

Cynulliad Cenedlaethol Cymru <a href="#">Pwyllgor Amgylchedd a Chynaliadwyedd</a>	National Assembly for Wales <a href="#">Environment and Sustainability Committee</a>
Egwyddorion cyffredinol <a href="#">Bil yr Amgylchedd (Cymru)</a>	General principals of the <a href="#">Environment (Wales) Bill</a>
RICARDO-AEA (Saesneg yn unig)	RICARDO-AEA
EB 58	EB 58



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Our Ref: ED61291  
 Issue Number 1

31 July 2015

**Re: With reference to Environment (Wales) Bill Consultation**

Dear Mr Jones,

We have been engaged by Mechline Developments Ltd to prepare and provide a technical review of biodigestion technology compared with other food waste technologies, along with a more detailed Multi Criteria Analysis (MCA) of specific technology, namely the 'Waste-2-0' biodigestion system.

Mechline Developments Ltd submission to the Committee in early June, said that they would forward further research to the Committee in subsequent weeks.


The attached 'Positional Review' paper by Ricardo-AEA is the first stage of this independent research. We recognise that this is submitted outside of the requested submission date, however, we do hope that the Committee will consider this paper.

This paper has concluded that innovative technology such as the Waste2O system, can provide a complementary solution to source-segregated collections by providing an onsite alternative, where a food waste collection is not available or may not be practical, to support the aims of the Environment (Wales) Bill and to better enable and aid Wales to achieve its environmental objectives.

We are continuing to support Mechline Development Ltd and are currently conducting a more detailed MCA. This information will not be ready for some time, given the considerable time that the analysis and detailed review requires.

Please do not hesitate to contact us to discuss the attached paper or the more detailed MCA study.

Yours sincerely,



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# The application of biodigestion technology for the treatment of food waste

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## 1 Introduction

Ricardo-AEA Ltd has recently been commissioned by Mechline Developments Ltd to conduct a multi-criteria analysis (MCA) to assess the performance of its Waste2O biodigestion system compared to other food waste treatment and disposal options. This project is currently underway and the results are not yet available. However, given the proposals within the draft Environment Bill to prohibit the disposal of food waste from commercial sources to sewer, this position paper has been prepared on behalf of Mechline Developments Ltd to present an independent review of the application of biodigestion technology for the on-site treatment of food waste, notably using the Waste2O system developed by Mechline Developments Ltd in advance of the results of the MCA being completed.

This paper outlines the key technical differences between biodigestion, dewatering and maceration systems, the difference in resource use and costs between the different technologies, and how biodigestion systems can provide an alternative solution for food waste treatment in Wales where collections are not possible or practical.

## 2 Overview of on-site food waste processing technology

Food waste maceration systems and increasingly dewatering and biodigestion systems are commonly used within commercial kitchens such as hospitals, prisons, universities as a means of managing their food waste. The technologies however are markedly different.

Food waste maceration systems essentially grind food to small particles, mixed with high volumes of water which is then flushed, untreated, via the drainage system into the public sewer. Dewatering systems, essentially build on maceration system, whereby food waste is macerated in the presence of water, however, the excess liquid is then extracted from the resultant slurry by means of a filter or centrifugal system and is discharged to sewer. The dehydrated food waste is up to 80% less in volume and is stored for collection, and can then be treated in an anaerobic digestion or in-vessel composting facility. Enzyme based biodigestion systems (including the Waste2O system developed by Mechline Developments Ltd) use a digestion process to process the food waste into a microscopic liquid suspension that is discharged to sewer. This contains no solids requiring disposal by other means.

The table overleaf provides a summary of the discharge to sewer from food waste macerators and biodigestion systems, as well as the acceptable limits for discharge into the sewer network. Published data available on the impact of dewatering systems on the sewer network could not be sourced for inclusion in this paper – although it can be assumed that whilst the suspended solids will be much lower, the effluent quality may still contain high levels of chemical and biological oxygen demand, fats, oils and greases as de-watering does not change the chemical composition of the waste. The information presented on the Waste2O system is based on the analysis undertaken by WRc. The Waste2O system is the only digestion system that has gained WRc independent certification, which demonstrates that the system met with the standards in place at the time of testing (2013), and that its performance and quality of wastewater discharge is acceptable to sewerage undertakers. Note that a high level literature search has been used to obtain a range of values for maceration systems, and the information presented does not present a comprehensive review of the outputs from the range of maceration technologies available.

