

French Standard

NF E 01-005

Classification index : E 01-005

ICS :

T1 Mechanical products

T2 Eco-design methodology

T3

D : Mechanische Produkte — Umweltgerechte Gestaltung (Okodesign)

F : Produits mécaniques — Méthodologie d'éco-conception

French standard approved by decision of the Director General of AFNOR on taking effect on.....

Replaces the experimental standard XP E 01-005, March 2009

Correspondence

At the date of publication of this document, there does not exist any CEN nor ISO work dealing with the same subject.

Analysis

This document is intended for enterprises already aware of the issue of integrating environmental concerns into their product design; it proposes a practical eco-design approach tailored to fit SMEs, enabling them to integrate environmental concerns into their projects as input data. This document also proposes a framework to take benefit from the approach (environmental claim).

Descriptors

International Technical Thesaurus :

Modifications :

Compared with the previous version, addition of explanations and examples of application ; addition of the conditions of environmental claim (clause 4).

Corrections

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Members of the standardisation committee

President: Mrs DAUBRESSE

Secretariat: Mrs KOPLEWICZ and Mr BEZOS - UNM

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Mr	ZANLORENZI	OUEST CONSTRUCTIONS FRIGORIFIQUES



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Introduction

This standard is based on the MAIECO method, research for which was funded and supervised by CETIM and ENSAM (thesis by Stéphane LE POCHAT, ENSAM-Paris, November 2005). Following its application by CETIM in several industrial projects, the method has been adapted based on past experience feedback, and then formalized into an experimental standard, as part of the MAPECO project supported by ADEME, with the participation of the following experts: Amandine AUTHIER (CETIM), Franz BARNABE (CETIM), Rim CHAOUY (AFNOR), Daniel FROELICH (ENSAM Chambéry), Danielle KOPLEWICZ (UNM), Samuel MAYER (CCI – Saint-Etienne), Lionel MELETON (CETIM), Pascal ROBERT (AFNOR), Chrystel SIMONE (CARMA). This MAPECO project in addition made it possible to accompany four enterprises (AERECO, SIL, Mecafonction, SKF Aeroengine) in the implementation of this experimental standard and to take into account their remarks to prepare the final version of this standard. The Appendix F gives an account of these experiments

This standard also takes account of other existing tools, in particular ECODIS, a European programme with which the FIM is associated.

This standard, which is specifically tailored to SMEs, targets persons who are directly involved in the design and development of mechanical products, as well as managers responsible for defining corporate policies, and decision-makers. This standard is not intended to be used for certification purposes. The proposed method and the environmental profile are intended to kick-start eco-design initiatives within companies as part of a teaching and continuous improvement approach.

1 Scope

This standard proposes an eco-design method that is tailored to mechanical products, and that takes account of the guidelines developed in XP ISO/TR 14062 *Environmental Management — Integrating environmental aspects into product design and development*.

NOTE For this standard, "mechanical products" mean products manufactured by enterprises from mechanical engineering and metalworking industry; they can be capital goods (machinery, production systems, components), tools, household goods, optical parts, measuring instruments.

This standard addresses enterprises which have decided to integrate an eco-design approach aimed at minimising the negative environmental impacts of their products throughout their life cycle.

Application of this standard assumes that the enterprise has the relevant in-house or outsourced environmental competencies.

This standard also proposes a claim template that enterprises may use as part of the communication on their environmental approach.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1

eco-design

integration of environmental characteristics into product design with the aim of improving the environmental performance of the product throughout its whole life cycle

NOTE eco-design consists in integrating environmental aspects as from the product design phase, whether this involves goods, services or processes. This integration is based on a global, multi-criteria environmental approach and is based on the consideration of all stages of the product life cycle.

[adapted from Directive 2005/32/EC and ADEME]

2.2

environmental aspect

element of an organization's activities, products or services that can interact with the environment

[ISO 14001]

NOTE For this standard, this definition is used in a limited meaning; environmental aspects correspond to: Raw Materials, Manufacturing, Use, Recycling at product end-of-life, Substances, Transportation and Packaging.

2.3

design guideline

rule intended to improve a specific environmental aspect of the product life cycle

2.4

set of design guidelines

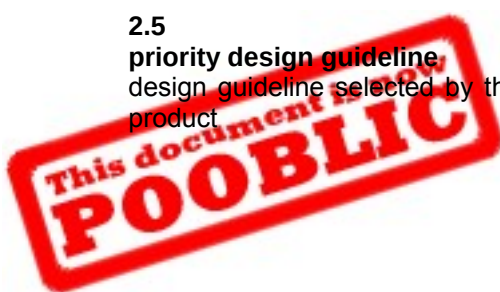
collection of the design guidelines relevant for the product, as assessed by the enterprise, and which will be reviewed at the end of the design phase

NOTE The set of design guidelines forms the state of the art in terms of development directions targeting the eco-(re)design of products

2.5

priority design guideline

design guideline selected by the project team from the set of design guidelines, to be mandatory applied to the product



2.6

environmental profile

environmental description of the product at a given moment in time, produced by ranking the product's environmental aspects over its life cycle

2.7

guideline indicator

GD indicator

qualitative or quantitative indicator representative of a given guideline, used to track this guideline during the design phase.

2.8

environmental aspect indicator

EA indicator

qualitative or quantitative indicator associated with each environmental aspect, as representative as possible of this environmental aspect, used to keep a multi-criteria view of the environmental quality of the product during its development.

NOTE When relevant, the guideline indicator can be used for the environmental aspect

3 Requirements

3.1 Project team

Application of the method described in this document shall be monitored by a multidisciplinary project team with recognised environmental competencies, supported by management, and involving all corporate functions likely to be impacted (R&D, Design Office, Purchasing, Industrialisation, Logistics, Marketing, etc.).

Management shall be involved at the key steps of the method, especially when ranking the guidelines (see subclause 3.2.3.2, strategic score). It shall ensure the availability of resources essential to implement the project.

NOTE The team concept is used with the meaning of combining different competencies and functions, and does not necessarily involve different physical persons.

Annex E identifies project review phases that shall be validated by the project team.

3.2 Eco-design method

3.2.1 General

The method described in this standard is based on the 5 steps set out below, which are also part of the design process (see figure 1), and which shall be applied successively in accordance with the requirements stated in 3.2.2 to 3.2.5:

- step 1: determination of the environmental profile of the product to be (re)designed
- step 2: selection/ranking of design guidelines
- step 3: choice of environmental indicators
- step 4: monitoring of indicators
- step 5: assessment – building on experience

NOTE 1 This method is particularly well suited to the redesign of an existing product; it can also be applied to new designs provided that there is a formal statement of the assumptions required for project roll-out.

To justify the implementation of this standard during the design of a product, the enterprise shall be able to tender as evidence all the documents stated in Annex E, and identified at each step.

NOTE 2 When applying this method, management of the enterprise enters a competency acquisition process with the aim of defining and/or confirming its strategy for eco-design, modifying its design process to enable the environmental issue to be taken into account, and creating new knowledge.

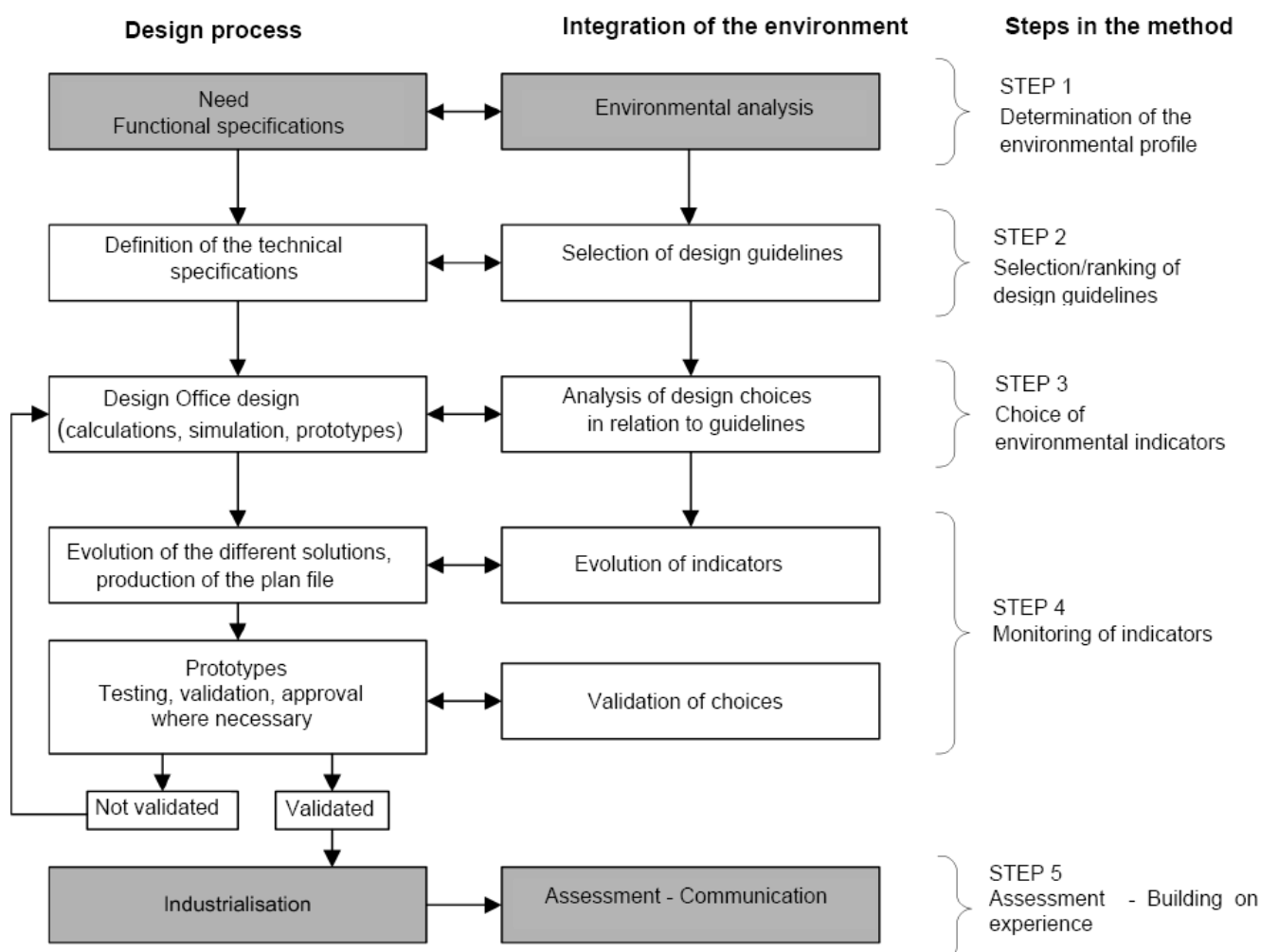


Figure 1

3.2.2 Step 1: determination of the environmental profile of the product to be (re)designed

3.2.2.1 Objective

This step shall make it possible to rank the 7 environmental aspects listed below according to their relative importance for the environmental impact of the product:

- Raw materials (RM): aspect relating to the choice of materials, components (purchased), and fluids used in the product composition (excluding packaging), ...
- Manufacture (M): aspect relating to all the processes required to develop the product and components (excluding packaging), internally and externally (number of parts, "polluting" operations, etc.), ...
- Use (U): aspect relating to all the resources required to use the product (energy-using product, energy source, energy interaction with an assembly, product requiring consumables, servicing, product life time, etc.), ...
- Recyclability at product end-of-life (PEL-R): aspect taking account of the reduction of the product impact at end-of-life and of its recyclability rate.

