

A photograph of a large industrial building, likely a digester, with a 'DVO' logo on its side. The building is surrounded by a field and some infrastructure. A red tractor is visible in the foreground.

BioReact AD boosts average daily biogas production by 20% at large Wisconsin dairy farm

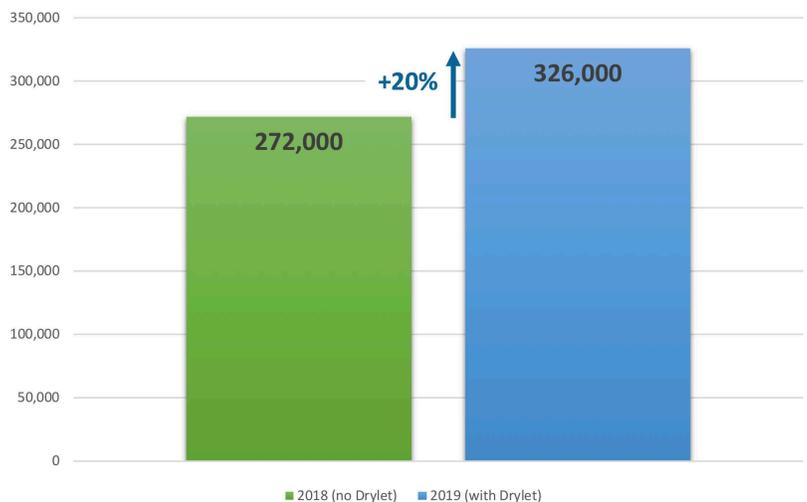
Results Summary

- **20%:** Average daily production boost of biogas for the same period year-over-year
- **60%:** Methane ratio remains unchanged and steady
- **\$300:** Daily value of additional electricity sold to the utility
- **\$1,345:** Average daily new gross income opportunity from renewable natural gas sold to the pipeline (on top of historically generated electricity)

THE SITE

Dallmann's East River Dairy is host to a 1.7-million gallon capacity digester designed by DVO, Inc. that generates electricity, bedding, fertilizer, and heat. The operation also incorporates an ammonia/nitrogen recovery system after the digester, which helps to clean the biogas. The resulting methane generates enough electricity to power 500 homes -- it is sold to the utility.

Comparative biogas production (ft³) for same 61-day period year-over-year



THE TECHNOLOGY

Drylet's innovative technology draws from material science and microbiology. Its BioReact AD product is comprised of carefully selected beneficial microbes embedded inside non-toxic particles made of an engineered porous media substrate. The particles are approximately 200-600 µm in size. They protect the microbes, allowing them to thrive and replicate fast so they can be effectively integrated into microbial ecosystems.



20%
biogas boost



54,100 ft³/day (average)
additional biogas produced



60%
unchanged methane ratio

How it works

Anaerobic digestion is a three-step process:

- 1. Hydrolysis:** Long-chain molecules from bacteria, such as carbohydrates, proteins and fats, are being degraded into sugars, amino acids and long-chain fatty acids respectively.
- 2. Acidogenesis and acetogenesis:** The products of hydrolysis are converted into short-chain fatty acids (e.g. acetate), CO₂ and H₂.
- 3. Methanogenesis:** Archaea (methanogens) convert SCFA, H₂ and CO₂ into methane.

The lysis, or breakdown, of the bacterial cell wall is necessary before the long-chain molecules contained inside the cell can be broken down. Drylet's innovative technology enables the enhanced degradation of undigested solid waste (hydrolysis), promoting a reduction in biosolids and an increase in the generation of biogas.

The process

BioReact AD was dosed in the methane digester at a daily rate of 13 lbs over 61 days. With a consistent influent (cow manure) in both composition and quantity over the whole period and no operational changes, the effect of BioReact AD clearly registered as a stable increase of biogas production with unchanged gas composition at 60% methane. Daily fluctuations in biogas production observed in both 2018 and 2019 may be attributed to external factors such as weather events.

The impact on revenue

The demonstration resulted in a 20% average boost of biogas generation. At the site, methane from biogas is used to generate electricity. Most of it is sold to the utility. It was calculated that electricity from the additional methane generated through using Bio React AD represents a net value of about \$300 per day. Additionally, significant solids reduction resulted in cleaned-up sludge lines, reducing operating and maintenance costs.

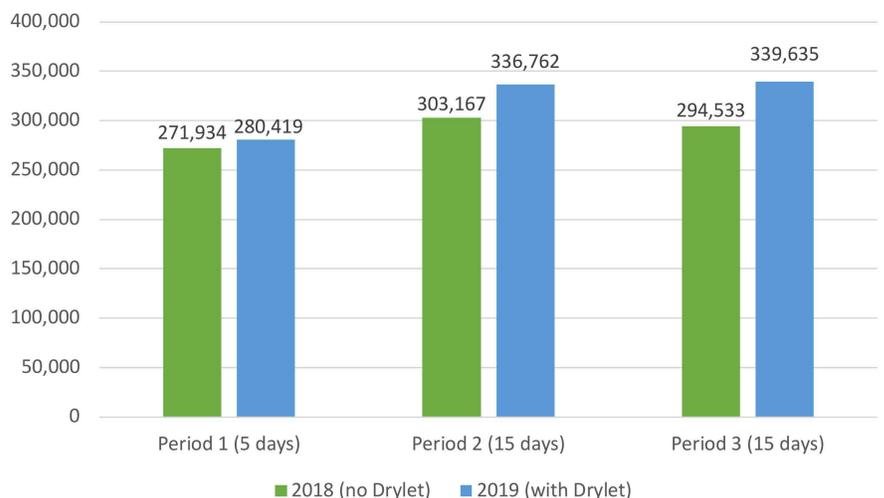
FACILITY OVERVIEW

Installed in 2012 by DVO, the anaerobic digestion system is part of an industrial complex that includes an underground mixed plug-flow digester heated at 101°F, two aeration tanks, a dissolved air flotation (DAF) tank, a nutrient recovery unit, and a Guaskor engine that produces electricity at the rate of 600 kW.

The influent is provided by the farm's 4,500 dairy cattle.

270,000 SCF of biogas are generated per day on average, with methane making up 60% of its content.

Comparative biogas production (ft³) year-over-year



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