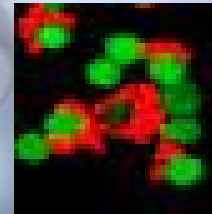


**Archaea**Solutions, Inc.



**Improved Wastewater Processing**  
Driven by **Arkea®**



# Background

- ArchaeaSolutions, Inc. is a high-science company focused on the use of Archaea organisms to assist natural cycle processes.
- Municipal wastewater treatment facilities, industrial wastewater treatment facilities, and similar entities are locales where this assistance is needed.
- Arkea®, our proprietary blend of Archaea organisms and other microbes, is proven to enhance waste breakdown and minimize pollution from these sources.



# Original Hypothesis

How Arkea® Can Prevent Pollution



# Original Hypothesis

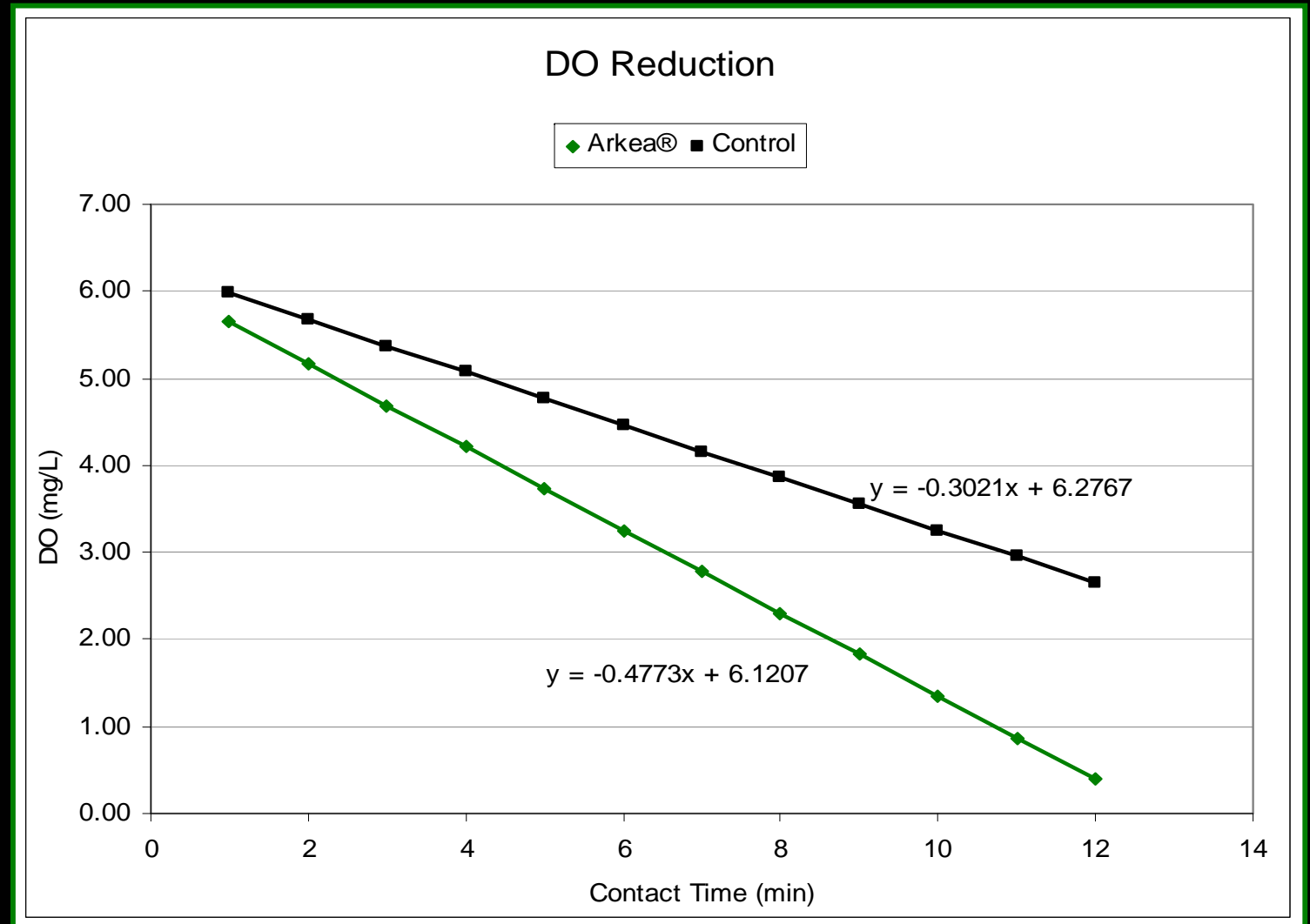
- Hypothesized:
- If presence of Archaea organisms can:
  - Increase metabolic rate and
  - Enhance breakdown of difficult molecules.
- Then facilities using it will pollute less (i.e. produce cleaner effluent, generate less sludge, and be less susceptible to upset).
- This hypothesis was tested by an independent university lab (no direction from us) and published in the Journal of Water Science & Technology.



