



AQUA-AEROBIC SYSTEMS, INC.  
A Metawater Company

# OptiFiber® Pile Cloth Media Filtration

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Aqua-Aerobic Systems, Inc.

# Presentation Overview

- Phosphorus Removal
- Cloth Media Filtration
- Pile Cloth Media Design
- Case Studies
- Summary

# Cloth Media Filter Overview

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# Experience

- 3,000+ Cloth Media Filters Worldwide
- New Plants and Retrofits



**San Antonio, TX**  
**312.0 MGD**



**Qingdao, China**  
**192.0 MGD**



**Bowling Green, OH**  
**36.0 MGD**

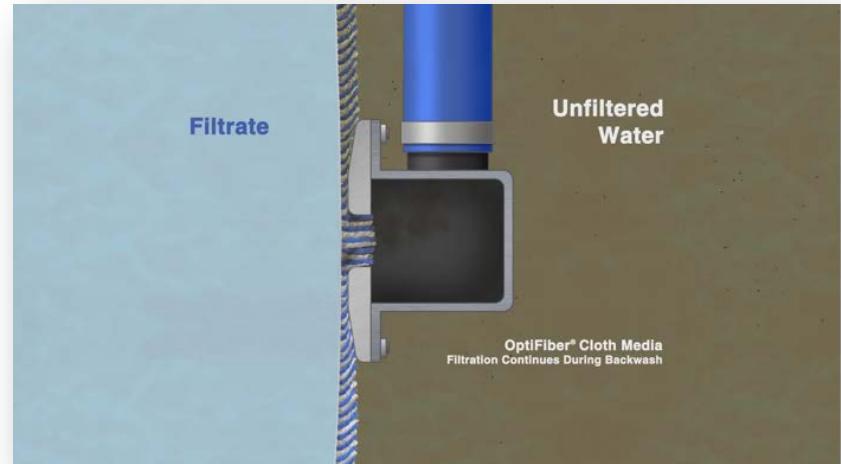


**Conway, SC**  
**9.0 MGD**

# Filter Design



Media

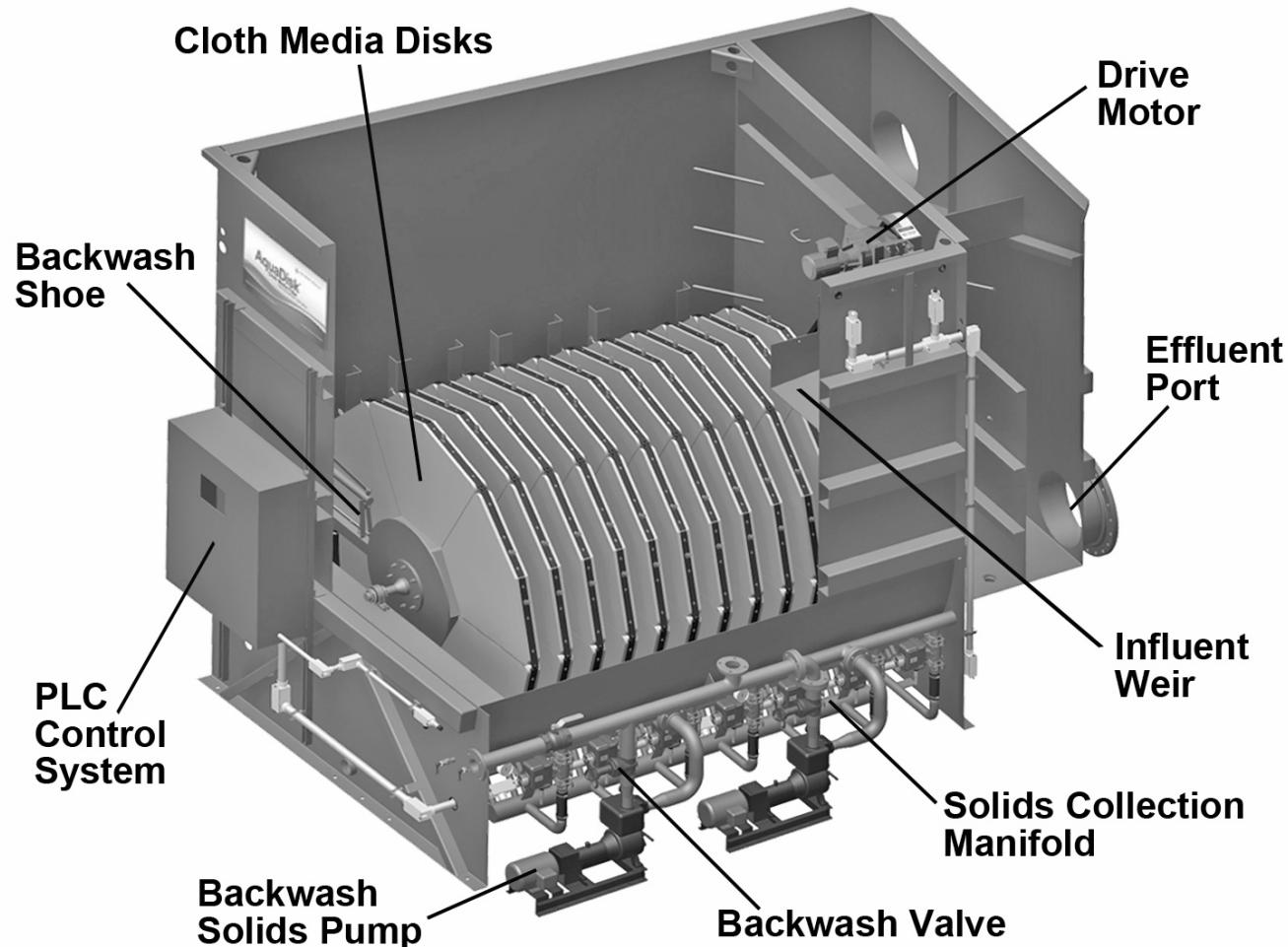


Backwash



Flow Path

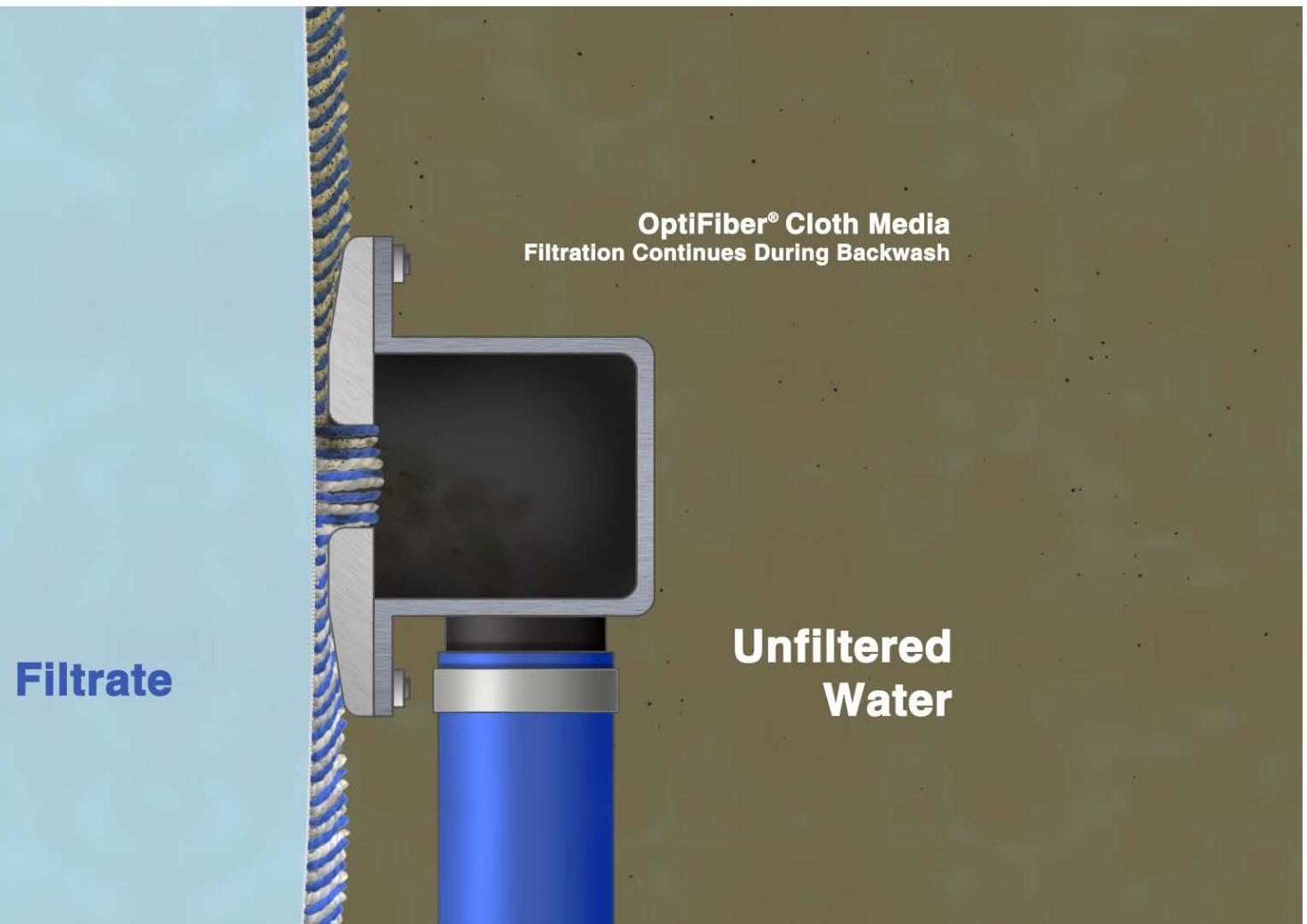
# AquaDisk® Cloth Media Filter



# Filter Operation



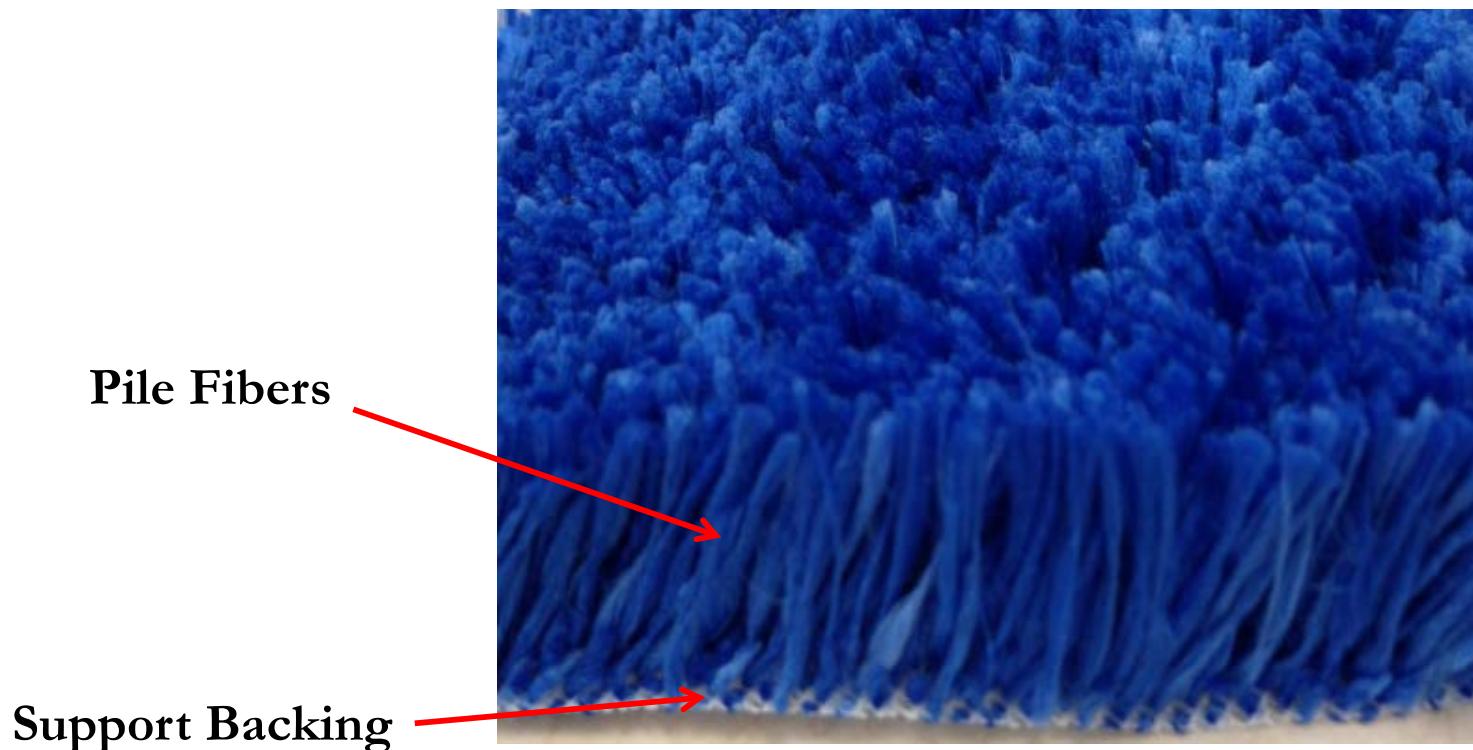
# Cloth Media Filter Backwash



# Backwash



# Pile Cloth Media Design



# Pile Cloth Media

## Media Options



OptiFiber PES-13®

OptiFiber PA2-13®



# Pile Cloth Media

## Media Options



**OptiFiber PES-14®**



**OptiFiber UFS-9™**

# Pile Cloth Media

## Media Options



OptiFiber PF-14®

