
**Packaging and the environment —
Organic recycling**

Emballage et environnement — Recyclage organique

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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.

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 18606 was prepared by Technical Committee ISO/TC 122, *Packaging*, Subcommittee SC 4, *Packaging and environment*.

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Introduction

Packaging plays a critical role in almost every industry, every sector, and every supply chain. Appropriate packaging is essential to prevent loss of goods and as a result decrease impact on the environment. Effective packaging makes a positive contribution towards achieving a sustainable society by, e.g.:

- a) meeting consumer needs and expectations for the protection of goods, safety, handling, and information;
- b) efficiently using resources and limiting environmental impact;
- c) saving costs in the distribution and merchandising of goods.

An environmental assessment of packaging should include the manufacturing and distribution system, the wastage of packaging material and goods, the relevant collection systems, as well as recovery or disposal operations. This group of ISO standards and supporting reports provides a set of procedures which aim to:

- d) reduce environmental impact;
- e) support innovation in product, packaging, and the supply chain;
- f) avoid undue restrictions on the use of packaging;
- g) prevent barriers and restrictions to trade.

A package should be designed to provide a number of functions for users and producers such as: containment, protection, information, convenience, unitization, handling, delivery, or presentation of goods. A major role of packaging is prevention of damage to or loss of goods. (See ISO 18601 [Annex A](#) for a list of the functions of packaging.)

ISO 18601 defines the interrelationships within the family of ISO standards which cover the environmental impact of packaging throughout its life cycle (see [Figure 1](#)). These standards will help define whether the selected packaging can be optimized and whether the packaging needs to be modified to ensure it can be reused or recovered after use.

Third-party certification is not required to demonstrate the requirements of these standards are met.

There are different methods to which public claims on the environmental attributes of packaging are discussed. Some of these are technical aspects on reuse or recovery, others relate to access by the population to reuse or recovery systems or the amount of packaging placed on the market for recovery. This series of standards addresses the technical aspects of the packaging. They do not address the requirements of ISO 14021 needed to support a claim or label.

This International Standard does not use the term “and/or” but instead the term “or” is used as an inclusive disjunction, meaning one or the other or both.

