

Case Study: FibrePlate's energy advantage is significant allowing plants to fund upgrades with energy savings



Delphos, Ohio

- 3.8 million gallons per day (“**MGD**”) average day flow and 7.66 MGD peak flow membrane bioreactor plant retrofit
- Existing Supplier: Kubota Membrane USA Corporation
 - Plant has issues with fouling and failed membranes and processing capacity has fallen to 1 million gallons per day
- Selected for Membrane Replacement: 2015
 - The administration looked at ~15 different options
 - Competition: GE Water & Process Technologies, Kubota Membrane USA Corporation, Koch Membrane Systems, Microdyn Nadir GmbH, newterra, Econity Co, Ltd

Source: “Council Oks WWTP pilot program”, Nancy Spencer, DHI Media (March 3, 2015);
“Delphos Mayor Gallmeier looking for a better year in 2015”, Nancy Spencer, DHI Media (December 27, 2014)

Comparison: Original Vs Replacement



Item	Existing Membrane System	Replacement Membrane System
Membrane Trains	5	3
Membrane Cassettes	130	12
Membrane Units	52,000	16,128
Actual Monthly Avg. Power Usage (kWh)	531,600*	237,400**

*Based on 2015 power usage at 0.8 -1.0 MGD

**Based on February – April 2016 at 1.2 MGD

From Ohio AEP Presentation
Re: Delphos WWTP

Savings Summary

Savings Summary Table			
Avg. Flow, Gallons/hr	36,186.88	Avg. Flow, Gallons/hr	36,186.88
Pre Power, kW	531.81	Post Power, kW	61.83
Ops Hours, hr/yr	8,760.00	Ops Hours, hr/yr	8,760.00
Pre Energy, kWh	4,658,640.61	Post Energy, kWh	541,629.02
Savings, kWh/yr		4,117,011.59	
Savings, %		88%	
Electricity Cost, \$/kWh		0.06	
Savings, \$/yr		263,488.74	
Total Incentives, \$		97,285.72	
Project Cost, \$		2,447,623.00	
Net Cost, \$		2,350,337.28	
Simple Payback, yr		8.92	

