

STRATEGIC BUSINESS PLAN (2025-04-01)

ISO/TC 122

EXECUTIVE SUMMARY

The packaging industry must continually assess the social impact of packaging and innovate to align with modern societal trends. Key factors shaping the industry today include environmental sustainability, the challenges posed by an aging population and declining birth rates, and the widespread adoption of advanced technology. In addressing the 17 Sustainable Development Goals (SDGs), there is an increasing demand for packaging solutions that prioritize safety, reliability, environmental responsibility, food waste reduction, and accessible design. The focus on ensuring that packaging is socially and environmentally appropriate has grown significantly, driven by collaboration among consumers, industry, government, and academia.

The packaging industry is intensifying efforts to manage plastics more sustainably. This includes reducing plastic usage, improving recycling practices, and incorporating recycled plastics into new products. Circular economy principles are gaining prominence, and the ISO is actively contributing through the development of standards that promote the reuse, recycling, and reduction of packaging waste. These initiatives aim to conserve resources and minimize environmental impacts by closing the material loop. The industry's commitment to the circular economy aligns with broader global efforts to reduce resource consumption and transition to sustainable production systems.

Despite these challenges, the industry remains committed to advancing accessible packaging designs that cater to all users, including the elderly and individuals with disabilities. These designs aim to prevent accidents from misuse, enhance product longevity, and maintain quality.

Two major trends—environmentally conscious packaging and accessible design—are driving innovation. Additionally, the development of packaging technologies that enhance food safety and reliability has made significant progress. Traceability in the food supply chain, from production to sale, is critical for consumer safety. Advanced technologies like RFID (radio-frequency identification) are crucial for ensuring product reliability throughout the supply chain. These technologies allow for more accurate tracking of goods and help prevent issues related to food safety. The emergence of active, intelligent, and smart packaging, which can monitor factors such as barrier integrity, distribution conditions, and expiration dates, is revolutionizing the field. Many companies are investing in these technologies to meet growing consumer demands for safety and transparency.

Moreover, recent advancements in artificial intelligence (AI) are transforming the packaging industry. AI-driven systems are being integrated into packaging design, manufacturing, and logistics, optimizing processes for greater efficiency and sustainability. AI can enhance predictive maintenance, improve quality control, and provide insights into consumer preferences, enabling more responsive and adaptive packaging solutions. This technology also plays a crucial role in optimizing waste management and recycling processes within the circular economy, contributing to smarter, more efficient material reuse and minimizing environmental impact.

The ISO/TC 122 committee will continue to develop a comprehensive suite of International Standards for the packaging sector. These standards will address terminology, dimensions, performance requirements, and testing methods.

ISO/TC 122 standards will provide cost-effective, reliable testing methods and deliver clear, unambiguous technical specifications through harmonization and standardization.

Additionally, ISO/TC 122 standards will enhance packaging design to meet global consumer needs, addressing critical social, safety, health, and environmental concerns, while incorporating circular economy principles.

By removing technical barriers in packaging, ISO/TC 122 standards will facilitate the seamless exchange of goods in international trade and logistics, opening markets across regions and supporting global commerce.

1 INTRODUCTION

1.1 ISO technical committees and business planning

The extension of formal business planning to ISO Technical Committees (ISO/TCs) is an important measure which forms part of a major review of business. The aim is to align the ISO work programme with expressed business environment needs and trends and to allow ISO/TCs to prioritize among different projects, to identify the benefits expected from the availability of International Standards, and to ensure adequate resources for projects throughout their development.

1.2 International standardization and the role of ISO

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade.

Three bodies are responsible for the planning, development and adoption of International Standards: ISO (International Organization for Standardization) is responsible for all sectors excluding Electrotechnical, which is the responsibility of IEC (International Electrotechnical Committee), and most of the Telecommunications Technologies, which are largely the responsibility of ITU (International Telecommunication Union).

ISO is a legal association, the members of which are the National Standards Bodies (NSBs) of some 164 countries (organizations representing social and economic interests at the international level), supported by a Central Secretariat based in Geneva, Switzerland.

The principal deliverable of ISO is the International Standard. An International Standard embodies the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in an ISO Technical Committee (ISO/TC), representative of all interested parties, supported by a public comment phase (the ISO Technical Enquiry). ISO and its Technical Committees are also able to offer the ISO Technical Specification (ISO/TS), the ISO Public Available Specification (ISO/PAS) and the ISO Technical Report (ISO/TR) as solutions to market needs. These ISO products represent lower levels of consensus and have therefore not the same status as an International Standard.

