's environmental policy statement, its product-oriented work is not limited to product development. Wherever there are environmental problems to work on in the organisation, the employees have a duty to achieve improvements. The attitude is that the results must be achieved as a natural element of the daily work and form part of employee development. In other words, the action is decentralised and not "left" to an environmental function.

Grundfos is also very aware of the importance of the action needed throughout the life cycle of its products. This is epitomised in the motto *The environmental partnership of the future:*

"Sustainability calls for forethought and long-term focus on sustainable solutions instead of cheap and easy, here-and-now solutions. For that, close cooperation is needed between all links in the distribution chain – the manufacturer, the wholesaler, the retailer and the electrician. As a manufacturer, Grundfos considers its principal task to be to develop material-saving, energy-efficient pumps and pump systems, to make these pumps with minimum waste of materials and energy, to distribute the products efficiently and to provide our customers with professional advice on energy-efficient pump operation.

The retailer can contribute to this process by actively promoting the new, energy-efficient solutions. To do that, his staff must learn more about the products and the benefits of energy-efficient solutions. In addition, the retailer must display energy-efficient pumps very prominently in his



shop and advise his customers – electricians – to stock and install energy-efficient products instead of the well-known standard ones. In the time ahead, Grundfos will take further steps to market energy-efficient products more distinctively and aggressively than hitherto.”

Quoted from the Grundfos Group's Annual Profile 1997

3 Status and Overview

This chapter explains how to build up a basis for decisions in order to be able to prioritise action on the product dimension and, on that basis, draw up plans and strategies for your product-oriented work.

The basis for decisions is as follows:

- an overview of your products' function and life cycle, and the significant environmental impacts associated with these (section 3.1)
- an overview of your possibilities for changing the product or the way it is produced, used or disposed of, and of possibilities for documenting your product's environmental impacts (section 3.2)
- an overview of the external requirements, enquiries and expectations concerning your products, together with other factors that can affect your products (section 3.3)
- assessment of the external requirements, expectations, etc. (section 3.4)
- assessment of possibilities within the company (section 3.5).

The last section of the chapter (section 3.6) suggests ways in which you can draw up plans and strategies for your continued work. It is often a good idea to start with one or more product-related projects before you decide on the final strategy. For example, in the first instance, you can use this chapter on a single product. That will take you through some of the main considerations in connection with product-oriented work.

If you already know what you intend to achieve with your product-oriented work, you can use the chapter as a checklist. You can also return to the chapter and go through it again when you have gained some project-based experience.

Put briefly, the purpose of the various elements of the basis for decisions is:

to create an overview of the life cycle and the impacts.

You must use the overview you gain of the life cycle to assess where the biggest environmental impacts (and potentials for improvement) of your

products lie and to ensure that possible changes in the design, composition or production of the products, *combined*, reduce the product's environmental impacts during its life cycle.

When you have an overview of the product's biggest environmental impacts and potentials for improvement, the next step is to decide what possibilities you have of changing the product's design and production/use. Factors on which your possibilities will depend are your placing in the product chain (do you make the raw materials, semi-manufactures or the end product?) and your possibility of getting things on which you yourselves have no direct influence changed (e.g. production of raw materials or disposal patterns).

It is important to note that this manual describes only the initial methods for creating a life cycle overview. However, Annex 2 contains information that will give you an impression of the kinds of environmental impacts that it might be relevant to consider. For slightly more complicated assessments based on the life cycle principle, you will also need the procedure and tools described in, for example, 'Manual on Environmental Assessment of Products' (see the reference list).

Map external requirements, enquiries and expectations

In many cases, the motivation for product-oriented environmental work will come from the fact that you have encountered or expect requirements, enquiries or expectations concerning documentation and/or improvement of your products' environmental properties from external parties. In the following, these are called "*external expectations*".

The expectations may concern direct and indirect environmental impacts and be formulated for many different reasons and by different players (other links in the product chain, authorities or other external stakeholders – called stakeholders in the following). The expectations may be systematised and well documented or be in the nature of more or less well-considered ad hoc expectations.

You can use the life cycle overview as your basis for judging whether the stakeholders' expectations concerning your product work are appropriate.

The reason for mapping the external expectations is to ensure that your work is in line with the expectations of the market, the authorities or other stakeholders concerning your products. Knowing the external expectations also provides you with the possibility of exploiting the market advantages of selling less environmentally harmful products.

Map internal needs and possibilities

Mapping needs and possibilities within the organisation means clarifying whether there are departments with specific needs/wishes concerning the product orientation and whether the organisation has the necessary environmental expertise.

3.1 LIFE CYCLE OVERVIEW

When building up knowledge about your products' life cycles, it is important to create an overview first and then, if necessary, seek more detailed information. If the overview is not in place, you will soon find yourselves using many resources to obtain data that will not necessarily make you any wiser about the products' environmental impacts and possibilities for improvement – or that do not correspond to the decisions to be taken.

If you have already carried out a life cycle assessment of one or more products, you can go straight on to assessing possible action areas in section 3.2.

3.1.1 Selection of product

If you make many different types of products, it may be a good idea to select a “get-going” product as case product. You can then apply the experiences from this to the other products.

There can be many reasons for selecting a specific product, for example:

- the product is your best-selling product
- the product is attracting most environmental interest in the market
- the product is believed to have a big potential for environmental improvements.

The main product on the market

TM Coating selected TM ECO-THERM anti-condensation paint as its case product, partly because it is the company's main product in terms of production volume and market share and partly because it is a good representative of the rest of the company's products. At the same time, it allows 'control of the customer side' because it is a subsidiary, TM Spraying, that sprays the paint on for customers. In addition, TM ECO-THERM anti-condensation paint is a relatively simple product.

A simple product

C.C. Jensen selected ship propeller castings because, in this context, they are a simple product. Also important is the fact that the product is supplied to customers with whom CCJ enjoys good cooperation – i.e. CCJ has excellent access to data – and that there were two committed employees who were prepared to help collect data. With the product in question, CCJ thought that it would have all the data it needed for the assessment. CCJ gave high priority to that because they did not want problems with collecting data to overshadow the actual work of incorporating the product dimension in their environmental work. They also thought that if they succeeded in getting the product-oriented approach and life cycle principles incorporated in the metal-casting division, they would have templates and techniques ready for other departments and other, more complicated products. Lastly, of CCJ's three divisions, the metal-casting division is the one that attracts most environmental attention from the authorities, and since it is important for the company to have a good image, it means a lot to be able to document that the production takes place in an environmentally satisfactory way.

Possibility of comparing new and old products

Coloplast has carried out several life cycle assessments and works continually on environmental improvements on the basis of the knowledge gained. Coloplast thinks that the life cycle assessments give it a good basis for comparing existing products with new alternatives and thus choosing solutions that benefit the environment.

Focus on the main product

Ergonova chose to assess the environmental impacts from its adjustable-height desks, which are its main product in terms of sales.

The product is representative

APC makes so-called UPSs (uninterruptible power supplies). APC chose to screen a UPS from its DP 300E series, partly because it is representative of the whole series and partly because it would provide background knowledge for use in reducing the present size of the UPS and thus the consumption of materials.

3.1.2 Overview of life cycle and environmental impacts

Tool 1 in Part B of the manual provides a guide to creating the necessary overview of a product's function, life cycle and associated environmental impacts. By using Tool 1, you will gain:

- *knowledge of the substances and materials used in the product.* This is a fairly simple task in the case of most products. However, it may be necessary to obtain information from your suppliers if the product contains semi-manufactures or chemical compounds whose composition you do not know.
- *an overview of the product's life cycle.* To create an overview of the product's life cycle, you may have to obtain information from suppliers (including transport suppliers/forwarding agents) and customers. Who makes the raw materials/semi-manufactures you use? How is the product used and disposed of?
- *a definition of the product's function.* It is important to define the product's function because the work on improving its environmen-

tal properties will often include an element of comparison – between your own and/or competing products or between different alternatives in, for example, the choice of materials (see also Tool 1).

- *a basis for assessing* where the principal environmental and occupational health impacts occur during the product's life cycle.

On the basis of the knowledge you gain from this you must try to judge where the significant environmental impacts and possibilities for improvement of your products lie. Tool 1 does not include an actual environmental assessment of the products. If you need a more detailed assessment (see Tool 1), you can use the procedure and tools described in 'Manual on Environmental Assessment of Products' (see the references).

Main impact during production of sub-components

At Ergonova, the overview showed that the biggest environmental impacts from the desks, seen in a life cycle perspective, were related to sub-processes at the suppliers of the metal underframes and to transport.

Energy consumption one of the significant environmental impacts

At C.C. Jensen, the overview indicated that energy consumption was one of the significant environmental impacts. It can be reduced by making more customised products, which ensures less offcutting at the customer's premises. Besides that, the overview has contributed greatly to understanding within the organisation and to training in product-oriented work.

Environmental and occupational health properties

By collecting suppliers' material safety datasheets for all the product's constituents, TM Coating has gained insight into the environmental and occupational health properties of each of the constituents and has developed a better dialogue with subsuppliers concerning the physical, chemical, environmental and occupational health properties of the various constituents.

TMC has also gained a picture of where the biggest energy consumption occurs during the product's life cycle. The detailed data gathered by the company provide a basis for starting up an energy management project.

Lastly, TMC has gained an overview of atmospheric emissions and has concluded that transport constitutes a significant part of the product's life cycle. A coming action area will therefore be transport.

3.1.3 Time required for start-up and overview

The difficulty of obtaining data on the part of the products' life cycle that lies outside the company is one of the most common obstacles encountered during work on life cycle assessments. By preparing a life cycle overview, you will get an idea of how big a job the data collection is going to be and will therefore be well equipped to plan the continuing activities.

The time you will need to prepare an overview depends on how much data the organisation already possesses about your products' environmental properties and what possibilities you have for adding to your knowledge, through trade organisations, suppliers, other business partners, etc.

The time you will need also depends on your employees' expertise/knowledge concerning environmental issues and product-oriented work and on how complicated your products are. To avoid the task running away with you, you must ensure that you define it properly and stop now

and again and assess what you have achieved and what you perhaps still lack.

A complicated product takes time

APC Denmark ApS's uninterruptible power supplies contain more than 2,000 different parts/components – various metal parts, electronics (circuit boards, modules, etc.) cables, batteries and many other things. Each of these parts/components is made of several different materials and it took the company's environmental coordinator 80 hours just to prepare a list of the main substances and materials used in the product.

APC Denmark ApS estimated that it would take more than 150 hours to build up a very general overview of the product's life cycle and associated environmental impacts. The LCA overview is therefore fairly comprehensive for this type of product. The company also expects to have to spend time regularly on following up at suppliers because new requirements and new focus areas keep coming.

That takes time, partly because:

- *data* are not updated, are in the wrong formats, cannot be deciphered, are lacking or are not accessible
- *suppliers* know too little about their products, cannot provide the right information or have to be contacted several times
- *conflicting interests* between departments concerning distribution of resources etc. have to be resolved.

Time is needed for training

TM Coating spent about 400 hours on gathering data and carrying out environmental assessments of data from suppliers and customers and on supplementary training of TM's key person for the life cycle overview.

Screening and training

C.C. Jensen spent about 220 hours on the life cycle overview, including updating knowledge and supplementary training in the LCA approach.

Visits to suppliers

Ergonova chose to visit all its main suppliers around the country to gain an insight into their environmental aspects, even though this was a time-consuming exercise, because they rightly thought that that would facilitate the subsequent dialogue and procurement of usable documentation.

When you have used Tool 1 in Part B for the first time or if you already have expertise on the LCA approach within your organisation, a preliminary overview, which you can obtain by means of Tool 1, will probably take 1-2 weeks unless the product is very complicated.

However, you must remember that work time and calendar time differ. Although the time actually spent on a life cycle overview is only a couple of weeks, the project itself can take considerably longer because it often takes time to procure information, particularly from suppliers.

3.2 POSSIBLE ACTION AREAS

On the basis of the overview created in 3.1, you can now map possible action areas for product-oriented environmental improvements. First, however, you must get your documentation in order because you will often need that to enter into a dialogue with customers and other stakeholders on your products' environmental impacts.

3.2.1 Documentation

Documentation does not in itself create environmental improvements, but does provide you with a basis for designating action areas, and nowadays being able to document one's environmental and occupational health impacts is a very valuable signal to send out to external stakehold-

ers. In some markets it is vital to be able to document one's products' environmental impacts.

Eco-label criteria (see Tool 2 in Part B) and the Green Buying Guides for Public Procurements (see Tool 3 in Part B) provide examples of the kind of environmental aspects relating to your products that you may be required to document.

Some companies choose to prepare documentation for their products' environmental impacts in the form of environmental product declarations. There are several different ways of preparing such declarations (see Tool 4 in Part B).

How you prepare your documentation and the resources you allocate to the task of collecting data will depend to a great extent on the type of product action you choose to work with.

3.2.2 Possibilities for environmental improvements

There are various ways to improve a product's environmental performance, and the more you know about your products, the more ways you will see. A product's total environmental impacts can be reduced by:

- changing the way the product is produced, transported, used or disposed of
- improving an existing product
- developing a new product or a new concept with the same function as an existing product
- developing services in association with the product (see, for instance, the Henkel-Ecolab/Berendsen example in section 4.1.1.1).

3.2.2.1 Production, transport, use and disposal

For some products, big environmental improvements can be achieved by changing production methods, transport/logistics or patterns of use and disposal. If the overview of the product's life cycle shows that there are significant environmental impacts associated with your own production, you should naturally concentrate your action there.

If the overview shows that significant environmental impacts come from use and disposal, you must consider how you can persuade your customers and/or the consumers to change their behaviour. You can influence the patterns of use and/or disposal in several ways – by preparing directions for use that include guidance on “eco-friendly use”, by bringing up care for the environment in sales and service situations or by establishing return schemes for your product and/or its packaging. The options open to you will depend on your position in the supply chain and a number of other factors (see section 3.2.3).

In some cases, transport can have significant environmental impacts. In such case, you should consider whether you can optimise your logistics – for example, by ensuring a full load on every run (see section 4.2.8).

3.2.2.2 Changing the product

If you are thinking about changing one or more of a product’s constituents/components or the design of a product, you must know enough about the product’s life cycle to be able to judge whether the change will reduce the product’s total environmental impact.

It is therefore necessary to have an overview of all the parts of the life cycle that the change can affect.

In some cases it may be necessary to carry out an actual life cycle assessment in order to judge whether a change in the composition or design of the product will reduce or increase the total environmental impact, while in other cases, the effect will be clear. Tool 1 and Annex 1 introduce the work on life cycle assessments.

3.2.2.3 Developing new products

Your work on reducing a product’s environmental impacts may lead to the development of a “new” product or a new concept that fulfils the same function as the old product.

Improvements in production, use and disposal

APC Denmark ApS worked on improvements within production, use and disposal, e.g.

- reduction of the energy consumption for production of the finished products
- reduced packaging on goods received from the suppliers through the suppliers having changed the form of packaging or the packaging material

and in product development

APC has, for example,

- doubled the lifetime of the product by switching to long-life batteries, which has also resulted in less waste in connection with maintenance of the equipment
- used design tools (see Chapter 4, section 4.2.3) that make it easier to develop new products with increased recyclability after “end of life”.

Recycling of textile waste

Berendsen Textile Service's laundry in Silkeborg has systematised sorting and sale of scrapped textiles with a view to maximising its financial return on this scrap. At prices of more than DKK 7 per kilo, careful sorting pays the wage of the person doing the sorting. The minimum price is at present DKK 9.80 per kilo, but one can often get up to DKK 40 per kilo for textiles of better quality, which are sold for industrial use. The laundry only sells to workshops that dispose of the cloths in an environmentally sound and safe way, including storing used cloths in special containers.

Changed product

C.C. Jensen can minimise the product's weight (and thereby reduce material and energy consumption) by producing in closer accordance with the customer's dimensions and, in the longer term, in cooperation with the customer, minimise the difference between the casting dimensions and the finished dimensions.

Whether you decide to work on changing patterns of use and disposal, substitution of hazardous substances in your products or an entirely different type of action, you must always remember to plan how you are going to document the work.

3.2.3 Consider your position in the product chain

Your position in the product chain can greatly affect your possibility of making environmental improvements or of getting others to do so.

Suppliers will have difficulty in making significant changes without very close cooperation with their customers. Production is usually based on given specifications that take time to change. Manufacturers of end products, on the other hand, will often have great influence on the design of the products. They can, for example, design a product to minimise the environmental impact in the use and disposal phase. For some products, further optimisation can be achieved through guidelines on correct use and disposal. End-manufacturers can also usually influence their suppliers.

Consider how your company itself and the other companies in the product chain can benefit from cooperation and be open to new possibilities.

When considering your options, it is important not to let yourselves be limited (too much) by “how things are today” and by what, on the face of it, you think you can or cannot influence.

3.2.4 Conclusion concerning possibilities

Describe 5-10 possibilities for improvement.

Gathering together what you have learnt in this section, you should describe 5-10 possibilities for significantly reducing your products' environmental impact, including any ideas for developing new products.

Include in your list also possibilities that you cannot directly see will produce improvements. You can examine these possibilities in greater depth later on in the form, for example, of more detailed life cycle assessments.

3.3 MAPPING EXTERNAL EXPECTATIONS CONCERNING YOUR PRODUCTS

External expectations can directly affect your possibility of selling your products now or in the future. It is therefore important for you to build up a picture of the expectations and decide what to do about them.

The purpose of mapping the external expectations is to ensure that you include your customers'/other stakeholders' expectations in your environmental work. It is important to keep the dialogue going in order to ensure flexibility in your development work.

As a company, you have a choice of two, in principle, different strategies with respect to expectations:

1. You can wait until they arise and then collect documentation and possibly carry out necessary product improvements.
2. You can actively seek to influence events by preparing documentation and regularly modifying your product or products in line with the latest knowledge.

In practice, most companies choose a strategy somewhere between these extremes. For competitive reasons it can be extremely risky to remain passive until external expectations arise. In other words, it may be too

late to react when a direct demand for action arrives. On the other hand, in some situations it may be difficult or demand too many resources to stay ahead of *all* potential requirements. It is therefore important to find a suitable level for your action.

When mapping the expectations, there are a couple of questions you must ask yourselves:

- What expectations have we encountered from this party before?
- What expectations can we expect this party to present us with in the future?

3.3.1 Analysis of stakeholders

This section presents some of the product-related expectations you may find yourselves faced with. The section is intended to provide you with inspiration for a systematic analysis of the external expectations concerning your products.

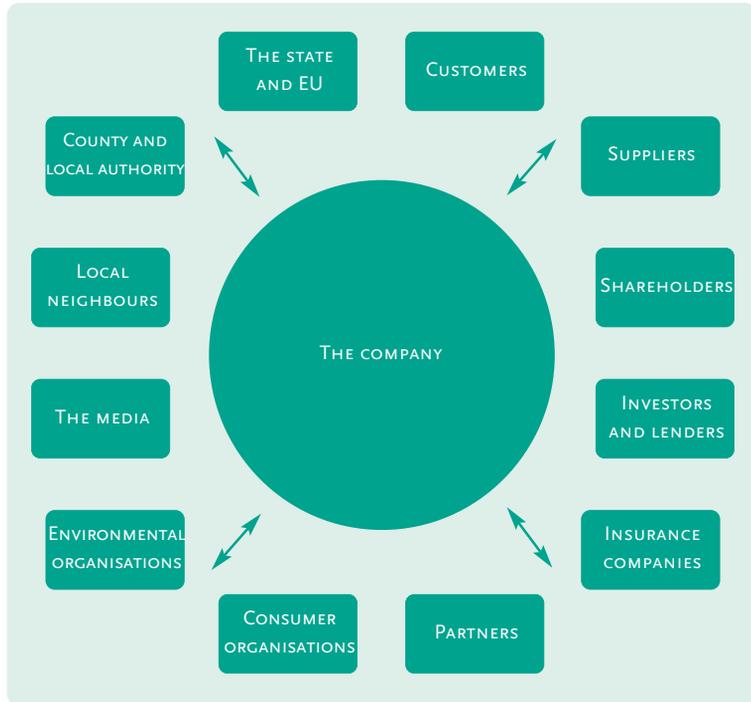
Figure 3.1 lists possible stakeholders. You can use it as a checklist when mapping the external expectations.

This manual does not contain a complete stakeholder analysis but focuses on product-related expectations. In the first instance, that means the immediate links in the production chain: customers and suppliers. Authorities and environmental and consumer organisations are also mentioned because they often have a number of requirements and wishes concerning companies' products.

3.3.2 Customers

Expectations from customers can be systematic and well considered, but you may also encounter ad hoc expectations that do not seem very well considered and that are perhaps neither reasonable nor relevant for your products (see also section 3.4).

FIGURE 3.1
THE COMPANY'S
STAKEHOLDERS
WITH RESPECT TO
ENVIRONMENTAL
ASPECTS



The environmental aspects of your products to which the customers attach importance can vary greatly. The expectations will often concern:

- the constituents and their possible environmental and occupational health effects
- production methods, including – particularly – the consumption of energy and ancillaries
- the amount of packaging and possibilities for its disposal
- disposal of the product
- transport distance and form of transport (air, rail or sea ...).

Section 4.2.6.2 provides guidance on designing a set of questions as an aid to identifying customer wishes.

Customers with different attitudes to PVC

Coloplast's medical disposables are made mainly of plastic, and the company's consumption of PVC raw materials amounts to around 800 tonnes per year, corresponding to about 10% of its consumption of raw materials. The company is therefore very affected by the discussions on use of PVC. Coloplast has consequently done some work on substituting PVC with other types of plastic, but has found that its customers' attitudes vary. Some will not accept PVC in any circumstances, while others think that the alternatives are at least as hazardous/undesirable.

3.3.2.1 The Green Shopping Bag

Expectations can also come from associations of customers. An example of this is Denmark's national procurement service (National Procurement Ltd.)'s "Green Shopping Bag", which, on behalf of public purchasers, sets environment-related requirements for the suppliers of a range of products. The requirements – or expectations – are based on the eco-label and energy label criteria and the Green Buying Guides from the Danish EPA. More information can be obtained on National Procurement Ltd.'s website: www.ski.dk.

National Procurement Ltd.'s expectations concerning the environmental aspects of products and services are included as requirements or used for prioritisation purposes in connection with the prequalification of suppliers for framework procurement agreements. National Procurement Ltd. intends in time to incorporate environmental aspects in all the framework agreements it enters into.

3.3.2.2 Customer expectations can require a lot of resources

It can take a lot of resources to live up to customer expectations concerning environmental documentation and environmental improvements. By initiating a dialogue with your customers concerning the expectations that you will/may be faced with in the future, you can plan your work accordingly and in that way seek to reduce the time spent on it.

3.3.2.3 Cooperation with your customers on the environmental impacts

Active cooperation with your customers on your products' environmental impacts can strengthen and benefit your relationship with them. By cooperating you will at the same time gain some influence on the expectations you are going to be presented with.

Benefits for both

Henkel-Ecolab's cooperation with its customers on reducing the environmental impacts in the use phase and CCJ's possibilities for cooperating with its customers on reducing offcutting are good examples of the benefits that can be gained from close dialogue between the manufacturer and the customer. The examples are described in greater detail in Chapter 4.

3.3.3 Suppliers

Your suppliers are the key to knowledge about, and reduction of, all the environmental impacts that precede your own production. Besides that, you can obtain from your suppliers information about constituents, including chemicals and semi-manufactures, which may greatly affect the products' total environmental impact.

Your work to reduce your products' environmental impacts will therefore necessarily lead to you making requirements or one kind of another of your suppliers or to cooperation with them.

APC Denmark ApS's supplier requirements in brief:

1. APC gives preference to suppliers that have an environmental management system.
2. APC will not generally compromise on product quality for environmental reasons.
3. APC gives preference to suppliers that minimise packaging, takes packaging back and uses eco-friendly materials.
4. APC gives preference to suppliers that use the most environment-friendly form of transport (e.g. rail or sea).
5. APC gives preference to suppliers that work to increase the lifetime of their products, recirculate materials and introduce return systems for their products.
6. APC gives preference to suppliers that do not use any of the following substances in their products: mercury, lead, cadmium, ozone-depleting substances, formaldehyde, organo-tin compounds, PVC.

It may go against the grain to make requirements concerning environmental documentation or environmental improvements on top of the requirements you also make concerning price, quality, reliability of delivery, etc. However, as long as your requirements are well thought through and you are open to dialogue, experience shows that the cooperation with suppliers often develops very well.

If your suppliers use the life cycle approach themselves, you may also receive requests from them concerning documentation and/or reduction of the environmental impacts relating to your part of the life cycle.

3.3.4 Local and national authorities

Expectations from the national environmental authority – the Ministry of Environment and Energy – concerning companies' products have traditionally been in the form of statutory requirements, but in recent years, various schemes have been launched with the aim of strengthening the development and sale of less environmentally harmful products.

The schemes from the Ministry of Environment and Energy that you as a manufacturer should consider are described below. However, far from all sectors and product categories are as yet covered by the schemes.

3.3.4.1 Eco-labels and energy labels

The eco-label schemes, the Swan and the Flower, are intended to help consumers choose less environmentally harmful goods. Concurrently with this, the EU has introduced compulsory energy labelling for the main domestic appliances. Tool 2 includes a description of the eco-label schemes.

3.3.4.2 Green Buying Guides

The Danish EPA has issued and is currently working on a series of purchasing guidelines, called Green Buying Guides, in the series “Better Environment through Purchasing – Environmental Guide to”. Tool 3 in Part B includes a description of the Green Buying Guides, including an explanation of how the guidelines can be used by manufacturers.

3.3.4.3 List of Undesirable Substances

The “List of Undesirable Substances” has been drawn up as a signal to agents, manufacturers, product developers and other players about which chemical substances should, in time, be phased out or whose use should be limited. The fact that a substance is on the list does not mean that the Danish EPA is thinking of prohibiting use of the substance but that the Agency wants to see use of it reduced.

“..... In September (1999), the Environmental Protection Agency, in cooperation with 120 local authorities, launched a campaign to get the consumers to buy detergents and cleaning agents that do not contain LAS (a detergent surfactant), which is on the “List of Undesirable Substances”). The aim is to reduce use of the substance and thereby also protect the environment.

The campaign is at the same time a signal to manufacturers to find alternatives to LAS in their products.....”

Quoted from the Danish EPA's press release before the campaign

3.3.4.4 Product panels and sectoral action

Product panels have been appointed for three sectors – electronics, textiles and freight transport – which will be the focus of special attention in the coming years. The panels are composed of stakeholders from the sectors in question and are to advise and present ideas for product-oriented activities.

In addition, during 2000, the Danish EPA will support sectoral initiatives within the following sectors:

- the plastics industry
- the iron and metalworking industries
- lighting
- refrigeration equipment
- the furniture industry
- detergents and cleaning agents
- packaging
- building and construction.

3.3.4.5 The Danish EPA's website

The Danish EPA's website (www.mst.dk) includes a description of the product initiatives, including eco-labels, Green Buying Guides, product declarations, and product panels, and lists possibilities for obtaining financial support for the work from the agency. The website also provides information on what is going on within the LCA field.

3.3.4.6 Energy information

Energy Information's website (www.energioplysningen.dk) provides information on possibilities for grants for energy savings and information on how to get answers to energy questions.

3.3.4.7 Regulation

Regulation will steadily increase in step with the increasing focus on the environmental impacts of products.

Electronics in focus for regulation – also internationally

Electronics is now a focus area in the authorities' product-oriented regulation, both nationally and internationally. In Denmark, for example, an executive order was issued at the end of 1998 on handling of waste from electrical and electronic equipment (Executive Order No. 1067 of 22 December 1998). At EU level, action is also being taken in the form of "Proposal for a directive on waste from electrical and electronic equipment. Third draft", European Commission, July 1999). The draft directive includes a proposal to phase out a number of chemical substances in electronic equipment, including lead and brominated fire retardants. This will require major development work in the electronics industry in the years ahead.

If you want to find out about future regulation or regulation in your export markets, it is a good idea to start by contacting your trade organisation. Most trade organisations keep track of political initiatives that might affect their member companies. Another source of information is the EU's website www.europa.eu.inc/com.

3.3.4.8 Regulation in the export markets

The product requirements in the export markets are in some cases more stringent than those you encounter in your home market. An example of this is Sweden, where, in the case of public procurements, documentation of the environmental impacts of products is often demanded before a supplier is approved.

Strict requirements concerning documentation in Sweden

At the beginning of 1997, APC Denmark ApS lost an order from a Swedish hospital owing to a requirement concerning documentation of material content, undesirable emissions and other factors.

