

**AMERICAN  
BIOGAS  
COUNCIL**

# Digesting Dumped Dairy

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ABC Webinar

April 15, 2020

# Today's Speakers



**Steve Dvorak**

**DVO, Inc.**



**Bryan Sievers**

**AgriReNew/SieversFamily  
Farm**



**Craig Frear**

**Regenis**



**Bernie Sheff  
(Moderator)**

**Montrose Environmental**

# Quick Notes



You should be able to hear me talking now. If you can't, use the questions module to describe your issue.

Two Audio Options: Phone or Computer  
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Pro tip: Don't call in on our phone if your audio is set to "Mic and Speakers"

Ask questions using the Questions Panel on the right side of your screen at any time.

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The screenshot shows the GoToWebinar interface. At the top, there's a menu with 'File', 'Options', 'View', and 'Help'. Below that, a status bar says 'Attendees still on hold' and 'Press \*1 to Start the Broadcast for all attendees.' There's a checkbox for 'Record on start' which is checked. A sidebar on the left contains icons for navigation. The main area shows a list of controls: 'Audience view' (100%), 'Sharing', 'Webcam', and 'Audio'. The 'Audio' section is expanded, showing two options: 'Computer audio' (unselected) and 'Phone call' (selected). Below this, it displays 'Dial: +1 (415) 655-0052', 'Access Code: 147-638-497 #', and 'Audio PIN: 79 #'. There's a link for 'Problem dialing in?'. Below the audio section is a 'Questions' panel with a table. The table has columns for 'Question' and 'Asker'. Below the table are options for 'Send Privately' and 'Send to All'. At the bottom, there's a 'Handouts' section (0 of 5) and a 'Chat' section. The footer includes 'Webinar Now', 'Webinar ID: 815-417-091', and the 'GoToWebinar' logo.

← Audio

← Questions

# Who We Are



The only US organization representing the entire biogas industry

## All sectors represented

- Project developers/owners
- Equipment retailers and dealers
- Waste management companies
- Waste water companies
- Farms
- Utilities
- Municipalities
- Consultants and EPCs
- Financiers, accountants, lawyers and engineers
- Non-profits, universities and government agencies

**200+**  
**organizations**  
**2,000+**  
**individuals**



# The US Biogas Market



## Current

255 on Farm  
1,269 Water  
66 Food Scrap  
645 at Landfills

## Potential

8,300 on Farm  
4,000 Wastewater  
1,000 Food Scrap  
440 at Landfills

14,000+  
Potential  
New Biogas  
Systems

2,200+  
Operational  
Biogas  
Systems

Breaking down 222  
Dairy Biogas  
Systems....  
1: > 20,000 cows  
6: 10,000-20,000 head  
16: 5,000-10,000 head.  
**Total LARGE farm  
digesters: 10%**



## Topics Covered

- Which dairies are dumping milk and why?
  - How have digester owners responded already?
- Changes in digester chemistry and biology
- What mechanical adjustments are needed
  - Storage implications for milk, digestate and water
  - Operational challenges and optimizing your system
- How will EPA/OTAQ treat milk related to D3/D5 RINs?

**Q&A after presentations**



# ABC Webinar

Digesting Dumped Dairy



# Where are farmers dumping milk?

Unfortunately, all across the country

- California, Colorado, Arizona, Texas, Florida, Wisconsin, Pennsylvania, New York, Vermont, etc.
- 5% of US milk production is being dumped per International Dairy Food Association (New York Times)
- During first week of April, 7% of US milk produced was dumped per DFA, USA's largest dairy cooperative (Wall Street Journal)
- DFA says farmers dumping 3.7 million gallons of milk/day

Even dumping in Canada and UK



# Why are farmers dumping milk when grocery shelves often empty?

Quarantine has affected the way milk is consumed and the type of processed milk products needed

Processing plants that serve food service market have cut back production or closed

- Large institutional buyers of milk shuttered abruptly - restaurants, hotels, schools, universities, etc.
  - In turn they abruptly cancelled large orders with food service milk and cheese plants
  - US cheese sales down 70%
  - Roughly half of butter and half of cheese produced in US is sold to restaurants

# Why are farmers dumping milk when grocery shelves often empty?

Processing plants that serve the retail/grocery store market are at capacity

- Grocery store milk sales up 30% in March
- Dairy is perishable, so retail fluid processors can only hold so much in inventory – and they're at capacity

Lack of appropriate-size dairy packaging to shift production to meet surge in retail/grocery store demand

- Plants that generally serve food service/restaurant markets don't have the packaging needed to sell product where current demand is – grocery stores
  - Fluid milk plants need 1 and ½ gallon containers
  - Butter & cheese milk plants need smaller, retail butter & cheese packaging