2 BUSINESS ENVIRONMENT OF THE ISO/TC

2.1 Description of the Business Environment

Note: Some of the statistics contained in this section have been contributed by Smithers, who published "The Future of Global Packaging to 2028" in December 2023. Information on this report and purchase can be found at <https://www.smithers.com/resources/2023/november/packaging-market-set-for-further-growth>

Between 2018 and 2021, global packaging demand experienced an average annual growth rate of 5.8%, showcasing a robust recovery from the social disruptions and demand decline caused by the COVID-19 pandemic. Despite rising costs and macroeconomic uncertainties, the global packaging market size is forecasted to grow from USD 1.17 trillion in 2023 to USD 1.42 trillion in 2028, achieving an average annual growth rate of 3.9% over the next five years. The primary drivers of this growth will be organic factors such as population increases and economic recovery in emerging markets.

The Asia-Pacific region is projected to experience the highest growth, with an average annual growth rate of 5.3% from 2023 to 2028. China, possessing the world's largest domestic market, is expected to account for 25.3% of global packaging demand by 2028 in terms of value.

Despite being considered a packaging form that is difficult to recycle after use, plastic flexible packaging has shown remarkable sales growth. It is projected to have the highest growth rate among packaging materials, with a global average annual growth rate of 5.1% over the next five years.

Paperboard-based packaging, including corrugated cardboard, paperboard, and liquid cartons, accounted for 31.8% of the global packaging material share in 2023, with a shipment value reaching \$373.8 billion, maintaining its position as the leading packaging material. It is expected to have an average annual growth rate of 4.2% until 2028, ranking second only to plastic flexible packaging. The demand for corrugated boxes

for e-commerce and substitutes for plastic packaging for consumer goods has surged, driven by stricter regulations on disposable plastic packaging in developed regions.

The demand for post-consumer recycled plastics (PCR) is expected to grow, primarily focusing on rigid plastic bottles and particularly mechanical recycling of r-PET. If plastics produced through chemical recycling (advanced recycling) technologies are officially recognized as recycled materials in various Western countries, infrastructure investments in this field are expected to expand. This would highlight the advantages of polyolefin flexible packaging, which has been previously considered difficult to recycle, such as resource conservation, volume reduction, and lightweight properties. Consequently, the demand for these materials is projected to increase significantly.

In 2023, artificial intelligence (AI) began making a significant impact on the packaging industry with disruptive technologies. It enhances packaging processes like technology development, logistics optimization, and waste sorting. AI also supports circular packaging with real-time tracking of metrics such as GHG emissions and PCR content, while advancing robotics, supply chains, and inspection systems.

AI's potential to address global challenges, particularly in reducing environmental impact and promoting sustainability, positions it to help the packaging industry contribute to global sustainability efforts.

The following political, economic, technical, regulatory, legal and social dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of this ISO/TC, and they may significantly influence how the relevant standards development processes are conducted and the content of the resulting standards:

Key drivers that influence Packaging Demand

- Overall population growing
- The trend towards smaller households
- The move towards smaller pack sizes as the incidence of families eating together at the dinner table becomes less common
- The increasing requirement for convenience among consumers
- The increasing requirements for accessibility
- Increasing awareness of environmental issues, and the adoption of new regulatory requirements on packaging recycling
- Rising health awareness amount consumers
- Growing requirements for brand enhancement / differentiation in an increasingly competitive environment
- Shift of consumer purchasing pattern- E-commerce and takeaway
- Transition to the circular economy
- New packaging material development
- Geopolitical risks, associated trade barriers and economic trends

2.2 Environment and packaging

First of all, we need to understand the trade-offs between packaging optimization, such as cost-effective, user- friendly and highly protecting function, and environmental burden.

Environmental problems have been highlighted on a global scale, and a reduction in environmental impact is demanded including the following: CO₂ generated from commodity distribution, disposal of final package waste, and usage of packaging materials. Reusable packaging is developed and produced from the viewpoint of being reused as many times as possible, as long as possible, in order to reduce overall costs along the supply chain and reduce the environmental impact. Reusable packaging is often heavier than single-use packaging, such as extruded polystyrene. However, Life Cycle Assessment (LCA) methodology has shown that, when effective reuse systems are in place, reusable packaging offers significant advantages over single-use alternatives. And reducing packaging at the source is also necessary to make packaging more acceptable in

the highly eco-conscious nations, such as the EU. This requires making packaging with the minimum materials to offer maximizing packaging functions, such as protection during transportation while using the minimum energy required. Such packaging requires standardization including methods and equipment for more efficient transportation, testing methods for packaged cargoes for ensuring the optimal protection, and more efficient assessment? methods.