- Hazardous substances (S): aspect relating to substances contained in a product likely to penalise product end-of-life (heavy metals, flame retardants, fluorine atoms, bromium, chlorine, etc.), ...
- Transportation (T): aspect relating to the geographic distribution (regional, national, European, worldwide) of the number of suppliers and subcontractors, shipment volumes, etc.
- Packaging (Pkg.): aspect taking account the amount, reuse, recyclability, biodegradability of packaging, etc.

NOTE At this stage of the method, it is important to understand that the obtained environmental profile gives a description of the most important environmental aspects to consider during the eco-design of the product, even if these aspects are already partly considered by the enterprise. This profile is not aimed to identify strong and weak points of the product.

EXAMPLE 1 a product is made of renewable RM ; however the score for RM environmental aspect is at level 4 in the environmental profile. This score of 4 means that RM aspect plays a very important role in the global environmental profile of the product, compared with the other aspects. If enterprise has already chosen renewable MP, it shows that this choice was relevant and it will be possible to take advantage of it when ranking the design guidelines (see 3.2.3.2), but this choice does not modify the environmental profile.

EXAMPLE 2 a product has a very low energy consumption compared with another product of the product line ; however the score for the environmental aspect U is at level 4 for both. The score of 4 means that U aspect (related to energy consumption) plays a very important role in the profile of both products, compared with the other environmental aspects. This score does not allow to conclude that one of both products is more energy-efficient. For that, the use of indicators is provided (see 3.2.4).

WARNING The proposed environmental profile is not aimed to compare two products, even similar. Moreover, it is not intended to communicate about the environmental performance of the product.

3.2.2.2 Procedure

Draw up the product Bill Of Materials (see example in Table E-2, Annex E).

NOTE 1 In case of design of a new product, the BOM of a similar product can be used as reference for the analysis.

Complete the environmental questionnaire (see Annex A), answering all the questions using the choices given in the questionnaire only (the answer "don't know" is ranked the most unfavourable); give reasons for the answers; these will then be used to draw up the product's environmental profile and define design directions.

Apply the analysis algorithm given in Annex B based on the answers to the questions.

Register the scores obtained for each environmental aspect

NOTE 2 These scores may be given in graph format (see figure 2)

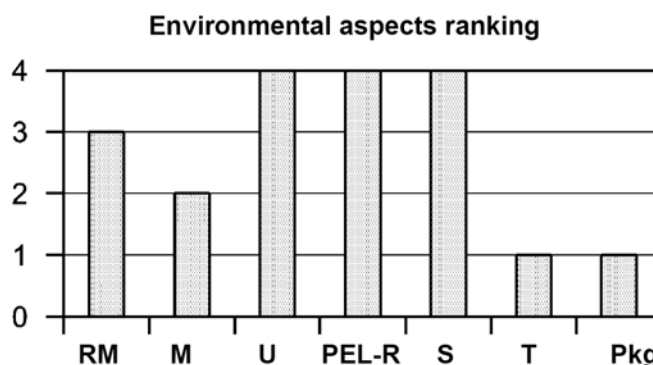


Figure 2

3.2.2.3 Documents to be produced

The following documents shall be available prior going to step 2:

- BOM (see template in Table E-2);
- Completed questionnaire with reasoned answers;
- Product environmental profile.

3.2.3 Step 2: selection/ranking of design guidelines

3.2.3.1 Objective

For each environmental aspect derived from step 1, relevant Guidelines (GD) on how to improve the product's environmental performance shall be proposed and ranked, taking into account the other technical, economic and strategic constraints relating to the design project.

3.2.3.2 Procedure

Using Annex C, select the Guidelines (GD) that are most relevant to the product's environmental profile.

NOTE 1 The GD proposed in Annex C are general guidelines. The enterprise should reappropriate these guidelines by developing and reediting them to fit the product under study (reformulation of the proposed GD or identification of design directions based on the core theme of the proposed GD).

Rank the guidelines (GD) by weighting them using the following three scores:

- Environmental score: allocate each GD with the environmental score for its related environmental aspect, as derived from the environmental profile (see Table 1).

Table 1

Environmental score	0	1	2	3	4
= Derived from the environmental profile	GD not selected	GD not particularly relevant	GD moderately relevant	GD likely to be selected	GD to be selected in priority

- Technical score: eliminate any GD that are irrelevant from a technical point of view so as to keep only GD that are technically feasible even if this involves a significant input from R&D. Rate the GDs, with a special focus on tangible improvement directions for the product under study (these directions can be identified based on knowledge of the product); also, rely on the tools available within the enterprise (Brainstorming) (see Table 2).

Table 2

	0	1	2	3	4
Technical score	Improvement direction not technically feasible – no opportunities in the Customer specifications	GD that cannot be eliminated from a technical perspective, but the improvement directions could conflict with other major constraints (large-scale investments, qualifications/requalification, safety, etc.)	Improvement direction likely to be considered, but preliminary R&D studies required. Medium to long-term	Existing technical solution – feasibility to be tested – fairly high implementation cost	Solution that can be rolled out to a short timescale and at an acceptable cost or Solution already rolled out by the enterprise or Product characteristic that the enterprise wants to promote.

NOTE 2 Technical score allows to give value to design solutions which confer to the product good environmental performances. When a product characteristic is already very good, possible action to improve it is low. This does not contradict the fact that this environmental characteristic is relevant and should not be downgraded; consequently the corresponding GD is relevant from a technical perspective.

EXAMPLE The recyclability rate of a product is assessed to 90 % using the simplified formula. However, GDs "Facilitate reuse of the product" or "Use recyclable materials" are fully relevant for this product.

- Strategic score: allocate the strategic score, generally determined by enterprise management and/or by project team members, according to the strategic interest of the considered guideline (see table 3).

Table 3

	1	2	3
Strategic score:	Solution that conflicts with other enterprise strategic directions or with the customer's specifications	Solution of "neutral" strategic importance but that offers certain advantages in terms of brand image (in relation to other business sectors, social pressures, etc.)	Solution with a top-ranking strategic advantage: (regulations/specifications/customer requests, savings on certain steps in the life cycle, etc.)

NOTE 3 Consistency between enterprise strategy and eco-design GDs is a key factor of the method. It makes necessary to engage and involve the top management of the enterprise to ensure appropriate support when the essential design choices are made.

Determine the final score for each of the guidelines by applying a formula selected by the project team; this formula reflects the importance that the project team wishes to allocate to each criterion, and therefore weights each of the Environmental, Technical and Strategic scores.

NOTE 4 As the purpose of an eco-design project is theoretically to minimise the environmental impact of the product life cycle, it is logical to rank the Environmental score at least on the same level as the Technical and Strategic scores.

NOTE 5 Scores should be recalculated with each new product design/redesign as they (the Technical score in particular) may change from one design to the next.

Draw up the " set of GDs " which represents all the GDs to be tracked; selecting at least 1 GD with the highest Environmental score and, possibly, eliminating the lowest-scoring GDs in order to restrict their number to a reasonable minimum.

Identify the number of priority/compulsory GDs (referred to as PGD) required by the eco-design specifications, making sure to apply the classification in decreasing order of importance to each environmental aspect (a template eco-design specification is given in Annex E).

NOTE 4 It is advised not to choose more than three Priority Guidelines (PGD).

3.2.3.3 Documents to be produced

The following documents shall be available prior going to step 3:

- Scoring of guidelines; reasons given;
- List of priority guidelines / eco-design specifications (see template, Table E.3)

3.2.4 Step 3: choice of environmental indicators

3.2.4.1 Objective

Each Priority Guideline shall be linked to a qualitative or quantitative indicator, referred to as the "GD indicator" (see Annex C) which is used to track the various possible scenarios during the design phase. This indicator may be target-linked.

NOTE The target may be determined via comparison with similar products.

Each relevant Environmental Aspect (EA) shall also be represented by an indicator called "EA indicator", which, together, form the product's environmental reference framework; the objective is to maintain a multi-criteria view of the product's environmental quality throughout its development in order to detect any drift, including that concerning "minor" Environmental Aspects.

3.2.4.2 Procedure

Define an indicator for each Priority Guideline ("GD indicator") (see Annex C).

NOTE 1 It is not required to characterise every "GD indicator" in quantitative terms. A decision can be taken based on a simple upwards or downwards "trend".

Define a "EA indicator" for each Environmental Aspect. This indicator shall be as representative as possible of the environmental impact of the relevant aspect; it can be chosen in the list of GD indicators or built by combination (Examples are provided in Table C.2).

Where appropriate, do not affect "EA indicators" for insignificant Environmental Aspects (i.e. with a very low Environmental score) and for which the enterprise has no action possibilities (Technical score = 0).

NOTE 2 A "EA indicator" may combine several "GD indicators". If there is only one single Priority Guideline for the given Environmental Aspect, the GD indicator may also be used as the EA indicator provided that this indicator is representative of the environmental impact for this particular aspect.

Define the tools required to characterise the GD indicators and EA indicators (a non-exhaustive list of tools is given in Annex D for information).

Make sure that the tools relating to GD indicators and EA indicators are developed and operational for the project.

Calculate quantitative indicators as far as possible.

3.2.4.3 Documents to be produced

The following documents shall be available prior going to step 4:

- List of selected GD indicators and EA indicators, together with any targets and reasons for the choices
- List of tools identified and set up
- Values of GD indicators and EA indicators for the reference product

3.2.5 Step 4: monitoring of indicators

3.2.5.1 Objective

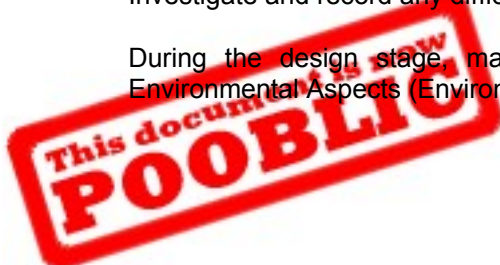
Design choices shall be assessed using GD indicators specific to each guideline in order to confirm the defined directions, identify any problems and propose the necessary actions.