# Then Hypothesis Was Proved

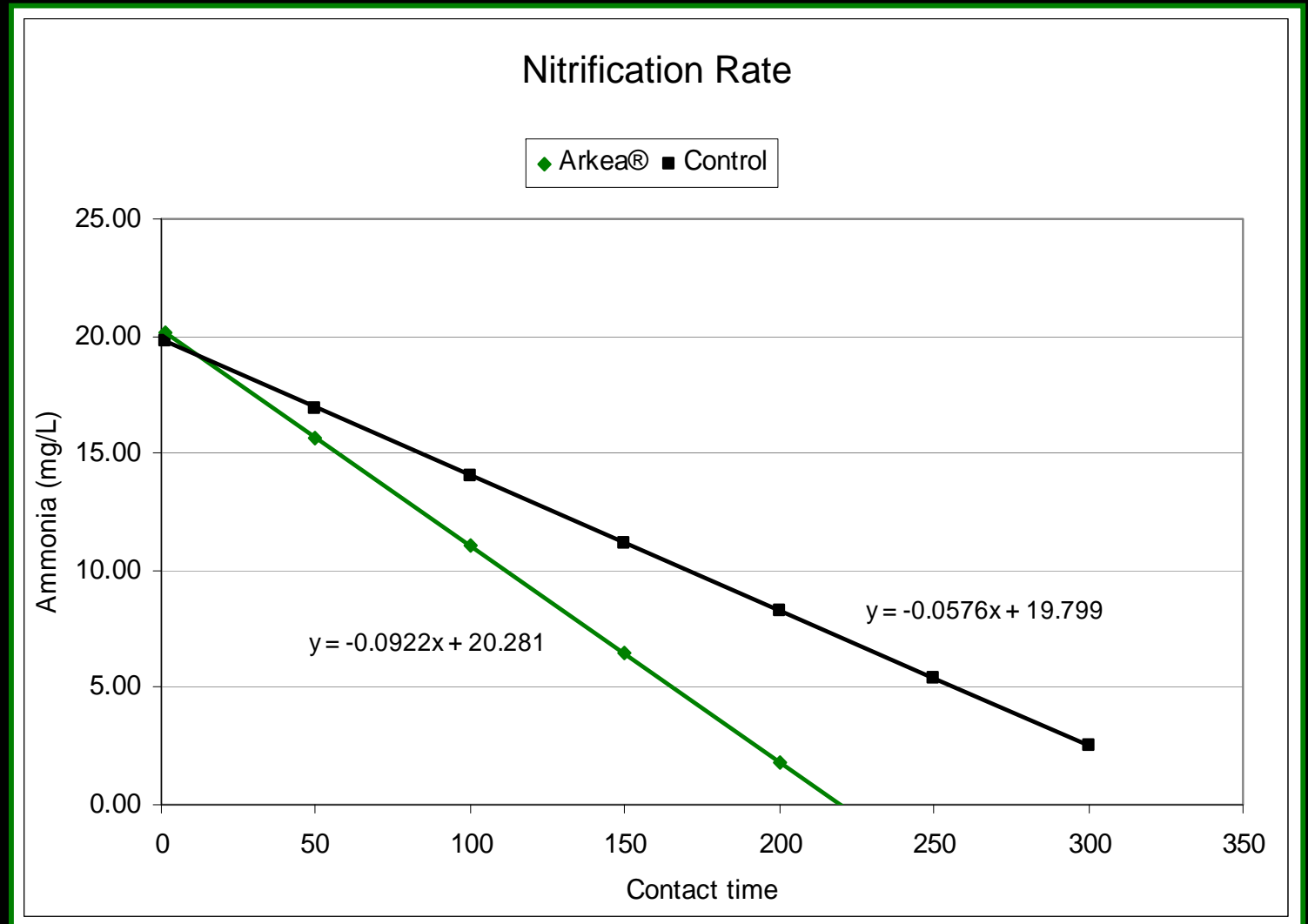
Jun, HB, et al. 2004. "Nitrogen removal and sludge reduction in a symbiotic activated sludge system between Archaea and bacteria. *Water Science and Technology*. Vol. 50, No 6, pp 189-197.

