TECHNICAL REPORT

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Environmental management — Integrating environmental aspects into product design and development

Management environnemental — Intégration des aspects environnementaux dans la conception et le développement de produit

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

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 2.

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is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TR 14062 was prepared by Technical Committee ISO/TC 207, *Environmental management*.

Introduction

All products, that is, all goods or services, have some impact on the environment, which may occur at any or all stages of the product's life cycle: raw material acquisition, manufacture, distribution, use and disposal. These impacts may range from slight to significant; they may be short-term or long-term; and they may occur at the local, regional or global level (or combination thereof).

The interest of customers, users, developers and others in the environmental aspects and impacts of products is increasing. This interest is reflected in discussions among business, consumers, governments and non-governmental organizations concerning sustainable development, eco-efficiency, design for the environment, product stewardship, international agreements, trade measures, national legislation, and government or sector based voluntary initiatives. This interest is also reflected in the economics of various market segments that are recognizing and taking advantage of these new approaches to product design. These new approaches may result in improved resource and process efficiencies, potential product differentiation, reduction in regulatory burden and potential liability, and costs savings. In addition, globalization of markets, shifts in sourcing, manufacturing and distributing all influence the supply chain, and therefore have an impact on the environment.

More organizations are coming to realize that there are substantial benefits in integrating environmental aspects into product design and development. Some of these benefits may include: lower costs, stimulation of innovation, new business opportunities, and improved product quality.

Anticipating or identifying the environmental aspects of a product throughout its life cycle may be complex. It is important to consider its function within the context of the system where it will be used. A product's environmental aspects must also be balanced against other factors, such as the product's intended function, performance, safety and health, cost, marketability, quality, and legal and regulatory requirements.

The process of integrating environmental aspects into product design and development is continual and flexible, promoting creativity and maximizing innovation and opportunities for environmental improvement. As a basis for this integration, environmental issues may be addressed in the policies and strategies of the organization involved.

Early identification and planning enables organizations to make effective decisions about environmental aspects that they control and to better understand how their decisions may affect environmental aspects controlled by others, i.e. at the raw material acquisition or end-of-life stages.

This Technical Report is intended for use by all those involved in the design and development of products, regardless of organization type, size, location and complexity, and for all types of products whether new or modified. It is written for those directly involved in the process of product design and development and for those responsible for the policy/decision making process. The information provided by this Technical Report may also be of interest to external stakeholders who are not directly involved in the product design and development process.

Environmental management — Integrating environmental aspects into product design and development

1 Scope

This Technical Report describes concepts and current practices relating to the integration of environmental aspects into product design and development, where “product” is understood to cover both goods and services.

This Technical Report is applicable to the development of sector-specific documents.

It is not applicable as a specification for certification and registration purposes.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14050, *Environmental management — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14050 and the following apply.

3.1
process
set of interrelated or interacting activities which transforms inputs into outputs

NOTE 1 Inputs to a process are generally outputs of other processes.

NOTE 2 Processes in an organization are generally planned and carried out under controlled conditions to add value.

[ISO 9000:2000, 3.4.1]

3.2
product
any goods or service

NOTE 1 The product can be categorized as follows:

— services (e.g. transport);

— software (e.g. computer program, dictionary);

— hardware (e.g. engine mechanical part);

— processed materials (e.g. lubricant).

NOTE 2 Services have tangible and intangible elements. Provision of a service can involve, for example, the following:

— an activity performed on a customer-supplied tangible product (e.g. automobile to be repaired);

— an activity performed on a customer-supplied intangible product (e.g. the income statement needed to prepare a tax return);

— the delivery of an intangible product (e.g. the delivery of information in the context of knowledge transmission);

— the creation of ambience for the customer (e.g. in hotels and restaurants).

Software consists of information and is generally intangible and can be in the form of approaches, transactions or procedures.

Hardware is generally tangible and its amount is a countable characteristic. Processed materials are generally tangible and their amount is a continuous characteristic.

NOTE 3 Adapted from ISO 14021:1999, 3.1.11.