3.2.5.2 Procedure

Throughout the whole design process, consider the GD indicators for Priority Guidelines (during project reviews, for example) and check their relevancy.

Investigate and record any difficulties relating to use of the tools (see Annex D).

During the design stage, make sure, at least, not to downgrade "EA indicators" for the most important Environmental Aspects (Environmental score = 4).



3.2.5.3 Documents to be produced

The following documents shall be available prior going to step 5:

- Evolution of GD indicators for priority guidelines
- Evolution of EA indicators for the most important EA
- Recording of difficulties relating to use of the tools

3.2.6 Step 5: assessment – building on experience

3.2.6.1 Objective

The project shall be assessed on the following points:

- product environmental quality - both pre and post-design (compliance with indicators -targets or trends- for the Priority Guidelines, no downgrading of EA indicators)
- implementation of the method (organisation, tools, etc.)
- building on experience

3.2.6.2 Procedure

3.2.6.2.1 Environmental quality

Characterise changes in GD indicators.

Calculate EA indicators at the post-design stage and, where possible, compare them against pre-design EA indicators.

Identify which answers in the environmental questionnaire have changed, and possible changes in the product's environmental profile.

3.2.6.2.2 Implementation of the method

Analyse the reliability and relevance of the tools used.

Assess the relevance of the priority guidelines, and of the other guidelines of the set of design guidelines (see the selected guidelines at step 2); investigate whether the design impacts the guidelines that were not selected.

Assess the behaviour of the project team, in particular the involvement of all the necessary corporate functions (R&D, Design Office, Purchasing, Industrialisation, Logistics, Marketing, etc.) to conclude the project from technical and organisational perspectives.

3.2.6.2.3 Building on experience

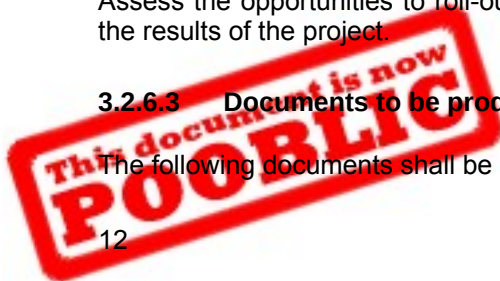
Manage the knowledge acquired during the project, so as to be able to reuse it for new projects in the view of building up a set of "routine" practices during the design process.

Propose modifications of the design process to allow consideration of the environmental issues.

Assess the opportunities to roll-out the method to other products of the product line or to close lines by including the results of the project.

3.2.6.3 Documents to be produced

The following documents shall be available at the end of step 5:



- Full eco-design specifications
- Assessment of the relevance of the tools used and the selected guidelines
- Building-on-experience process deployed

4 Environmental claim

The manufacturer may decide to benefit from the implementation of this approach for some or all of its products by issuing a self-declared environmental claim meeting the requirements of ISO 14021. The manufacturer is free to decide on the format of this claim (physical marking on the product, label on the product, information included in the product instruction leaflet, etc.).

The content of this claim shall refer to this standard, for instance by stating "Product subject to an eco-design approach in accordance with NF E 01-005".

This claim may also include any information on the product's environmental performance that the enterprise judges useful to communicate.

NOTE This claim does not replace the environmental labelling or marking which can be requested by a specific regulation (for instance, consumer products or products covered by the directive EuP).

In any case, the enterprise shall make available a document (table or diagram) summarising changes in GD indicators for priority guidelines and EA indicators. This document shall also state the reference to the methods used for calculating or measuring these indicators (an example is provided in Table 4).

Table 2 — Template for GD indicators of priority guidelines and for EA indicators (pre and post-redesign)

EA	GD indicator for priority guideline	Value of GD indicator		EA indicator	Value of EA indicator		Calculation or measurement method
		Pre-redesign	Post-redesign		Pre-redesign	Post-redesign	
RM	Mass (kg)	105	98	CO2 impact for the materials used in the product (kg CO2 eq.)	288	257	Internal method XXX
..	..	..	..	..	..	..	..



Annex A (normative)

Environmental Questionnaire

This Annex contains the environmental questionnaire to be completed by the enterprise, with the possible addition of other questions applicable to the product under study. As a preliminary, the product subject to the project and its context shall be described.

NOTE Answers to questions marked with an asterisk are used to produce the product's environmental profile from the algorithm given in Annex B. Answers to other questions provide input to the enterprise's thinking on design guidelines and are used in the overall assessment.

REMINDER Answer all the questions using only the choices given in the questionnaire (the answer "don't know" takes the lowest ranking); give reasons for the answers.

Description of the product subject to the project and of its context

Product name (trade designation, project reference, etc)	
Description of the product	
Main technical characteristics of the product	
Does the product included into a product line? If yes, give its reference	
State whether the answers to the questionnaire representative: • Of the product only • of a complete line of products developed by the enterprise • of all the products developed by the enterprise	
Types of markets aimed for the product (B to B/B to C, industrial sectors ...)	
Known (stated) expectations from these markets in terms of environment linked to the eco-design strategies or guidelines (see Annex C)	

A.1 Regulation

▪ WEEE*

Is your product covered by Directive 2002/96/EC governing waste electrical and electronic equipment (WEEE)?

☐ Yes

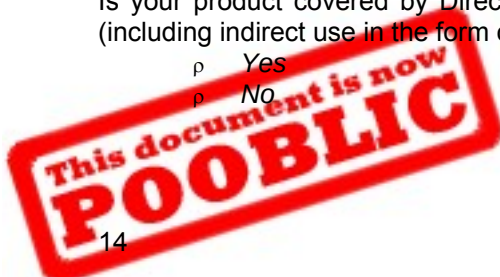
☐ No

▪ RoHS*

Is your product covered by Directive 2002/95/EC governing the restriction on the use of hazardous substances (including indirect use in the form of a component of a system covered by this directive)?

☐ Yes

☐ No



▪ End-of-life vehicles (ELV)*

Is your product covered by Directive 2000/53/EC governing end-of-life vehicles (including indirectly in the form of a component of a system covered by this directive)?

- ☐ Yes
☐ No

▪ EuP*

Is your product covered by Directive 2005/32/EC governing the eco-design of energy using products, and is it subject to any execution measures?

- ☐ Yes
☐ No

▪ Packaging*

Is your product covered by Directive 2004/12/EC governing packaging?

- ☐ Yes
 ☐ As a packaged product
 ☐ As a packaging product
☐ No

▪ Other regulations* (in particular, regulations for placing "products" on the market)

Is your product subject to any other regulation covering one or more environmental aspects?

- ☐ Yes
☐ No

A.2 Environmental assessment

A.2.1 Raw materials (excluding packaging)

1) Does your product contain any rare materials¹

- ☐ Yes
 ☐ Zinc
 ☐ Copper
 ☐ Nickel
 ☐ Lead
 ☐ Silver
 ☐ Tin
 ☐ Other
☐ No

2) Apart from metal, does your product contain any recycled materials²?

- ☐ Yes
☐ No
☐ Don't know

3) Does your product contain any renewable materials³?

- ☐ Yes
☐ No

¹ In the absence of any specific definition for the given industrial sector, materials are considered as rare materials when their known stock is less than 50 years of use at their rate of current consumption

² Material which has been reintegrated into the production process by taking a material reclaimed via a manufacturing process and then re-processed into a finished product, or into a component to be integrated into a product (ISO 14021:1999). It includes materials from manufacturing waste, also called pre-consumer material, as well as materials from products at end of life, also called post-consumer material.

³ Material which can be restocked in a short timeframe, at human scale and at a cadence at least equal to their rate of consumption (animal, plant production, etc.). Petrol, natural gas and metal ores are all non-renewable resources, as is water which has a cycle that can largely exceed a human lifetime.

A.2.2 Manufacture⁴ (excluding packaging)

- 4) *How many parts does your product contain⁵? A template BOM is given in Annex E.
- ☐ 1-10
 - ☐ 11-50
 - ☐ 51-100
 - ☐ > 100
- 5) Of all the manufacturing operations covering the product and its components, is the greatest number of operations presenting an environmental risk⁶ performed:
- ☐ Mostly at your suppliers and subcontractors
 - ☐ Mostly at your internal manufacturing site

A.2.3 Use

- 6) *Does your product use energy during its use phase?
- ☐ Yes
 - ☐ No
- 7) If yes, what type of energy does it use (direct product power source)?
- ☐ Electricity
 - ☐ Primary energy (petroleum products, gas, etc.)
 - ☐ Renewable energy or energy generated by a reclamation process
- 8) *Is your product intended to be integrated into a larger assembly (vehicle, hydraulic circuit, refrigeration system, machinery, etc.)?
- ☐ Yes
 - ☐ No
- 9) If your product is integrated into a larger assembly (equipment, machine, etc.), is it likely to modify the normal operating performance of this assembly (efficiency⁷ lifetime, etc.)?
- ☐ Yes
 - ☐ No
- 10) *If your product is integrated into an assembly, what is its lifetime compared with this assembly (for normal operating, according to the recommendation of use)?
- ☐ Longer lifetime
 - ☐ Similar lifetime
 - ☐ Shorter lifetime

⁴ Manufacturing includes material working and treatment as well as the assembly of products and components. It does not take into account raw materials digging and making.

⁵ It is advisable to decompose the product and its components up to the most elementary level (i.e. up to the mono-material), with the aim not to penalize the recyclability rate. For purchased components, details on parts and materials is usually not known. Number of parts, nature and quantity of materials can be assessed either from technical data sheet and maintenance notice, or by asking the supplier. Without this information, the component will be considered as one single non-homogeneous material, and thus will penalize the recyclability rate. This would give an improvement direction for the future. For fasteners, count one single part per type of fastener.

⁶ Operation that generates emissions in the air, water or ground that present a risk to the environment, or that generates hazardous waste and/or that is highly energy intensive (e.g.: operations involving heat treatments, surface treatments, degreasing, lubricated machining, etc.)

⁷ Example : a tire is a component which has effect on the energy consumption of a machinery due to its rolling friction (coming from overheating)

11) *Does your product operate with consumables⁸ (fluids, seals, etc.) or is it used to apply another product (paint, liquid fertilizer, adhesive, etc.) or does it need to be regularly maintained with specific products during its use phase (example: cleaning products) ?

