

From Food Waste to Fuel Cell

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Hong Kong is well known as “Food Paradise”, while people enjoy a variety of delicious food from different places, have they ever noticed the serious food wastage in Hong Kong?

According to Environmental Protection Department, there are 3,200 tonnes of food wastes produced daily, which constitute 35% of municipal solid waste. This poses heavy burden on existing landfills and if this problem is unsolved, they will be filled up in 2014.

Moreover, in addition to the burning of fossil fuels to generate electricity, the disposed food wastes may emit greenhouse gases, such as methane, when naturally decomposed, thus worsening climate change.

With severe food wastage and high carbon emission, this project investigates the use of food waste to generate electricity while lowering carbon emission.

First of all, common commercial food wastes were collected, namely bread crust, coffee grounds and tofu dregs, because they are useless materials and will be disposed to landfills. They were blended with water and yeast was added in to allow alcoholic fermentation for a day. Bread crust was found to have strong odour of ethanol while coffee grounds and tofu dregs only had a light smell. They were then distilled at around 80°C and ethanol was successfully separated from bread crust, which has a comparable amount as that from grapes (control). It is also found that the efficiency of fermentation increases with temperature.

Ethanol collected could subsequently be used as the reducing agent in a fuel cell with oxygen as the oxidizing agent, which generated electricity with little carbon emitted.

To sum up, our investigation makes use of disposed food to generate electricity with less greenhouse gases released, which helps reduce pressure on landfills and relieve climate change. Thus the environment can be protected and sustainable development can be achieved.