



To: The Flathead County Commissioners and the Flathead City/County Health Department

Resources about Energy Production from Biosolids and Wastewater (Septic and Sewer) 4-2023

Ideas, solutions, and expertise on energy production from Biosolids and Wastewater (septic and sewer) should first be tapped locally from one of the leading national and international companies with expertise in energy production from Biosolids and Wastewater (septic and sewer) in the county. **SCS Energy** led the design and building of the highly successful Flathead County Landfill Gas to Energy Project which they have managed since 2001. According to their web site “SCS Engineers has one of the longest and most successful Biogas practices in the United States primarily in landfill gas to energy (LFGE) and digester gas-to-energy (DGE)....SCS designs, constructs, and operates more LFGE and DGE facilities than any other engineering firm in the nation.”
<https://www.scsengineers.com/services/biogas-anaerobic-digestion-renewable-energy-systems/biogas/>

HDR Engineering was not hired to look at energy options when they were asked to design a facility for septage waste but it appears they too may have some expertise in this area.
<https://www.hdrinc.com/search?search=biosolids+and+energy&category=All>

Birgitte Ahring, a professor with the Bioproducts, Sciences and Engineering Laboratory at Washington State University Tri-Cities is developing a way to drastically improve energy production at small waste water treatment plants. She is partnering locally with the Walla Walla Wastewater Treatment Plant, the Pacific Northwest National Laboratory and Clean-Vantage, LLC. **Ahring said a much higher amount of biogas can be produced by applying a specialized upfront pretreatment process using heat and oxygen-based agents before the anaerobic digestion process.** In a final process step, she said the biogas can be further upgraded to pure methane, which can be used as a bio-natural gas. Ahring said converting a larger fraction of sewage sludge into useful energy will reduce the need for landfilling of the material. Birgitte Ahring, WSU Tri-Cities professor of biological systems engineering and chemical engineering, 509-372-7682, bka@wsu.edu
<https://tricity.wsu.edu/improving-energy-production-at-small-wastewater-treatment-plants/>

Research team at Montana State collaborates with Bozeman households to study more efficient use of food waste for energy and fertilizer. pointed out that converting food waste into fertilizer diverts waste from the dump, and – because food waste generates methane as it rots – converting food waste into fertilizer and making use of the biogas also prevents the emission of unused greenhouse gas. Ebel also noted that using biodigesters could ultimately help increase energy independence. A small digester like the ones tested in the Bozeman households delivers enough gas to feed the kitchen stove of a four-person household, he said. Larger models can run entire households and generate additional electricity for sale, he added.

<https://www.montana.edu/news/22550/research-team-at-montana-state-collaborates-with-bozeman-households-to-study-more-efficient-use-of-food-waste>

All anaerobic digestion systems adhere to the same basic principles whether the feedstock is food waste, animal manure or wastewater sludge. Although the process is the same, designs will vary from digester to digester. Design variations are described below followed by descriptions of digester categories. The main categories of digesters are stand-alone digesters, on-farm digesters, and digesters at wastewater treatment plants.

<https://www.epa.gov/anaerobic-digestion/types-anaerobic-digesters#WRRFdigesters>

<https://www.epa.gov/anaerobic-digestion/frequent-questions-about-anaerobic-digestion>

<https://www.epa.gov/agstar/how-does-anaerobic-digestion-work>

The Flathead County Landfill, because of the electric infrastructure in place there to process energy generation, maybe an ideal location for adding anaerobic digesters. Additionally, the landfill has the functional capacity to handle traffic and to utilize the digestate, which is the residual material left after the digestion process. Digestate is composed of liquid and solid portions. These are often separated and handled independently, as each have value that can be realized with varying degrees of post processing. The solid digestate can meet a need at the landfill for daily cover of the garbage.

BENEFITS OF ANAEROBIC DIGESTERS OVER COMPOST FACILITY AND LAND APPLICATION OF EXCESS LIQUID
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The Anaerobic Digestion Process can significantly reduce the volume of biosolids.

“The AD process itself is reliable, with low operation and maintenance requirements. It lowers greenhouse-gas emissions and **can reduce sludge volume by as much as 90%**, lowering the mass that must be disposed of in landfills. It also has been shown to [reduce microplastics in water](#).”

<https://www.fluencecorp.com/what-is-anaerobic-digestion/>

Anaerobic digestion can reduce harmful pathogens in waste, making it safer to use as a beneficial soil amendment.

<https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Waste-reduction-programs/Organic-materials/Anaerobic-digesters>

An anaerobic digester has a pathogen-reducing effect. It has been shown that a **95%** pathogen reduction can be achieved using a 20 day retention time mesophilic digester in the 95 to 105°F temperature range. Higher rates of pathogen reduction are achieved with thermophilic digestion.

<https://extension.psu.edu/fate-of-nutrients-and-pathogens-during-anaerobic-digestion-of-dairy-manure>

Pre-treatment methods of sludge and septic waste in the anaerobic digestion process demonstrate increased production of bio-gas. ...Ultrasonication is an emerging and very effective mechanical pretreatment method to enhance the biodegradability of the sludge, and

it would be very useful to all wastewater treatment plants in treating and disposing sewage sludge. Ultrasonication enhances the sludge digestibility by disrupting the physical, chemical and biological properties of the sludge... The full-scale installations of ultrasonication have demonstrated that there

is 50% increase in the biogas generation, and in addition evaluation of energy balance showed that the average ratio of the net energy gain to electric consumed by the ultrasound device is 2.5.

