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From the Earth... for the Earth®

ENERGY INNOVATION:

Boosting Biogas Production with an Organic Biologic Booster

Kevin Mulvihill

CEO

Thomas Kavookjian

Material Technologist



Prodex™



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TECHNOLOGIES®**



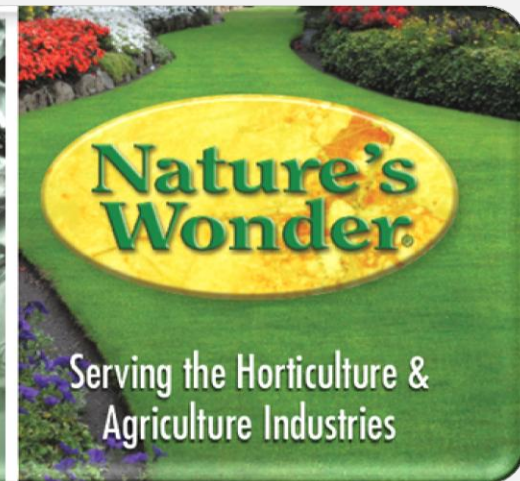
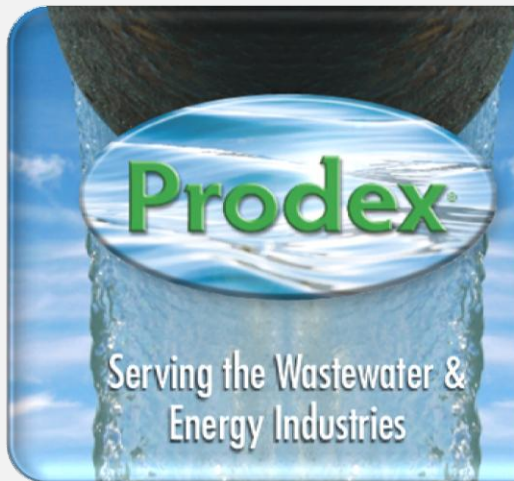
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About Us

- Revolutionary Patented Stabilization & Extraction Process Used to Produce Our Core Material
- Developed/Manufacture a Line of Biologic Boosters
- Improve Biological Efficiency in a Variety of Environments
- Our Family of Companies:



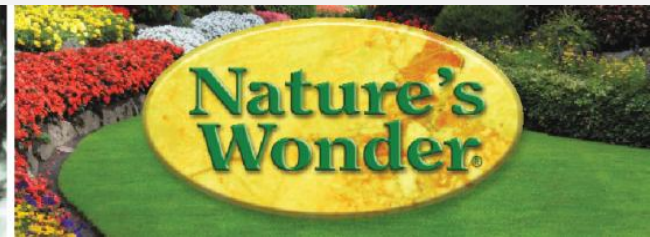
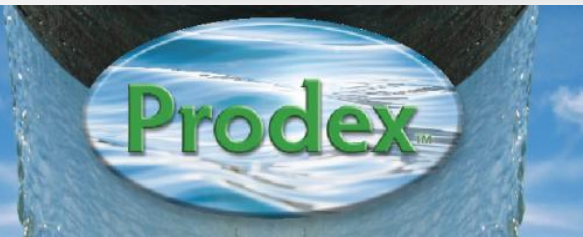


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- ***Increasing Renewable Energy Production***
 - In Wastewater Treatment, Agricultural, and Industrial Anaerobic Digesters
- ***Improving Plant Operational Efficiency***
 - In Activated Sludge and Non Activated Sludge Environments





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Prodex: Biological Activity Enhancer (BAE®)

BAE[®]

BIOLOGICAL ACTIVITY ENHANCER

Organic, Cost Reducing Solution for Wastewater Systems

- Biologic Booster
- Created Using a Revolutionary Extraction Technology
- Derived from Carefully Selected Peat Sources
- Increases Existing Microbial Populations 4-5 times
- Doubles Microbial Activity



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Boosting Biogas Production with BAE®

**BAE Provides a Comprehensive Economic Benefit
for the Wastewater and Biogas Industries**

BAE helps Operators
Take Full Advantage of
the Energy Source Right
at their Finger Tips

- Results have shown increases in Methane Gas Production from 28% to more than 100%

Enhances the Anaerobic
Digestion Process

- Increases Volatile Solids Destruction (VSD), Improving Sludge Quality & Dewatering