As a result of this episode, at the end of 1997, APC began preparing an environmental product declaration. Today, APC uses the declaration in connection with customer enquiries.

It may often be difficult to obtain a clear picture of requirements and developments in the export markets. You should therefore consider how you can involve your distributors in the task of procuring the necessary information.

3.3.5 Consumer and environmental organisations

There are a number of consumer organisations that are working to spread knowledge of less hazardous products. Consumer organisations often focus most on health and safety in connection with the use of products.

Green Information (www.greeninfo.dk) is an independent information centre on environment and consumption. Green Information publishes pamphlets with good advice to the consumers on the chemical substances and materials they should try to avoid in cosmetics, baby care products and many other products.

Other consumer organisations are Green Families (www.gronnefamilier.dk), the Consumers' Advisory Council (www.forbrugerraadet.dk), the National Consumer Council of Denmark (www.fs.dk) and the Danish Asthma Allergy Association (www.astma-allergi.dk).

The environmental organisations often select a problem as the theme of a campaign in the form of activities and/or contributions to debate in newspapers or other media. An example of a product-oriented campaign is Greenpeace's campaign against genetically modified food products

(www.greenpeace.dk). Noah (www.noah.dk) and the Danish Association for the Conservation of Nature (www.dn.dk) are other environmental organisations that contribute significantly to the debate.

Many of the consumer and environmental organisations publish a members' newsletter, describing their activities, and many of them also have a website, where you can obtain information about their activities.

3.4 ASSESSMENT OF EXTERNAL EXPECTATIONS

When you have an overview of the external expectations, you must decide whether they are relevant for your products and then carry out a complete assessment of the influence the expectations have and could have on your possibility of selling the products.

Expectations from customers, authorities and other stakeholders will often be based on environmental considerations concerning a group of products. This means that there might be expectations that are not relevant – or that are impossible to meet for your specific product(s). There can also be expectations that conflict with your other environmental work.

Assess whether the external expectations are relevant for your particular product(s)

If you have studied Tool 1, you will have a basis for meeting the expectations or for entering into a dialogue with the stakeholders on any inappropriate demands.

3.4.1 Assess the expectations in relation to the product's function

In every dialogue concerning your products' environmental impacts, it is important to include qualitative parameters, which describe the product's function and effectiveness. One litre of paint is not just one litre of paint. There can be big differences in the content of solvents, covering power, durability, and many other things. The environmental impacts from the

product must always be assessed in relation to the product's functional unit (e.g. 1 m² of wall covered with paint for five years). Tool 1 in Part B includes a discussion of this problem.

When care for the environment overshadows quality

Henkel Ecolab sells cleaning agents. Its customers include dairies. A dairy in Sweden told Henkel that the cleaning agents it purchased must not contain active chlorine. Henkel considered the matter but had to conclude that they could not offer a cleaning agent of suitable hygienic standard without using active chlorine.

Henkel lost the customer to a competitor because they could not live up to the customer's environmental requirements. Later, however, the customer returned to Henkel when they discovered that the environmentally better solution did not live up to their hygienic standards.

The reasons for the expectations concerning a company's products should also be assessed. On what assumptions are the expectations based? Are they well documented?

3.4.2 Overview of product requirements

When preparing objectives and an action plan you may find it helpful to make notes on the technical aspects and resource requirements of the various expectations, including whether it will be necessary to call on external expertise in order to meet the requirements concerning, for example, measurement or testing.

List the expectations concerning documentation and/or environmental improvements and add your notes on each of them.

Direct product requirements can be listed as follows:

- A. Expectations that the product lives up to
- B. Expectations that the product does not live up to
- C. Expectations that require further clarification

You can then make notes on the various requirements on the basis of the following questions:

- How is fulfilment of the requirement to be documented?
- Is there a time limit?
- Is it actually possible?
- Will external expertise be needed?
- What will it cost to modify the product/clarify the situation?

On the above basis, B and C requirements can, if necessary, be subdivided according to whether they are easy or difficult (technically and financially) to investigate or to live up to.

3.4.3 Overview of other matters

You should also list and comment on other matters from the stakeholder analysis that could in time affect the production, use, disposal or sale of your products, e.g. possible legislation.

3.4.4 General assessment

To gather up what you have learnt from the stakeholder analysis you should carry out a general assessment of the effect that the expectations have or might have on your possibility of selling your products.

Different conclusions could be:

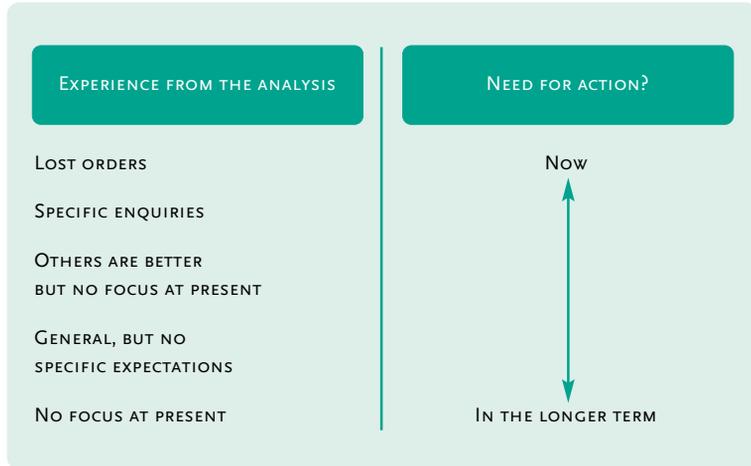
- There are clearly formulated requirements concerning our products, and we need to live up to the expectations in order to sell the products. Otherwise, we shall risk losing orders.
- We have received enquiries about our products' environmental performance, but that has not affected our sales and does not look like affecting them in the near future.
- Our competitors have better environmental documentation and cleaner products, but that has no market consequences at the present time.
- There are potential market shares but no specific expectations.
- There is growing focus by authorities and/or interest groups on our products' environmental impacts.
- There is no focus on them at the present time.

APC Denmark ApS sums up the situation as follows:

“More environmentally active customers and competitors mean that environment is going to be on the agenda. There will have to be considerable demand from the stakeholders – particularly from the market in the form of the customers – before we include environmental aspects as a strategic decision-making parameter.”

The stakeholder analysis and experience from customer enquiries definitely provide information about the time perspective for taking action. This is illustrated in figure 3.2.

FIGURE 3.2:
TIME PERSPECTIVE
FOR ACTION



The situation at the top of the figure (lost orders) will generally mean an acute need to take action, while the situation at the bottom does not set alarm bells ringing immediately, but, on the contrary, allows long-term, well planned product action.

3.4.5 Threats and potentials

If possible, you should now specifically describe (potential) threats and market potentials associated with your products’ environmental impacts. This will often be two sides of the same coin.

New fertile soil
At APC Denmark ApS, the risk of losing customers in the future was turned into prevention through the introduction of an environmental management system and related product-oriented environmental action and to a desire to have an environmentally sound profile. APC has also managed to reduce its resource consumption, thereby benefiting financially, and gained more motivated employees.

Many different customer wishes call for extensive knowledge and documentation.

In Sweden, it is the individual local authority that does the purchasing for its local hospital(s), and environmental issues have a big effect on the market. The wishes concerning both documentation and environmental performance are not “harmonised”, so Coloplast finds that it has to start from scratch with each customer by completing extensive questionnaires. To facilitate the work of documentation in future, Coloplast has built up a life cycle-based database with answers to all the environmental questions that have been received in the Swedish market.

3.5 INTERNAL POTENTIALS

Within the organisation you must get the following matters clarified:

- Are there departments with special needs or wishes relating to your products’ environmental impacts?
- Do your employees have the necessary environmental knowledge or should you add more aspects to your environmental training programme for employees?

3.5.1 Internal needs and wishes

It may be a good idea to find out whether the different departments have special wishes or needs in order to carry out the product-oriented action. Your purchasing department, for example, might want better methods of getting an environmental dialogue going with the suppliers, and your sales and marketing department may need material that will enable them to tell the customers about your products’ total environmental impacts.

The production department might benefit from a control tool for calculating the individual products’ contribution to wastewater discharge or energy consumption – information that can be used when pricing products.

Registration system for costing and green accounts

On the basis of an LCA overview, C.C. Jensen has established a registration system for a selected product. The data recorded include:

- energy consumption – total, per production unit and per functional unit (see definition in Tool 1 in Part B)
- consumption of materials and substances – total and per functional unit
- waste and by-products – total and per functional unit
- hours used and other employee costs – total and per functional unit.

The data are gathered together in internal green accounts for use in planning and control and also form the basis for external green accounts and for costing.

The system is very simple, and the employees like the practical control tool that the overview is – and the tool encourages them to work with environmental improvements.

You will already have cast some light on these aspects via the stakeholder analysis, but Chapter 4 gives a thorough introduction to potentials for the various departments' interaction with the work on the product dimension. Whether you study Chapter 4 now or later depends on whether you want to establish an integrated strategy now or want initially to run a number of projects (see also section 3.6).

Needs and potentials within the organisation should be regularly assessed in relation to the activities initiated in connection with your product-oriented work – e.g. as a reaction to market enquiries/requirements.

3.5.2 Knowledge within the organisation

You must also find out whether you have the necessary expertise within the organisation to carry out specific elements of the product-oriented work – e.g. in connection with:

- more specific life cycle assessments

- a special need for product development/design
- analysis of, for example, a product's evaporation or use of specific test methods (could be required, for instance, in connection with eco-labels).

As will be seen, the needs will to a great extent depend on the employees' assumptions and wishes and on the specific action. Here, too, it is therefore necessary regularly to assess the need for training of employees and any need for external expertise.

Section 5.8.2 gives an example of how the product dimension is incorporated in APC Denmark's environmental training programme.

3.5.3 Conclusion concerning potentials within the organisation

Describe briefly the internal needs and wishes, the need for training/competence and any need for external expertise on parts or all of the task that have been identified so far.

3.6 STRATEGY FOR CONTINUATION OF THE WORK

This section is intended to provide you with ideas for continuing your product-oriented work. The general recommendation is that you initiate one or more project activities in order to gather more knowledge and experience before you establish an actual strategy for the work.

3.6.1 Initiation of project(s)

In this chapter you have so far worked up an experiential basis for one or more of your products. Since you are now well on the way with your deliberations concerning these, this is the obvious moment to initiate some activities relating to the product or products. Particularly if there is market pressure on one or more products, you can start there.

Earlier in the chapter you have built up knowledge concerning:

- potentials for improvement (sections 3.1 and 3.2)
- external requirements and expectations, including whether there

- are eco-label criteria or Green Buying Guides, and an assessment of threats and potentials (sections 3.3 and 3.4)
- wishes, needs and potentials within the organisation (section 3.5).

If you have not already done so, you should now gather up the threads of these activities, as described in section 3.2.4 (potentials for improvement), 3.4.4 (external expectations) and 3.5.3 (potentials within the organisation).

Build up experience and a system via one or more projects. After that, you should establish an integrated strategy for your product-oriented work.

On the basis of the above-mentioned experiences and conclusions, you can identify one or more projects. The project(s) could, for example, focus on:

- achievement of one or more of the potentials for improvement identified in section 3.2 for an existing product or product development project
- preparation of an environmental product declaration for a product (for help, see Tool 4 in Part B)
- a more detailed analysis of the environmental consequences of an idea generated in section 3.2
- being granted an eco-label for a product (for help, see Tool 2 in Part B)
- work on the requirements in a Green Buying Guide (for help, see Tool 3 in Part B)
- a more detailed life cycle assessment of a product in order to have a better basis for decisions.

If the project concerns several departments, you can obtain help in Chapter 4, in which you will find a list of useful methods for the various functions.

When you have selected a project, you must naturally also prepare an action/project plan, which must contain:

- a clear definition of the objective and the actual improvements you want to achieve
- a description of the project activities
- a time schedule, possibly with milestones for slightly larger projects
- the manning of the project, including any need for external expertise
- a plan for evaluation/follow-up.

As always, it is important to carry out a realistic assessment of the necessary resource consumption in the form of time and outlays.

If you make several different products, another project idea is to go through Chapter 3 for further products. It is a good idea to choose products along the line of those you have already looked at because, then, you can use again some of the work you have already done.

3.6.2 Integrated strategy for your product-oriented work

When you think you have sufficient experience, you should draw up an integrated strategy for your product-oriented work.

The strategy must at least ensure that you can meet the expectations concerning your products, so that sales are not at risk. As a basis for judging whether you can meet them, you can obtain input from your assessment of the stakeholder analysis (section 3.4.4).

The strategy should also ensure that you will be working towards continual improvement – continual reduction of your products' environmental impacts, seen in a life cycle perspective.

You must decide:

- what you are going to focus on concerning your products, i.e. where the main potentials for environmental improvements lie, where the main present and potential market requirements are, and

- what possibilities you have for selling less environmentally harmful products;
- what needs and possibilities you have for cooperating with suppliers and customers on achieving the improvements;
 - how the various departments are to be involved, and which of them are particularly relevant with respect to the main action areas identified above; Chapter 4 provides advice on ways of involving the individual departments;
 - how/when you are going to implement the product-oriented work in your management/control systems. Chapter 5 provides advice on implementation.

When you have done that, you must naturally draw up an action plan for implementing the strategy.

4 The Product-oriented Approach in Practice

Once you have obtained an overview of the significant environmental impacts in your products' life cycles and clarified your objectives and expectations concerning your product work, you must translate your knowledge and decisions into practice and thus incorporate the product dimension in your environmental work.

This chapter focuses on two main action areas: the external area, with cooperation in the product chain (section 4.1) and the internal area, which concerns how the various departments within the organisation can incorporate the product dimension in their environmental work (section 4.2).

In section 4.1, *The product-oriented approach is based on dialogue, cooperation and environmental improvements in the product chain*, three relationships are stressed:

- 4.1.1 the cooperation with the customers (here the manual differentiates between industrial customers, public purchasers and retailers)
- 4.1.2 the cooperation with the suppliers
- 4.1.3 the cooperation with the transport suppliers.

Section 4.2 of the manual deals separately with the individual departments within the organisation and suggests methods that the departments can use. Figure 4.1 gives an overview of methods for the various functions.

4.1 THE PRODUCT-ORIENTED APPROACH IS BASED ON DIALOGUE, COOPERATION AND ENVIRONMENTAL IMPROVEMENTS IN THE PRODUCT CHAIN

The product chain, i.e. the process from the time the raw materials are extracted and made into components that are then assembled to form the finished product, is of fundamental importance for the entire process of product-orienting your work. The players that you have most chance of influencing and cooperating with are your immediate customers and

suppliers. It is usually more difficult to have a close dialogue with links that lie further away in the product chain, and it costs resources to include all links. Therefore:

Start with the customers and suppliers that are close to you because it is with them that you have the biggest common business interests. Transport suppliers may also be important cooperation partners if transport is a major link in your product chain.

If you use or have used resources on environmental improvements, you may find that you have more environmental knowledge than your customers and/or suppliers. In that case, you will need to make an extra effort to convince them of the benefits of serious, combined action.

Before you start contacting customers and/or suppliers, there is some “homework” you should do first:

1. Look at the result of the life cycle overview you obtained by means of Chapter 3 (or in another way). Where in the product chain are the biggest environmental impacts and the biggest potentials for improvement? For example, do the environmental impacts depend on how the product is used or has the user (almost) no influence on that?
2. Who determines the design and quality of the products, including the use of different substances and materials? Is it only the customers or is it you yourselves, or do the design and quality depend on the raw materials you can get from your suppliers? Which of your customers/suppliers are important for achieving improvements, both in the form of developing less environmentally harmful products and in the form of reducing impacts during use and disposal? Assess your options and whether there are any parties on which you are particularly dependent.
3. Where are you yourselves placed in the product chain? If you are the

end-producer for the retail market, are your customers either retailers or the end-users, with whom it can be difficult to cooperate individually? The suppliers, on the other hand, are potential cooperation partners. If you yourselves are a supplier to other companies, you may have a limited number of large customers to consider. On the other hand, your possibility of influencing their decisions is limited. In other words, where do you think you have the greatest possibility of exerting influence/getting cooperation?

4. What are the benefits of cooperating – both to you and to the customer/supplier? Identify areas that can produce benefits for both parties (in other words, create a “win-win” situation), for example, in the form of larger market shares, savings in production costs, greater supply reliability, closer business relations with greater loyalty, a good image, etc. You will find it easier to get cooperation going if you can point out potential benefits.
5. How high priority does your management give to incorporating the product dimension in the product chain? What resources will you use on it and is it an important element of your environmental policy or going to be an important element in the future? The answers are undoubtedly closely related to the above questions concerning benefits and will give you an idea of how proactive you should be.

Focus on the benefits of cooperation – both to you yourselves and to those you want to cooperate with. It is hard to say no to the possibility of “win-win”.

It is natural to focus on environmental and occupational health improvements in your production, and more and more companies are demanding that their suppliers reduce their own internal environmental and occupational health impacts. However, with the life cycle approach, there are a couple of vital considerations. Firstly, it is important to ensure that your own environmental improvements do not create environmental problems elsewhere in the product chain. Secondly, you should consider

how to make it easier for your suppliers, customers, waste disposers, etc. to care for the environment and achieve environmental improvements. If you yourselves can achieve environmental improvements or other benefits at the same time, so much the better!

Environmental improvements at the supplier

Dalmose Trævare-industri, which makes coffins, decided to allow their supplier of MDF profiles to decide for itself the design of the profiles provided all the functional requirements were met. That has enabled the supplier to rationalise its production and achieve resource savings.

When you have done your “homework”, you can decide whether you are going to focus on your customers, your suppliers or your transport suppliers – or on all three.

4.1.1 Dialogue and cooperation with the customers

Your possibility of influencing or cooperating with your customers naturally depends on your relationship with them. Some particular types of customers are discussed below, but there can of course be others.

You will find further inspiration for incorporating the product dimension in your cooperation with your customers in the Danish EPA’s manual “Environmental Dialogue with Customers” (see the reference list). This provides guidance on choosing the right customers for an environmental dialogue, identifying customer needs and evaluating the dialogue with the customers.

4.1.1.1 Industrial customers

If your principal customers are other companies, you can start with the question of whether it is the customers or you yourselves that determine the product’s design and function. If the customers “dictate” how the product should look, you can investigate whether the function that your product must fulfil can be achieved in another way or by the customer

using the product in a less environmentally harmful way. A couple of examples are given below.

Optimum dosage of detergents reduces consumption

Berendsen Textile Service has entered into a contract with Henkel-Ecolab on the supply of equipment for dosing detergents at its laundries. The equipment, which ensures optimum dosage and thus minimises the consumption of detergents, has been installed at all Berendsen's laundries. The equipment is linked to an automatic data registration system to record consumption etc. A uniform system for the entire sector makes it possible to compare consumption at the different service centres and thus to set common standards and exchange experience.

Less material, less weight

By studying the product's life cycle more closely, C.C. Jensen have discovered a big wastage of material at the customer buying its ship propellers. About 15% of the cast propeller is ground away at the customer's premises, and C.C. Jensen are investigating whether they can cast closer to the final dimensions and thus save on the raw materials – aluminium and bronze.

As the examples show, there are benefits for both parties in the cooperation. In the Henkel-Ecolab/Berendsen cooperation, Berendsen (the customer) has reduced the amount of detergent used in its laundries, while Henkel-Ecolab has expanded its business area within development and supply of dosing equipment.

At C.C. Jensen and its customer, the benefit for both parties is a reduction in resource consumption, both on the raw material side – steel – and in connection with the processing of the finished ship propeller. Besides that, the lower weight means less fuel consumption for transport from C.C. Jensen to the customer.

If you yourselves design the product, you should also in this situation

find out how your customers use the product and whether you can help to reduce the environmental impacts during use.

Focus on service and guidance for customers

Bodenhoff sells photocopiers and has an associated service scheme. The company states in its environmental policy that the use phase is important: “Bodenhoff advises and instructs its customers on the best way to use its products from the point of view of the environment and occupational health and safety, and ensures that its employees adhere to this policy.

To facilitate environmentally sound behaviour among the users and its own service engineers, the company has had a special return container developed with separation at source of toners, filters, packaging, etc. The container is set up at the customer’s premises, and the customer calls Bodenhoff when it needs emptying. The waste then undergoes further separation, and the various fractions are disposed of in the most environmentally sound way.

Quoted from the brochure “Bodenhoff and the Environment. Policy, Practice and Products”

Another important option is product development and product modification, where you yourselves systematically assess the possibility of using less environmentally harmful materials and generally work to reduce the environmental impacts during the product’s entire life cycle. This is described in detail in section 4.2.3: *Product development*. Here, too, the customers’ needs and wishes are a parameter that should be considered in the development work.

In the industrial market, some customers are normally more important than others, and with these customers you can build up close relations over the years – possibly in the form of real development cooperation. For your product-oriented environmental work, this gives you the possibility of achieving both environmental benefits and market advantages. With selected customers you can, for example, build up shared knowledge about the environmental impacts during the life cycle of the prod-

uct and a shared database that you can use to set up product chain-based targets with related key figures and indicators.

Life cycle-based targets

In the case of vehicles, the weight greatly affects energy consumption in the use phase, which is one of the significant environmental impacts. It is therefore obvious to set an objective for reduction of the vehicle's weight. However, achieving the objective can be a complex task, for although one can directly reduce the weight of the chassis by using different materials, the users' growing demands concerning safety (airbags, reinforced frames, etc.) take the weight of vehicles up. To achieve the overall target it is therefore essential to follow up closely on the product development going on at many different suppliers.

4.1.1.2 Public purchasers

If public institutions are among your principal customers, cooperation with them will often not be very close, and you may have to relate to a large number of customers. Public purchasers are a large group, and tools have been developed in recent years for them to use to assess the environmental aspects of different types of products. As mentioned in Chapter 3, in the case of the Danish market, these tools include the Green Buying Guides and various checklists that have been drawn up by National Procurement Ltd. Even if your product(s) is/are not at present covered by specific guidelines, you should acquaint yourselves with the types of requirements that are suggested in the existing guidelines. That will give you a good idea of the environmental aspects to which special attention is paid and public purchasers' environmental priorities.

Use the Green Buying Guides. Many others that do that, and when many parties focus on the same environmental impacts, it promotes the wish for action.

Spend time supplying the desired environmental documentation for your products because that may be the only information the purchasers have

on which to base their choice of supplier. It is a very good idea to structure your documentation in line with the guidelines used by public purchasers.

Section 4.2.5: *Procurement* includes references to tools for use in incorporating the product dimension in connection with procurements. If you yourselves are suppliers, you should decide how you can/are going to meet the requirements mentioned.

4.1.1.3 The retail trade

The environmentally aware part of the retail trade wants to sell eco-labelled products and other products with documented low environmental impacts. The retail trade is, in the nature of things, very sensitive to consumer wishes and choices, and these can change from day to day, especially if a given product receives attention in the media. Here, it is important to build up mutual trust, so that the buyers know that they can rely on you to handle any problems sensibly.

Environment high on the agenda at the Danish Cooperative Retail and Wholesale Society (Co-op Denmark)

Co-op Denmark and the chains of shops attached to it, are working actively on environmental improvements on the basis of an established environmental policy. Among other things, that means that they invite their suppliers to environmental discussions, where both parties can present their wishes, requirements and ideas. Co-op Denmark finds it important to keep itself informed about its suppliers' environmental potentials and about more eco-friendly products that are on the way.

Regardless of how much importance your retailers attach to environmental issues, you should keep an eye on the market trends and have a contingency procedure for communicating with the press and others in any critical situation. That is particularly important if your products contain substances that might give rise to environmental and occupational health concerns, even though they are not at present documented as harmful.

The growing sales of organic products and the serious problems experienced by Shell in the Brent Spar case (dumping of a worn-out oil platform in the North Sea) show that the consumers have immense power – but also that the “power” in the form of demand or lack thereof is not necessarily based on environmental knowledge.

4.1.2 Dialogue and cooperation with your suppliers

If you already have a certified environmental management system or are building one up, you have/must have some form of structured evaluation of your suppliers’ environmental performance, because purchasing and supplier control are elements of the system.

With the knowledge you have acquired about the products’ environmental impacts throughout their life cycle, you should decide whether you need to take a closer look at the cooperation with some of your suppliers. If you have previously given priority to avoiding substances that can cause undesirable environmental impacts in your own production, you could decide to look at relevant aspects in other phases of the life cycle. For example, you could investigate whether some of the substances your supplier uses in the product cause problems in connection with recycling or disposal – or whether product development at your supplier is the key to getting the complete product’s energy consumption in the use phase reduced.

Recycling and disposal in the electronics industry

In the electronics industry, great attention is focused on recycling and disposal. This means, for example, that manufacturers and suppliers must:

- avoid using certain substances, such as PCB, cadmium and mercury
- label large plastic components with the type of plastic
- avoid assembling the product so that it cannot be separated again
- in other words, avoid gluing, riveting, etc.

As the end-manufacturer, you should ensure that the suppliers do the same.

As in the case of customers, you should select your main suppliers and spend most time on them. If you have not already settled this question, you can use the manual “Environmental Dialogue with Suppliers” (see the reference list). This manual contains a collection of practical experiences and recommendations from the wide range of environmentally certified companies in Denmark.

In addition, section *4.2.5: Purchasing* of this manual gives examples of tools in the form of checklists etc. that you can use in the cooperation with your suppliers.

4.1.3 Dialogue and cooperation with the transport suppliers

In connection with your environmental management system or an environmental approval, you may already have considered your transport suppliers’ environmental impacts in the form of noise on the way to and from your company or handling of hazardous substances. In a product/life cycle context you can supplement this with other aspects, such as:

- reduction of need for transport
- logistics planning
- choice of form of transport
- choice of engine technology with a view to reducing both fuel consumption and emissions.

This is most relevant if you yourselves provide the transport. The first step then is to investigate your transport needs and normal practice. Can the volume of transport be reduced, for example by changing some internal routines or by rationalising your transports?

Henkel-Ecolab is concentrating on back orders in order to reduce transport

Henkel-Ecolab has chosen transport as an action area. A first overview showed that the following functions affected the amount of transport:

- Order Reception (minimise clerical errors)
- Logistics (transport planning)
- Sales (sell larger orders that “suit” the form of transport)
- Research & Development (develop concentrated products with less weight and volume)
- Stock Control (minimise back orders).

The company found a disproportionately high quota of back orders, and that was costly in transport terms. The company therefore appointed an internal group to clarify the reasons for the many back orders and to suggest solutions to the problem.

Next, you should consider the form of transport used, i.e. whether products and materials are transported by road, rail, sea or air. Companies often use a mixture of forms of transport. There is no clear answer to the question of which form of transport is the most or least environmentally harmful. However, for long-distance transport, a rule of thumb says that transport by air is more environmentally harmful than transport by rail or sea. In the case of road transport, the main parameter is how fully packed the lorries are. If you have to transport one tonne one kilometre, it is better to carry out the transport with one fully loaded 16-wheel lorry with trailer than one fully loaded Ford Transit because the environmental impact is allocated to all the products in the lorry/van. If you are transporting goods in an almost empty 16-wheel lorry, it is worse than transporting them in an almost empty Ford Transit.

For the chosen form(s) of transport, you can then look at the possibilities of rationalising fuel consumption and reducing emissions.

If you buy transport services from other companies, you should control

this through requirements for the transport suppliers. Bang & Olufsen mention transport specifically in their life cycle-based environmental policy: “For environmental reasons, we require our transport suppliers to ensure a high level of capacity utilisation and optimum use of technology for the transport units.” This was amplified as follows in the company’s environmental report for 1998/99:

B&O’s environmental requirements for its transport suppliers

In accordance with our purchasing strategy, a growing proportion of our transport is managed by the supplier. In the financial year under review, the proportion of goods delivered free of charge was 87%. There is therefore a far greater need for purchase contracts to specify Bang & Olufsen’s environmental requirements concerning the form of transport to be used in connection with the purchase of goods. In principle, these requirements imply at least fulfilment of current EU legislation, with particular focus on use of resources, planning and current rules on working hours, together with the transport technology used.

Some transport firms are themselves environmentally certified and therefore work to ensure continual improvements. You can contact them to find out where you might be able to achieve improvements and what you as a transport buyer have to consider.

Optimum cooperation – seen from a transport supplier’s side

The transport company Schenker-BTL says that to improve the possibility of reducing the environmental impacts from lorries, customers should:

- provide as much, correct information as possible about the goods and how they are to be handled, particularly in the case of hazardous goods
- give the transport supplier as much time as possible to plan the transport
- demand engine technology based on the EURO codes
- choose transport suppliers that have sufficient capacity to plan.

