

The Commercial Breakthrough?

The potential value of commercial and industrial waste is not being fully realised: a fact recognised in England's recent Waste Review. **Stephen Almond**, engineer for TITECH UK, examines how modern sorting techniques can be used to improve C&I recycling rates

Commercial and industrial (C&I) waste is generated from a wide variety of business sources, from factories and industrial plants to wholesalers, shops and offices. Defra statistics show that 48m tonnes of C&I waste was generated in England in 2009, 23 percent of which was sent to landfill. Not only does this mean that potentially valuable resources are being disregarded as waste, but also that extra costs are being incurred as landfill tax continues to increase.

The composition of C&I waste can

vary significantly depending on the type of business in a given catchment area. Where the collection is from predominantly industrial premises, it will contain not only general office waste but also high levels of wood and plastics. Commercial premises, such as wholesalers, catering establishments, shops and offices, are likely to include higher levels of paper, cardboard, glass and organic materials.

Because many of these materials also occur in the domestic waste stream, it has been suggested – most recently in

Defra's Waste Review – that services for C&I waste and household waste should be integrated. This is based in part on the idea that the same automated techniques that have yielded such improvements in household waste recovery rates can do the same for C&I waste. Automated sorting can indeed improve C&I waste recovery rates – but not by combining the two waste streams for processing. The highly variable nature of C&I waste means that the MRF process is very different for this materials stream.



TITECH targeting plastic film at Wastebeater, Belfast

The Way Forward

CURRENTLY MANY waste recycling companies are only recovering low levels of materials from C&I waste (typically 10-20 percent) 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 applications.

The company has been working to improve the C&I waste sorting process, by developing a fully automated process to optimise material recovery and purity rates. Work has been ongoing with a number of parties – both multinational and independent waste companies and plant builders – and at the test centre. As a result of this development programme, an optimum C&I MRF design has been formulated.

The fully automated system adopts the following basic approach (see Figure 1):

- material first passes through a shredder, with an optimum size level of <300mm
- a trommel or screens will then remove the inert fines. Typically the trommel/screens will be set to



TITECH technology targeting heavy paper, wood and mixed plastics

three size ranges – material larger than 300mm will be sent back to the shredder and two further size ranges will split the material again for further sorting

- the ferrous metals will be identified by a magnet, whereas an eddy current separator will identify the non-ferrous metals
- ballistic screens separate the 2D and 3D materials and will remove any remaining fines that have been missed
- TITECH optical sorters are then able to identify different fractions – wood, cardboard, paper, plastic film, mixed rigid plastics, mixed

plastic bottles and glass

- optical sorters can then also be used to purify a single stream.

This is not just a theoretical approach to C&I waste sorting: commercial installations already using this approach have identified significant benefits. Typically, up to 80 percent of material (not including fines) can now be recovered, with the possibility of achieving greater than 90 percent recovery rates. Purity levels have also improved dramatically, with sensor-based sorting technology recovering materials at over 94 percent purity, therefore ensuring maximum revenue return. ➤