# DO Reduction Kinetics



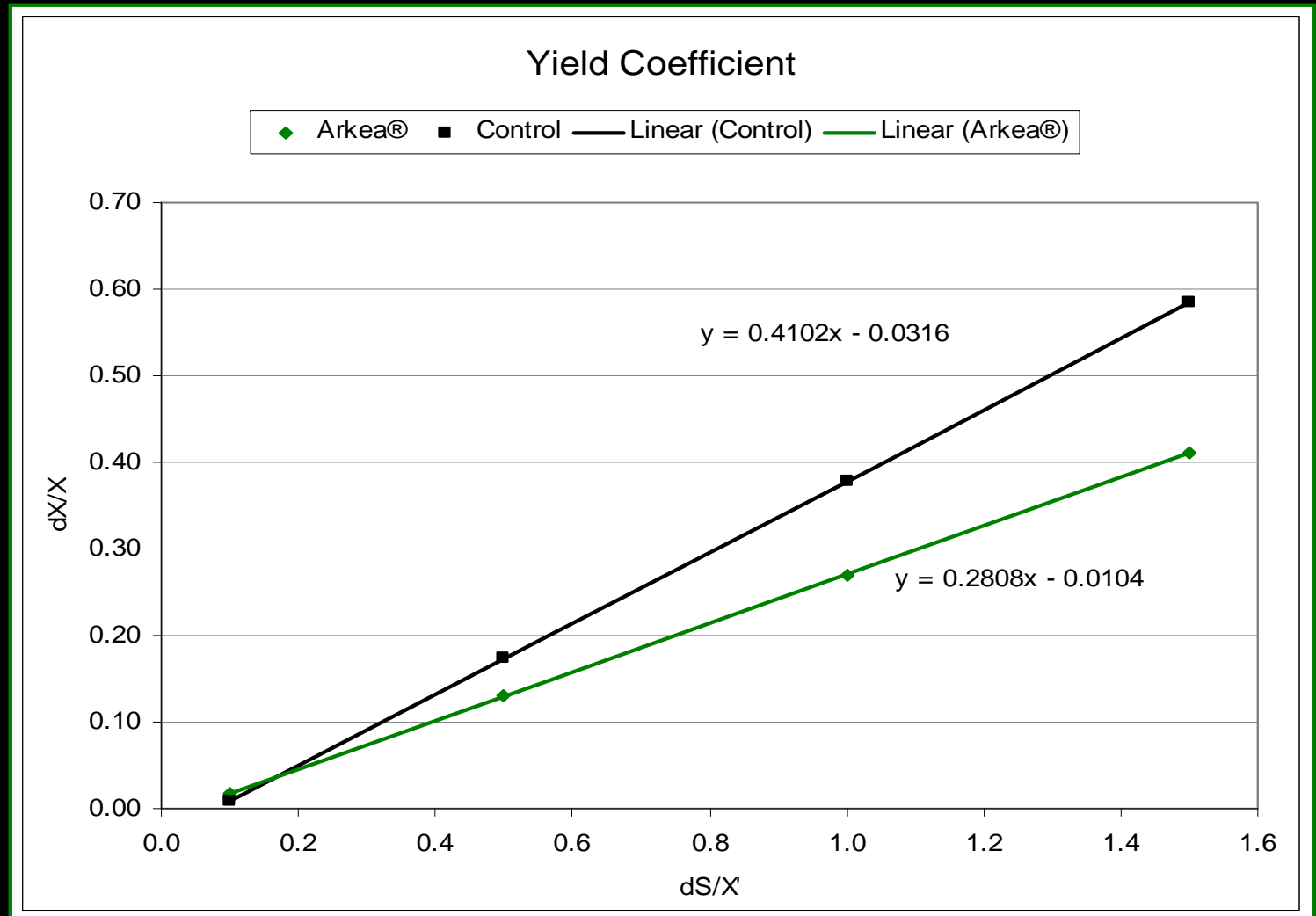
- Oxygen was used more rapidly, indicating accelerated metabolism.
- Coefficient of “x” indicates Arkea® driven rate was approximately 50% higher.

# Ammonia Oxidation



- Ammonia was oxidized more rapidly, indicating accelerated metabolism.
- Coefficient of “x” indicates Arkea® driven rate was about 37% higher.