☐ Yes - Give details

☐ No

12) If yes, does this use generate:

12a) waste⁹

☐ Yes

☐ Hazardous¹⁰

☐ Non-hazardous

☐ No

12b) emissions or leakages (to air, water or ground)

☐ Yes: Draw up a list of these emissions and identify those that present a risk to the environment:

☐ Air

☐ Greenhouse gas (CO₂, methane, CFC, etc.)

☐ Sulphur oxides (SOx)

☐ Nitrogen oxides (NOx)

☐ VOC (hydrocarbons, halogen-containing substances)

☐ Carbon monoxide (CO)

☐ Particles

☐ Other

☐ Water

☐ Heavy metals¹¹

☐ Hydrocarbons

☐ Nitrates

☐ Phosphates

☐ Nitrogen compounds

☐ PCB

☐ Other

☐ Ground

☐ Heavy metals¹²

☐ Hydrocarbons

☐ Halogen-containing substances

☐ Other

☐ Other

☐ No

13) Does the product require preventive maintenance during normal operation throughout its lifetime?

☐ Yes

☐ No

14) *What is the lifetime of your product? State, where applicable, the unit and ranges of associated values considering equivalent products on the market

☐ Very short: (0-2 years or X cycles of operation or)

☐ Short: (2-5 years or X cycles of operation or)

☐ Average: (5-10 years or)

☐ Long: (> 10 years or)

⁸ Product, element or substance required for operation, with a use period limited to its wear or consumption period (battery, oil filter, printer cartridge, etc.) and shall be renewed or replaced – in some cases, wear parts (such as seals, tire gums) can be considered as consumables.

⁹ Waste being considered is "any residue from a process involving production, processing or use; any substance, material, product or, more generally, any movable property that has been abandoned or that its owner intends to abandon" (French law of 15 July 1975).

¹⁰ See the European Waste Catalogue (EWC) – Annex to Decision 94/3/EC

¹¹ Main hazardous heavy metals for aquatic environment : Ag, Al, As, Cd, Cr VI, Cr III, Cu, Fe, Hg, Ni, Pb, Sn, Zn

¹² Main hazardous heavy metals for ground : As, Cd, Cr, Cu, Hg, Ni, Pb, Zn

15) *Is your product (several possible answers):

- ☐ Single use (cartridge for cartridge-operated fixing tool, etc.)
☐ Occasional use (lawn-mower, etc)
☐ Frequent Intermittent or Continuous use (pump, machine tool, etc.)

A.2.4 Recyclability at product end-of-life (excluding packaging)

16) *Indicate the product's estimated recyclability rate:

$$Tr = (M_r/M_{tot}) * 100 \text{ (Tr expressed in \%)}^{13}$$

where

M_{tot} = total mass of the product (excluding packaging)

M_r = mass of recyclable and potentially recycled in the purchased components and the parts of the product

$$= \sum a_i * m_i$$

m_i = mass of material or purchased material or part i

a_i = recyclability rate for the material, purchased material or part i

with the following approximations :

a_i = 1 for metallic materials

a_i = 0 for plastic materials, except specific data known by the enterprise

a_i = 0,8 for purchased components or parts made of several unidentified metals

a_i = 0,5 for purchased components or parts made of metals plus 1 or 2 other non metallic materials

a_i = 0 for purchased components or parts made of several plastics, for dual components or metallic parts encased with plastics, for electronic components

NOTE : This simplified formula can be used as default environmental indicator.

A.2.5 Hazardous substances

17) *Does your product contain any electric or electronic components¹⁴

- ☐ Yes
☐ No

¹³ The proposed formula is to be used as default formula in the absence of a recognised formula (standardised, ...) for the given product.

EXAMPLE :

Components or product parts	m_i (kg)	Material	a_i	$a_i * m_i$
Metal probe	0,8	S235JR (structural steel)	1	0,8
Shower curtain	0,3	Synthetic fiber	0	0
Shower curtain rail	0,15	Steel encased with PVC	0	0
Electronic control box	1,5	Electronic component	0	0
Pump	2,5	Several steels	0,8	2
Box – Basin side	0,6	DC01 (cold rolled steel for drawing)	1	0,6
Box – Cover side	0,3	Glass	0	0
M_{tot}	6,15	M_r		3,4
Tr	55%			

¹⁴ Most of electric and electronic components contain several substances considered as hazardous by Regulation 1272/2008.

- 18) *To the best of your knowledge, does your product (product / components / packaging) contain¹⁵ any of the following substances:
- 18a) Metals or derived metallic elements, classified as hazardous (such as regulated metals: lead, mercury, cadmium, chromium 6)
- ☐ Yes
- ☐ No
- ☐ Don't know
- 18b) Flame retardants in plastics (polybromobiphenyl PBB, polybrominated diphenyl ethers PBDE, etc.)¹⁶
- ☐ Yes
- ☐ No
- ☐ Don't know
- 18c) Molecules containing atoms of fluorine, bromine, chlorine (e.g. PTFE, PVC, etc.)
- ☐ Yes
- ☐ No
- ☐ Don't know
- 18d) Other¹⁷ regulated or at-risk substances on the market?
- ☐ Yes
- ☐ No
- ☐ Don't know

A.2.6 Transport

- 19) * Give the geographic distribution of your suppliers and subcontractors of materials, parts and components of tier N-1, as a percentage of their volume (number or mass of purchased products)¹⁸ (Total = 100%):
- ☐ Regional : ...%
- ☐ France : ...%
- ☐ European : ... %
- ☐ Worldwide : ... %
- 20) Give the geographic distribution of your shipments, as a percentage of their volume (number or mass of sold products):
- ☐ Local (or radius < 100 km) : ...%
- ☐ National (or radius < 500 km) : ...%
- ☐ European (or radius < 1000 km) : ... %
- ☐ Worldwide (or radius > 1000 km) : ... %

A.2.7 Packaging

A.2.7.1 Packaging / Procurements

- 21) Is your procurement packaging:

21a) Reusable¹⁹?

- ☐ Yes, 100%
- ☐ Yes, partly
- ☐ No

¹⁵ Regarding its materials, alloy elements, coatings, surface treatments, inks, dyes, additives, ... Substances used in the manufacturing process of the product are not considered.

¹⁶ Most of plastics used in industry contain flame retardants

¹⁷ Example: phthalates in toys, azo dyes, nickel, etc. See also the Regulation 2006/1907 (REACH) and the list of substances subject to authorisation (<http://echa.europa.eu>)

¹⁸ If relevant (and if the information is available), consider the tiers below N-1.

¹⁹ Characteristics of a packaging that is conceived and designed to accomplish within its life cycle a minimum number of trips or rotations, for the same purpose for which it was conceived.(EN 13429).

21b) Recyclable²⁰?

- ☐ Yes, 100%
- ☐ Yes, partly
- ☐ No

21c) If the packaging is recyclable, do you carry out the sorting process for recycling?

- ☐ Yes
- ☐ No

A.2.7.2 Packaging / shipments

22) Are packagings for grouping and transport (pallet, plastic film-wrap, shuttle boxes, etc.):

22a) Reusable?

- ☐ Yes, 100%
- ☐ Yes, partly
- ☐ No

21b) Recyclable?

- ☐ Yes, 100%
- ☐ Yes, partly
- ☐ No

A.2.7.3 End customer

23) * Does the product include a packaging system²¹ for the end customer?

- ☐ Yes
- ☐ No

24) If yes, how many different packaging materials are there?

- ☐ 1
- ☐ 2
- ☐ 3

25) * If yes, how many packaging components are there?

- ☐ 1
- ☐ 2
- ☐ 3

26) Are packagings:

26a) Reusable?

- ☐ Yes, 100%
- ☐ Yes, partly
- ☐ No

26b) Recyclable?

- ☐ Yes, 100%
- ☐ Yes, partly
- ☐ No

26c) Biodegradable²²?

- ☐ Yes
- ☐ No

²⁰ Characteristic of a packaging that can be picked from the waste flow by the available processes and programmes, and which can be collected, processed and returned to use in the form of a raw material. (EN 13430)

²¹ Sales packaging or "primary" packaging

²² A material is said to be biodegradable when it can be 100% biodegraded, i.e. converted totally into carbon dioxide and/or methane, water and biomass

Annex B (normative)

Analysis algorithm

This annex provides the analysis algorithm to be applied to Step 1 in order to rank environmental aspects, based on the answers to the environment questionnaire (question numbers are identified on the algorithm). When the product is subject to a regulation covering one or more of the 7 environmental aspects, this aspect takes priority status and its score shall be automatically upgraded to 4. This is aimed to ensure that regulatory requirements shall be systematically considered in the projects as priority aspects, whatever the environmental score of this aspect is (see examples in Table B.1).

