Sept 2025/PT/SG1

TECHFLASH

We are pleased to introduce you to Fraunhofer TechFlash - Fraunhofer's Flash News on latest and exciting technologies.
This week's TechFlash is about a research project for increasing safety in waste sorting plants, **>>DangerSort<<** which is currently in progress.

DangerSort, a sensor-based e-waste sorting to reduce possibilities of battery fires

Fraunhofer Institute for Integrated Circuits (IIS) was founded in 1985 in Erlangen, Germany. Its core mission is to conduct world-class cutting-edge research on microelectronic and information technology system solutions and services. Today, it is a globally renowned application-oriented research institution, and currently a largest institute of the Fraunhofer-Gesellschaft organisation. The scientists and engineers work closely with industrial customers and public institutions, offering R&D services, licensing technologies, and providing expertise for product development. The diverse research areas at Fraunhofer IIS include: Audio and Media Technologies, Communication Systems (5G, wireless IoT), Development Centre for X-ray Technology (for non-destructive testing, materials characterization), Engineering of Adaptive Systems (focusing on AI, IoT, trusted electronics, quantum communication), Positioning and Networks (satellite navigation, radio-based positioning, RFID), Smart Sensing and Electronics (developing intelligent sensor systems for various applications, including digital health), Supply Chain Services (optimizing business processes through data-driven solutions and IoT) & Artificial Intelligence and Machine Learning (including large language models and Edge AI).

Image 1 - Fraunhofer IIS, a prototype sorting system

According to a study by the German association, BDE (Bundesverband der Deutschen Entsorgungs), Wasser- und Kreislaufwirtschaft e. V., in Germany alone, over 10,000 fires occur per year in the waste sorting facilities during the recycling process and around 80% times the fires are caused by lithium-ion batteries found in the e-wastes. The damage caused by such fires is estimated roughly €1 Billion a year. The **DangerSort** project targets to reduce the risks of such fires.

Fraunhofer IIS is developing a sensor-based system which uses X-ray scanning technology & artificial intelligence to detect hazardous lithium-ion batteries and separate them from the rest of the waste streams. So far, there have been no preventive measures against fires caused by batteries, only solutions to combat them, such as improved fire extinguishing systems. This sensor-based technology could also make it easier to recycle batteries.