# Research Facility



# QA/QC

## Endurance Testing

- 500,000 backwashes
- Cloth durability, mechanical resistance, shoe-plate wear
- Drive, chain & sprocket, seal, pump



UltraFiber Endurance Testing

# Technology Timeline

## Cloth Media Filtration

### OptiFiber® Cloth Filtration Media

RESEARCH AND DEVELOPMENT

AQUA-AEROBIC SYSTEMS, INC.  
A Membrane Company

The display board features three columns of cloth media samples. The first column contains OptiFiber NF-402, OptiFiber NF-405, OptiFiber PA-10P, OptiFiber PA-10C, OptiFiber PES-10P, OptiFiber PES-10C, OptiFiber PES-10M, and OptiFiber PES-10S. The second column contains MICROSCREEN, MMK-O, MMK-O-213, MMK-313, PA-1, EX-80-III, MMK-PES, PA-13-CU, SR-42-01, PA2-13-1, PA2-13-S, PA2-13-NB, PA2-13-M, PES-3, PES-HC-0, PES-HC-3, PES-HB-51, PES-HB-MS, PES-010, PES-011, PES-13-A14, and EX-43-2B. The third column contains PES-15B, PES-13-2, PES-13-NBM1, PES-13-NBM2, PES-13-NB52, PES-13B-2P, PES-13A-2P, PES-13A-3P, PES-13A-4P, PES-14A-3P, PES-13A-5P, PES-14A-5P, PES-14B-9P, UF-SD, UF-SD9, UF-SD-9B, UF-SD-8, Under Development, Under Development, Under Development, Under Development, Under Development, and Under Development.

**OptiFiber® Engineered Cloth Filtration Media**

Asia-Aerobic Systems has been dedicated to the continued advancement of cloth media since its introduction in 1900. Our extensive knowledge of cloth media allows us to introduce new construction, testing and application advancements to maintain our leadership in cloth media technology. We have developed over 70 different media types over the last three decades, but only a select few are labeled as "OptiFiber". These approved needs are successfully applied in a variety of applications ranging from tertiary filtration and wastewater treatment.

**The Cloth Story**  
The Past, Present and Future

The first use of non-woven media took place back in 1900 with a wire gauze straining apparatus. By 1950, it was no longer known as cloth media, but rather "media" or "medium" without further innovation. In 1991, Aqua-Aerobic Systems revolutionized the industry by introducing the first media design using PES cloth media. This was followed by the introduction of OptiFiber® cloth media in 1995.

**Timeline:**

- 1900: Woven Cloth (1900)
- 1950: Woven or Perforated Cloth Screen (1950)
- 1990: Scaling of PES Cloth Media (1991)
- 2000: OptiFiber® Cloth Media (1995)
- Today: OptiFiber® Cloth Media

