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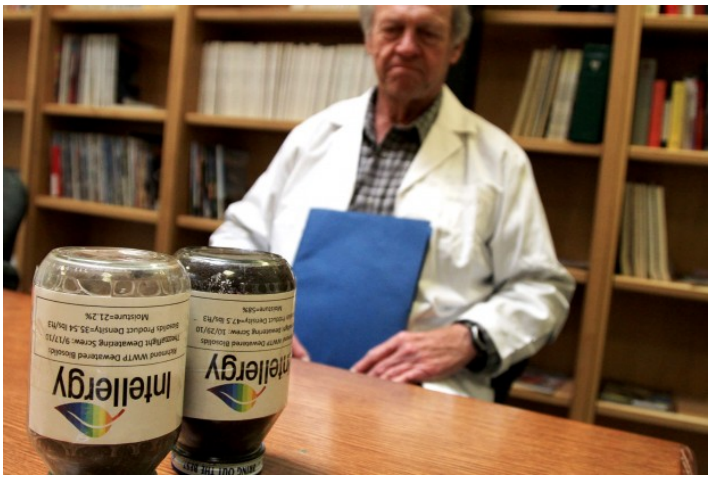
Bay Area agencies working together to create sewage alchemy



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If you brushed your teeth, took a shower and flushed the toilet this morning, you may not have thought much about what happened after the wastewater went down the drain. But a coalition of Bay Area agencies has been working for years to find innovative methods to convert that waste into something of value.

Bay Area Biosolids to Energy, which comprises 16 cities and water districts—including the City of Richmond and the West County Water District—is coordinating an uncommon, multiyear project to find a more sustainable way to deal with the Bay Area's human waste.

"Anywhere there's people, there's wastewater that needs to be treated," said Caroline Quinn, coalition project manager and engineering services director for Delta Diablo Sanitation District, which handles wastewater for Pittsburg, Antioch and Bay Point.

Most wastewater plants recycle the liquid portion of human waste, but the sludge left over, called biosolids, remains a challenge. Faced with increasingly limited disposal options, the coalition members are hoping to turn today's sewage into tomorrow's clean energy.

"We can't continue to handle biosolids the way we have been. It's not sustainable," Quinn said. Today's wastewater treatment facilities are already fairly sustainable.

The West County Water District wastewater treatment facility in Richmond taps methane that comes from processing human waste, then pipes it back into the system to help power the process. Acres of solar panels surround the site, supplementing the remainder of the power the treatment plants needs.

Most treatment plants in the Bay Area use similar technologies to process wastewater. "You can think of it like a concrete human body, it really works in the same fashion," said E.J. Shalaby, general manager of the West County Water District facility in Richmond. Raw sewage is fed into the system and goes through a number of processes to separate liquid from solids, and relies on naturally occurring enzymes to break down the solids. "At the end of the day it's all about separating

solids from liquids.” The liquids are purified to a level clean enough to be dumped in the bay, or are piped into the Chevron refinery.

There, the solids go into an anaerobic digester where they are heated and naturally occurring microorganisms break down the sewage sludge. The digested sludge goes into drying beds, leaving a dried, dirt-like residue of biosolids.

The West County Wastewater District treatment plant uses solar and methane cogeneration to power the plant's operations. The facility will host a prototype of Intellergy's steam reformation technology by the end of the year. (Courtesy of West County Wastewater District)

But that’s where the sustainability breaks down. The Bay Area produces over 158,000 metric tons of biosolids every year, enough to fill AT&T Park to 51 feet, Quinn says. ”At the end of the day, we still have biosolids left over,” said Quinn. There are two options to get rid of biosolids, Quinn says: as low-grade fertilizers for agricultural use, or as cover in local landfills. ”However, if you look at those two disposal options, it’s becoming less viable,” she said. Over 800,000 trucking miles are racked up every year to haul the Bay Area’s biosolids, Quinn said, and as landfills brim near capacity and agricultural land yields to development, wastes will need to be trucked farther and farther out from the urban centers where they are produced.

California Assembly Bill 32, aimed at reducing greenhouse gas emissions by 25 percent by 2020, along with stricter regulations on what can go into landfills, also have the coalition hoping to find a better way to convert biosolids into energy.

The Bay Area’s population — 7.3 million as of last year — is expected to swell to more than 9 million people in th next 20 years, according to the Association of Bay Area Governments. As the number of people in the region grows, so grows the volume of their waste.

“It is an issue for the entire Bay Area. Everyone is a part of the production of biosolids. We want to be environmental stewards and create out of what we get resources for our communities that we serve,” Quinn said. She said that as wastewater managers looked to the future, the increasingly untenable way of managing biosolids would have to change to major rate hikes and growing ecological impact from trucking.

In 2003, the Bay Area Biosolids to Energy coalition was formed to find a way to turn a low value commodity produced in droves into energy. “There’s a lot of energy inherent in biosolids,” Quinn said. It is not an entirely new idea: European and Canadian cities have been leading the development of greener ways of dealing with municipal waste. But the scale of the project is what is new, and Quinn says she hopes the project can become a template for other metropolitan areas to work together to find collective solutions to what is a universal problem. But the main focus of the coalition is to find the best ideas to fix Bay Area’s biosolids disposal problem.

Galloway in front of his test model. (Photo by Christopher Connelly)

The Coalition's call for proposals drew a torrent of responses, from as far away as Ireland. From those, they whittled the list down to the three most promising technologies. Florida-based MaxWest Energy's plan for a gasification facility that would recycle heat for on-site use caught their eye. So did a proposal from Houston's Synagro, which called for a biomass facility that would use dried biosolids as an energy source. A third proposal, from Richmond's Intellergy, aims to produce hydrogen that can be sold as a commodity or used in fuel cells. Intellergy's offices and labs are in a mustard-colored concrete building near the Ford Assembly Building. When I met Terry Galloway, Intellergy's chief technology officer, their offices were in the middle of a remodel and the building was empty.

Galloway, a former UC Berkeley environmental engineering professor and researcher at Lawrence Livermore National Laboratory, has been working on hydrogen his whole life. Galloway's system uses super-heated steam to breakdown the biosolids, producing hydrogen that can power fuel cells or tied into existing hydrogen infrastructure and used to power hydrogen-fueled vehicles.

It could also turn out a carbon-rich fertilizer that Galloway says would be valuable in California's high-nitrogen soil. He's devised the technology to process medical waste, which he says is chemically similar. "It can work on any organic material really," Galloway said. Intellergy is building a small demonstration module that will be trucked in to the West County plant in Richmond to test out the method on biosolids by the end of the year.

"This is good for Richmond if it works how they say it will. And I think it will, they've put a lot on the line for this," Chad Davisson, wastewater manager for the city of Richmond. He also pointed to the possibility of using Intellergy's designs as an alternative to the digesting technology at the city's wastewater treatment plant in Point Richmond, which has faced ongoing problems in the last year. Davisson, who has worked in wastewater treatment for years, says the project is an exciting game changer.

"Human waste has a lot of energy in it," he said. "Instead of just perceiving wastewater treatment as some crude, necessary evil, this type of technology is really recognizing that there is a value that can be captured out of it."