

Sow's ear to Silk purse

Making a silk purse from a sow's ear has never been a promising prospect. But, says Dr Tom Shelley, plants and processes are getting better at extracting cash from trash



Waste disposal has been widely viewed as a cost, and increasingly also a problem, for decades. However, as plant, processes, equipment and attitudes mature, it is also becoming increasingly possible not only to convert waste into useful energy, but also to recycle recovered materials and even to sell them for profit.

Looking briefly at the latter, Paul Rudenko, who launched his eBay-inspired waste dealing site, HazValue.com, in September, says the idea sprang from seeing companies paying to have dead batteries taken away, only to be sold on to third parties. HazValue.com combines two elements: auctioning off waste online and ensuring that those who purchase it (or are paid to take it away) have the required Environment Agency certificates – such as ISO 9001, 14001, 27001 and OHS 18001.

Importantly, Rudenko's website also provides for material tracking, which is a huge plus for organisations with corporate social responsibility programmes. Not only can they report volumes passed through the website, but also how those materials were reprocessed. Current users include waste brokers, chains of garages and a Ferrari dealership.

Returning to more conventional waste processing, though, plant engineers will be interested to learn that mixed dry waste, having no sale value in its raw state, is being successfully processed at Bywaters' state of the art 250,000 tonne per year separating facility at Lea Riverside in East London. The site commenced operations in June 2008 and operates with a two-bin system: orange for dry waste, cans etc, and blue for food and contaminated waste.

The company collects orange bin waste from both commercial premises in the area and

nearby London boroughs, whose local authorities collect from the public. There is still a gate charge, but, because the company sells its separated waste streams, this is much less than landfill – and the firm has recently won a contract from North London Waste that will reduce the authority's disposal costs by an estimated £760,000 per year.

Looking at the dry waste stream, which was configured by Kaizen Recycling, material is first loaded into two hoppers that feed bag breakers via conveyors. The two streams then proceed past two teams of six people who remove bags, clothing, boots and shoes by hand. Plastic bags follow a separate recycling stream, while the remaining waste streams move on through a series of three screens built by Eggersmann Alangenbau.

Dirty dancing

These are equipped with rollers having eccentric cams that effectively force large items to dance, while smaller items fall between cams and rollers to conveyors below. The first screen removes large pieces of cardboard as the overflow, while the second dances paper and small pieces of card. The third dances plastic bottles, leaving items of less than 30mm as the underflow, along with any steel.

Plastic items pass through a machine, made by Norwegian firm TiTech Polysort, that uses infrared to identify plastic types, with air jets to push them into separate collection hoppers. The first sort removes PET (polyethylene terephthalate) and the second, HDPE (high density polyethylene). Meanwhile, the stream containing metal from the underflow of the third screen passes beneath magnets to remove ferrous material before being exposed to eddy currents that recover aluminium and other non-ferrous metals in a machine developed by German company, Steinert.

Bywaters is running an impressive waste processing and separation plant in East London





As for the paper stream, that passes a second set of human pickers, who remove white paper, which is recycled separately at higher value, as well as cans and other items still entrained. The final outputs – metals, plastics, paper and card – are baled and go off to specialist recycling companies.

Implementation manager Kelly Barker says the venture has been so successful that Bywaters plans to double its throughput to the maximum it is licensed to handle in the next few years. That will take it to 500,000 tonnes per annum.

So much for the kinds of plant (and investments) required to make separation processes more or less automatic, reliable and effective. If, on the other hand, waste has already been separated at source, it can either be removed at zero cost or – provided enough can be accumulated – sold. That's an attractive proposition, but making it work isn't easy.

As a minimum, plant engineers need to think about establishing clearly identifiable bins for different materials. They are also going to need crusher plant capable of operating on a relatively small scale. David Moody, business development director for Minima, explains that his company's crushers, which cost around £500 each, use a scissor mechanism for compaction. The machines hold more than 80 cans when crushed and reduce both cans and bottles to about 20% by volume in a crushing cycle that takes 12 seconds. Moody suggests that transport savings alone over a five year period should be around £5,000.

Meanwhile, the WEEE Directive (waste electrical and electronic equipment) demands specialist attention when it comes to disposing of notified materials. Balcan Engineering, for example, collects fluorescent and other lamps from factories, hospitals and hotels, crushes them and takes them to a site in Lincolnshire for reprocessing. Phosphors are

recovered using an air stream and sent to another plant to distil mercury residues. Its goal is 80% material recycling by weight, with particular attention to glass, metal and phosphor/glass powders containing mercury, but the firm states that, with the market value of retrieved materials currently low, there is no merit in more sophisticated plant.

What about waste incineration? That's tougher than most imagine – unless the feedstock is uncontaminated biomass. Ross Donovan, managing director of the Austrian made Evotherm wood pellet heating system distributor Asgard Biomass Systems, says he spent seven years developing a heating system fuelled by used cardboard, consulting at every step with the Environment Agency. Then, just as two prototype plants had been demonstrated, the agency discovered that old cardboard came under the Waste Incineration Directive – meaning a requirement for additional monitoring and gas burner initiation equipment.

That, he says, rendered the project economically unviable, but it wasn't the end of the story. The European Court of Justice then declared that a material, 'which is a net contributor of energy and is largely consumed by the burning process' is not waste, but fuel under UK law.

Cardboard cutout

Donovan's view: "There are people out there doing things [with waste incineration] that are probably technically illegal, but a blind eye is turned to them." Needless to say, his financial backers pulled out and he turned to selling the Evotherm wood pellet-based heating system, although he reckons he still has useful knowhow – for example, around the design of integral shredding plant.

His experience is not unique and the list of problems with burning organic waste is long. Duncan Henderson, assistant marketing manager with Cleaning Service Group, advises that waste wood is generally contaminated with preservatives, which can include arsenic. Henderson's organisation has developed a process that turns such materials into wood chips, followed by chemical washing to make them safe for burning.

Meanwhile, another organisation that's scoring success with waste incineration is London Waste (Plant Engineer, May/June 2005), which exports around 33MW electric power from its steam raising plant. Commercial manager Jim Kendall explains that thinking is moving towards anaerobic digestion of food waste, leading to biogas production, mostly methane – as currently used to power many of the UK's wastewater treatment plants. London Waste's new plant at Edmonton, due to start construction next year, will process 50,000 to 70,000 tonnes of food waste per year. Energy output is expected to be 1–2MW, which will be added to the existing steam raising plant output. **PE**

Pointers

- Mixed dry waste can be sorted semi-automatically and sold for profit
- Such plant can be labour intensive in some streams, due to realistic investment
- Conveyors, screens and cam systems perform most separation functions well
- Magnets, eddy current and blower systems handle recyclable metal waste
- European law can impact waste-to-energy schemes
- Anaerobic digestion of food waste, leading to biogas, is the way forward

Minima crushers reduce 80 cans to 20% by volume in a 12 second cycle