With concern about CSR (Corporate Social Responsibility) rising, the packaging industry is working hard from design to waste reduction including the employment of biomass material and sorted collection of refuse on the basis of the 3Rs (Reduce, Reuse, and Recycle) toward constructing a sustainable circulating society. The industry is implementing plans, especially using the LCA technique with its emphasis on resource and energy savings, as well as countermeasures against hazardous materials from material procurement for packaging products to their final disposal as waste. Today, the regulation of chemical materials is moving to international unification. It is inevitable, therefore, that people concerned about packaging should develop and manufacture products by investigating and confirming the trends of chemical material regulation in the world (PRTR-Pollutant Release and Transfer Register, a reporting system for use and transfer of specified chemical substances, RoHS-Restriction of Hazardous Substances, REACH-Registration, Evaluation and Authorization of Chemicals, and VOC-Volatile Organic Compound). Nowadays, the production of packaging products is globalized and international standardization for those products is required as environment-conscious measures for packaging and packaging waste.

Furthermore, many developing countries face challenges in reducing, reusing, and recycling packaging. Meanwhile, developed countries are the main contributors to greenhouse gases (GHGs) from industrial production.

2.3 Active and intelligent packaging as a tool of product safety/security, quality assurance and food loss prevention

Active and intelligent packaging (AIP), often referred to as “smart” packaging, is an evolving technology that improves the preservation of the product it contains and effectively delivers it to distributors and consumers. AIP provides enhanced functionality for packaging beyond simply containing and moving the product.

AIP helps to improve food safety and shelf life and contributes to reducing food waste by providing consumers with more accurate information. It is useful for improving the safety and security of perishable and temperature-sensitive products such as vaccines and pharmaceuticals. AIP helps optimize the transportation and efficiency of logistics by providing interactive and accurate supply chain information. It also helps companies gain branding and marketing benefits. Ultimately, the technology helps to minimize packaging and product waste by reducing unnecessary resources and product spoilage during distribution.

AIP is generally categorized into active packaging and intelligent packaging. Active packaging includes materials or systems that interact directly with the product or environment to improve preservation. Examples include oxygen scavengers, antimicrobial coatings, and moisture absorbers. Intelligent packaging focuses on providing users with information about the condition of a product or package through a variety of sensors, indicators, or other data communication methods. Examples include time-temperature indicators (TTIs) and RFID tags. AIP technologies can be used independently or in combination with each other (e.g., active labels and printed electronics for tamper-proofing).

The market for active and intelligent packaging is growing due to increasing demand for fresh and high-quality food, food safety and traceability issues, and advancements in technology. It is particularly used in food, pharmaceutical, and e-commerce packaging applications.

According to Smithers' market research, the combined AIP market value in 2019 was estimated at USD 6 billion, growing at a CAGR of 5.1%. The global AIP market is expected to reach USD 8.6 billion by 2025. Of this, the active packaging market is expected to reach USD 6.1 billion, and the intelligent market is expected to reach USD 2.5 billion. The market share of active packaging is higher than that of intelligent packaging, but the annual growth rate of intelligent packaging is expected to be 13.3%, which is higher than that of active packaging at 4.1%. As materials and communication technologies advance, more products and packaging related to AIP will be created to enhance the products and user experience they contain. The

main industry sector is food and beverage, accounting for 90.2% of all applications.
(<https://www.smithers.com/services/market-reports/packaging/the-future-of-active-and-intelligent-packaging>)

On the regulatory side, there is a general concern about the safety of food contact materials in particular. European Regulation (EC) No. 450/2009 states that active and intelligent food contact materials must be provided and certified as safe for use in contact with food under specified contact conditions. International standards such as ISO 22000 and FDA and national regulations are also being strengthened. Recently, due to environmental issues, they are being developed in forms that are easy to separate and dispose of.

ISO TC122 has published a standard (ISO 6608-1:2024) on the definition, functional requirements and evaluation factors for active packaging, and is preparing intelligent packaging and related standards in the future.