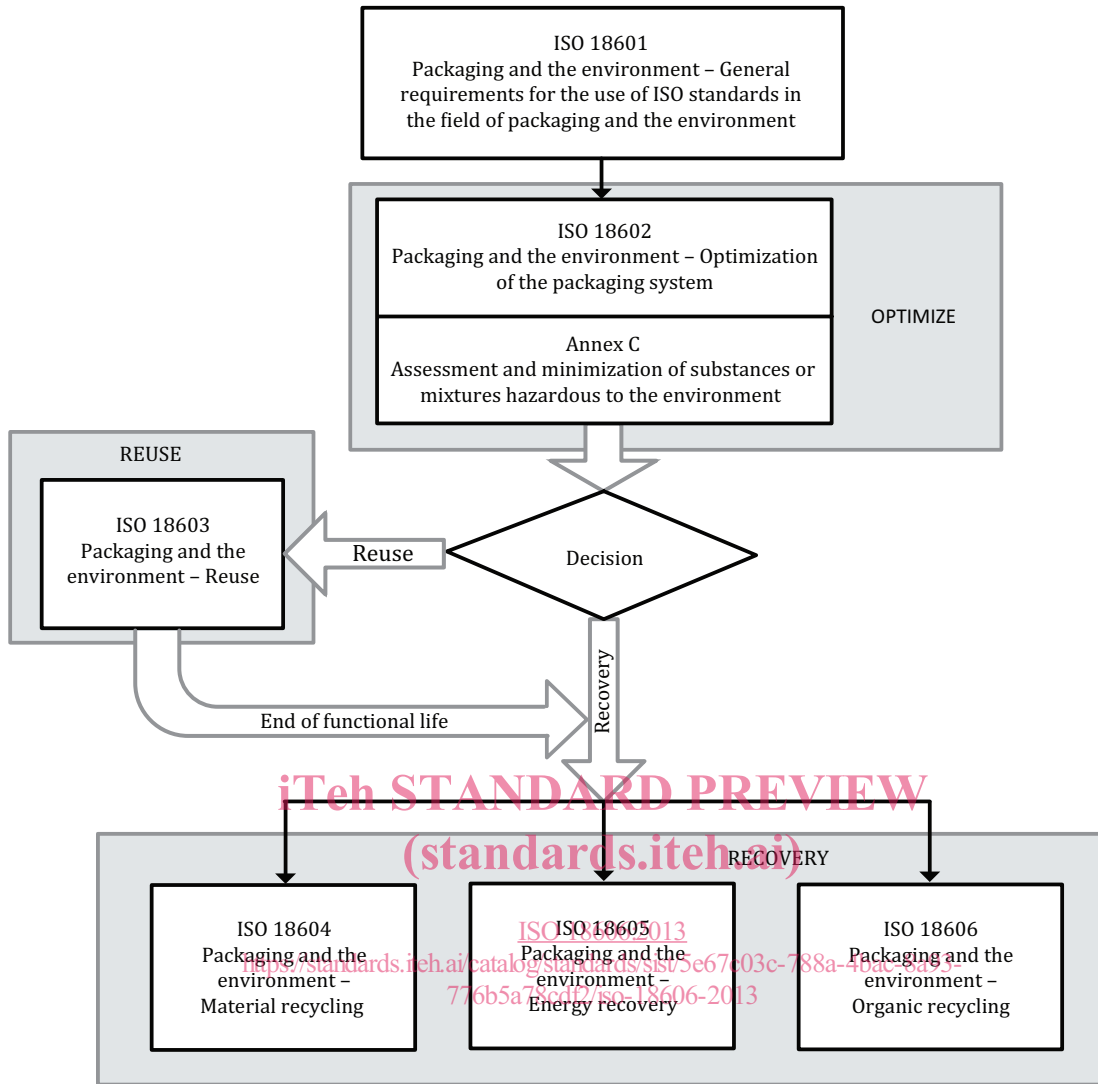


Figure 1 — Relationship of the Packaging and environment standards

The purpose of packaging is the containment, protection, handling, delivery, and presentation of products. In order to save resources and minimize waste, the whole system in which the packaging takes part should be optimized. This includes prevention as well as reuse and recycling of used packaging. Organic recycling by industrial aerobic composting or anaerobic digestion coupled with composting is an option for reducing the need for final disposal of used packaging while increasing the options for its recycling. This International Standard defines the standard specification to be met for packaging to be recovered by organic recycling.

Organic recycling, organic recovery, and biological recycling are interchangeably used to indicate biological waste treatment processes applied to used packaging to produce compost (in industrial composting plants) or compost and biogas (in anaerobic digestors). Examples of packaging suitable for organic recycling are provided in [Annex E](#).

This International Standard presents a framework for self-assessment to determine whether the organic recycling has been met.

Packaging and the environment — Organic recycling

1 Scope

This International Standard specifies procedures and requirements for packaging that are suitable for organic recycling. Packaging is considered as recoverable by organic recycling only if all the individual components meet the requirements.

Therefore, packaging is not considered recoverable by organic recycling if only some of the components meet the requirements laid down in this International Standard. However, if the components can be easily, physically separated before disposal, then the physically separated components can be individually considered for organic recycling.

This International Standard is applicable to organic recycling of used packaging but does not address regulations that exist regarding the recoverability of any residual packaged goods.

This International Standard does not provide information on requirements for the biodegradability of used packaging which ends up in the soil environment as litter, because littering is not considered as a recovery option. This International Standard is also not applicable to biological treatment undertaken in small installations by householders.

For each of the packaging components the following four aspects are addressed:

- a) biodegradation;
- b) disintegration during biological waste treatment process (i.e. composting);
- c) negative effects on the biological process;
- d) negative effects on the quality of the resulting compost, including the presence of high levels of regulated metals and other substances hazardous to the environment.

This International Standard establishes the requirements for packaging suitable for organic recycling.

NOTE “Organically recoverable”, “compostable”, or “compostable packaging in municipal and industrial composting facilities” or “biodegradable during composting” are expressions considered to be equivalent to organically recyclable for the purposes of this International Standard.

The procedure for applying this International Standard is contained in ISO 18601.