The transport sector, with the potentials that exist there for reducing environmental impacts is an extensive topic in itself. The following manuals contain some specific recommendations and checklists:

- “Environmental Management and Transport. Manual for Small and Medium-sized Enterprises”. Published by COWI, 1999, with support from the Danish EPA and the Danish Agency for Trade and Industry.
- “Environment and Safety – Manual for Road Transport”. Published by the Danish Shippers Council and the Association of Danish International Road Hauliers, 1997.

Section 4.2.8: *Logistics* in this manual gives selected examples from these two manuals.

4.2 HOW DOES ONE WORK WITH THE PRODUCT DIMENSION IN THE DIFFERENT DEPARTMENTS IN THE COMPANY?

Companies with experience of the life cycle approach have an important message for others: make sure that you anchor tasks and responsibilities in the organisation. Results are created not by having a fine plan written at a desk, but through the daily work.

That means that training and exchange of knowledge and experience are very important. To make decisions that are best for the environment – and for the customers – one must understand what consequences one’s own choices and actions have elsewhere in the life cycle of a product and in the organisation. At the same time, it is important to strike a balance. It is not necessary for all employees to be environmental experts.

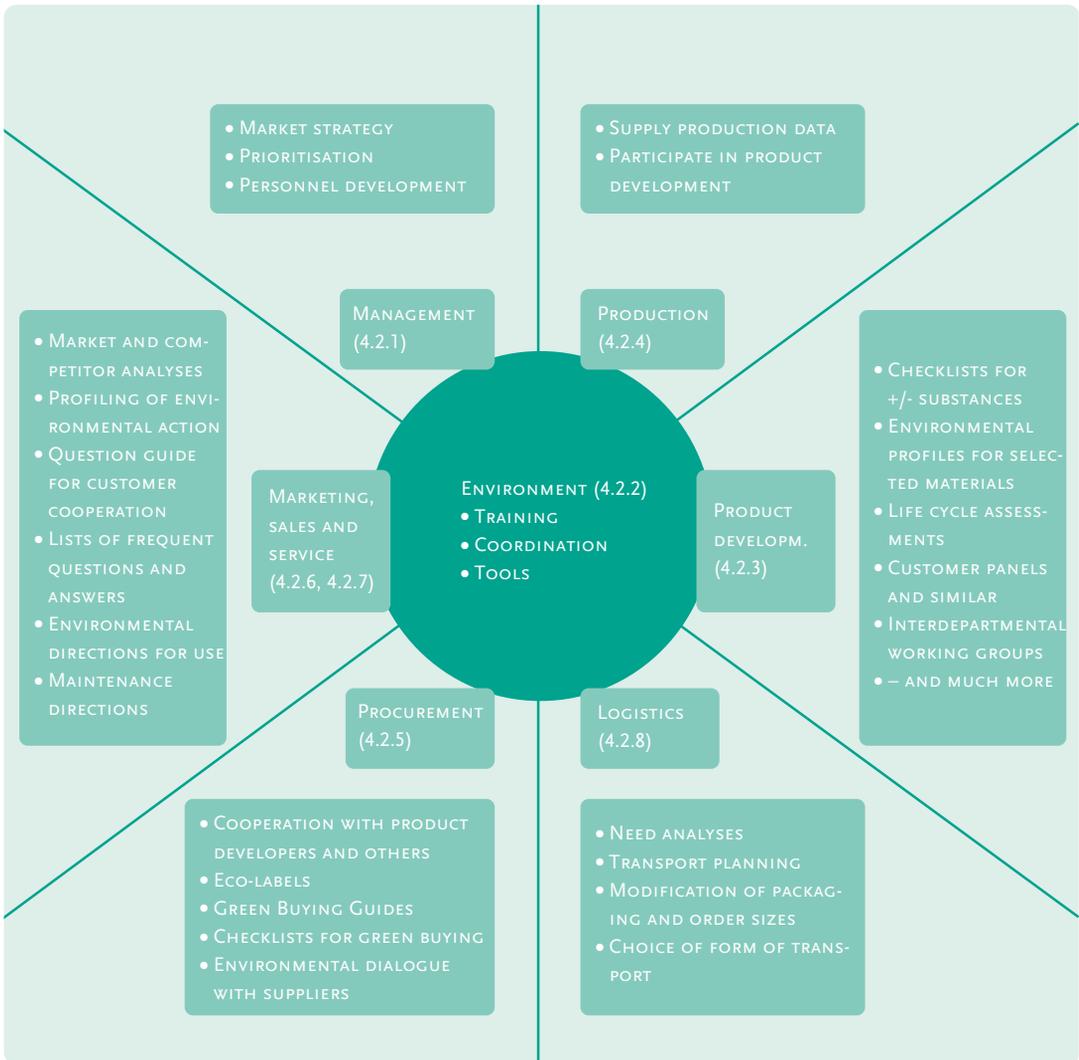
Very few companies are able to make a major effort in many places at the same time, but no matter where you start, the employees in the department in question will need one or more tools to help them to use the life cycle approach and incorporate the product dimension in their work. In other words, where, when and how the environmental aspects of a product or products should be incorporated in the daily work.

For the departments in which you decide to make a special effort, you should establish a policy that supplements and amplifies your corporate environmental policy. An environmental policy is seldom sufficiently specific to mark out guidelines for the individual departments, so you should draw up a policy with related objectives for “green” purchasing, “green” product development, etc.

Selected functions are discussed below, with a short description of their options and suggestions for tools in the form of checklists and similar. In some cases, the tools have been “borrowed” from other sources; where that is so, there will be a reference to the source. In these cases, you should obtain the original publications so that you have the complete material. The tools are for inspiration, and it is up to you yourselves (typically through cooperation between the environmental function and the function that is to use the tool) to develop or adjust your own tools.

Figure 4.1 shows suitable tools for the different functions and the sections in the manual that deal with the various functions.

FIGURE 4.1
FUNCTIONS AND
TOOLS



4.2.1 The management must be actively involved

It is generally the task of the management to establish your environmental strategy and priorities, assign responsibility and resources on that basis and ensure that the organisation as such is equipped to undertake the tasks. That also applies to incorporating the product dimension in the company's work. Here, the management's role is particularly important because of the need to coordinate and prioritise across the organisation. In other words, the management must decide whether the existing information flows and decisions are sufficiently effective for the product-oriented work. As shown by the example below, lack of coordination can have serious consequences beyond the environmental work itself.

An unfortunate example from real life

The development department of a large company had fixed an environmental objective for phasing out a given substance that was problematical both environmentally and with respect to the market. All the people in the development department and the sales & marketing department were informed about this objective. Unfortunately, through an oversight, the purchasing function was not informed. As a result, while the other departments were taking action on the objective, the company's buyers negotiated a big contract with a supplier that obliged the company to take a considerable minimum amount of the "banned" substance for the next five years.

A company's product-oriented environmental strategy is also far more visible in the marketplace – to suppliers, customers and consumers – than traditional environmental management. The management therefore has to decide what profile the company is to have and how much importance is to be attached to environmental aspects in your cooperation with, particularly, customers and suppliers.

To ensure the necessary effect, the product-oriented policy and declarations of intent must be translated into actual targets that the management must follow up on; if you have an environmental management system, the targets can be incorporated in it. The product-oriented environmen-

tal targets can be directly related both to the product itself – e.g. phasing out a problematical substance in the product – and to other areas of your activities, e.g. incorporation of the product dimension in x% of the procurements for the administration. It is important to think right across the organisation so that the environmental targets are supplemented by other targets. When you set a target for development of a less environmentally harmful product, the sales department should have a sales target for the new product. In other words, the responsibility for achieving the environmental targets must be spread out in the organisation, although this must be done in a way that ensures that the success criteria relating to the responsibility are reasonable.

Ensure that the success criteria for the individual function/employee suit the product-oriented objectives or at least that there is no conflict.

Experience shows that to achieve satisfactory results, the management must back up and visibly prioritise the environmental action. The management should express the priorities in many different contexts – including, particularly, ensuring the necessary resources for the tasks. You can also work with organisational targets to promote the action. If you do not already work with such targets in your environmental work, you can take the opportunity of doing so when you incorporate the product dimension. More and more employees are being drawn into environmental work in their daily lives, so it is extra important to ensure motivation and efficiency. The following examples of organisational targets are intended as inspiration.

- Motivation of employees. Bonus schemes to which various employee groups contribute and benefit from promote motivation. A scheme of that nature could, for example, be linked to reducing the quantity of selected, non-renewable resources used during a product's life cycle. That encourages product developers and buyers to find better alternatives, while sales representatives and others in

contact with the customers can work to promote return schemes and recycling.

- Supplementary training in product-oriented environmental work. Set targets for the number of employees taking relevant internal and/or external courses.
- Environmental responsibilities in job descriptions. Set targets for the proportion of managers/middle managers and key employees whose job descriptions include environmental responsibilities, resulting in the setting of success criteria that affect their salary and career prospects.
- Reporting to the management. Particularly in large companies, it is common for managers/middle-managers to have to report periodically to the top management on selected areas. Here, environmental performance and initiatives should be reported together with other business elements.
- Information across the organisation. In companies with a line organisation, the information flows typically go up and down along these lines. You can work to promote information across the organisation both by calling for this and through incentives, but you can also formalise cross-flow of information. For example, persons from a line/function can be required to participate in certain meetings or decisions in another function.

4.2.2 The changing role of the environmental department

In a traditional environmental management system, the environmental manager naturally focuses on what is happening in the production and directly related departments. The knowledge gathered from outside very often concerns official requirements and various other stakeholders' requirements. The environmental manager will often also be charged with motivating and "training" his colleagues, carrying out actual environmental assessments and keeping the management informed – and many other things as well.

When you work with a product-oriented approach, many of the tasks will be the same, but new dimensions will emerge. They naturally include

the entire environmental life cycle perspective, with which the environmental manager must be conversant, and which he must communicate to his colleagues. They also include supporting many different functions with new tools and ensuring coordination of the action between the departments. Besides these dimensions, however, the environmental managers' role vis-à-vis the management changes. When the environmental perspectives spread beyond the company's own boundaries, the management will need far more extensive assessments than previously. That means that the environmental manager must also think in terms of market strategy, the organisation of the company, etc. – or at least know how to ally himself with others who can contribute to that knowledge. To ensure the necessary impact in the management, the environmental manager needs to be something of a “universalist” as well as an environmental expert. That is a real challenge – and one that you should take seriously.

As mentioned earlier, not all your company's employees need to be environmental specialists. It is important, however, that you determine what knowledge the individual employee needs (for example, some general knowledge about the product's environmental impacts during its life cycle) or has a duty to acquire (for example, knowledge about the environmental consequences of the choices the employee makes). You should build up sufficient knowledge to be able to carry out the regular assessment and decisions, but can purchase from external experts any one-off assessments you need, such as assessment of the environmental impacts of the chemicals you use.

You can also use external experts in cases where you yourselves do not know enough. However, it is a good idea to start on the basis of your knowledge. That increases the chance of good practical solutions that the individual employee can use because he himself has been involved in finding the solution. If you do use experts, you should ensure that the knowledge they add is firmly anchored in your organisation so that you yourselves can take over.

Mapping knowledge routes

At APC Denmark ApS, the environmental coordinator mapped how product-related documents and knowledge flowed round in selected parts of the company. The mapping exercise produced several benefits, including:

- a common understanding of words and concepts
- an overview of the documents circulating in the company and the routes by which they do so
- an overview of the individual departments'/employees' need for information
- an understanding of what is needed for the employees to carry out desired actions in the most efficient way.

4.2.3 Product development

For companies that develop products themselves, incorporation of the product dimension in their product development work is a must. The materials chosen and the way they are combined determine much of the product's later function and the environmental impacts associated with its use and disposal. It is therefore here that one finds the best potentials for reducing the environmental impacts from products. If you do not develop your products yourselves you can instead seek influence by presenting your wishes, requirements or proposals concerning the product and its environmental aspects to the company or companies in the product chain that carries/carry out the product development.

Incorporate environmental and occupational health aspects in connection with product development and specification. It is here that the basis is laid for the product's environmental and occupational health impacts during its life cycle.

Besides achieving environmental improvements, experience shows that working systematically with environmental aspects during product development can have beneficial side effects – in the form, for example, of savings, quality improvements, better contact with the market and greater customer satisfaction. If you make consumer durables, produc-

tion equipment or similar with high added value, where you yourselves control the product development, and where there are well-defined distribution channels and perhaps also return schemes, you have many possibilities. If you make goods for the private consumer, the situation may be more diffuse. For instance, it is somewhat harder to clarify consumer wishes, and most ordinary consumers' considerations concerning the environmental aspects of your product or products are far less systematic than those of professional buyers.

In some cases, there may be a shift in costs during the product's lifetime. For instance, the development phase and the launch of the new product may cost more – particularly if you have to invest in new equipment to make the new product. On the other hand, using and disposing of the product may cost less, which could mean bigger sales. You thus need acceptance by the management and a clear policy with clear objectives for what you want to achieve. Precisely this means that there is an obvious link between product development and environmental management and that objectives for continual improvements must include objectives for product improvements.

4.2.3.1 All products can be improved

Irrespective of the type of product, there will always be some potential for reducing its environmental impacts, and that potential must be looked into – see the following rules of thumb. With such a list, it may be tempting to tackle each problem separately, but if you choose a step-by-step solution, you must be careful to avoid suboptimisation – in other words, it is no good achieving improvements in one place if you thereby create greater problems somewhere else.

TABLE 4.2:
 RULES OF THUMB
 FOR ENVIRONM-
 ENTAL IMPROVE-
 MENTS IN CON-
 NECTION WITH
 PRODUCTION DE-
 VELOPMENT

Choice and use of materials

- reduce the content of hazardous substances
- incorporate recycled and recyclable materials
- use more durable materials
- use smaller quantities of materials

In the processes

- reduce wastage
- reduce energy consumption
- reduce the use of hazardous substances

Use of the product

- ensure that it is energy-efficient
- reduce the amount of waste and emissions
- minimise the packaging

Reuse and recycling

- incorporate reusable/recyclable materials
- ensure that the product can be easily separated after use
- use as many standardised materials as possible
- ensure that each part/component is labelled
- reduce the number of components in the product
- reduce the number of different materials in the product

Increase the lifetime of products and components

- ensure that components and parts of the products can be used in other products
- ensure that the product can be upgraded
- ensure that spare parts etc. are readily available for maintenance and repair
- use reconditioned parts from worn-out products

Disposal

- ensure that the parts of the product or components that cannot be reused or recycled can be incinerated with energy recovery or, as the last option, be deposited at a landfill site with the smallest possible impact on the environment.

Source: WICE: Design for Environment, 1994

4.2.3.2 *Tools for use in the life cycle approach to product development*

Training is a key parameter when you start working systematically with the life cycle approach to product development. It takes more than a few fiery souls to ensure continual improvements. Everyone involved should therefore have sufficient basic environmental knowledge for their needs.

Besides that, you can draw up lists of acceptable and unacceptable substances and checklists with questions that the product developer must always consider. You can, for example, use the above overview from WICE (table 4.2) as your basis and supplement it with things that are relevant for your own types of products. You can also appoint a team to act as the Devil's Advocate and ask critical questions about the product developers' proposals, and you can set up score systems and environmentally based criteria for when a new product is acceptable.

You should, of course, use life cycle assessments in your product development work, so that you think thoroughly about the environmental impacts in all phases of the product's life cycle. Here, you can start by setting up an environmentally ideal concept for the product in the different phases and, on that basis, consider the real potentials and alternatives. Figure 4.3 shows an example of prioritised ideal requirements for a seat. The ideal requirements are prioritised, so cleaning, repair and disposal should preferably be unnecessary or – as the next best alternative – minimised.

FIGURE 4.3:
IDEAL CONCEPT
FOR A SEAT –
EXAMPLE FOR THE
USE AND DISPOSAL
PHASES

	Ideal solution	Next-best solution
Cleaning	No cleaning required - the product is used and thrown away - the user wipes the seat himself by sitting on it	Minimum cleaning - solid materials are used - textiles and foam are not used
Repair	No repair Robust materials are used, e.g. cast iron or aluminium	Minimum repair - the wearing parts can - the wearing parts can
Disposal	Disposal is not needed - the product lasts for ever - the product disposes of itself – e.g. by reducing to vegetable mould	The product is easy to dispose of - only one material is used - the materials can be reused/recycled or incinerated

Source: Based on the Institute for Product Development's seminars for industrial designers, 1998

To support use of the life cycle approach in product development, PC-based analytical tools have been developed for quantifying environmental impacts. However, to use the tools, you must have some data available. The tools are therefore easiest to use if you have an existing product with which to compare the modifications. In addition, the results must always be used with caution because some of the data embedded in the tools are average figures for different processes and thus not sufficiently specific for your particular product. In Denmark, the most popular tools are LCV (Life Cycle Tool), developed in connection with the EDIP project, and SimaPro, developed by Pré in the Netherlands (see Annex 1 in Part C).

EDIP (Environmental Design of Industrial Products) is a comprehensive method, and companies without any knowledge of LCA and detailed environmental assessments may have difficulty in getting going on it. To facilitate its use, the method has been simplified and described in “Manual on Environmental Assessment of Products” (see the reference list), which supplements this manual’s recommendations in several areas.

4.2.3.3 The phases in product development

The development of new products “from scratch” normally comprises a number of phases, from idea, through development of a product concept and detailing, to launching the product on the market, as shown in the following example from Grundfos.

Grundfos’ seven phases of product development

Grundfos operates with seven phases in product development:

1. Gathering ideas
2. Preliminary study (environmental requirements for the project and the product)
3. Concept phase
4. Development phase (life cycle assessment of the objectives set in phase 2)
5. Preparation phase
6. Production start-up
7. Sales phase.

Environmental aspects receive the same attention as other design parameters, such as price, quality and ease of production. This means that a dialogue often develops on why a proposed solution is good or bad, which trains the product developers to think environmentally in their work. That is more effective than “simply” preparing positive/negative lists of substances and materials because the product developers are confronted more clearly with the consequences of their choices, and that promotes understanding.

In the early phases, there are great degrees of freedom, but the information is qualitative and not very detailed – particularly in the case of entirely new product concepts, where direct comparison with “old” products is not possible. Later in the process, there is more possibility of obtaining quantitative data, including data concerning the potential environmental impacts. Here, on the other hand, the options are more limited, and that means that it becomes more difficult to make basic changes to the product. In other words, you must consider the environmental aspects as early as possible in the development process, particularly if you are aiming for major and more radical changes.

4.2.3.4 The level of ambition

A decision you have to make is how extensive the product improvement action is to be. For most companies, it is natural to start with gradual improvements in order to gain practice in incorporating environmental aspects and methods, and at this level, you will find it reasonably easy to deal with both the work and the consequences. Very extensive “sustainable” environmental improvements, on the other hand, call for complete redefinition, not only of the product but also of the need covered by the product, and thus redefinition of the patterns of use. In some cases, the infrastructure in society and the way companies cooperate may have to change in order to fulfil our needs in new, sustainable ways. Very extensive solutions of this kind are hardly within the scope of a single company – here, cooperation in the product chain and with other stakeholders in the different phases of the product’s life cycle is essential.

As will be seen from the following figure, the scope of your product development can be divided into four levels that reflect the extent of the action and the product changes.

Level of improvement	Objective	Improvement (%)	Time horizon (years)	Technical innovation	Changes in patterns of use	Infrastructure changes
1	Gradual improvements	5-20	0-2	+	-	-
2	Redesign of existing product concepts	20-50	0-5	++	+	-
3	Alternative fulfilment of objectives	50-75	0-10	+++	+++	+++
4	System renewal	>75	0-30	++++	++++	++++

(Source: Stevels, 1997, Stevels and Van der Wel, 1998)

FIGURE 4.4:
LEVELS IN
PRODUCT
DEVELOPMENT

Level 1, which is the starting point for most companies, concerns adjustments and minor modifications, e.g. substitution of certain substances. The work is carried out at your company, and the product retains its original function and can be used as it is usually used. Typical tools for the product developers are +/-lists of recommended/undesirable substances and simple rules of thumb, e.g. those given in the previous overview. However, you must remember that such tools do not in themselves produce environmental improvements. Both Grundfos and Coloplast have found, for example, that it is essential to have close cooperation between the product developers and environmental experts because environmental assessments are often complicated to carry out.

Establish good cooperation between the product developers and the environmental experts in the organisation.

Cooperation between product developers and the environmental department at Coloplast

The need for environmental assessments varies considerably from one development project to another. They are therefore divided into three types:

Type 1, Registration: Further environmental assessment is unnecessary (e.g. a variant of an existing product).

Type 2, Screening: The environmental department carries out a simplified environmental assessment in the form of screening. The environmental impacts are regarded from the start as limited (e.g. a new low-volume product with known material characteristics).

Type 3, LCA: The environmental department performs a real life cycle assessment. The environmental impacts are largely unknown or are expected to be considerable and might affect the production sites' conditions for environmental approval (e.g. a new high-volume product, where new materials are used).

At *Level 2*, you check the product more thoroughly. This might also lead to changes in the way the product is manufactured and used. Basically, however, it is still the same product. Because the changes are bigger, it may be necessary to carry them out in cooperation with, for example, suppliers or customers. As support in this work you will need more detailed tools, e.g. PC-based tools for life cycle assessments (EDIP, SimaPro or others, see Tool 1 of the manual for further information).

At *Level 3*, you will investigate whether the users' needs can be met in entirely different ways than with the existing product. Here, it is not enough to use environmental assessment tools because the product's basic function, the users' way of using it, the infrastructure during the product's entire life cycle and possibly in society, and many other factors, must also be assessed.

Level 4, which corresponds to translating the sustainability principles into practice, is a further development from level 3 and will include real

quantum leaps, both technologically and organisationally. At the present time, this level is more theory than practice.

If you lack experience in taking the life cycle approach in product development, you should start at level 1 by preparing simple checklists and training your product developers – possibly in the form of “on-the-job training”, where an environmental expert is directly involved in discussions and decisions.

For action beyond level 1, you should actively involve other parts of the organisation from the start, for example, via an interdepartmental working group, so that their knowledge, wishes and reservations can be considered before it is too late – or very much costlier – to change something. By appointing an interdepartmental working group, you help to highlight the product development work, and more people/departments are now engaged in gathering knowledge that can be used in the development of new products and concepts. For example, it is important for the economic analyses also to be seen in a life cycle perspective – in other words, for the consequences for other links in the product chain, for the users, and for society, to be assessed. Will the product be more expensive or cheaper to use and dispose of? What is the supply horizon for the raw materials, and will that effect the price over time? These are just a few of the questions that must be asked.

4.2.4 Production

It is naturally important to involve the production department in the development work so that the proposals discussed do not prove impracticable when the time comes to make the product.

Some companies do not have a separate product development department. There, the necessary and desired modification and development take place in the production department. Contract manufacturers, in particular, can use some of the recommendations given in the above section on product development, with the limitation that the process itself calls for close dialogue with the customers.

Another important function for the production department in product-oriented work is to procure data per unit produced and/or per functional unit. This may prove a big challenge because the available data – for example, on energy consumption and emissions, are calculated for the production as a whole and not for the individual product. “Environmental Project No. 488, 1999” from the Danish EPA (see the reference list) provides examples of how the company Teknos Schou, which makes metal paint, has gathered and processed data from its production department for use in a life cycle assessment.

4.2.5 Procurement

The buyers’ function is to procure the right goods of the right quality at the right price. In addition, the goods should be environmentally efficient by getting more out of less, i.e. they should contribute to greater added value with lower environmental impact, and this need not be at variance with the quality or price requirements. The buyers can also be involved in assessing the suppliers and their environmental performance and in establishing expanded relations and cooperation with selected suppliers.

In the following, procurement and supplier control are dealt with separately, but in practice, there is some overlap. Procurement focuses on the products themselves, while supplier control is about how good/credible suppliers are with respect to environmental issues.

4.2.5.1 Purchasing for your own products and production

In connection with procurements, you should differentiate between the raw materials etc. that are used directly in your products or in their production and other products, such as office materials, furniture, etc. In the case of the environmental profile of your own products, it is the first group that is the most important, but changes in the form of purchasing alternative, less environmentally harmful materials etc. cannot be decided by the buyers alone. Product developers, the production department and the environmental department should assess the potentials together because it is important to ensure that the products continue to function as intended and live up to the customers’ needs and expectations. The po-

tentials for changing practice relate particularly to the development of new products or modification of existing products.

The buyers must translate the environmental requirements into practical action.

One particular role of the buyers will be to specify the requirements to be made of the suppliers and the products purchased and to clarify any consequences for price, supply reliability, etc. To do that, the buyers will have to build up environmental knowledge and be provided with clear guidance on what it is they are to find out. Like the product developers, the buyers also need to work in close tandem with environmental experts and others that can assist in assessing the alternatives found by the buyers.

No matter what products you want, you should always assess the need for the purchase and see what function the product is intended to fulfil. The less you have to purchase, the more you will save, both in environmental impacts and financially.

Questions to clarify needs

- Who are the actual users, and who comes into contact with the product?
- What is the actual need that has to be fulfilled? What function is required?
- Can the need be covered in other ways than buying new and, if so, how? Perhaps by changing some work routines? Perhaps you already have another product/machine/tool that can be used for the task in question? Can the existing product be renovated and reused?
- For how long will you need the product? Is the need static or does it change?
- Will the whole of the product be used within its lifetime or will some of it be scrapped?

4.2.5.2 Other procurements

With the other type of procurements, which is not in the same way vital for your own products or production – for example, PCs for the office – there is greater flexibility. Here, the buyers – possibly together with the environmental department – can themselves check out and purchase less environmentally harmful alternatives. And that is important because your demand helps to build up the market for less environmentally harmful products. In the following we discuss some selected tools and sources from which you can obtain further information.

Your demand is part of other companies' market. Wherever possible, use "official" recommendations about environmentally sound purchasing so that the total demand for a given "green" product does not become too diffuse and difficult to live up to.

If you want to work systematically with the product dimension in connection with your procurements, you should start with a single product category in order to build up experience. It is a good idea to choose a category that is visible to many employees or in which there are big potential environmental benefits, e.g. within office operation or cleaning. Start by assessing the need and ask few, simple questions about the products and the suppliers' environmental aspects – and remember that you must be able to use the answers you receive.

With a view to strengthening the demand for less environmentally harmful products that are used by many, various guidelines, checklists, etc. have been issued in the last few years for use in procurements (addressed particularly to public sector purchasers). In Denmark, we have the Danish EPA's "Green Buying Guides for Public Procurements" and National Procurement Ltd.'s checklists. You can obtain the Green Buying Guides free of charge from Miljøbutikken (phone +45 33 95 40 00) or download them from EPA's website www.mst.dk. You will find National Procurement Ltd. (SKI)'s checklists and recommendations at the website www.ski.dk.

If there are Green Buying Guides on (some of) the products you buy, it is best that you use them. Standardised requirements concerning both performance and documentation make life easier for the suppliers, in addition to which, you yourselves do not have to carry out environmental assessments of the products. In the same way, whenever possible, you should buy eco-labelled products (the Swan or the EU's Flower). An overview of these product categories is available at www.ecolabel.dk. If the product uses energy in the use phase, you should find out if there are energy labels for the product category. On SKI's website you will find a list of various labels and where they are used.

If you want to incorporate health and safety considerations in your procurement activities, the Danish Working Environment Authority (WEA) has supported the preparation of guidelines on incorporating occupational health and safety considerations in the procurement and use of desks, office chairs, floorings and lighting. By agreement with WEA, the guidelines, together with a short background report on such procurement, are to be found at www.dk-teknik.dk. WEA has also supported the preparation of guidelines on the procurement and use of office machines: "Standardised tests and Guidance on Installation and Procurement" and "Where does the cupboard go – fitting out offices". You will find these guidelines at www.teknologisk.dk/1026 or [775](http://www.teknologisk.dk/775).

If you want an alternative approach to procurements, the GRIP Center in Norway has prepared guidelines with many questions, points systems and cost-benefit analyses. You can download this material from www.grip.no.

4.2.5.3 Environmental assessment of suppliers

If, through product development or in some other way, you have defined some areas where it is important that your suppliers act in a specific way, you must obviously specify these requirements to the suppliers and ensure the necessary documentation. The requirements could, for example, concern the suppliers' use of undesirable substances or processes.

Requirements as an element of fulfilling your own objectives

APC Denmark ApS has prepared a simple questionnaire that is focused on the company's objectives for its own products (Uninterruptible Power Supplies). The questions to the suppliers include whether they are working to prolong the lifetime of their products and whether they use mercury, cadmium, lead, ozone-depleting substances, formaldehyde, organic tin compounds or PVC in their products. The questionnaire is thus an active tool in APC Denmark's work to fulfil its own objectives.