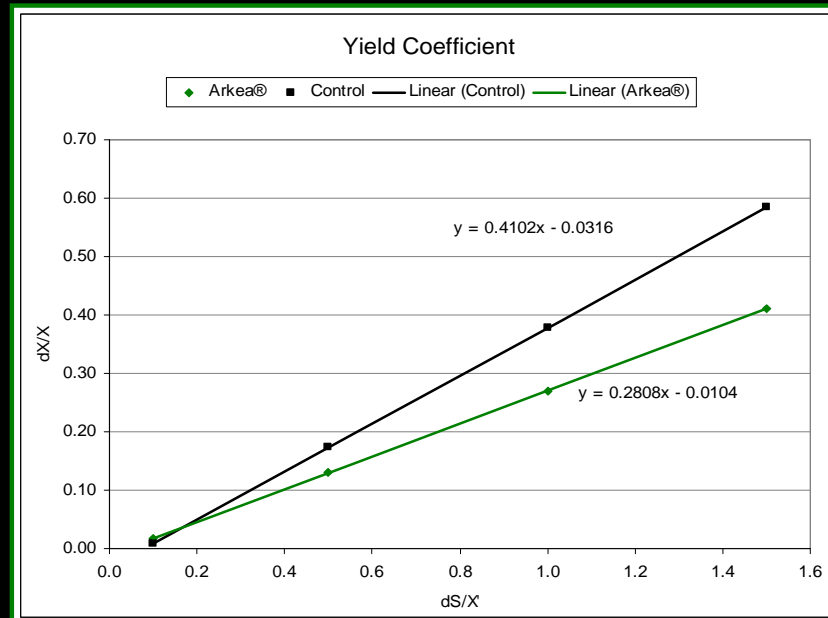
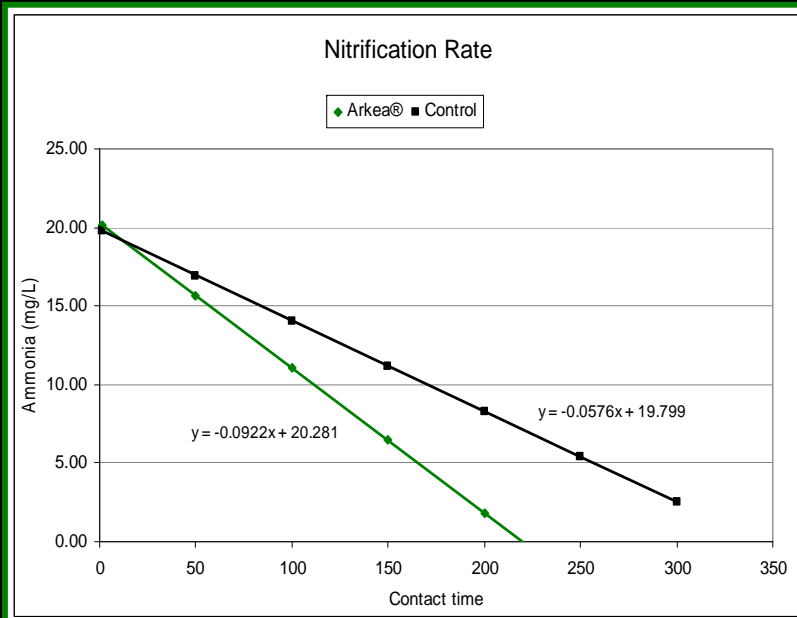
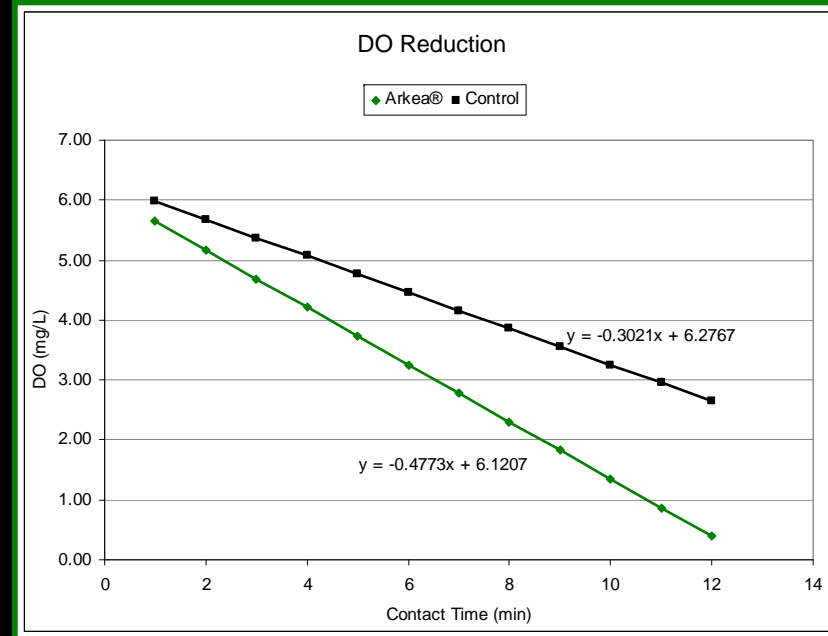
# Sludge Yield



- Increased metabolism usually means increased endogenous metabolism and less sludge yield.
- “x” coefficient was 31% less when Arkea® is present.

# Hypothesis Confirmed

Graphed data confirm  
hypothesis: Arkea®  
accelerates metabolism  
and breaks down  
difficult molecules such  
as ammonia and  
sludge.





# Next Step

Hypothesis was proven. Now test in field.



**Prevent Municipal WWTF Pollution**

# Effluent Quality

- Data to right are typical and from an Ohio WWTF.
- Both BOD (-32%) and TSS (-43%) drops are marked and significant, especially when compared to influent data.
- The before data are averages for 15 months prior to Arkea® treatment.
- The +Arkea® data are averages for nine months since Arkea® treatment began.