# Why are farmers dumping milk when grocery shelves often empty?

## Loss of export sales

- Food service sector largely shut down globally

## Lack of employees to process milk

- Workers sick or afraid to work closely with others

## Lack of transportation to retailer

- Trucking companies struggling to find drivers as some who fear virus have stopped working

# Why are farmers dumping milk?

Unfortunately can't easily donate milk to food banks

- Milk still needs to be processed at processing plants
  - Operating at capacity
  - Don't have storage space for excess milk

Many states don't allow farmers to sell directly to the public

- Those that do require a permit which can be difficult to obtain – and takes time

# How are dairy anaerobic digester owners responding?

- Field spreading
  - Breakdown of milk will produce strong odors
  - Have BOD, COD and nutrients to consider and deal with
- Add to manure lagoon

Many lagoons already at or near capacity, and have to consider spring rainfall
- Use raw milk for animal feed
- Add to anaerobic digester
  - Increase biogas production for more electricity/CNG (if capacity available)
  - Decrease BOD and COD
  - Destroy odors and pathogens

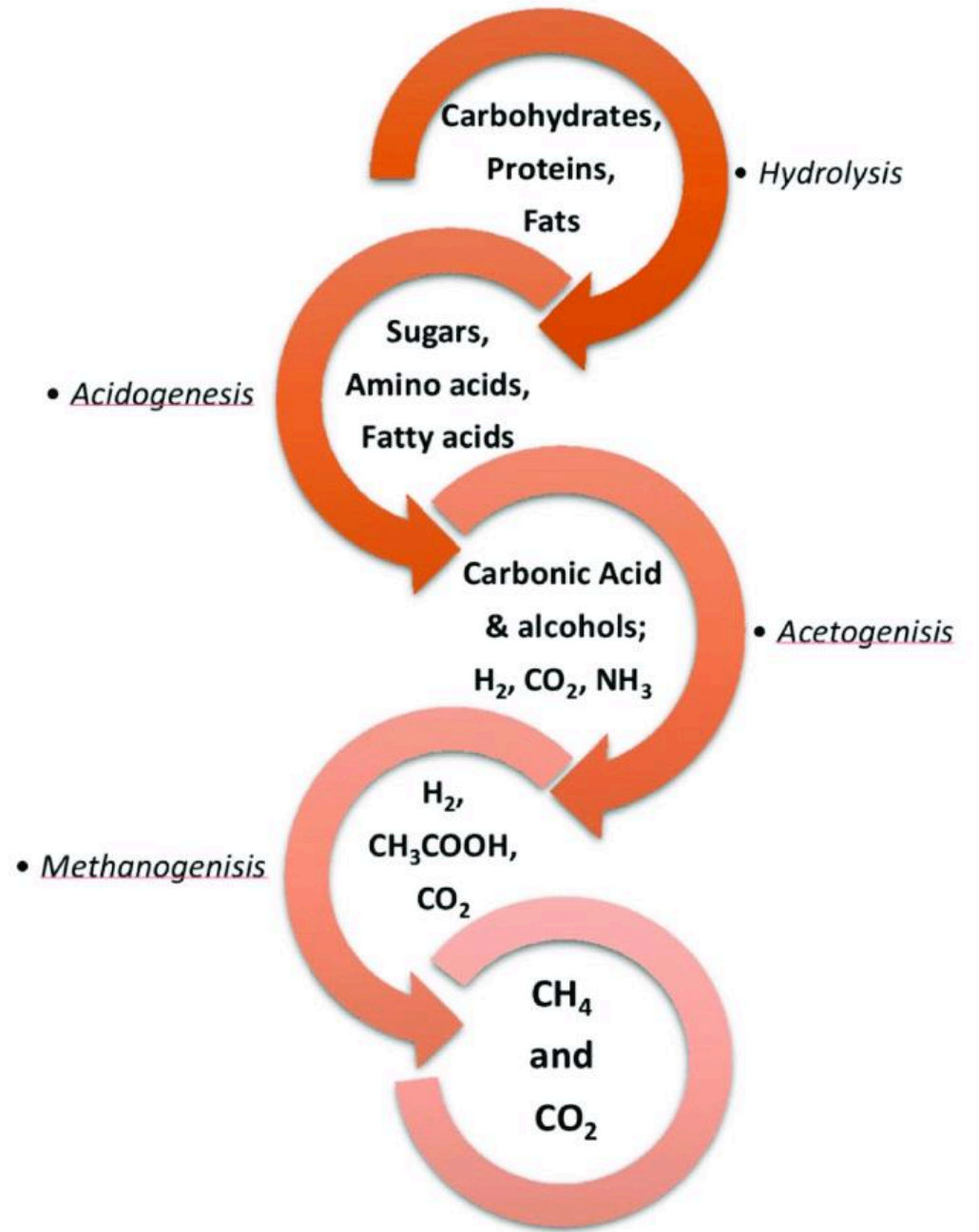