2 Normative references

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

ISO 14851, *Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium — Method by measuring the oxygen demand in a closed respirometer*

ISO 14852, *Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium — Method by analysis of evolved carbon dioxide*

ISO 14855-1, *Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions — Method by analysis of evolved carbon dioxide — Part 1: General method*

ISO 14855-2, *Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions — Method by analysis of evolved carbon dioxide — Part 2: Gravimetric measurement of carbon dioxide evolved in a laboratory-scale test*

ISO 16929, *Plastics — Determination of the degree of disintegration of plastic materials under defined composting conditions in a pilot-scale test*

ISO 20200, *Plastics — Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test*

ISO 21067:2007, *Packaging — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21067 and the following apply.

3.1 compost

soil conditioner obtained by biodegradation of a mixture consisting principally of vegetable residues, occasionally with other organic material and having a limited mineral content

3.2 composting

aerobic process designed to produce compost

3.3 disintegration

physical breakdown of a material into fragments

3.4 total dry solids

mass of solids obtained by taking a known mass of test material or compost and drying at about 105 °C to constant mass

3.5 ultimate biodegradability

breakdown of an organic chemical compound by micro-organisms in the presence of oxygen to carbon dioxide, water, and mineral salts of any other elements present (mineralization) and new biomass or in the absence of oxygen to carbon dioxide, methane, mineral salts, and new biomass

3.6 volatile solids

mass of solids obtained by subtracting the residue of a known mass of test material or compost after incineration at about 550 °C from the total dry solids of the same sample

Note 1 to entry: The volatile-solids content is an indication of the amount of organic matter present.

3.7 packaging component

part of packaging that can be separated by hand or by using simple physical means

[SOURCE: ISO 18601:2012, definition 3.11]

3.8 packaging constituent

part from which packaging or their components are made and which cannot be separated by hand or by using simple physical means

[SOURCE: ISO 18601:2012, definition 3.12]

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3.9**organic recycling**

through microbial activity, the controlled biological treatment of the biodegradable components of used packaging which produce compost and, in the case of anaerobic digestion, also methane

Note 1 to entry: Landfilling and littering are not considered as organic recycling.

3.10**anaerobic digestion**

process of controlled decomposition of biodegradable materials under managed conditions where free oxygen is absent, at temperatures suitable for naturally occurring mesophilic or thermophilic anaerobic and facultative bacteria species, that convert the inputs to a methane rich biogas and digestate

Note 1 to entry: In a second phase, the digestate is typically stabilised by means of a composting (aerobic) process.

4 Principle

The purpose of this International Standard is to establish requirements for packaging that can be recovered by means of organic recycling. Organic recycling is carried out in industrial composting plants or anaerobic digesters.

A packaging is considered as suitable for organic recycling if all the components are suitable for organic recycling. However, individual components of the packaging can be considered recoverable by organic recycling if they meet the requirements of this International Standard. The suitability of packaging components and packaging material is verified by the test scheme described in this International Standard.

5 Basic requirements (standards.iteh.ai)**5.1 Control of constituents**

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Constituents known to be, or expected to become, hazardous to the environment during the biological treatment process, besides the substances given in [Annex A](#), shall not be deliberately introduced into packaging or packaging materials intended to be designated as suitable for organic recycling.

5.2 Assessment**5.2.1 General**

Except as identified in [5.3](#), assessment of the biological treatability of packaging and packaging components shall include the following five assessment procedures as a minimum:

- characterization (see [5.2.2](#));
- biodegradation (see [5.2.3](#));
- disintegration, including effects on the biological treatment process (see [5.2.4](#));
- compost quality (see [5.2.5](#));
- recognizability (see [5.2.6](#)).

5.2.2 Characterization

Each packaging material under investigation shall be identified and characterized prior to testing, including at least:

- information on, and identification of, the constituents of the packaging materials;
- determination of the presence of substances hazardous to the environment, e.g. regulated metals;

- determination of the organic carbon content, total dry solids, and volatile solids of the packaging material used for biodegradation and disintegration tests.

NOTE In addition to the chemical characteristics for volatile solids, pass levels for regulated metals are also provided as their total absence is not possible.