Your own environmental profile will be affected to some extent or other by your suppliers' environmental profiles. Besides that, it is often good for long-term supplier-customer relations that the suppliers become ever better and are able to keep step with both your needs and those of your customers/the end-users.

Demanding customers are an important factor in the development of suppliers.

You cannot and should not turn every stone with respect to your suppliers' environmental impacts, but you can ask a few questions that will give you an idea of whether the suppliers are working actively on environmental improvements – for example, whether they have an environmental policy, prepare green accounts, have environmental certification, or set objectives for improvement of their environmental work. The manual “Environmental Dialogue with Suppliers” (see the reference list) gives some examples of relevant matters to ask about. The sources mentioned under purchasing also include simple questions to clarify suppliers' environmental aspects. With supplier control, too, it is best to start in a small way and then gradually develop the system.

It may be difficult for suppliers to obtain the desired documentation if they do not have an environmental management system or similar, documented environmental work. Grundfos therefore started by convening its

suppliers to seminars at which they were told what Grundfos expected from them.

Quality and environmental management promotes exchange of information

Through its quality management system, Grundfos has a classification of its suppliers.

The same type of classification is on the way for environmental performance, and the company has given its suppliers five years to introduce an environmental management system if they themselves wish to do. In 1998, Grundfos held seminars to introduce the system to the suppliers, and from 2003, environmental performance will be a fully integrated element of quality assessment. Grundfos has found that it is very difficult to obtain quantitative data on suppliers' environmental aspects if the suppliers do not have some form of environmental management. The company is therefore encouraging them to do that.

4.2.5.4 Use of questionnaires

A questionnaire is an obvious way of obtaining information from your suppliers. However, questionnaires easily become too general if you ask all suppliers the same questions, and in that case, the answers are of relatively little value.

If you decide to use a questionnaire, you should consider:

- for what purpose you are sending it out. If you primarily want to get the suppliers going on systematic environmental work, general questions concerning, for example, environmental policy, environmental objectives, environmental management and environmental accounts are suitable. If, on the other hand, you want specific information, e.g. the products' content of substances and production methods, you must ask for exactly that.
- how you intend to react to suppliers that do not respond to the questionnaire.

- how you are going to process the answers. If you receive many identical answers, you can gain an overview by using a scoring system.
- how you are going to follow up on the answers. It is important to give the suppliers some feedback. They should at least be told what you are using the answers for.
- how often you will send questionnaires out and thus what priority you give to getting information from the suppliers.

The scope of the questionnaire should depend on what you are going to use the answers for. If you are going to use them actively to assess the suppliers' environmental performance, it is important for the suppliers to have the possibility of giving a balanced answer. If you simply want to send a signal about the focus areas in your environmental work, your questionnaire should not be larger than a single A4 page.

Hartmann has focused on its suppliers' environmental performance for a long time now and have arrived at the following model, which, although ambitious, is simple to handle for both the company and the suppliers.

Evaluation of suppliers at Hartmann

Hartmann has fixed on six action areas in their own environmental strategy. The six areas are: environmental policy, environmental objectives, environmental management, environmental accounts, cleaner technology and preventive action, and life cycle assessments. All suppliers deemed to be important from an environmental angle are asked to complete a questionnaire, in which, for each of the six areas, they have to state whether the action: 1) has been completed; 2) is in progress; 3) is planned; or 4) is not planned. The answers are then used to evaluate the suppliers and draw an environmental profile of each. The company can see clearly from the environmental profile whether the supplier is environmentally active and in which areas. The smaller the area of the profile, the more active, and vice versa. When the profiles have been completed for all the suppliers in the various supplier categories, Hartmann sends a copy of the result to each of them, together with a copy of the average profile, so that the supplier can see if he is better or worse than the average. Up to the present time, no supplier has been discarded because of a “bad” profile, but Hartmann has had calls from suppliers who can themselves see that they lie below the average, asking whether they are in “the danger zone”.

In Hartmann’s questionnaire, the suppliers are also asked to judge what their three significant environmental impacts are and, for each of them, to state what they have to do to reduce the impact and how much further they expect to be able to reduce it over the next 10 years. In that way, Hartmann encourages dialogue and cooperation on the environmental problems that the suppliers themselves regard as important.

4.2.5.5 Practical support for the suppliers

You should also decide how much time you are going to use on the environment-related cooperation with the suppliers. Will you, for example, spend time keeping the suppliers informed about new measures and help them build up knowledge. This can be particularly important if your

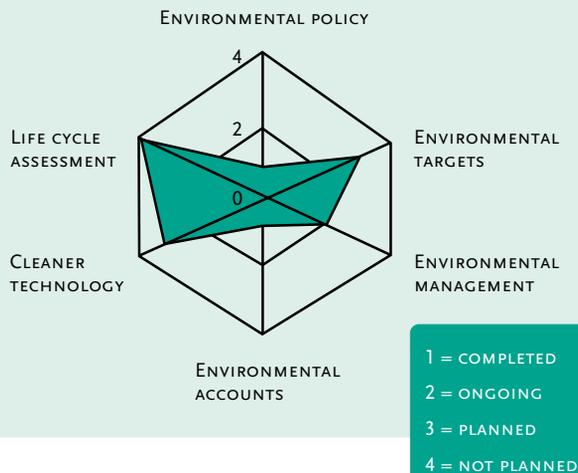
suppliers are very small and do not themselves have sufficient resources to keep up with the latest environmental news or build up documentation systems.

Important to support small suppliers

In the graphic company Levison + Johnsen + Johnsen, the environmental coordinator acts as consultant, both internally and externally. This means, for example, that she spends time advising very small suppliers that are environment-minded, but that have very few resources to spend on anything other than the production itself. High priority is given to this because very small enterprises are often extremely environmentally aware but cannot document it. The ongoing dialogue therefore also functions as part of the documentation.

You will find further recommendations and examples of cooperation with suppliers in the Danish EPA's manual "Environmental Dialogue with Suppliers" (see the reference list).

Hartmann's environmental profile for suppliers



4.2.5.6 Include occupational health and safety aspects

If you want to include your suppliers' health and safety conditions, you can use a tool developed by WEA: "Companies' occupational health and safety profile", which is addressed to both purchasers and suppliers. You will find the tool at www.dk-teknik.dk. Each company can itself examine its health and safety situation from A to Z and provide its customers and others with documentation in the form of a profile of the company's working environment. The profile covers seven areas: ergonomics, noise, children & young people, chemicals, indoor climate, occupational accidents and incidents, and psychological working environment. By means of the tool, a company can examine both the loads that exist and the preventive work carried out. Buyers can request suppliers to use the tool and send them the resulting working environment profile, which gives them a good impression of the suppliers' working environment and of the action taken by the suppliers to improve it.

4.2.6 Sales and marketing

In this section we differentiate between the sales and marketing departments as follows:

- the marketing department gathers and disseminates information from and to target groups (groups of individual customers), competitors, the market and society in general
- the sales department (sales representatives) is in direct contact with the individual customers.

In practice, there is a natural overlap – for example, via their knowledge of individual customers, the sales representatives can help the marketing department to gain a complete overview. The reason for differentiating between the two functions here is to show clearly the potential of each of them and thus also the tools they need.

People in sales and marketing do not normally know very much about environmental matters. The knowledge has to be built up.

That means that they need close cooperation with the environmental department and preferably some systematic methods they can use to incorporate the product dimension in their work. Examples of such tools are given below.

4.2.6.1 The marketing function's potentials

The marketing function can:

- create an overview of the market and its potentials and threats, including environmental aspects
- pass on customer requirements/wishes and market trends to the other departments in the organisation
- create – or at least work to achieve – the environmental profile you want
- establish – or contribute to the development of – an environmentally based marketing strategy, including identifying the most important market segments from an environmental point of view.

Precisely because demand to a very great extent determines how attractive it is for companies to develop cleaner products, every company needs to market its environmental advances. With a view to preventing companies from misusing environmental arguments and thus from misleading the consumers, the Consumer Ombudsman has issued guidelines that provide a clear definition of good marketing and describe the documentation on which it must be based. You can download the guidelines from www.fs.dk.

The guidelines are based on the fundamental principle in the Danish Marketing Act (section 2), which states: “It shall be an offence to make use of any false, misleading, or unreasonably incomplete indication or statement likely to affect the demand for or supply of goods, real or personal property, and work or services. It shall be possible to substantiate the correctness of indications or statements on real facts.”

The guidelines' main recommendations are as follows:

1. Investigate whether there are special marketing rules in special legislation, e.g. the Act on Chemical Products and Substances.
2. Procure documentation on how the product affects the environment.
3. State clearly the background for your environmental argument.
4. Judge the overall impression.
5. Verify facts in advance.
6. Do not generalise without having information about the entire life cycle of the product.
7. Compare like with like.

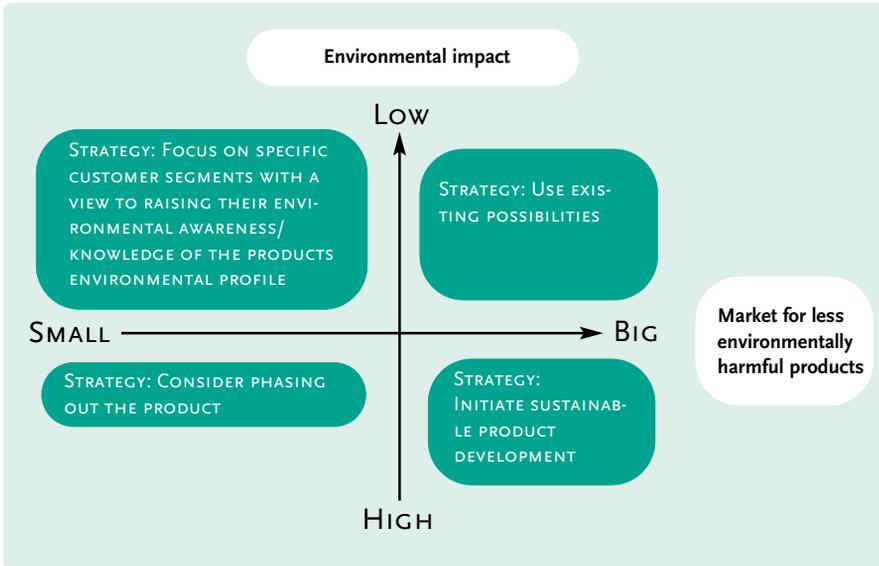
If you want to use environmental arguments actively in your marketing, it is a good idea to have an independent expert look through your documentation.

Establish your marketing strategy

When you are planning how you are going to use environmental aspects in your marketing, you can look at the relationship between your products' environmental impacts and the market potentials.

The figure on the next page is a very simplified outline of the reality, but it can be used to illustrate some relationships between environmental impact, market potential and choice of strategy – and thus be included in the management's basis for decisions, which could take the form of a management group seminar in which all the department managers participate and have the opportunity of passing on their experiences and views.

FIGURE 4.5:
ESTABLISHING
YOUR ENVIRON-
MENTAL STRATEGY



Quoted from EEA’s LCA Guidebook, p. 39 (see the reference list)

“Low” environmental impact

If you know that your product has a low environmental impact or expect it to have a low impact, compared with similar products on the market, the first step you must take is to ensure that you can document that. Many companies choose to apply for an eco-label (if that is possible) or to prepare an environmental product declaration if the product’s environmental profile is to be used in connection with marketing.

Demand exists

Within some product categories, including paper, printing services and domestic appliances, a market has been built up for products with a low environmental impact. The market for low impact paper and printing services has developed mainly through demand from public sector purchasers. The market for energy-efficient domestic appliances has arisen through a combination of two factors: the first is that the EU has introduced compulsory energy labelling of domestic appliances so that the

consumers can compare the products' environmental performance, while the second is the desire by consumers to reduce their electricity bills.

Even if your products correspond to the demand and you have your documentation ready, it may be necessary to market the products' environmental characteristics in order to exploit the market potential.

No demand

However, the market for low impact products is still limited to very few product categories. Within all other product categories, you will have to create a market for low impact products before you can gain market advantages. Experience shows that a market does not develop by itself – you have to work actively to create it.

“High” environmental impact

If you have products with a relatively “high” environmental impact, it is the market's requirements and your product's position that determine whether it will pay you to try to reduce the product's environmental impacts or whether it is better to concentrate on incorporating environmental aspects in the development of new products and phase out the old ones as new and environmentally “better” products become ready to take over.

The management can use an overview from the above figure when deciding on the company's environmental strategy.

4.2.6.2 The sales representatives' potentials

From an environmental angle, the sales representatives can:

- influence the customers to make more environmentally sound choices
- inform the customers about relevant environmental aspects – also relating to use and disposal of the products, so that they build up knowledge about these matters

- gather information about the customers' wishes, expectations and needs and answer questions from the customers
- help to build up closer cooperation with the customers.

Many sales representatives experience problems in using environmental arguments when trying to sell to customers. Most of the difficulty is due to lack of knowledge and training – among both the sales representatives and the customers. The Danish EPA's manual "Environmental Dialogue with Customers" (see the reference list) sheds light on these problems and recommends ways of overcoming them – for example, by having an employee from the environmental department accompany the sales representatives on calls to customers, if the customers are ones with whom you have good relations, and where you want to get the environmental dimension incorporated.

Equip your sales representatives for the dialogue with the customers

It is important for a sales representative to be able to give the customers fast and precise answers to environmental questions. It is therefore a good idea to prepare overviews, guidelines, etc. and to give the sales representative an understanding of the underlying environmental problems. Three such tools are outlined below.

1. a question guide to clarify customer needs etc.
2. an overview of customers' questions and good answers to them
3. environmental directions for use of products.

1. Question guide to clarify customer needs and how the product is used

The main purpose of a customer-oriented question guide is to clarify how the customers use your products and what environmental consequences that has. This will enable you to find out whether your customers experience real environmental problems that you can help to solve and – particularly – a potential for improvement that you can help to utilise. It is also important to gain an impression of your customers' environmental attitudes and how that can affect your cooperation with them.

By going on the offensive with your customers you can at the same time give yourselves a strong environmental profile – if, let it be noted, you are prepared to take the consequences of the information you receive. If you do not know what you will use the information for, do not ask for it. The question guide is particularly suitable if you have relatively few large customers because it takes time to use it and follow up on the results.

You can use the question guide as your basis for an interview, but you must also do some homework – gather as much information as possible beforehand. You should also consider what benefits you can offer and what you yourself want to get out of focusing on the environment. In other words, where is the win-win potential greatest? Here, it is important to think long-term because it can be difficult to find equal benefits in the very short term.

Henkel-Ecolab visits key customers

Henkel-Ecolab's environmental manager accompanies the sales representatives on calls at key customers in order to determine the potential for expanded cooperation or at any rate to ensure that environmental issues will not be a problem in the cooperation. Decision-makers from both the customer and Henkel-Ecolab participate in the meetings in order to ensure quick decisions and their implementation in practice. The meetings often lead to new meetings between technical staff and others who are to carry out the actual work. The interface between the two companies therefore grows. A positive spiral develops, forming fertile soil for new ideas and action areas to the benefit of the environment and the companies.

Examples of topics that can be included in the question guide are given below. Some of them may concern confidential information that you will only get provided you and the customer enjoy a mutual trustful relationship. It is assumed that you have already obtained available information on the customers, such as environmental policy, certification, green accounts, etc. Otherwise, start with that.

The customer's general environmental attitude and action:

- What does the customer consider to be the main impacts in connection with the production and the products?
- What factors does the customer prioritise in its own production and in relation to the products?
- Has the customer any proposals or wishes about what you should prioritise?
- Does the customer want you to introduce more environmentally sound production technology? Has the customer any special requirements or wishes?
- How much do the environmental aspects matter in the customer's market? You should preferably try to obtain concrete examples of the demand.

Use of the products

- How is the product used? (ask if you can see this for yourself)
- Is the product used together with other products and, if so, does this affect the total environmental impact?
- How are the users instructed in limiting the environmental impacts in connection with use and disposal?
- How much of the product does the customer use per operation/unit?
- What emissions and discharges are there in connection with the product, and how big are they? (Any data can be used to improve your life cycle assessment, which is initially based on estimates or calculated evaluations of the potential impacts.)
- How much wastage is there and how much is reused/recycled or disposed of?
- Do the users experience any health impacts or other problems from using the product?
- Does the customer use alternative products or has he considered doing so? If so, which and why?
- How is the product disposed of? Are parts of it reused for other purposes?
- Does the customer know of any environmental or health problems

later in the life cycle to which your product contributes? If so, what problems?

- Has the customer any suggestions for improvements to the product and/or in the cooperation with you?

2. Overview of questions frequently asked by customers – and good answers to them

If you have sales representatives that are in close contact with the customers, you have a good possibility of keeping yourselves informed about the customers' interest in environmental issues. The sales representatives will often encounter a variety of questions, and it may be a good idea to gather these questions together systematically and then find good answers to them. Put the questions and answers together in an overview that the sales representatives can use (and that can be used in your environmental training of sales representatives). You can also include the most obvious questions and answers in your environmental reports or other material that you send to your customers and other stakeholders.

How much pollution does a laundry cause?

In 1997, Berendsen Textil Service (BTS) gathered and systematised environmental questions from customers and employees and then had environmental experts look at the questions and find good explanations and answers. These were then processed and included in the company's environmental publication "Environment 1997". The following is an example of a question and answer:

Question: Does Berendsen Textil Service reuse water?

Answer: Yes, very much so. Many of our machines, including continuous batch washers (tunnel washers), are designed to reuse water. Our most efficient machines use 8-10 litres of water per kg laundry, compared with an average consumer in the home of 25 litres per kg laundry. (*ed. 1997 figures*)

With our present machines (*ed. 1997*), the average consumption from the whole of BTS is 16 litres of water per kg laundry. That includes all water, including water used in sanitary installations, water for steam production, etc., which means that the actual water consumption for laundry is slightly lower. Some departments also have collection tanks where the rinsing water is collected and reused in the washing process.

3. *Environmental directions for use/guide to proper use and disposal*

If your products have a long lifetime and there are big environmental impacts in connection with their use or disposal – and particularly if the users' behaviour affects the extent of the impacts – you should prepare environmental directions for use that tell the users how to use your product with the greatest possible care for the environment.

There is not at present a standard for environmental directions for use, but the instructions should be short, concise and easy to understand, so that the user only has to read them once to know what to do and what not to do. You could sell the message together with the benefits for the user along the lines: "We have developed a table with a surface that is easy to maintain. You only need water with a little washing-up liquid in it to keep the table clean. Do not use harsh cleaning agents. That way, the table will last longer and you will be helping to protect the environment."

The following are suitable subjects to include in environmental directions for use:

Use:

- cleaning (e.g. furniture, surfaces)
- maintenance (e.g. vehicles, electrical appliances)
- repair and service (products with a certain lifetime)
- possibility of renewing parts of the product (e.g. for design or fashion reasons)
- dosage and handling (e.g. chemicals).

Disposal:

- reuse/recycling
- special handling
- separation at source
- return scheme.

Extract from APC's environmental product declaration for Uninterruptible Power Supplies (UPS)

"After use, the system can be returned to the supplier for environmentally sound recycling or disposal. Please contact the supplier for information about the return scheme.

The system contains the following parts, which contain valuable materials and that should be disposed of in an environmentally safe way:

Batteries, leads, printed circuit boards, fans, transformers, covers (steel), condensers, relays, fuses, power supply (copper), plastic parts (PC and ABS), aluminium frame."

You must yourselves make it easy for the user to use and dispose of the product in an environmentally sound way. It is no good just writing to the users, telling them that they must do such and such to benefit the environment – you still have a (moral) responsibility to ensure that they can do as asked in the circumstances in which the product is normally used. If you can combine eco-friendly behaviour with other benefits for the users, you will have a greater chance of success.

Dosing pump for washing-up liquids – care for the environment in the hurly burly of daily life

Every day, families in Denmark wash up, and many of us simply turn the bottle upside down – and overdose. With a dosing pump, a single squirt gives enough washing-up liquid, and we save money and save the environment from an unnecessary load. Such a pump should be durable so that it can be reused many times on new bottles of detergent. And supermarkets must, of course, stock refill bottles that fit the pump.

Short directions for use can be affixed to the back of the bottle, telling about the importance of not overdosing and how to handle the bottle when it is empty.

If there are few (typically professional) users, you can supplement the directions for use with training in correct use. Hands-on is more effective than reading about it. If there are a lot of (typically private) users, you can consider training the sales persons (shop staff), who are in direct contact with the coming users.

4.2.7 Installation and after-sales care

If installation, service and maintenance are included in the services you sell to the customers, you have a direct influence on the environmental loads during use and, to some extent, disposal – firstly, by ensuring optimum adjustment and maintenance and, secondly, by informing and training the users in proper use and disposal. A typical example of this is photocopiers, which are normally leased or sold with regular service included. The service engineer who goes out to the users can be trained to inform the customer's staff about such things as correct disposal of used toner cartridges – preferably via a return scheme, choice of types of paper, the placing of the copier to avoid health and safety problems, etc. When servicing the machine he can check the energy consumption so that the machine runs as energy-efficiently as possible and assess any problems with noise, ozone emission, heat emission, etc.

You could perhaps prepare a checklist for the service engineer to ensure that he can answer relevant questions from the users – see also the previous section on tools for sales representatives.

Another possibility is to provide training for the coming users when the machine/product is installed. The training can include the environmental aspects.

4.2.8 Logistics

Many phases of a product's life cycle involve transport, and it is difficult to get an overview of all of them. Start with the transports that begin or end at your premises and that are big enough to warrant attention.

COWI's manual "Environmental Management and Transport" from 1999 provides help in mapping the extent of transport operations and the associated environmental loads, together with suggestions for improvements. Start by describing the transport and its extent:

TABLE 4.6:
DESCRIPTION
OF TRANSPORT
OPERATIONS

Description	
Purpose of the transport	List the raw materials, materials, products, etc. that are transported
Destinations	List towns, countries or regions. Possibly use the designations local or regional
Transport distance	In kilometres
Quantity of goods	In tonnes (possibly in cu.m or sq.m)
Number of runs	Give the figure for a lengthy period, e.g. a month or a year
Mode of transport	State the form of transport (van, lorry (incl. size), rail, sea, air)
Capacity utilisation	Indicate how efficiently the mode of transport's capacity is utilised, calculated in relation to the weight of the goods, cu.m or sq.m

Do not forget the “invisible”, unplanned transport – in connection with incorrect deliveries, emergency repairs, subsequent deliveries/delivery of back orders. The manual contains forms etc. for calculating the environmental load with different forms of transport.

You must also describe your transport needs – if possible making it independent of what you transport today. Is it possible to transport smaller quantities and transport more optimally from an environmental point of view – but in a way that works in practice? Here, you should look at:

- the company's operation and organisation, including cooperation with suppliers, customers and transport suppliers, and the possibility of establishing remote warehouses
- the technology, i.e. the forms of transport used, the production technology and your information and planning systems
- the goods, including packaging, i.e. what is transported, when and under what conditions
- your employees' knowledge and motivation.

The manual provides concrete proposals for improvements within the above areas.

If you purchase transport services and therefore decide to impose requirements on your transport suppliers, make them simple and precise so that the providers can live up to them and document compliance. The Association of Danish International Road Hauliers and the Danish Shippers' Council have formulated four areas in which they consider it realistic to set requirements for transport suppliers:

1. compliance with current legislation
2. the vehicles' fuel consumption and emission of pollutants
3. use of planning and freight optimisation tools
4. management and organisation, including cooperation and documentation.

You will find further information, forms, methods, etc. in the two manuals from COWI and Danish International Road Hauliers (see the reference list).



5 Product Orientation in the Environmental Management System

5.1 ASSUMPTIONS AND PURPOSE

Earlier chapters in this manual focused on clarification, planning and preparation of action plans for product-oriented work (Chapter 3) and have given you some concrete tools for product-orienting different departments and activities in your company (Chapter 4).

It is assumed that you are already working systematically with environmental aspects wholly or partially on the basis of the requirements in ISO 14001 or that you are at least acquainted with management systems (e.g. ISO 9001 or 14001). If you are not already working with environmental management in your company, you will find in this chapter various matters to which you must pay attention or check when you introduce the system. The chapter does not, however, provide general guidelines on constructing and implementing environmental management. Methods and tools for that purpose have been developed elsewhere – see, for example, the Danish EPA’s website for more information (www.mst.dk). The recommendations in the chapter have been written to suit an existing environmental management system based on ISO 14001. If you do not have such a system, you must instead “translate” the recommendations to suit your own situation.

You may decide to build up an environmental management system concurrently with your product-oriented work. ISO 14001 states that the system must also include the indirect impacts of the company’s activities. In popular terms, that means the impacts that lie outside the company’s place of production. This is precisely the product-oriented approach, with which – depending on your level of ambition – all phases of the product’s life cycle are to a varying extent also managed.

Working in a product-oriented way means working on continual improvement of the product, seen in a life cycle perspective.

The purpose of incorporating the product dimension in a real environmental management system (ISO 14001) is to ensure a product-oriented approach at the strategic (management) level in your company.

There are several reasons for that:

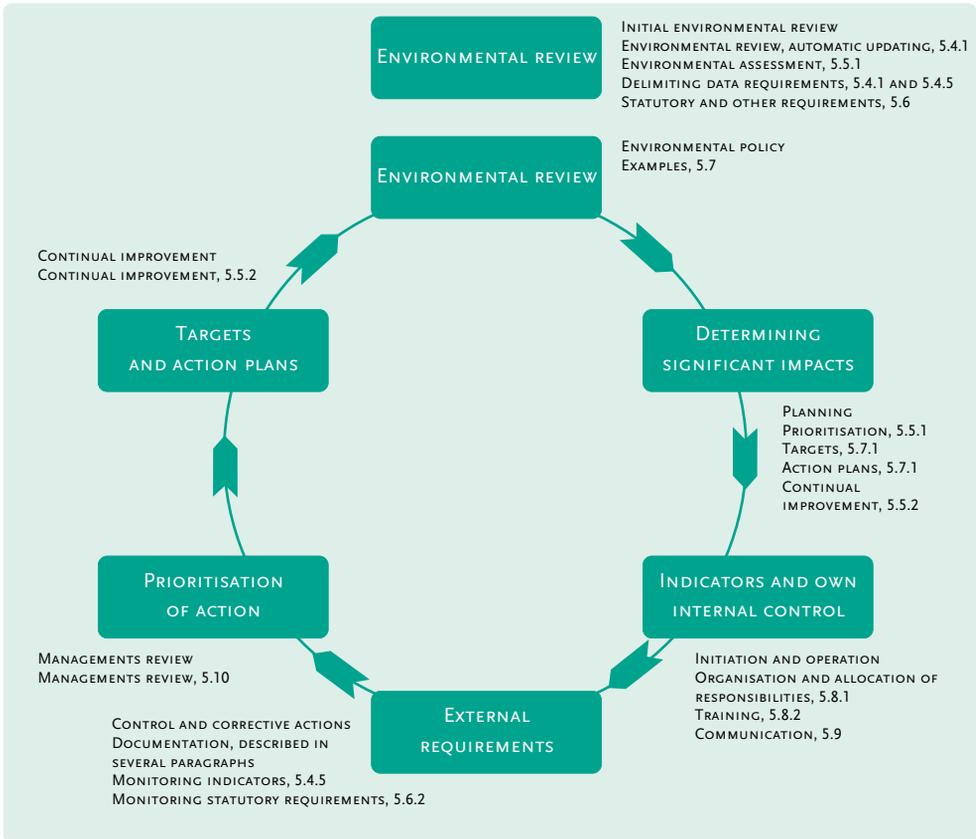
- to incorporate environmental aspects in your marketing and business strategy
- to save time and money
- to avoid suboptimisation in connection with measures to improve environmental performance
- to ensure continual improvement at the product level as well
- to use well functioning routines and documentation
- to ensure communication and responsibility across the organisation.

If you are already working with environmental management, the product-oriented approach is really only a supplement to the existing system, so you do not have to make any fundamental changes to the structure.

5.2 HOW DO YOU IMPLEMENT THE PRODUCT-ORIENTED APPROACH?

The recommendations given in the manual for implementing the product-oriented approach in an environmental management system are in accordance with the structure in ISO 14001. Figure 5.1 below shows the elements in the management system.

FIGURE 5.1:
THE STRUCTURE IN
ISO 14001



The figure also shows where to go in the chapter for more information about the individual elements.

Table 5.2 shows where and what there may be a need to develop when incorporating the product dimension in your environmental management system.

TABLE 5.2:
 PRODUCT ORIENTATION IN THE ENVIRONMENTAL MANAGEMENT SYSTEM

The environmental management system	Product orientation
Reviewing and assessing environmental impacts	<ul style="list-style-type: none"> • You extend reviewing and assessment to include environmental impacts during the product's life cycle, including in any export markets. The scope and degree of detail will depend on your level of ambition for your product-oriented work. • You ensure that current and coming legislation relating to the product is included in the criteria for selecting significant environmental impacts.
Environmental policy	<ul style="list-style-type: none"> • You describe the product-oriented work in your environmental policy statement.
Planning	<ul style="list-style-type: none"> • Your objectives and action plans cover the specific product aspects that you prioritise.
Implementation and	<ul style="list-style-type: none"> • The management assigns responsibility and operation delegates tasks to the parts of the organisation that are affected by the product-oriented work. • You expand your purchasing and supplier control to ensure purchasing that corresponds to the chosen product-oriented work. • You train the employees in the aspects that are important for the product-oriented work. • You inform all the company's employees about the product-oriented work. • You include in your external communication information about proper use and disposal and about the production of the raw materials. • You supply documentation for the product(s)' environmental impacts. • You record and answer external enquiries concerning the product(s).
Control and corrective	<ul style="list-style-type: none"> • Your own internal control covers the product-action oriented work, including any requirements about using specific tests or methods of measurement
The management's review	<ul style="list-style-type: none"> • The management prioritises resources so that the product-oriented work is maintained and expanded with new targets that are coordinated with the company's business strategy

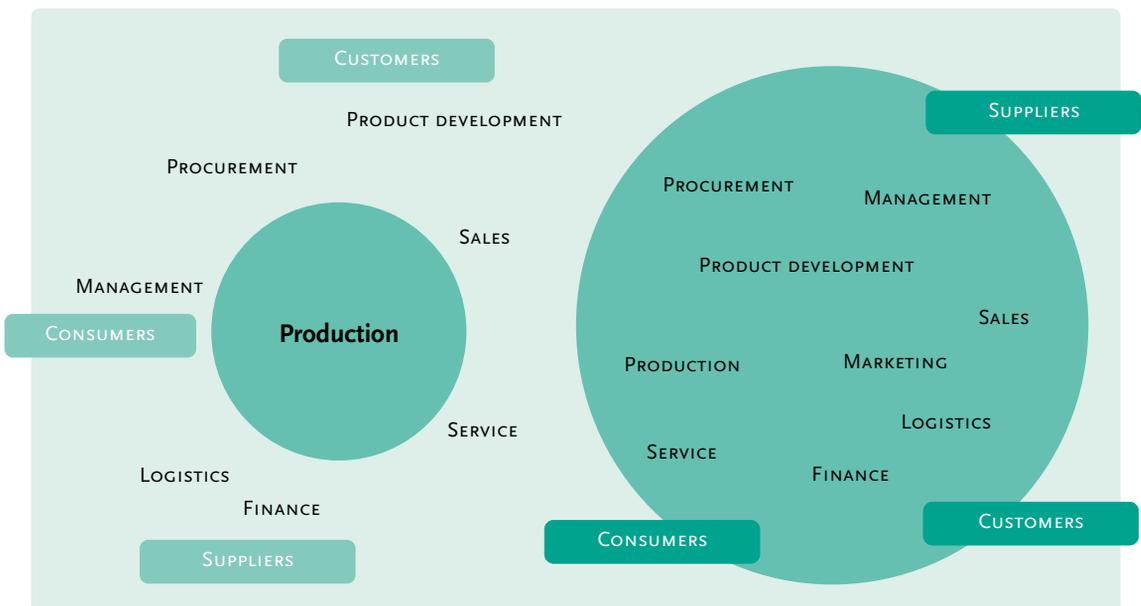
5.2.1 From company-oriented to product-oriented

In a “traditional” environmental management system constructed, for example, on the basis of the requirements in the ISO 14001 standard, the focus is naturally on the production and the environmental impacts from the production. In an environmental management context, other departments, such as purchasing, sales, marketing or product development, are often less directly involved. That is natural when the aim is to reduce the environmental impacts from the production.

When, on the other hand, you want to incorporate the life cycle approach and focus on the entire environmental impact of your products, the other departments – particularly the product development department – become more important. Similarly, the external relations – particularly in the product chain – also become more important. The process is shown in figure 5.3.

The figure illustrates the various departments in a company that are usually involved on an ad hoc basis in the company-oriented environmental

FIGURE 5.3:
FROM COMPANY-ORIENTED TO PRODUCT-ORIENTED ENVIRONMENTAL MANAGEMENT



management. Market demands – for example, from customers and consumers – are incorporated, but the focus is on environmental impacts in the production process. In product-oriented environmental management, most of the departments in the company participate actively. Market demands and expectations are handled in relation to the entire life cycle of the product(s).

In connection with the product orientation you should decide which departments are most vital to your action and what they can/must do. This includes deciding on the responsibilities each of the departments is to have.

The most important department naturally varies from company to company and also depends on what you want to achieve with the product orientation. Here are some examples:

- If you yourselves design the products, the product development department is vital. Your product developers should therefore be trained or helped to incorporate environmental considerations from the idea phase to complete prototypes. Many environmental problems later in a product's life cycle can be avoided or reduced by action at the development stage. During the development of the product, the marketing department should ensure that the users' wishes and needs are analysed and incorporated from the start because the launch of the product and any "training" of the users must be evaluated and planned on an equal footing with the product itself. For many products it is necessary to create a market or at least make a special effort to make the product's environmental qualities visible – particularly if the price or habit is the users' main reason for buying your types of products.

The customers are asked about the environment

In connection with product development, Grundfos works with customer panels, where a number of present and potential customers are asked about their attitudes, wishes and expectations in a variety of areas, including environment. Experience shows that the customers do not at present attach particular importance to environmental aspects, but when asked directly, they find energy consumption important. That supports Grundfos' continual action to develop pumps with a reduced energy consumption.

- If you want action together with or concerning your suppliers, the purchasing department is important, and the buyers also need tools for incorporating environmental considerations in their daily work. Besides participating in your own product development strategy by translating product specifications into requirements for the suppliers, the buyers are important in themselves because they demand more eco-friendly products. Just as you yourselves are sensitive to the wishes of the market, you help to create a market for other companies' more environmentally sound alternatives by demanding them – even in the case of products that are not particularly important for you – for example, office supplies.
- If the environmental impacts depend on how the product is used, the sales and service departments are important because they can inform and possibly train the customers in correct use. In addition, the marketing department can gather information on the importance of environmental aspects in the market, compare with competitors, etc.
- The management is always important. Without visible prioritisation and backing by the management, the process is almost doomed to come to a standstill at some point or other.

The various departments and their opportunities are discussed in Chapter 4, section 4.2. There, you will also find suggestions for “tools” for use by the departments in their product-oriented environmental work.

If you already have an environmental management system, you must start by reviewing it with “product glasses” on. It is important to start by gaining a clear picture of the extent to which the system also includes the product dimension before you get down to revising existing procedures.

In the following we give some pointers concerning possible significant changes to your present management system and about things to which you must pay attention in your review of the system. Importantly, we also explain how to incorporate the product dimension in practice.

5.3 ASPECTS TO WHICH YOU MUST PAY PARTICULAR ATTENTION

The main purpose of the environmental management system is to establish responsibility and authority for specific tasks, including ensuring continual improvement and documenting the work. You must make sure that there is a unifying principle all the way from your product-oriented environmental policy, through objectives and targets, to the action plans.

Remember that there must still be coherence between your environmental policy, your environmental objectives and targets and your action plans.

In connection with the product orientation, you should take a close look at your present distribution of responsibilities. If a large part of the responsibility for your company’s environmental work lies with a central environmental department, experience shows that responsibility for the individual tasks in connection with product orientation should be decentralised. The responsibility must lie with those responsible for the tasks in the day-to-day work. At the same time, it is important to ensure good coordination and information across the organisation. Particularly if the organisation is so large that coordination does not take place naturally, you should consider incorporating it in the procedures themselves.

On the documentation side, there may be special requirements that you want to live up to – for example, eco-label criteria, specific information for use in an environmental product declaration or information requested by the customers. Where you previously presumably organised your documentation to meet official requirements and your own internal control needs, your documentation must now be much broader and satisfy more needs. These needs can easily change from time to time, so make sure that you have the necessary data and can adjust them as needed.

Figures 5.4 and 5.5 show some major differences and similarities between a “traditional” environmental management system and a product-oriented system.

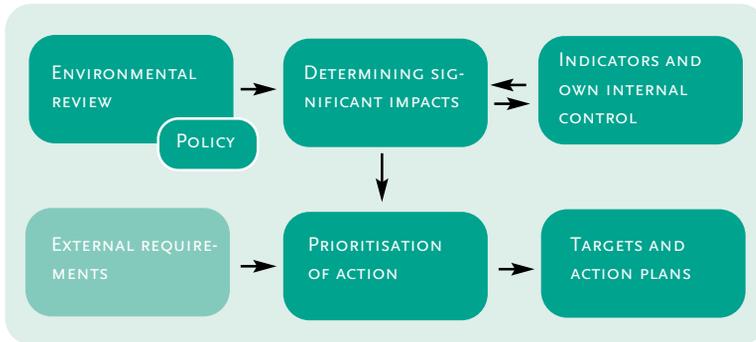


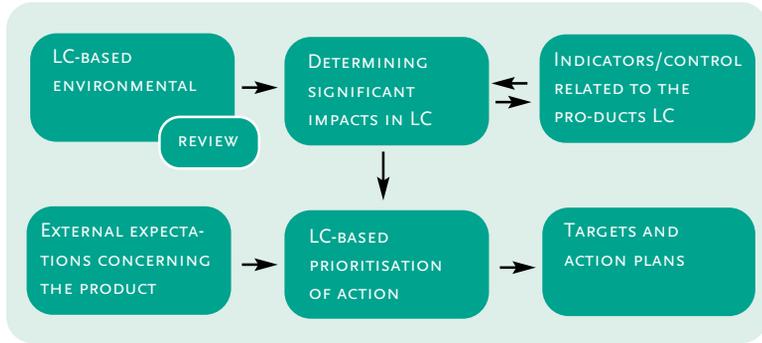
FIGURE 5.4:
THE PROCESS
TOWARDS ENVI-
RONMENTAL
ACTION PLANS IN
“TRADITIONAL”
ENVIRONMENT
MANAGEMENT

The purpose of the associated documentation is:

- to keep tabs on your own internal control
- to document achievement of the prescribed targets.

External requirements are also included in a “traditional” environmental management system, but often at a very general level (e.g. a desire to have a certified environmental management system). The systematic dialogue with the stakeholders on product aspects seen in a life cycle perspective is less pronounced. The market’s expectations concerning the product are not usually an important part of the basis for prioritisation.

FIGURE 5.5:
THE PROCESS TOWARDS ENVIRONMENTAL ACTION PLANS IN PRODUCT-ORIENTED ENVIRONMENTAL MANAGEMENT



The purpose of the associated documentation is:

- to keep tabs on the product's total environmental impacts
- to document achievement of the targets set
- to meet external stakeholders' need for information.

Figures 5.4 and 5.5 show that the external requirements and expectations have greater weight in a product-oriented environmental management system, and the requirements will often be rather specific in selected areas. Reviewing, significant environmental impacts, key figures, prioritisation, targets and action plans are now related to the product's entire life cycle.

For Coloplast, the change from traditional to product-oriented environmental management has had an effect.

Integration of product-oriented considerations

Coloplast is changing its environmental management system, partly with a view to achieving satisfactory integration of product-oriented environmental considerations.

The targeted action has resulted in:

- a new procedure for integration of environmental considerations in product development
- preparation and control of mass balances for specific key products
- organisational changes

The individual elements/areas where special focus is required, and where supplementary tools/checklists etc. will be needed, are described in the following sections.

5.4 REVIEW OF ENVIRONMENTAL IMPACTS

5.4.1 Environmental review

The general aim of the initial review is to create an overview of environmental impacts related both to your own production and to your product(s). On that basis you must arrive at the significant environmental impacts and identify where they come from (the company's own production or other links in the product chain). Supplemented by workplace assessments, this provides a good basis for deciding which environmental and occupational health and safety impacts you must start working on (see also Tool 1 in Part B).

As the basis for your product-oriented work you must collect and process data for the product action you have decided on. The data must then be incorporated, registered and monitored in your environmental management system.

If you have an environmental management system, you will also have a data registration system. This must be adjusted because the data can rarely be used directly in life cycle assessments.

If you do not yet have an environmental management system, you should build up a data registration system so that the product dimension is included from the start.

If you have an environmental management system you will already have a lot of data – particularly production data (illustrated in figure 5.5). You must then determine what data already registered can be used in the product-oriented context and what you lack. You thus already have an operating control and registration system. However, you may need to expand this – see section 5.4.3 – because you must monitor and measure new data relating to the product in order to achieve improvements and supply documentation for your products. You will also have to adjust the procedures and instructions for monitoring and measuring data.

If you have to begin building up an environmental management system, you have a good opportunity of incorporating the products' life cycle from the start. You must focus on creating a clear picture of environmental impacts throughout the products' life cycle. You must build up an operating control and registration system that ensures that you regularly monitor and measure key data. This is important because it is your tool for controlling environmental targets and action plans. However, it is also a tool for supplying documentation for your products.

In figure 5.6, the traditional approach is shown in the hatched area, where the small boxes are your environmental aspects (processes associated with consumption of resources and emissions/discharges to soil, air and water, together with waste etc.).

Whether you already have an environmental management system or are getting ready to build one up, in your product-oriented environmental work you must to some extent widen your focus to cover all levels in the

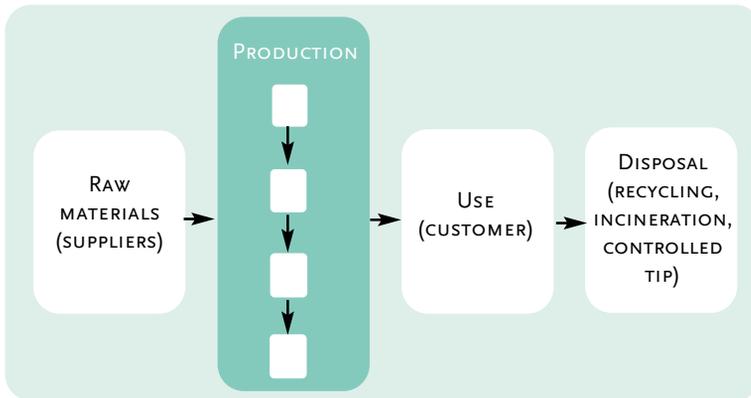


FIGURE 5.6:
REVIEW PRO-
DUCTS' ENVIRON-
MENTAL ASPECTS

products' life cycle – that means not only the phases raw materials/production of raw materials, use and disposal, but also the transport phase, which covers all transports in the product system. The scope will naturally depend on your chosen level of ambition. Part B of the manual explains clearly what data you should procure and how. For example, the initial environmental review can be based on data from the purchasing and accounts departments, wastewater permits and similar. Experience shows that you undoubtedly have a great deal of life cycle data in your systems, but you have to dig them out from the different sources.

It is very important to start by establishing an overview so that you can identify the significant environmental impacts and concentrate on them. Otherwise, you may easily risk data death. Start by focusing on the data you can get hold of easily.

It is also important to note that you do not have to clarify all product aspects all at once or clarify all of them in an equally detailed way. Like other environmental work, product orientation is a phased process in which you gradually tighten what you require of yourselves and others.

5.4.2 Environmental aspects outside the company

Regardless of your choice of product-oriented action, you will need to look beyond your own four walls, as outlined in figure 5.5. You must, for

example, look at the production of the raw materials used in your products and at the distribution, use and disposal of the products. Tool 1 in Part B explains how to establish a clear picture of your products' environmental aspects within and outside the company. It is a case of creating lists of materials and flow diagrams in which you go through the entire life cycle of each product, the inputs and outputs, thereby gaining an overview of consumption, emissions and waste.

Tools 2-4 in Part B explain what to do with respect to eco-labels, environmental product declarations and external expectations. The tools can be used as aids in your product-oriented data collection.

You will find it advantageous to include in your review documentation obtained from suppliers, e.g. specific requirements concerning test methods, as required in the eco-label criteria. In practice, you can prepare a standard letter (form) for the relevant suppliers in which you ask them to state whether they live up to the requirements as set out, for example, in the eco-label criteria. You should then register the replies in your system and check at least once a year that the suppliers still live up to the requirements. Chapter 4, section 4.2.5, deals with the design of questionnaires and matters to be considered in that connection.

5.4.3 Environmental aspects within the company

For environmental aspects that have already been mapped in the company you may have to increase the degree of detail. You must map the actual processes involved in the production of the product or products selected in sufficient detail for consumption and emissions to be attributed to the individual product. In connection with environmental management systems, one usually has key figures for consumption and emissions per tonne finished product, per surface area or similar, or has a total figure for consumption for the company. It is not certain, either, that all processes in the company are involved in the production of the product or products on which you are focusing. If your product-oriented work includes occupational health and safety, you may also need to include the working environment more actively.

You must therefore review your records to see whether they can be used as they are or need to be supplemented by more a detailed review. This is particularly relevant if you make several types of products and your present registration – of energy consumption, for example – is at a general company level. In that case, you must either measure or calculate the energy consumption for the individual process you use to make the product(s). If you make several products at the same facility, then, using the same example, you must allocate the energy consumption to the individual products. You can use a qualified estimate for this, based, for example, on the value of the product.

You must also decide whether you have all the data you need for the environmental assessment. You should remember, however, that you do not have to go into too much detail before you know whether it is a major environmental impact you are looking at:

Use your time on the main impacts

In its life cycle assessment of three types of paint, Technos Schou A/S spent a lot of time distributing the environmental impacts in the production between processes and products. It subsequently found that these were of very little importance compared with impacts in other phases of the life cycle.

Source: Environmental Project, No. 488, 1999. Danish EPA.

5.4.4 Responsibility

Before starting on the data collection you must decide who is to be responsible for and participate in the review. Since the review relates both to your own production and the products' life cycle, it is important for the employees involved in the work to have some knowledge of environmental impacts within the various areas.

New employee groups or key persons from different departments must be involved when the environmental work is product-oriented. For example, it is a good idea to make the buyer responsible for contact with the

suppliers, the sales representative for contact with the users/customers etc. (see section 4.2 in Chapter 4).

It may be practical to have different employees participate in the collection of data, but you must establish who is to be responsible for evaluating the data collected.

5.4.5 What data must be included?

If you have decided on a specific product strategy, e.g. eco-labelling of the products, the criteria for this give a useful indication of the data that must be collected and registered. However, you should be aware that even though the phases and focus areas that are relevant in a product perspective are indicated in the different sets of requirements, that does not necessarily mean that they are the most important action areas seen from *your* point of view. You should therefore not focus exclusively on these requirements but use them as a guide in connection with a more integrated consideration of the company's environmental aspects and planning of environmental measures.

5.5 EVALUATION, PRIORITISATION, CONTINUAL IMPROVEMENTS

5.5.1 Evaluation and prioritisation

On the basis of the results of your environmental review, you must evaluate the direct and indirect environmental impacts with a view to identifying the significant ones and listing possible environmental improvements. If, in your product work, you are guided by externally defined requirements, it is particularly important to note that with environmental management, it is not necessarily enough simply to meet these requirements – certified environmental management requires you to consider the significant environmental impacts and continually reduce them.

You should therefore be able to document whether the externally defined requirements are also the most important or whether other environmen-

tal impacts should be included as well. For example, the revision of the eco-label criteria or a new procurement guide for a product group does not automatically guarantee continual reduction of *your* significant environmental impacts.

Identification of significant environmental impacts is vital for formulating your environmental policy, prioritisation, targets and action plans. On this point you may therefore also need to expand the list of environmental impacts when the product is incorporated and expand your criteria for prioritising significant environmental impacts.

As an aid in evaluating and identifying significant environmental impacts, you should prepare criteria for assessing the environmental impacts. The assessment criteria are almost the same as in ordinary environmental management – but seen in a life cycle perspective. In the subsequent prioritisation of action, the prioritisation criteria should reflect the purpose of your product work.

In both the eco-label criteria and the Green Buying Guides, the significant environmental impacts of a product in a life cycle perspective are listed and prioritised. In connection with the preparation of the set of requirements, the environmental impacts that you must be able to document (e.g. emissions, use of chemicals, etc.) have been found significant and been prioritised. You may nevertheless have to add other criteria for significance. Your company is perhaps subject to special restrictions concerning, for example, wastewater or to special conditions relating to disposal of the product.

You will need additional forms or checklists to carry out an assessment and the subsequent prioritisation. The following box gives some examples of where you can find the necessary information.

- The Danish EPA's List of Undesirable Substances (see the reference list)
- Statutory requirements
- The result of the product screening (tool 1 in Part B)
- Environmental projects (www.mst.dk)
- Your trade association and any exchange of experience groups
- Green Buying Guides
- Eco-label criteria
- Danish Working Environment Authority (WEA)'s List of Effects of Problematical Substances and Materials (see the reference list)
- WEA's Order on Substances and Materials (www.arbejdstilsynet.dk)

The point of the prioritisation is that when working with the product-oriented approach, you must include far more elements than your own environmental aspects/environmental impacts in the production, e.g. use and disposal or another product focus, when you are working with the product-oriented approach.

When prioritising your environmental aspects, you should at least include the following factors:

- significant environmental impacts
- statutory requirements
- technical possibilities
- financial framework
- operational and business assumptions
- stakeholders' requirements and views.

5.5.2 Continual improvement

To ensure continual improvement, you should set environmental targets for the various departments/areas that are essential for the product work, e.g. in connection with product development or purchasing or as part of your after-sales service and maintenance.

5.5.2.1 Product development

The product development department is vital for environmental improvement of the product. It is during development of the product, including the choice of design and function and the choice of materials, that you take vital decisions that affect the product's total environmental impact during its life cycle. The choice of materials and processes and the possibility of substitution will have an effect throughout the product's life cycle, while design will have a big effect on whether and, if so, how the product can be separated into components when the time comes to dispose of it. The department is of importance to the lifetime and use of the product.

With the product-oriented approach, new requirements will thus be made concerning areas/elements that are to be monitored, measured and controlled. Depending on the areas you prioritise, you will need to prepare procedures, special checklists and new forms to ensure and document that you include relevant environmental considerations in a structured and targeted way when changing existing products or developing new ones.

In procedures, instructions and forms you should decide what to do about:

1. substitution or reduction of hazardous substances
2. substitution or reduction of non-renewable resources
3. reduction of energy consumption, including energy consumption for transport, where weight and volume may be of great importance
4. design with a view to repair, reuse or recycling/recovery of materials – and the longest possible lifetime.

When considering the above points you must make sure that you look at the product in a life cycle perspective. See also section 4.2.3 for amplification.

These written procedures should naturally be designed in the same way as your other documents.

APC Denmark's environmental instruction to product developers

The product specification for a new product must include decisions on the following points:

1. choice of materials
2. consumption of materials
3. recycling proportion
4. energy consumption
5. packaging
6. disposal/recycling/return scheme
7. lifetime/possibilities for repair/possibilities for upgrading
8. information for environmental declaration

Each point must be specified, e.g. point 3:

- All the materials used (metal/plastic) must as far as possible be labelled to enable reuse/recycling
- Avoid mixing materials
- The plastic materials used must contain >5% recycled plastic
- Label plastic items >25g in accordance with ISO 11469 (EU's Waste Directive, 2nd draft)
- Choose methods of assembly that will enable the appliance to be separated easily
- Avoid polluting plastic with labels, metal inserts, coating, etc.

5.5.2.2 Raw materials

You may need a better dialogue with your suppliers concerning chemicals and materials in order to improve the environmental aspects of your product – for example, with respect to substitution of hazardous substances or non-renewable resources or with respect to access to information concerning environmental aspects in connection with the production of the raw materials.

In connection with your product work it is important to consider

whether the methods and measurements used by your suppliers provide an adequate basis for their documentation of environmental impacts, i.e. whether the methods used for monitoring and measurement/registration are sufficient to enable you to achieve your environmental objectives. You should regularly review your relationship with your suppliers and develop and incorporate in your environmental management system a procedure for tackling suppliers, for following up on their documentation and, particularly, for deciding what questions you should ask your suppliers and what you should demand of them. You may therefore need to supplement your existing system with checklists for questions and requirements, together with new procedures and instructions.

In its environmental report for 1998 *Grundfos* set out the following targets and strategies for environmentally sound procurements:

Focus area	Target	Strategy
Carcinogenic substances	All carcinogenic substances must be removed from products and processes by the end of 2002	Identify high-risk substances and develop alternatives in cooperation with the suppliers. Matters concerning chemicals must be dealt with openly.
PVC	All products sold to Grundfos must be free of PVC by the end of 1999	Identify products containing PVC and develop alternatives in cooperation with the suppliers. Matters concerning chemicals must be dealt with openly.
Resource consumption	All suppliers must work actively to reduce their resource consumption and the associated impact on the environment	In all framework agreements for procurements, a paragraph will be added setting reduction requirements for selected environmental impacts
Packaging	Only packaging that meets Grundfos' environmental standards may be used	If the supplier is not able to supply environmentally approved packaging, he must undertake to take his packaging back.

5.5.2.3 Use and disposal

The same applies to information concerning use and disposal of the product. On the basis of feedback from customers and waste disposal companies (changed patterns of use or new waste technologies), you should regularly monitor and assess both with a view to determining whether there are grounds for adjusting the project. You can do the monitoring in different ways – either through direct dialogue with the stakeholders (e.g. customers) or through regular questionnaire-based surveys. You may therefore need special procedures and instructions for this area.

Dialogue with the customers is described in Chapter 4. Section 4.2.6 gives examples of actual tools.

You can find out more about waste from the Danish Centre for Waste (www.affaldsinfo.dk). There you will find information on handling different types of waste, methods of disposal and technologies, equipment suppliers, literature, etc.

5.5.2.4 New investments

An environmental management system usually also includes procedures for procurement of new equipment. Besides the technical/quality parameters, it is important that there is no significant increase in consumption of raw materials and ancillaries and, particularly, that energy consumption per unit produced remains unchanged. Before making major investments you should have procurement procedures and instructions in place to ensure that you assess needs and consequences in a life cycle perspective.

5.6 STATUTORY REQUIREMENTS AND OTHER REQUIREMENTS

5.6.1 Statutory requirements and other requirements

When environmental management is being introduced in a company it is important to list the environmental requirements to which the company is subject. The statutory requirements normally relate to the company's production and the associated emissions/discharges. They include requirements concerning handling of hazardous waste, limit values for substances contained in atmospheric emissions, wastewater, etc. When incorporating the product approach, you must remember that the product(s) is/are covered by special statutory requirements relating to production, use and disposal both in Denmark and in the export markets.

Statutory requirements must be complied with in order to gain and/or keep environmental certification. You must therefore also remember the statutory requirements concerning the products.

Statutory requirements concerning products are often in the form of requirements concerning specific constituents (chemicals) in the product and special rules concerning handling of these in connection with use and disposal – for example, the Nickel Directive and the battery collection scheme, handling of used electronic products and scrapping. A great deal of legislation does not relate to specific products because that would be difficult, but to the products' constituents. The Packaging Directive differs from this general picture by setting out specific requirements concerning both constituents, material consumption and, particularly, disposal.

Your customers are an important source of information. Establishing a dialogue with your customers' environmental managers would be a good way of obtaining information on local requirements, for example concerning waste handling, sorting and disposal. Another important source could be your trade association, which, among other things, perhaps enters into voluntary agreements on your behalf concerning phasing out specific substances – for example, the PVC Agreement.

If you use substances that are subject to regulation either as ancillaries or in the product, they are presumably already included in your environmental management system. However, you should make sure that requirements concerning product factors outside the company are also investigated and included – for example, requirements concerning emissions during use, including ozone emission from office machines, requirements concerning disposal – for example, requirements concerning reuse/recovery of materials or emission requirements relating to incineration etc.

5.6.2 Monitoring the situation

As in traditional environmental management, you must keep up to date on changes in statutory requirements and regularly update your legislation file.

For some chemicals there are statutory requirements concerning their

use, but most have not yet been analysed and made the subject of statutory requirements. The Danish EPA has published a list of undesirable chemicals, which gives an indication of chemicals to which special attention will be paid in future. It is therefore a good idea to monitor requirements concerning substances and materials and to ensure that you know the legislation concerning use and disposal of the company's products. This will also significantly improve your possibility of informing customers and other stakeholders.

On the Danish State's website on legislation (www.retsinfo.dk) you can search for specific substances to gain an idea of what is happening with respect to legislation. Schultz Lovservice (Schultz Law Service) (www.schultz.dk) and others publish acts, executive orders, etc. (CD-rom or paper format) on a commercial basis, so you can keep abreast of changes.