**OptiFiber® Media Development**  
An Eight Step Process

**OptiFiber® Research & Technology Center**

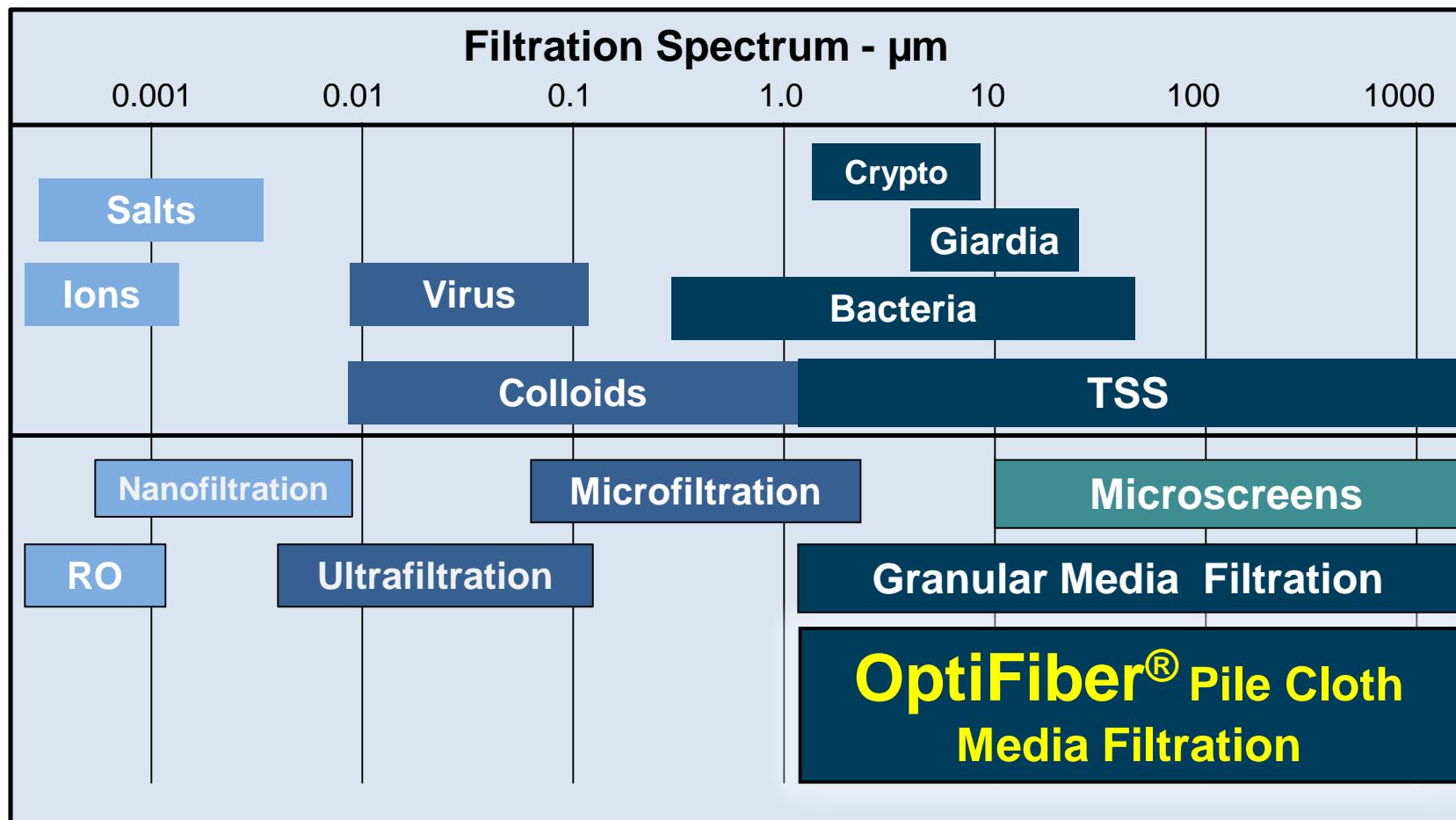
In 2011, Aqua-Aerobic Systems in partnership with the Rock River Water Reclamation District, completed the construction of the OptiFiber® Research & Technology Center at the District's current treatment plant. The facility was constructed for the purpose of conducting laboratory-scale research and development of cloth media products. The center also serves as a resource for future communication and application, both domestic and international.

