INGEDE
International Association of the Deinking Industry

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Automated Sorting of Recovered Paper:

Infrared Eyes Detect Interfering Flexo Prints and Board

Paper recycling preserves the environment – and it also contributes to protect the climate as it saves energy and resources. That is why more and more paper shall be recycled, and that is why paper mills produce more and more high paper grades from recycled fibres or at least with a significant portion of deinked pulp. But this means that the raw material has to be inspected more thoroughly.

But more paper being collected from households in many cases also means a change for the worse in paper quality. Non-paper components such as wood, plastics, metal or textiles have to be removed prior to the recycling process. In order to produce new, bright newsprint from recovered paper, this has to be free from brown board and should consist mainly of newspapers and magazines.

But serious problems hide even in the bright newspapers. In order to produce the white paper for newspapers and magazines, copying paper or hygiene papers, the printing ink has to be removed – this process is called deinking. Publishers in the UK and Italy for some years print newspapers with water-based flexographic inks. Unlike the common offset printed newspapers, flexo prints currently are not deinkable and have to be rejected.

Optical sensors can detect what is invisible to the human eye. The Austrian research center CTR in Villach is an expert in the field of optical metrology. Their “Spectral Imaging Technology” and numerous industrial projects in this area have established CTR’s international reputation. This is why INGEDE, a European association of paper mills, has started a joint project with CTR in order to optimise automated sorting of recovered paper for deinking using this technology. The aim is to detect and reject not only non-paper impurities like plastics or wood, but also unwanted papers like cardboard or pamphlets that are dyed throughout.

Even flexo news that are impossible to distinguish by the naked eye will be detected by the sensor system that CTR develops. “This is the biggest challenge for us. Flexo news which come across the borders from the UK or Italy in the course of the globalisation of the recovered paper trade, yet can only be identified by their title”, says Raimund Leitner,

project leader with CTR. “Our system will manage that on the assembly line, within ten milliseconds or less.”

Still recovered paper is mostly sorted by hand on the assembly line. Especially the board fraction has to be separated from the recovered paper which usually is being collected together with packaging material. The “classic” among the infrared sensors can distinguish paper from board automatically. Four plants in Germany and two in Austria in the meantime utilise this technology developed by CTR. Once the disturbing board has been recognized, a precise, powerful airstream blows it into a separate chute.

The new system has a higher resolution and a wider spectral range. So it can even detect and reject flexo inks. A prototype of this plant has been mechanically completed and runs in the Villach Research Center, the first results of the new image analysis are very promising.

Reflected Beam Betrays Paper and Inks

The “material fingerprint” of a substance is based on the classification by sensor systems in the near infrared and the visible light. A light source illuminates the sample. Part of the light will be absorbed by the sample, the remaining light reflected. The reflected beam displays signatures typically for the material – a sort of a fingerprint that reliably identifies the material. Especially the near-infrared spectra provide important information that visible light does not. By that, the images gain an additional dimension: Length, width and material information. This enables to measure simultaneously and contact-free – and delivers a spatially resolved analysis of some hundred spectra with one single image. “It is not the hardware alone that makes the system. It takes a combination with adequate algorithms to compile an intelligent system from it”, Leitner explains. “For the industrial application an on-line classification is necessary which in the first place allows real-time detection. Real-time in this case means that there are usually only about ten milliseconds or less for recording, processing and classification of one line of the image. Only with the classification of this speed industrial sorting systems can be developed and implemented.”

Multispectral image processing has been used for plastic sorting plants for a long time. The food industry also utilizes the technology, e.g. to determine the quality and degree of ripeness of fruit or vegetable or to detect contermination of poultry. In mineralogy this system can help to tell genuine from false turquoises, detect minerals or evaluate drilling

cores. It can also assist in medical technology (dermatology, cosmetics, plastic surgery).

INGEDE is an association of leading European paper manufacturers founded in 1989. INGEDE aims at promoting utilisation of recovered graphic paper (newsprint, magazines and office paper) and improving the conditions for an extended use of recovered paper for the production of graphic and hygiene papers.

The CTR, Carinthian Tech Research AG, was found in 1997 and performs industry oriented research and development in the field of intelligent sensor technology. CTR's focus is quality and process optimization for the industry. The optical recognition system was awarded the Austrian "Phoenix Innovation Price" in 2003 (www.ctr.at)

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