Parameter	Waste <sub>2</sub> O system	Maceration systems
Quantity of food waste processed (kg/ day)	180	180
Number of units required	1 x 3.8 kW unit	4 x 2.3 kW units
Electricity (£/yr)	£138.70 <sup>8</sup>	£335.00 <sup>8</sup>
Water use (£/yr)	£919.80 <sup>9</sup>	£4,295 - £7,735 <sup>9</sup>
Liquid discharged to sewer (£/yr)	£273.75 <sup>9</sup>	
Waste <sub>2</sub> O bio-fluid pack (approx 1 per month)	£397.85	-
Waste <sub>2</sub> O annual booster top-up	£75.00	-
<b>TOTAL</b>	<b>£1,805.10</b>	<b>£4,630 - £8,070</b>

The Welsh Government’s draft Environment (Wales) Bill proposes a ban on the disposal of food waste to sewer from non-domestic premises, on the basis that: increased quantities of food waste will be available for treatment in anaerobic digestion facilities so that the waste can be used to generate renewable energy and produce a high quality fertiliser; and to prevent issues associated with sewer blockages, sewer flooding, environmental pollution, odours and rodent infestations.

We understand that a cost benefit analysis was undertaken by Eunomia Research and Consulting<sup>10</sup> in 2013 to support Welsh Government to assess if a ban on food waste to sewer was appropriate. A review of the analysis has been conducted, and it is clear that the modelling was based on maceration technology only with no consideration given to the use of biodigestion or dewatering systems for the treatment of food waste. This report highlighted two case studies, which provided the annual costs associated with maceration systems, these being for Bath NHS Trust and Stockport NHS Trust. It should be noted that the case study for Bath NHS Trust describes the benefits the Trust has seen by switching to a Waste<sub>2</sub>O system instead of macerators (although reference to Waste<sub>2</sub>O wasn’t mentioned in the report). The Trust reported savings of £3,000 per annum in electricity consumption and £25,000 in water usage<sup>11</sup>. Similarly, Stockport NHS have also switched to the use of a Waste<sub>2</sub>O system instead of using macerators as a result of the annual savings that could be realised.

## 4 Practicality issues

The draft Environment (Wales) Bill sets out the power to prohibit the disposal of food waste to sewer. It does not appear that Welsh Government has yet considered an alternative solution in the event that a food waste collection is not available or practical. It is evident that biodigestion systems can play a clear and complementary role in cases where source segregated food waste collections are not practical from a technical, economic or environmental perspective. Where a separate food waste collection is not possible, biodigestion systems such as the Waste<sub>2</sub>O system can provide an alternative to landfill without having a negative impact on the public sewer network.

We understand that adhering to the waste hierarchy is the most important tool in preventing waste and reducing waste to landfill, and that after food redistribution and food waste prevention, the next preferred option, where practical and possible, would be to segregate food waste for a source segregated food waste collection for recovery via anaerobic digestion (AD). Indeed, producers of waste, through their Duty of Care, have a legal duty to apply the waste hierarchy when making decisions about their waste.

In terms of the waste hierarchy, the Waste<sub>2</sub>O system has ‘waste prevention’ benefits, in that the system measures the quantity of food waste deposited in the system. This information can be transferred via Bluetooth to an app, which provides an easy way for organisations to track their food waste arisings as well as estimating the cost associated with the food waste (based on WRAP metrics). We have seen first-hand the impact that monitoring data can have on practices within kitchens as this data can enable benchmarking to take place with measures introduced to prevent waste from arising. In addition, the

<sup>8</sup> Waste<sub>2</sub>O 3.8kWh operated 24 hours per day at a cost of 10p per unit of electricity which equates to £0.38 per day. Four 2.3kW food waste digesters used to process the same quantity of food used 4 hours per day, 7 days per week at a cost of 10p per unit of electricity which equates to £0.92 per day.

<sup>9</sup> Maximum 600 litres per day required at a cost of £0.42 per litre for hot water and £0.14 per litre for discharge to sewer. For maceration systems, assumed that Water usage is approximately 20-36 litres per minute, and based on length of use, the volume of water used per day ranges from 4,800 to 8,640 litres per day at a cost of £0.12 per litre, and £0.14 per litre for discharge to sewer. Note it is assumed that 90% of volume is discharged to sewer.

<sup>10</sup> Eunomia Research and Consulting (2013) Additional Policy Options Analysis for Welsh Government: Costs and Benefits of extending Waste Framework Directive requirements, waste treatment restrictions, requirement to sort and a ban on the disposal of food waste to sewer.

<sup>11</sup> [http://www.ruh.nhs.uk/team\\_green/responsible\\_disposal/food\\_waste.asp?menu\\_id=5](http://www.ruh.nhs.uk/team_green/responsible_disposal/food_waste.asp?menu_id=5)