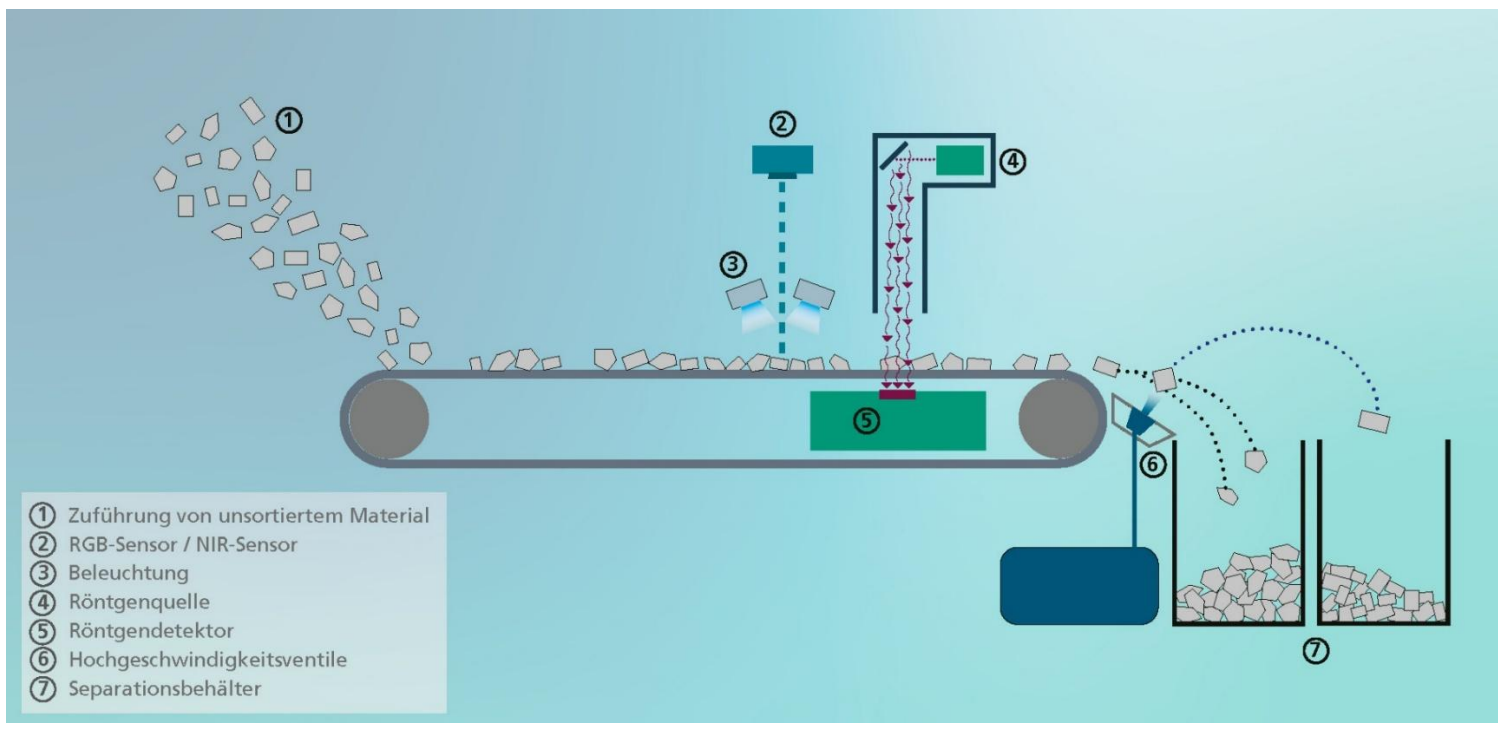

Image 2 – a concept showing the logic behind this project.

- **X-ray Scanning**:
  A prototype system set up at Fraunhofer IIS demonstrates the potential of the idea. A high-speed conveyor belt in the X-ray sorting system, transports the waste stream at a speed of 3 meters/ second. An X-ray source above the conveyor belt operates very similar to an airport luggage scanner and screens the material stream. This technology can also identify batteries installed in appliances or concealed by other waste. An X-ray detector mounted below the conveyor belt takes images at the speed of the conveyor, resulting in a continuous series of radiographic images.
- **AI Image Analysis**:
  This series of images is then analysed real-time by an AI system that is designed for rapid image processing, adapted from an autonomous driving application, retained on these images to detect lithium-ion batteries from different electrical appliances in the streams.
- **Segregation by automated air-jet**:
  The compressed air nozzles of around 5mm diameter size are actuated after the AI detection to separate those batteries into a different chamber. The most crucial and precise activity here is the timing between evaluating & analysing the radiograph and starting the nozzles. This is a difficult step as these batteries can range in varying sizes, from tiny button cells to e-bike batteries.

The project **DangerSort** is funded by the German Federal Ministry of Education and Research (BMBF) and scheduled to conclude by August 2025. This project is also a part of the AI Application Hub on Plastic Packaging, and involves 51 industry, academic, and societal partners through the KIOptiPack and K3I-Cycling labs. Early battery detection allows for safer recycling and potential reuse of battery components, boosting the Circular Economy and the AI-X-ray combo is designed for integration into commercial sorting lines which can turn into a scalable technology business.

Please click below to collaborate with us on your innovative ideas. We look forward to hearing of your interest to discuss this and other numerous exciting technologies.

Yes, I am interested

About Fraunhofer-Gesellschaft:

Founded in 1949, the Fraunhofer-Gesellschaft based in Germany is the world's leading applied research organization. It offers contract-based R&D services for specific industry demand, application-oriented technology development from proof-of-principle up to market-readiness across the value chain and offers technical consultancy and feasibility studies to nearly all the industry sectors. The Fraunhofer-Gesellschaft currently operates 75 institutes and research units throughout Germany. Over 32000 employees, predominantly scientists and engineers, work with an annual research budget of €3.6 billion. Fraunhofer generates €3.1 billion of this from contract research. Our global footprint is very strong, with offices and research centres in the USA, Europe and Asia. Some of our renowned innovations are the MP3 software, white LED's and the smallest of cameras. Fraunhofer has been a long-time trusted innovation partner in India, collaborating with some of the major players in the fields of Material Science, Energy, Environment, Automotive, Electro-mobility, Production Technology, Microsystems and Smart Cities, working with Industry, Government and Public Sector.

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