

First edition  
1999-11-15

---

---

## Environmental management — Examples of environmental performance evaluation (EPE)

*Management environnemental — Exemples d'évaluation de la performance  
environnementale (EPE)*



Reference number  
ISO/TR 14032:1999(E)

**AVA** Documents  
© ISO 1999  
Document Sharing Hub

**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

© ISO 1999

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 734 10 79  
E-mail [copyright@iso.ch](mailto:copyright@iso.ch)  
Web [www.iso.ch](http://www.iso.ch)

Printed in Switzerland

## Table of contents

|                                                                                                                                                                                                                                                                  |           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Foreword</b>                                                                                                                                                                                                                                                  | <b>v</b>  |
| <b>Introduction</b>                                                                                                                                                                                                                                              | <b>vi</b> |
| <b>1 Scope</b>                                                                                                                                                                                                                                                   | <b>1</b>  |
| <b>2 Terms and definitions</b>                                                                                                                                                                                                                                   | <b>1</b>  |
| <b>3 Format for the examples provided in this Technical Report</b>                                                                                                                                                                                               | <b>1</b>  |
| <br><b>Annexes A to Q - Examples illustrating EPE and the use of ISO 14031</b>                                                                                                                                                                                   |           |
| <br><b>Annex A</b>                                                                                                                                                                                                                                               |           |
| <b>Schreinerei Schmid, Abendsberg, Germany</b>                                                                                                                                                                                                                   | <b>3</b>  |
| (A small cabinetry/furniture-making company, with 11 employees, developing environmental performance evaluation to inform critical customers that it is environmentally aware)                                                                                   |           |
| <br><b>Annex B</b>                                                                                                                                                                                                                                               |           |
| <b>Clemens Härle Brewery, Leutkirch, Germany</b>                                                                                                                                                                                                                 | <b>6</b>  |
| [A family-owned and operated brewing company, with 33 employees, implementing environmental performance evaluation starting with a company eco-balance study (an input/output scheme for mass and energy) and management commitment to environmental protection] |           |
| <br><b>Annex C</b>                                                                                                                                                                                                                                               |           |
| <b>Frederiksborg Linnedservice A/S, Oelsted, Denmark</b>                                                                                                                                                                                                         | <b>13</b> |
| (An industrial laundry, with approximately 70 employees, serving hospitals and rest homes, using ISO 14031 to review indicators developed to support its ISO 14001 environmental management system)                                                              |           |
| <br><b>Annex D</b>                                                                                                                                                                                                                                               |           |
| <b>Perusahaan Pelindung Getah, Malaysia</b>                                                                                                                                                                                                                      | <b>21</b> |
| (A rubber glove manufacturing company, with approximately 100 employees, getting started on environmental performance evaluation)                                                                                                                                |           |
| <br><b>Annex E</b>                                                                                                                                                                                                                                               |           |
| <b>Katayama Shokuhin Company, Shiunji Plant, Japan</b>                                                                                                                                                                                                           | <b>25</b> |
| (A food processing company, with approximately 200 employees, getting started on environmental performance evaluation)                                                                                                                                           |           |
| <br><b>Annex F</b>                                                                                                                                                                                                                                               |           |
| <b>Envases Alvher, Mataderos Plant, Buenos Aires Province, Argentina</b>                                                                                                                                                                                         | <b>30</b> |
| (A site of a company manufacturing flexible laminated packaging, with 210 employees, using environmental performance evaluation to evaluate its solvents recycling program)                                                                                      |           |
| <br><b>Annex G</b>                                                                                                                                                                                                                                               |           |
| <b>Petroquímica Cuyo S.A.I.C., Western Argentina</b>                                                                                                                                                                                                             | <b>34</b> |
| (A chemical processing company, with approximately 230 employees, implementing environmental performance evaluation integrated with its ISO 14001 certified environmental management system)                                                                     |           |
| <br><b>Annex H</b>                                                                                                                                                                                                                                               |           |
| <b>Immenstadt Clinic, Allgau Region, Southern Germany</b>                                                                                                                                                                                                        | <b>39</b> |
| [A 180 bed hospital, with approximately 260 employees, implementing environmental performance evaluation in a service organization using a company eco-balance (an input/output scheme for mass and energy) approach]                                            |           |
| <br><b>Annex I</b>                                                                                                                                                                                                                                               |           |
| <b>YPF Luján de Cuyo Refinery, Central Western Argentina</b>                                                                                                                                                                                                     | <b>43</b> |
| (A multinational oil company's refinery, employing approximately 570 people, implementing environmental performance evaluation integrated with its ISO 14001 certified environmental management system)                                                          |           |

## Annex J

**Hipp Company, Pfaffenhofen/Ilm, Southern Germany .....47**  
(A food processing company, with approximately 750 employees, and with an environmental management system certified to ISO 14001 and EMAS, getting started on environmental performance evaluation)

## Annex K

**United Chemical and Metallurgical Works (Spolek), Ustí nad Labem, Czech Republic.....52**  
(A chemical company, with approximately 2 000 employees, using environmental performance evaluation as a tool for environmental management system implementation)

## Annex L

**Danish National Railway Agency, Denmark.....56**  
(A company managing Denmark's railway infrastructure, with approximately 3 400 employees, using ISO 14031 as an instrument for improving the structure and quality of its indicators for environmental performance evaluation)

## Annex M

**Elkem Fiskaa Silicon, Kristiansand, Norway .....62**  
(A silicon metal production plant, part of a multinational company with approximately 5 300 employees, focusing on the views of interested parties in its implementation of environmental performance evaluation)

## Annex N

**Electrolux AB, Sweden.....67**  
(A large multi-national company manufacturing household and commercial appliances, with approximately 112 300 employees, using the environmental aspects of its products to select indicators for environmental performance evaluation)

## Annex O

**ICI, United Kingdom .....72**  
(A large multi-national chemical company, with 67 500 employees and complex environmental aspects, developing operational performance indicators to reflect the environmental burdens of its activities)

## Annex P

**City of Seattle, Washington, USA .....82**  
(A large city with over 530 000 residents and approximately 10 000 city employees, illustrating the implementation of EPE and the use of indicators for EPE by a local government)

## Annex Q

**Silicon Valley Environmental Partnership, California, USA .....88**  
(A non-profit, non-governmental organization using environmental condition indicators to track regional environmental conditions)

**Bibliography .....93**

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this Technical Report may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TR 14032 was prepared by Technical Committee ISO/TC 207, *Environmental management*, Subcommittee SC 4, *Environmental performance evaluation*.

## Introduction

This Technical Report is a companion document to ISO 14031:1999 and was developed with the understanding that many organizations would benefit from examples illustrating how environmental performance evaluation (EPE) has been applied by a variety of organizations. Please refer to ISO 14031:1999 for guidance on the process and concepts of EPE.

The purpose of this Technical Report is to provide real-life examples for the consideration of organizations undertaking EPE. The examples aim to encourage and assist organizations, particularly small and medium sized enterprises, by showing how EPE can be conducted by a range of organizations.

The examples provided in this Technical Report were developed and written by organizations or individuals and submitted to ISO/TC 207/SC 4 through appropriate ISO member bodies. These examples have been edited to reflect the process of EPE described in ISO 14031:1999. The reader may not find them to be comprehensive regarding environmental aspects, environmental performance criteria, or number and type of indicators selected, as these are issues determined by each organization according to its particular circumstances.

© ISO 1999 – All rights reserved

# Environmental management — Examples of environmental performance evaluation (EPE)

## 1 Scope

This Technical Report provides examples of EPE that represent a range of applications from simple to elaborate. They also represent a range of organizations (e.g., manufacturing and service companies; non-governmental organizations; government agencies; small, medium and large enterprises; organizations with and without certified environmental management systems) and geographic locations.

### IMPORTANT -

The examples in this report are included only because they illustrate the use of EPE.

Value judgements in these examples related to the relative environmental benefits of one material over another, one process over another, or one product over another, reflect decisions made specifically by the management of the organizations in the examples. No endorsement is given by ISO/TC 207/SC 4 to those decisions, to the scientific data used, or to their conformity with other ISO standards.

No endorsement is given by ISO/TC 207/SC 4 to any organization or any organization's products or services.