	BOD In	BOD Eff
Before	209	2.93
+Arkea®	199	2.00
% Drop	5%	32%

	TSS In	TSS Eff
Before	191.67	7.93
+Arkea®	186.11	4.56
% Drop	3%	43%

**Data Confirm Arkea® Causes Cleaner Effluent  
& Therefore Decreases Pollution**

# Municipal TKN

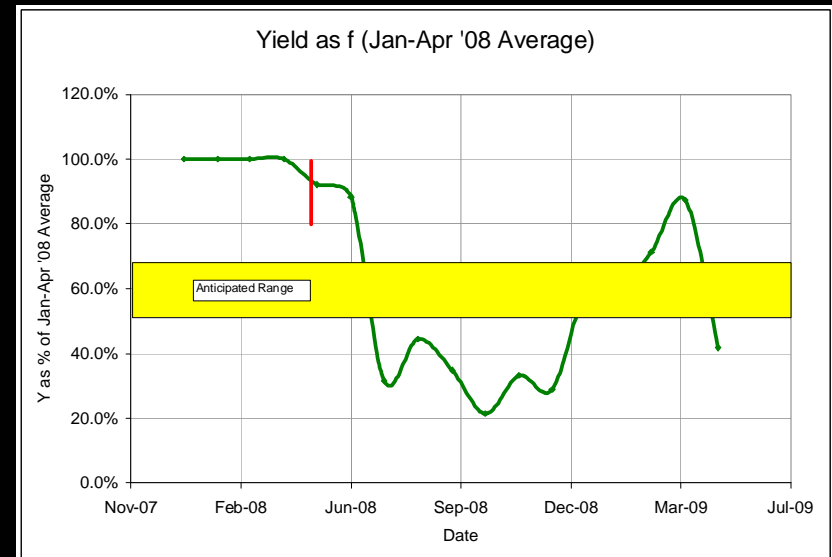
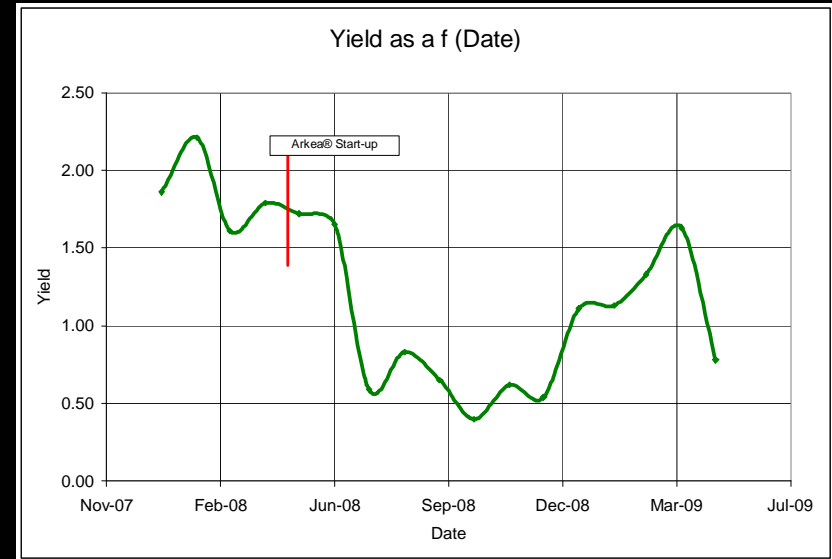
- In less than 6 months, TKN dropped to +/- 1 mg/L and has remained there for almost five years.
- Plant is in the state of New York where winters are quite cold.
- Science now knows Archaea organisms have 3,000-fold more ammonia oxidase genes than other soil microbes.

Time Period	mg/L
6/2004 - 5/2005	>7.00
7/2005 - 9/2005	<2.00
9/2005 - Present	+/- 1.00

**Data Confirm Arkea® Reduces Nitrogen in Effluent  
& Therefore Decreases Pollution**

# Municipal Plant Sludge

- With Arkea® treatment, sludge yield dropped to range of 20 – 70% of pretreatment levels.
- Increases are caused by sludge from pulp and paper plant's wastewater entering WWTF.
- Have further stabilized process, so no peaks above 60% of previous performance occurred in 2009.



**Data Confirm Arkea® Reduces Sludge Yield  
& Therefore Decreases Pollution**



# Please Note:

The foregoing WWTF data are typical and representative examples of a large number of customers. Additional customer data, insights, and references available upon request.



**Prevent Industrial Wastewater Pollution**

A golden key is inserted into a white puzzle piece. The puzzle piece is set against a grey background with a wavy, textured pattern. The key is positioned vertically, with its head at the top and its shaft passing through the hole of the puzzle piece.

# Industrial Wastewater

Industrial plants often have higher waste loads whose strength oscillates widely. The molecules may also be non-biological and difficult to metabolize. The first step in pollution prevention is to stabilize the process so effluent waste peaks no longer occur.