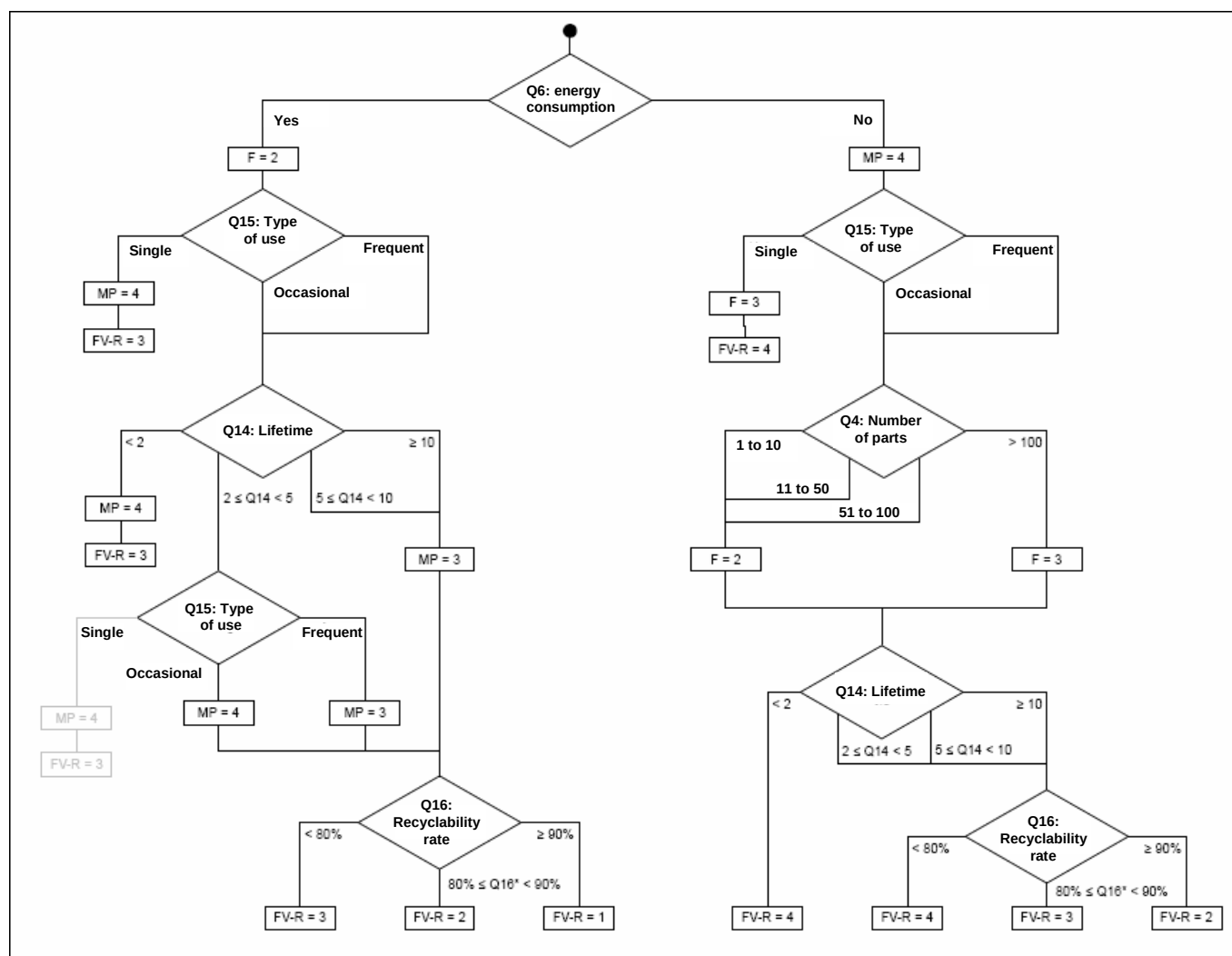


Figure B.1 — Decision-making tree for environmental aspects RM, M, U and PEL-R

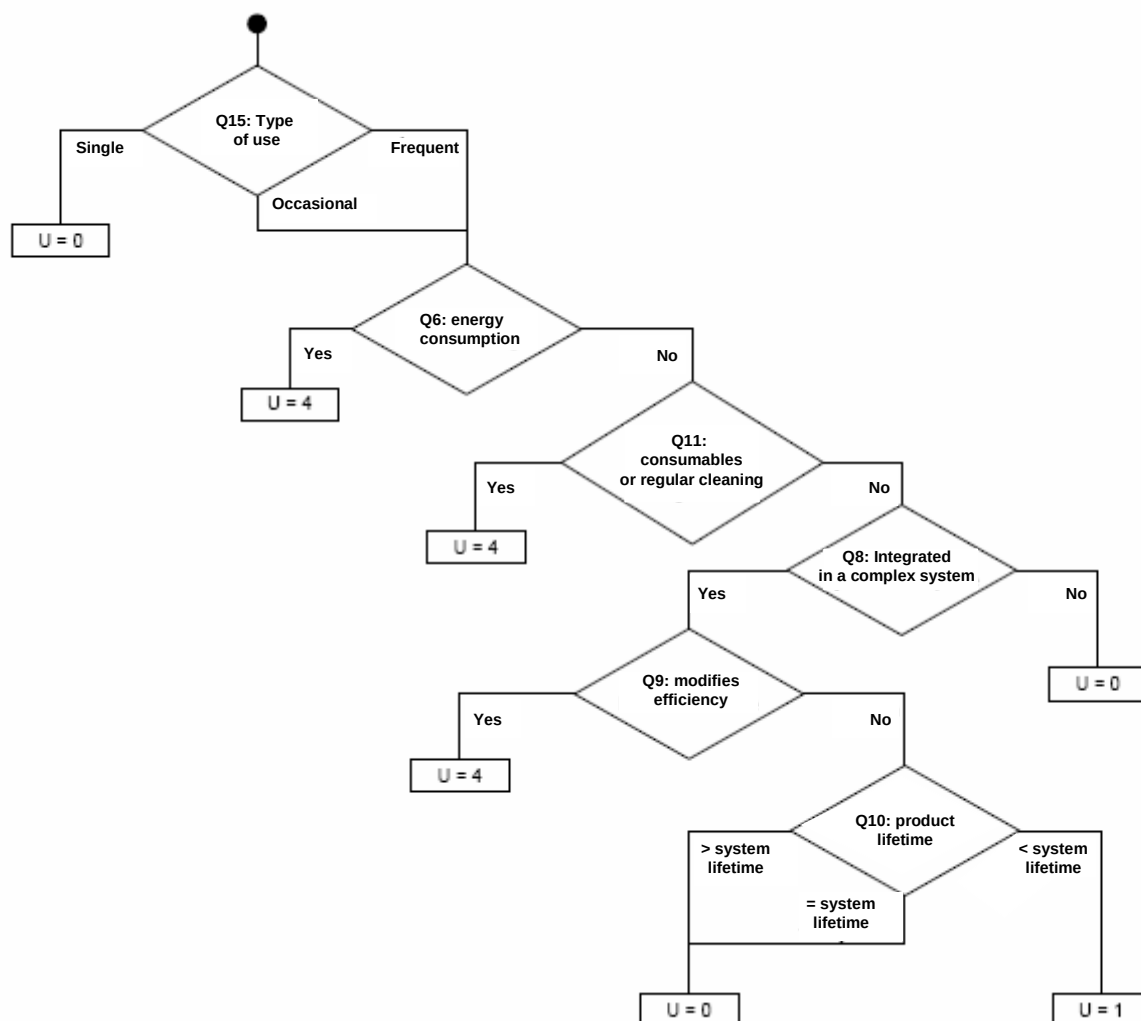


Figure B.2 — Decision-making tree for environmental aspect U

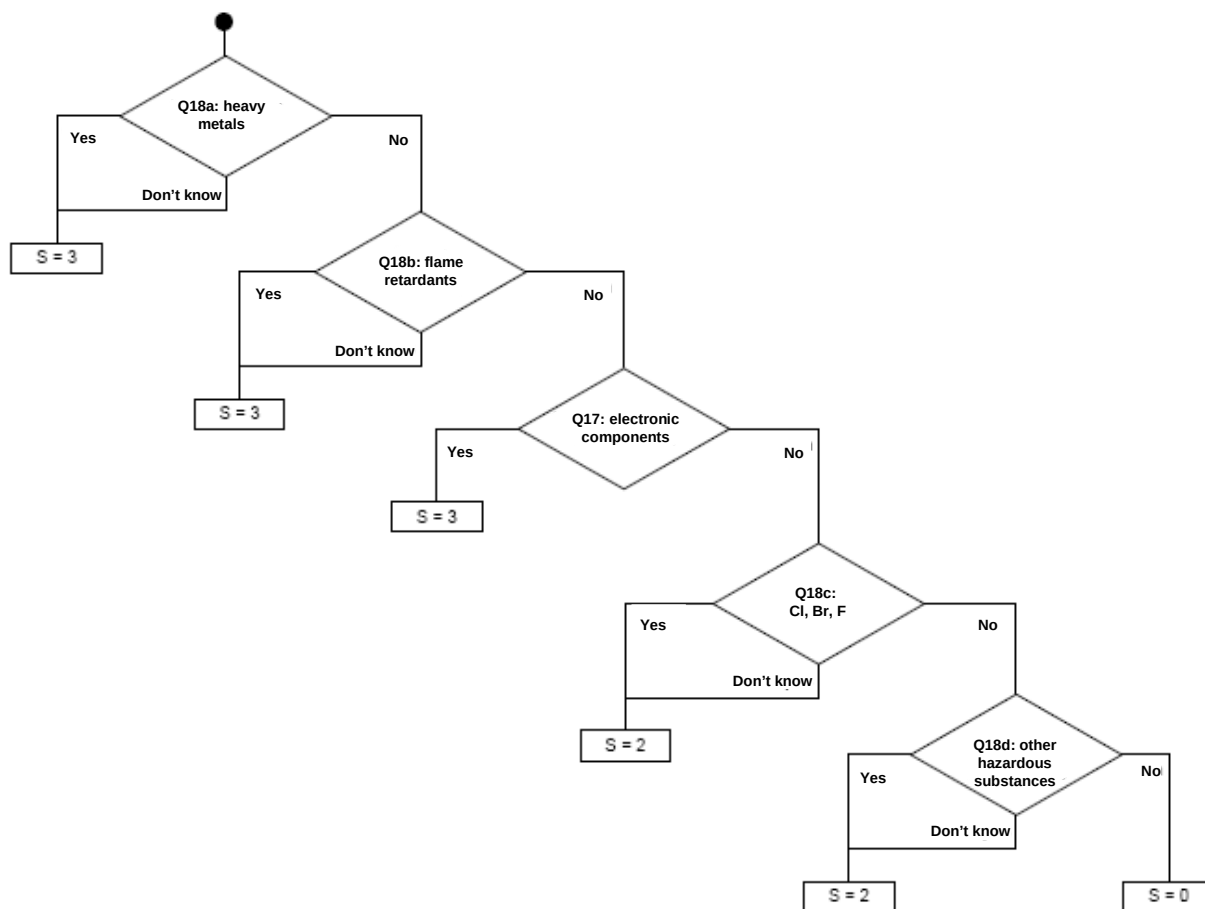


Figure B.3 — Decision-making tree for environmental aspect S

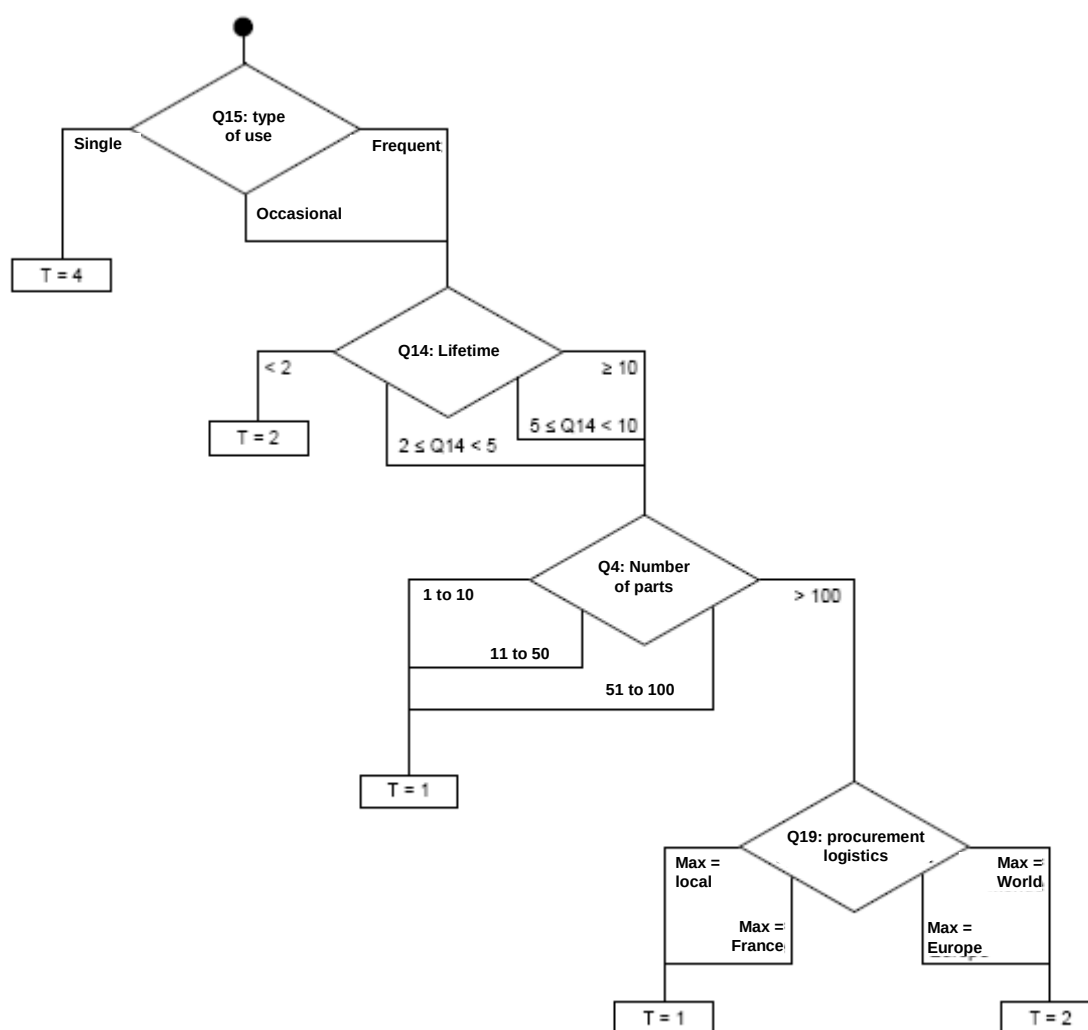


Figure B.4 — Decision-making tree for environmental aspect T

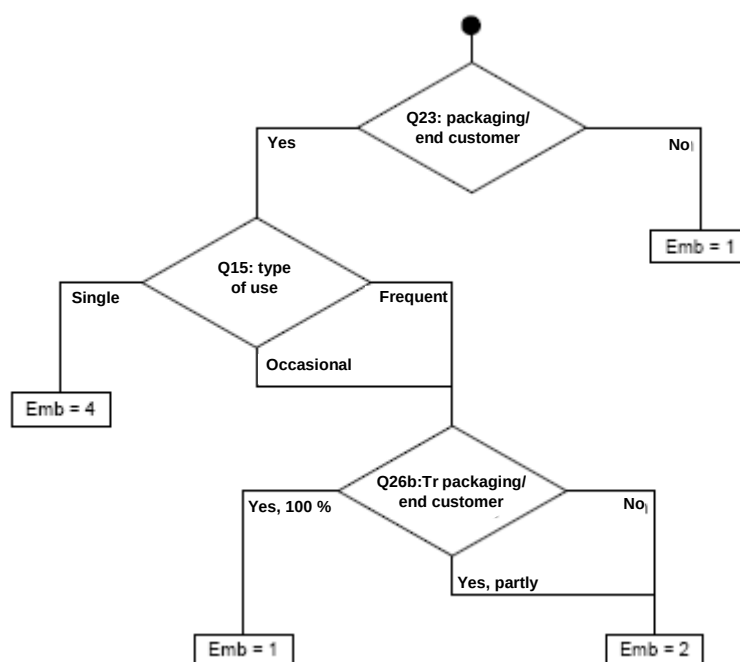


Figure B.5 — Decision-making tree for environmental aspect Pkg

Table B.1 — Examples: Regulations – Special rules

The product is covered by Directive 2002/96/EC governing waste electrical and electronic equipment (WEEE).	PEL-R = 4
The product is covered by Directive 2002/95/EC governing the restriction on hazardous substances (including indirectly).	S = 4
The product is covered by Directive 2000/53/EC governing the end-of-life vehicles (ELV) (including indirectly).	PEL-R = 4 and S = 4
The product is covered by Directive 2004/12/EC governing packaging.	As a packaging product: Pkg = 4



Annex C (informative)

Guidelines for environmental improvement of the product, GD indicators and EA indicators

This annex provides in Table C.1 a summary of the strategies that can be deployed for each environmental aspect, and identifies the general guidelines (giving the question numbers for the environmental questionnaire, where applicable).

A choice of indicators is also suggested: GD indicators in Table C.1 and EA indicators in Table C.2.

Table C.1 — Guidelines and GD indicators

Environmental aspects	Strategies	Guidelines	GD indicators
Raw materials (RM)	Select materials with the least environmental impact	Use materials with the lowest possible environmental impact (e.g. the lowest CO ₂ content)	CO ₂ content (kg CO ₂ equivalent)
		Use renewable materials (Q3)	Number, mass, % of renewable materials
		Use recycled materials (see supplier) (Q2)	Number, mass, % of recycled materials
		Use recyclable materials	Number, mass, % of recyclable materials
		Use materials with the lowest possible energy content	Total energy content (MJ/product) or per material (MJ/kg of material)
	Minimise use of materials	Reduce weight	Weight (kg)
		Reduce volume	Volume (l, m ³)
	Develop new concepts	Dematerialise the product, propose services	Number of hired products
		Plan shared use of the product: 1 product = multiple users	Average use rate (hours of product use per day) Number of people with access to the product (person/product)
		Integrate new product functions	Number of functions per product
		Optimise product functions, minimise the number of components	Number of functions per product or per component

Environmental aspects	Strategies	Guidelines	GD indicators
Manufacture (M)	Optimise production techniques (Q5)	Use alternative production technologies (BAT : Best Available Techniques)	Number of on-site BAT per product % of BAT per product / total number of on-site processes Number, % of BAT per product / number of processes throughout the product life cycle
		Limit the number of production steps	Number of on-site production steps Number of production steps throughout the product life cycle
		Minimise energy consumption for each product	Energy consumption per product (kWh or MJ / product)
		Opt for clean energy solutions	% kWh clean energy / kWh total energy Quantity of greenhouse gas (t eq CO ₂) / product
		Minimise the quantity of waste	Total mass of waste (kg) / product Weight or % of SIW and NHIW / product
		Minimise consumables	Total mass of consumables (kg) per product
		Choose less polluting consumables	Number, mass, % of polluting consumables per product
	Set up good management practices	Set up an environmental management system (EMAS or ISO 14001)	Certification: yes / no Number of years of certification
		Encourage all subcontractors to set up an environmental management system (EMS)	Number, % of subcontractors with an EMS Number, % of subcontractors having set up an EMS
		Purchase eco-designed products – consumables – components	Number, mass, % of eco-designed products – consumables – components out of the total number of purchases for the product



Environmental aspects	Strategies	Guidelines	GD indicators
Usage (U)	Minimise the impact of product use	Improve the energy performance (consumption / efficiency) of the product – or assembly integrating the product (Q9)	Product energy consumption Product energy efficiency, load losses, etc.
		Use less polluting energy sources (Q7)	Quantity of greenhouse gas emitted during use Use of renewable energy: yes / no
		Minimise the quantities of consumables (Q11)	Total mass of consumables (kg) per product Consumable use efficiency
		Use less polluting consumables (Q12)	Number, mass, % of polluting consumables per product
