

AD at the point of waste

Have large-scale AD facilities had their day? **DAN EATHERLEY, RICHARD GUETERBOCK, MICKEY HOWARD** and **STEFFEN BOEHM** say the future lies with smaller, more localised, plants

Britain's food and drink industry could be missing out on creating sustainable energy while recycling its organic waste. It is a suggestion being explored by an interdisciplinary research project led by the University of Exeter with small and medium-sized enterprises (SMEs) across the south-west.

Funded by the Engineering and Physical Sciences Research Council, the university's Business School has been gauging the potential for bakeries and dairy processors in Cornwall, Devon, Dorset and Somerset to adopt the principles of the circular economy. It is looking at how they can close material, water and energy loops within their own firm, and share surpluses with other businesses. There has been plenty of great practice – and some not so great.

A clear message is emerging: food and drink manufacturers are not making the most of the value locked in their organic waste streams. Wastewaters and other residues are being discharged into sewers often at great cost or, in the case of farm-based dairy processors, dumped in dirty water pits or simply hosed on to fields.

Bioenergy, particularly anaerobic digestion (AD), is central to business resilience, where the ability to reuse water, recirculate solids and generate electricity on-site will be key to combating material and water shortages as well as energy price rises.

But the companies visited by the team do not have the capital, technical know-how or time to consider the opportunity. So they are incurring unnecessary costs, missing out on a source of renewable energy and the chance to convert residues into high-value products.

AD facilities were first installed in the UK by farmers back in the energy crises of the late 1970s. Crude by today's standards, these small installations nevertheless allowed energy to be generated from slurries and other wastes.

During the early years of this century, Britain saw the commissioning of a new breed of monster digesters based on continental

designs but at a much larger scale to divert biodegradable wastes from landfill. These merchant plants cost upwards of £10m and a rapid return on investment was all that mattered.

But many have now encountered technical problems because they took the continental farm AD designs and simplistically multiplied the scale by 10. They often fail to digest the organic material sufficiently, do not generate enough energy, and the digestate tends to be smelly and contaminated with plastic food packaging. Furthermore, the incessant traffic of heavy goods vehicles delivering feedstock hardly endears these plants to locals.

Meanwhile, encouraged by Government subsidies, more and more farm-based AD plants have drifted towards the continental model, growing larger and running not just on wastes but specially grown energy crops. But a rethink is now being forced: land is much more costly on this side of the English Channel and the public is rightly alarmed about its use to grow fuel rather than food.

All this suggests that large-scale AD may

have had its day, particularly given the planned withdrawal of financial incentive schemes. But that does not mean the end of all AD. In fact, we are on the cusp of a renaissance, with AD and other bioenergy technologies positioned to be an integral feature of the food factory of the future. The challenge for AD is to build smaller-scale facilities at points where production residues are created.

Inspired by circular economy principles, food factories of the future will maximise the value from their organic wastes, surpluses or byproducts, producing biogas to supply heat and electricity on-site as part of a decentralised energy system, tailored to the factory's needs. Industrial refineries, meanwhile, will convert residues into novel ingredients for new processes. And, right now, researchers at the University of Exeter's Environment and Sustainability Institute are studying how microbial communities within AD reactors can be customised to different feedstocks, enhancing process stability and versatility.

The opportunity is mind-boggling: an astonishing 97% of all Britain's food businesses (excluding beverage-makers) are SMEs. That means there are 6,700 firms up and down the country of whom almost none are making the most of their organic resources. The UK needs to foster a more sustainable, resilient and flexible food and drink sector. Small-scale, localised bioenergy generation, including AD, is part of the answer.

With the right support from policy-makers – including funding and inspirational demonstrator projects – the factory of the future is just around the corner.

● *Dan Eatherley, Mickey Howard and Steffen Boehm, from the University of Exeter Business School, recently presented interim results of their research at the All-Party Parliamentary Sustainable Resource Group (www.circular-food.net). Richard Gueterbock is marketing director for Clearfleau Group, a supplier of anaerobic treatment technology*



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