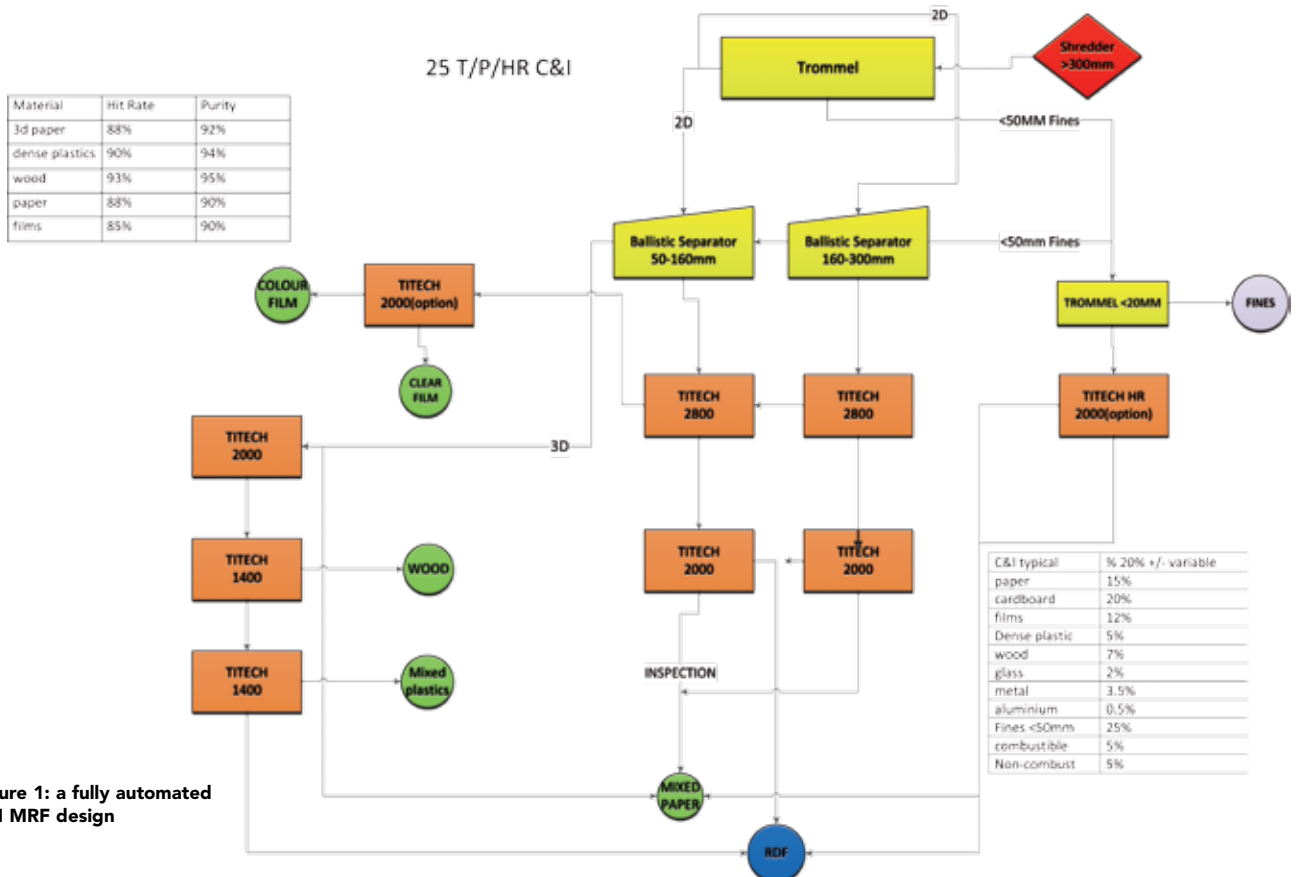


Figure 1: a fully automated C&I MRF design

Full automation of the C&I process brings secondary benefits too. For example, it virtually eliminates the need for manual picking (limited numbers will be used for quality control), which reduces labour costs. Automated systems can also maintain higher throughputs and deliver consistent quality and quantity 24/7. In addition, an automated MRF design has a much smaller footprint than traditional processes. Typical payback periods for a fully automated C&I MRF are 12 months or less.



A fully automated process will optimise C&I material recovery and purity rates

Latest Developments

SENSOR-BASED SORTING technology continues to make advances and is finding new applications all the time. We have recently developed a sorting system that reliably targets wood (see Wastebeater case study, below). Using two near infrared (NIR) sensors, the system is able to differentiate between materials that are atomically very similar to one another, such as wood and paper. Once the wood fraction is isolated,

further separation to achieve even higher purity is possible. Sensor-based sorting can identify and separate contaminated wood; whether this is wood that has been treated with a laminate or contains nails. Clean wood is more valuable and has high-end applications like animal bedding.

The integration of waste services and processing can only be taken so far. While domestic and C&I waste can be processed at the same facility, the two streams should not be mixed. That said, the economic and

environmental benefits of increased materials recovery from C&I waste are clear. Landfill tax is rising, so the recovery of recyclates will save £56 per tonne in disposal fees at current rates alone. Coupled with the fact that recovered materials hold a significant potential value – copper is worth up to £3 000 per tonne – significant economic gains can be made. In addition, recovering more from C&I waste reduces our reliance on virgin sources and on landfill as a disposal route. [CIWM](#)

Case Study: Wastebeater

TITECH HAS developed an optical sorting system that can recover wood from a mixed C&I waste stream. The system achieves a very pure wood fraction by using twin NIR sensors to examine different parts of the spectrum and has been installed for the first time in the UK at Wastebeater's C&I MRF in Belfast, Northern Ireland.

Over the last five years, Wastebeater's Belfast MRF has witnessed significant changes in the composition of the C&I waste stream. The waste entering the plant has become much lighter and now contains greater quantities of plastic film, paper, card and rigid plastics. This has had serious implications in terms of materials sorting, as the original technology was not extracting all the potential value from the waste.

Kieran Byrne, managing director of Wastebeater, explained: "We knew there was a strong market for clean recycled materials, so we wanted to develop a sorting process that would allow us to derive high value, high purity fractions from the waste. We investigated all of the possibilities and decided that optical sorting would be the most effective."

The company was able to demonstrate how its technology worked in a number of different applications at different sites, including C&I waste sites in Europe, and the results it could achieve for different fractions.

During the first phase of installation, four TITECH systems were installed to sort the 2D fraction of the plant's waste stream and target film and paper and the two companies worked closely during an initial six-month bedding-in period to make sure that the new systems were delivering optimum performance.

In 2010 the company was asked to install a second phase, this time to recover materials from the 3D fraction such as heavy paper, wood and mixed plastics. Three further sorting systems were supplied, with one unit targeting paper, one unit targeting wood and the third unit providing a clean-up on the wood line while also extracting plastics.

Targeting wood from the 3D fraction was a new application for the company in the UK. The latest twin NIR sensing technology can gather greater amounts of information about what is on the belt, providing an even more accurate assessment of the materials that are passing through. The twin sensor system is particularly good at identifying materials that are traditionally difficult to sort because they are very similar to one another, such as wood and paper.

The dual sensor system provided Wastebeater with at least 98 percent purity of recovered wood. In addition to providing the MRF with increased levels of saleable products, the technology has helped the plant to make significant cost savings, as Kieran explained: "We are now processing up to six times as much waste per hour while achieving significantly higher recycling rates as compared to more traditional labour intensive operations. This new system has further enhanced our competitive edge in the UK recycling industry."

A third stage is being planned to further sort the valuable plastic fraction and recover plastic bottles separately. An additional unit will be used to purify the PE films and target the natural clear film where there is particular value.