You must also keep an eye on what is on the way. You can do that through the Danish EPA and the Danish Energy Agency's strategies and action plans (www.mst.dk or www.energistyrelsen.dk) or at EU level through the Environment Commission's website (www.europa.eu.inc/comm./DGS/Environment/Index)

5.7 HOW MIGHT YOUR ENVIRONMENTAL POLICY, TARGETS AND ACTION PLANS LOOK?

The chosen product-oriented action should appear from your environmental policy statement, as shown in the following examples.

Examples taken from different companies' environmental policy statements:

From Grundfos' environmental policy statement

"Within a financially sustainable framework, environmental impacts and resource consumption must be reduced throughout the company through the development of new products and processes. The environmental impacts throughout the life cycle of the products must be assessed and described. Where possible, the products must be designed for reuse or recycling. The company must ensure that products and packaging can be disposed of in an environmentally sound way."

From Berendsen's environmental policy statement

"To minimise the environmental impacts by optimising products, processes, services and transport on the basis of a life cycle approach."

From Henkel-Ecolab's environmental policy statement

"We market products and systems with documented performance with respect to both function and environmental impacts. Good hygiene and environmental care are prioritised criteria in the development of products and systems. We offer our customers information on the environmental aspects of our products, system and service."

From Coloplast's environmental policy statement

“Coloplast recognises its responsibility for controlling its environmental impacts. Besides complying with statutory requirements, trade agreements and customary rules, this means that we will seek – through prevention and continual improvement – to reduce the environmental impact of our production and the use of our products. We intend to be an environmental leader in the development of products and in the production through which our products are created...”

From Bang & Olufsen's environmental policy statement

“All human activity affects the environment. This also applies to the production and use of our company's products. Bang & Olufsen is constantly working to reduce its environmental impact and create a balance between this impact and consideration for our product's useful properties, economy, lifetime and design excellence, so that we are among the best in the industry...
... We want to participate in a global, sustainable development and see our activities in a life cycle perspective.”

5.7.1 Objectives, targets and action plans

Environmental objectives, targets and action plans must be written down, reflect the company's environmental policy and prevent pollution.

If you use the product-oriented approach, you must also ensure continual improvement of the product, seen in a life cycle perspective.

Plans must therefore be drawn up for improving the company's environmental work on the product side as well. The action plans must include responsibility, time limits and a description of the specific measures. Remember to allow enough time and money.

Example of product-oriented target: to reduce the content of copper by 5% per product unit by the year 2001 compared with the year 2000.

In a traditional environmental management system, action plans are often limited to a single department or, in all cases, to a limited number of employees. With the product-oriented approach, action plans can be somewhat broader and cover more departments if you are going to achieve a real improvement.

TABLE 5.7: EXAMPLE OF AN ACTION PLAN

The following example is of a company that has chosen to take action on chemical substitution in a specific product with a view, for example, to gaining an eco-label.

Target:	Substitution of chemicals x, y, z in product AA within a 1-year period			
Action plan:	Substitution of chemicals x, y, z in product AA			
Department	Activity (What?)	Method (How?)	Time limit (When?)	Responsible (Who?)
Sales	Are the customers asking for this?	Collecting enquiries from customers, questionnaire-based survey – are there particularly problematic substances?	3 months	
Marketing	Can we sell it?	General market analysis – in what direction is the market moving?	3 months	
Product development	Are the functional and quality properties met? Will the lifetime be the same? Analyses and tests of the product	Are there any design consequences?	max. 1 year	
Purchasing	Are there other chemicals or suppliers on the market?	Studies of suppliers	6 months	
Production	Is it possible to make the new product?	Test productions of new products	2-3 years	
Environmental manager	Are the alternatives better?	Preparation of environmental and health assessments of alternatives in a life cycle perspective	3 months	

The example of the action plan to gain an eco-label does not differ in its structure from a traditional environmental management system. It is intended to stress the need for input from different departments in the company.

You must ensure in the underlying procedures and instructions that you follow up regularly on the progress being made and that the employees involved meet and exchange information regularly.

5.8 HOW DO YOU ORGANISE THE WORK ON PRODUCT-ORIENTED ENVIRONMENTAL ACTION?

5.8.1 Organisation and allocation of responsibilities

If you already have an environmental management system, you may have to judge whether the person who is already responsible for tasks in connection with the environmental management system – typically an environmental manager or coordinator – is also going to be made responsible for the environmental aspects of products. Many small companies will find it natural to use the same person for both, while in larger organisations, it may prove useful to involve more people – for example, employees in product development, purchasing, sales/marketing, service, etc.

Whether you have an environmental management system or not, you therefore need to describe the competencies and responsibilities of the employees with tasks relating to the system. You can allocate competencies and responsibilities both to individuals and to whole groups. You should appoint an environmental coordinator for each department.

As mentioned, product-oriented environmental work requires several interdepartmental activities. We therefore recommend that you appoint an interdepartmental environmental group, in which the environmental coordinators from the various departments and your environmental manager discuss product aspects across the board. This will ensure that the information is passed on.

5.8.2 Need for training and checklists

It is important to consider how you are going to involve the employees in your product-oriented work and the competencies and responsibilities that should be allocated to them. This includes preparing/adding concrete training plans.

Your deliberations should result in written procedures and instructions in a form that suits your normal work procedures or the present system.

Your employees may need special training or special instructions and checklists to enable them to carry out the new tasks.

The level of training for the individual employee will naturally differ according to his or her intended role or function. For some of your employee categories you may need tailored courses (specialised courses), while for others, general knowledge will probably suffice.

All the employees in your company should not only be informed that you are now using the product-oriented approach in your work but also be instructed about the effect that will have on their daily work and what you expect of them. In the case of the employees to whom you intend to allocate specific tasks and responsibilities, you should ensure that they can rise to the task.

Several consulting firms and educational institutions (business schools, technical schools, etc.) offer both specialised and more general courses for different employee categories and functions. If you would like further information, you can contact them directly.

At APC Denmark ApS, the environmental coordinator has prepared a training plan in the form of a matrix of the different employee groups' need for training. As an element of the product orientation, the matrix will be supplemented by knowledge about the products' life cycle and actual product-oriented information. The training plan comprises a general module that all employee groups must take and a number of special

modules designed for selected groups. Some of the special modules are designed for individual employee groups, while others will have participants from across the organisation. In the general module there are also participants from across the departments. Each module lasts for several hours and ends with a test to determine what the participants have learnt. The instruction is given primarily by in-house instructors because it is important to ensure that the content is as close as possible to the employees' daily work. Outside experts are invited for some subjects.

The principle behind the training plan is shown in the following diagram.

	General module	Special modules							
	Environmental policy LCA/products Contingency plan Waste separation Communication Employee involvement Mini-insight into statutory requirements and standards	Expanded statutory re- quirements and standards	Control of suppliers	Customers	Audit	Chemical substances	Design for Environment	Product orientation	Special factors
Departments									
Development	X	X	X	X	X	X	X	X	X
IT	X		X		X			X	
Marketing	X	X		X	X			X	
Finance	X				X			X	
Service	X	X			X	X		X	
Administration	X		X		X			X	
Production PE/MFE	X	X	X		X	X	X	X	
Purchasing	X	X	X		X		X	X	
Goods reception	X		X		X			X	
Dispatch	X		X		X			X	
Special areas	X				X	X		X	
Safety committee	X	X	X		X	X		X	

5.9 HOW SHOULD COMMUNICATION BE ORGANISED AND HANDLED?

Here, communication should be perceived in the broadest sense since it includes not only the command routes and dialogue across your organisation, but also your communication with the outside world – with your stakeholders.

It is important for you to decide whether your present environmental management system and the organisation of your environmental management work are geared for handling broad communication. The need to systematise the dialogue will naturally depend somewhat on the size of your company and the way your company is organised.

5.9.1 In-house communication

To ensure that important information reaches the relevant employee group or groups, it is a good idea to describe what types of information must be passed on to whom and how, preferably with a time limit.

It may also be important to discuss major product factors in a broader forum (with representatives of the relevant employee groups) at regular intervals or as needed. You should describe your information strategy on this point as well – what triggers a need for action and who is to take the action.

The descriptions should appear from your procedure for communication, possibly underpinned by instructions for different employee groups.

In the example of an action plan shown in section 5.7.1 you will see that many employee categories are needed in order to incorporate all environmentally relevant aspects of products.

5.9.2 External communication/dialogue

The external dialogue is an essential element of all environmental management work. That also applies to information and communication

about the product's environmental performance, particularly because your product work is directly related to the market conditions. Your external communication/dialogue should be particularly with suppliers and customers, but your other stakeholders (neighbours, authorities, shareholders, etc.) may also wish to have life cycle-related information.

The Danish EPA has issued a number of publications on environmental dialogue (see the references).

Your product-related communication with your stakeholders can comprise many different components – for example:

- training and guidance concerning use (e.g. visits to the customers)
- supplier seminars
- labelling of products (e.g. eco-labels)
- environmental product declarations
- directions for use.

It is important to gather up outside enquiries in order to pass them on systematically within your organisation. In this respect, product-oriented environmental management does not differ from traditional environmental management.

Chapter 4 explains the importance of dialogue and tools for it.

5.10 THE MANAGEMENT'S REVIEW

In a product-oriented environmental management system, the management's focus must be expanded to include the product-related objectives, targets and procedures. You must there expand the agenda for the management's periodical reviews.

With the product-oriented approach, new monitoring results from your sales, marketing, service and purchasing departments will be of particular interest:

- What are the customers and the market demanding?
- Is your “green” product profile selling?
- Are you adequately monitoring new methods of disposal?
- Are you able to supply the necessary documentation for your products’ environmental performance – for example, in the form of directions for use?
- Do you have sufficient control of the product’s environmental properties in the use situation?
- Do you have proper control of the suppliers and has there been a clear improvement in the documentation supplied for production of raw materials and chemicals?
- Should some of the suppliers be replaced?

Your environmental manager/department will be able to provide important input concerning (expected) changes in statutory requirements at product level at home and abroad – for example, on new requirements concerning disposal of whole products or components or requirements concerning chemicals or materials. The environmental manager/department will also know about new or changed Green Buying Guides affecting your product and about any tightening of the criteria for eco-labels.

Monitoring the situation is naturally not enough in itself. It is also important for the management to decide whether the internal work procedures and instructions that are intended to ensure that information from the market and stakeholders is passed on, discussed and used actively are adequate. This information, which enters the company by different routes, and which is product-related, will very often be useful to several of your employee groups.

New items on the management’s agenda could therefore be:

- the sales and marketing department’s periodical surveys of customer satisfaction and expectations concerning the development of the market for your “green” products
- the purchasing department’s periodical surveys of suppliers: prices and opportunities relating to the product work

- the product development department's progress on environmental products
- new statutory requirements, new requirements in Green Buying Guides and new or more stringent eco-label criteria
- evaluation of communication, anchorage and use of information within the company in relation to the product work
- evaluation of new training needs.

The new items on the agenda are intended to ensure that you maintain existing environmental targets and set up new ones that incorporate the product dimension in a life cycle perspective and that the management prioritises the action and ensures the necessary resources and competencies.

5.11 THE OTHER ELEMENTS IN THE ENVIRONMENTAL MANAGEMENT SYSTEM

We have chosen to focus on those areas in the environmental management system where there is a need for special focus in order to incorporate the product dimension. The remaining elements, such as:

- document management
- operating control
- contingency and remedial action
- control and corrective action

must naturally also be adapted to the company's product-oriented work. For example, it should be checked in the internal audit that the employees know and understand the life cycle approach if that is part of your environmental policy and that your buyers, product developers, etc. really incorporate environmental considerations in their work to the extent prescribed by you.



6 References and Supplementary Literature

Danish Environmental Protection Agency:

Manual on Environmental Assessment of Products. Published in the series Miljønyt (Environmental News), 2000.

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Planning an Environmental Dialogue. Miljønyt, No. 43, 2000.

Environmental Dialogue through the Press. Miljønyt, No. 44, 2000.

Environmental Dialogue with Colleagues. Miljønyt, No. 45, 2000.

Environmental Dialogue with Customers. Miljønyt, No. 46, 2000.

Catalogue of Tools for Environmental Dialogue. Miljønyt, No. 47, 2000.

Environmental Dialogue with Suppliers. Miljønyt, No. 48, 2000.

List of Effects of Problematical Substances. Working Report No. 1, 1997.

List of Undesirable Substances, 1998 (revised in 2000).

Life Cycle Assessment of 3 Types of Metallic Paint. Environmental Project No. 488, 1999. (the Teknos Schou project).

Environmental Product Declarations, Working Report No. 47, 1997.

Others:

COWI Consult: Environmental Management and Transport. Manual for Small and Medium-sized Enterprises, 1999.

Danish Shippers' Council and Association of Danish International Road Hauliers: Environment and Safety – Manual for Road Transport, 1997.

European Environmental Agency: Life Cycle Assessment. A guide to approaches, experiences and information sources. Environmental Issues Series, No. 6, 1997.

Danish Agency for Trade and Industry and Danish Environmental Protection Agency: Product-oriented Environmental Management – Script for growth groups and compendium for use by growth groups. The material can be obtained from COWI Consult, Århus (secretary for department 1331, phone +45 87 39 66 72).

Stevens, 1997, Stevens and Van der Wel, 1998, quoted from:

N. Wisberg (ed.): “Analytical Tools for environmental design and management in a systems perspective”. CHAINET/Center for Environmental Science (CML), Leiden University, Holland. Draft version, 1999.

World Industry Council for the Environment (WICE): Design For Environment, 1994.

In the manual, readers are referred to the following websites:

Danish Working Environment Authority: www.arbejdstilsynet.dk

Danish Asthma & Allergy Association: www.astma-allergi.dk

Danish Society for the Conservation of Nature: www.dn.dk

dk-TEKNIK ENERGY & ENVIRONMENT: www.dk-teknik.dk

Energy Information Office: www.energioplysningen.dk

EU's Commissioner for the Environment:
www.europa.eu.inc/com/DGS/Environment/Index

Danish Consumer Ombudsman: www.fs.dk

Danish Consumer Council: www.forbrugerraadet.dk

National Consumer Agency of Denmark: www.fs.dk

Greenpeace: www.greenpeace.dk

GRIP Centre, Norway: www.grip.no

Green Information: www.greeninfo.dk

Green Families: www.gronrefamilier.dk

Danish IT Industry Association: www.itb.dk

Danish Eco-label Secretariat: www.ecolabel.dk

Danish Environmental Protection Agency: www.mst.dk

Environmental Management Council (Sweden): www.miljostyrning.se

NOAH: www.noah.dk

Schultz Law Service: www.schultz.dk

Scientific Certification System (USA): www.scs1.com

Danish State's website for legislation etc.: www.retsinfo.dk

Danish Building Research Institute: www.sbi.dk

National Procurement Ltd., Denmark: www.ski.dk

Technological Institute: www.teknologisk.dk

- see also the list of the participating companies' websites at the beginning of Chapter 2.

Part B: Tools

1 Overview of a product's life cycle

This tool can be used to obtain an overview of a product's life cycle. It is the first step in a real environmental assessment.

When you use this tool, the main results you obtain are:

- an overview of the phases of the product's life cycle
- clear definition of the scope of a life cycle review
- collection and organisation of data in a suitable form.

The tool consists of five steps:

1. Designation of the product
2. Preparation of list of materials and substances
3. Preparation of flow diagrams/process tree
4. Quantification of input/output flows
5. Completion of MECO form (MECO = Materials, Energy, Chemicals and Other).

In general, with this tool, you must use as your basis the data that are easily accessible. The work involved in using the tool takes 1-2 weeks. We recommend that you obtain "Manual on Environmental Assessment of Products" (see the reference list), which will help you carry out a real environmental assessment of the product.

1.1 DESIGNATION OF THE PRODUCT

Before you start it is important to designate the product you are going to work on.

Think about the following questions:

- Are there two products you want to compare to clarify whether the environmental impact is smaller for one than for the other?
- Do you want to determine whether a modification of a product will reduce the environmental impact?
- Do you want to look at a product to see where the significant environmental impacts occur in its life cycle?

It is important to define what the product or products you choose to work on does/do. This is also called the product's function and is expressed by establishing the functional unit.

The functional unit describes:

- 1. a quantity (number, volume or area)**
- 2. a duration (lifetime or a chosen period of time)**
- 3. a quality or properties.**

For example, some drainpipes are made of plastic. To compare drainpipes made of PVC and PP (polypropylene), you must ensure that the pipes have the same dimensions.

Today, milk is sold in 1-litre cardboard cartons or in 2-litre plastic bottles. The consumers may find a 2-litre bottle difficult to handle. On the other hand, it has a better closing mechanism than the cardboard carton. In other words, some consumers will consider that the two products have the same quality, while others will not – even though both products deliver 500 litres of milk per year to the family.

It is thus not the product itself that you should focus on, but its function. If you can describe clearly the same function for two products you want to work on, you can also carry out a real comparison.

Examples of functional units are shown in example 1.

Product	Functional unit
Pump	Delivery of 5 cubic metres of water per hour at an outlet pressure of 1.5 bar. Lifetime: 10 years
Paint	1 m ² painted surface with gloss 90 and high coverage for 5 years
Television	Reception of TV programmes 6 hours per day and 18 hours standby for 10 years for a 28" television

EXAMPLE 1:
FUNCTIONAL
UNITS FOR VARI-
OUS PRODUCTS

1.2 PREPARATION OF LIST OF MATERIALS AND SUBSTANCES

Prepare a material specification to get a systematic overview of the materials and substances that will form part of the finished product. For each material or substance, indicate the quantities (kg or %-weight) in the product.

If the product is fairly simple and consists of non-composite materials and substances, you can set up the material specification directly, as illustrated in example 2.

Material	Quantity
Outer case, polypropylene	200 g
Vacuum flask, glass	150 g
Insulation, expanded polystyrene	25 g
Lid and handle, polypropylene	80 g

EXAMPLE 2:
MATERIAL SPECI-
FICATION FOR A
THERMOS FLASK

If, on the other hand, the product is fairly complex, with many components, it may be helpful to set up a so-called list of parts for the product as the basis for the material specification.

In the list of parts you divide the product into different components, which you then subdivide if they comprise several parts.

From your knowledge of the materials used in the individual components, you can sum up the total use of the materials or substances of which all the components consist (see example 3).

You should make a determined effort to procure information about the largest parts (components/substances) used in the product.

You can try to obtain any data you lack concerning the composition of components, materials and/or substances either through suppliers or by assessing the product on the basis of your knowledge of other products. If the suppliers cannot tell you in what quantities the individual materials are used, you can find this by weighing the individual components.

A possible procedure for gathering data from suppliers is as follows:

- Establish personal contacts at the relevant companies
- Explain the purpose of your enquiry and what the data are going to be used for
- Send precise questions
- Follow up on the personal contact
- In many cases, you may have to pay a visit in order to assist the supplier and avoid misunderstandings.

If some of your suppliers have introduced environmental management or some other form of systematic environmental work, start with them because that is where you are most likely to be able to procure data.

Example 3 shows a list of parts and a material specification for a pump.

It will be seen that the pump consists of a cabinet, which in turn consists of a number of components, including a tank, a strap and two drain plugs. The tank is made of 1143 g stainless steel, the strap is made of 190 g stainless steel, and the two drain plugs are made of in all 45 g fibre-reinforced PPE. At the bottom of the table, all identical substances and materials are added together, so that you get an overview of the amount of material, e.g. stainless steel, used in the whole pump.

You then enter all the data on materials and constituents obtained by setting up the list of parts and material specification in the flow diagram with inputs and outputs (see example 6) and carry them forward to the matrix form (see example 7).

EXAMPLE 3:
LIST OF PARTS
AND MATERIAL
SPECIFICATION
FOR A PUMP

Item	Number	Substance of material	Unit, weight (gram)
Cabinet			
Tank	1	Stainless steel	1143
Strap	1	Stainless steel	190
Stator housing	1	Stainless steel	849
Air valve	1	Stainless steel	10
Rotor shaft	1	Stainless steel	190
Ballbearing	1	Stainless steel	37
Tightening flange	1	Stainless steel	276
Other steel items	8	Galvanised steel	136
Rotor	1	Recycled aluminium	132
		Tinplate	474
Stator	1	Tinplate	1067
		Copper wire	316
		Fibre-reinforced PETP	35
		Polyester film	11
Saddle for electrical unit	1	Recycled aluminium	300
Inserts in plate	1	Brass	20
Type plate	1	Unknown metal	?
Intermediate plate	1	Fibre-reinforced PPE	1070
Drain plug	2	Fibre-reinforced PPE	45
Motor shield	1	Fibre-reinforced PPE	770
Coil housing	1	Fibre-reinforced PPE	155
Runner		Fibre-reinforced PPE	20
Terminal box lid	1	Fibre-reinforced PPE	140
Pipe with union	1	Fibre-reinforced PPE	230
Base-plate	1	Fibre-reinforced PP	260
Non-return valve	1	PP	approx. 10
Seal ring	1	PP	4.3
Cable coupling	1	PA (nylon)	7.5
Cabinet		Materials, total	
		Stainless steel	2695
		Galvanised steel	136
		Recycled aluminium	432
		Tinplate	1541
		Copper wire	316
		Brass	20
		Unknown metal	?
		Fibre-reinforced PETP	35
		Fibre-reinforced PPE	2430
		Fibre-reinforced PP	260
		PP	approx. 14.3
		PA (nylon)	7.5
		Polyester film	11

1.3 PREPARATION OF FLOW DIAGRAMS/PROCESS TREE

First, it is important to get an overview of:

1. the processes that the product passes through
2. the inputs and outputs during the product's life cycle.

Start by roughly sketching the product's life cycle and then add more and more detail. By working from level 1 to level 3 below, you get a flow diagram that shows in detail all process steps/activities and all inputs/outputs in each of the phases of the product's life cycle from production of raw materials to disposal.

1.3.1 Level 1

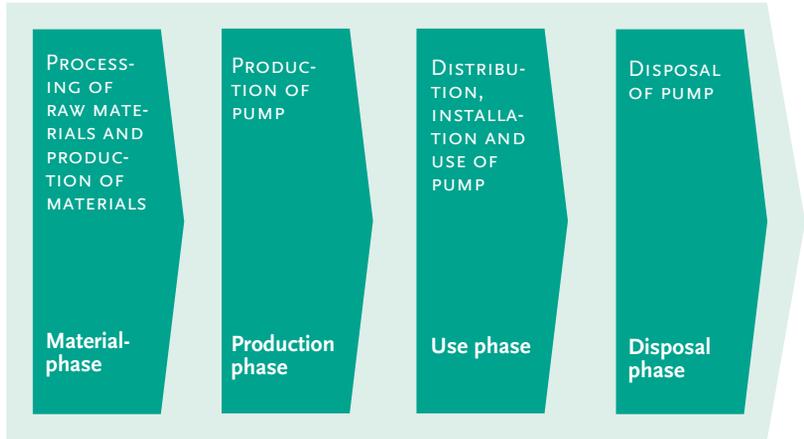
Prepare a flow diagram showing roughly the life cycle of the product.

You illustrate the product's life cycle by drawing the various phases in the life cycle:

- material phase
- production phase
- use phase
- disposal phase
- transport phase.

Example 4 shows a general flow diagram for a pump.

EXAMPLE 4:
GENERAL FLOW
DIAGRAM FOR A
PUMP – LEVEL 1

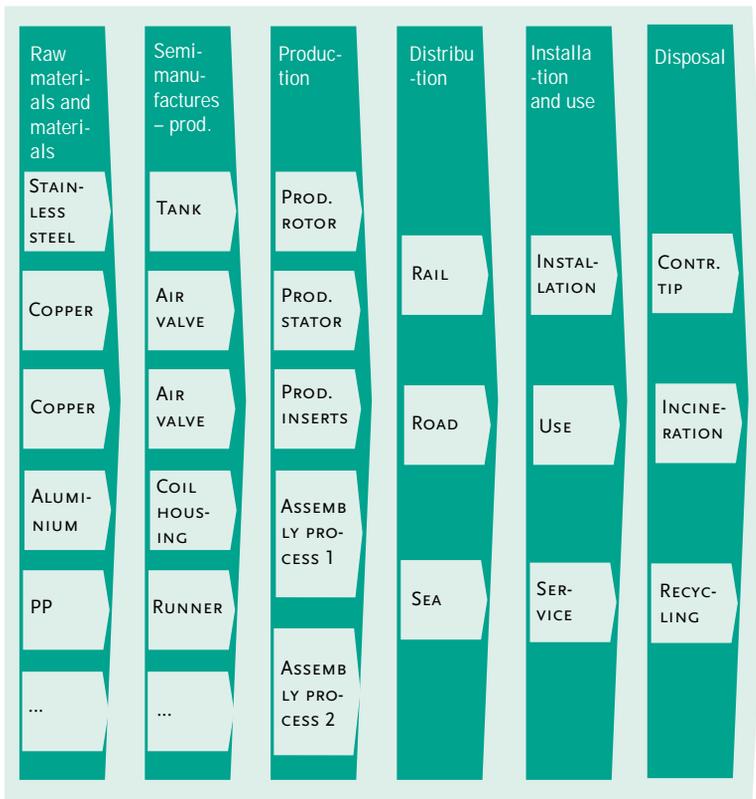


1.3.2 Level 2

Add to the general flow diagram a description of the process steps through which the product passes in each phase.

Then prepare a drawing showing the process steps that take place in each phase.

It is a good idea to start by preparing drawings covering the process steps in your own company, because you know most about them. If you understand the processes that take place at, for example, suppliers of subcomponents, you can enter them as well; otherwise, in the first instance, you must simply add the name of the subcomponent.



EXAMPLE 5.
DETAILED FLOW
DIAGRAM SHOW-
ING THE INDIVI-
DUAL PROCESS
STEPS FOR EACH
PHASE OF THE LIFE
CYCLE OF A PUMP
– LEVEL 2

1.3.3 Level 3

Enter the inputs and outputs for each “box”/step in the flow diagram. Start with what is called level 1 above.

Remember that you can often indicate the main flows without much detailing. Most of the production personnel know where “the shoe pinches” – and so do suppliers.

Inputs are, for example:

- raw materials, materials and chemicals
- energy consumption
- water consumption
- ancillaries, e.g. degreasing agents, lubricants, etc.

Outputs are, for example:

- atmospheric emissions
- discharges to water
- waste quantities.

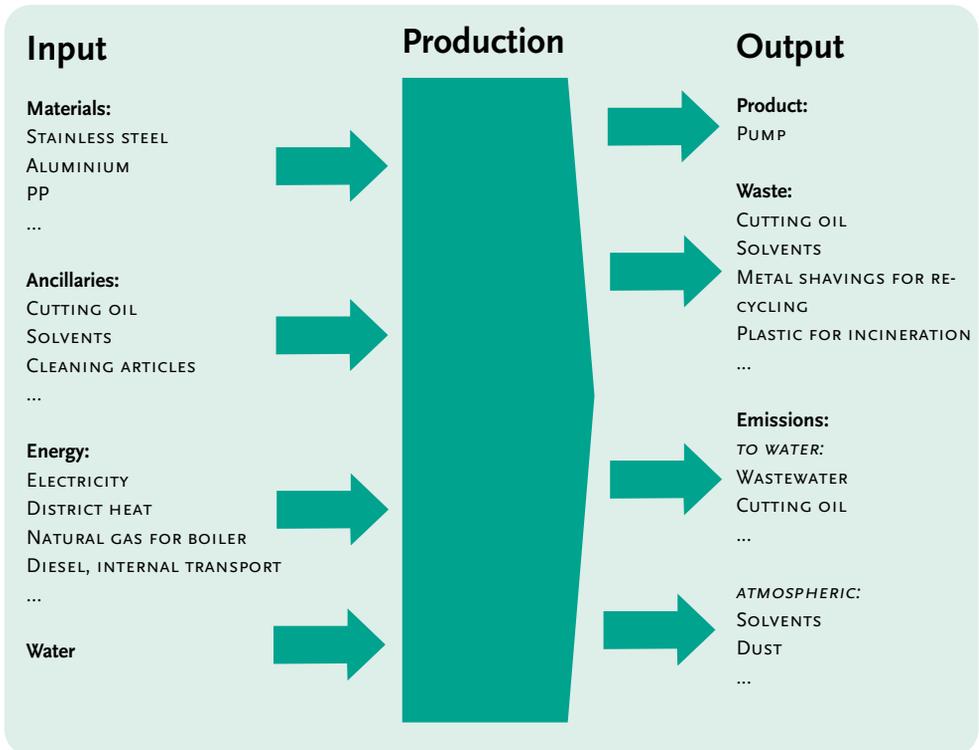
In addition, you should note any health effects, e.g. chemical impacts, noise or dust problems, in the process tree.

