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Plastics — Recycling and recovery — Necessity of standards

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 14, *Environmental aspects*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Facing resource consumption beyond the capacity of the global ecosystem, the complex challenges connected to the plastics recycling must be overcome globally. It is more efficient that processes and a better management of waste indicate the most obvious potential to increase resource efficiency. This management can be achieved by reducing waste or by reusing, or recycling of the waste. Plastics waste entering a formal waste management system, are usually recycled, incinerated or disposed of in landfill. However, in communities where a formal waste management system does not exist, a substantial proportion of plastics waste is disposed of in uncontrolled dumps, watercourses, or burned openly (UNEP, 2016). Different kinds of plastics included in plastic waste, must be reused, collected and recycled to a much higher degree than today. Therefore, an agreement for this work and identification of the necessity of standards in the plastics recycling system and giving direction for the adoption of regional standards and/or the developing of new and existing standards took place at ISO/TC 61 Plastics-meeting in Japan 2018 and gave the reason for the work on this document.

This document has been developed to assist all plastics industry stakeholders in the development of new and improved standards for plastic recycling.

It gives a short general introduction to plastic recycling and describes the process from feedstock to plastics, the different types of recycling technologies and highlights common problems in relation to recycling of plastic materials and products. Both fossil and non-fossil feedstock are discussed.

In Clause 6, existing standards are mapped. In Clause 8, challenges in the transition to a sustainable plastic system are discussed. The necessity of standards is identified in Clause 9.

The overall structure of this document is as follows:

— brief overview of the current situation;

— general description of recycling techniques;

— inventory of existing standards (national, regional and global);

— mapping of relevant challenges;

— necessity of standards.

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Plastics — Recycling and recovery — Necessity of standards

1 Scope

This document gives a brief overview of the current (2019) situation in plastic recycling systems, relevant existing standards and short description of different recycling techniques. It aims to identify the necessity of standards in the plastics recycling system and give direction for the adoption of regional standards and/or the development of new and existing standards.

This document addresses various recycling options, with focus on, but not limited to, mechanical recycling, chemical and/or feedstock recycling and the corresponding preparatory activities.

This document excludes organic recycling (also designated as biological recycling) and energy recovery.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *Plastics — Vocabulary*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Overview prerecycling plastic technologies

4.1 General considerations related to recycling

4.1.1 Process into the polymer resins

Polymer resins in a bulk state which go through a thermal or chemical process (whether it is the moulding of thermosetting plastics, extrusion, injection moulding or film blowing of thermoplastics or spinning of a fibre from the melt) undergo deformation by applied forces. It means that the finished article is subjected to stress. Since plastics are a large group of similarly based but significantly different materials, the process has various effects on their short- and long -term behaviours. These effects should be considered during design and recycling of a plastic component or product before and after each lifecycle.

4.1.2 Design for sustainability

Design for sustainability includes selecting a proper material composition for a particular application. It is essential to define the properties not only to the performance of the component or product during usage phase, but also to its recycling and the next lifecycle. Design of a particular application should

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