<https://www.sciencedirect.com/science/article/abs/pii/S1350417710000453>

...possibility of recovering methane from septic tank sludge in an anaerobic digester was explored with and without ultra-sonication pre-treatment in laboratory scale reactors and a 2 m³ pilot anaerobic digester was operated on raw septic tank sludge over a period of 1 year. Methane production potential of the raw septic tank sludge was 298.88 ± 9.7 L kg VS destroyed, which increased to 409.96 ± 13.25 L kg VS destroyed after sonication pre-treatment. Methane content in biogas increased from 73.15 to 81.83% upon sonication pre-treatment of the sludge.

<https://link.springer.com/article/10.1007/s12649-017-0065-0>

Oregon Is Turning Sewage into an Endless Supply of Green Energy

Converting poop into heat and electricity offers a tantalizing proposition: more waste equals more clean power. <https://reasonstobecheerful.world/oregon-water-treatment-methane-green-energy/>

The [Waste-to-Energy \(WTE\) Technical Assistance for Local Governments](#) pairs national laboratory experts with U.S. local governments and decision makers, and provides technical assistance to advance WTE technologies, including addressing knowledge gaps, specific challenges, decision making considerations, planning, and project implementation strategies. WTE resources considered include organic waste, such as food waste, wastewater sludge, animal manure, and fats, oils, and greases. ...[2023 Waste-to-Energy Technical Assistance for Local Governments Announced](#) BETO (The U.S. Department of Energy (DOE) Bioenergy Technologies Office (BETO)) and the National Renewable Energy Laboratory (NREL) are launching the next phase of the organic Waste-to-Energy Technical Assistance for Local Governments. The data from this program can help communities evaluate the most sensible end-uses for their waste, such as repurposing for: on-site heat/power, transportation fuels, nutrient recovery, or other options. <https://www.energy.gov/eere/bioenergy/bioenergy-technologies-office-funding-opportunities>

Other links to facilities turning bio-solids into energy

<https://www.anaergia.com/reference-facilities/rialto-bioenergy-facility/>

PROBLEMS WITH TURNING BIOSOLIDS AND SEPTIC WASTE INTO COMPOST

There is growing public and government concern with chemicals found in compost made from bio-solids from municipal sewage and septic waste. <https://civileats.com/2020/01/30/questions-remain-about-using-treated-sewage-on-farms/>

<https://www.sierraclub.org/sludge-garden-toxic-pfas-home-fertilizers-made-sewage-sludge>

New Rules to address the growing public health concerns with the chemicals found in septic waste will require additional testing of compost from biosolids and septic waste and likely further limit use of this compost. Biden-Harris Administration Proposes First-Ever National Standard to Protect Communities from PFAS in Drinking Water <https://www.epa.gov/newsreleases/biden-harris-administration-proposes-first-ever-national-standard-protect-communities>

Growing public health concerns with compost containing biosolids from sewage treatment plants and other sources including sludge from sump pumps like at car washes, industrial source, or from septic waste has the public and local governments rejecting use of compost containing this waste.

In 2003, [Switzerland](#) became the first country to ban biosolids, while Maine last year put [restrictions](#) on their use. Municipalities in [Wisconsin](#), [Michigan](#) and [Florida](#), among others, have stopped spreading sludge altogether.

The **City of Tacoma's** pretreats biosolids by closely monitoring upstream industry's discharge to reduce the amount of toxins that make it to its treatment plant and, ultimately, its biosolids. Fourteen staff members monitor nearby industries' discharges. Similarly, regulators in **Michigan** have successfully [reduced](#) the amount of PFAS in biosolids by identifying which businesses were sending the chemicals to the sewers and requiring those businesses to find another way to dispose of them. <https://www.mlive.com/news/2020/01/substantial-drops-seen-in-pfas-entering-michigan-waterways-from-businesses.html>

Critics point to the EPA's Office of Inspector General's critical [2018 report](#), which found that the EPA couldn't properly regulate biosolids because it "lacked the data or risk assessment tools needed to make a determination on the safety of 352 pollutants found in biosolids." Among those pollutants were hormones, pesticides, plasticizers, and medications, and it labeled 61 of those "acutely hazardous, hazardous, or priority pollutants."

Endocrine disruptor compounds, pharmaceuticals and personal care products were detected in 13 of 14 shallow ground water wells just north of Flathead Lake that were sampled in 2010 by the Flathead Lake Biological Station in the Flathead River Drainage.

Law suits are increasing common to protect water quality PFAS and other chemicals found in sludge and its application as compost. <http://www.ncpolicywatch.com/2019/11/18/selc-plans-to-sue-burlington-over-pfas-14-dioxane-pollution-in-drinking-water-sludge/>

Measuring the volume of septic waste in a septic tank annually. Both the regulatory and pumping industry recommend that the sludge and scum layer in a septic tank should never be permitted to fill more than about 30% of the septic tank's volume. Therefore, it will take about 5 years for one adult to fill 300 gallons of a 1,000-gallon septic tank with sludge and scum. A family of four will fill the 300-gallon storage volume of a 1,000-gallon septic tank in about 1.5 years. By making adjustments in this analysis for adults working outside of the home a third of the time and children going to school, it is easy to conclude that a septic tank should be pumped every two to three years.

<https://extension.psu.edu/septic-tank-pumping>

<https://waterquality.montana.edu/well-ed/care-maintenance/privatesepticsystems.html>