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Fiber Optic Sensor Sorting Process



Overview

How Do Optical Sorting Technologies Identify Fiber Optical sorting technologies use Near-Infrared (NIR) light to identify the unique molecular Optical Sort.

Key Takeaways

Fiber optic sensor sorting primarily uses optical and near-infrared (NIR) technologies to identify and separate fibers based on their chemical composition and physical properties.Overview of Fiber Sorting with Sensors

Fiber sorting systems employ optical sensors to detect and classify fibers in textiles or recycled materials. The process typically involves material feeding, sensory examination, data processing, and material separation. Fibers are transported via conveyor belts or chutes, where sensors capture data about each fiber's chemical or physical characteristics. This information is processed in real time, and actuators such as air jets or mechanical arms divert fibers into designated bins for recycling or quality control purposes .

Near-Infrared (NIR) Spectroscopy

A widely used method in fiber sorting is Near-Infrared (NIR) spectroscopy. NIR sensors shine light on fibers and measure the reflected wavelengths, which correspond to the unique molecular "fingerprint" of each fiber type. This allows the system to distinguish between cotton, polyester, wool, and blended fibers. The data is compared against a digital library of known fiber profiles, enabling high-speed, accurate sorting at industrial scales .

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Optical Sorting Machines

Advanced machines like FiberMax™ use high-resolution optical sensors to sort fibers at speeds up to 1,000 feet per minute (5 m/sec). These systems can handle contaminants, mixed paper, and various fiber types, reducing the need for manual sorting and improving recycling efficiency . Optical sorting can also be enhanced with AI-driven algorithms, which improve classification accuracy and reduce contamination in recycled streams .

Active vs Passive Optical Sorting

Optical sorting can be categorized into active and passive methods. Active sorting uses optical tweezers, Raman spectroscopy, or AI-assisted detection to manipulate and separate fibers at a microscopic level. Passive sorting relies on deterministic light fields and lens systems to sort fibers based on size, shape, or optical properties. Both approaches offer high resolution, non-invasive sorting, and are increasingly applied in textiles, recycling, and materials science .

Advantages and Limitations
• Advantages: High speed, precise identification, reduced labor, ability to handle mixed fibers, and integration with AI for improved sorting accuracy .

• Limitations: Dark-colored fibers or heavily dyed materials may reduce NIR sensor accuracy, requiring complementary technologies like mid-infrared spectroscopy or multi-sensor fusion .
Industrial Applications

Fiber optic sensor sorting is widely used in:

• Textile recycling: Separating cotton, polyester, wool, and blends for circular economy initiatives .

• Paper and pulp industry: Sorting OCC, ONP, and mixed paper streams .

• Quality control: Ensuring fiber purity and removing contaminants in commercial and industrial production lines . These systems enable millisecond-level sorting, processing thousands of fibers per hour, and are essential for efficient recycling and high-quality fiber recovery.

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Optical sorting technologies use Near-Infrared (NIR) light to identify the unique molecular

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Optical sorting involves the automated separation of items based on their optical properties such as color, shape, size, and texture. It

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Optical sorting combines optical tweezers with diverse techniques, including optical spectrum, artificial intelligence (AI) and

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MSS, Inc., the optical sorter division of the CP Group, is introducing its next generation fiber sorting technology, the

A novel approach for sensor based sorting performance determination

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Abstract Sensor-based sorters execute an “accept-reject” task to selectively remove the target particles from a

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How to use fiber optic sensors on sorting machines?

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What is a Fiber Optic Sensor?

A fiber optic sensor operates with an optical fiber cable connected to a dedicated light source. These sensors offer great mounting

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Sensor-based sorting consists of various process phases: Material feeding and transportation, sensory examination, data processing

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