No organization's particular application of the guidance in ISO 14031 is recommended because the management of each organization has selected the application most suited to its needs. No endorsement is given by ISO/TC 207/SC 4 to the choices made by individual organizations or to the relative merits of these different applications of EPE.

## 2 Terms and definitions

For the purposes of this Technical Report, the terms and definitions given in ISO 14031 apply.

## 3 Format for the examples provided in this Technical Report

### 3.1 General

Examples illustrating EPE and ISO 14031 are provided in Annexes A to Q. The contents of these examples are organized under the headings given in 3.2.

### 3.2 Headings

#### 3.2.1 Introduction

This section briefly describes the organization and its history. The purpose is to provide:

- a context for understanding how EPE was applied; and
- suitable information for a reader of ISO/TR 14032:1999 to relate his or her own organization to the organization described in the example.

#### 3.2.2 Planning EPE

This section describes how the organization planned its EPE, and can illustrate:

- the identification of environmental aspects;
- the development of environmental performance criteria;
- the consideration of the views of interested parties; and
- other planning activities referenced in ISO 14031:1999.

### 3.2.3 Selecting indicators for EPE

This section describes how the organization selected environmental performance indicators (EPIs) related to management efforts (management performance indicators - MPIs) and to the organization's operations (operational performance indicators - OPIS). This section also describes how the organization considered environmental condition indicators (ECIs) in developing its EPE.

### 3.2.4 Using data and information (if applicable to the example)

This section describes (as appropriate) the following as elements of the EPE process:

- collecting data;
- analyzing and converting data;
- assessing information;
- reporting and communicating.

### 3.2.5 Reviewing and improving EPE (if applicable to the example)

This section describes how the organization used information to examine the EPE process and to identify opportunities for improvement.

### 3.2.6 Summary/conclusions

This section includes a summary of any lessons learned by the organization from the application of EPE. It may also include the organization's conclusions on its future application of EPE.

2

## Annex A

### Schreinerei Schmid, Abendsberg, Germany

(A small cabinetry/furniture-making company, with 11 employees, developing environmental performance evaluation to inform critical customers that it is environmentally aware)

#### Introduction

The Schreinerei Schmid company was established in 1895, and since its establishment has been located in Abendsberg, Germany. There is both housing and other industrial facilities in the vicinity of the workshop. Eleven employees are involved in production and administration, and company has annual sales of approximately one million Deutsche Marks. Since 1995, the company has had an internal environmental information and control system. The company also produced its first environmental report in 1995, with a target audience of the company's environmentally conscious private and corporate customers. In late 1997, the existing environmental management features were broadened to establish an environmental management system for registration under the European Eco-Management and Audit Scheme (EMAS). This effort was supported, in part, by the Bavarian State Government's promotional scheme for small and medium-sized enterprises and handicraft businesses.

#### Planning EPE

As is traditional in the cabinetry/furniture-making field, environmental and health aspects have been primary concerns in product development for a long time. This is also reflected in the company's environmental policy. In planning for environmental performance, the company intends to satisfy the demands of customers for ecologically sound products. Thus, the business strategy of the company is to expand market position, especially through the production of solid wood furniture, and by using natural oils and waxes for ecologically sound surface treatment. In this way, occupational health aspects for staff were improved (i.e., the use of and need for auxiliary agents in certain processes). Furthermore, reducing the environmental impacts of the company's production benefits the company. By increasing the efficient use of resources and materials, and by decreasing the amount of unnecessary waste, a competitive cost basis for production is realized. The company's environmental performance criteria are based on their environmental objectives and targets.

#### Selecting indicators for EPE

Table A.1 lists the environmental aspects of Schreinerei Schmid as well as their related environmental performance criteria which were adopted from the company's environmental objectives under the company's internal environmental information and control system, which was later registered under EMAS.

**TABLE A.1 - Schreinerei Schmid Environmental Aspects and Performance Criteria**

| Environmental Aspect                                                                                                                                                            | Related Environmental Performance Criterion                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Electricity consumption                                                                                                                                                         | Reduce electricity consumption                                          |
| Water consumption                                                                                                                                                               | Reduce water consumption                                                |
| Use of solid wood (instead of composite wood products, such as plywood or particle board, due to concerns about releases of formaldehyde and other substances into ambient air) | Increase the use of solid wood instead of composite wood products       |
| Consumption of paints and primers                                                                                                                                               | Reduce the consumption of paints and primers                            |
| Treatment of wood surfaces with natural waxes and oils                                                                                                                          | Increase the percentage of surfaces treated with natural waxes and oils |
| Consumption of solvents and paint thinners                                                                                                                                      | Reduce the number of litres of solvents or paint thinner used           |
| Generation of waste for disposal                                                                                                                                                | Reduce the amount of waste for disposal                                 |

Table A.2 provides informational statistics on the company, as well as the company's indicators for EPE, which were selected based on the company's business strategy and environmental policy.

TABLE A.2 - Schreinerei Schmid Statistics and Indicators for EPE

| Company Statistics                                                                                                                                                                                                                                       | 1993            | 1994    | 1996    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|---------|
| Annual sales (in Deutsche Marks)                                                                                                                                                                                                                         | 880 000         | 900 000 | 940 000 |
| Number of employees                                                                                                                                                                                                                                      | 9               | 10      | 11      |
| Workshop area in square metres                                                                                                                                                                                                                           | 640             | 640     | 780     |
| <b>Indicators for EPE</b>                                                                                                                                                                                                                                |                 |         |         |
| Kilowatt hours of electricity used                                                                                                                                                                                                                       | 17 731          | 17 965  | 24 797  |
| Cubic metres of water consumed                                                                                                                                                                                                                           | 345             | 398     | 201     |
| Percentage of solid wood used                                                                                                                                                                                                                            | 85 <sup>a</sup> | 70      | 70      |
| Kilograms of paints and primers used                                                                                                                                                                                                                     | 610             | 435     | 426     |
| Percentage of surfaces treated with natural waxes or oils                                                                                                                                                                                                | 3               | 22      | 30      |
| Litres of solvents or paint thinner used                                                                                                                                                                                                                 | 125             | 110     | 60      |
| Kilograms of waste for disposal                                                                                                                                                                                                                          | 1 450           | 1 320   | 60      |
| <sup>a</sup> The percentage of solid wood used in 1993 was greater than in 1994 and 1996 due to an exceptionally large order for furniture received in 1993. Therefore, 1993 production was not typical of Schreinerei Schmid's usual annual production. |                 |         |         |

## Using data and information

### Collecting data

The company's environmental information system provides the basis for data collection to support the development of indicators for EPE. In the initial years of implementing the company's environmental programs, a considerable amount of data had to be estimated. Over time, the scope of the environmental information system was broadened to be able to support all selected indicators. All indicators were expressed as absolute amounts or as proportions. The use of relative data (i.e., per kilogram or per item of furniture produced) was not considered appropriate because individually designed products have unique sizes and natures that do not support comparisons among products.

### Assessing information

The assessment of information is carried out by comparing the company's environmental objectives with the selected indicators for EPE. The sharp rise in consumption of electricity in 1996 resulted from the enlargement and construction of a new workshop. Considerable progress has been made since 1994 in other areas, especially regarding decreased water consumption, decreased consumption of environmentally relevant auxiliary agents, and the increased percentage of the surface areas of products treated with natural waxes and oils. Through new waste management practices, involving extensive internal and external recycling of production wastes, waste for disposal has virtually dropped to zero,

### Reporting and communicating

For clients, other interested parties and the general public, the company's progress in improving its environmental performance is documented, with the company's 1994/95 environmental report providing baseline information. This report is updated and published every three years as the public environmental statement required by the company's registration to EMAS. In addition, this information is made accessible over the Internet at <http://members.aol.com/schmids40>. Internally, the environmental report is used by the company owner as a basis for company meetings and discussions with staff on environmental issues, and to support dialogue between the company and public authorities.

## Reviewing and improving EPE

On the basis of the environmental performance achieved, new environmental objectives and targets were set as the company's environmental performance criteria. These criteria are:

- to increase the use of solid wood in the production of furniture by 10%, making its products more acceptable to its customers;
- to reduce electricity consumption by 10% through optimization of compressed air systems and replacement of heating ovens;
- to reduce the total volume of waste, for both disposal and recycling, by 10%.

