Spoil Detection-based Smart Labels - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts (2025 - 2030)

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Report description:

The Spoil Detection-based Smart Labels Market size is estimated at USD 1.11 billion in 2025, and is expected to reach USD 1.88 billion by 2030, at a CAGR of 11.09% during the forecast period (2025-2030).

Smart labels are becoming one of the most popular technologies across the pharmaceutical, food, and cosmetics industries. They are viewed as an ideal means to achieve greater efficiencies and profitability while providing the authenticity of an item and its traceability.

Key Highlights
- Smart labels provide detailed information about individual items in less time and offer real-time information. They also ensure authenticity and supply chain integrity while creating new opportunities for brands to engage with customers. The rising customer preference for hygienic food materials and the ability to quickly detect the degree of freshness is expected to drive the demand in the spoil detection-based smart labels market over the forecast period.
- The increased food and pharmaceutical recalls in recent years have raised global awareness about the genuine challenges of maintaining safe product temperature ranges during the production, handling, and administration of specific 'cold chain' goods. In January 2020, FUSION IV Pharmaceuticals Inc. dba. AXIA Pharmaceutical voluntarily recalled all unused sterile drug products within expiry, to the user level, due to a lack of assurance of sterility.
- Further, the emergence of the COVID-19 pandemic has led to an increase in visible behavioral changes due to a higher inclination toward safe and traceable food on e-commerce platforms and raised public consciousness about health and safety in general.
- According to an IBM study (2020), approximately 71% of consumers were willing to pay an additional average premium of around 37% for companies providing full transparency and traceability of their products. Under such conditions, end-to-end

visibility within the supply chain has become one of the top priorities for businesses seeking to build trust with their consumers, where blockchain and IoT are expected to make a significant impact.
- Smart labels in the pharmaceutical, healthcare, and food industries are buoyed by the increasing need to track and maintain the quality of the products in these industries. Some smart labels are also equipped to detect spoilage, especially during transit. Many kinds of sensors are integrated into these labels, such as optical, ultrasonic, and active sensors. They are durable and provide information about moisture, temperature, movement, location, and many other factors.
- Companies deploying such sensors can use them to check the products' condition to prevent spoilage and validate their freshness. Companies may also check the temperature of storage facilities to avoid spoilage.

Spoil Detection Based Smart Labels Market Trends

The RFID Segment is Expected to Hold a Major Market Share

- The trend of integrating sensors such as RFID with spoil detection-based smart labels is likely to be introduced across various industry verticals in the next few years. RFIDs have a limited cost and negligible maintenance, which make them appealing for numerous applicative scenarios such as manufacturing, logistics, healthcare, agriculture, and food.
- Smart label development is an innovative application of RFID. Typical RFID systems comprise two major components: the reader and the label. The smart label consists of an RFID system and a graphical user interface (GUI).
- Principally, the two main components involved in the RFID system are the transponder (the label attached to the antenna) and the interrogator (RFID reader). Spoil detection-based smart labels convey the exact degree of freshness of the food material by changing its texture and color or communicating to the system with the help of RFID tags.
- According to FAO data, on a global level, about 33% of food is wasted in the supply chain. As per the European Commission, this figure amounts to over 40% of food products before reaching the retail market. The key reasons for this food waste in the supply chain range from their production origin, transformation, and packaging, largely for their aesthetic reason, HORECA purchasing management, distribution, and retail. Many distribution centers and warehouses have been investing in improving process efficiency to increase the efficiency of the processes as a part of improvement programs. Such investments are expected to drive growth for RFID-based smart labels.
- RFID technology has generated demand for a printer capable of concurrently printing text, bar codes, and graphics on the label's surface in addition to reading, programming, and verifying the RF tag embedded in the label. Smart label printers function as traditional printers when creating graphics, bar codes, and human-readable text. They also have RFID encoders and readers embedded inside.
- An RFID system enables unique traceability per product without requiring a direct line of sight for data reading. This exclusive automation results in the visibility of supply chain and logistics processes, which reduces errors, unknown losses, and out-of-stock to a minimum while simplifying and lowering inventory management and purchasing forecasting.

North America is Expected to Hold the Largest Share

- North America is one of the largest markets for spoil detection-based smart labels globally, with the United States accounting for a significant share in the region. The country's huge demand can be attributed to the vast presence of small and big retail stores. The United States is led by retail giants, such as Walmart and others, driving the upsurge in activity, largely contributing to the country's growth of the studied market.
- According to the US Department of Agriculture, food waste is estimated at 30-40% of the food supply annually in the United States. Food waste has led to huge food insecurity in the country. The country is expected to witness 50 million people suffering

from food insecurity in 2022 alone. This staggering increase in food security will likely fuel large-scale initiatives to reduce food spoilage, driving the market growth. To address the alarming food wastage on the shelves of various retail stores, vendors are introducing new spoil detection based on smart labels to minimize such wastage.
- Technology proliferation in the studied market has allowed smart labels to predict freshness and help consumers and distributors understand spoiled ones. Research studies have helped develop indicator labels that can indicate on-package freshness for guavas without altering the quality of the fruit.
- Also, USDA and FDA (Food and Drug Administration) announced a framework agreement to label cell-based meats and potentially other food products in 2019. This is expected to augment the market size in the country further. Vendors in the country invest in technologies that drive greater traceability throughout their supply chains, with blockchain increasingly used along with spoil detection-based smart labels.
- Besides the rise in healthcare expenditure in the country, RFID technology is expected to propel the spoil detection-based smart label market in the healthcare and medical sectors. The increased spending is anticipated to create new deployment avenues for spoil detection-based smart labels. Overall, the market is expected to mature significantly in the country over the forecast period.

Spoil Detection Based Smart Labels Industry Overview

The competitive rivalry in the spoil detection-based smart labels market is high due to the presence of some key players such as Evigence Sensors, Insignia Technologies, and many more. The players in the industry have been able to successfully come up with product developments through continuous research and development by entering strategic partnerships that have enabled them to boost the market growth.

- March 2022 - Avery Dennison Corporation acquired the linerless label technology developed by Catchpoint Ltd, a UK company based in Yorkshire, England. The purchase covers Catchpoint's patents, brand, trade secrets, and know-how.
- January 2022 - SpotSee, one of the global leaders in condition-indicating solutions that protect life sciences products against damage and ensure supply chain integrity, acquired Biosynergy, Inc., a manufacturer of medical devices primarily used to monitor the core temperature of red blood cells.
- January 2022 - CCL Industries Inc., one of the world leaders in specialty label, security, and packaging solutions for global corporations, government institutions, small businesses, and consumers, acquired two U.S. headquartered, software-powered tag and card businesses - International Master Products Corporation, and Lodging Access Systems, LLC for its Avery unit.

Additional Benefits:

- The market estimate (ME) sheet in Excel format
- 3 months of analyst support

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