		Minimise emissions (including noise emissions) and the quantities of waste generated by the product (Q12)	Quantity, % of polluting emissions generated throughout the product life cycle Quantity, % of waste generated throughout the product life cycle
		Encourage correct use of the product	% of proper use of the product among users
	Optimise product lifetime	Improve product durability and reliability (Q10-Q14)	Programmed product lifetime Effective product lifetime
		Facilitate product servicing and repairs (Q13)	Rate of products effectively repaired Time between two servicing operations Repair times Repair and servicing costs for each product lifetime
		Work on the product's modular structure and its adaptability	Number, % mass of interchangeable modules / product
		Minimise the product's overall dimensions	Overall product volume
		Think about the design of the product (promote proper use of the product, don't follow trends)	Planned product obsolescence Follows a trend: yes / no
		Strengthen the product – user link	User satisfaction rate Indicator for user-perceived quality

Environmental aspects	Strategies	Guidelines	GD indicators
Usage (U)	Develop new concepts	Dematerialise the product, propose services	Number of hired products
		Plan shared use of the product: 1 product = multiple users	Average use rate (hours of product use per day) Number of people with access to the product (person/product)
		Integrate new product functions	Number of functions per product
		Optimise product functions, minimise the number of components	Number of functions per product or per component
End-of-life recyclability (PEL-R)	Improve recyclability at product end-of-life (Q16)	Design in order to facilitate reuse of the product (robustness, design)	Product reuse rate
		Design in order to facilitate product disassembly	Potential product separation rate
		Design in order to facilitate reuse of parts and components (robustness, design)	Number, mass, % of reusable parts/components per product
		Design in order to facilitate recycling materials	% of recyclable materials Product recyclability rate % of material recycling % of "degraded" recycling
	Develop a production disposal system	Develop a product disposal system	Disposal system created: yes / no % of products disposed of per year
Substances (S)	Manage hazardous substances (Q18)	Minimise or eliminate hazardous substances	Number, % of hazardous substances per product
		Facilitate "safe" (less polluting) product incineration	Number, % of materials contributing to the formation of hazardous substances during incineration
		Facilitate "safe" (less polluting) product disposal at a landfill site	Number, % of materials contributing to the formation of hazardous substances during disposal at a landfill site

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Environmental aspects	Strategies	Guidelines	GD indicators
Transport (T)	Minimise the impact of logistics operations	Opt for less polluting means of transport	Rate of less polluting transport means (% t.km) per product
		Minimise product logistics (<i>Q19-Q20</i>)	Procurement rate per area (local, France, Europe, world) per product Number of km involved from raw materials procurements up putting on the market
	Minimise the impact of product transportation	Minimise product mass	Product mass
		Minimise the product's overall dimensions	Overall product volume
Packaging (Pkg)	Minimise the impact of product packaging	Reduce the quantities, number and weight of packaging (<i>Q24</i>)	Number of packagings per product Number of packaging materials per product Mass of packaging per product Volume of the packaged product
		Use reusable packaging (<i>Q21a-Q22a-Q26a</i>)	Rate of reusable packaging Frequency of packaging reuse
		Use less polluting packaging materials (raw material and end-of-life) (<i>Q21b-Q21c-Q22b-Q26b-Q26c</i>)	Rate of recyclable packagings per product Rate of biodegradable packagings per product Environmental impact of packaging materials per product

Table C.2 — Exemples d'indicateurs d'aspect environnemental

Environmental aspects	Examples of EA indicators
Raw materials	- CO2 impact of product materials - Energy content of product materials - Recycled material content - Etc...
Manufacture	- Production-related energy consumption per product - Mass of waste per product - Mass of polluting emissions per product (air, water, ground) - CO2 Impact of product manufacture - Etc
Usage	- Product energy consumption - Product lifetime - Mass of generated waste - CO2 Impact of product use - Etc...
Substances	- % of hazardous substances in the product - Conformity of the product to the substances regulation - Etc...
End-of-life recyclability	- Potential or actual recyclability rate - Disassembly time - Etc...
Transport	- t.km per product - Efficiency of transportation means - useful volume /transported volume
Packaging	- Global environmental impact of packaging materials per product - CO2 impact of packaging materials per product - % of biodegradable packaging materials - Etc...



