SMART PACKAGING – A NEW TOOL FOR BETTER RECYCLING PACKAGING

Keywords: Artificial Intelligence, *intelligent Separation technologies for Materials, use of invisible barcodes, sensors and databases, interconnectivity, data tracking, Industry 4.0.*

Background to Case Study.

Effective recycling relies on effective and efficient sorting. Separating the different elements found in waste streams is crucial for enabling the recovery of useful materials, minimizing the amount of material sent to landfills, and allowing recyclable materials to find a new purpose.

Plastic Packaging Recycling using Intelligent Separation technologies for Materials' (PRISM) uses invisible inks to develop a more efficient, low cost sorting technology that will increase sorting efficiency and therefore the purity and quality of recycled material.

Fluorescent marking technology can give solutions in recycling and especially in the separation of plastics into single-material streams. The inclusion of as little as 0.1 per cent of 'non-compatible plastic' in a particular stream, can reduce the quality of the final recycled product significantly.

Near-Infra Red (NIR) sorting technology is commonly used in many material recovery facilities (MRF) as it can differentiate between different polymers allowing high volumes of plastics to be sorted at low cost.
The new method involving the use of labelling packaging with fluorescent inks involves the use of ultraviolet (UV) light and when integrated with the current NIR-based method, adds an additional level of sorting.
The fluorescent label sorting system is designed to be integrated with the current NIR-based sorting systems used in material recycling facilities (MRFs), meaning there would be no adverse effect on sorting speed.

LOOKS LIKE THIS   PERFORMS LIKE THIS

Invisible Barcode Technology
An invisible barcode printed on articles is visualized by a blacklight and extracted
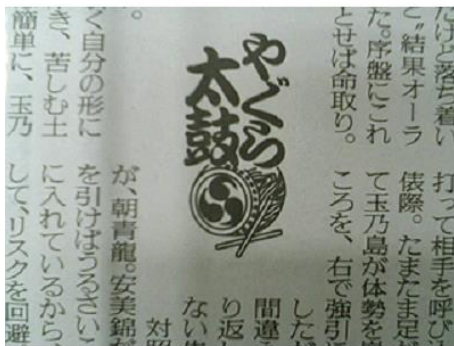
Normal   Illuminated

Introduction to the Case Study and it's growth within Industry 4.0

Consumers many times face the problem to figure out which items can be recycled, and which cannot. Machines in sorting plants can have the same problem. Sorting packages is time consuming thus impairing the health of workers recycling plants. Using invisible barcode" technology i aims to fix the problem.

The technology used is based on the following idea. Rubbish is being sent around in a continuous loop to try out different ways of sorting it. Rubbish passes with a speed of three meters per second and cameras are scanning and identifying each item. They capture images at 150 frames per second.

The cameras are hunting for hidden codes on the packaging. These codes are created by subtle changes to the pixels on the packaging artwork to do with contrast which the naked eye will not notice.

This information like a QR code tile is repeated around the package in order to make it easiest for the cameras to catch it and although consumers cannot see it, cameras can! The same code can be embossed in plastic allowing accurate identification of every package where it comes from and if it is recyclable or reusable.

A database tells the sorting machine what the package is made of, and air jets can sort the waste packaging by blowing it in different directions. The sorting can reach up to 90% range of the packaging.

That technology can distinguish food grade plastics from non food grade plastics so that the right kind plastic can be reused to manufacture new items.

The same technology could make self checkouts faster in supermarkets, and it could help consumers sort their recycling at home with information provided on an app.

The Case Study and Industry 4.0 Elements: A Pictorial Overview

The packages are printed with invisible watermarks.

Special cameras can read the barcodes even though the consumers won't spot them.

The aim is to make recycling less confusing at home and to improve recycling rates in plants which helps to better protect the environment and prevent the unnecessary disposal of packaging into landfills or incinerators.
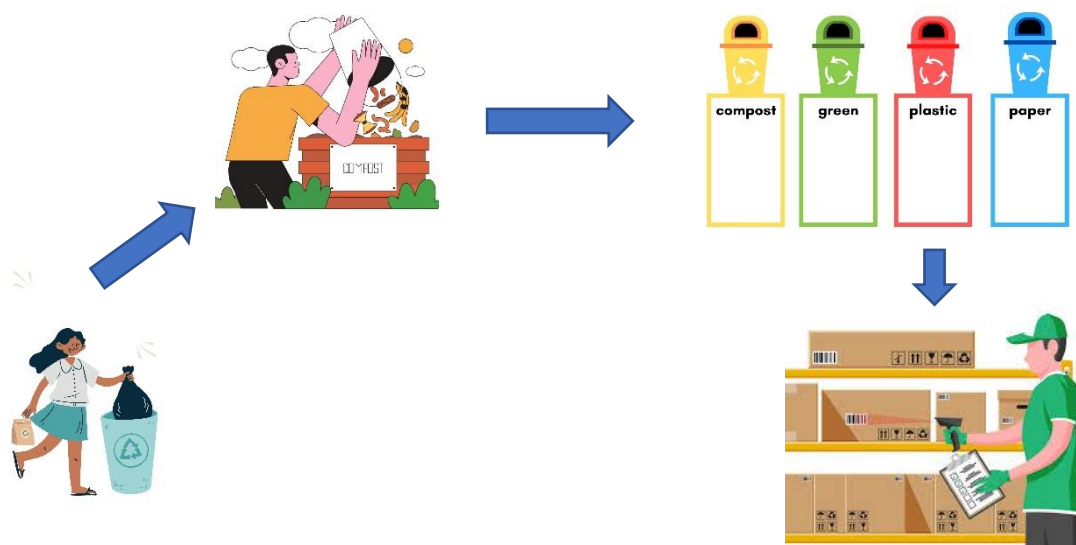
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The Element Explored within Industry 4.0 Application.

TOMRA

TOMRA Recycling designs and manufactures sensor-based sorting technologies for the global recycling and waste management industry. Over 7,400 systems have been installed in more than 100 countries worldwide.

Responsible for developing the world's first high-capacity near infrared (NIR) sensor for waste sorting applications, TOMRA Recycling remains an industry pioneer with a dedication to extracting high purity fractions from waste streams that maximize both yield and profits

TOMRA Recycling's pioneering industry expertise continues to result in state-of-the-art machines and exceptional service within the waste and metal recycling industries.

Goal: support customers to optimize their sustainability and operational value. Method: use established and renowned industry expertise to provide state-of-the-art machines and exceptional service throughout the entire process.

TOMRA Recycling is part of TOMRA Sorting Solutions which also develops sensor-based systems for sorting, peeling and process analytics for the food, mining and other industries.

Application Target Audience	*Recycling plants, consumers.*
Resources Used:	*https://www.ibm.com/cloud/learn/what-is-artificial-intelligence* *https://www.packaginginsights.com/news/ai-in-packaging-how-artificial-intelligence-is-driving-the-packaging-industry-forward.html* *https://recyclinginside.com/recycling-technology/separation-and-sorting-technology/*
Further Reading:	*https://www.fastcompany.com/90432163/these-invisible-barcodes-make-plastic-more-likely-to-be-recycled* *https://researcher.watson.ibm.com/researcher/view_group.php?id=5608* *https://resource.co/article/invisible-marker-%E2%80%98barcode%E2%80%99-project-gets-funding-boost-10911*

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