Remember also to consider the need for operation and maintenance of the product in the use phase and the materials and substances used for that.

In the case of the disposal phase it is important to consider and note whether the whole of the product is disposed of in the same way or whether some parts are disposed of in a different way. For example, one can envisage large metal parts being separated and sent for recycling, while the rest of the product goes for incineration.

Start by outlining inputs and outputs at level 1 (see example 6). If you go into too much detail when establishing the first overview, you risk suffering data death. If you have information at a more detailed level (see example 5), e.g. via an environmental management system, it seems obvious to use it.

Example 6 illustrates a process tree with inputs and outputs for the production phase (level 1).



1.4 DATA COLLECTION

You need to have an idea of the size and size ratios of the inputs and outputs in order to judge which environmental impacts are important, seen in a life cycle perspective. You therefore need to collect data for the inputs and outputs you have entered.

1.4.1 Where to find data

Start by collecting the easily accessible data:

- in electronic registration systems that you have built up in connection with other environmental work or in connection with the implementation of environmental management

EXAMPLE 6:
 FLOW DIAGRAM
 FOR PUMP WITH
 INPUTS AND OUT-
 PUTS

- in product specifications, suppliers' material safety datasheets for use and technical datasheets
- in environmental approvals, inspection reports or similar
- from employees in the production department, the development department or the purchasing department
- from suppliers and customers.

A company or supplier often does not know what it “costs” in energy terms (energy content per kg material) to produce materials and substances. If you are unable to procure the necessary information, you may find it in reference books or databases.

If you have “Manual on Environmental Assessments”, you will find some of the data you need there, together with some rules of thumb for estimating figures that you lack. If you have access to the EDIP PC tool, you will find there a unit process database with information about what it has “cost” in energy terms to produce a number of substances and materials.

1.4.2 Lifetime

As mentioned under the explanation of the functional unit, besides determining the size of the various inputs and outputs, it is important to determine the lifetime (e.g. number of operating hours or years) of the product. The product's lifetime is of great importance, particularly when looking at the environmental impact from two different products with the same function.

If one develops a new product or modifies an existing product, e.g. by substituting materials, it is important to investigate whether that affects the lifetime of the product. A shorter lifetime represents an environmental impairment.

1.4.3 Breaking down flows

You may encounter situations in which data cover the production of several products – for example, if you make many types of products but only record the total energy consumption for lighting and heat or if you

calculate the total consumption of cooling water for two process lines in which different items are made.

In such cases, you need to break these material, energy, emission or waste flows down to distribute the figures between the product you are investigating and other products.

The most natural breakdown is to look at the quantity of the product in relation to the others. This can be done on the basis of the value of the products. Choose the breakdown method that seems most natural for you and for which you have data.

1.5 COMPLETING A MECO FORM

When you have collected and entered input and output data in the flow diagrams, you must summarise the data in a MECO form in order to create an overview of the data collected.

A MECO form is as shown below:

	Material phase	Production phase	Use phase	Disposal phase	Transport phase
Materials					
Energy					
Chemicals					
Other					

Materials, M:

Under materials, indicate for each phase of the product's life cycle:

- the materials (resources) and substances used directly in the product (i.e. remains in the product for the rest of its life cycle) and the quantities of waste produced (minus chemical waste, which must be listed under chemicals)
- water consumption.

The reason for listing the quantities of waste under materials is that the waste is regarded as a potential resource. If, for example, there are metal shavings from fabrication of the rotor and the shavings are collected because they can be sent for recycling, the metal is treated as a resource that can be used in another product. The metal must therefore be credited to the pump, i.e. it is deducted from the total material consumption.

Energy, E:

Under energy you list the forms and quantities of energy used in the different phases of the life cycle, i.e. whether electricity, oil, natural gas or other form of energy is used and, if so, in what quantity (kWh or MJ). You will find it easier to obtain an overview of the size of the consumption in the various phases if you convert the consumption of the individual forms of energy into the same unit.

Remember that energy is generated during waste incineration and that this energy must be credited to the pump. You do that by deducting it from the total energy consumption, thus entering it as a negative energy consumption under disposal in the MECO form.

Chemicals, C:

Chemicals cover:

- use of chemical ancillary substances/products, e.g. lubricants, cutting oil or cleaning agents and
- atmospheric emissions and emissions to water, e.g. carbon dioxide and nitrogen oxides to the air or phosphates and heavy metals to water.

Other, O:

Other should include health factors, e.g. noise. Besides that, land use may be a parameter, e.g. in the case of agricultural production or dam building for energy production, where large areas of land are used.

EXAMPLE 7.

Example 7 illustrates a completed form with input and output data for a pump.

COMPLETED MATRIX FOR A PUMP

Source of environmental problems	Material phase	Production phase	Use phase	Disposal	Transport
Materials The resources used, e.g. - materials - substances Any waste problems	Aluminium 0.2 kg Chrome 0.3 kg Iron 1.4 kg Copper 0.3 kg Nickel 0.1 kg Waste: 6 kg	Waste: 1.5 kg	Waste: 250 kg	Aluminium -0.04 kg Chrome -0.06 kg Copper -0.1 kg Nickel -0.03 kg Iron -0.3 kg (credited) Waste: 6 kg Hazardous waste: 0.5 kg	
Energy MJ energy	550 MJ	380 MJ	22,200 MJ	-20 MJ (credited)	35 MJ
Chemicals e.g. poisonous substances, ozone-depleting substances, hydrocarbons nutrient salts	PAH Few data	Coolant Lubricant Xylene		No data available	
Other e.g. non-chemical health and safety problems		Noise Dust	Noise	Dust	

1.6 FURTHER WORK

In the MECO form, the company's data are collected in a clear way related to the individual phases of the life cycle and the types of data (materials, energy, etc.).

The MECO form gives a first indication of where the significant environmental impacts occur and reveals where data are lacking. The MECO form can also be used for a first assessment of the product or for a first comparison of products.

The next step is to incorporate what you know about the environmental significance of using raw substances and energy and of discharging substances to water and atmospheric emissions. That means that you have to translate your data on inputs and outputs into environmental impacts and then assess the importance of these.

This translation and assessment lie outside the scope of this manual. We recommend that you go on to "Manual on Environmental Assessment of Products" (see the references). This manual tells you how to carry out an assessment on the basis of a MECO form and how to continue if you want to use a PC tool.

2 Eco-labels

There are two publicly controlled eco-labels on the Danish market:

The Nordic eco-label, Svanen (the Swan)



and the European eco-label, the Flower



Besides these, there are a number of foreign labelling schemes that may be relevant if you export. Examples are the government controlled German eco-label “Den blaue Engel” (the Blue Angel) and the Swedish “BRA MILJÖVAL” (Good Environmental Choice). Green Information’s website (www.greeninfo.dk) contains a review of the different labels and symbols that can be used on products.

This tool includes an introduction to the Swan and the Flower, together with some good advice if you are considering applying for an eco-label.

2.1 THE CRITERIA DOCUMENT IS THE BASIS

For a product to be granted an eco-label, it must meet a number of specified criteria. The criteria are prepared for a product category and are gathered together in a so-called criteria document. A product category is based on the function of the products. Products that are regarded as analogous by the consumers (i.e. products that consumers choose between in a purchasing situation) therefore figure in the same product category. The label is intended only for the environmentally best products within a product category. Examples of product categories are: refrigerators and freezers; car care products; printed matter; textiles; and toilet paper and kitchen rolls.

The eco-label schemes do not apply to food products, beverages or pharmaceuticals.

The different eco-labels have different measures for the percentage of a product category that can gain the label – typically 30%. In practice, all the products that meet the criteria get the label – even though more than 30% have already gained it.

The eco-label criteria are regularly revised and tightened (about every three years). Therefore, a company that has obtained an eco-label for a product once must continually improve the product's environmental performance in order to keep the label.

Criteria are continually being developed for new product categories, so you must keep an eye on the situation in case criteria are on the way for your products.

There are different criteria within the different schemes. Basically, the products must be suitable for their intended function. At the same, a number of conditions for the products and the process by which they are produced must be met. There may, for example, be conditions concerning the maximum content of specific substances in the finished product or conditions for maximum permissible emission of harmful substances in a specific part of the production process. In some documents, scoring systems are used for an overall evaluation of critical parameters (e.g. the toxicity of constituents in soap and shampoo).

Lastly, positive or negative lists may be used for a number of constituents. That is the case in the criteria document for PCs, which lists a number of flame retarders that must not be used for plastic components weighing more than 25 g.

2.2 THE ECO-LABEL SECRETARIAT MANAGES THE SCHEME

It is the Eco-label Secretariat that is in charge of the day-to-day management, including granting the eco-labels. The secretariat's address is:

The Eco-label Secretariat:

dk-TEKNIK ENERGY & ENVIRONMENT

Gladsaxe Møllevvej 15

DK-2860 Søborg

Denmark

Phone: +45 3969 3536

Fax: +45 3969 2122

The secretariat has its own website at:

www.ecolabel.dk

The website lists the product categories for which criteria have been prepared. The lists can also be obtained from the Eco-label Secretariat.

Green Information's website (www.greeninfo.dk) contains a list of the products sold in Denmark that have been granted an eco-label licence for the Swan or the Flower.

2.3 THE PROCESS OF OBTAINING AN ECO-LABEL

To obtain an eco-label, you have to go through a number of considerations and decisions. These are outlined below.

2.3.1 Criteria document and guide to applying for an eco-label

The Eco-label Secretariat has prepared a guide to applying for the Flower: "Guide to applying for the EU Eco-label".

The secretariat also has a guide to applying for the Nordic eco-label: "Rules on Nordic eco-labelling of products". You can obtain the guides and criteria documents for your product from the Eco-label Secretariat.

2.3.2 Is your product included?

There will often be no doubt as to whether your product is included, but in special cases one must be careful. For example, a floor treatment

agent that both cares for floors and cleans them is evaluated on the basis of the criteria for film-forming floor care agents and not the criteria for cleaning agents. In case of doubt, contact the Eco-label Secretariat.

2.3.3 What criteria must be fulfilled?

The criteria documents are divided into product requirements and system requirements.

The product requirements are the requirements that the product and the related process in the life cycle must live up to according to the criteria. The system requirements concern, for example, statutory requirements and quality control and/or environmental management.

Gaining an eco-label is a phased process. It is usually not a good idea to attempt to meet all the requirements at one and the same time, partly for resource reasons and partly because a number of requirements depend on each other.

An example of the latter is eco-labelling of adhesive. Here, a number of requirements are made concerning constituents and a requirement concerning evaporation of organic compounds. In this situation, it makes no sense to test the product for evaporation before one is certain that the constituents live up to the criteria.

It may help to divide the requirements into A, B and C requirements, as described in Part A of the manual, section 3.4.2, in order to get an idea of the size of the job.

“Documentation requirements” naturally cover documentation of the product requirements, but they also include requirements concerning, for example, compliance with legislation and quality control and/or environmental management.

As described earlier, the criteria are revised approximately every three years. It is therefore a good idea to find out when the next revision will

take place and decide whether to work towards fulfilment of present or future requirements.

2.3.4 Evaluate the requirements

In connection with the initial review of the product (see Part B, Chapter 1, of the manual), you have formed an overview of the significant environmental impacts in the product's life cycle. You should now carry out an evaluation to determine whether there is accordance between the criteria set up and your view concerning the significant environmental impacts.

If you have identified significant environmental impacts in connection with the product that are not covered by the criteria, it is still important to investigate whether anything can be done about them.

If there is a lack of accordance between the criteria and the product's environmental impacts, it may be a good idea to contact the Eco-label Secretariat for an explanation of the requirements. You can also obtain a lot of help from other companies in your industry or from your trade association.

2.3.5 Objective and action plan

When fixing a date for submission of your application, it is important to take account of:

- the market situation. Is there a demand for eco-labels from customers or other stakeholders? How far have your competitors got?
- the work involved. How many hours of work will be needed to prepare the application? What resources can be released for this work?

If the company is working towards obtaining an eco-label licence for one or more products, it may be a good idea to integrate this as a target in your environmental action plan.

The identified product requirements with a deadline for when the docu-

mentation for the application for an eco-label is to be ready must be set up in an action plan. If the projects are big ones, it is a good idea to integrate them into your environmental management system.

2.3.6 Product modification

In many cases, it will be necessary to modify the product in order for it to live up to the criteria. Such modification can be a major or a minor project. However, you should always prepare an action plan for the project so that factors concerning the allocation of responsibilities and resources are clarified.

2.3.7 Documentation

The various criteria documents contain information on the type of documentation of compliance with the individual criteria that is required. The requirements concerning documentation vary greatly – from requirements concerning a signed declaration, e.g. that the product does not contain certain chemical substances, to requirements concerning a complete analysis of, for example, the content of a chemical substance.

The requirements concerning documentation appear from the criteria documents. The latest documents show how compliance with each and every requirement is to be documented. In the older criteria documents, it is not always clear what type of documentation is required. In case of doubt, contact the Eco-label Secretariat, phone +45 3969 3536.

2.3.8 Application

The actual application must be submitted on a standard contract for the Swan or the Flower. The required documentation must be attached to the application.

2.3.9 Submission

In Denmark, it costs DKK 3,500 to apply for the Swan label for a product, in addition to which a fee of 0.4% of the licensee's turnover (excl. VAT) in Denmark is charged. However, the charge for using the Swan label cannot exceed DKK 250,000 per year per licence.

If a company also wishes to market the Swan-labelled product in other Nordic countries, the product must be registered in each country. A fee corresponding to 0.4% of the turnover in the country in question must be paid, although subject to the following minimum and maximum limits:

Finland: FIM 4,000 and FIM 250,000
Norway: NOK 10,000 and NOK 300,000
Sweden: SEK 10,000 and SEK 350,000
Iceland: ISK 5,000 and ISK 200,000

The charge for applying for the Flower is DKK 3,500. There is also a fee for use of the label, amounting to 0.15% (although minimum DKK 3,500 per year) of the licensee's turnover (excl. VAT) within the EU on the product for which the eco-label has been granted. It is only necessary to apply for the EU label in one Member State.

2.3.10 The market's reaction

After gaining the eco-label, you should naturally test the market's reaction. Furthermore, for some products, there are requirements concerning continual registration of enquiries/complaints concerning eco-labelled products. In connection with environmental management, registration of environmental enquiries is required (see also Chapter 5).

2.3.11 Continual development

The eco-label criteria should be regarded as minimum criteria for a product's environmental properties. It is important for the company to continue making requirements concerning improvements and not to stop development work on the product once it has gained eco-label for it. There are two reasons for this: firstly, the criteria are being continually tightened and, secondly, there are requirements concerning documentation of continual improvement within the framework of a certified environmental management system.

2.4 CONTINUED WORK

The work on eco-labelling can be used as the basis – and inspiration – for continuing the work on the product-oriented approach.

The work on the eco-label criteria has given you insight into the environmental impacts that are important for your products. This insight will provide you with a good basis for continued work on life cycle assessments or elements of such assessments. You will find inspiration for this work in Part B, Chapter 1, and Annex 1, of the manual.

3 Green Buying Guides

The Danish EPA is publishing a series of Green Buying Guides with a view to ensuring that purchasers with relatively little time can pursue an environmental sound procurement policy. EPA published around 30 Green Buying Guides, each dealing with one product category, up to the end of 1999. New guides are published regularly.

All the Green Buying Guides are based on the same concept and are divided into two parts: one containing an environmental guide and one containing background documentation.

The environmental guide part includes “good advice before purchasing”, a review of the product category’s environmental impact from cradle to grave, a review of the main environmental aspects to consider when purchasing in this product category, and a checklist. The checklist contains questions about important environmental aspects prepared as yes/no questions. The buyer is intended to send these questions to the supplier or manufacturer of a product. The supplier or manufacturer then puts a tick in the appropriate box beside each question and sends the checklist back to the buyer.

The background documentation describes in detail the environmental impact of the product in question, seen in a life cycle perspective. For example, the documentation explains where the environmental impact occurs, which materials can cause problems, and the importance of the energy consumption.

The environmental considerations recommended in the buying guides’ checklist are broken down into categories, depending on what is thought to be the most important environmental consideration for the product category in question. For example, for computers, questions are formulated within the categories: environmental and energy labels, energy consumption, production, environmental management and occupational health and safety.

Green Buying Guides and the related background documentation (in Danish) are available free of charge from:

Miljøbutikken
Central Information
Læderstræde 3
DK-1201 Copenhagen K
Denmark
Phone +45 33 92 76 92

For further information on the Green Buying Guides, see the Danish EPA's website (www.mst.dk) under the category "Subject areas".

3.1 HOW CAN MANUFACTURERS USE THEM?

Manufacturers can use the Green Buying Guides as a good indicator of the product-related environmental aspects on which customers (or suppliers) will normally focus.

The formulation of the checklist (as yes/no questions) means that you yourselves must be able to document to purchasers that your product is made in accordance with the environmentally sound directions given in the Green Buying Guides.

The checklist in Green Buying Guides can cover matters concerning:

- you yourselves (supplier or manufacturer) and
- your sub-suppliers.

The checklist takes account of environmental aspects concerning:

- production processes
- constituents
- materials
- energy factors
- methods of disposal

- environmental and energy management
- health and safety (to a lesser degree).

An example of the way in which the questions are formulated is: “Do you avoid using xx (name of substance)?”. To answer this question in the affirmative, neither you nor your suppliers must use the substance in question at all.

However, situations can arise in which a substance is being phased out or in which alternative substances can only be used in part of the assortment, so one is not in a “100% situation”. In such cases, it would be relevant for you to be able to document the extent to which, for example, the substance in question is avoided, even though the answer to the question has to be no.

This means a greater quantity of information, but the information can be used in many other contexts in connection with your product-oriented environmental management.

Green buying guide for tables

The checklist in the environmental guide for tables includes questions concerning surface protection. The questions are given below. A yes answer to questions is regarded as positive by buyers (good for the environment).

- Is the table made entirely without use of organic solvents and heavy metals?
- Do you use UV-hardening paint/varnish on wood?
- Do you use water-based paint/varnish on wood?
- Do you use alkaline vats for degreasing metal parts?
- Do you use powder paint for metal parts?
- Do you use water-based paint/lacquer for metal parts?

The first thing to do is to clarify which factors concern your company itself and which factors concern your subsuppliers. You can then decide how the information is to be obtained.

3.1.1 How can you prepare yourselves?

In a situation in which a buyer sends you a checklist, the questions will usually concern a specific product. To anticipate the questions, you must therefore, in principle, decide on all questions for all the company's products.

A good way of starting on this task is to collect documentation from your suppliers because that is often a very time-consuming process. In connection with your environmental management, you must consider your suppliers' environmental impacts. You should incorporate questions etc. from your work on Green Buying Guides in the relevant procedures.

4 Environmental product declarations

This tool contains a short overview of the international work within environmental product declarations, followed by some tips on preparing an environmental product declaration for one or more of your products.

4.1 ABOUT ENVIRONMENTAL PRODUCT DECLARATIONS

Environmental product declarations are basically neutral in their statement. An environmental product declaration does not contain a positive statement about a product, but simply provides information on the product's environmental performance so that the user himself can assess the product's environmental properties and compare with those of similar products.

Environmental product declarations can be prepared not only for finished products, but also for raw materials, semimanufactures and services.

Internationally, one differentiates between Type II and Type III declarations (Type I are eco-labels). In 1999, ISO adopted a standard (ISO 14021) for "Self-declaration environmental claims" – the so-called Type II declarations. The standard describes how the most common terms and symbols are to be used. It is stated in the standard that organisations using the claims must have the documentation on which they are based in order. The documentation need not be LCA based and impartial third party control is not required. Self-declaration claims can be regarded as a type of environmental product declarations, and several Danish companies have already prepared them – see the example from APC Denmark at the end of this chapter.

Type III are the real environmental product declarations. They are based on LCA data. They are also checked by a third party and are therefore regarded as more reliable than self-declaration claims. In the spring of 2000, ISO issued a technical report (ISO TR 14025), which is in the nature of a guide but is not an actual standard. If you want to prepare

yourselves for the requirements in a Type III declaration, it would be a good idea to read this technical report.

4.1.1 Environmental product declarations in other countries

Sweden and the USA/Canada are the only countries that have so far established schemes for certification of environmental product declarations.

For further information on the Swedish scheme, which is managed by the Swedish Environmental Management Council, see the council's website: www.miljostyrning.se/epd.

Scientific Certification System (SCS) stands for an American system for environmental declaration. You can contact SCS via its website: www.scs1.com.

Norway, Germany, the Netherlands and Korea are looking into the possibilities of establishing national certification schemes for environmental product declarations. In Norway, a 3-year pilot project is planned, with the Confederation of Norwegian Business & Industry (NHO) in overall charge of the system.

4.1.2 The situation in Denmark

In Denmark, too, preliminary studies are in progress to clarify how a Danish certification scheme can be established. The Danish EPA sent out a proposal for consultation in 2000. Denmark is also participating in a Nordic project to clarify various questions, including how the existing/coming schemes in the Nordic countries can be coordinated.

Examples of other Danish initiatives are given below:

- In 1996/97, the Danish EPA funded a project aimed at qualifying the discussions concerning environmental product declarations. In the project, proposals were prepared for environmental product declarations addressed to professional users and private consumers

(Environmental Product Declarations, Working Report No. 47, 1997).

- A project now in progress for the Danish Ministry of Housing and Urban Affairs is investigating the possibilities of environmental declaration of building products. The target group here is the companies designing the products. For further information, contact the Danish Building Research Institute: www.sbi.dk.
- For the Danish EPA, a project is at present in progress on environmental product declarations for consumer electronics, the target group here being private consumers. For further information, contact dk-TEKNIK.
- The Danish IT Industry Association has tried to help its members by issuing a guide on the formulation of an environmental product declaration for copying machines, printers, fax machines and PCs. The declaration, which was published in 1998, is intended to answer the most common customer questions and will be regularly updated by the association in step with new environmental knowledge or new views from authorities, users or other interested parties. The declaration is a Type II declaration. Further information can be obtained at: www.itb.dk.

4.2 GOOD ADVICE ON PREPARING TYPE II DECLARATIONS

If you want an environmental product declaration that meets the requirements of a specific scheme – for example, the Swedish scheme – you must naturally follow the guidelines in the scheme in question.

If, on the other hand, you want to prepare your own uncertified Type II declaration (Self-declaration claims), you can base it on the ISO 14021 Standard. In addition, you should consider:

- what expectations you have encountered so far and what the future can be expected to bring
- who your target groups are and the degree of detail the target groups in question can cope with.

4.2.1 The expectations

Part A, Chapter 3, of the manual provides help in mapping present and future expectations concerning your products. If you have many different products or the expectations concerning your products vary greatly from product to product, you may have to select a product before you can create an overview of the expectations.

If you want to make a start on formulating an environmental product declaration that is primarily intended to answer the most common questions concerning the product, it is best to start with the questions you yourselves have asked.

If you have not previously systematically registered expectations concerning your products, it would be a good idea to check these and establish a procedure in your environmental management system that will ensure that all future enquiries concerning the environmental aspects of the product are registered (see Chapter 5).

4.2.2 The target group

It is also important to define the main target group for the declaration. Is it professional buyers with some background knowledge of environmental matters or buyers who have little or no knowledge in this area?

It is always a good idea to consult the users of the declaration when deciding what data in the declaration should be presented. It is important always to ask yourselves: "Can our target group understand and use the information?"

4.2.3 Formulation of the environmental product declaration

The preparation of an environmental product declaration should preferably be an ongoing process in which the declaration is expanded and amplified as you learn more about the product's life cycle and environmental impacts.

It is a good idea to establish a direct target for the appearance of the first declaration and a long-term target for what the declaration should in time include.

Often, a declaration will at first contain answers to a number of environmental questions that can be directly answered with the knowledge that already exists in the company and then be expanded to include the result of a life cycle assessment.

In many of the Type II declarations that exist today, the companies have chosen to focus on substances that the product does *not* contain (PVC, lead, cadmium, ...).

An important consideration in the formulation of a declaration is also that the users must be able to access the underlying data. You must be able to document all the claims in an environmental product declaration if asked to do so by a user.

This consideration is particularly relevant in the case of products with a secret composition or secret production methods.

4.2.4 Data collection and documentation

The amount of data to be collected will depend to a great extent on the chosen formulation. If your environmental product declaration is to be based on a life cycle assessment, collecting the necessary data will be the task that requires most resources.

It is a good idea to set up procedures for registration of data in the environmental management system (see Chapter 5). Systematic registration of the data used is necessary as documentation of the result of a life cycle assessment. By systematically registering the data collected, you also enable reuse of the data in later assessments.

Systematic registration of life cycle-based data is also essential for the environmental product declaration to be checked by a third party and thus become a so-called Type III declaration.

4.2.5 Guide on environmental marketing

Regardless of how an environmental product declaration is prepared, you must remember that the Marketing Act must be complied with.

The Consumer Ombudsman has prepared a guide on environmental marketing, which explains briefly how environmental claims can be used in the marketing of products without violating the Marketing Act.

It is stressed in the guide that all claims must be documented and that generalisations (such as environmentally sound, eco-friendly) must not be used without a thorough report on the entire life cycle of the product that shows that the product has a considerably smaller environmental impact than other products in the same product category throughout its life cycle.

The guide can be purchased from the Danish Consumer Council, phone +45 32 96 07 11 or can be seen on the Internet at:
www.fs.dk/kg/kg1393.htm.

4.2.6 From environmental product declaration to product improvements

The reason for improving a product's environmental properties can be a wish to improve critical parameters in the environmental product declaration or a general wish to reduce the product's environmental impacts during its life cycle.

The knowledge gained concerning a product's environmental impacts by working with the life cycle approach will often act as a spur to the work of improving the product's environmental properties.

4.2.7 Supplying environmental product declarations

Prepare a procedure in your environmental management of quality man-

agement system for supplying environmental product declarations in connection with marketing, customer enquiries and other enquiries as a means of spreading awareness of the company's environmental product declarations (see Chapter 5).

Examples of Type II environmental product declarations
(APC Denmark ApS)

Declaration of product environmental attributes for Uninterruptible Power Supplies

Supplier's Name : APC Denmark ApS
Supplier's Address: Silcon Allé, 6000 Kolding, Denmark

declares, under his sole responsibility, that the product

Product Name: Uninterruptible Power Supplies
Product Type: APC Silcon 10 - 480 kW 400V
Seller/Manufacturer: APC Denmark ApS, Silcon Allé, 6000 Kolding, Denmark

Type:	10kW	20kW	40kW	60kW	80kW	120kW	160kW	240kW	320kW	480kW
Height	1400 mm	1800 mm	1900 mm	1800 mm	1900 mm	1800 mm				
Width (with built-in batteries)	800 mm	800 mm	1000 mm	800 mm	800 mm	1125 mm	1125 mm	1600 mm	1600 mm	1600 mm
Depth	800 mm									
Weight (with built-in batteries)	550 kg	570 kg	650 kg	410 kg	440 kg	800 kg	800 kg	1400 kg	1400 kg	1000 kg

Batteries:
Type: Lead-acid

Instructional information concerning the handling of the batteries in the product including proper installation replacement and disposal is given in the product documentation.

conforms to the following laws, standards, regulations and directives:

Safety	EN50091-1
EMC-Directive	EN50091-2
CE Mark	

conforms to the environmental specifications, as listed in the ECO declaration below:

Operational data: 3x380/400/415V, 50Hz

Energy consumption:

Type:	10kW	20kW	40kW	60kW	80kW	120kW	160kW	240kW	320kW	480kW
Efficiency AC to AC 100% load	94,0%	95,5%	95,5%	95,1%	95,5%	95,8%	95,3%	95,3%	95,0%	95,8%
Typical losses, nominal load	0,5kW	0,9kW	1,5kW	2,4kW	2,9kW	5,3kW	6,2kW	9,2kW	10,6kW	15,9kW

Physical emission:

Type:	10kW	20kW	40kW	60kW	80kW	120kW	160kW	240kW	320kW	480kW
Audible noise	52 dB(A)	52 dB(A)	55 dB(A)	50 dB(A)	50 dB(A)	71,5 dB(A)	71,5 dB(A)	71,5 dB(A)	71,5 dB(A)	73 dB(A)

Declaration of product environmental attributes for Uninterruptible Power Supplies

Chemical emissions: None (Ozone, Dust, Styrene)
(Normal conditions)

Materials:

The above-described product does not contain:

- PVC;
- Cadmium;
- CFC;
- Mercury;

Upgradability/Extendibility:

Above system is upgradable in the following manner:

System unit: Controller, TSM, SSW, PSU, PU and Batteries.