**Stabilize Process to Prevent Pollution**

**Cleaner Effluent at Food Processors**



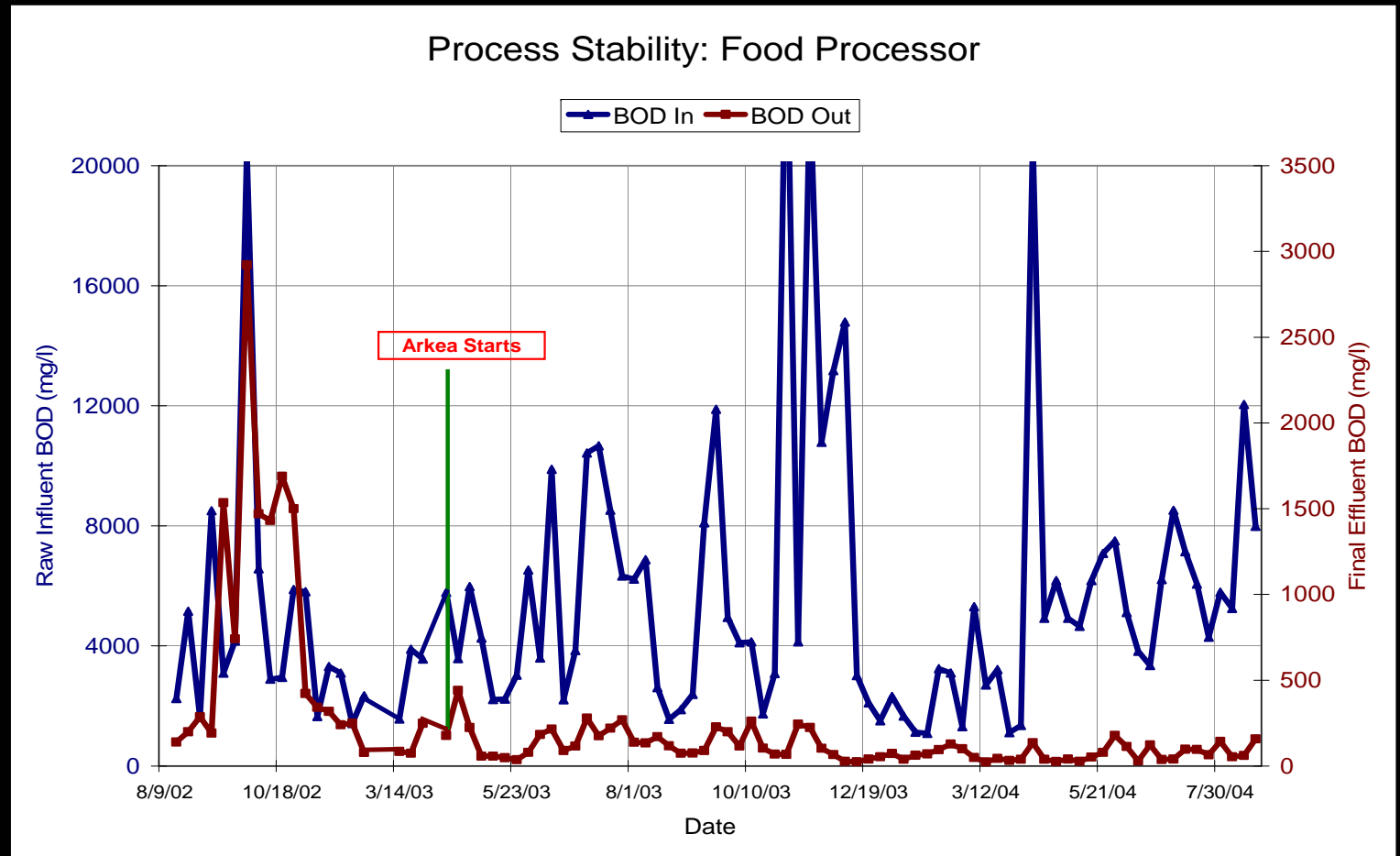
# Industrial Pollution Prevention

In general, industrial wastewater has higher waste concentrations, higher levels of non-biological material, and more antimicrobial compounds.

In addition, manufacturing cycles can cause massive variations in the waste load. In a winery example that follows, incoming BOD can vary from 200 ppm to greater than 20,000 ppm in a single 8-hour period.

