SLOVENSKI STANDARD
SIST-TS CEN/TS 16524:2014

01-marec-2014

Proizvodi strojne in kovinskopredelovalne industrije - Metodologija optimiziranja vplivov na okolje pri načrtovanju in razvoju proizvodov

Mechanical products - Methodology for optimising environmental impacts in product design and development

Mechanische Produkte - Methodik zur Verminderung der umweltrelevanten Auswirkungen bei Produktgestaltung und Entwicklung

Produits mécaniques - Méthodologie d'optimisation des impacts environnementaux à la conception et au développement des produits

Ta slovenski standard je istoveten z: **CEN/TS 16524:2013**

ICS:

13.020.30	Ocenjevanje vpliva na okolje	Environmental impact assessment

SIST-TS CEN/TS 16524:2014 **en,fr,de**

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 16524

September 2013

ICS 13.020.30

English Version

Mechanical products - Methodology for reduction of environmental impacts in product design and development

Produits mécaniques - Méthodologie de réduction des impacts environnementaux à la conception et au développement des produits

Mechanische Produkte - Methodik zur Verminderung der Umweltauswirkungen bei Produktgestaltung und Entwicklung

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Ref. No. CEN/TS 16524:2013: E

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Foreword

This document (CEN/TS 16524:2013) has been prepared by Technical Committee CEN/TC 406 “Project Committee - Mechanical products - Ecodesign methodology”, the secretariat of which is held by AFNOR.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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Introduction

Eco-design methodologies can be divided into three types, depending on whether their purpose is the environmental assessment of products, the environmental improvement of products or to enable the two phases to be carried out during the same eco-design project.

The environmental assessment phase of products in the eco-design process can be an impediment for enterprises (owing to need for expertise, time and resources). Therefore, the methodology discussed in this document has been developed with the aim of helping designers to identify ways of improving the environmental performance of a product without carrying out a complete environmental assessment of the product (in terms of LCA).

The approach therefore consists of restricting the scope of analysis to the area defined by the constraints of the product-enterprise pair, which takes into account the technical factors of the product, economic constraints, the practices of an enterprise and its development strategies. Secondly, it consists of exploring the potential for environmental improvement within this restricted field.

This Technical Specification is intended to give enterprises, in particular SMEs, a pragmatic methodology to consider environmental aspects during their product design. It allows them to:

— identify the environmental aspects of a product, including but not limited to energy aspects;

— be able to make progress in product design (for environmental impact reduction), taking into account capabilities of the enterprise;

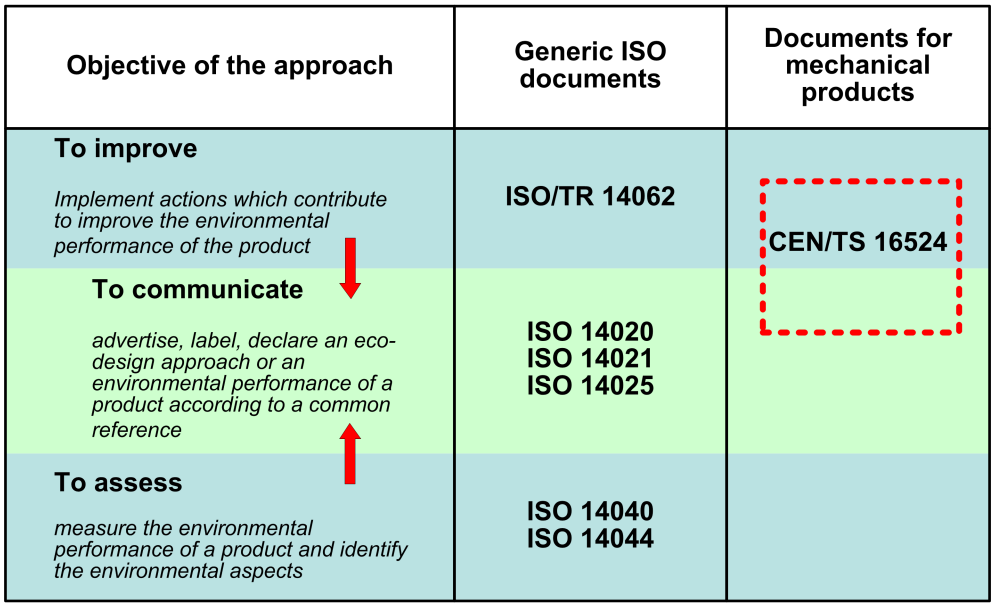
— promote to clients and public authorities the environmental improvement approach on a mechanical product with this methodology (environmental claim).