**OptiFiber® Media Advantages**

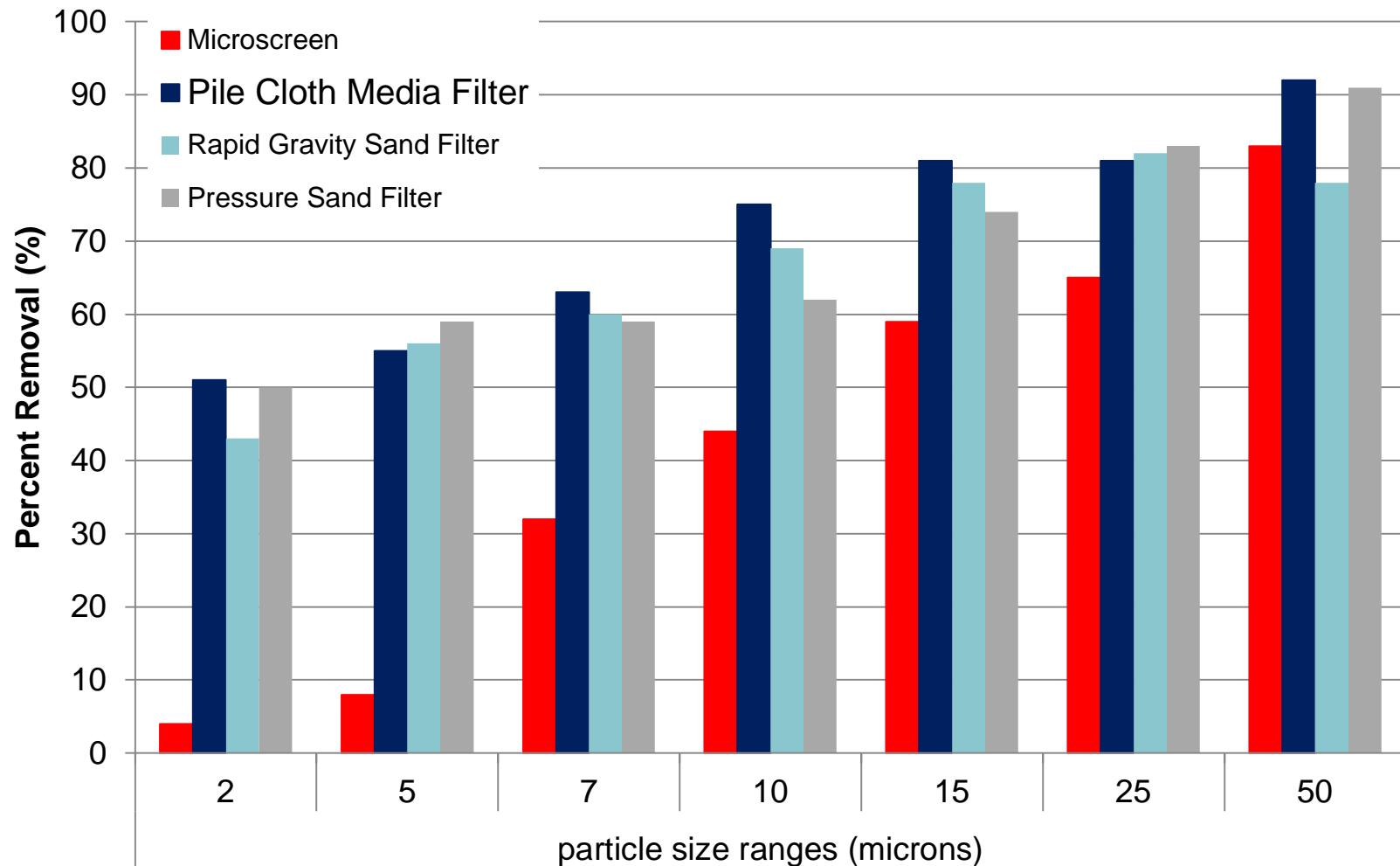
- Wet strength and mechanical integrity
- Stronger pleats offer efficiency versus white air lay backwash
- Engineered tracking minimizes potential for bridging
- Low backwash volume results in water savings and energy reduction

# OptiFiber® Pile Cloth Media

Where Does Cloth Media Fit?