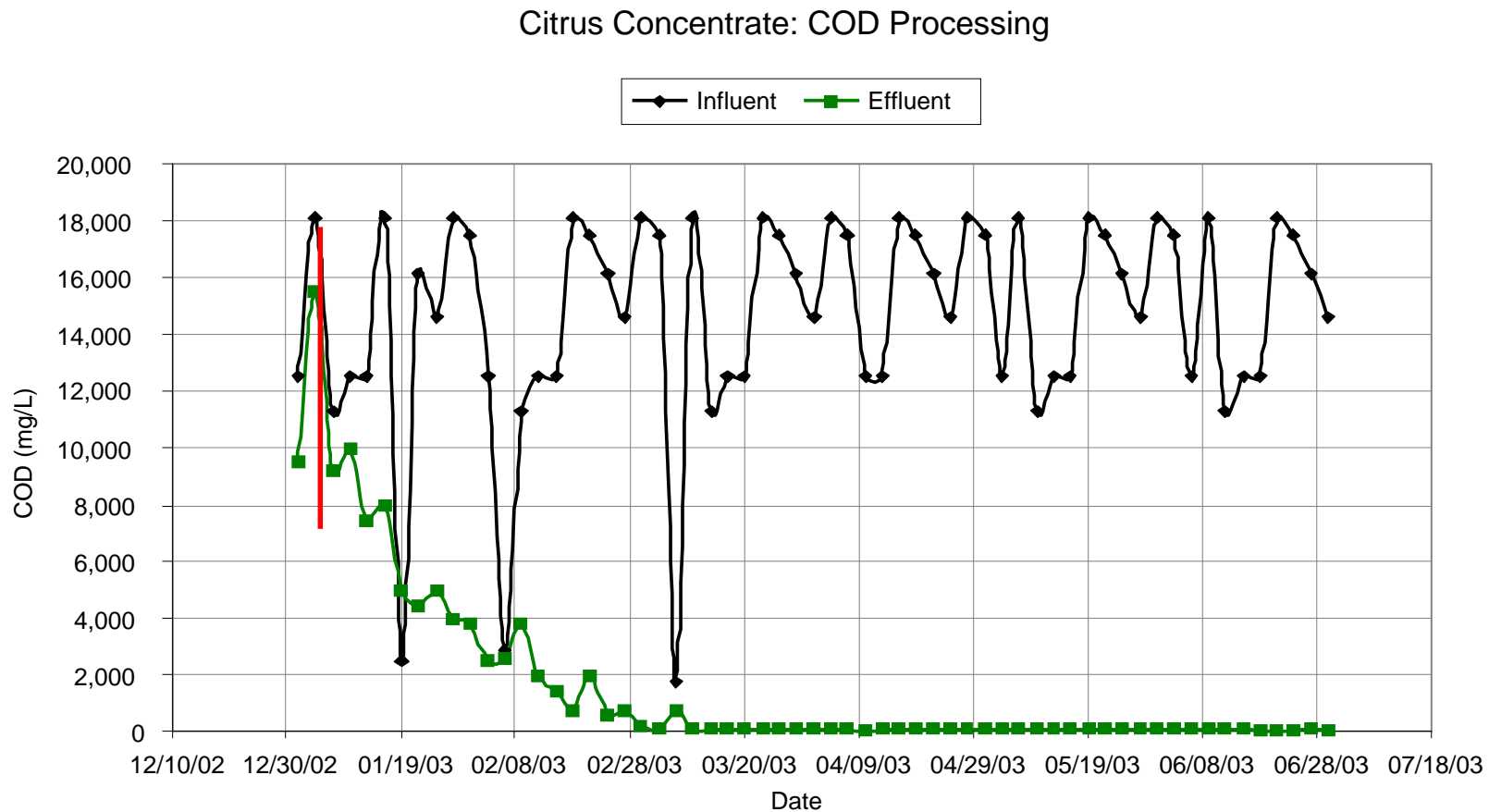
Quite often, the first job is stabilizing the process vs. these load variations.

# Stabilize Winery Process



- These data are from a winery in Napa Valley, CA.
- Prior to Arkea® treatment “Effluent Out” mimicked “BOD In”.
- But since Arkea® treatment began, “Effluent Out” has stabilized at a low level regardless of Incoming waste load (“BOD In”).
- Results have held constant for seven (7) years.

# Stabilize Citrus Process



- These data are from a juice processing plant in Florida.
- As at winery, prior to Arkea® treatment, effluent mimicked incoming waste load.
- But afterwards, effluent stabilized at low level, regardless of influent load.
- NOTE: Citrus oils are toxic to microbes. Overcoming this hurdle was difficult.



# Preventing Pollution from Sludge

Slaughterhouse

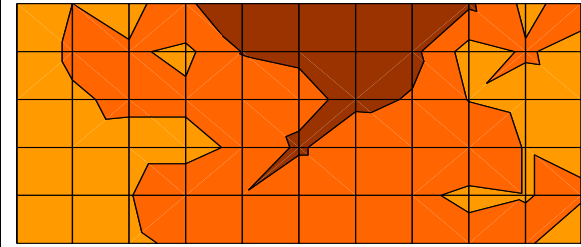
# Beef: BioDredging Accumulated Sludge

A municipality with a slaughterhouse killing 480 animals/hr on a 24/7 basis could not cost effectively manage their bio-solids using mechanical dredging. An Arkea® product was developed to directly consume their accumulated sludge.

