

DEPACKAGING EQUIPMENT

Food waste is a major component of the biodegradable elements of both the municipal and commercial and industrial (C&I) waste streams; however the presence of packaging materials in food waste streams presents a potential barrier to efficient processing and recovery, particularly where processing of the food waste by anaerobic digestion (AD) to recover biogas is planned. WRAP estimates that there may be between 8.3 and 11.3 million tonnes of commercial and industrial food waste in the UK. This fraction of the waste stream will contain a higher proportion of packaging waste than the estimated 6.7 million tonnes of domestically generated food waste with out of date and spoilt foodstuffs forming a significant proportion.

This article is based on the findings of recent research on depackaging technologies carried out for WRAP by SLR Consulting Limited (SLR).

The expansion of the organics recycling industry to provide additional capacity for processing separately collected food waste is expected to play a significant

role in achieving landfill directive targets. However, the packaging materials in food waste feedstocks, particularly those collected from food manufacturers or retailers, contaminates these organic feedstocks with a range of materials including plastics, paper, card, metals (steel and aluminium cans and lids) and glass.

This contamination is a problem for AD systems in general but particularly 'wet' or 'low-solids' AD systems, where plastics can form a floating layer on the surface of the wet digestate and result in process difficulties associated with trapped gases and flow blockages. In addition, dense items such as metals, grit and broken glass sink to the bottom of digesters and tanks and can cause blockages and abrasion in the feedstock handling and transfer systems.

In addition to the adverse impact on the digestion process equipment, excessive contamination can affect the visual appearance of a product and may result in failure to comply with PAS 100 or PAS 110 standards if it is significant and may require investment in an additional process step to screen contamination from the final product.

CURRENT TECHNOLOGICAL APPROACHES

Depackaging technologies currently on the market operate using basic physical processes such as compression, shredding, agitation and screening to separate packaging from its contents. Compression approaches form the bulk of those available. A number of technology suppliers are also marketing products designed for the recovery of meat and fish (from bones, sinew etc) as suitable for the depackaging certain food products. Crushing, shredding and vigorous agitation of the packaged waste provides the initial stage of opening and removing food waste from its packaging.

This stage is subsequently followed by a series of separation, screening, washing and bulking operations designed to maximise the quality of the output and separate packaging material from the organic.

These technological approaches are suitable for separating food wastes from paper/card, rigid and film plastics and metal cans. The removal of food wastes from glass packaging is, however, more difficult using these destructive technologies as the crushed glass is likely to cause abrasive damage to the equipment,



significantly shortening its operational lifespan. During SLR's recent research for WRAP into suppliers of food waste depackaging equipment, only one supplier (out of nine) claimed that their technology was suitable for the removal of glass.

Belt press technology is designed for the separation of soft products from packaging as well as for other industrial uses such as fruit pulping and meat reclamation. Pre-crushed waste is pressed against a perforated rotating drum by the belt separating a soft pulp via the drum and a low-moisture residue post from the belt. In general, belt press technology is

suitable for the separation of soft foods and liquids from packaging such as paper, card, plastic film, lightweight plastic containers (such as margarine or yoghurt containers) or foil.

Given the origins of some belt press technologies in food production, it is possible to source machines of this type that are suitable for use in hygiene sensitive environments.

Technologies incorporating screw-presses, hydraulic rams and rotating drums are suitable for the crushing of heavier packaging including steel and aluminium cans and plastic bottles, in addition to being able to separate the softer materials. ►►



A variety of depackaging options are available to operators

the quality of outputs is likely to be higher if a less variable input is introduced to the technology. Where the food industry uses such technology in-house to process off-spec and spoilt foods, there is an opportunity to maximise recovery and quality by batch feeding specific product ranges which may include only a single or a limited range of packaging material types.

Any degree of source segregation that can be achieved prior to processing will help to improve the quality of the product and minimise the investment requirements for further processing to remove contamination, prior to or after organic processing, or in order to meet market specifications for recyclates.

The research carried out by SLR for WRAP showed that the depackaging industry is currently not well developed in the UK. The application of the technology types range from the processing of mixed organic MSW and commercial waste, specific retail streams of spoilt and out of date food products and to the process recycling of packaging within the food manufacturing industry.

The majority of technology providers and processes were found by SLR's research to be based in mainland Northern Europe including Germany

and Denmark in particular. The UK's need for this technology is, however, under expansion, driven partly by the expansion of the organic waste processing industry and the introduction of quality protocols and standards for compost and digestate outputs that require low levels of contamination in the resulting products.

►► Whereas the majority of current technologies employed use similar crushing stages to facilitate the initial breakdown of the packaging, innovative approaches such as Atritor's Turbo Separator have been designed specifically to address the packaging problem. The Turbo Separator directs the packaged waste through the unit's agitator where it comes into contact with a series of beater blades and breaker bars. These blades and bars can be designed bespoke for the materials and application, enabling the same approach to be used as part of solutions for the separation of the constituents of plasterboard and metal from pyrolised tyres as well as packaging from foodstuffs.