The improvement of the environmental impact implies that the intended performance of the product (fitness for use, durability, etc.) is maintained.

To implement this methodology, it is necessary that the enterprise staff have knowledge and expertise in environmental issues; if not, external expertise should be available. When applying this methodology, management of the enterprise may enter a learning 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.

The aim of this Technical Specification is not to measure the actual environmental performance of a product, nor to conduct a full life cycle assessment according to ISO 14040.

Figure 1 shows the relationship between this document and existing documents from ISO.



NOTE More specific methodologies might exist for specific mechanical products.

Figure 1 - Relationship between this document and existing documents from ISO

This Technical Specification can assist the enterprise to comply with the requirement of EN ISO 14001 and the recommendations of EN ISO 14006, to establish, implement and maintain a procedure to identify the environmental aspects of its products.

This Technical Specification is not intended to support any specific product implementing measures of Directive 2009/125/EC (Energy related Products). It may provide methodologies for identifying the more relevant environmental aspects in order to propose alternative design options to improve the environmental performance of the product.

This document is not intended for calculation of environmental footprint.

1 Scope

This Technical Specification describes a methodology for reducing the overall environmental impact through product design and development that is tailored to mechanical products as defined in 2.1.

This methodology is particularly well suited to the redesign of an existing product; it can also be applied for the design of a new product provided the necessary assumptions regarding a (virtual) reference product are taken.

It addresses enterprises which have decided to integrate an eco-design approach to optimise environmental impacts within the product life cycle, in relation to the other product aspects, such as functionality, quality, costs, etc.

NOTE 1 This document 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. The proposed methodology is intended to kick-start eco-design initiatives within companies as part of a teaching and continuous improvement approach.

This document also includes a template that enterprises may use as part of the communication on their environmental approach.

This document is neither intended nor suitable to compare products (even similar) of other suppliers.

This document is neither intended nor suitable for certification purposes.

NOTE 2 An example of implementation of the methodology is given in Annex D; the basic principles for the establishment of this method are given in Annex E.

2 Terms and definitions

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

2.1
mechanical product
product manufactured by enterprises from mechanical engineering and metalworking industry, such as capital goods (machinery, production systems, components), tools, household goods, optical parts, measuring instruments

2.2
reference product
existing product of the company to be re-designed, with the same intended use

Note 1 to entry: It can be also a similar product existing on the market, or the Technical Specification of a product.

2.3
environmental aspect
EA
element of an organisation's activities, products or services that can interact with the environment

Note 1 to entry: For this document, environmental aspects are categorised into Raw Materials acquisition, Manufacturing, Use, Product End-of-life, Hazardous substances, Transport and distribution, Packaging.

[SOURCE: ISO 14001:2004, 3.6, modified – Note 1 to entry has been adapted]

2.4
(environmental) design option
DO
measure intended to improve a specific environmental aspect within the product life cycle, in relation to the other product aspects, such as functionality, quality, costs, etc

2.5
scoring of environmental aspects
SEA
representation of the relative importance of the product's environmental aspects over its life cycle

Note 1 to entry: This SEA does not express the environmental performance of the product.

