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Environmental management — Material flow cost accounting — Guidance for phased implementation in organizations

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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).

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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 207, *Environmental management*, Subcommittee SC 1, *Environmental management systems*.

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

Achieving the Sustainable Development Goals (SDGs) established by the United Nations in 2015 has become a high priority for society. In particular, Goal 12 requires both governments and private sectors to ensure sustainable consumption and production patterns. Companies of all sizes need to achieve improvements in material and energy efficiency for sustainable production.

A number of International Standards provide guidance on material flow cost accounting (MFCA), which is an approach to assess material efficiency within an organization (see ISO 14051) and to enhance material efficiency in cooperation with supply-chain partners (see ISO 14052). While organizations are encouraged to implement MFCA based on ISO 14051, depending on levels of operations, they may prefer a more simplified approach to MFCA. To address this need, this document provides guidance for organizations to initiate a phased implementation of MFCA. This approach focuses on the most relevant production process to enhance material efficiency along with cost reductions, possibly leading to additional business opportunities (e.g. a green supply chain).

This document can be used independently of ISO 14051 and ISO 14052. However, the basic philosophy of MFCA as well as the terms and definitions are the same as in ISO 14051. In addition, this document has been designed to help organizations to identify new business opportunities regarding material and energy efficiency. Large organizations can also use this document as a starting point for their implementation of MFCA in a specific department or process.

This document provides:

— common terminologies;

— principles;

— a calculation approach, analysis and improvement;

— an application of the MFCA implementation result.

Annex A gives a case example of an MFCA implementation in organizations.

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Environmental management — Material flow cost accounting — Guidance for phased implementation in organizations

1 Scope

This document gives practical guidelines for the phased implementation of material flow cost accounting (MFCA) that organizations, including small and medium-sized enterprises (SMEs), can adopt to enhance their environmental performance and material efficiency.

The phased approach provides flexibility that allows organizations to develop their MFCA activities at their own pace, according to their own circumstances. The resulting information can act as a motivator for organizations to seek opportunities to simultaneously generate financial and environmental benefits by reducing material losses and energy consumption.

This document is applicable to any organization, regardless of its level of development, the nature of its activities, or the location at which these activities occur.

This document provides basic calculation procedures to analyse saving potentials by avoiding material losses. Detailed calculation procedures or information on techniques for improving material or energy efficiency are out of the scope of this document.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purpose of this document, the following terms and definitions 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/

3.1
energy cost
cost for electricity, fuels, steam, heat, compressed air and other like media

Note 1 to entry: Energy cost can be either included under material cost or quantified separately, at the discretion of the organization.

[SOURCE: ISO 14051:2011, 3.4]

3.2
energy use
application of energy

EXAMPLE Ventilation; lighting; heating; cooling; transportation; data storage; production process.

Note 1 to entry: Energy use is sometimes referred to as “energy end-use”.

[SOURCE: ISO 50001:2018, 3.5.4]

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3.3
material
substance that enters and/or leaves a process

Note 1 to entry: Materials can be divided into two categories:

— materials that are intended to become part of products, e.g. raw materials, auxiliary materials, intermediate products;

— materials that do not become part of products, e.g. cleaning solvents and chemical catalysts, which often are referred to as operating materials.

Note 2 to entry: Some types of materials can be classified into either category, depending on their use. Water is one such material. In some cases, water can become part of a product (e.g. bottled water), while in other cases it can be used as an operating material (e.g. water used in an equipment washing process).

Note 3 to entry: Energy carriers like fuels or steam can be identified as materials, at the discretion of the organization.

[SOURCE: ISO 14051:2011, 3.10, modified — "quantity centre" changed to "process".]

3.4
material flow cost accounting summary sheet
MFCA summary sheet
spreadsheet that reflects the *MFCA* (3.6) information for a production process that is treated as a single process

3.5
material cost
cost for a substance that enters and/or leaves a process

Note 1 to entry: Material cost can be calculated in various ways, e.g. standard cost, average cost, and purchase cost. The choice between cost calculation methods is at the discretion of the organization.

[SOURCE: ISO 14051:2011, 3.12, modified — "quantity centre" changed to "process".]

3.6
material flow cost accounting
MFCA
tool for quantifying the flows and stocks of *materials* (3.3) in processes or production lines in both physical and monetary units

[SOURCE: ISO 14051:2011, 3.15]

3.7
material loss
all material outputs generated in a process, except for intended products

Note 1 to entry: Material losses include air emissions, wastewater and solid waste, even if these material outputs can be reworked, recycled or reused internally, or have market value.

Note 2 to entry: By-products can be considered as either material losses or products, at the discretion of the organization.

[SOURCE: ISO 14051:2011, 3.16, modified — "quantity centre" changed to "process".]

3.8
system cost
cost incurred in the course of in-house handling of the *material* (3.3) flows, except for *material cost* (3.5), *energy cost* (3.1) and *waste management cost* (3.9)

EXAMPLE Cost of labour; cost of depreciation and maintenance; cost of transport.

[SOURCE: ISO 14051:2011, 3.21]

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3.9
waste management cost
cost of handling *material losses* (3.6) generated in a process

[SOURCE: ISO 14051:2011, 3.22, modified — "quantity centre" changed to "process", notes to entry have been deleted.]

4 Principles

4.1 Understand the basic material flow and energy use

The material flows related to products and energy use, including material losses in the most relevant production process, are identified and quantified as physical data.

4.2 Ensure the reliability of physical data

Physical data on material flows and energy use are collected in consistent measurement units.

NOTE Refer to ISO 14033.

4.3 Estimate and attribute costs to material losses and energy use

The costs associated with material losses and energy use are estimated, and these costs are attributed to the material losses and energy use.

4.4 Link physical and monetary data

Decision-making on environmental and management issues within organizations is supported by linking physical data with associated cost.

5 Cost calculations in a phased approach

5.1 General

Data on material flows and energy use should be translated into monetary units to support decision-making according to the cost calculations. This process consists of one preparation-phase, four calculation-phases and one analytical phase. Organizations can incrementally implement MFCA as indicated in 5.2 to 5.7.

5.2 Preparation phase — Identification of the most relevant production process in the organization

The organization should identify its most relevant production process. If there is a single production process in the organization, all of the material losses and energy use should be examined. If multiple processes are present, the organization can select either the most relevant production process or multiple processes as one single production unit for calculation.

A selection approach for the most relevant production process should be divided into two steps:

a) assess the magnitude of the different material losses and energy use;

b) select the process with a high raw material unit cost, large volume of material losses and defective products, etc. as the most relevant production process.

If the organization wants to assess several relevant processes, adoption of ISO 14051 is recommended.

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