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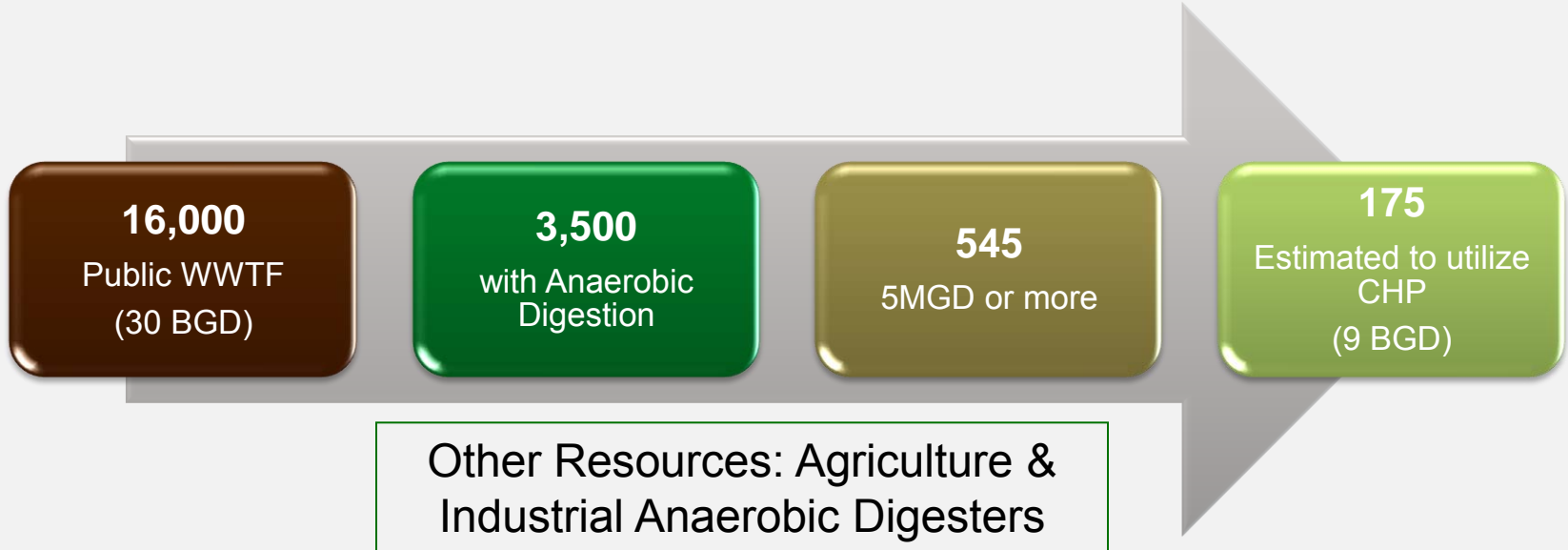


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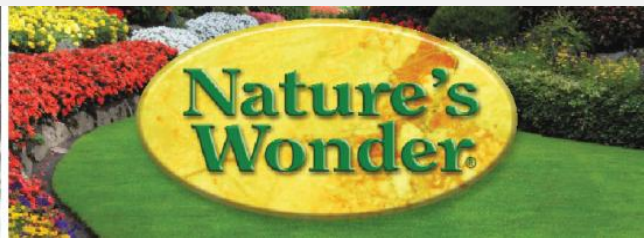
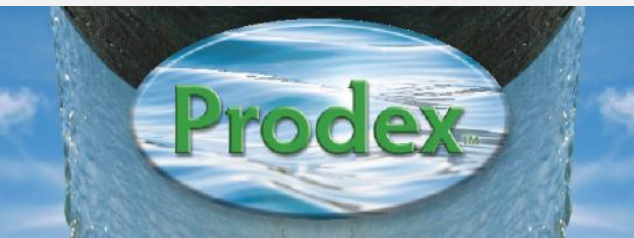


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WASTE TO ENERGY VS. ENERGY GOING TO WASTE



Information collected from US EPA, US DOE Energy Efficiency & Renewable Energy, Energy & Environmental Analysis Inc (EEA)