# Biological and Chemical Implications

- Waste dairy milk and other dairy by-products can be **effective substrates for co-digestion with dairy manure;**
- The BMP of raw dairy milk is reported to be **0.512 m<sup>3</sup> CH<sub>4</sub>/kg VS or 8.2 ft<sup>3</sup> CH<sub>4</sub>/lb. VS**
- ~ 8.70 ft<sup>3</sup> CH<sub>4</sub> per gallon milk
- ~ 100 ft<sup>3</sup> CH<sub>4</sub> per hundred weight
- ~ 10 kWh per hundred weight
- The high production capability is due to milk being primarily composed of **sugars which are readily digested and converted by the micro-organisms.**



# Caution !!

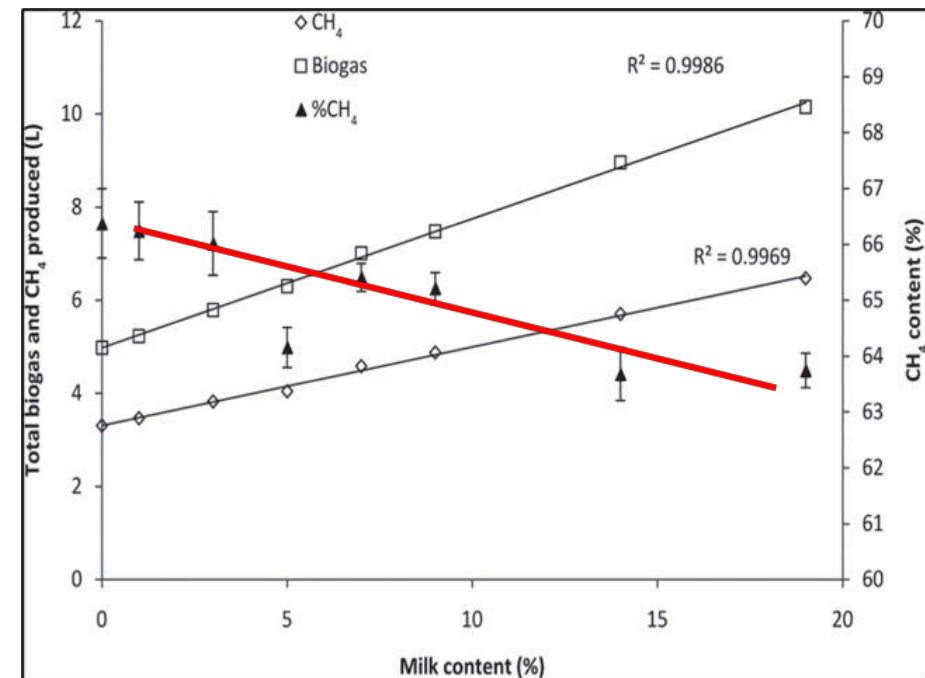
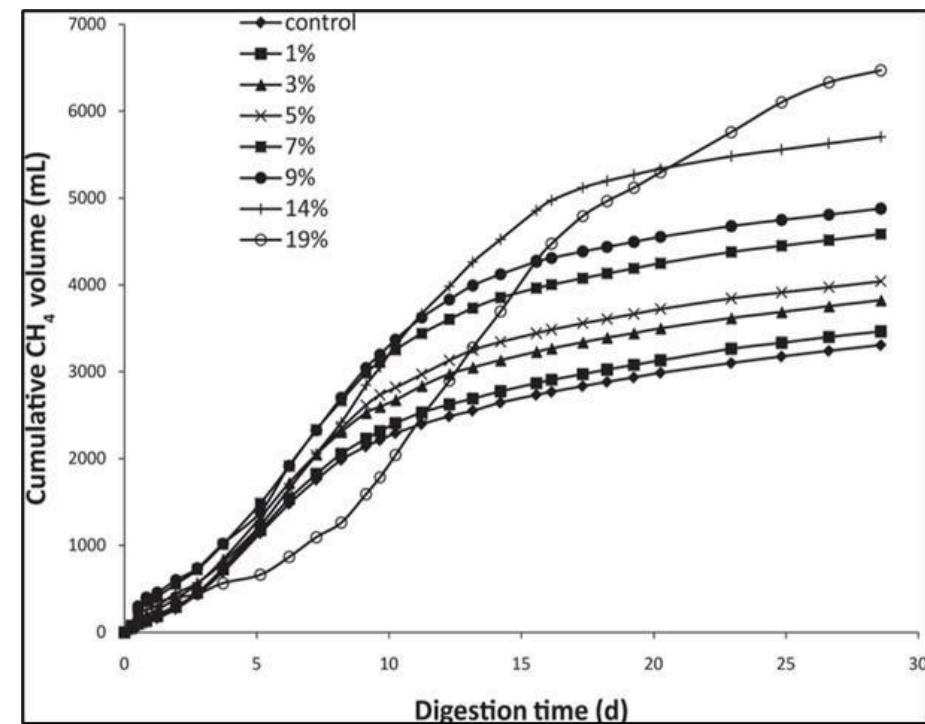
- As it is readily digested, **raw milk can quickly sour an anaerobic digester due to product inhibition**—causing it to become ill and decrease in its biogas production.
- Product inhibition is when the first steps of the AD process progresses so quickly that **acid builds up too fast for the latter steps to effectively proceed**, lowering the pH and inhibiting the bacteria, particularly the sensitive methanogens.
- Thus, an attempt at aiding in treating a waste milk problem with intent for enhanced biogas production **can lead to sustained underproduction and loss of income—IF MISMANAGED.**