New vs Old Plant Equipment

*From Ohio AEP Presentation
Re: Delphos WWTP*

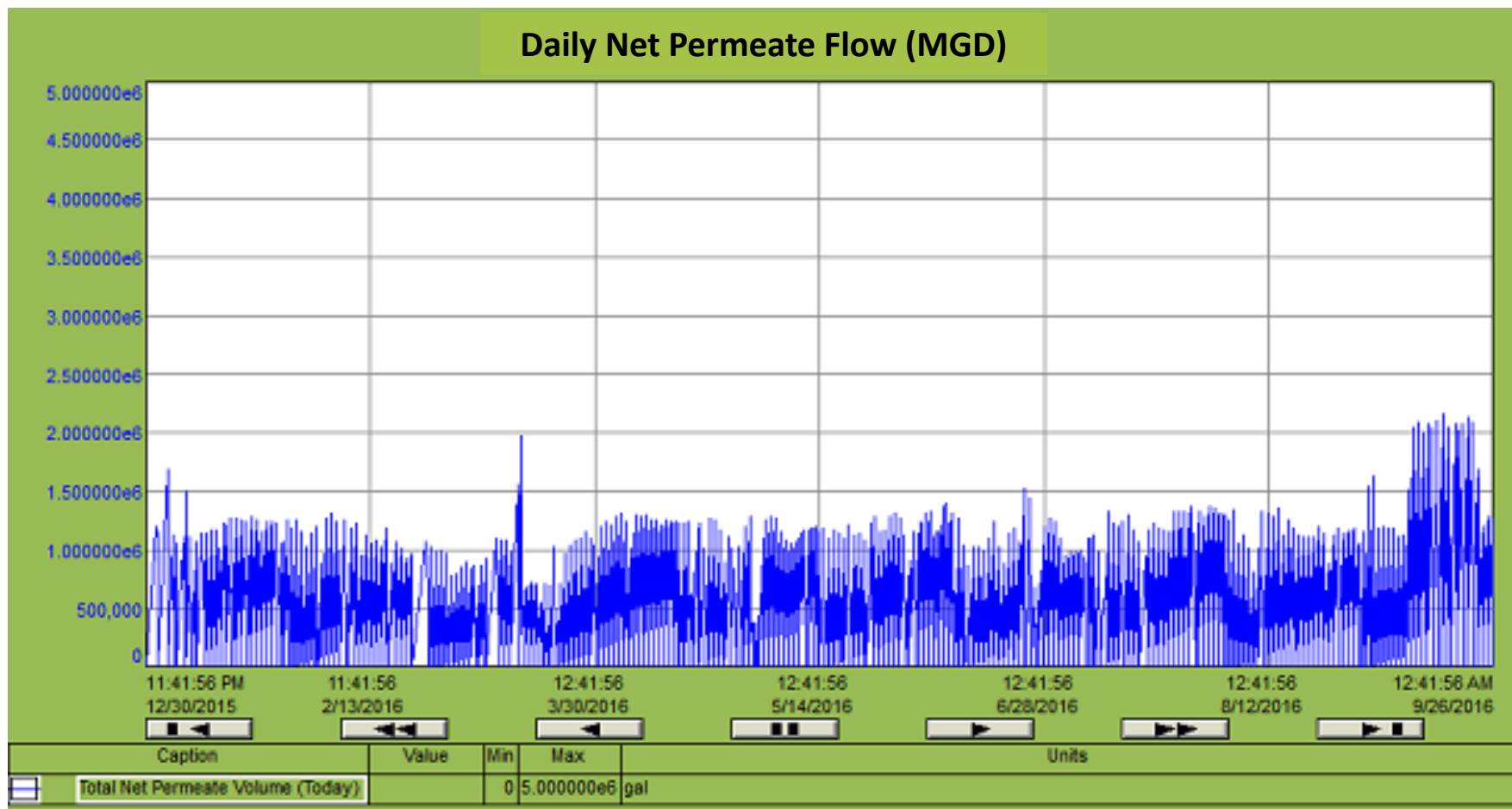
New Equipment

- * 3 anoxic tank mixer – 4 hp each
- * 3 pre aeration tank mixer – 4 hp each
- * 2 pre aeration blower – 40 hp
- * 3 aeration blower - 125 hp
- * 3 permeate pump – 60 hp each
- * 2 return activated pump – 25 hp each (one backup)