One change in the set of indicators for EPE has been necessary as a result of reviewing the EPE process. Since the total volume of waste for disposal has been reduced to almost zero through intensive recycling measures, the strategy of the company owner is now focused on globally reducing all waste streams of the company. Therefore, "total volume of waste for both recycling and disposal" will be integrated as a new indicator replacing the old indicator "kilograms of waste for disposal".

## Summary/conclusions

EPE has proven to be environmentally and economically valuable for a small company. Data to support some of the selected indicators for EPE was readily available at the beginning. Data sources and data collection mechanisms to support other indicators for EPE had to be developed or improved during the process.

The most important benefit of conducting EPE for the company owner was that he finally had access to hard figures about the environmental performance of the company. Together with regularly updated environmental objectives and targets, the owner is able to control and improve effectively the company's environmental performance, and to communicate it successfully to the market. Through the information provided in the environmental report, the company could expect a steady increase in its regional customer base and a steady increase in demand for its products.

If you have questions or would like additional information regarding this example, please contact the ISO member body for Germany:

Deutsches Institut für Normung (DIN)  
 Burggrafenstrasse 6  
 D-10787 Berlin Germany  
 Telephone: 49 30 26 010  
 Fax: 49 30 26 01 12 31  
 E-mail: [postmaster@din.de](mailto:postmaster@din.de)

## Annex B

### **Clemens Härle Brewery, Leutkirch, Germany**

[A family-owned and operated brewing company, with 33 employees, implementing environmental performance evaluation starting with a company eco-balance study (an input/output scheme for mass and energy) and management commitment to environmental protection]

#### **Introduction**

Clemens Härle is a small brewery run by the Härle family. Despite a trend to the contrary in the brewing industry sector, the brewery is able to maintain its share of the market against competition from larger breweries. The company is located in the town center of Leutkirch in the Allgäu region (State of Baden-Württemberg, Germany). The company produces 28 500 hectolitres of beer and sells 16 000 hectolitres of other beverages annually. Clemens Härle brewery had a turnover of approximately 8,1 million Deutsche Marks in 1997. The majority of the 33 employees are employed in sales and the production process.

The brewing of beer involves producing wort in a mashing and boiling process in the brewing house from the raw materials, which are hops, malt and water. After cooling, the wort is fermented. This fermented immature beer is then stored and filtered. The finished beer is then decanted into bottles or pumped into kegs (pressurized containers). All processes are subject to the strict food standards and purity laws that apply to Bavarian breweries. The supporting infrastructure consists of an energy supply, water supply and treatment plants, wastewater treatment and disposal, as well as facilities for the maintenance of technical equipment and vehicles.

The finished products are stored at the brewery until the company transports them, using its own vehicles, to its customers. All vehicles are fuelled by organic diesel, refined from rapeseed oil. The sale of the finished product is limited to an area with a 50 kilometre radius from the brewery to guarantee premium quality. This also helps to reduce the environmental impacts of distribution activities.

The raw materials (i.e., malt and hops) are only purchased from farms controlled by two independent institutions. No pesticides or artificial fertilizers are normally applied. Where their use is essential, only the application of the minimum quantity that achieves the necessary effect is permissible.

Numerous measures have also been carried out for many years to reduce the consumption of resources, in particular water and energy, and the volume of emissions. A new wort-boiling system in the brewing house reduced the consumption of heating oil by 25%. The use of waste heat was also improved. A heat recovery system achieves annual savings of approximately 45 000 litres of heating oil. Optimizing processes have leveled out peaks in electricity consumption. Water consumption has been reduced by nearly 50% in the last twenty years. Because waste is sorted with care, few recyclable materials are to be found in the non-recyclable waste. Organic waste from production processes is reused in agriculture. Only reusable containers (i.e., bottles and kegs) are used.

Noise pollution problems were addressed with noise abatement measures. These were accompanied by independent surveys to guarantee that the noise levels on neighboring properties are considerably lower than the legal noise emission limits. Thus, adequate margins were always maintained to avoid disturbance to the neighbors.

There were a few difficulties with wastewater acidity (i.e., pH values) at the municipal sewage plant before a neutralization system could be put into operation. Since then, the fluctuations in the pH values have been reduced and the relationship with authorities responsible for water standards has improved.

Environmental activities are used to promote the company to the public, through mechanisms such as press releases and guided tours. The company's profile has been raised by many reports in the media and by winning awards for its environmental activities. Overall, Härle has managed to maintain a long-lasting well-balanced relationship with interested parties (e.g., local residents and authorities).

## Planning EPE

The establishment of an environmental management system certified to either the European Eco-management and Auditing Scheme (EMAS) or ISO 14001 has not been an objective of the company. The owners feel that these systems would be too time-consuming and bureaucratic for a company of this size and that the environmental benefit that normally results from certification could also be achieved by the company's less formal environmental management system. A detailed environmental report and a company eco-balance study (an input/output scheme for mass and energy) were compiled for the first time in 1995.

### Company Eco-Balance Studies

A "company eco-balance study" is an internal annual recording of all incoming (input) and all outgoing (output) material and energy streams of the company. Input streams include raw materials, physical plant and equipment, water and energy. Output streams include wastewater, air emissions, products and wastes after production. These environmental data are systematically recorded for the entire company year after year and are the basic data supporting indicators for EPE.

Three areas for action were identified:

- conserving electrical and heating energy;
- changing to more environmentally friendly energy sources;
- altering the use of cleansing agents and disinfectants.

Härle intends to produce additional environmental reports in future.

The company's many environmental activities and the 1995 eco-balance study have provided a good basis and information for planning its environmental performance evaluation (EPE). A very good data base existed for the operational area, but the information base on management efforts was rather limited. The following tables illustrate how the important environmental aspects were being managed before the EPE initiative began.

**TABLE B.1 - Significant Environmental Aspects**

| Significant Environmental Aspects                                                                                                                                                                                   | Management Status                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water and energy consumption                                                                                                                                                                                        | Taken into account at Härle (for approximately 20 years), as is usual in breweries. Reason: Water and energy consumption account for a great share of production costs, and are therefore analyzed precisely for economic reasons.                                                                                       |
| Air emissions, wastewater effluent and solid waste                                                                                                                                                                  | Accurate data is available from the eco-balance study for the most relevant environmental aspects of wastewater (both volume and quality), solid waste and air emissions.                                                                                                                                                |
| <ul style="list-style-type: none"> <li>• Possible leakage of ammonia from the cooling system;</li> <li>• Use of cleaning agents and disinfectants;</li> <li>• Purity/quality of water and raw materials.</li> </ul> | <ul style="list-style-type: none"> <li>• Monitoring of the cooling system (ammonia) and the use of cleaning agents and disinfectants is related to safety.</li> <li>• The health of consumers has to be guaranteed by regular monitoring to ensure that water and raw materials meet food safety regulations.</li> </ul> |
| Local/regional environmental conditions                                                                                                                                                                             | No direct local/regional environmental objectives                                                                                                                                                                                                                                                                        |

TABLE B.2 - Environmental Performance Criteria

| Environmental Performance Criteria            | Management Status - Data Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Legal and other requirements                  | <ul style="list-style-type: none"> <li>• Legally relevant federal laws on emission protection, technical guidelines on noise, technical guidelines on air and hazardous substances regulation.</li> <li>• Legal requirements are routinely monitored and checked to avoid problems with authorities.</li> <li>• The aim of the company is to achieve a continually improving environmental profile; consumers' environmental concerns are determined by random surveys on individuals.</li> </ul> |
| Past and present performance                  | Good planning data is available at Härle, since water and energy consumption have been systematically recorded over a long period of time.                                                                                                                                                                                                                                                                                                                                                        |
| Standards and good management practices       | Although an environmental management system certified to EMAS or ISO 14001 is not an objective for Härle, internally set standards are documented in the environmental report.                                                                                                                                                                                                                                                                                                                    |
| Performance data from industrial associations | Comparisons with other breweries is a traditional "craftsman's tool" in the brewing sector.                                                                                                                                                                                                                                                                                                                                                                                                       |
| Checking/auditing the management              | Not considered appropriate at Härle, because it is a small family business.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Scientific research                           | Research results, as far as they are relevant for small breweries, are used for setting the company's objectives (Example: Brewing Guidelines from the Bavarian Environment Ministry).                                                                                                                                                                                                                                                                                                            |

This document is a proprietary document of the International Organization for Standardization (ISO). It is not to be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage or retrieval system, without prior written permission from ISO.