2.4 Accessible design

The packaging industry must now review the social significance of packaging and develop or improve it to harmonize with society in line with today's trends, including environmental conservation, the aging population, combined with the diminishing number of children, and high informatization. The needs of safety, reliability, environmental consciousness, and accessible designs are especially increasing at present, and the momentum of considering the social and environmental adequacy of packaging is growing in cooperation with consumers and retailers as well as people from industry, government, and academia.

One major issue in society along with the environmental problem is how to respond to our aging society. The problem with our aging society has only just been addressed in the packaging field in the last few years. Packages created from these efforts, which are called accessible design packages, have been used for all packages including food and toiletries. Consumers will not buy inconvenient goods more than once, and differences between policies for accessible design affect business survival.

When we think of what consideration should be given to accessible designs of packages and containers, we can roughly cite (1) designs to make merchandise easily understandable, (2) designs for easy opening and content removal, (3) designs for easy carrying, (4) designs for easy use,

2.5 BENEFITS EXPECTED FROM THE WORK OF THE ISO/TC

Progress and develop of the packaging in the entire world are the main purpose for ISO/TC 122, especially in developing countries. Many of developing countries have good product especially in agriculture field that they can't sell them in global markets, which is mainly due to unsuitable packaging. Many local agriculture products, such as saffron, date, pistachio and so on are exported in bulk to other countries, packaged in bags with other country's name printed on them, and selling in global markets; in fact, the countries using the name gets benefit of it. To solve this problem as well as the other issues mostly mentioned in section 2, the following benefits should be expected from the work of ISO/TC 122.

- 1) ISO/TC 122 standards will provide cost effective and more reliable test methods allowing for clear, unambiguous technical specifications through harmonization and clarification.
- 2) ISO/TC 122 standards will improve the design of packaging fitting for global consumer needs of sustainability or accessible packaging responded to, or is expected to, address relevant social, safety or health concerns.
- 3) ISO/TC 122 standards enable easy, fair and efficient trade in the field of international trade and logistics, by removing technical barriers of packaging and opening markets in various regions of the world.

3 REPRESENTATION AND PARTICIPATION IN THE ISO/TC122

3.1 Membership

See;

<https://www.iso.org/committee/52040.html?view=participation>

Analysis of the participation

- Participation in TC 122 is relatively complete and balanced among the countries that produce and distribute commodities using various types of packaging.
- To be honest, the most active members would include USA, China, Japan, Republic of Korea, Germany, Sweden, Russian Federation and the UK. These are countries where packaging industry are matured and seek business opportunities by global standardization.

4 OBJECTIVES OF THE ISO/TC AND STRATEGIES FOR THEIR ACHIEVEMENT

4.1 Defined objectives of the ISO/TC 122

The TC 122 will elaborate a package of International Standards in the packaging sector with regard to terminology and dimensions, performance requirements and tests, and utilization of related technologies on packaging

4.2 Identified strategies to achieve the ISO/TC's defined objectives

The work of TC 122 and its subcommittees and working groups is usually done by plenary meetings, working group sessions, ad hoc groups, and teleconferences (meetings by modern means). A meeting will be scheduled only if the work-progress made by the various working groups justifies such a meeting. A great deal of standardization work will be done by correspondence.

ISO/TC 122 will continue to work closely with CEN/TC 261, where appropriate, with the development of new standards.

5 FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE ISO/TC WORK PROGRAMME

Some factors have increased the delays in the improving and proceeding of the work program. The most important factor is the lack of interest of participating actively in the development of new projects. On the other hand, interest in a project is not necessarily maintained throughout the development of process and low attendance to some working group meetings could indicate that although membership may be balanced, it might not be representative. There is always the danger that a small group of experts could produce a document that is voted against by bodies, which did not assist in its development.

The other important factors in causing delays in the delivery of standards are the lack of consensus caused by differing national regulations or attitudes towards the subject of study and the absence of proven test methods. More worrying however, is the lack of resources to conduct collaborative trials which may occasionally prove necessary to validate test methods.

There also is an increasing and disturbing infringement into TC 122's areas of responsibilities in such areas as RFID technology, packaging security, and processes/information exchanges with a security purpose.

6 STRUCTURE, CURRENT PROJECTS AND PUBLICATIONS OF THE ISO/TC

This section gives an overview of the ISO/TC's structure, scopes of the ISO/TCs and any existing subcommittees and information on existing and planned standardization projects, publication of the ISO/TC and its subcommittees.

All of this information is updated regularly and is available on ISO's website, ISO Online.

The link below is to the TC's page on ISO's website:

<https://www.iso.org/committee/52040.html>

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