- * Total of 709 hp

Old Equipment

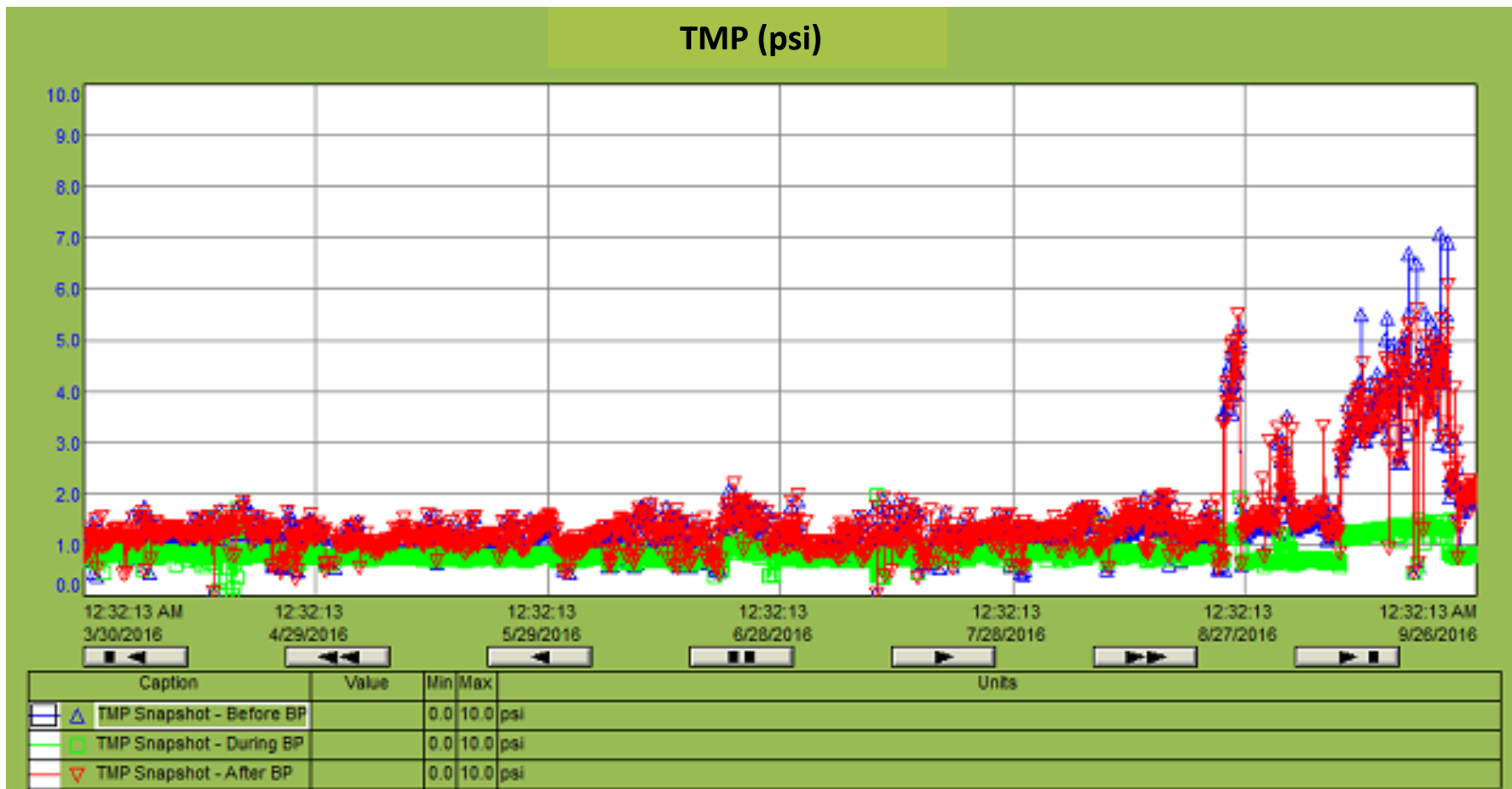
- * 5 anoxic tank mixer – 4 hp each
- * 5 anoxic tank pump – 25 hp each
- * 5 pre-aeration mixer – 4 hp each
- * 3 pre-aeration blower – (1) 40 hp and (2) 125 hp
- * 6 K turbo blower – 225 hp each
- * 10 permeate pump – 25 hp each
- * Total of 2055 hp

Delphos, Ohio



9 month Flow Data

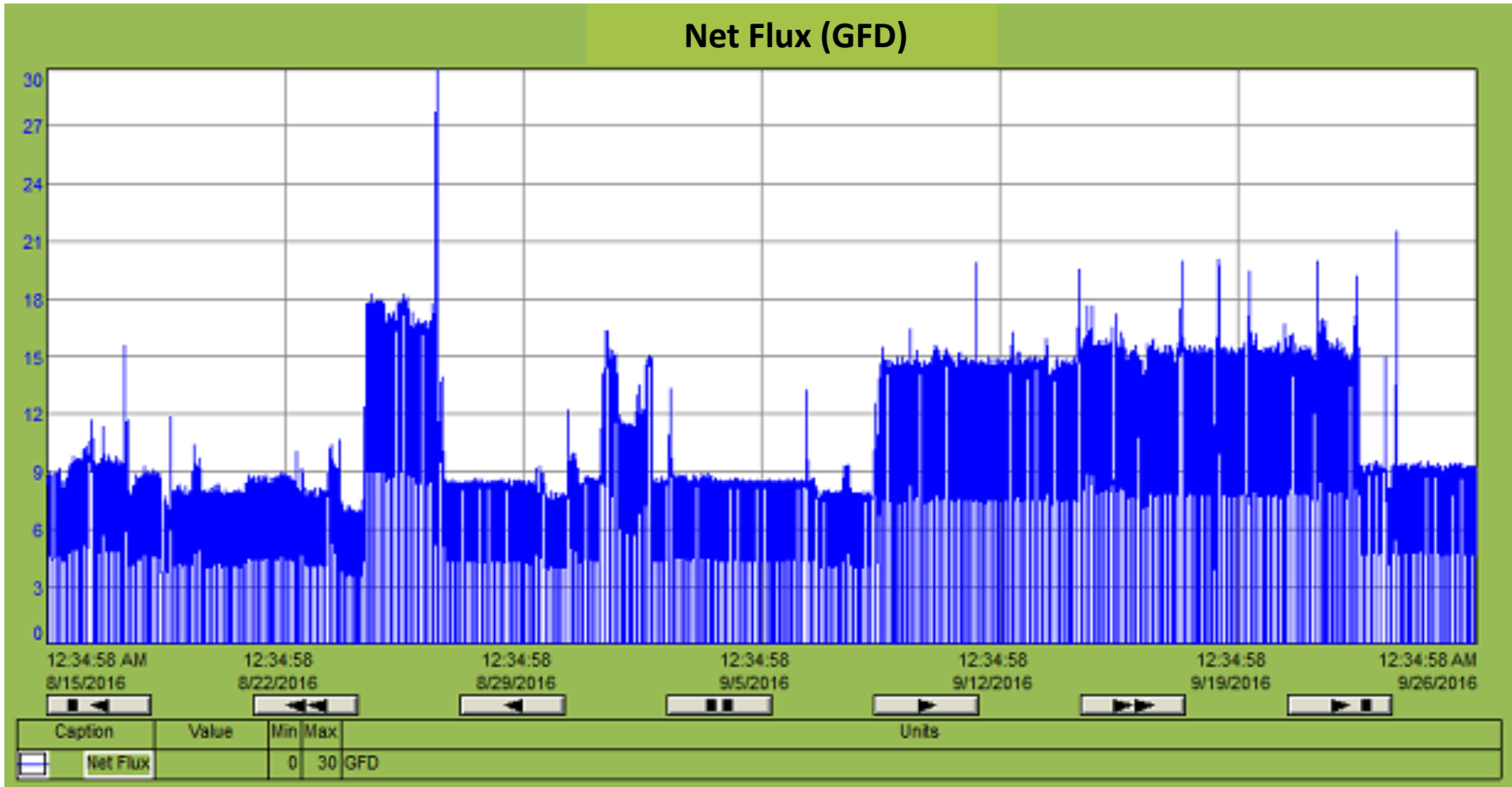
Delphos, Ohio



6 Month TMP Data

Delphos, Ohio

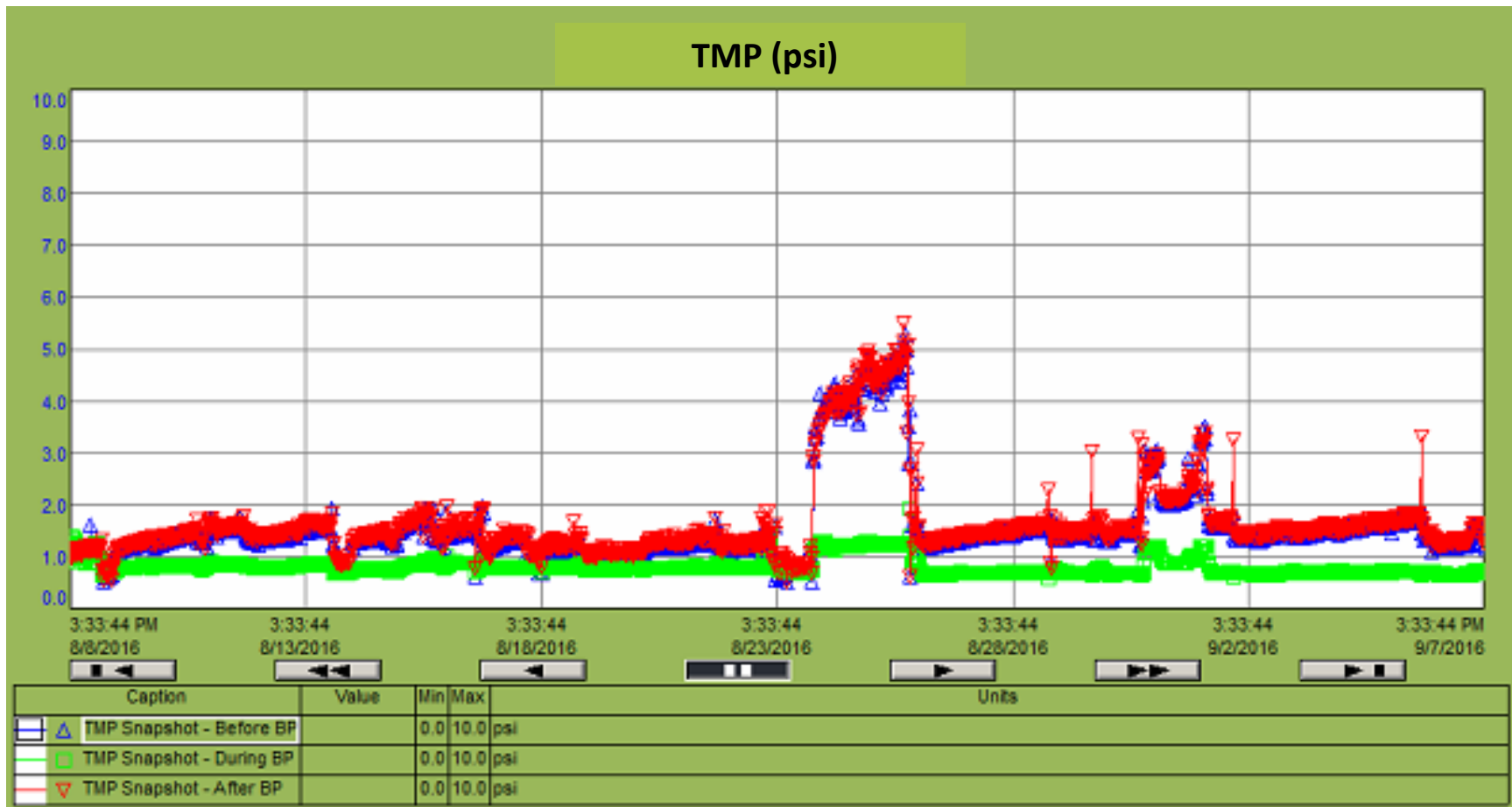
2 Day and 14 day Peak Test



Net flux of the 2 day peak test - 16-18 GFD, 14 day peak - 15.26 GFD

Delphos, Ohio

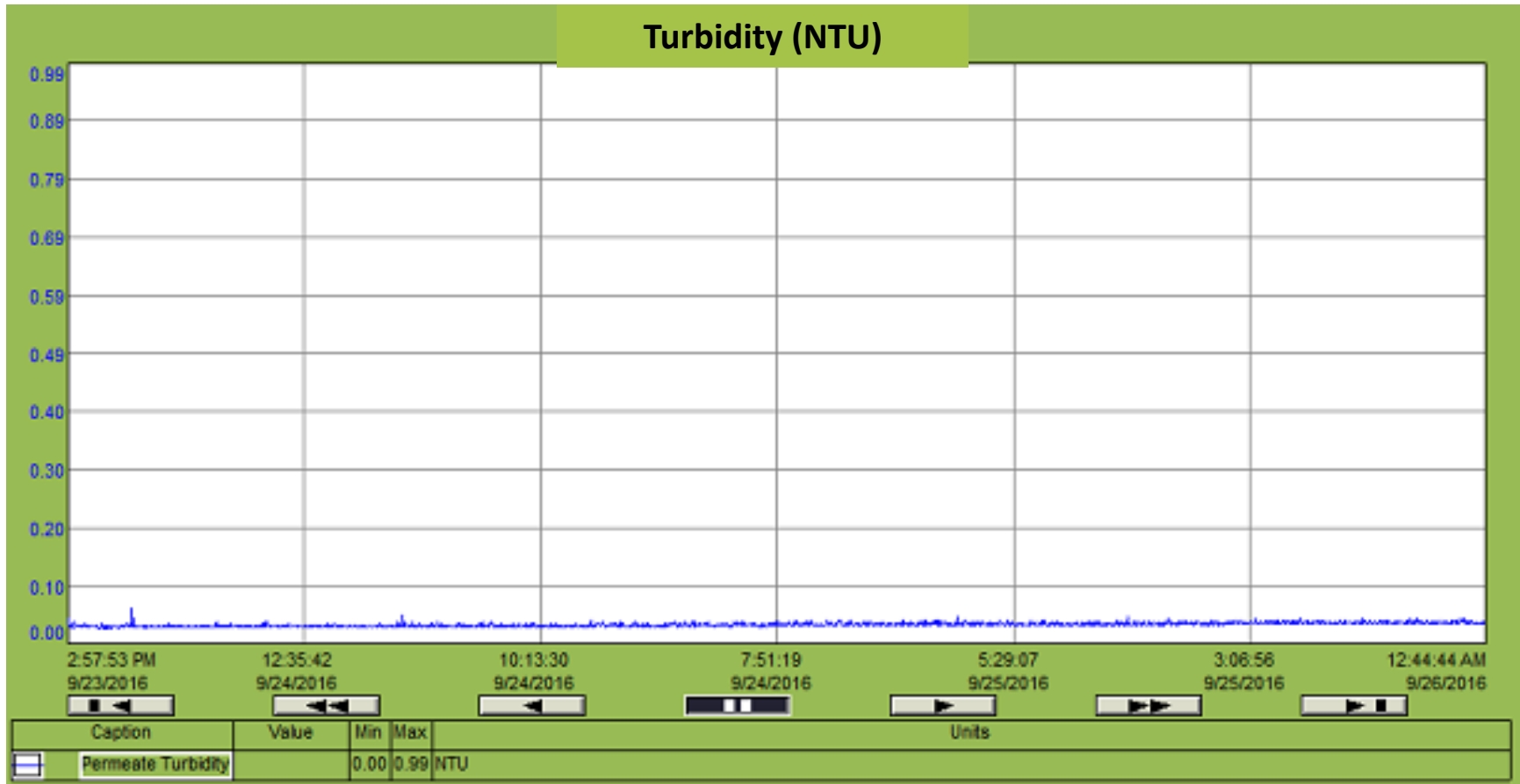
48 Hour Peak Test



TMP of the 2 day peak test at 16.7 GFD – TMP returns to pre peak level immediately

Delphos, Ohio

Delphos Performance - Turbidity



4 day turbidity data September 23th to 26th, in Operation for 9 months

Fowler WWTP

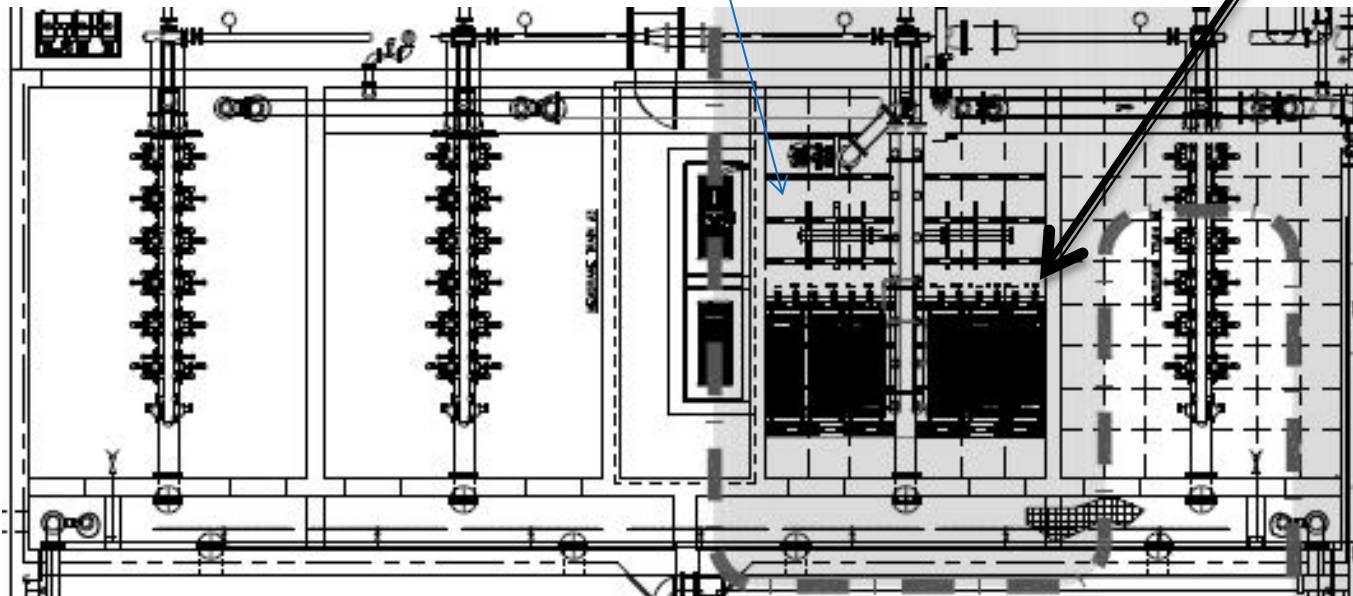


Forsyth County, Georgia

- 2 million gallons per day (“**MGD**”) average day flow and 4.5 MGD peak flow membrane bioreactor plant retrofit
- Existing Technology: Hollow Fiber
 - Plant had issues with fouling and processing capacity
- Selected for Membrane Replacement: 2016
 - AECOM looked at GE Water & Process Technologies, Koch Membrane Systems, Microdyn Nadir GmbH, Evoqua
- Currently being commissioned
- 6 FPC400-S Cassettes in existing GE tank
- 1.25 MMF

Applications: Retrofitting a Hollow Fiber MBR

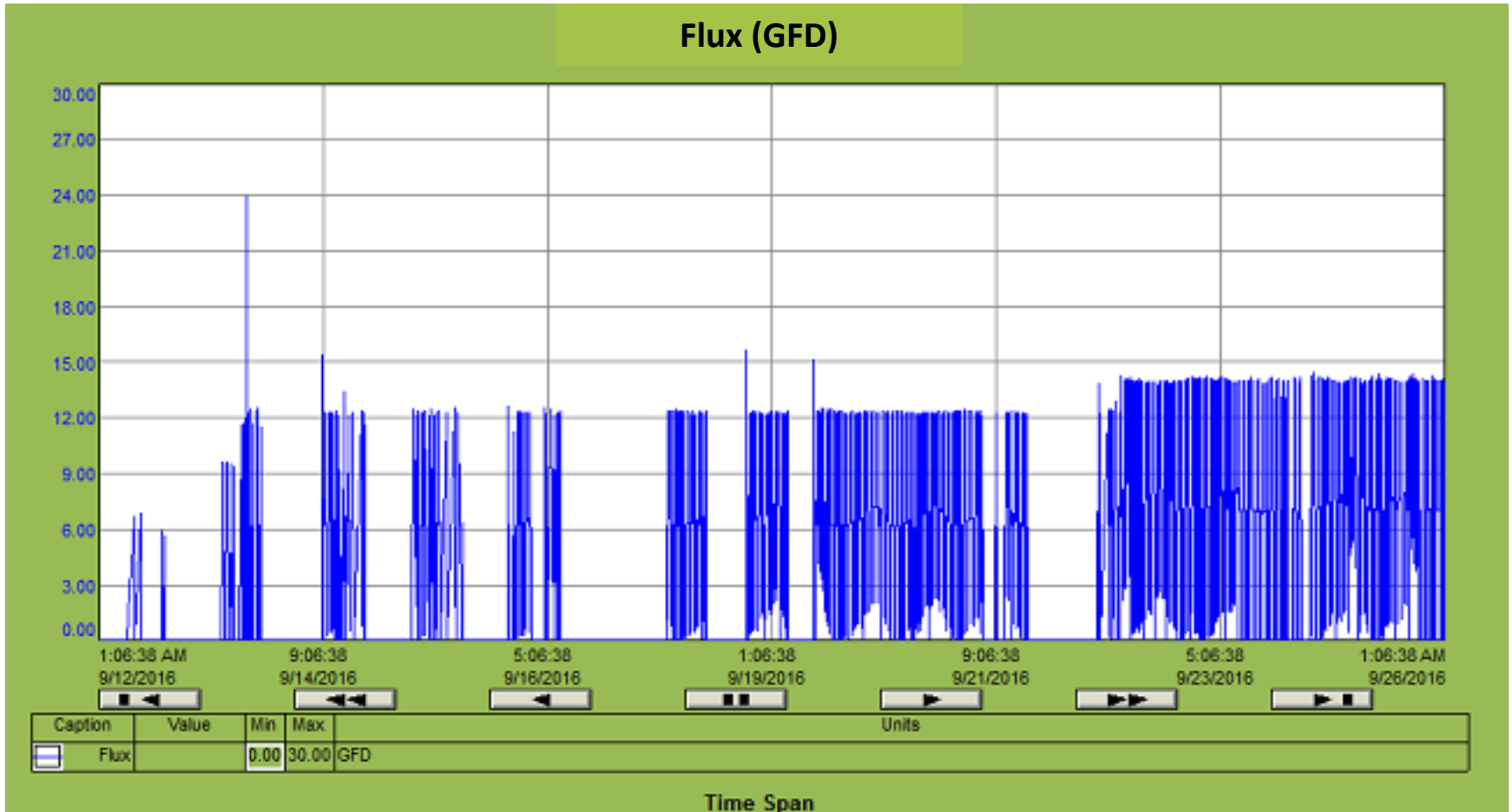
Residual space in train 2 membrane tank is retrofitted with fine bubble diffusers for more efficient biological treatment



- 1 – ½ tank with FibrePlate™ replaces 2 hollow fiber tanks with same capacity
- 1 full tank with FibrePlate™ will treat the plant capacity

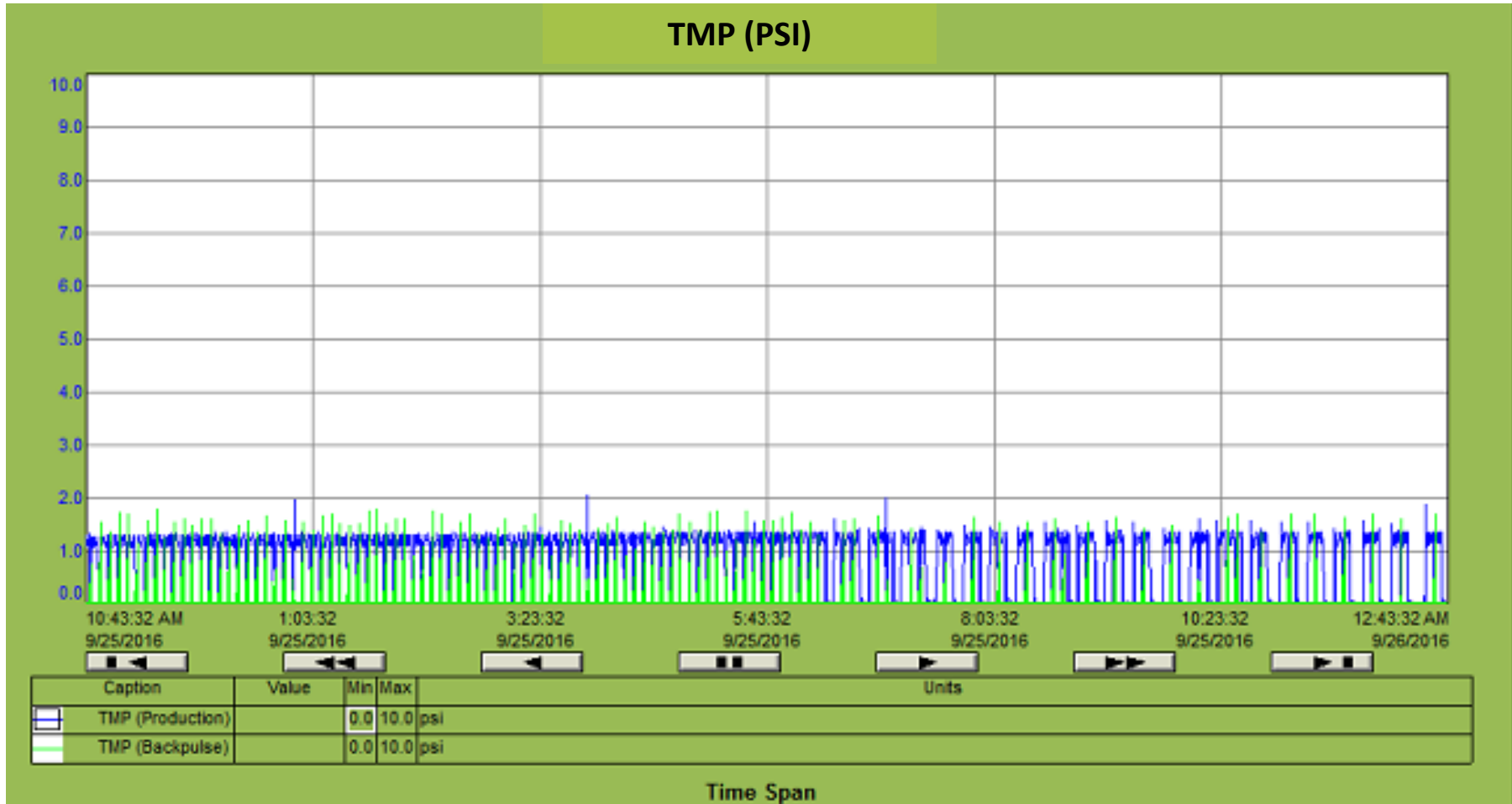
Forsyth County, GA

Fowler WWTP



2 week flux data

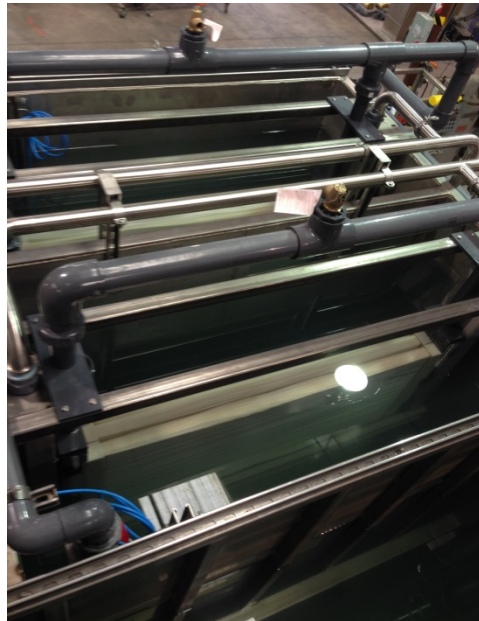
Fowler WWTP



2 week TMP data

Munz Meddenhall

- Wastewater treatment system built by Cloacina LLC for a detention centre near Los Angeles, California
- Commissioned August 2016



Videos

- **Auto Insitu Desludging**
- **Even Aeration Distribution**

4. Wrap Up and Q&A

Key Takeaways

1. Original advantages
 - footprint savings,
 - energy savings,
 - fluxes and
 - auto in situ desludging advantagesare validated in operating plants
2. Simplest system with no moving parts except one valve/once per week
3. Operating Performance is exceeding expectations
4. Continuous improvements are continuing to raise the industry bar on reliability

Please visit our WEFTEC booth # 3245



THANK YOU!

OPEN Q&A