# Caution !!

- Co-digestion with dairy manure can reduce this **inhibition risk** due to presence of its natural alkalinity and buffers
- However, **even co-digestion has its limits** with the side graph showing inhibition at 19% volumetric milk with manure—under perfect conditions in the laboratory.
- In addition, co-digestion will produce higher levels of carbon dioxide, **lowering the overall methane percentage**, which can be detrimental to downstream processes.

Wu, X., Dong, C., Yao, W., & Zhu, J. (2011). Anaerobic digestion of dairy manure influenced by the waste milk from milking operations. *Journal of dairy science*, 94(8), 3778-3786.





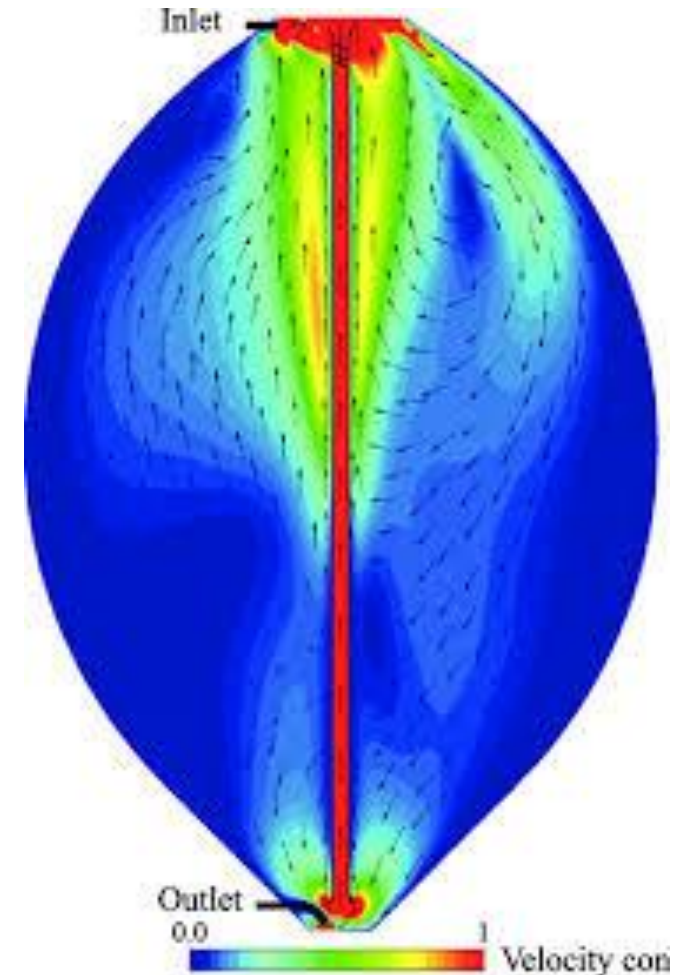
# Operational Implications—Heating

- What is the impact of 6,000 gallons of milk to a digester with regards to heating?
- $\Delta T$  of Milk (deg. F) x weight of milk (lbs.) x 1 BTU/lbs./degree is amount of energy needed.
- 6,000 gallon-load of waste milk at 60 deg. F needs 40 deg. x 6000 gal. x 8.34 lb./gal. x 1 BTU/lb./deg.
- 2,001,600 BTU or **+2 MMBTU of heat**. The amount to be generated is more likely **2.4 MMBTU** when efficiencies are considered.