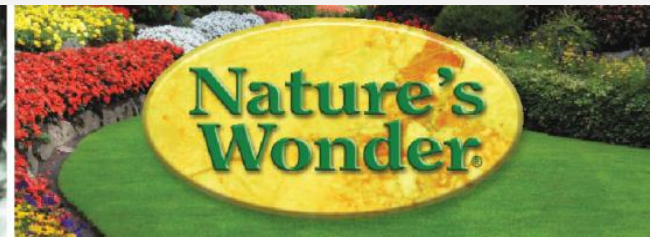
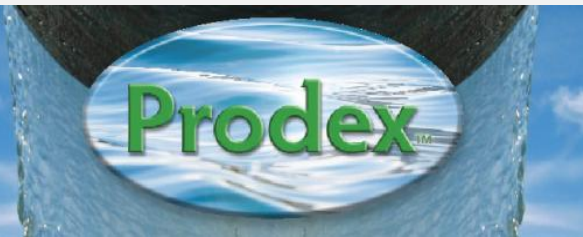
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US Energy Opportunity: Biogas

- If all 545 plants were to employ CHP systems, approximately **340 megawatts (MW)** of clean electricity could be generated, offsetting 2.3 metric tons of carbon dioxide emissions annually.
 - That is equivalent to planting approximately 640,000 acres of forest or the emissions of approximately 430,000 cars.*
- If the US tapped our entire supply of sewage, animal waste and landfill gas, we could replace about 6% of natural gas consumption.**

* EPA CHP Partnership, *Opportunities for and Benefits of CHP at Wastewater Treatment*

** Global Intelligence Alliance, *How to Profit from Biogas Market Development*





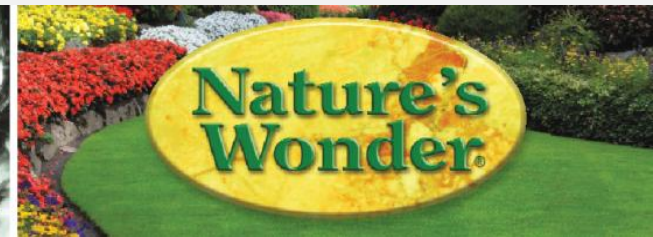
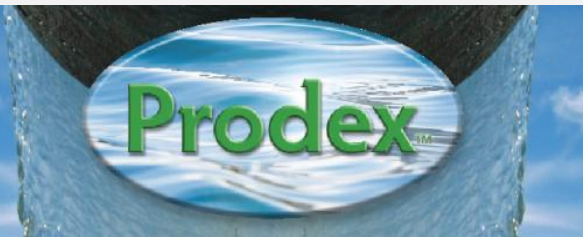
Biogas Project Profile: Landis SA, Vineland, NJ (6MGD)

- Increased Methane Gas Production by 28%
- Increased Energy Efficiency From 85% to 100%
- Reduced Loan Payback Period by 5.4 months
- Yearly Savings

KWH 221,664	\$29,924
Fuel 8,700 gal.	\$21,315
Loan Reduction	<u>\$27,500</u>
Total	\$78,739



2010 US EPA Energy Star Award Recipient
BAE was Instrumental in Landis Being Recognized
for Achieving Outstanding Energy Efficiency





Biogas Project Profile: East Coast WWTP (55MGD)

- Case Study in Development
- 53% increase in Methane Gas Production
- Prior to Evaluation, 2 electric generators in use.
 - A 3rd generator began operating *regularly* during the evaluation.
- Significant annual savings on energy costs.
- Improved sludge quality led to a major reduction in polymer usage, resulting in additional significant cost savings.

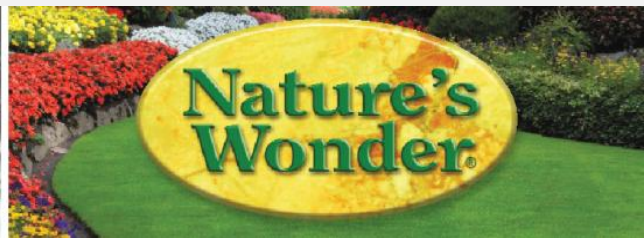
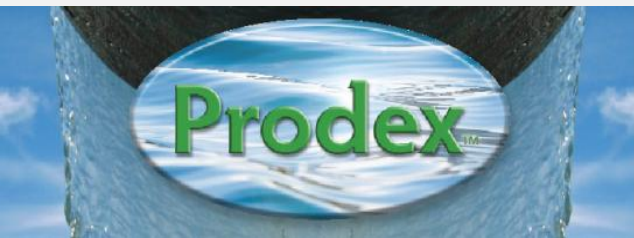
Projected Savings:

Electricity	\$1,138,775
Natural Gas	\$ 282,584
Polymer	\$342,680
Total Projected Savings	\$1,764,039

Results Summary:

	Before	After
Lbs. of Volatile Solids Fed/day (per Digester)	28,388	20,445
Cubic Feet of Gas per Lb of VSD (per Digester)	14.37	21.85

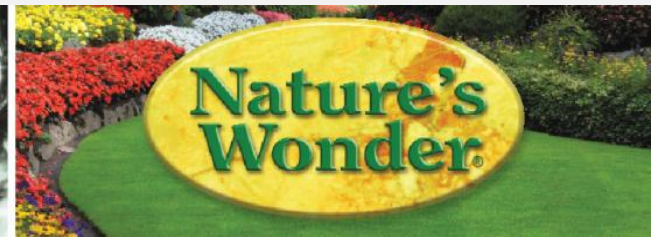
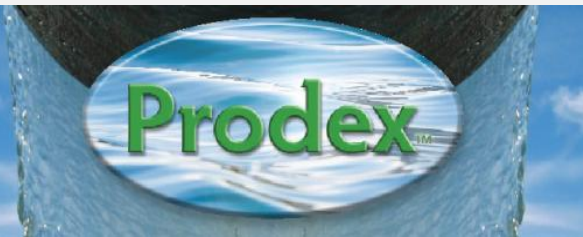
Note: There was more digester gas produced per pound of Volatile Solids Destroyed with less solids fed





Biogas Project Profile: Hayward WPCF, CA (12MGD)

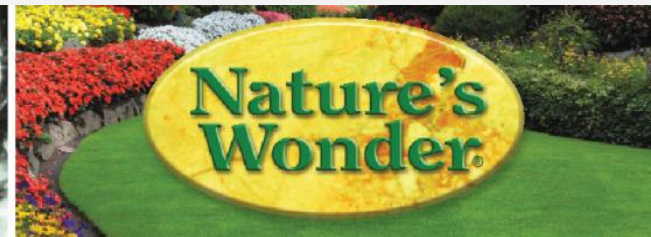
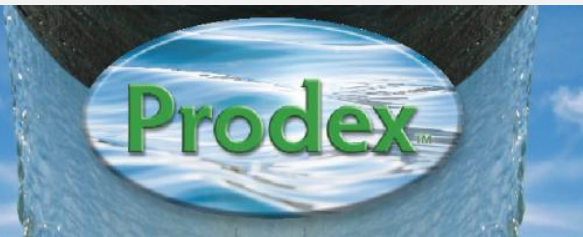
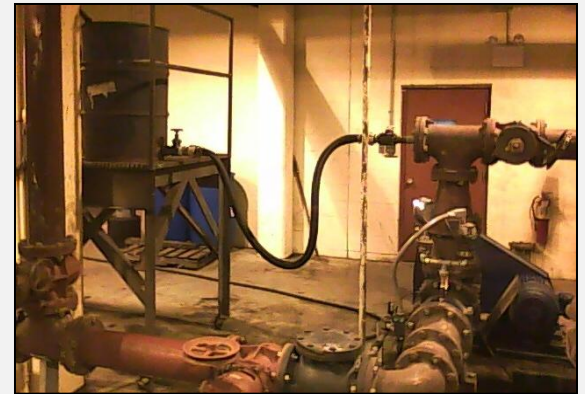
- Case Study in Development, Monetizing Results and Collateral Benefits
- Cogeneration Operating Hours have Doubled
- Increase in Gas Production with BAE is Apparent
- Reduction in Polymer Usage





Biogas Project Profile: Ocean County UA, *Bayville, NJ* (24 MGD)

- **Project Goals**
 - Increase methane production in one of three digesters
 - Treated digester #3 with 4 gallons per day of BAE
 - Added material at the suction side of the digester pump
- **Results**
 - Increased monthly production by 130,180 ft³ of gas in five months
 - Value of Increased KWH \$77,982





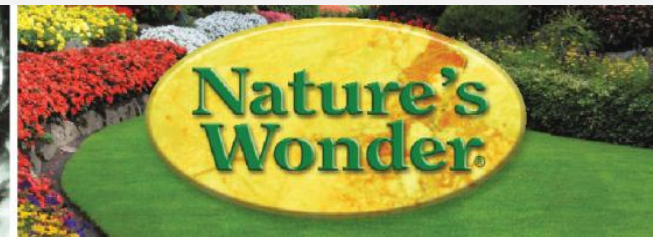
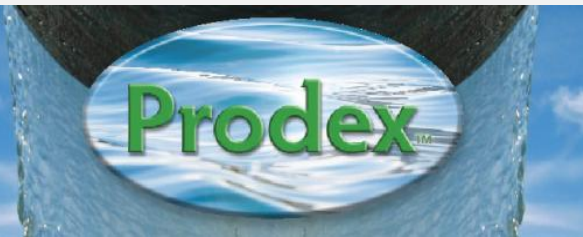
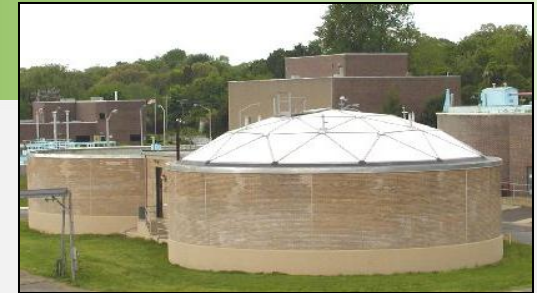
Biogas Project Profile: Cumberland Co. UA, *Bridgeton, NJ* (3 MGD)

- **Challenges**

- Unable to meet Class-A Biosolids requirement of 38% VSD
- Second phase dominated by acid forming bacteria limiting methane production and causing major odor
- High secondary clarifier blankets and surface scum problems

- **Results**

- Met the demands of all challenges
- EPA National 1st Place Award "Beneficial Reuse of Biosolids"



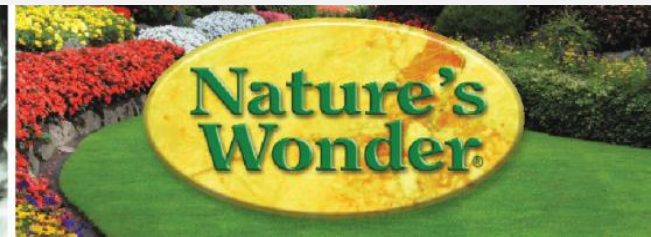
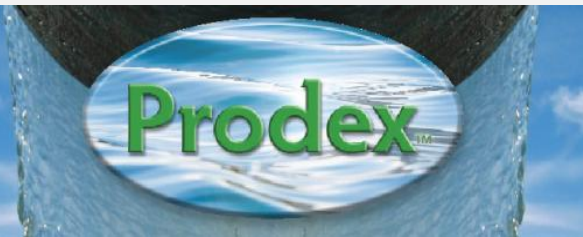


Biogas Project Profile:

Linden Roselle SA, *Linden, NJ* (10 MGD)

- Used BAE to measure gas production potential.
- Data used to maximize CHP system design and equipment selection.
- Results:

	Before	30 Days	60 Days
Methane:	109,000 ft ³	160,000 ft ³	178,000 ft ³
% Increase:	-	46%	63%





Biogas Project Profile: Evaluation Highlights

- In Progress:
 - Back River WWTF, Baltimore, MD
 - Stevens Point, WI
 - Ironwood, MI
- Upcoming:
 - Miami, FL
 - Derry Twp (Hershey), PA
 - Franklin Twp, PA
 - Rahway, NJ
 - Minneapolis, MN
 - Boston, MA
 - California: 5-7 WWTPs



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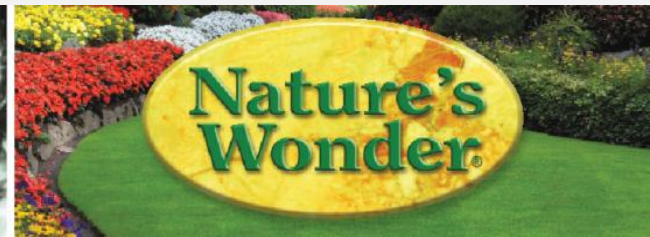
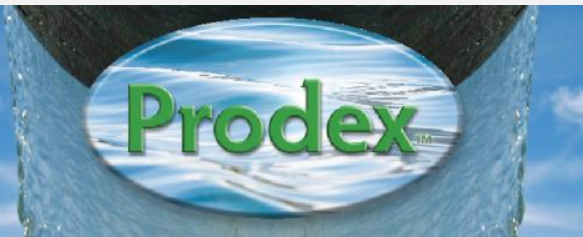
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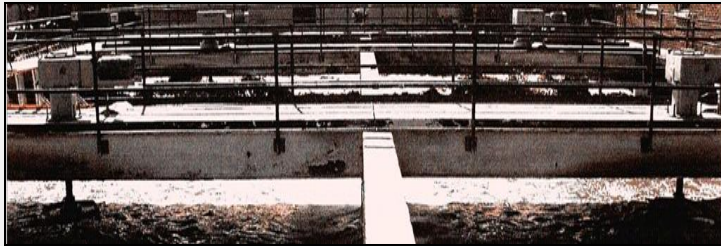
BAE®: Operational Efficiency Application

- Decreases Effluent TSS and BOD levels
- Improves Sludge Settling
- Reduces Sludge Hauling Costs
- Maintains Nitrification at low dissolved oxygen levels
- Improves Energy Efficiency
- Reduces Operational Costs





Op. Eff. Project Profile: Cinnaminson SA, NJ (1.3 MGD)

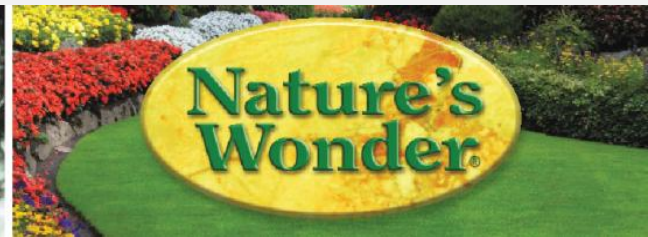
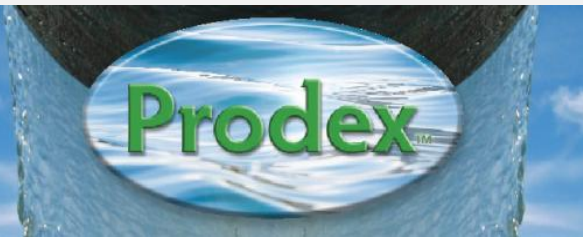
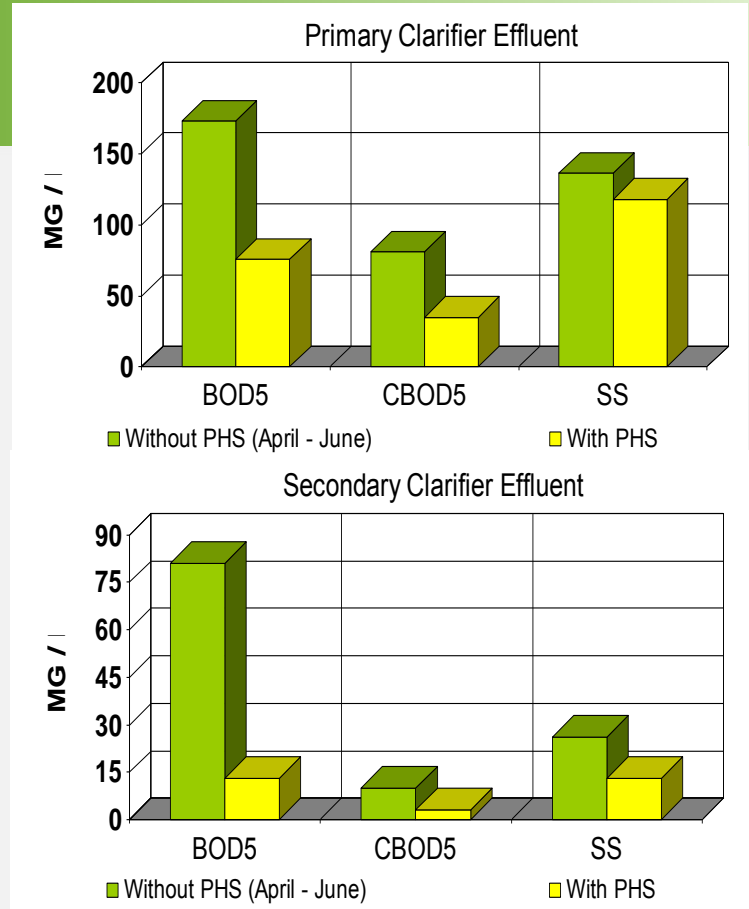


Secondary Clarifier Reduction: BOD 83%, CBOD 70%, SS 50%

Yearly Operational Savings

Caustic Soda	\$8,200
Clarifier Polymer	\$21,316
Aeration Tank	\$31,677
Sludge Disposal	<u>\$39,000</u>
Total Yearly Savings	\$100,193

SS reduction equaled 125 lbs per day totaling 45,625 lbs per year

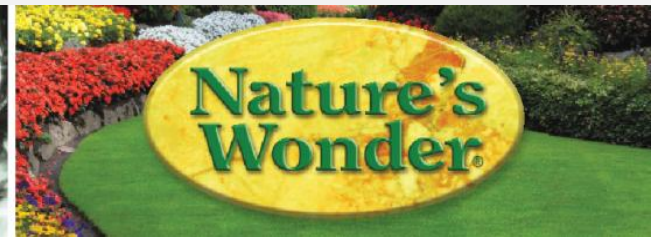
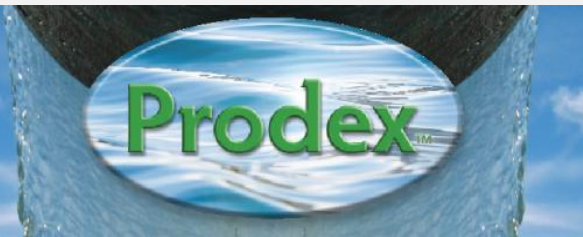




Op. Eff. Project Profile: Gloucester Co UA, *West Deptford, NJ* (1.3 MGD)

- Plant experienced an excessive biological disruption from surfactants being discharged into the collection system.
- This dramatically affected the biology in the plant, placing the plant in violation for loading rates exceeding their permit limit.
- Would have incurred significant fines should this have occurred for another 30 days.
- Results:
 - At the beginning of the fourth sludge cycle:
 - Older forms of microbial populations began to appear indicating an abundant lower life form population
 - At the conclusion of the thirty day period:
 - Laboratory examination determined that higher life forms had established a healthy and abundant population.

(Sludge retention time was approximately three days)





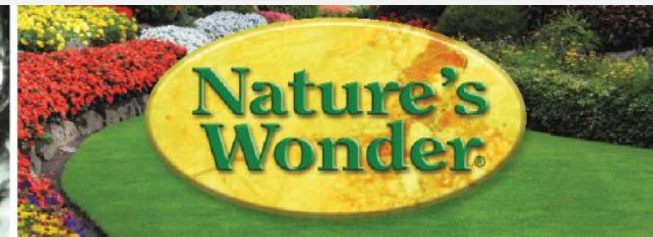
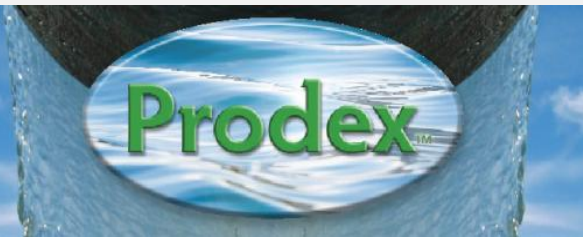
Op. Eff. Project Profile: Lambertville MUA, NJ (1 MGD)

- **Challenges**

- Failing contactors causing high solids & ammonia effluent issues
- Ongoing odor complications
- Plant upgrade 12 months away DEP mandates dictated immediate restitution to effluent challenges

- **Results**

- Ammonia reductions as high as 29% and solids reductions by 19%
- Odors dissipated measurably
- Subjugated diesel fuel discharge





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Conclusion

- BAE meets the growing demands authorities face with increasing populations and aging infrastructures
- BAE is a low cost wastewater treatment option that eliminates or defers necessary capital investments needed for expansion
- Most importantly BAE provides an organic solution to wastewater treatment challenges and will ultimately provide a safe and sustainable environment for future generations



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Thank You

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