2.6
design option indicator
DO indicator
qualitative or quantitative indicator representative of a given design option, used to track this option during the design phase

2.7
environmental aspect indicator
EA indicator
qualitative or quantitative indicator associated with a particular environmental aspect, as representative as possible of this environmental aspect, used to keep a multi-criteria view of the environmental performance of the product during its development

Note 1 to entry: "Multi criteria view" means the consideration of all environmental aspects, to avoid a shift of impact (e.g. change of material can result in lower recyclability rate).

2.8
recoverability
ability of component parts, materials or both that can be diverted from an end-of-life stream to be recovered (see Figure 2)

[SOURCE: ISO 22628:2002, 3.9]

2.9
recyclability
ability of component parts, materials or both that can be diverted from an end-of-life stream to be recycled (see Figure 2)

[SOURCE: ISO 22628:2002, 3.7]

2.10
material recyclability coefficient
r
percentage by mass (mass fraction in percent) of a material potentially able to be recycled

[SOURCE: ISO 22628: 2002, 3.8, modified – vehicle has been replaced by material]

2.11
reusability
ability of component parts that can be diverted from an end-of-life stream to be reused (see Figure 2)

[SOURCE: ISO 22628:2002, 3.6]

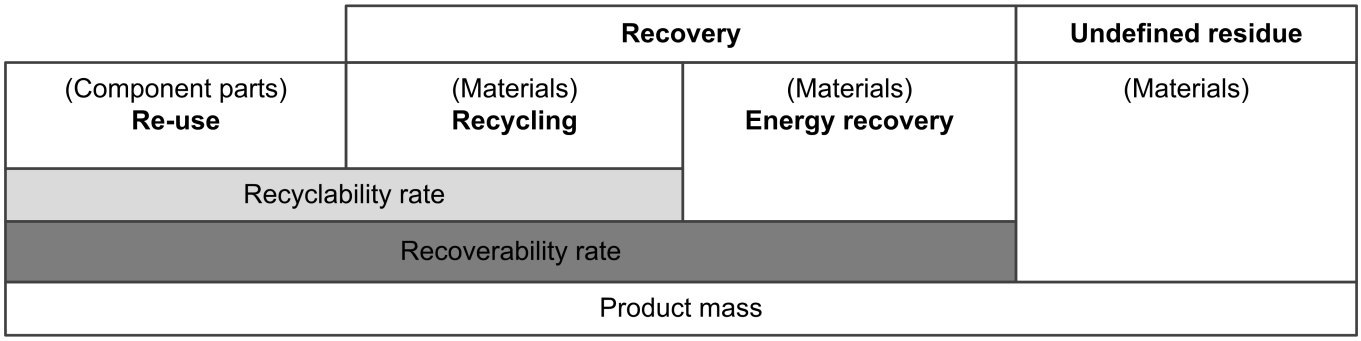


Figure 2 — Overview of key terms

2.12
ecodesign
integration of environmental aspects into product design with the aim of improving the environmental performance of the product throughout its whole life cycle

[SOURCE: Directive 2009/125/EC]

3 Abbreviated terms

The abbreviated terms necessary for the understanding of this Technical Specification are the following:

BOM	Bill Of Materials
DO	Design Option
EA	Environmental Aspect
ErP	Energy related Products (European Directive)
ELV	End-of-Life Vehicles (European Directive)
M	Manufacturing aspect
Pkg	Packaging aspect
PEL	Product End-of-Life aspect
RM	Raw Material aspect
S	Hazardous Substances aspect
SEA	Scoring of Environmental Aspect
T	Transport and distribution aspect
U	Use aspect
RoHS	Restriction on Hazardous Substances (European Directive)
WEEE	Waste Electrical and Electronic Equipment (European Directive)

4 Requirements

4.1 Application of the methodology

The methodology described in this document shall be applied by a multidisciplinary project team with recognised environmental competencies, supported by management, and involving all corporate functions likely to be impacted (e.g. R&D, Design Office, Purchasing, Manufacture, Logistics, Marketing, etc.).

Management of the enterprise shall be involved at the key steps of the methodology, especially when ranking the design options. It shall ensure the availability of resources essential to implement the project.