# Operational Implications—Loading/Mixing

- Organic Loading Rate (OLR)
  - Whole milk is generally 12% TS, 90% VS with a BMP of 8.2 ft<sup>3</sup> CH<sub>4</sub>/lb. VS and 63% CH<sub>4</sub>.
  - The 6,000-gallon load will add – (6000 x 8.34 x 0.12 x 0.9) – or 5,404 lbs. of VS that must be considered in the OLR of the digester. **An increase of >10% in the OLR is not preferred.**
- Detention Time
  - The addition of the milk **may reduce the detention time** to the extent that time for digestion is reduced.
- Mixing
  - The mixing in the digester may be impacted if the amount of milk **drops the solids content to a point that solids are no longer suspended.**
  - Mixing time may need to be increased if the milk reduces the solids content appreciably.



# Bryan Sievers, AgriReNew/Sievers Family Farm



A descendant of German and Norwegian immigrants that settled in Iowa between 1850 and 1873, Bryan Sievers, and his wife Lisa, are the current generation of owners and operators of the Sievers' farm. Bryan is an enthusiastic environmental steward of the land and takes pride in using all available resources, including the air, land, water, and sun for their highest and best use. The Sievers' 2,300 acre farming operation, 2,400 head beef cattle feedlot, and renewable energy facility is located in western Scott County, Iowa near Stockton. In 2014, AgriReNew, a company created by the Sievers and their partners, Dr. William and Judy Davidson, received the Agricultural Biogas Project of the Year Award from the American Biogas Council and received the 2014 Iowa Environmental Excellence Award for their anaerobic digester project.

Bryan and Lisa are 1982 graduates of Iowa State University. Bryan received his degree in Agricultural Business while Lisa received her degree in Industrial Administration with an emphasis in Accounting. Lisa is also a Certified Public Accountant. Bryan and Lisa have two children and five grandchildren.

Bryan's past experiences include being a 3-year letterman on the Iowa State University baseball team, leadership roles in the Iowa Farm Bureau, serving two terms in the Iowa Legislature (one term in the Iowa House and one term in the Iowa Senate), and is currently serving as Chair of the Iowa Economic Development Authority's Biomass Conversion committee. This committee is responsible for creating an Action Plan to expand Iowa's biomass production and processing capacity as part of a comprehensive renewable energy strategy through Governor Kim Reynolds' Iowa Energy Plan.



# Let us answer your questions!



**Steve Dvorak**  
DVO, Inc.



**Bryan Sievers**  
AgriReNew/Sievers  
Family Farm



**Craig Frear**  
Regenis

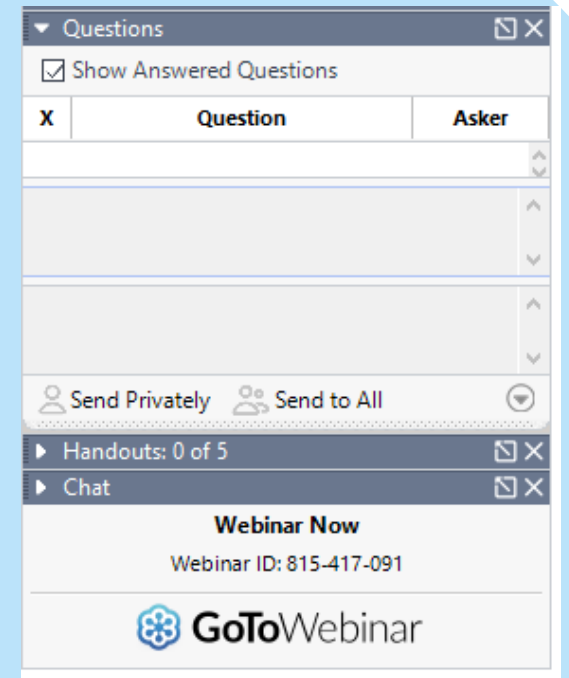


**Bernie Sheff**  
(Moderator)  
Montrose  
Environmental

Use the  
**QUESTIONS  
PANEL**  
on the right  
side of your  
screen.

All questions and  
comments will be  
recorded.

We expect the  
recording of the  
webinar and  
slides to be  
available  
tomorrow for all  
ABC Members  
and webinar  
registrants



# Thank you!

Don't forget to fill out our **survey** after the webinar

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- Receive regulatory and policy intelligence
- Connect with other biogas and anaerobic digestion leaders
- Support the industry's growth and outreach

Thanks for attending!