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Case Study

Xiangyang, Hubei Proince:
Innovative Sludge-to-Energy Plant Makes a Breakthrough in China

Problem to resolve: sludge is a substance whose disposal is expensive and environmentally hazardous: Nevertheless, its embodied energy makes it a potential net earner.

Response: Sludge accelerated fermentation process generates surplus energy**Background.**. This Sludge-to-Energy factory located in a quiet island of central China's Xiangyang city probably won't grab the attention. Its stainless steel complex and three-story office building look similar to any other. But don't be fooled by appearances. The plant here holds a secret that has lured more than 100 Chinese mayors to pay their respects and uncover how they can replicate its success. On any given day, the factory eats up several hundred tons of human excreta and other waste – a smelly, hazardous slurry called sludge – and spits out enough clean energy to fuel 400 cars. In a country struggling with pollution from massive quantities of untreated sludge and seeking new sources of clean energy, policymakers want to get more sludge-to-energy projects up and running soon. Back in 2011, about 150,000 tons of sludge piled up here - basically toilet waste, all left by the previous compost project operator.

	
The Xiangyang sludge-to-energy plant (TOVEN.)	*Xiangyang City View* [1]

Sludge in China contains low organic matter levels – about 40%~50% – due to sewage systems that include both municipal stormwater runoff and wastewater from households. In comparison, international sludge-to-energy plants frequently have material that's up to 70% organic matter. Organic matter is a key ingredient for producing methane, which can later be captured to generate power. Strategies such like preheating solid waste could help increase the levels of organic matter and boost energy production. But the technology to implement such a solution did not exist in China at the time, and the decided to develop but only partly satified with the result.

Eventually, success came closer thanks to some ingenious engineering and a surprising ally: Xiangyang's restaurants. Since the project went online in 2012, not only has the plant treated all the aged sludge that piled high at the site, but it also handles fresh sludge and kitchen waste. Every day, sludge generated by the Xiangyang's 2 million residents is delivered here by truck or pipeline. The plant mixes the sludge with kitchen waste collected from restaurants to increase organic matter, heats the mixture to temperatures as high as 130 degrees Celsius, and sends it through a process called co-digestion. Two 20-meter high, silver-colored anaerobic digestion tanks inhale 450 tons of sludge and kitchen waste and exhale at least 12,000 m^3 of methane. The factory then burns half of the methane to power its operation and processes the rest into compressed natural gas. The compressed natural gas is sold at a nearby gas station to local taxi drivers, helping to meet the city's growing demand for cleaner-burning transportation fuels. What's left from the solid waste is either sterilized to be used in fertilizer or converted into biochar, an alternative soil used for potted trees.

Another good news is the discovery that compared to other disposal methods, such as turning sludge into compost or burning it at incineration facilities, the methane conversion costs less while at the same time generating commercially viable products. Compared with landfill and incineration methods for dealing with sludge, the plant could reduce greenhouse gas emissions more than 95% over the course of its lifetime. If 10% of the sludge generated in China last year was treated in the same way, it would have reduced greenhouse gas emissions equivalent to 380 million tons of carbon dioxide, roughly equal to Ukraine's total emissions in 2012.

At present, about 400 miles east of the factory, Hefei is putting together its first experiment converting municipal sludge into energy. Beijing has also rolled out a plan to tap into the energy potential of sludge, along with other cities such as Chengdu, Changsha, and Chongqing.

Credentials:

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Sources:

[1] http://en.hubei.gov.cn/visiting_hubei/sight_seeing/201605/W020160531578873401655.jpg