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

4.2 Description of the methodology

4.2.1 General

The methodology described in this document is based on the five steps set out below, which are also part of the design and development process (see Figures 3 and 4), and which shall be applied successively:

— Step 1: determination of the scoring of the environmental aspects of the reference product,

— Step 2: selection/ranking of design options,

— Step 3: choice of suitable DO end EA indicators related to the reference product,

— Step 4: evaluation of the redesign using DO and EA indicators,

— Step 5: final assessment and consideration for future activities.

The objective of each step is described in 4.2.2 to 4.2.5, where the procedure which shall be followed is stated (written as direct instructions).

The output documents of each step are input for the next step and shall be validated by the project team before going to this next step.

NOTE In this document, “methodology” is used for the overall approach of reducing environmental impacts; “method” is used for specific tasks, such as indicator calculation.

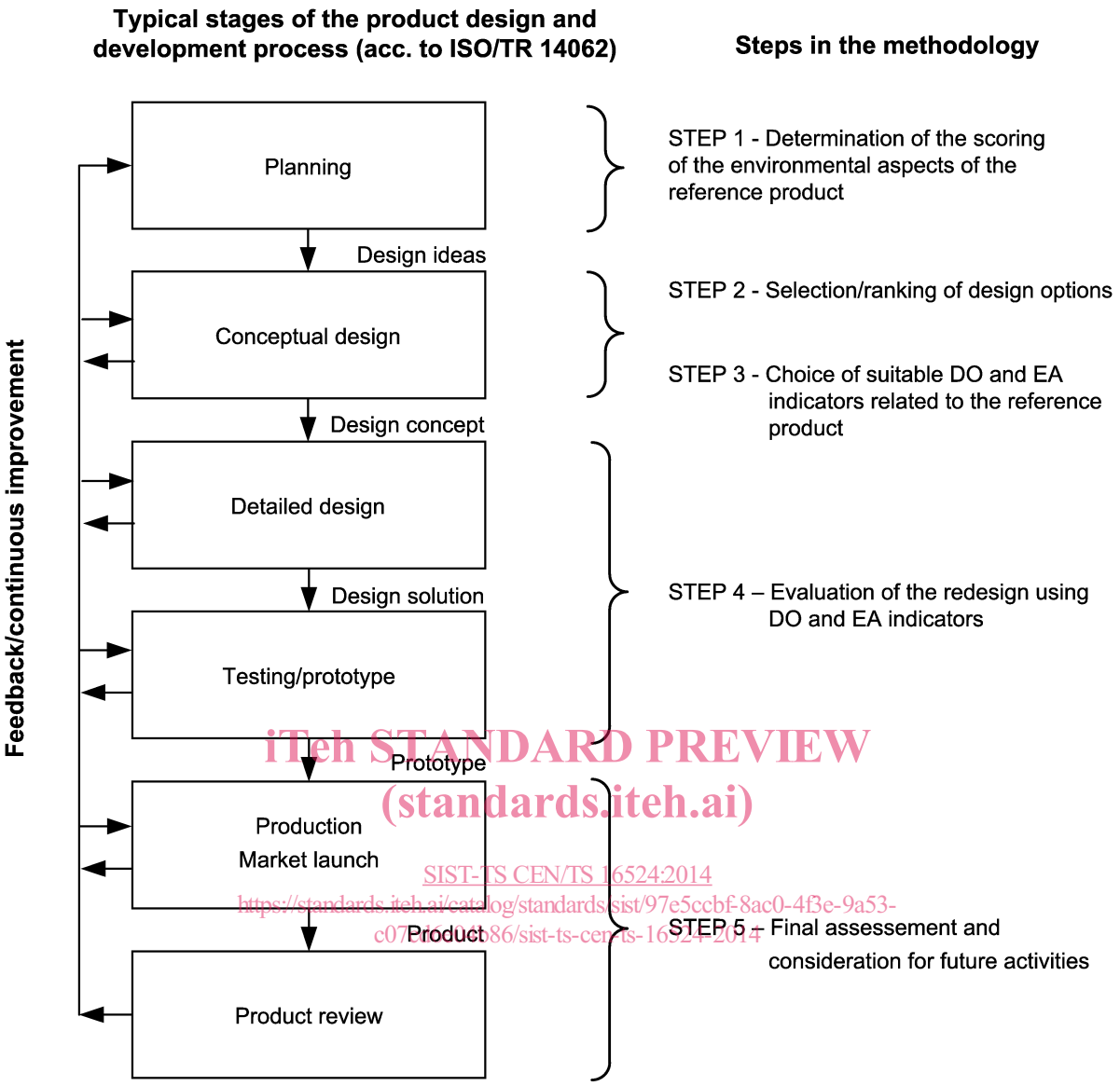


Figure 3 — Interrelation of the methodology with the design and development process