Spare parts are available 10 years after end of production

Service is available 10 years after end of production

The above system is designed for **easy assembly and disassembly**, by using screws.

After end of life, this system can be given back to the supplier for environmental conscious recycling or disposal.

Please contact your supplier for take back information

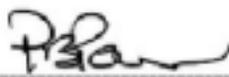
The systems contain following parts, which contain valuable materials and should be disposed of in an environmental acceptable manner.

Batteries, Wiring, Printed Wiring Boards, Fans, Transformers, Doors and Covers (Steel), Capacitors, Relays, Fuses, Current bar (copper), Plastic parts (PC and ABS), Frame (aluminum).

Kolding, 24 August 1998



Quality and Environmental Manager
APC Denmark ApS



Managing Director Peter Bøgh Petersen
APC Denmark ApS

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Part C: Annexes

Annex 1. Introduction to life cycle assessments

The purpose of this annex is to give a brief introduction to life cycle assessments and to what they can be used for. At the end of the tool, Danish companies' experiences with the use of life cycle assessments are described.

1.1 WHAT IS AN LCA?

A life cycle assessment is an inventory and assessment of the environmental impacts that occur during a product's life cycle, including resource consumption and emissions/discharges.

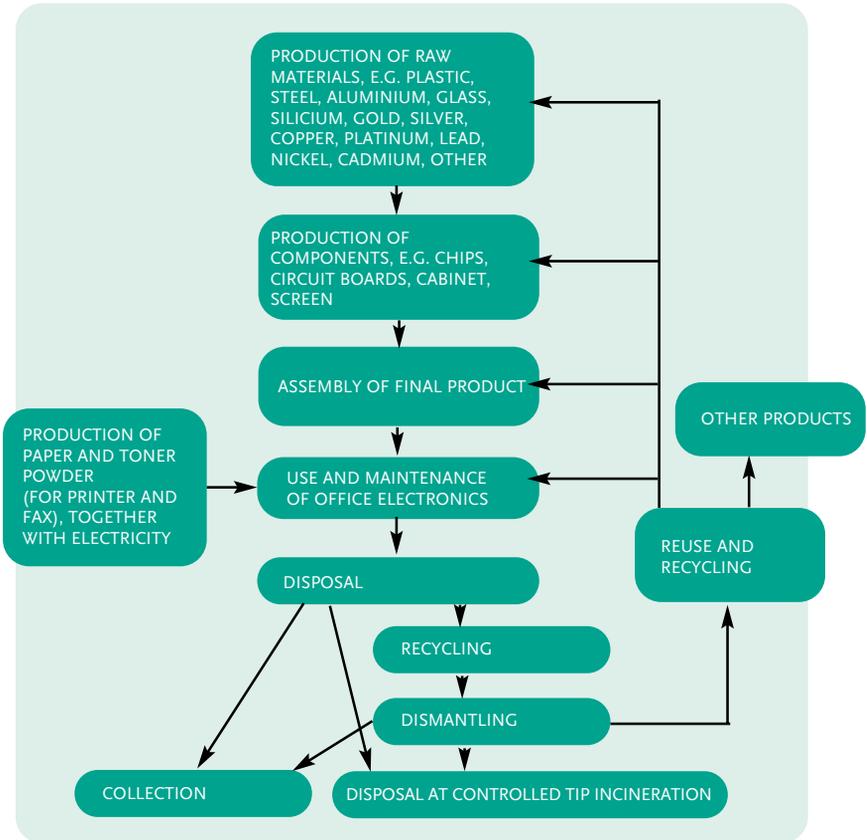
A product's life cycle comprises the phases through which a product passes, from extraction of raw materials, through production and use, to final disposal of the product. The diagram in figure 1 shows the life cycle for office electronics.

1.1.1 The goal in connection with product-oriented environmental work

In connection with product-oriented environmental work, the purpose of carrying out a life cycle assessment is to make an inventory of and assess the total environmental impacts during a product's life cycle and thus gain a possibility of reducing them.

By taking account of all the environmental impacts in a product's life cycle, one avoids suboptimisation, i.e. modifications resulting in environmental improvements in one phase of the product's life, e.g. production, leading to increased environmental impacts in another phase of the life cycle, e.g. disposal, and the environmental work can be addressed to those phases in the product's life cycle in which the greatest environmental improvements can be achieved.

FIGURE 1:
 DIAGRAM SHOWING THE LIFE CYCLE OF OFFICE ELECTRONICS, FROM “BACKGROUND DOCUMENTATION FOR OFFICE ELECTRONICS”, DANISH ENVIRONMENTAL PROTECTION AGENCY, 1998



1.1.2 Use

Today, life cycle assessments of products¹ are used by different players and for different purposes. Examples are:

- political decisions
- criteria for eco-labels
- basis for recommendation in Green Buying Guides for purchasers
- support for decisions and prioritisation in companies
- product development in companies.

¹ In connection with life cycle assessments, the designation products is used as a common designation for products and services.

The authorities have used life cycle assessments as the basis for national action plans. For example, the political decision to recycle paper instead of incinerating it is based on a life cycle assessment of the two disposal systems. Recently, the Danish EPA used a life cycle assessment of the Danish bottle return system as opposed to introducing cans to argue that Denmark should keep the present bottle return system.

That life cycle assessments cannot yet be based on exact methods and that methods and interpretation of results are still open to discussion can be seen, for instance, from the debate that followed the last-mentioned life cycle assessment of beverage packaging². It is therefore necessary to pay great attention to what life cycle assessments can be used for and how they are used.

Life cycle assessments provide the background knowledge behind the preparation of the criteria that a product must meet in order to be granted one of the official eco-labels (the Nordic Swan or the EU's Flower). Tool 2 in Part B concerns eco-labels.

The Danish EPA has issued a number of Green Buying Guides for public purchasers. The guides provide advice to purchasers on environmentally sound purchasing. The guides are also based on life cycle assessments. Tool 3 in Part B concerns Green Buying Guides.

Many Danish companies also use life cycle assessments or elements of them. The LCA work is used in product development in some companies, as an aid to the development of products with reduced environmental impacts. It is also used to establish environmental knowledge. The knowledge you gain from carrying out life cycle assessments for one or

² "The environment is a hostage in the can war", Dagbladet Ingeniøren (Engineering Weekly), week 2/99

"Svend Auken is losing the war against beer cans", Dagbladet Ingeniøren, week 2/99

"Sharply drawn fronts in the can issue", Dagbladet Ingeniøren, week 3/99

more of your company's products can also be used as environmental documentation for customers and other stakeholders – in the form, for example, of an environmental product declaration. Tool 4 in Part B concerns environmental product declarations. The knowledge built up can also be used to identify action areas for the company's environmental work.

1.1.3 Limitations

There are some limitations connected with the preparation and use of life cycle assessments as a method.

As a method, LCA is at an early stage of development. There is therefore still a great need for development and experience with the use of existing methods.

Another important limitation is the fact that choices and assumptions are often based on subjective evaluations, so it can be difficult and, in many cases, directly impossible to compare the results of different LCAs.

A third important limitation is that the available data are in many cases encumbered with great and varying uncertainties that make it difficult to interpret the results.

Lastly, it is often very difficult to collect data for the life cycle phases that lie outside your own company because most companies have not yet calculated the individual products' environmental impacts and are therefore unable to provide this information.

However, despite these limitations and barriers to the work, a life cycle assessment can provide valuable information for use in prioritising environmental work.

1.2 STANDARDISATION OF THE WORK

In the last few years, a number of standards have been prepared for life cycle assessments. Internationally, the standardisation work is taking place under ISO.

The standardisation of the life cycle work is divided into four standards (ISO 14040-14043). Standards ISO 14040 and ISO 14041 are approved standards. ISO 14042 and 14043 have not yet been published officially, but there are English drafts of them with the formally adopted content.

Unlike the situation with ISO 14001 (with requirements concerning environmental management systems), it is not possible to be certified in accordance with the ISO standards. However, it is recommended that companies have a critical review carried out by an independent expert or by a group of stakeholders headed by an expert. This critical review is intended to facilitate understanding of the LCA and increase its credibility³.

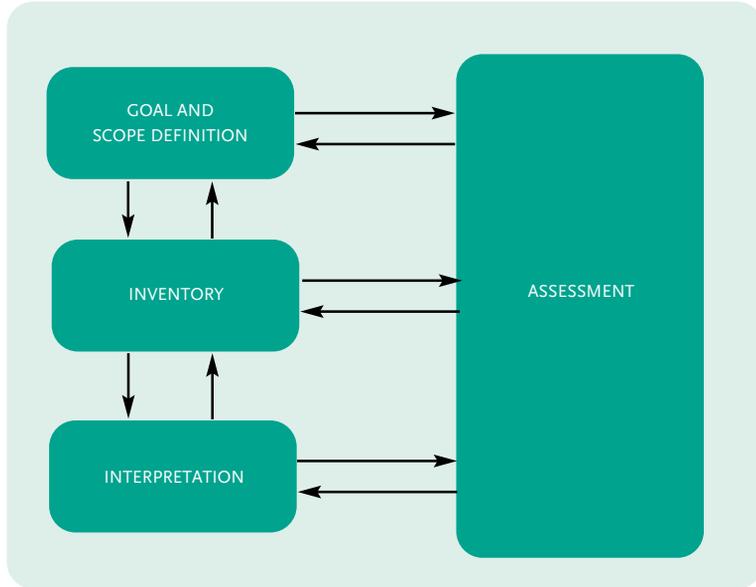
1.2.1 ISO 14040

The ISO 14040 standard covers 'Principles and framework', i.e. the general principles and structure of the work. The standard describes the basic phases and elements of a life cycle assessment and the uses and limitations of the method. The phases are shown in figure 2.

As will be seen, LCA is an iterative process in which it is often necessary to go back and change the goal and scope definition on the basis of experience and interpretations on the way – for reasons of data accessibility, for example, or a need to change the focus as a consequence of growing environmental understanding.

³ A critical review must be carried out if the LCA is a comparative LCA that will be used for marketing or if it is used to make a comparative assertion that is disclosed to the public.

FIGURE 2:
PHASES IN A LIFE
CYCLE ASSESSMENT
(ISO 14040, 1997)



1.2.2 ISO 14041

The ISO 14041 standard deals with 'Goal and scope definition and inventory analysis'.

1.2.3 ISO 14042

The ISO 14042 standard deals with 'Life Cycle Impact Assessment, LCIA'.

1.2.4 ISO 14043

The ISO 14043 standard deals with 'Life Cycle Interpretation'. It provides a framework for systematic interpretation of the data collected.

The ISO standards describe the general framework for an LCA but do not offer any method for performing one and give only a few examples of how to perform an LCA in accordance with the standards. A technical report, with examples of data collection (life cycle inventory, LCI) in accordance with ISO 14041 are in course of preparation.

1.3 THE PHASES IN LCA

The assessment phase, see figure 2, is probably the phase that is most discussed in connection with LCA method development and in connection with the standardisation work in ISO. It is thus not surprising that it has been difficult to adopt a standard in this area and that the standard now adopted does not indicate which method is to be used in the assessment.

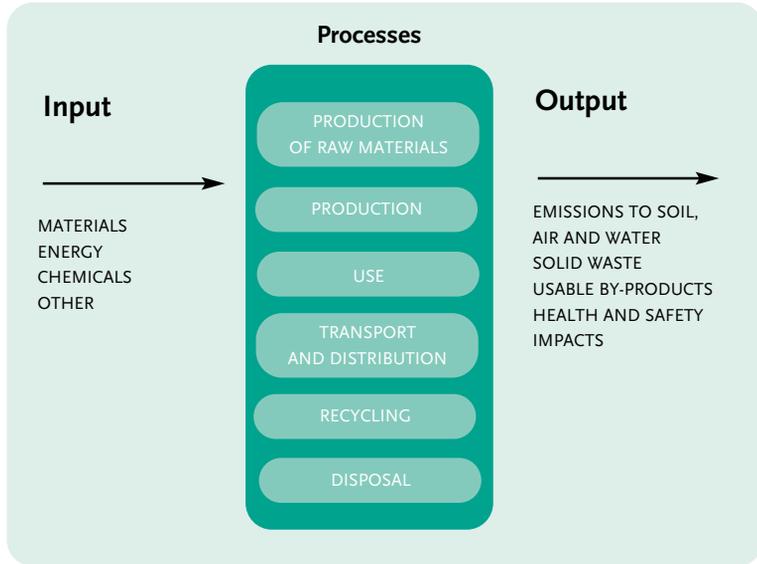
The various phases in an LCA (see figure 2) are briefly discussed below.

1.3.1 Goal and scope definition

It is extremely important to make a thorough description of the goal (who the target group is and what the result is to be used for), and a thorough definition of the scope of the work before this is initiated. It is essential, for example, to clarify and describe how the product's life cycle is defined (it is not normally possible to go into every detail), how the data is to be collected, what assessment method is to be used (including the parameters that are to be assessed, including whether occupational health is to be included), and how the result is ultimately to undergo a 'critical review'/be quality assured. A very important part of this phase is to establish the product's functional unit, which describes the function fulfilled by a product. This is necessary as a basis for comparison. For example, when considering milk supply, it is no good comparing one kilo of glass with one kilo of cardboard or plastic. Here, a suitable functional unit would be supplying one litre of milk at a given temperature.

Another important part of the preliminary work is to make a process tree or a flow diagram showing inputs and outputs from the various processes. Figure 3 shows a simplified diagram of the inputs and outputs that are to be mapped in a life cycle assessment.

FIGURE 3:
DIAGRAM SHOW-
ING INPUTS, OUT-
PUTS AND PRO-
CESSES IN A PRO-
DUCT'S LIFE CYCLE



1.3.2 Inventory

The inventory, which is created by reviewing the data associated with the product's life cycle, is the most time-consuming phase in an LCA. Experience shows that it is often difficult to obtain data on resource consumption and emissions from subsuppliers or information about how the product is used and disposed of. In addition, understanding is often gained on the way that makes it necessary to change the data collection strategy. For example, it may be found that some data are difficult to obtain or that some processes have a much greater environmental impact than others.

One way of reducing the time consumption is to use existing data from databases or earlier LCAs. It is important to note that the quality of these varies greatly. It is also important to note that there may be big differences between data for the same process, depending on several factors, including the technology used, the geographical siting and the delimitation of the parameters that are included. Some data will be specific for a specific process in a specific locality, while others will be average

data for, for example, an industry. It is therefore necessary always to take a critical view of collected data.

1.3.3 Assessment

As described, the assessment phase is the most debated phase in an LCA. In the Danish LCA method, EDIP (Environmental Design of Industrial Products), resources, emissions and occupational health are assessed. A general presentation of the method is given below. For a more detailed description of EDIP, see the reference list.

Resources are fossil fuels, metals, other minerals, biomass, water and the category “other”, which covers all the resources that cannot be categorised in the other categories. Resources are assessed by comparing the consumption per functional unit with the annual consumption of the given resource and with known reserves.

Emissions are assessed in relation to their potential to contribute to the following environmental impacts: greenhouse effect, ozone depletion, photochemical ozone formation, acidification, nutrient salts load, persistent toxicity, ecotoxicity, toxicity for humans, and a number of waste parameters. The calculated environmental potentials are then compared with the total environmental load within the described categories and a weighting based on the political reduction targets for the environmental impacts described.

The occupational health assessment includes an assessment of the potential for:

- chemical impacts to lead to cancer, reproductive damage, allergy and damage to the nervous system
- monotonous, repetitive work to lead to musculoskeletal damage
- noise to lead to hearing damage
- accidents to lead to bodily harm.

EDIP, including the PC tool, includes parameters for assessing a wide range of the most common resources and emissions on the basis of the

above-mentioned principles. However, there will often be a number of different resources and emissions for which assessment parameters have not been established. Expert assistance is normally needed for assessment of a 'new' resource or emission on the basis of the method's rules. However, in many cases, one can make a preliminary assessment/sensitivity assessment by assuming a 'worst case scenario' to see whether the given resource or emission can be presumed to affect the final result.

1.3.4 Interpretation

In this phase, the results from the other phases are summed up, discussed and interpreted in relation to the stated goal. On the way, these considerations may give rise to changes in the definition and inventory. The interpretation phase must also deliver the final output to the parties that are going to use the results of the LCA. Lastly, the interpretation includes uncertainty and sensitivity assessments of the results achieved and a critical review carried out by internal or external parties.

1.4 PC TOOLS

Many practitioners like to use a PC tool in connection with the work with LCA. That facilitates the calculations and helps to 'keep tabs' on the large quantity of data and makes the work more systematic.

The various PC tools differ greatly. Besides the purely technical aspects of using them, one must be aware that the assessment part is different and that the data accompanying the PC tools are of varying quality.

1.4.1 The Danish EPA's LCV tool

One of the most widely used PC tools in Denmark is the Danish EPA's LCV tool, which has been based on and developed in connection with the EDIP project. The tool consists of two parts – a calculation part and a database. The calculation part follows the EDIP method very closely. The use of the tools is described in a special publication and the method is described in a number of books.

The database contains mainly data from five examples of industrial products worked with under the EDIP project. The Danish EPA has initiated a project to update the database in 2000. [Der burde måske være en note enten her eller i begyndelsen af håndbogen om at: "The manual was written and published in 2000 and therefore relates to the situation at that time". It is naturally also possible to insert one's own data.

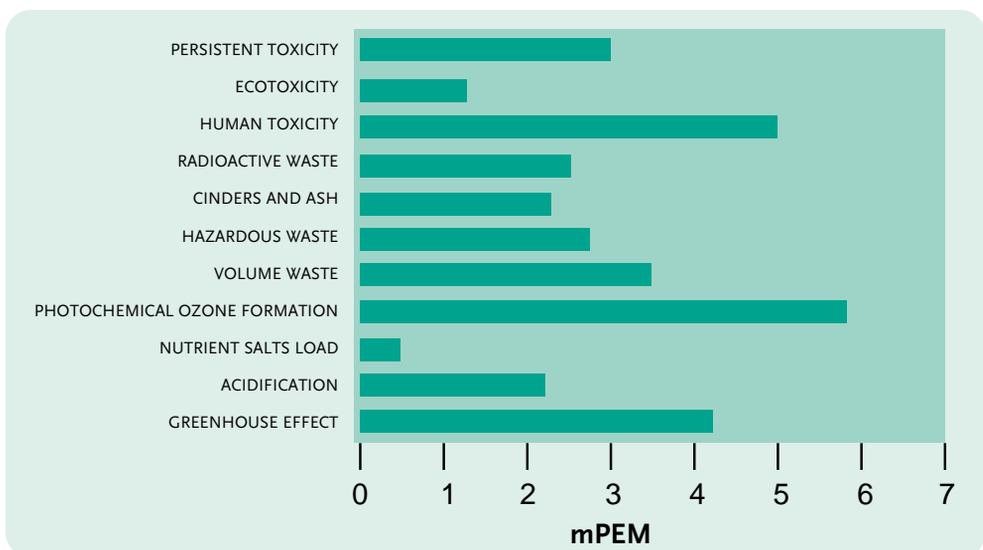
For emissions, the assessment (see method description in 1.3) results in an environmental profile as shown in figure 4.

It must be stressed that, in its present form, the tool is available as a beta version, which has certain deficiencies. For example, one has to have a thorough knowledge of the tool in order to use it correctly. The Danish EPA is at present considering the future fate of the tool.

1.4.2 Other tools

Another tool used to some extent in Denmark is Simapro, which is a Dutch PC tool. It is preferred by some companies because it contains a large database and has a better user interface than the LCV tool. On the

FIGURE 4:
EXAMPLE OF
WEIGHTED ENVI-
RONMENTAL PRO-
FILE FOR EMISSIONS
DURING A PRO-
DUCT'S LIFE CYCLE.
THE UNIT TMPE
(TARGET MILLI-
PERSON EQUI-
VALENT) REFERS TO
THE EDIP ME-
THOD'S WEIGHTING
WITH POLITICAL RE-
DUCTION TARGETS.



other hand, the assessment part is not based on the EDIP principles but on a Dutch method. However, EDIP's assessment method can be inserted into Simapro.

There are a number of other PC tools on the market that are suitable in different contexts. We recommend seeking information on the Internet because development is moving fast in this area.

Annex 2 . Action areas and improvement potentials

An assessment of where you can achieve improvements in the product must be based on the concrete data you collect concerning the product. Some rules of thumb are given below for where you may find potential areas for improvement. The tables are intended as inspiration for identification of action areas and improvement potentials but not to be used on their own in the actual work of analysis. For that, more concrete reference works etc. will be needed – for example, “Manual on Environmental Assessment of Products” (see the reference list).

The focus points for environmental improvements will be concentrated on the areas in which there is:

- a large consumption of materials
- a consumption of non-renewable resources and resources that are in short supply
- a consumption of large quantities of virgin (non-recycled) resources
- use or emission of hazardous substances
- energy-intensive processes.

The following table contains questions that may help in identifying more action areas more precisely – identifying the significant environmental impacts and localising where they occur in the life cycle.

Questions for identification of action areas

Phase of life cycle	
Materials	1. Are there substances or materials in the product that are characterised as hazardous?
	2. Are ancillary substances that are characterised as hazardous used during the raw material phase?
	3. Does the product contain substances of materials that are non-renewable and/or scarce resources?
	4. How large a part of the product consists of virgin resources (i.e. resources that have not been used before)?
	5. Are processes that can be described as energy-intensive used for production of substances and materials?
	6. Are there emissions/discharges to water, air or soil from the various production processes that cause environmental or health problems?
Production	7. Are ancillary substances that are characterised as hazardous used in the production?
	8. Does the product contain substances or materials that are non-renewable and/or scarce resources?
	9. Are processes that can be described as energy-intensive used for production of substances and materials?
	10. Are there emissions/discharges to water, air or soil from the various production processes that cause environmental or health problems?
Use	11. What is the lifetime of the product?
	12. Are ancillary substances that are characterised as hazardous to people or the environment used during use of the product?
	13. Does the product contain substances or materials that are non-renewable and/or scarce resources?
	14. Is the product energy-intensive during the use phase?
Disposal	15. Which parts of the product can be recycled? Is the product designed for separation into small fractions?
	16. Are there any environmental impacts in connection with disposal of the product?
	17. How much packaging is used for the product?

When product-orienting your environmental management work, you must set yourself targets – also for reduction of the products’ environmental impact. It is therefore important for your product-related action to produce a number of ideas for improvements – seen in a life cycle perspective.

The questions in the following tables can be used to identify potentials for improving a product. However, it is important to stress that it is necessary to analyse any proposals for improvements closely before real changes are made to the product or the production methods.

Inspiration for improvement potentials in the materials phase

Phase of life cycle	The company’s assessment of the potentials for improvement
Materials	Assess whether:
	<ul style="list-style-type: none"> • all substances and materials used in the product are necessary • the quantity of the materials can be reduced • the product consists of materials and substances that can be recycled or whether it is possible to replace virgin (new) materials with recycled materials
	Assess whether:
	<ul style="list-style-type: none"> • they can be substituted or replaced by less hazardous substances of materials
	Assess whether:
	<ul style="list-style-type: none"> • the non-renewable, scarce resources can be substituted by resources that are renewable and/or resources of which there are ample quantities
	Assess whether:
<ul style="list-style-type: none"> • the virgin resources can be replaced by recycled materials • the materials used can be recycled when the product is disposed of 	
Assess whether:	
<ul style="list-style-type: none"> • it is possible to substitute with other resources that require less energy to produce 	
Assess whether:	
<ul style="list-style-type: none"> • it is possible to reduce or remove emissions 	

Inspiration for improvement potentials in the production phase

Phase in life cycle	The company's assessment of improvement potentials
Production	Assess whether: <ul style="list-style-type: none"> • substances or materials can be substituted by less hazardous substances or materials
	Assess whether: <ul style="list-style-type: none"> • non-renewable, scarce resources can be substituted by resources that are renewable and/or resources of which there are ample quantities
	Assess whether: <ul style="list-style-type: none"> • energy consumption can be reduced
	Assess whether: <ul style="list-style-type: none"> • it is possible to reduce or remove emissions

Inspiration for improvement potentials in the use phase

Phase in life cycle	The company's assessment of improvement potentials
Use	Assess whether: <ul style="list-style-type: none"> • substances or materials can be substituted by less hazardous substances or materials
	Assess whether: <ul style="list-style-type: none"> • non-renewable, scarce resources can be substituted by renewable resources and/or resources of which there are ample quantities
	Assess whether: <ul style="list-style-type: none"> • the use phase is energy-intensive • the energy consumption during use can be reduced
	Assess whether: <ul style="list-style-type: none"> • the product can be designed so that it can be upgraded (individual parts can be replaced instead of the product being scrapped) • the product can be designed to make it easy to repair

Inspiration for improvement potentials in the disposal phase

Phase in life cycle	The company's assessment of improvement potentials
Disposal	Assess whether: <ul style="list-style-type: none">• the product is/can be designed for easy separation and recycling• it is possible to reuse or recycle all or parts of the product• the material diversity can be reduced (i.e. the number of subcomponents)
	Assess whether: <ul style="list-style-type: none">• toxic or similar substances or products are formed during, for example, incineration
	Assess whether: <ul style="list-style-type: none">• it is possible to use less packaging

Annex 3. Vocabulary

EMAS

EMAS stands for Environmental Management and Audit Scheme. Parallel with an ISO 14001 certification, a company can be registered under EMAS after verification by an impartial third party. The scheme is European and more extensive than ISO 14001 with respect to environmental performance and publication of the company's environmental performance.

ISO 14001

ISO stands for International Standard Organisation. ISO 14001 is a globally recognised and used standard for an environmental management system that can be certified by an impartial third party.

Life cycle assessment

Life cycle assessment (LCA) is a method for systematically calculating and assessing the environmental impacts (resource consumption and emissions) during the production, use and disposal of a product or a service. International standards have been developed for life cycle assessments (ISO 14040-43) and a national (Danish) method has been developed: Environmental Design of Industrial Products (EDIP), see Wenzel et al. (1997) and Hauschild & Wenzel (1998).

Eco-labels

Eco-labels (type I; ISO 14024) are a means of classifying the best third of the products in a given category of products and are awarded to products that fulfil a number of specified criteria. In Denmark, the Nordic eco-label (the Swan) and the European eco-label (the Flower) are used.

Environmental performance

A company's environmental performance is an expression of the extent and nature of its environmental impacts. Environmental performance is a relative concept with a high degree of subjective perception.

Environmental product declaration

Environmental product declarations are a means of providing neutral,

qualitative and quantitative environmental information about products and services. There are two types of environmental product declarations: type II, which are self-declaration environmental claims (ISO 14021) and type III, which are LCA-based, third party-controlled declarations (ISO TR 14025).

Products

(Chemical) products are defined as both solutions and solid, liquid or gaseous mixtures of two or more (chemical) substances.

Substances

(Chemical) substances are defined as elements and their compounds occurring naturally or produced industrially.

Product function

A product's function is the user's need that is covered by the product. The product itself can, for example, be 1 litre of paint, while the function is protection of 4 m² surface for five years, i.e. the function includes some qualitative elements.

Data Sheet

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Manual on Product-Oriented Environmental Work

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Translation: Access Translations, Pauline

Performing organization(s):

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Abstract:

Manual on Product-oriented Environmental Work" offers inspiration and guidance to companies on applying life cycle principles and incorporating the product dimension in their environmental work. The manual can be read by anyone wanting ideas about how to incorporate the product dimension, both within the company and in cooperation with suppliers, customers and others.

Resume:

"Håndbog i produktorienteret miljøarbejde" handler om, hvordan virksomheder kan indarbejde livscyklustankegangen i deres miljøindsats. Håndbogen rummer dels forslag til metoder og emner, der kan indgå i arbejdet, dels eksempler fra en række virksomheder. I håndbogen er der lagt vægt på daglig praksis og muligheder for at udbygge samarbejdet i produktkæderne såvel som mellem miljøfunktionen og andre funktioner internt i den enkelte virksomhed. Håndbogen er bygget op, så det er muligt at hoppe til de dele, der er mest relevant i forhold til de ønsker og behov, som virksomheden har.

Terms:

cleaner products; life cycle assessment; environmental auditing; eco-labelling; environmental policy of companies

Supplementary notes:

English translation of "Håndbog i produktorienteret miljøarbejde", (Miljønyt no. 53, 2000) The manual forms part of a miniseries of publications focussing on life-cycle approach and assessment, published in the Danish EPA series Miljønyt. The publications will provide companies, organizations, authorities etc. with the knowledge required to integrate the life-cycle approach in their environment work.

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