Annex D (informative)

Design Office tools

This annex contains a non-exhaustive list of tools suited to the implementation of this standard.

EA	Tools specific to environmental concerns	Conventional tools
All	- Directives, regulations governing the product - ...	
RM	- Material energy content - List of rare materials - List of recyclable materials - List of renewable materials - Table of average recycled material content - Environmental impacts - materials - X-Pro software (ECODIS), etc. - ...	- Design software - Material selection software - Functional analysis, functional specifications - Design for Assembly - Creativity tools: TRIZ, brainstorming, etc. - ...
M	- Environmental impacts - procedures and consumables: X-Pro software (ECODIS), etc. - ...	- Risk analysis - Supplier specifications - Production organisation methods - Simultaneous engineering - European documents on Best Available Technologies (BAT) - ...
U	- Environmental impacts - energy modes - ...	- Functional analysis, functional specifications - Design for Assembly - Product FMECA, reliability analysis - Design calculations, tests, simulations (leaktightness, insulation, efficiency, performance/accuracy, control/inspection, etc.) - ...
PEL-R	- List of recyclable materials - Table of gravity sorting of plastics - Table of chemical compatibility of plastics - Method for calculating the recyclability rate - X-Rec software (ECODIS) - ...	- Design for Assembly - Product FMECA, reliability analysis - ...
S	- List of banned and/or restricted substances (product, process, end-of-life incineration/waste disposal) - X-Mat software (ECODIS) - ...	- Safety data sheet - ...
T	- Environmental impacts - transport methods - ...	- Purchasing specifications - Logistics organisation methods - Palletizing plan - ...
Pkg.	- Environmental impacts - packaging materials - Information on packaging recycling sectors - ...	- Supplier specifications - ...

Annex E (normative)

Project review

The results of each step shall be formalised in documents validated by the project team, as shown in Figure E-1. This project review can be included in the design review. Templates are proposed for some of these documents in Tables E-2 and E-3, which contain an example (in *italics*).

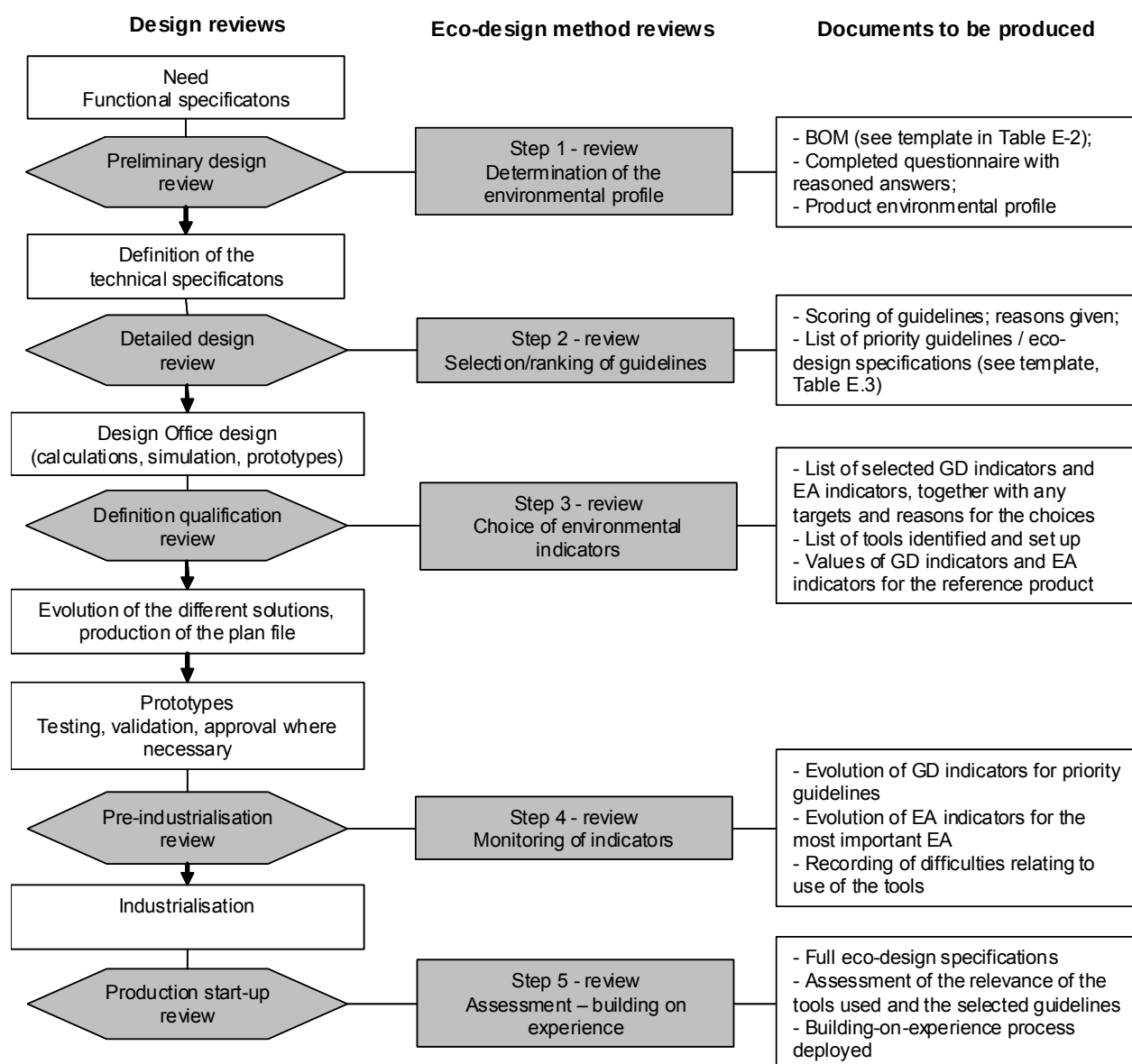


Figure E-1



Table E-2 – Template – BOM

Part	Number of constituent parts	Quantity in the product	Unit weight (kg)	Total weight (kg)	Material	Related recyclability coefficient	Recyclability rate (%)	Identified hazardous substance	Supplier name	Supplier location
Block A	1	2	8.8	17.6	Nickel-plated brass	100 %	17,6*1	Ni, Pb		National
Block A	10	1	10,4	10,4	Steel encased with PVC	0 %	0	Pb in PVC		Local
Miscellaneous, not identified	35	1	2	2		0 %	0			
Total parts	41									
	Product weight (kg)	30 kg	Weight of the identified product (kg)	28 kg						
% weight of the identified product (kg)		93,3 %			Product recyclability rate		17,6/30 = 58 %			

Table E-3 – Template – Eco-design specifications

EA	Guideline	Score	Priority	GD indicator	EA indicator	Monitoring function	Related tools	GD indicator value		EA indicator value		Remarks
RM	Minimise product weight	28	X	Weight (kg)	Environmental impact	Designer	BOM	Before redesign 10	After redesign 8	Before 52	After 41	Has the product weight been reduced in terms of equivalent function?

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Annex F (informative)

Examples of implementation of the method

F.1 Presentation

The four following examples deal with:

- baking oven
- aeronautics roll bearing
- extraction opening for domestic ventilation
- injection mould for biodegradable earthenware pot

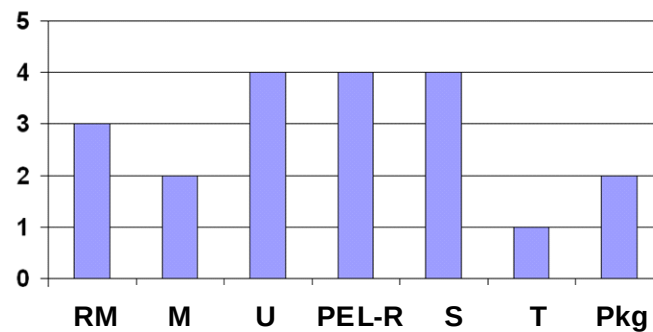
F.2 Baking oven

F.2.1 Main characteristics

- Product covered by Directives WEEE and RoHS
- Product containing rare materials : zinc, copper, nickel, lead
- Number of parts and components > 100
- Energy using product (gas and electricity)
- Lifetime > 10 years
- Frequent use product
- Product requiring use of cleaning products – seals are considered as consumables
- $Tr = 92\%$
- Product containing electric components
- Product containing lead, brominated flame retardants (plastics of levers in PA), PCV (chlorine molecules) for a mass concentration less than 0,1%
- Packaging for final consumer with more than 3 materials.