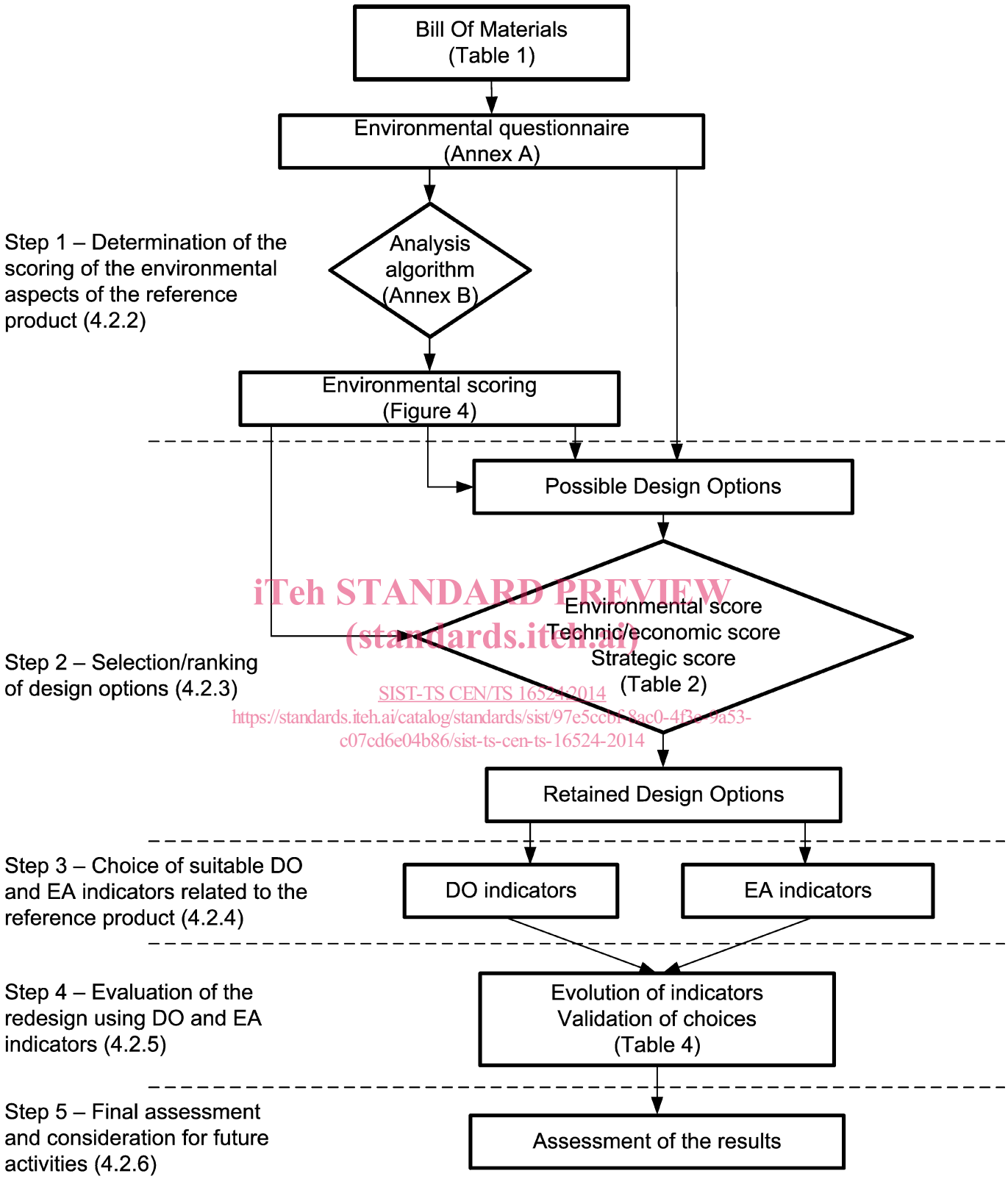


Figure 4 — Schematic illustration of the methodology

4.2.2 Step 1: determination of the scoring of the environmental aspects of the reference product

4.2.2.1 Objective

This step shall make it possible to determine the scoring of the environmental aspect (SEA) of the reference product which will be the base line for further improvements, i.e. to rank the seven 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).

— Manufacturing (M): aspect relating to all the processes required to develop/manufacture the complete product (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 consumption, type of energy source, influence on energy consumption within an assembly, product requiring consumables, servicing, product lifetime, etc.).

NOTE 1 This aspect combines the phases "installation and maintenance" and "use" of the 2009/125/EC Directive.

— End-of-life (PEL): 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 be regulated by European legislation (for instance, heavy metals classified as hazardous or flame retardants classified as hazardous).

NOTE 2 The phase "End-of-life" of the 2009/125/EC Directive is split into two aspects: end-of-life and hazardous substances.

— Transport and distribution (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 into account the amount, reuse, recyclability, biodegradability of packaging, etc.

NOTE 3 The phase "Packaging, transport and distribution" of the 2009/125/EC Directive is split into two aspects.

NOTE 4 The proposed SEA is not aimed to compare two products, even similar. It is not intended to measure the actual environmental performance of the product.

4.2.2.2 Procedure

4.2.2.2.1 Describe the reference product and the project perimeter:

a) product name (trade designation, project reference, etc);

b) description of the reference product;

c) main technical characteristics of the product;

d) types of markets aimed for the product:

   1) B to B, state the industrial sectors;

   2) B to C;

