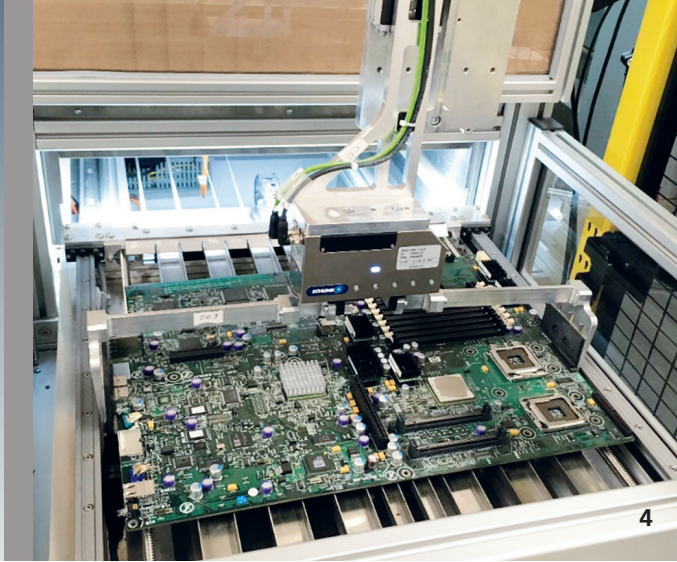


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DEMONSTRATOR SYSTEM FOR LASER DETECTION OF ELECTRONIC COMPONENTS

Task

Modern electronic devices contain a large number of different materials, only some of which are recovered at the end of their service life by current recycling processes. However, other valuable technology raw materials can be recovered in a circular economy if they are separated into fractions with high concentrations of the target materials.

Method

The consortium of the EU project ADIR has developed an automated demonstration line for the targeted removal of electronic components from end-of-life electronics. A key point here is to provide information on where which components are assembled and which materials they contain. This information is obtained using image processing, 3D laser measurements and laser spectroscopy, and then stored in a database.

Results

An inspection system was built and integrated into the demonstrator: It receives electronic circuit boards from pre-processing, produces high-resolution color images, and then measures the 3D height structure on the board. The results are compared with those of known printed circuit boards (PCBs) already stored in the database. The materials of unknown components are identified using laser-induced breakdown spectroscopy (LIBS); the components are evaluated – supported by image processing software – to identify which target

fractions are present. This system creates a digital twin of all processed PCBs, which can be used in the subsequent process step to selectively remove and sort valuable components by laser de-soldering. The process has already been successfully tested in field trials at a recycling plant. Specialized metallurgical plants have recovered valuable materials, such as tantalum as a secondary raw material, from the enriched sorting fractions. The ADIR project consortium demonstrated that the entire recycling concept operates efficiently at both the Berlin Recycling and Secondary Raw Materials Conference on March 2–3, 2020 and the Mineral Recycling Forum on March 10–11, 2020 in Aachen, Germany. The system sorted around 1000 disassembled cell phones and more than 800 printed circuit boards.

Applications

When information about the structure and material composition of end-of-life devices is lacking, recycling raw materials at high-quality faces a great obstacle. This is where digitally networked optical measurement technology can close the gap and enable society to efficiently recycle and save resources.

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- 3 CAD drawing of the demonstrator line.
- 4 Automatic transfer of a printed circuit board to the inspection system.