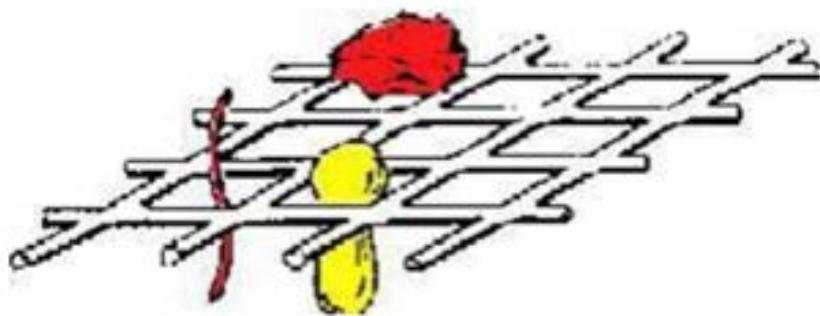
# Performance Comparison



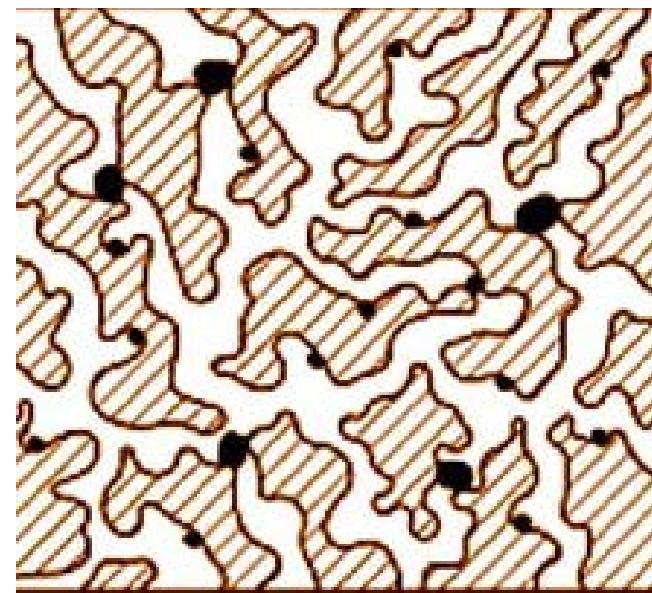
Pedro, S.A., Mifsut, C.L., Iglesias, M.F., Sánchez, J., Sánchez, P.P., Pérez, A.R. (2011) ESTUDIO DEL PORCENTAJE DE ELIMINACIÓN DE PARTÍCULAS POR PARTE DE DIFERENTES SISTEMAS DE FILTRACIÓN, EN EL TRATAMIENTO TERCIARIO DE LAS AGUAS RESIDUALES URBANAS