F.2.2 Environmental profile



F.2.3 Priority guidelines and environmental indicators

a) Environmental aspect: RM

- LDP1 : reduce mass and number of parts
- GD indicator: mass (in kg)
- EA indicator : CO2 eq. For product materials
- Tools : CAD

b) Environmental aspect: U

- LDP2 : improve energy efficiency of the oven
- GD indicator: energy consumption (in kWh)
- EA indicator:
- Tools : Tests (EN 50304);

c) Environmental aspect: M

- LDP3 : Optimise production wastes and scraps
- GD indicator: rate of waste (in %)
- EA indicator: production energy consumption per product (kWh)
- Tools : CAM

F.2.4 Results of indicators

- GD indicators

EA	GD indicator	Ref. value	Final value
RM	Weight	101	93
M	Rate of waste	33%	15%
U	Energy consumption (in kWh)	1,62	1,27

— EA indicators

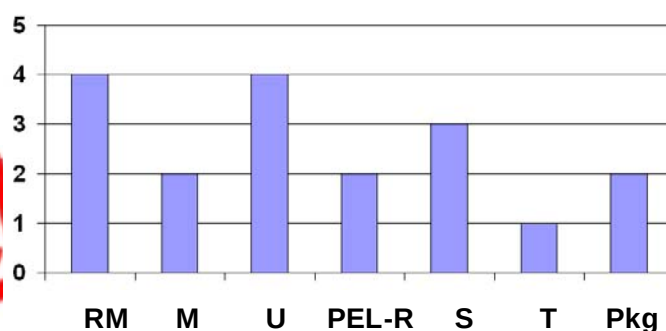
Ea	EA indicator	Ref. value	Final value	Comments
RM	CO2 eq. for materials	486	391,5	-19%
M	Energy consumption/product		↘	Indicator to be implemented – less components, thus less manufacturing
U	Energy consumption (kWh)	1,62	1,27	- 21 %
PEL-R	Recyclability rate	92,7	92	Decrease of the product mass – indicator to be reviewed
S	% conformity to RoHS (based on number of suppliers)		80%	Global approach to be conducted for REACH
T	Not significant			
Pkg	Material environmental impact	→	→	Study to be conducted in 2010 with packaging path

F.3 Aeronautics roll bearing

F.3.1 Main characteristics

- Product containing rare materials : copper, nickel, lead, silver
- Number of parts and components = 1 to 10
- Product not using energy but integrated into an assembly and likely to modify the normal operating performance of this assembly.
- Lifetime > 5 years and higher than the lifetime of the assembly in which it is integrated.
- Frequent use product
- Product requiring use of oils, a part of which can be emitted in air.
- Tr > 90%
- Packaging for final consumer with more than 3 materials

F.3.2 Environmental profile



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F.3.3 Priority guidelines and environmental indicators

a) Environmental aspect: RM

- LDP1 : Reduce the RM quantity needed for manufacturing the roll bearing
- GD indicator: supplied RM mass /final part mass
- Tools : techno-economic study

b) Environmental aspect: U

- LDP2 : Reduce power loss in the roll bearing
- GD indicator: kW
- Tools : power software and calculation sheet, test bench
- LDP3 : Increase product lifetime (collection, reconditioning and reuse)
- GD indicator: lifetime (h) and number of reconditioned products/number of supplied products
- Tools : experience feedback, theoretical calculations (wear, lifetime...), appraisal on collected products, client awareness (proposal in specifications), guide for renovation

c) Environmental aspect: M

- LDP4 : reduce quantity of consumables (RM and energy) and use less pollutant products during manufacturing
- GD indicator: consumables mass (kg)
- Tools : inventory of more pollutants products during manufacturing, FMEA, inventory of energy consumptions, building on experience of processes

F.3.4 Results of indicators

— GD indicators

EA	GD indicator	Starting value	Final value
RM	supplied RM mass/ final part mass	Product 1 : 10,5 Product 2 : 8,5 Product 3 : 9,6	Product 1 : 7,5 Product 2 : 6,9 Product 3 : 7,2
M	Consumable mass – material (yearly data)		Less than 15% of dewatering solvent
	Consumable mass – energy (yearly data)		- 25%
U	Power loss in the roll bearing (kW)	optimised	optimised
	Number of reconditioned products/number of supplied products	Wait return of roll bearings for reconditioning in 3 to 5 years	

— EA indicators

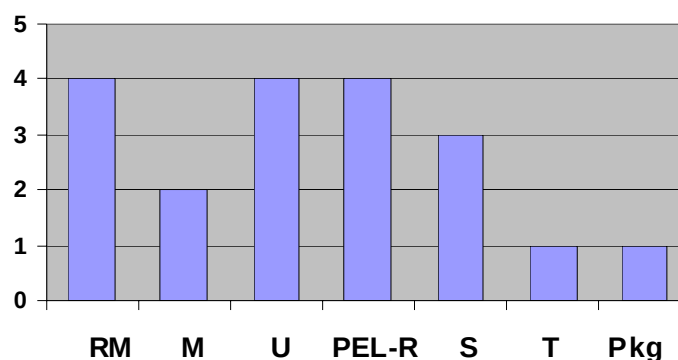
EA	EA indicator	Starting value	Final value	Comments
RM	CO2 eq. of materials		↘	Values have not been calculated. A downtrend can be easily assessed as the entry materials have been decreased (without changing the material) which results in less energy for machining. The mass gain for supplied RM results in a lower impact during transport (per product).
M	Energy consumption/product		↘	Indicator to be implemented – less components, thus less manufacturing
U	Power loss in roll bearing (kW)	optimised	optimised	Systematically considered in every project

F.4 Extraction opening for domestic ventilation

F.4.1 Main characteristics

- Number of parts and components = 11 to 50
- Product not using energy
- Product integrated in a more complex system (building) with an effect on its performance (energy losses due to ventilation)
- Lifetime > 10 years (less or equivalent to the system lifetime, i.e. building lifetime)
- Product not requiring consumables for its operation during use phase
- Tr (for an extraction opening mainly made of plastics) : < 80%

F.4.2 Environmental profile



F.4.3 Priority guidelines and environmental indicators

a) Environmental aspect: U

— LDP1 : Reduce emissions, including noise emission

— GD indicator: product noise less than 36 dB

— Tools : techno-economic study

b) Environmental aspect: U

— LDP2 : Reduce energy consumption due to ventilation

— GD indicator: kW or MJ

— Tools : SIREN CSTB

c) Environmental aspect: PEL-R

— LDP3 : Use recyclable materials, severable and chemically compatible

— GD indicator: % of severable, recyclable and chemically compatible materials

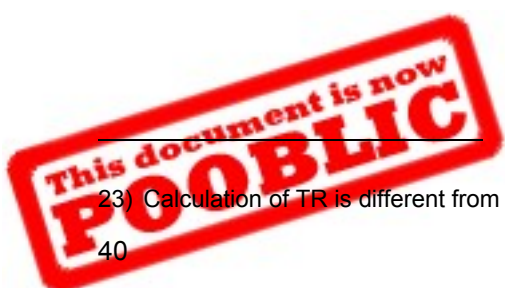
— Tools : XP R 10-402 :1996²³⁾

F.4.4 Results of indicators

— GD indicators

EA	GD indicator	Ref. value	Final value
U	Noise (dB)	38	35
U	Energy loss	Defined by software SIREN of CSTB	Loss flow rate optimised compared with the reference
PEL-R	% of severable, recyclable and chemically compatible materials	96%	Under calculation

²³⁾ Calculation of TR is different from the calculation proposed in this standard



— EA indicators

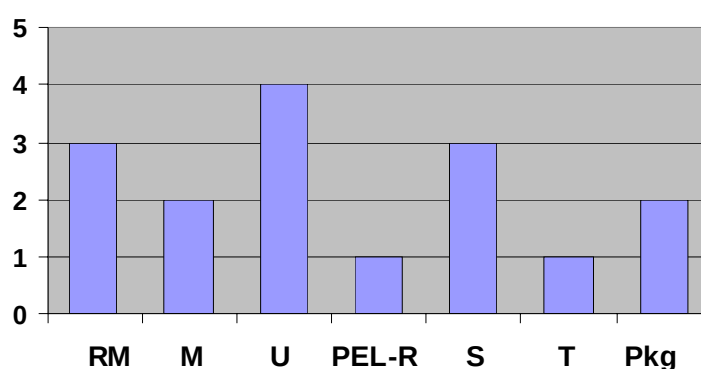
EA	EA indicator	Starting value	Final value	Comments
RM	Mass (kg) or content in CO ₂ eq	520 g	↘	Reduction of product weight with equivalent materials
M	Number of production steps or number of parts per MU	36	↘	Reduction of number of parts per MF
U	Energy loss	Reduction from 27 à 57% acc. type of dwelling	→ Reduction from 27 à 57% acc. type of dwelling	Otimising thermal losses is made by specific adjustments using a thermodynamic simulation software from CSTB (SIREN)
PEL-R	Recyclability (in %, mass)	96%	→	
S	% of hazardous substance in the product		→	
T	Rate of supply per zone per product		→	
Pkg	Volume of packaged product or packaging mass		→	

F.5 Injection mould for biodegradable earthenware pot

F.5.1 Main characteristics

- Product containing toxic substances: beryllium (small quantity in the mould)
- Number of parts and components = 50 to 100
- Product using energy
- Lifetime 2 to 5 years, optimised according to the number of injection cycles to be performed for the product (decided by the client).
- Frequent use product
- Tr > 90%

F.5.2 Environmental profile



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F.5.3 Priority guidelines and environmental indicators

- a) Environmental aspect: RM
 - LDP1 : Reduce mould mass and volume
 - GD indicator: final part mass
 - Tools : structure optimisation software
- b) Environmental aspect: U
 - LDP2 : Encourage a correct use of the product
 - GD indicator: % of product correct use among users
 - Tools : client training, instruction for use, product maintenance
- c) Environmental aspect: M
 - LDP3 : Develop an environmental management system (ISO 14001)
 - GD indicator: certification ISO 14001
 - Tools : external support

F.5.4 Results of indicators

- GD indicators

EA	GD indicator	Ref. value	Final value
RM	Mass (t)	1,1	0,8
M	ISO 14001	0	<i>Under development</i>
U	Correct use (%)	0	90

— EA indicators

EA	EA indicator	Starting value	Final value	Comments
RM	Mass (t)	1100kg	↘	Optimisation of mould plates
M	Certification ISO 14001		<i>Under development</i>	
U	% of correct use	0%	↗	Complete training to injection/compression
PEL-R	Recyclability (% , mass)	96%	→	Mould composition >96% steel
S	% of hazardous substance in the product	0.13%	→	2% beryllium for 50 kg of steel (only the cavities)
T	Rate of supply per zone per product		→	
Pkg	Volume of packaged product or packaging mass	5kg	→	Pallet Europe + plastic film



Annex G (informative)

Glossary

EA	Environmental aspect
GD	Guideline
PGD	Priority Guideline
WEEE	Waste electrical and electronic equipment (European Directive)
RoHS	Restriction on Hazardous Substances (European Directive)
ELV	End-of-life vehicles (European Directive)
EuP	Energy Using Products (European Directive)



Annex H (informative)

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