3.3
design and development
set of processes that transforms requirements into specified characteristics or into the specification of a product, process or system

[ISO 9000:2000, 3.4.4]

NOTE 1 The terms “design” and “development” are sometimes used synonymously and sometimes used to define different stages of the overall process of turning an idea into a product.

NOTE 2 Product development is the process of taking a product idea from planning to market launch and review of the product, in which business strategies, marketing considerations, research methods and design aspects are used to take a product to a point of practical use. It includes improvements or modifications to existing products or processes.

NOTE 3 The integration of environmental aspects into product design and development may also be termed Design For Environment (DFE), eco-design, the environmental part of product stewardship, etc.

3.4
environment
surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans and their interrelation

NOTE Surroundings in this context extend from within an organization to the global system.

[ISO 14001:1996, 3.2]

3.5
environmental aspect
element of an organization's activities, products or services that can interact with the environment

NOTE A significant environmental aspect is an environmental aspect that has or can have a significant environmental impact.

[ISO 14001:1996, 3.3]

3.6
environmental impact
any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services

[ISO 14001:1996, 3.4]

3.7
life cycle
consecutive and interlinked stages of a product system, from raw material acquisition or generation of natural resources to the final disposal

[ISO 14040:1997, 3.8]

3.8
product system
collection of materially and energetically connected unit processes which performs one or more defined functions

[ISO 14040:1997, 3.15]

3.9
supply chain
those involved, through upstream and downstream linkages, in processes and activities delivering value in the form of products to the user

NOTE 1 In practice, the expression “interlinked chain” applies from suppliers to those involved in end-of-life processing.

NOTE 2 In practice, the expressions “product chain”, “value chain” are often used.

4 Goal and potential benefits

The goal of integrating environmental aspects into product design and development is the reduction of adverse environmental impacts of products throughout their entire life cycles. In striving for this goal, multiple benefits can be achieved for the organization, its competitiveness, customers and other stakeholders. Potential benefits may include:

— lower costs by optimizing the use of materials and energy, more efficient processes, reduced waste disposal;

— stimulation of innovation and creativity;

— identification of new products, e.g. from discarded materials;

— meeting or surpassing customer expectations;

— enhancement of organization image and/or brand;

— improved customer loyalty;

— attraction of financing and investment, particularly from environmentally conscious investors;

— enhancement of employee motivation;

— increased knowledge about the product;

— reduction in liability through reduced environmental impacts;

— reduction of risks;

— improved relations with regulators;

— improved internal and external communications.

5 Strategic considerations

5.1 General

This clause describes some of the common strategic considerations that organizations take into account when integrating environmental aspects into product design and development. It is useful to consider the goal (see Clause 4) within the context of the organization's existing policies, strategies and structure. These existing policies or strategies can provide valuable direction to integrating environmental aspects into product design and development.

5.2 Organizational issues

It is important to consider strategic issues such as those mentioned below, because they may have economic and environmental implications for the organization. The overall objectives of the organization influence the extent to which these strategic issues are relevant:

— competitors' activities;

— customer needs, requirements and demands;

— supplier activities;

— relationships with investors, financiers, insurers and other stakeholders;

— organization's environmental aspects and impacts;

— activities of regulators and legislators;

— activities of industry and business associations.

5.3 Product-related issues

Organizations that integrate environmental aspects into product design and development commonly consider the following product-related issues:

a) early integration, i.e. addressing the environmental aspects early in the design and development process;

b) product life cycle, i.e. analysis from raw material acquisition to end of life (see Figure 1);

c) functionality, i.e. how well the product suits the purpose for which it is intended in terms of usability, useful lifetime, appearance, among others;

d) multi-criteria concept, i.e. consideration of all relevant environmental impacts and aspects;

e) trade-offs, i.e. seeking optimal solutions.

These issues are discussed in more detail in 7.3.

5.4 Communication

A communication strategy is an integral part of the process of incorporating environmental aspects into product design and development. An effective strategy addresses both internal and external communication.

Internal communication could involve providing information to employees on

— the organization's policy,

— product-related environmental impacts,

— training courses on environmental issues, programmes and tools,

— successful projects or products,

— site-specific impacts on the environment.