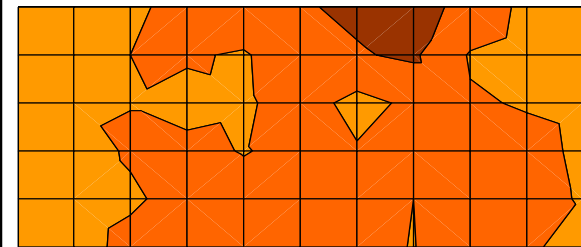
The two-dimensional topographic charts to the right show BioDredging effectively reducing sludge depth. The dark brown area is >100" in depth. Orange is 80 – 100". Gold is 60-80". Dark yellow is 40-60". Yellow is 20-40". Vanilla is <20".

This is a clear example of preventing pollution. Also, it was accomplished at a fraction of the cost of mechanical dredging.

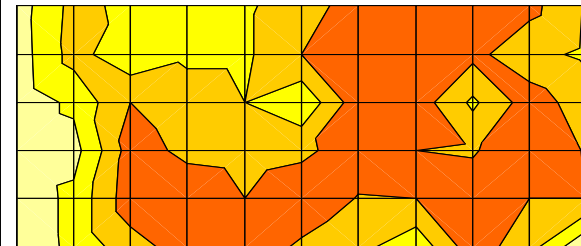
Feb 19



March 21



May 22



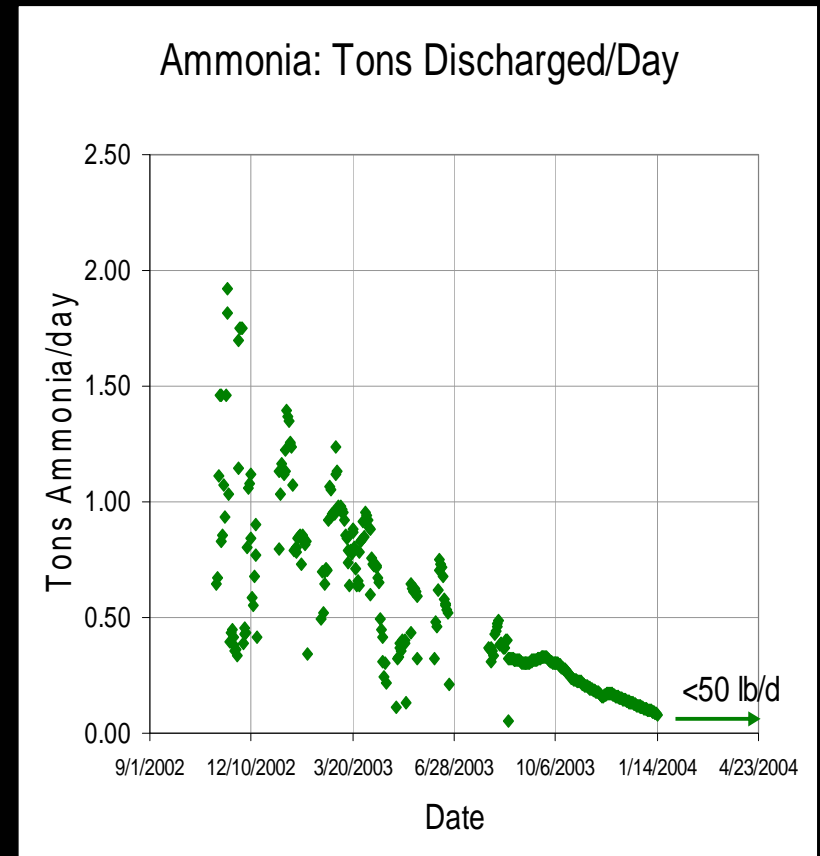


# **Prevent Nitrogen Pollution**

**Ammonia Nitrate Factory & Municipality**

# Explosives Manufacturer

- 150 million gallon lagoon with COD 8-15 mg/L.
- Discharged 2 Tons of ammonia per day prior to Arkea® treatment.
- Over a period of slightly over one year, ammonia discharge reached levels less than 50 lbs/day.
- Have maintained discharge of significantly less than 50 lbs/day for years.
- Nitrate pollution prevention followed same path.
- Firm went from “shut down” threat to winning state EPA award (“Black Diamond”) for effective wastewater processing.





A golden key is inserted into a white puzzle piece. The puzzle piece is set against a background of other puzzle pieces, some of which are partially visible. The surface has a textured, wavy pattern. The key is positioned vertically, with its head at the top and its shaft passing through the hole in the puzzle piece.

# In Summary

- ArchaeaSolutions, Inc. was able to prove its initial hypothesis that the presence of Archaea organisms could both accelerate metabolism of waste and also enhance breakdown of difficult molecules.
- Based on that work, the utility of our product Arkea® has been proven in municipal and industrial applications.



**Questions, Inquiries**

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