Sensors hit the right t

The waste management industry is constantly evolving, and so too is the potential of automated sorting technology. **Stephen Almond** explores some of the latest developments

AT A GLANCE
How advances in sorting technology mean that greater rates of recovery from previously challenging waste streams are now more achievable

Recovery of a very pure paper fraction is made possible using NIR sensors at Wastebeater's C&I MRF in Belfast

■ **THE RECOVERY OF VALUABLE MATERIALS IN TRADITIONALLY DIFFICULT TO MANAGE WASTE** streams presents challenges and opportunities. If the UK is to meet landfill diversion targets, then achieving the highest possible recovery of recyclate will be vital.

Emphasis is usually placed on commingled dry waste streams. But attention is now shifting to the opportunities to recover valuable recyclate from other waste streams, including commercial and industrial (C&I), construction and demolition (C&D) and municipal solid waste (MSW). Key to long-term success in materials recovery, irrespective of the waste stream, is the need for materials to be of sufficient consistent quality to have a commercial value.

This is where the automated MRF comes into its own. Sensor-based sorting systems can achieve recovery rates of up to 99% and typical purity rates of >95%.

■ Solid recovered fuel (SRF) procurement is very much a buzz word in the waste management industry, with energy-from-waste (EfW) developers looking to source end markets for their fines. One such end market is cement manufacture, but the quality and purity of SRF is key and one of the biggest concerns is its chlorine content.

While modern cement plants have filtering systems in place to remove chlorine content, older plants are not so equipped and require SRF that has already been dechlorinated. Using ultra-high resolution near infra red (NIR) sensors, PVC of >6mm can be removed from SRF to reduce its chlorine content.

TiTech UK has also developed an online monitoring software package that monitors the SRF's key characteristics: water content, chlorine content and calorific value. Again, this is valuable to EfW plant operators because SRF has to meet a certain calorific value in order to be of 'saleable' quality.

■ A relatively new application of sorting technology is in recovering a variety of valuable, recyclable materials from MSW. One of the greatest challenges of MSW is the high organic material content, which can significantly influence the quality of the recyclables output.

TiTech is involved in the first two UK MSW installations where high-quality, high-value end products are being recovered from MSW on a commercial scale using a unique combination of optical sorters and mechanical screens. Examples of this include the use of high-resolution NIR for plastic recovery from organic fractions between 10-50mm along with the plastics and fibre from >50mm.

■ The potential value of C&I waste is not being fully realised, and many waste recycling companies are achieving only low levels of materials recovery, typically 10-20%, using manual or semi-automated techniques. These MRFs are labour-intensive, require high capital outlay and have a significant footprint.

The materials recovered often have low purity levels and therefore low value. Sorting technology offers an ideal solution for the C&I waste sorting process by fully automating the process, optimising material recovery and purity rates.

TiTech technology is now in place at a number of fully automated MRFs which are capable of processing up to 35 tonnes/hour, with only three or four staff in final quality control. Used in this setting, NIR sensors can typically recover up to 85%, not including fines, of all valuable materials including paper, cardboard, plastic films, rigid plastics, films, wood and metals.

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Purity levels have also improved dramatically, with sensor-based technology recovering materials of typically more than 95% purity, guaranteeing maximum revenue return.

One new approach lies in the use of a two-step NIR sorting process to ensure maximum recovery. With the first step, the NIR is programmed to select 'aggressively', by positively targeting recyclate, to maximise recovery. The second step then 'cleans' the product by targeting all contaminants to ensure maximum purity, thus increasing its market value. As an example, paper with up to a 95% recovery and purity is achievable using this two-step process.

■ As well as TiTech's unique PET flake sorting application at Eco Plastics' Hemswell plant (see case study), the two-step NIR sorting process highlighted above is also being applied to PET bottles, achieving more than 99% purity rates in the valuable fractions and virtually eliminating manual involvement.

New sorting solutions are also being developed for plastic bag and film sorting, with the multi-step process used to provide grades such as 90:10 clear films or high-purity PE film materials suitable for extrusion collected from across a range of different types of MRFs.

■ Wood and metals can also benefit from automated sorting solutions. The latest NIR software can differentiate between different wood fibre types more clearly, making it possible to grade and separate wood from other materials more easily.

And, new technologies using a fluorescent X-ray source can be used to recognise material by chemical density for applications such as recovering copper from steel. Using X-ray and sophisticated colour cameras, aluminium, stainless steel, circuit boards and wire can be targeted from a range of applications including shredder scrap from waste electronics and end-of-life vehicles.

The advances in sensor-based sorting technology look set to continue for many years to come. The ability to programme the technology to target almost any recyclable fraction, and separate it at the quantity and quality demanded by end markets, means that the applications and opportunities are virtually limitless.

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CASE STUDY: ECO PLASTICS

Five AutoSort Flake systems (pictured right) will be incorporated into a new facility in Hemswell, Lincolnshire, as part of Eco Plastics' £15m expansion to supply its recently announced joint venture with Coca-Cola Enterprises. Eco Plastics' expansion will increase the amount of food-grade recycled PET produced at the plant to 40,000 tonnes, almost 70% of the UK total.

TiTech has developed a solution that will allow the sorting of PET flake by material and colour simultaneously, providing a milestone in the quality and purity of the PET output.

This follows the successful Hemswell processing facility that opened in 2010, where 20 TiTech units are used to sort mixed plastics from UK MRFs.

Jonathan Short, Eco Plastics managing director, says: "We are pleased with the standard we have been able to achieve. Previously the industry has not been able to sort PET flake to this high standard of quality and purity. This development will help us to supply our extrusion equipment and all our PET flake customers with the highest quality material available in the market today."

This industry milestone has been possible thanks to the strong working relationship between Eco Plastics and TiTech.

As Brian Gist, TiTech UK sales engineer, explains: "This announcement is a great example of two businesses working together

to produce exceptional results. Eco Plastics had a clear understanding of what it wanted to achieve and was supportive throughout the process. We took up the challenge and are pleased with the standard that has been set."

To achieve the levels of purity and quality demanded by its customers for food-grade pellet, Eco Plastics needs to sort its infeed of plastic bottles by polymer type and colour. Particularly high levels of purity are required for this application, so the removal of any contaminating materials early in the process is essential.

The technology will operate on the PET line at Hemswell, where material has been identified, shredded and then washed by the primary plant. The washed flake is sorted by size, before the flake sorters remove any impurities at an unrivalled purity level. The system is based on TiTech's bespoke spectrometer technology.