# Filtration Particle Removal Mechanisms

Surface Mechanism



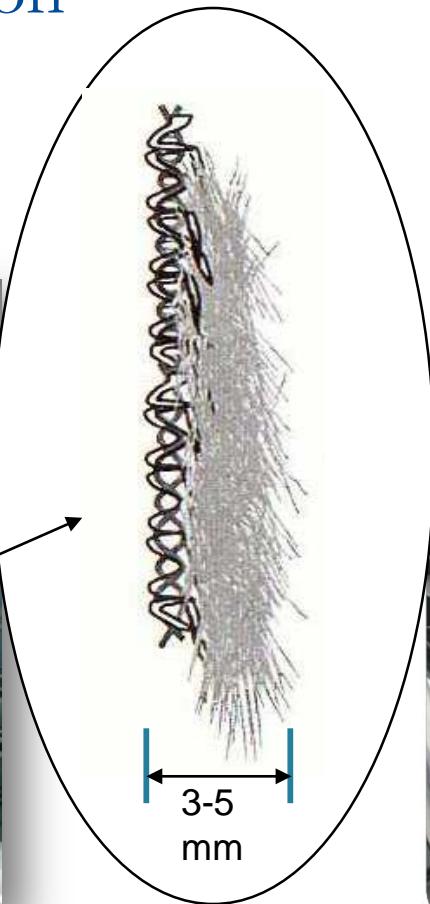
Depth Filtration



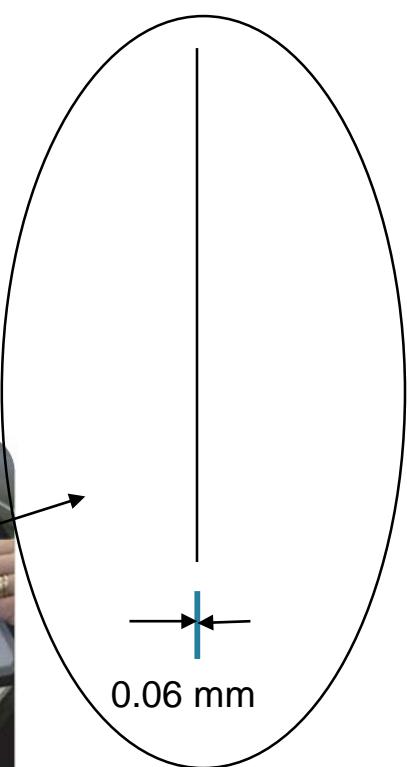
# Pile Cloth Filtration vs. Screening

## Media Comparison

Pile Cloth Media

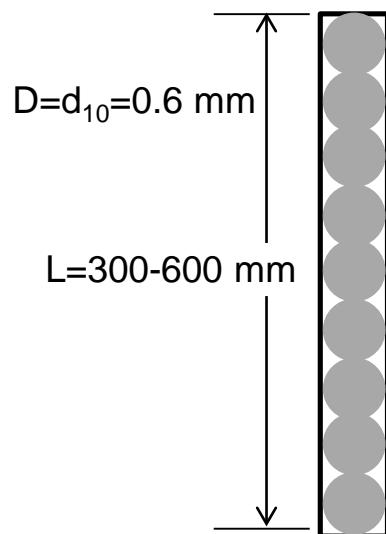


Microscreen Media



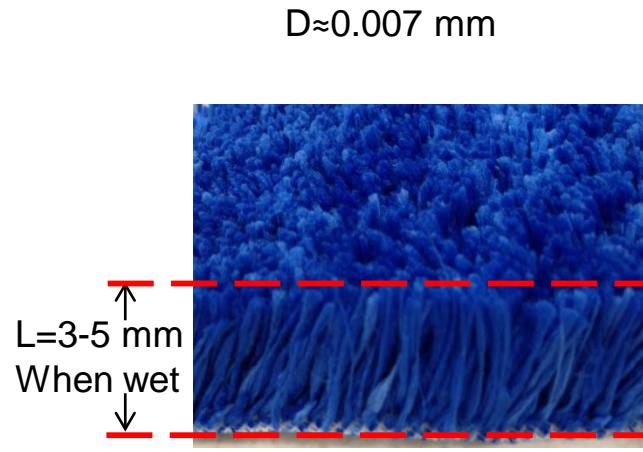