5.2.3 Biodegradation

To be designated as organically recyclable, each packaging, packaging material, or packaging component shall be inherently and ultimately biodegradable as demonstrated in laboratory tests and to the criteria and pass levels given in [6.3](#).

5.2.4 Disintegration

To be designated as organically recyclable, each packaging, packaging material, or packaging component shall disintegrate in a biological waste treatment process to the criteria and pass levels given in [6.4](#), without any observable negative effect on the process.

5.2.5 Compost quality

To be designated as organically recyclable, no packaging or packaging component thereof, submitted to a biological waste treatment process, shall be recorded as having a negative effect on the quality of the resulting compost as specified in [6.5](#).

5.2.6 Recognizability

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The packaging or packaging component (which is intended for entering the biological waste stream) shall be recognizable as organically recyclable by the end user by appropriate means.

5.3 Exemptions

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5.3.1 Equivalent form

A packaging material demonstrated to be organically recyclable in a particular form shall be accepted as being organically recyclable in any other form having the same or a smaller mass-to-surface ratio or wall thickness.

5.3.2 Materials of natural origin

Chemically unmodified packaging materials and constituents of natural origin, such as wood, wood fibre, cotton fibre, starch, paper pulp, bagasse, or jute shall be accepted as being biodegradable without testing (see [6.3](#)) but shall be chemically characterized (see [5.2.2](#)) and fulfil the criteria for disintegration (see [6.4](#)) and compost quality (see [6.5](#)).

6 Detailed requirements

6.1 General

In order to meet the requirements of this International Standard a packaging or a packaging component shall demonstrate all of the characteristics found in [6.2](#) to [6.5](#).

NOTE Examples of how to use this International Standard are given in [Annex E](#).

6.2 Characterization of the packaging

6.2.1 Regulated metals and other substances

The concentrations of regulated metals and other substances hazardous to the environment in the packaging shall not exceed the limits as described in [Annex A](#) specific to the country where the final product will be placed on the market or disposed. It is the responsibility of the user to conform to the applicable national or regional regulations dealing with metals, other elements, and substances hazardous to the environment.

6.2.2 Minimum of volatile solids

The packaging or packaging components shall contain a minimum of 50 % of volatile solids.

6.3 Ultimate biodegradation

6.3.1 Aerobic biodegradation

The ultimate level of aerobic biodegradation shall be established by testing under controlled conditions.

A packaging is considered to have demonstrated a satisfactory rate and level of biodegradation if, when tested in accordance with ISO 14855-1 or ISO 14855-2, it achieves the minimum biodegradation percentage specified in [6.3.1.1](#) within the time period specified in [6.3.1.2](#).

The ultimate aerobic biodegradability shall be determined for the whole material or for each organic constituent. For organic constituents which are present in the material at a concentration between 1 % and 10 % (by dry mass), the level of biodegradation shall be determined separately.

Constituents which are present at concentrations of less than 1 % do not need to demonstrate biodegradability. However, the sum of such constituents shall not exceed 5 %.

Only biodegradation tests that provide unequivocal information on the inherent and ultimate biodegradability of a packaging material or its significant organic constituents shall be used. The controlled aerobic composting test (ISO 14855-1, ISO 14855-2) shall be used unless inappropriate to the type and properties of the material under test. In the event that alternative methods are necessary, an internationally standardized biodegradability test method shall be used, in particular ISO 14851 and ISO 14852, which are designed for polymeric materials.

6.3.1.1 Conversion to CO₂

90 % of the organic carbon shall have been converted to CO₂ by the end of the test period (absolute biodegradation).

As an alternative, relative biodegradation can be demonstrated in which conversion of carbon to CO₂ from the sample is at least 90 % of the conversion of carbon to CO₂ from the reference.

Both the reference and the test sample shall be composted for the same length of time and the results compared at the same point in time after the activity of both has reached a plateau. The reference used shall be microcrystalline cellulose. The reference shall have met the validation criterion specified in the biodegradation test method used.

NOTE Although the biodegradation test includes the conversion of the polymers into cellular biomass and humic substances in addition to carbon dioxide, no recognized standard test methods or specifications exist for the quantification of these conversion products. When such tests and specifications become available, this International Standard may be revised.

6.3.1.2 Test period

The test period shall be no longer than 180 days.