TABLE B.3 - Views of Interested Parties

| Interested Party                             | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Management representatives, employees        | <ul style="list-style-type: none"> <li>Company strategy is biased towards environmental awareness and protection by the personal commitment of the Executive Director.</li> <li>As is typical for a small enterprise, informal exchange is favored over formal rules for employee suggestions ("We know each other and talk to each other").</li> <li>Special meetings are held on environmentally relevant topics with the master brewer and the head of purchasing.</li> </ul> |
| Customers                                    | Customer interests are identified through focused surveys.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Suppliers                                    | Conducting discussions with suppliers and establishing purchasing guidelines (quality and source of raw materials, packaging to be used).                                                                                                                                                                                                                                                                                                                                        |
| Banks, insurance companies                   | Building confidence with the environmental report.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Supervisory bodies, legislator               | Regular contact is maintained with authorities.                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Local community                              | Regular personal contact with those responsible.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Media (and Publicity)                        | <ul style="list-style-type: none"> <li>Arousing interest by publicizing environmental activities, interviews; in exchange, reports are made and company data is disclosed.</li> <li>Active exchange of public opinion in regional newspapers, national news agencies and specialist journals about industry sectors and environmental affairs.</li> </ul>                                                                                                                        |
| Research institutes                          | Active participation in research projects.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Environmental groups and other organizations | Contact and information exchange with environmental organizations and the conduct of mutual activities.                                                                                                                                                                                                                                                                                                                                                                          |

### Selecting indicators for EPE

The company's environmental report explicitly outlines the environmental performance objectives at Härle. The majority of the environmental objectives focus on technical and organizational measures. If possible, the objectives are expressed quantitatively. For example objectives related to energy are:

- qualitative (organizational/ technical) objective:  
To plan and arrange investment in a combined heating and power plant.
- quantitative (operational process) objective:  
To improve the electrical efficiency in the whole company by at least 1 kW · h per hectolitre of beer produced over the next three years.

Operational performance indicators (OPIs) derived from the control of production (e.g., energy and water consumption) and from the eco-balance study were selected and directly used to check progress towards the objectives set. Absolute values were listed in the eco-balance report on the Härle brewery products for the inputs and outputs indicated in Table B.4.

**TABLE B.4 - Input and Output Categories of the Härle Brewery Eco-Balance Study**

| Inputs                                                                                                                                                                      | Outputs                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Raw materials<br>Operating and auxiliary materials<br>Packaging<br>Office and advertising material<br>Energy<br>Environmental media (e.g., water, air, soil)<br>Commodities | Main products<br>By-products<br>Waste<br>Solid waste<br>Wastewater<br>Waste (exhaust) gases<br>Energy emitted<br>Commodities |

The following OPIs related to significant environmental aspects, expressed as absolute values (for example, in 1994 electricity consumption was 413 000 kW · h and wastewater volume was 6 800 m<sup>3</sup>), were to compare environmental performance over the last 10 years:

- electricity used in kilowatt hours per year;
- diesel fuel used in litres per year;
- heating oil consumed in litres per year;
- water consumed in cubic metres per year.

The absolute values were then related to the number of hectolitres of beer produced. This resulted in an additional set of relative OPI's which were also compared over the last 10 years. By doing this, and by using graphical representation, the changes in the absolute values are more readily understood. Some examples of these relative OPI's are:

- litres of heating oil consumed per hectolitre of beer produced;
- kilowatt hours of electricity used per hectolitre of beer produced;
- megajoules of natural gas consumed per hectolitre of beer produced;
- litres of diesel fuel consumed per hectolitre of total beer and other drink products;
- total water consumed in litres per hectolitre of beer produced;
- potable water used for brewing in litres per hectolitre of beer produced;
- non-potable water used for cleaning and other purposes in litres per hectolitre of beer produced;
- hectolitres of beer produced per cubic metre of water (to measure water efficiency).

### Using data and information

The collection and analysis of environmentally relevant data at the Härle brewery, although fairly comprehensive, was found to need some improvement for EPE, as described below.

### Collecting data

Even in small breweries such as Härle, data on energy and water consumption is collected regularly for each process. This is done using Electronic Data Processing (EDP) and by hand (in the brewing book). Collected data is regularly analyzed by the master brewer.

Data on input materials is well-known (e.g., raw, operating and auxiliary materials purchased). The large amount of work involved in collecting this data is a problem, since the data on quantities needed for the performance evaluation has to be gathered from individual invoices filed in folders. Although software is used for book-keeping and for some sales records, this software does not support identifying and recording material flow quantities.

Before the eco-balance study, data on emissions, waste materials and waste heat was not adequate. There was little qualitative data on the chemical contents and environmental properties of materials used. Missing information was collected from external sources, in particular from suppliers.

An unusual feature of data collection at Härle is that data on volumes of inputs and outputs was not only taken for the complete brewery, but also for each individual process. This means that it is not only possible to identify how much of a particular material was used, but also where exactly these substances were used or produced. Due to the amount of work involved, the brewery will not, in the future, make such detailed

investigations of the process relevant indicators, which are very interesting for a detailed operational performance evaluation. However, Härle will continue to collect water and energy consumption data for each process.

Theoretically, it would be possible to use the automatically measured and recorded data on the neutralization system to identify the exact volumes of wastewater. However, it requires less work and is more practicable to use a differential calculation (i.e., water used minus brewing water, where sources of error such as rain drainage are taken into account).

The exact identification of environmental data was often problematic because it involved too much work or measuring methods were too complicated or too expensive. The possibilities for time saving are limited, because the company's information systems are not in a network (accounting, sales, recording of operational data in the production process) and data on quantities cannot be obtained in the form needed. This shows how important it is to aim for corporate environmental information systems, particularly for small and medium-sized enterprises. It will be easier to compile OPIs if a company can access and use the necessary data from a normal company Electronic Data Processing (EDP) system.

### Analyzing and converting data

The analysis of the data on volumes and quantities showed varying quality in the data because it was collected in different ways. For example:

- Some quantities were actually measured (e.g., measurements from water and electricity metres) or quantities were known exactly (e.g., from invoices and receipts);
- Other volumes and quantities were calculated (e.g., emissions calculated from oil consumption);
- Some volumes and quantities were estimated values based on experience (e.g., from the master brewer) for processes which had not been included in a data collection system (e.g., consumption of glue for labels);

### Assessing information

EPE revealed that electricity consumption has constantly increased over the last ten years, and is considerably higher than in comparable companies. This is probably due to the increased use of machinery.

It was determined that by replacing heating oil with natural gas, emissions of carbon dioxide, nitrogen oxide and sulfur dioxide could be reduced considerably.

EPE provided information on and helped to identify processes on which more precise technical examinations should be conducted.

By analyzing the relevant process eco-balance information, it was possible to obtain an overview of the areas in which significant quantities of cleansing agents are used.

### Reporting and communicating

The results of the environmental performance evaluation published in the environmental report were systematically used for public relations. For example, a press conference was held which was featured in regional and national newspapers, and in radio news broadcasts.

The environmental report was distributed to targeted customers, visitors, authorities, opinion-formers and interested consumers. The results were also published in consumer and environmental journals.

The environmental profile of the company was strengthened by winning the prize for environmental excellence awarded by the Environment Ministry of Baden-Württemberg. The total response to the environmental report, which included the eco-balance study, is considered to be very good.

### Reviewing and improving EPE

#### Check

How effective is the present environmental performance evaluation process?

The Executive Director of Härle considers that a significant and general improvement of the company's environmental management system has been achieved by EPE.

Identifying indicators for EPE has given new insights on how to optimize the processes, especially in the areas of water use, energy use, and transport. EPE has also helped to identify several effective measures for improvement (e.g., in waste management).

The material and energy eco-balance studies required approximately 50 man-days, using both an external consultant and internal employees. This first examination took so much time because data on quantities of stock and on the consumption or volume of waste was not readily available for many raw materials, auxiliary materials, or emitted substances.

Internal and external expenditure, including software, totaled approximately 30 000 Deutsche Marks.

## Act

How can the environmental performance evaluation process be improved?

For data which has to be recorded annually, it is possible to reduce workload by making the recording time period the same as for the business year. Detailed environmental reports, such as the one from 1995, should be published every three years.

Workload for data recording should be less for the next environmental performance evaluation process because a detailed database now exists. The data recording will also be simplified through the eco-balance studies on commodities and processes.

Data will continue to be recorded and administered with eco-balance software. For future eco-balance studies, the workload for the inputs and outputs will be reduced to approximately 20 man-days and costs are estimated at approximately 10 000 Deutsche Marks.

Large time and cost savings can only be achieved with difficulty if the EDP information systems are not extended and also used to support environmental performance evaluation. This would be too large an exercise for a small company if it wanted to develop a company-specific solution. Therefore, improvements in this area would only be possible if the software companies integrated functions on environmental performance evaluation into their products.

The time taken for recording data can also be reduced by using checklists containing a systematic listing of data sources, including location and storage medium.

The potential cost reductions identified so far have shown that it is possible to link indicators for EPE to costs. This has already happened for the use of water and energy as well as for some of the raw, auxiliary and operating materials. Potentially, this could be expanded into systematic environmental cost management.

## Summary/conclusions

Excellent data now exist and participation in the European Union's Eco-Management and Audit Scheme (EMAS) or certification to ISO 14001 would be relatively easy should the Härle brewery decide to do so in the future. Environmental performance evaluation following the guidance in draft versions of ISO 14031 has been successfully completed without an environmental management system that meets all the requirements of EMAS or ISO 14001.

If you have questions or would like additional information regarding this example, please contact the ISO member body for Germany:

Deutsches Institut für Normung (DIN)  
Burggrafenstrasse 6  
D-10787 Berlin Germany  
Telephone: 49 30 26 010  
Fax: 49 30 26 01 12 31  
E-mail: [postmaster@din.de](mailto:postmaster@din.de)

## Annex C

### Frederiksborg Linnedservice A/S, Oelsted, Denmark

(An industrial laundry, with approximately 70 employees, serving hospitals and rest homes, using ISO 14031 to review indicators developed to support its ISO 14001 environmental management system)

#### Introduction

Frederiksborg Linnedservice A/S is an industrial laundry that hires out, washes and maintains linen and clothing for hospitals and rest homes in North Zealand and in the Copenhagen area of Denmark. 40% of the company is owned by the county of Frederiksborg and 60% is owned by Berendsen Textile Service A/S, which is a part of the Sophus Berendsen A/S group. It has approximately 70 employees and an annual turnover of about 30 million DKr.

During 1997 and 1998 Frederiksborg Linnedservice developed an environmental management system which was certified to ISO 14001 in June 1998. The company's environmental policy commits it to "a constant reduction of the environmental impact caused by our production". Health and safety matters within the company are dealt with by the safety committee which co-ordinates its activities with those relating to the environmental management system operations.

The company's activities are covered by the "Regulation of companies other than listed ones", which is legislation that requires the company to give notice to the local authority of any significant changes in its activities. (Note: listed companies are those required to apply for an environmental permit before they can commence or expand production.) The municipality of Frederiksværk issues the company's wastewater discharge permit under Chapter 4 of the Law of Environmental Protection.

#### Planning EPE

As part of the development of its environmental management system the company identified its significant environmental aspects, set environmental performance criteria (objectives and targets) and identified its interested parties.

The company's significant aspects are:

- the consumption of water, energy and washing chemicals;
- waste water discharge;
- laundry transportation;
- various aspects arising during the upstream and downstream lifecycle phases of the products that the company processes (i.e. linen and clothing).

As part of its environmental management system, Frederiksborg Linnedservice has established environmental targets relating to its environmental performance. Like the other 21 laundries belonging to the Berendsen Textile Service, Frederiksborg Linnedservice is working on benchmarking and optimizing its environmental performance regarding its consumption of water, electricity, chemicals and oil/gas under the so-called Water, Electricity, Chemicals and Oil/Gas (WECO) program. The WECO program involves setting overall targets for the Berendsen Textile Service and individual targets for each of the 21 laundries within the group through an economic evaluation of these four inputs. All Berendsen Textile laundries in Denmark and Sweden will be certified to ISO 14001 within 2 to 3 years. Then each laundry will be able to adjust its specific targets within the overall WECO targets as part of its target setting within ISO 14001.

The most important interested parties were also identified during the implementation of ISO 14001 and these are:

- employees;
- neighbors;
- the municipality of Frederiksværk and the County of Frederiksborg;
- customers;
- board of directors/management;
- Berendsen Textile Service A/S;
- Sophus Berendsen Corporate Environment Department.

## Selecting indicators for EPE

In order to monitor and evaluate how its environmental performance compares with the targets that have been established under its EMS, Frederiksborg Linnedservice developed a series of management and operational performance indicators. ISO 14031 was used to evaluate whether these indicators could be usefully supplemented with additional Management Performance Indicators (MPIs) and Operational Performance Indicators (OPIs) and with environmental condition indicators (ECIs).

This evaluation took place at a series of meetings with attendance by environmental and other managers from Frederiksborg Linnedservice, Berendsen Textile Service and Sophus Berendsen A/S. The meetings typically consisted of an introduction to ISO 14031 and to the process of identifying significant aspects and selecting indicators. This was followed by a systematic review of the annex to ISO 14031 and the lists of significant environmental aspects, indicators, objectives and targets from the environmental management system. Finally, a potential list of indicators was prepared and the relevance of each indicator was discussed taking into account the technological and economic circumstances of the company.

The result was a list of 44 indicators grouped as:

- (E) - existing indicators, i.e., those selected in the development of the company's environmental management system;
- (D) - indicators for which the basic data exists and whose applicability will be evaluated as part of the objective and target setting process for 1999;
- (F) - relevant future medium and long term indicators.

The indicators selected, the reasons for their selection and their relation to environmental objectives and targets are presented in Table C.1 and C.2.

## Review of the indicators for EPE

The indicators will be evaluated annually unless otherwise stated. If the period is a project period, this is indicated by a (P). Indicators contained in Sophus Berendsen's Environmental Questionnaire are indicated by SBEQ. The Questionnaire is sent out each year by the Sophus Berendsen Corporate Environment Department to collect site specific information on environmental management activities and environmental performance for the corporate database. This is published in Sophus Berendsen's Environmental Profile.

**TABLE C.1 - Management Performance Indicators (MPIs)**

| MPI                                                                                                                                     | Status | Reasons for Choice of Indicator and Relation to Environmental Policy, Environmental Objectives or Targets                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Implementation of policies and programs</b>                                                                                          |        |                                                                                                                                                                                                                                                                                  |
| Number of questions answered on a questionnaire concerning environmental conditions sent to selected environmentally critical suppliers | E      | To give an initial estimate of the environmental performance level of suppliers. Used as a criterion for the selection of suppliers and for development collaborations with suppliers<br><br><b>Objective:</b> estimation of suppliers causing significant environmental impacts |
| Number of meetings having work place assessment on the agenda                                                                           | E      | To estimate if work place assessment (health and safety review) is occurring on an ongoing basis<br><br><b>Objective:</b> implementation of action plans concerning work place assessment                                                                                        |
| Score from a questionnaire concerning the degree of staff satisfaction                                                                  | E      | To estimate the level of staff satisfaction<br><br><b>Policy:</b> safe and attractive working conditions                                                                                                                                                                         |

| MPI                                                                                                                                                                                                                            | Status | Reasons for Choice of Indicator and Relation to Environmental Policy, Environmental Objectives or Targets                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of days lost per week due to sickness                                                                                                                                                                                   | E      | Indicates the health and safety conditions within the company<br><br><b>Policy:</b> safe and attractive working conditions<br><br><b>Objective:</b> improvement of current health and safety conditions                     |
| Number of reports of industrial injuries                                                                                                                                                                                       | E      | Indicates the health and safety conditions within the company<br><br><b>Policy:</b> safe and attractive working conditions<br><br><b>Objective:</b> improvement of current health and safety conditions                     |
| Number of environmental instruction hours per employee (Environmental instruction consists of external courses, internal seminars/course and on-the-job training)                                                              | E      | To ensure that all employees receive a minimum level of environmental training<br><br><b>Objective:</b> at least one day of environmental instruction for each employee                                                     |
| Number/percentage of environmentally assessed acquisitions and important rebuildings out of the total number of acquisitions and important rebuildings                                                                         | D      | To document whether new acquisitions and important rebuildings are being environmentally assessed<br><br><b>Objective:</b> systematic environmental assessment of new acquisitions and important rebuildings                |
| Number/percentage of products environmentally assessed by the company out of a selected number of existing and newly purchased environmentally critical products                                                               | D      | To document whether selected products are being environmentally assessed<br><br><b>Objective:</b> environmental assessment of products having significant environmental impacts                                             |
| Number of hours spent on environmental projects using Life Cycle Assessment                                                                                                                                                    | D      | <b>Objective:</b> active participation in projects concerning Life Cycle Assessment                                                                                                                                         |
| Number of implemented environmental objectives and targets and the number being implemented on time                                                                                                                            | D      | To estimate the efficiency of the management system (May be used during the review of the management)<br><br><b>Policy:</b> formulation of realistic and measurable targets                                                 |
| Percentage of staffing hours used for environmental instruction and training                                                                                                                                                   | D      | To show the prioritization of environmental instruction in relation to other types of training<br><br>No direct objectives but expressed as the objective of at least one day's environmental instruction for each employee |
| Number/percentage of environmentally critical products for which the company has specified environmental requirements (e.g. demands substitution of chemical substances or unacceptable environmental performance by supplier) | D      | To estimate the environmental performance in relation to products of the supplier<br><br><b>Objective:</b> assessment of suppliers and products having a significant environmental impact                                   |

| MPI                                                                                                                              | Status    | Reasons for Choice of Indicator and Relation to Environmental Policy, Environmental Objectives or Targets                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Compliance to environmental demands and expectations</b>                                                                      |           |                                                                                                                                                                                                                                                     |
| <ul style="list-style-type: none"> <li>Number of regulatory non-compliances</li> <li>Number of injunctions</li> </ul>            | E<br>SBEQ | <p>To estimate degree of compliance with the regulatory requirements. Indicators used for the management review</p> <p><b>Policy:</b> as a minimum to meet the present regulations</p>                                                              |
| Number of deviations from procedures and instructions per month for functions/units where it is found relevant (BTS level)       | D         | To identify the weaknesses of the environmental management system in different functions/units (Indicator used for the management review)                                                                                                           |
| Number of corrective actions per function/unit                                                                                   | D         | To estimate the efforts to rectify the weaknesses of the system (Indicator used for the management review)                                                                                                                                          |
| <b>Economic performance</b>                                                                                                      |           |                                                                                                                                                                                                                                                     |
| Value (DKr) of raw material and resources saved compared to consumption in the fourth quarter of 1995 (WECO)                     | E         | <p>To show the operational savings of raw material and resources</p> <p>To promote the WECO objectives concerning reduction of consumption of chemicals</p>                                                                                         |
| Costs of chemicals consumed (WECO) per kilogram of laundered clothes                                                             | E         | <p>To compare operational costs with those of other laundries</p> <p>To promote the WECO objectives</p>                                                                                                                                             |
| <ul style="list-style-type: none"> <li>Cost of fuel per vehicle</li> <li>Costs of maintenance and repairs per vehicle</li> </ul> | E         | <p>To show the total operational costs related to the company's vehicles (see also the operational performance indicator under supplies and deliveries)</p> <p><b>Objective:</b> reduction of the environmental impact resulting from transport</p> |
| Annual duty for sewage discharge                                                                                                 | D<br>SBEQ | <p>To show the operational costs of important water consumption and the resulting large sewage discharge</p> <p>To promote the WECO objectives</p>                                                                                                  |
| Number of staffing hours spent on environmental projects/action programs per group of staff                                      | F         | <p>To estimate the prioritization of the effort made in the environmental field</p> <p>May be applied if for instance the aim is that 5% of a staff group's working time should be spent on environmental work</p>                                  |

| MPI                                                                                                                         | Status    | Reasons for Choice of Indicator and Relation to Environmental Policy, Environmental Objectives or Targets                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Relations to interested parties</b>                                                                                      |           |                                                                                                                                                                                                                            |
| Number of requests from external interested parties concerning the environmental performance of the company                 | E         | To estimate the interest in the company's environmental activities among the interested parties<br><br><b>Objective:</b> to ensure a dialogue with external interested parties regarding company environmental performance |
| Number of environmentally related complaints from neighbors regarding noise, smell and others issues                        | E<br>SBEQ | To estimate the company's standing in the local area<br><br><b>Policy:</b> consider the environment an important part of the company's relation to society                                                                 |
| Number of newspaper clippings referring to the environmental management and/or the environmental performance of the company | F         | To estimate whether environmental performance is being communicated widely<br><br><b>Objective:</b> to ensure a dialogue on the company's environmental activities with external interested parties                        |
| Number of new customers mentioning environment as part of the reason for choosing Frederiksborg Linnedservice               | F         | To estimate the marketing value of the environmental management activities<br><br><b>Policy:</b> consider the environment to be an important part of our trade with customers and suppliers as well as with society        |

TABLE C.2 - Operational Performance Indicators (OPIs)

| OPI                                                                                                                                                                                                                                    | Status    | Reasons for Choice of Indicator and Relation to Environmental Policy, Environmental Objectives or Targets                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Materials</b>                                                                                                                                                                                                                       |           |                                                                                                                                                   |
| Chemicals used per kilogram of laundered textiles<br><br>(SBEQ: Kilograms of washing chemicals, kilograms of sodium hypochlorite and litres of petrol)                                                                                 | E<br>SBEQ | To estimate the consumption of chemicals for comparison with other laundries<br><br><b>WECO-target:</b> reduction of the consumption of chemicals |
| Quantity of water used per kilogram of laundered textiles (WECO)<br><br>(SBEQ: Total consumption in cubic metres and cost of water in DKr)                                                                                             | E<br>SBEQ | To estimate the consumption of water for comparison with other laundries<br><br><b>WECO-target:</b> reduction of the consumption of water         |
| Number of auxiliary products containing polyvinylchloride<br><br>(SBEQ: Volume in cubic metres and cost in DKr of polyvinylchloride-containing plastic waste; quantity in kilograms and cost in DKr of polyvinylchloride for wrapping) | E<br>SBEQ | To estimate rate of phase-out of polyvinylchloride-containing products<br><br><b>Objective:</b> survey of the use/employment of PVC               |

| OPI                                                                                                                                                                                                                                                                   | Status    | Reasons for Choice of Indicator and Relation to Environmental Policy, Environmental Objectives or Targets                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chlorofluorocarbon stock in air-conditioning<br>- number of products, equipment, machinery, containing chlorofluorocarbons<br><br>(SBEQ: Quantity in kilograms of chlorofluorocarbons in air-conditioning and in fire-fighting equipment)                             | E<br>SBEQ | To estimate the initiative compared to the phase-out of chlorofluorocarbons<br><br><b>Objective:</b> survey of the stock of chlorofluorocarbons                                         |
| Re-washing (a second wash of the textiles as a result of quality control) as a percentage of the total amount of laundry                                                                                                                                              | E         | To survey the extent of re-washing in order to find possibilities for reducing the extent of re-washing<br><br>To promote the WECO-objectives                                           |
| Percentage reduction in use of chlorine per kilogram of washed clothes compared with previous year's use                                                                                                                                                              | D         | To estimate the status of the reduction in use of chlorine.<br><br><b>Objective:</b> reduction to a technically necessary level                                                         |
| Percentage of re-circulated water used during the textiles washing process (for each principal type of textile, if possible)                                                                                                                                          | F         | To estimate performance in relation to water reuse for comparison with other laundries<br><br>To be used if a water re-circulation target is set for the laundries                      |
| <b>Energy</b>                                                                                                                                                                                                                                                         |           |                                                                                                                                                                                         |
| Consumption of electricity and oil/gas per kilogram of washed clothes (WECO)<br><br>(SBEQ: Total consumption in megawatt hours and cost in DKr of energy: consumption of energy by type (electricity, steam, district heating/natural gas and oil) in megawatt hours) | E<br>SBEQ | To estimate the consumption of electricity and oil/gas for comparison with other laundries<br><br><b>WECO-objective:</b> reduce the consumption of electricity and oil/gas              |
| Percentage of the energy consumption used as process energy and for space heating                                                                                                                                                                                     | E<br>SBEQ | May be used for estimation of the payment of energy taxes                                                                                                                               |
| Estimated steam boiler efficiency as a percentage                                                                                                                                                                                                                     | E<br>SBEQ | To assess if the steam boiler is operated efficiently<br><br><b>WECO-objective:</b> reduction of the consumption of oil/gas.                                                            |
| <b>Products</b>                                                                                                                                                                                                                                                       |           |                                                                                                                                                                                         |
| Number of discarded pieces of textile per type of textile                                                                                                                                                                                                             | E         | To estimate the durability of the various textiles processed<br><br><b>Objective:</b> reduction of the environmental impact during the lifetime of the textiles                         |
| Percentage of purchased textiles with eco-labels (if applicable)                                                                                                                                                                                                      |           | Used as part of the assessment of goods relating to the environmentally friendly purchase policy<br><br><b>Objective:</b> determination of targets for purchase of eco-labeled textiles |

| OPI                                                                                                                                                                                                                                     | Status    | Reasons for Choice of Indicator and Relation to Environmental Policy, Environmental Objectives or Targets                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supplies and deliveries</b>                                                                                                                                                                                                          |           |                                                                                                                                                                                        |
| Consumption of fuel per kilometre per vehicle                                                                                                                                                                                           | E         | To estimate whether certain vehicles use unexpectedly high amounts of fuel<br><br><b>Objective:</b> reduction of the environmental impact during transport                             |
| <b>Waste</b>                                                                                                                                                                                                                            |           |                                                                                                                                                                                        |
| Amount of waste by type in cubic metres (SBEQ) as well as the costs of waste in DKr                                                                                                                                                     | E<br>SBEQ | To estimate performance in relation to waste minimization.<br><br><b>Objective:</b> waste minimization                                                                                 |
| Waste per kilogram of washed clothes                                                                                                                                                                                                    | F         | To estimate performance in relation to waste minimization, specified by type according to the future waste regulations of the municipality<br><br><b>Objective:</b> waste minimization |
| Number of (and percentage of) the different types of hazardous waste for which reduction plans have been made                                                                                                                           | F         | To estimate the reduction in the use of products that lead to the generation of hazardous waste<br><br><b>Objective:</b> waste minimization and replacement of hazardous substances    |
| <b>Emissions to soil and water</b>                                                                                                                                                                                                      |           |                                                                                                                                                                                        |
| Amount of waste water per kilogram of washed clothes                                                                                                                                                                                    | D<br>SBEQ | To be estimated together with the consumption/reuse of water per kilogram of washed clothes in order to control the water balance<br><br>To be seen as a part of the WECO-objectives   |
| Nitrification inhibition as a percentage (based on self-control measurements)                                                                                                                                                           | D         | To estimate whether legal requirements (at present only a guideline) are being respected within a good margin<br><br>(No objective/targets in relation to the waste water load)        |
| Discharged Biological Oxygen Demand and Chemical Oxygen Demand in waste water (based on self-control measurements). To be followed as the annual concentration and absolute amount as well as the amount per kilogram of washed clothes | D         | To estimate status/performance in relation to regulatory requirements/guidance<br><br>(No objective/targets in relation to the waste water load)                                       |

### Using data and information

Data and information for the monitoring of the selected indicators will be collected as part of the ISO 14001 process supplemented by contacts with key site, subsidiary and corporate representatives.

The information generated by the EPE process will be communicated internally as part of the ISO 14001 communication activities. This will include oral presentations by the site manager and environmental co-ordinator and by other participants in the EPE project at subsidiary and corporate level as well as the dissemination of the present project report.

## Reviewing and improving EPE

The present indicators as well as any new indicators selected in the 1999 ISO 14001 planning process will be reviewed as part of the internal environmental reporting process and the management system review. The site environmental co-ordinator will, in co-operation with the relevant subsidiary and corporate environmental personnel, make suggestions for further use and improvement of EPE as part of the ISO 14001 process, and decisions will be taken as part of the management system review.

## Summary/Conclusions

Frederiksborg Linnedservice offers the following observations regarding its implementation of EPE:

- The use of ISO 14031 inspired the company to find new management and operational performance indicators, which may be incorporated into the existing environmental management system. The management performance indicators may be especially useful in relation to the management review, while the operational performance indicators are particularly useful in the daily operation of targets and conditions.
- The company is already working actively with operational performance indicators as a tool for controlling the consumption of water, electricity, chemicals and oil/gas (WECO). Using ISO 14031 stimulated the development of additional ways of controlling these parameters (for instance by focusing on the reuse rate of water and on the economic savings) and the development of the relevant indicators.
- For the time being, environmental condition indicators are not considered applicable but the company may in the future consider how to use environmental conditional indicators in its external communication with interested parties.
- The presence of an environmental management system means that developing new indicators can be done in a straightforward process since procedures for collection and handling of data and data reporting do already exist.
- ISO 14031 can be seen as an alternative to ISO 14001 for companies who do not wish to establish an extensive management system but who would, however, like to work systematically and continuously on improving their environmental performance. For a company with an EMS certified to ISO 14001, EPE can supplement the procedures already developed and especially help focus the process of internal environmental reporting and the management review.
- The implementation of EPE also included MPis and OPis relating to health and safety aspects of the activities at the site as part of the ongoing dialogue with the health and safety committee at the site.

If you have questions or require additional information regarding this example, please contact the ISO member body for Denmark:

Dansk Standard (DS)  
Kollegievej 6  
DK-2920 Charlottenlund Denmark  
Telephone: 45 39 96 61 01  
Fax: 45 39 96 61 02  
E-mail: [dansk.standard@ds.dk](mailto:dansk.standard@ds.dk)

## Annex D

### Perusahaan Pelindung Getah, Malaysia

(A rubber glove manufacturing company, with approximately 100 employees, getting started on environmental performance evaluation)

#### Introduction

The Perusahaan Pelindung Getah (M) Sdn. Bhd. (PPGM) is a small private limited company established in 1988 and located in Malaysia. The PPGM factory is located upstream from a public water supply intake which consequently requires the PPGM to comply with stringent effluent standards. The total number of employees at the PPGM is approximately 100. The factory has three production lines which operate 24 hours per day, for 312 days each year. The factory produces approximately 8 million pieces of medical examination gloves per month, most of which are exported to the United States of America.

The PPGM uses a natural rubber latex concentrate with 60% dry rubber content preserved with 0,7% ammonia on latex by weight. A latex compound is prepared by adding chemicals to the latex in a sequence of batch operations. The additives include fatty acid soap (stabilizer), sulfur (cross-linking agent), zinc dibutyldithiocarbamate (accelerator), zinc oxide (activator), alkylated phenols (anti-oxidant) and titanium dioxide (pigment). After mixing with the chemicals, the latex is left to mature for one day before its utilization in glove manufacturing.

The manufacturing process uses the coagulant dipping technique and an automatic chain drive system. The dipping process begins with cleaning of the porcelain formers and finishes with stripping of the gloves from the formers. Although the technology adopted for glove manufacturing is widely used by latex glove manufacturers since it is practical and has low operating costs, environmental considerations had not been fully incorporated in the design resulting in significant environmental concerns.

The occurrence of residual soluble proteins in latex gloves has the potential to cause allergic reactions in sensitized individuals and their release into the wastewater.

The wastewater from the PPGM factory is treated on site in an effluent treatment plant utilizing a chemical flocculation, anaerobic digestion and activated sludge process. Hazardous chemical sludge containing zinc is produced. Legislation require PPGM to collect, transport, treat and finally dispose of the sludge to a central treatment facility. PPGM is also required to treat its effluent to comply with the existing regulatory standards. The effluent standards with which PPGM is expected to comply are that the zinc concentration in the final discharge be less than 1 mg/l and Chemical Oxygen Demand (COD) is to be less than 50 mg/l.

