Cold climates no bar to biogas production

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LAUREL McFADDEN struck a match and held it up to a nozzle on a giant tank. A small blue flame flickered into life, indicating that the mixture of mud, ground-up kitchen scraps and water inside the tank was generating methane.

In a warm climate, producing biogas in this way is no big deal. However, McFadden's demonstration took place in Alaska in near-freezing temperatures. The ability to make biogas under such conditions could be hugely significant in cutting reliance on fossil fuels in colder parts of the world.

Cooking on biogas is cheap, convenient and smoke free (Image: Liu Jin/AFP/Getty)

Biogas is generated by microbes when they break down organic matter in airtight tanks called digesters. The process is cheap and can reduce landfill. What's more, the use of small-scale digesters connected to domestic appliances can cut exposure to harmful smoke given off by other fuels.

People have been producing biogas for fuel for centuries. The Assyrians, for example, apparently used it to heat their baths in the 10th century BC. In colder climates, however, the microbes naturally present in organic matter such as kitchen waste and manure grow too sluggishly for this to be practical. "Their lifestyle is not suited to the demands of our lifestyle," says Ricardo Cavicchioli, a microbiologist at the University of New South Wales in Sydney, Australia.

To get around this problem, researchers have tried housing the digesters in warm locations such as greenhouses. Katey Walter Anthony, an ecologist who worked with McFadden at the University of Alaska Fairbanks, had a radically different idea. She had studied microbes called psychrophiles that live in permafrost, where they metabolise organic material and release methane as a by-product.

Her realisation that these microbes might thrive inside cold digesters led to McFadden's experiments with digesters containing psychrophile-rich mud from a frozen lake in Alaska. Using a 1000-litre digester, the pair were able to produce 200 to 300 litres of methane per day. Similar-sized digesters in warmer regions can produce 1000 litres of biogas a day - enough to power a fridge for 16 to 20 hours.

Anthony and McFadden are now working to increase the yield of their method. If they succeed, their technology could be of huge benefit to people in cooler climes who still rely on fossil fuels and firewood. It is easy enough to find a source of the microbes in frozen soils, and once a culture is thriving in one digester, it can be used to kick-start others.

Psychrophiles could also be used in the growing number of industrial biogas plants. At present these have to channel 20 to 40 per cent of the energy they produce into keeping the digesters warm enough for the microbes to grow.

If psychrophile-fed digesters become more efficient, these plants could one day feed all the energy

they generate into the grid.

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