

# Environmental Impact Study of Food Waste Disposers

for The County Surveyors' Society, Herefordshire Council and Worcestershire County Council

by Dr Tim Evans BSc MS PhD CChem CEnv FCIWEM MRSC

**Synopsis** by J Howell-Thomas, Worcestershire County Council

## 1 Synopsis

This study examines the financial and environmental impacts of food waste disposers (FWD) and finds that they provide a cost-effective, convenient and hygienic means of separating kitchen food waste (KFW) at source and diverting it from landfill. The study also finds that this costs less and has a better carbon footprint than other routes.

In terms of Best Value Performance Indicators, FWD reduce BV84 (kilograms of household waste collected per head of population), BV86 (cost of household waste collection per household) and BV87 (cost of waste disposal per tonne municipal waste).

Herefordshire Council and Worcestershire County Council have been pioneering in promoting installation of FWD. FWD have the benefit of separating at source a difficult fraction of biodegradable waste and diverting it using existing infrastructure and without entailing any regulatory bureaucracy.

The net global warming potential<sup>1</sup> (GWP) of separate collection and treatment of KFW by composting is -14 kgCO<sub>2</sub>e/tKFW. For households with FWD feeding to wastewater treatment works where sludge is treated by anaerobic digestion, the biogas is used as renewable energy, the biosolids are used on land and the GWP is better than -168 kgCO<sub>2</sub>e/tKFW<sup>2</sup>. This is the pathway for Severn Trent Water's works in Herefordshire and Worcestershire and Welsh Water's works in Herefordshire. In contrast, landfill is +743 kgCO<sub>2</sub>e/tKFW.

The cost of collecting and disposing KFW via the solid waste route in Herefordshire and Worcestershire averages £18.63 per household\*year and the quantity is 180 kgKFW per household\*year (2005/06 actuals). This is the approximate annual saving for each installed FWD. By February 2007, 640 FWD had been installed under the Herefordshire and Worcestershire cashback scheme at a total cost of £39,650, i.e. £62 per FWD, which represents a payback period of only

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<sup>1</sup> Global Warming Potential is expressed as carbon dioxide equivalent (CO<sub>2</sub>e) over 100 years.

<sup>2</sup> This figure is based on direct before and after measurements in a town where 30% of households had FWD installed.

3 years and 4 months. The ground KFW is transferred to the wastewater collection and treatment system and therefore adds to the costs of the water company.

Water companies are understandably concerned about changes that might adversely affect demands on water resources or that would increase sewer blockages; field trials in several countries have shown that FWD do not affect water usage or accumulation in sewers significantly. Wastewater treatment works (WwTW) are designed to treat biodegradable material suspended in water, i.e. similar to the output of FWD. Ground KFW has been found actually to improve the composition of wastewater for the advanced nutrient removal processes that are now being demanded of WwTW. The additional cost for water companies depends on the route for treating and using or disposing the sewage sludge; for the route most usual in Herefordshire and Worcestershire it would be about £0.68 per household\*year, this is only 4% of the cost of the MSW-landfill route.

Overall, food waste disposers appear to be a very cost effective means of separating putrescible kitchen waste at source and diverting it from landfill. The carbon footprint of FWD feeding to a WwTW with anaerobic digestion (AD) and electricity generation (CHP)<sup>3</sup> is competitive with separate collection of KFW delivering to centralised AD with CHP and significantly better than centralised composting. They are convenient and hygienic for householders but do not discourage home composting. Home composting is ideal for kitchen and garden waste but some householders are unable or are not inclined to practise it. FWD avoid the problems of odour and vermin that can be associated with separate collection via the solid waste route.

Herefordshire Council and Worcestershire County Council (H&W) have been in the vanguard of exploring the potential of FWD as an alternative for people who do not wish to home compost, collect and store kitchen food waste (KFW), etc.

Field studies have shown that use of FWD has a negligible effect on water consumption, that the ground KFW is conveyed in sewers at normal flow velocities and that in practice there is no increase in accumulation in sewers, that only about 3 kWh<sub>e</sub>/household\*year is used by FWD but that the food waste generates at least 33 kWh<sub>e</sub>/household\*year electricity from biogas at wastewater treatment works (WwTW) that have anaerobic digestion, which is the most prevalent type of sludge treatment in the UK. Field studies have confirmed that FWD do not influence sewer blockage neither are the particles large enough to block the screens at CSOs (combined sewer overflows). When sewage sludge is used on land (which is the route for the majority

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<sup>3</sup> This is the route in H&W

in the UK), the organic matter in KFW is conserved and the nutrient cycles are completed. FWD increase the amount of biosolids produced at a WwTW but the extra cost of wastewater treatment and of treating it by AD with biogas CHP and recycling the biosolids to agriculture is less than one-tenth of the amount saved by H&W for the solid waste route.

Historically WwTW were required to remove suspended solids, biological oxygen demand (BOD) and ammonia from the water. Suspended solids are collected, together with surplus biomass from removing the BOD as sewage sludge and treated. The ammonia is converted to nitrate. Many WwTWs are now required to remove nitrogen (nitrate as well as ammonia) and phosphorus in addition to solids and BOD. The preferred treatment is 'biological nutrient removal' (BNR) but the wastewater at many WwTW does not have sufficient carbon to sustain the biomass needed for BNR and WwTW have to purchase additional carbon (e.g. methanol) and chemical dosing (commonly iron). FWD assist BNR by adding carbon.

This study has found that food waste disposers (FWD) provide a convenient and hygienic means for householders to separate kitchen food waste (KFW) at source; they divert it from municipal solid waste landfill. Importantly, FWD do this using existing infrastructure and, by taking wet putrescible matter out of the solid waste stream, they make management of the dry fractions easier and less expensive and avoid odour issues, which have proved so detrimental to public acceptance of alternate weekly waste collections. There is no reason that FWD should discourage home composting since FWD are not designed to take garden waste and indeed exclusion of cooked KFW from home composting might encourage home composting.

## **2 Acknowledgements**

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