This example concentrates on starting an EPE process. PPGM does not have an environmental policy and no environmental management system is in place, but the management of PPGM has agreed to evaluate its environmental performance following the principles of ISO 14031. In this example, the company is attempting to reflect the relationship between the indicators for EPE and the company's environmental performance criteria.

#### Planning EPE

The management of PPGM decided to plan their EPE based on the environmental aspects related to the company's activities, the views of selected interested parties and some selected environmental performance criteria.

The important environmental aspects of the company's products and activities were identified as indicated in Table D.1.

TABLE D.1 - Important Environmental Aspects of PPGM

| Product/<br>Activity          | Environmental Aspect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Potential Impact/Effect                                                                                                                                                              |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rubber glove                  | <ul style="list-style-type: none"> <li>Disposal of rejected gloves (i.e., those not meeting product specifications)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Soil and ground water contamination through land application and air pollution through open burning</li> </ul>                                |
| Latex compounding             | <ul style="list-style-type: none"> <li>Addition of chemicals (e.g., stabilizers, curatives, protective agents, pigments, defoamers) in latex compounding</li> <li>Discharge of residual latex containing toxic chemicals</li> <li>Addition of sulfur powder during latex compounding and emission of sulfur dust</li> <li>Mixing of ammonia-preserved latex in open tanks and emission of ammonia vapor</li> <li>Washing of latex mixing and storage tanks and generation of hazardous solid waste (residual latex coagulum containing toxic chemicals)</li> <li>Generation of hazardous liquid waste containing high concentrations of zinc and COD</li> </ul> | <ul style="list-style-type: none"> <li>Soil and ground water contamination through land application</li> <li>Water pollution</li> <li>Health-related problems for workers</li> </ul> |
| Leaching of gloves with water | <ul style="list-style-type: none"> <li>Discharge of effluent from leaching tanks</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Water pollution</li> </ul>                                                                                                                    |

After reviewing public statements, minutes of meetings and discussions with interested parties, the important interested parties were identified as indicated in Table D.2.

TABLE D.2 - The Views of Interested Parties

| Interested Parties                                        | Expected View                                                                                                                                                                |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Department of the Environment                             | <ul style="list-style-type: none"> <li>Treated effluent shall comply with regulatory requirements</li> </ul>                                                                 |
| Export market (e.g., U.S.A. Food and Drug Administration) | <ul style="list-style-type: none"> <li>Level of extractable protein in rubber gloves shall be less than or equal to 0,3 mg extractable protein per gram of rubber</li> </ul> |
| Public water treatment plant operator                     | <ul style="list-style-type: none"> <li>Quality of river water at the intake which may be affected by the effluent discharged from the PPGM factory</li> </ul>                |
| PPGM top management                                       | <ul style="list-style-type: none"> <li>Cost effectiveness of environmental control measures</li> </ul>                                                                       |
| Local community                                           | <ul style="list-style-type: none"> <li>PPGM's operations shall not cause any nuisance</li> </ul>                                                                             |

In the plan for development of the EPE process, the following environmental performance criteria were selected :

- total compliance with regulations;
- zero public complaint on its operations;
- minimal adverse environmental effect (e.g., meet ambient air quality standards);

- maintaining the number of pieces of gloves rejected to be less than 5% of the total pieces of gloves produced, in accordance with product specification.
- maintaining the level of extractable protein in gloves at less than or equal to 0,3 mg extractable protein per gram of rubber.

The PPGM management plans to implement the following environmental management programs to address its environmental performance :

- reduction of extractable protein level in gloves;
- improvements in effluent treatment plant efficiency;
- waste minimization through process modification;
- monitoring of surface water quality upstream and downstream of the PPGM factory.

### Selecting indicators for EPE

PPGM selected indicators for EPE to provide information on management efforts, performance of its operations and the condition of the environment as a direct consequence of the implementation of environmental management programs. The management of PPGM has also established the objectives and targets to be achieved within a specified time-frame for each of the programs. The indicators selected are more meaningful with the establishment of these objectives. The PPGM has also set up a project plan for each program. The project plan lists the activities to be carried out, the time frame, the resources, and the responsibilities associated with each activity.

The indicators selected in relation to environmental performance criteria are presented in Table D.3.

**TABLE D.3 - Selected Indicators for EPE**

| Indicators for EPE                                                                                            | Basis for Selection of the Indicator                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Management Performance Indicators (MPIs)</b>                                                               |                                                                                                                                                                      |
| • Annual total cost of implementing environmental programs.                                                   | • For the evaluation of management commitment (i.e., useful public relations material).                                                                              |
| • Number of environmentally-related complaints received by PPGM per year.                                     | • For evaluation against the environmental performance criterion on zero public complaint.                                                                           |
| • Number of effluent samples analyzed monthly not complying with regulatory standards.                        | • For evaluation against the environmental performance criterion on total compliance with regulations.                                                               |
| <b>Operational Performance Indicators (OPIs)</b>                                                              |                                                                                                                                                                      |
| • Number of pieces of gloves rejected in relation to the total number of pieces of gloves produced per month. | • For evaluation against the environmental performance criterion on controlling rejects in order to reduce wastes.                                                   |
| • Extractable protein level of glove measured in milligrams of extractable protein per gram of rubber.        | • For evaluation against the environmental performance criterion on eliminating the potential cause of protein allergy (This information is useful to the U.S. FDA). |
| • Quantity of zinc in kilograms discharged to the receiving watercourse per month.                            | • For evaluation against the environmental performance criterion on minimizing wastes.                                                                               |
| • COD load in kilograms discharged to the receiving watercourse per month.                                    | • For evaluation against the environmental performance criterion on minimizing wastes.                                                                               |
| • Quantity of dried sludge in kilograms produced per month.                                                   | • For evaluation against the environmental performance criterion on minimizing wastes.                                                                               |

| Indicators for EPE                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Basis for Selection of the Indicator                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Environmental condition indicators (ECIs)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>Incidence of protein allergy associated with the use of rubber gloves by sensitized individuals (i.e., number of official reports per year).</li> </ul>                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>For evaluation against the environmental performance criterion on eliminating the potential cause of protein allergy.</li> </ul>                                                                                              |
| <ul style="list-style-type: none"> <li>Changes in the quality of surface water upstream and downstream of the factory's effluent discharge point. This indicator is based on the test for inhibition of oxygen consumption by activated sludge as carried out in accordance with the ISO 8192 procedure. The specific indicator is the percentage of change in EC 50 value where EC 50 is defined as the concentration which inhibits the oxygen consumption by 50%.</li> </ul> | <ul style="list-style-type: none"> <li>For evaluation against the environmental performance criterion on ensuring the environment is not adversely affected by PPGM's operations (This information will be useful to the water treatment plant operator).</li> </ul> |

### Using data and information (Collecting, analyzing, and converting data)

Some of the indicators require raw data collection on a regular basis, analysis of the collected data and conversion of the data into indicators. For example, the indicator on the quantity of zinc discharged to a watercourse per month requires regular measurements of effluent flow rates and zinc concentrations in the effluent. The PPGM management uses a commercial software to enable the collected data to be stored and managed. The computer software has the capability to display the analyzed data in a graphical form and to show the trend of the various indicators with time. The information can be incorporated in a report, prepared using a word processor, for communication to interested parties on a regular basis.

### Reviewing and improving EPE

PPGM may consider adding more indicators, for example, on the consumption of toxic chemicals, energy and water. The company's management will also consider implementing an environmental management system to improve the use of EPE in the company.

### Summary/conclusions

PPGM recognizes the need for EPE and in general the need for the company to embark on an EMS following the ISO 14001 system to maintain competitiveness in its industry.

If you have questions or require additional information regarding this example, please contact the ISO member body for Malaysia:

Department of Standards Malaysia (DSM)  
 21st Floor, Wisma MPSA  
 Persiaran Perbandaran  
 40675 Shah Alam  
 MY-Selangor Darul Ehsan Malaysia  
 Telephone: 60 3 559 80 33  
 Fax: 60 3 559 24 97  
 E-mail: [central@dsm.gov.my](mailto:central@dsm.gov.my)