Downstream processes separate the organic food waste from the packaging material. These processes are largely familiar to the waste industry, involving a range of wet and dry gravity and density separation, screening, agitation, magnetic/eddy current removal and washing. Technology produced by Brand GmbH uses a water spray directed downwards on a stream of material being transported upwards. The spray washes the organic material downwards for collection while the more solid packaging residues continue upwards. This type of approach, not involving direct contact with the waste enables Brand's technology to be one of the few suitable for use with glass packaging.

OUTPUT QUALITY

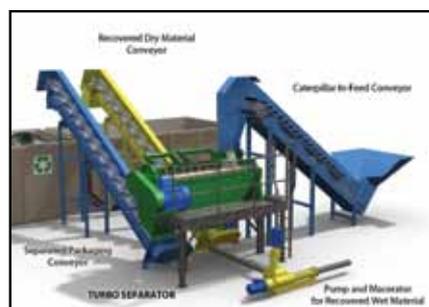
To some extent the choice of technology is likely to depend on the focus of the wider project, which may bias the choice between the production of a quality organic output or towards the separation of a clean and potentially valuable recyclate stream. For the organic waste industry, the focus is most likely to be on minimising the contamination in the organic stream for processing, whilst for the food industry this choice will include the extension of opportunities for meeting packaging obligations.

As with all waste recovery processes,



TABLE 1: DEPACKAGING EQUIPMENT

DEPACKAGING EQUIPMENT		
	PRODUCT A	PRODUCT B
Company name	Atritor Limited	
Address	Edgewick Park, Canal Road, Coventry, CV6 5RB	
Tel	+ 44 2476 662266	
Website	www.turboseparator.co.uk	
Contact name	Mark Hulme	
Email	mhulme@atritor.com	
Model name/code	Turbo Separator TS2096	Turbo Separator TS3096
Types of food/beverage handled *	Beans, cigarettes, deodorants, processed meats, soups, toothpaste, beverages, coleslaw, detergents, pasta, potato chips, sugar, biscuits, coffee, gravy, granules, pet foods, powdered milk, tea, baby foods, cosmetics, household products, sachets, pharmaceuticals, vegetables, cereals, custard, insecticides, sauces, flour, yoghurt, soap powder, shampoo, oil, paint, plasterboard and many more	
Types of packaging handled **	Tin cans, tin trays, plastic bottles, soft packaging, aluminium cans, sachets, pouches, polymer bags, paper bags, Tetra Pak, boxed products, plastic containers, steel drums, plastic drums, trays, blister packs, tubes, cartons, plastic jars, & cardboard containers	
Dimensions (mm)	System dependent	
Throughput capacity (m ³ /hr)	Material dependent	
Separation efficiency (%)	Up to 99%	
Speed (rpm)	Variable	
Power requirements (kW)	22kW (machine only)	37kW (machine only)
Base package includes	TS2096 in-feed conveyor/separated packaging conveyor/recovered material conveyor/recovered material pump & macerator	
Fabrication	Carbon steel or stainless steel available	
Delivery time (approx)	Dependent on system	
Guarantees provided by supplier		
Capital cost range (£ excl VAT)	£60,000 up to £115,000	£75,000 up to £130,000
Operating cost per annum for maintenance & consumables, estimate (£ excl VAT)	£2.50 per/hr based on £0.10 per kW/hr	£3.50 per/hr based on £0.10 per kW/hr
Operating cost per annum for maintenance & consumables, estimate (% of purchase price)	3% dependant on product	
Required service intervals (monthly or annually)	Dependant on product (annually)	



A range of depackaging systems are available

TABLE 1: DEPACKAGING EQUIPMENT

DEPACKAGING EQUIPMENT	
	PRODUCT A
Company name	Brand GmbH
Address	Aeussere Speicher Str. 1
Tel	0049 3525 513697
Website	www.ha-di-tec.com
Contact name	Mr. Brand
Email	info@ha-di-tec.com
Model name/code	Food Waste Processing Line
Types of food/beverage handled *	All
Types of packaging handled **	Excluded pallets all
Dimensions (mm)	15x20 m
Throughput capacity (m3/hr)	6 to 8 tons/hour
Separation efficiency (%)	95 to 99 %
Speed (rpm)	
Power requirements (kW)	About 80 Kw
Base package includes	(E.g. machine, support and controls)
Fabrication	(material and grade)
Delivery time (approx)	2 to 3 months
Guarantees provided by supplier	6 to 12 months
Capital cost range (£ excl VAT)	289.000,00 Euro
Operating cost per annum for maintenance & consumables, estimate (£ excl VAT)	Depending to input materials
Operating cost per annum for maintenance & consumables, estimate (% of purchase price)	Very low separating cost per ton
Required service intervals (monthly or annually)	Depending input materials



Many food items are wasted without being opened, therefore, robust depackaging solutions are required