e) known (stated) expectations from relevant market players in terms of strategies for optimising the environmental impact of the product (see Table C.1 for those strategies and examples of related design options).

4.2.2.2.2 Draw up the Bill Of Materials (BOM) of the product and its packaging, comprising the list of parts, their mass, their material(s), their material recyclability coefficient, the identified hazardous substances, and in case of purchased components, the supplier name and location. A proposed template is given in Table 1.

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

Decompose the product and its components up to the necessary level to represent:

— the recyclability rate (refer to question QB9 in Table A.1);

— the number of parts (refer to question QB1 in Table A.1);

— the knowledge of possible hazardous substances (refer to question QB10 in Table A.1).

For assemblies and other components that are not broken down to their most elementary level, such as purchased components, assess the number of parts, nature and quantity of materials from technical data sheet and maintenance notice, or by asking the supplier.

NOTE 2 Without this information, the component will be considered as one single non-homogeneous material, and thus will penalise the recyclability rate.

For fasteners, count one single part per type of fastener of the same material.

For products with a high number of parts (e.g. more than 100), in order to optimise the time needed to create the BOM, the decomposition into parts can stop at subassembly level; in such cases, the subassembly may be decomposed into homogeneous materials rather than parts; columns 2 to 4 of Table 1 are not filled.

NOTE 3 For such products, the relevance of meeting the exact numbers/masses of the parts diminishes regarding its impact on the results of the environmental questionnaire D.2.3 and the analysis algorithm D.2.4.

Coating including painting can be counted as a separate part to pay specific attention to its environmental impact.