Such communication can also involve mechanisms that obtain feedback from employees on product design and development issues.

External communication can be an opportunity for enhancing the value and benefits of integrating environmental aspects into product design and development. This communication can be to stakeholders, such as customers and suppliers, and can include information on

— product properties (performance, environmental aspects, etc.),

— proper use and end-of-life handling of products.

There are various national and international standards for external communication. For example, the ISO 14020 series provides principles, examples and requirements for environmental labelling.

6 Management considerations

6.1 General

This clause describes the role of top management and the importance of its commitment to a programme of integrating environmental aspects into product design and development. The decisions taken by management determine the framework and targets of the programme, the level of support the work will receive and the degree of optimization the programme will achieve.

6.2 Management role

The process of integrating environmental aspects into product design and development can be initiated either by management (top-down) or by designers and product developers (bottom-up). In practice, both approaches can take place simultaneously. Regardless of which business function initiates the process, top management level support is needed to have a significant effect on an organization's product design and development activities.

Top management actions are needed to enable effective implementation of procedures and programmes. This includes the allocation of sufficient financial and human resources and time for the tasks involved in integrating environmental aspects into product design and development. An effective integration programme engages actors involved in the product design and development process, such as product developers and designers, experts from marketing, production, environment, procurement, service personnel and customers or their representatives.

In general, management may formalize its commitment to the programme by establishing particular goals within the following processes:

— continual environmental improvement of products;

— management of the supply chain;

— active participation in the programme by employees engaged in product design and development; and

— fostering the creation of new ideas and innovation.

Management establishes and maintains the basic framework within which the organization operates. When integrating environmental aspects into product design and development, elements of this framework may include:

— defining the environmental vision and policy;

— defining objectives and targets to

  — ensure legal compliance,

  — reduce adverse environmental impacts of products;

— allocating resources;

— assigning responsibilities, tasks and accountabilities;

— defining, supporting and monitoring product design and development programmes;

— defining and instituting programmes for review of the product design and development process;

— organizing/structuring environmental functions and processes for product design and development;

— identifying recruitment and training needs for implementing the programmes;

— defining measurement and performance indicators;

— following up and providing feedback on environmental performance.

6.3 Proactive approach

Integration of environmental aspects into product design and development seeks to prevent adverse environmental impacts before they arise. It provides a systematic opportunity to anticipate problems and their solutions along the whole product life cycle. Organizations that take proactive actions in this regard may increase their chances to benefit from this approach.

6.4 Support from existing management systems

The integration of environmental aspects into product design and development can be supported by existing management systems (e.g. quality and environmental management systems or product stewardship programmes). On the other hand, the existing management system may be activated by these integration activities. ISO 14001 and ISO 14004, for example, describe and give guidance to establishment of environmental management systems that can be used in connection with product design and development.

Help box No. 1

Links with environmental management system

For many organizations, the environmental impact of their products is related to a significant environmental aspect. Therefore it is often relevant for them to consider products in the environmental policy, objectives and targets of their environmental management system, e.g. ISO 14001.

An organization can identify the significant environmental aspects of its products and establish procedures to identify and track developments in environmental, legal and other requirements applicable to its products. It can also define, design, initiate and maintain appropriate training programmes to ensure employees adhere to established and developing environmental standards or practices.

In addition, the product design and development process is usually part of an existing management system, such as ISO 9001, through which the environmental aspects and product-related activities could be incorporated according to the stages of the process.

6.5 Multidisciplinary approach

The success of integrating environmental aspects into product design and development in an organization is enhanced by involvement of relevant disciplines and organizational functions such as design, engineering, marketing, environment, quality, purchasing, service delivery, etc. These competencies often involve several people, depending on the size of the organization.

The aim is to ensure that all relevant business functions contribute and commit to environmental improvement in the earliest stages of the design and development process and stay involved throughout the process, up to and including market launch and product review. The key tasks and participants (shown below in brackets) from the business functions involved in integrating environmental aspects into product design and development may include: