INTERNATIONAL STANDARD

ISO 15270

Second edition
2008-06-15

Plastics — Guidelines for the recovery and recycling of plastics waste

Plastiques — Lignes directrices pour la valorisation et le recyclage des déchets plastiques

Reference number
ISO 15270:2008(E)

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Published in Switzerland

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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 15270 was prepared by Technical Committee ISO/TC 61, *Plastics*.

This second edition cancels and replaces the first edition (ISO 15270:2006), which has been technically revised.

Introduction

This International Standard has been developed to assist all plastics industry stakeholders in the development of

— a sustainable global infrastructure for plastics recovery and recycling;

— a sustainable market for recovered plastics materials and their derived manufactured products.

For the reduction of plastics waste and in support of the objectives of sustainable development, top priority should be given on a product life-cycle basis to

— general reduction of material and energy resource use;

— specific optimization of the use of plastics raw materials.

Options involving the beneficial re-use of plastics products and the integration of plastics recovery processes are important downstream components of sustainable development.

The selection of methodologies and processes for the management of plastics waste available from pre-consumer sources and end-of-life products may be approached using various strategies, all of which should include a preliminary analysis of the available recovery options. In general, plastics recovery technologies can be divided into two classes:

a) material recovery (mechanical recycling, chemical or feedstock recycling, and biological or organic recycling);

b) energy recovery in the form of heat, steam, or electricity generation using plastics waste as substitutes for primary fossil fuel resources.

As the optimal recovery option depends on many prevailing circumstances, life-cycle analysis should be applied to decide, depending on the type and composition of the plastics waste, which options are environmentally more favourable and sustainable. In the case of commingled or composite plastics waste, energy recovery and some feedstock recycling processes often represent the optimal choice. Moreover, plastics waste may be managed utilizing a hierarchical framework comprising life-cycle strategies for prevention and minimization both of the volume of waste and of its potentially adverse environmental impact as described in ISO 17422. The potential occurrence of regulated substances in plastics waste requires particular attention.

NOTE 1 Efficient and discriminatory collection procedures are essential if the operational objective is recovery of monomers or other feedstocks. For mechanical recycling, and indeed all plastics recovery operations, proper process monitoring and control procedures are required. These procedures should include the establishment of specific guides and specifications covering recovered plastics, including, where appropriate, rules for traceability and assessment of conformity.

NOTE 2 This International Standard is intended to provide a valuable resource that is globally relevant, no matter which particular legislative or regulatory framework for plastics recovery and recycling governs its application. In order to facilitate adoption of the standard within the contexts of diverse national and regional legislative and regulatory environments, the following considerations are emphasized:

a) The subject of plastics recovery and recycling, being often presented within the perspective of solid-waste management, frequently applies terminology, technology, economics and infrastructure that are based on solid-waste management concepts. These concepts have consequently tended to define the legislative and regulatory environments referred to above.

b) Alternative perspectives for plastics recovery and recycling that are more comprehensive than those inherent to the solid-waste management model are available based on the concepts of integrated resource management (see Annex B) and sustainable development. Integrated resource management focuses on more extensive systems than

solid-waste management. It applies life-cycle analysis to achieve better understanding of the resource conservation and eco-efficiency implications of resource management strategies and policies. In this approach, the management of both energy and material resources are viewed within an integrated perspective. The concept of sustainable development, while also applying life-cycle thinking to waste and resource management, is more comprehensive than integrated resource management in that it requires consideration of the so-called three pillars of sustainable development, viz. ecological benefit, economic growth and social progress.

NOTE 3 Although the plastics recovery and recycling sector is a relatively new and emerging industry, significant national and regional efforts have been undertaken to provide legislative and regulatory frameworks applicable to one or more market sectors. The existence of such legal and regulatory frameworks must be kept in mind by users of this International Standard. In the interest of ensuring global relevance, an effort has been made to avoid terminology and definitions that appear to promote one legislative or regulatory framework over another. The intent is that terminology and definitions included in this International Standard embrace, rather than exclude, differing interpretations. A specific example is the question of whether or not a material must be defined as waste before it can be recovered. There is no universal agreement on this point and the standard attempts to accommodate a range of current and possible future definitions and interpretations of the term “waste”.

Plastics — Guidelines for the recovery and recycling of plastics waste

1 Scope

This International Standard provides guidance for the development of standards and specifications covering plastics waste recovery, including recycling. The standard establishes the different options for the recovery of plastics waste arising from pre-consumer and post-consumer sources as illustrated diagrammatically in Annex A. The standard also establishes the quality requirements that should be considered in all steps of the recovery process, and provides general recommendations for inclusion in material standards, test standards and product specifications. Consequently, the process stages, requirements, recommendations and terminology presented in this International Standard are intended to be of general applicability.

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 472:1999, *Plastics — Vocabulary*

ISO 14021, *Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling)*

ISO 17422, *Plastics — Environmental aspects — General guidelines for their inclusion in standards*

ASTM D 7209, *Standard Guide for Waste Reduction, Resource Recovery, and Use of Recycled Polymeric Materials and Products*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 and the following apply.

3.1
agglomerate
shredded and/or granulated plastics material in the form of particles which cling together

3.2
baling
process in which plastics waste is compacted and secured as a bundle to facilitate handling, storage and transportation

3.3
batch
quantity of material regarded as a single unit, and having a unique reference

NOTE Batch is primarily a processing term.

3.4
biodegradation
degradation caused by biological activity, especially by enzymatic action, leading to a significant change in the chemical structure of a material

[ISO 16929:2002]

3.5
biological recycling
aerobic (composting) or anaerobic (digestion) treatment of biodegradable plastics waste under controlled conditions using micro-organisms to produce, in the presence of oxygen, stabilized organic residues, carbon dioxide and water or, in the absence of oxygen, stabilized organic residues, methane, carbon dioxide and water

3.6
collection
logistical process of moving plastics waste from its source to a place where it can be recovered

3.7
commingled plastics
mixture of materials or products consisting of different types of plastic

NOTE The term “mixed plastics” is used synonymously.

3.8
contaminant
unwanted substance or material

NOTE The term “impurity” is a deprecated synonym of contaminant and should not be used.

3.9
converter
specialized operator capable of shaping plastics raw material to make a usable semi-finished or finished product

3.10
depolymerization
chemical reversion of a polymer to its monomer(s) or to a polymer of lower relative molecular mass

[ISO 472:1999]

3.11
energy recovery
production of useful energy through direct and controlled combustion

NOTE Solid-waste incinerators producing hot water, steam and/or electricity are a common form of energy recovery.

3.12
environmental aspect
element of an organization's activities or products or services that can interact with the environment

[ISO 14001:2004]

3.13
environmental impact
any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects

[ISO 14001:2004]

3.14
feedstock recycling
conversion to monomer or production of new raw materials by changing the chemical structure of plastics waste through cracking, gasification or depolymerization, excluding energy recovery and incineration

NOTE Feedstock recycling and chemical recycling are synonyms.

3.15
flake
plate-like regrind

NOTE The shape of regrind depends both on the plastics being processed and the manner of processing.

3.16
fluff
filament-like regrind

NOTE Common usage of the term “fluff” also includes shredder residue fractions produced in the commercial recycling of durable goods such as automobiles.

3.17
homogenizing
processing to improve the degree to which a constituent and/or property is uniformly distributed throughout a quantity of plastics material

[EN 14899:2005]

3.18
landfill
waste disposal site for the deposit of waste on to or into land under controlled or regulated conditions

3.19
lot
definite quantity of some commodity manufactured or produced under conditions that are presumed uniform

[ISO 472:1999]

NOTE Lot is primarily a commercial term.

3.20
material recovery
material-processing operations including mechanical recycling, feedstock (chemical) recycling and organic recycling, but excluding energy recovery

3.21
mechanical recycling
processing of plastics waste into secondary raw material or products without significantly changing the chemical structure of the material

NOTE Plastics secondary raw material is a synonym of recyclate.

3.22
micronizing
process by which a plastics material is ground into a fine powder

3.23
organic recycling
controlled microbiological treatment of biodegradable plastics waste under aerobic or anaerobic conditions

NOTE The term “biological recycling” is used synonymously.

3.24
post-consumer
descriptive term covering material, generated by the end-users of products, that has fulfilled its intended purpose or can no longer be used (including material returned from within the distribution chain)

NOTE The term “post-use” is sometimes used synonymously.

3.25
pre-consumer
descriptive term covering material diverted during a manufacturing process

NOTE 1 This term excludes re-utilized material, such as rework, regrind or scrap that has been generated in a given process and is capable of being reclaimed within that same process.

NOTE 2 The term “post-industrial material” is sometimes used synonymously.

3.26
purge material
material resulting from the passing of polymer through plastics processing equipment for the purpose of cleaning the equipment, or when changing from one polymer to another, or when changing from one colour or grade of polymer to another

3.27
recovered material
plastics material that has been separated, diverted or removed from the solid-waste stream in order to be recycled or used to substitute virgin raw materials

NOTE See ISO 14021.

3.28
recovery
processing of plastics waste material for the original purpose or for other purposes, including energy recovery

3.29
recyclate
plastics material resulting from the recycling of plastics waste

NOTE 1 The terms “plastics secondary raw material”, “recycled plastics” and “regenerate” are sometimes used synonymously.

NOTE 2 As soon as the used plastics material has been treated in such a way that it is ready to replace a virgin product, material or substance in a production process, it loses its characteristics as waste.

3.30
recycling
processing of plastics waste materials for the original purpose or for other purposes, excluding energy recovery

3.31
regrind
shredded and/or granulated recovered plastics material in the form of free-flowing material

NOTE The term “regrind” is frequently used to describe plastics material in the form of scrap generated in a plastics processing operation and re-used in-house. This term is also used to describe fine plastics powder used as filler in the recovery of plastics.

3.32
re-use
use of a product more than once in its original form

NOTE In view of the fact that a re-used product has not been discarded, re-use does not constitute a recovery option.

3.33
shredding
any mechanical process by which plastics waste is fragmented into irregular pieces of any dimension or shape

NOTE Shredding usually signifies the tearing or cutting of materials that cannot be crushed by fragmentation methods applicable to brittle materials, as typically carried out in a hammer mill.

3.34
waste
any material or object which the holder discards, or intends to discard, or is required to discard

4 Sources

4.1 General

Plastics material for recovery may be obtained from various sources, including the following:

4.2 Pre-consumer sources of materials

a) Plastics producers:

— off-grade materials.

b) Plastics processors:

— processing purge material and scrap;

— scrap products, parts and semi-finished products.

c) Others:

— industrial and commercial products made of, or containing, plastics, including packaging and containers.

4.3 Post-consumer sources of materials

a) Disposables:

— personal goods;

— packaging films and containers.

NOTE Such disposables may be recovered by sorted municipal collection systems or by specific consumer-incentive systems involving cash deposits on containers or by any other organized/unorganized individual or group of individuals for economic benefits.

b) Durable goods:

— domestic appliances;

— electronic equipment;

— transportation equipment;

— construction products;

— industrial equipment.