

Cap landfills and harvest gases

An innovative and ambitious plan to use caps made from fly ash on old landfill sites could free councils from the costs and responsibilities of maintaining landfill sites, as well as improving the environment, reports **Alison Carter**

It is well documented that the UK has a problem with contamination at older landfill sites.

When these sites were set up, there were few controls and it was expected that water would flow through them allowing the waste to “dilute and disperse” harmlessly into the soil. Unfortunately, when they were operating, from the 1940s to the 1980s, the waste sector was not aware of the consequences of this approach and, over the past decade, problems have arisen leaving the sector now dealing with leachate production and greenhouse gas emissions.

The next generation has inherited significant problems. However a company called Lichen Renewal claims to have a solution. Director Quinton Richards, planning barrister and environmental scientist, says that low-permeability caps comprised of pulverized fuel ash (PFA), a waste product from coal-fired power stations, will minimise water entering the landfill sites thereby minimising leachate production, improving the surrounding environment and giving better control of landfill gas, which can then be used to dry out green waste.

Working on the concept at the Cheltenham based company since 2009 with Ged Duckworth, an environmental consultant with a focus on waste management and land contamination, Richards says this system is a win for all concerned, including the coal industry that produces the fly ash, as it will save on disposal and void costs. This technology will capture methane emissions, generate heat and power from pre-treated green waste and remediate the site with no cost to the taxpayer.

Once a site is capped with PFA, its emissions are captured and channelled to an engine which converts the gas into heat and power. The heat is used to dry local green waste from around 50 per cent moisture content to 20 per cent. This drying process makes the following steps of gasification and pyrolysis more efficient. Both processes involve converting carbon-based products, via a controlled chemical reaction, into carbon monoxide and hydrogen. The resulting gas is commonly called synthetic gas, or syngas. This is collected and used to produce heat and electricity. Biochar (biological charcoal) is also



System aims to convert liabilities into assets

produced, locking in carbon for hundreds of years. The electricity produced can be used by the local community and the biochar forms part of the site’s artificial soil layer. The PFA cap is protected by an artificial soil that can comprise waste streams from providers such as the construction industry, compost and organic municipal waste post treatment.

No concern about abundance of coal ash

As the UK produces 6Mt of coal ash every year there are no concerns about supplies running out. While half of coal ash is used in the manufacture of other products, the remaining 3Mt is left in heaps of redundant ash near coal-fired plants.

Pulverised fuel ash is useful to engineer a low-permeability layer because it has pozzolanic property which means that it can be turned into a cement-like material. Not only does PFA capture landfill gas emissions,

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but it also reduces the amount of water infiltration, so the level of leachate (soluble components of biodegradable waste) gradually falls, which means the waste becomes drier and in effect increases the available methane for extraction. The fly ash cap reduces the volume of air entering the site, allowing extraction equipment to remove methane without drawing in excess oxygen.

Lichen’s scheme would reduce councils’ liability for costs of remediation, restoration, and ongoing environmental monitoring, which would be absorbed by the company. It also allows councils to meet the revised Waste Framework Directive by moving waste up the hierarchy, through using materials such as PFA to capture greenhouse gas emissions and by not disposing of PFA directly into mono landfill sites. The process fulfils the Renewable Energy Directive through utilising landfill gas, gasification and pyrolysis. The draft Soil Framework Directive is met through remediation of damaged land and the Water Framework Directive is met by protecting groundwater from polluting leachate.

According to Lichen, there are around 22,000 historic landfill sites in the UK. Many leach pollutants into the groundwater and emit greenhouse gases. Indeed, 1,500 historic landfill sites are emitting significant enough levels of emissions to worry regulators. From preliminary modelling Lichen estimates that, if it capped 500 sites it could mitigate 11–13Mt of CO₂e annually.

Richards confirms that, while the concept is relatively straightforward, the approach to each site depends on the material it contains and a hydrogeological risk assessment. Lichen asks for a licence to occupy a site for 25 years and, backed by insurance from Lloyds, is then able to create opportunities for different uses such as energy, leisure or even viticulture. Both private land owners and councils benefit from the end result of safe, productive land.

Lichen is looking to put its plans into action at two sites in the South East. It is talking to investors to raise funds for securing growth. On successful application being granted, Lichen expects to have the facility operating within a year with a two- to three-year horizon for completion. ■

Alison Carter is the editor of Waste Planning.