# L/D Ratio

Rapid Sand Filter



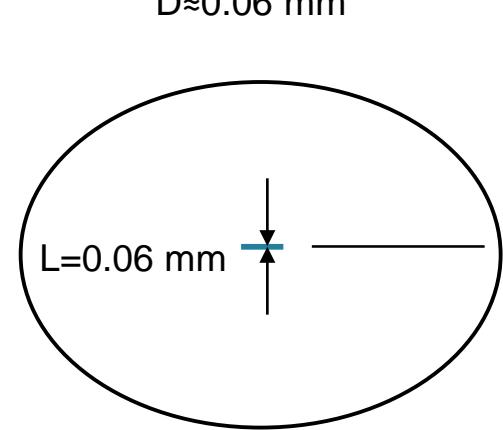
$$L/D = 500-1000$$

PES-14 Microfiber



$$L/D = 425-715$$

Microscreens



$$L/D \approx 1$$

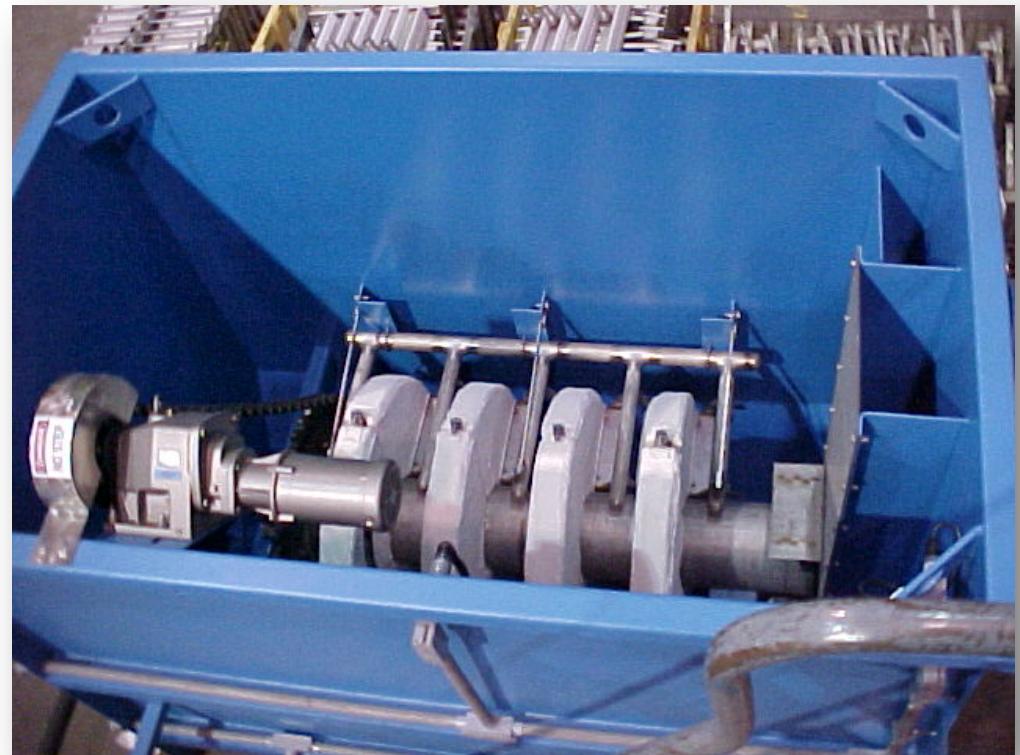
# Mechanical Configurations

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# Mechanical Configurations

## Small Flow Systems

- Aqua MiniDisk®



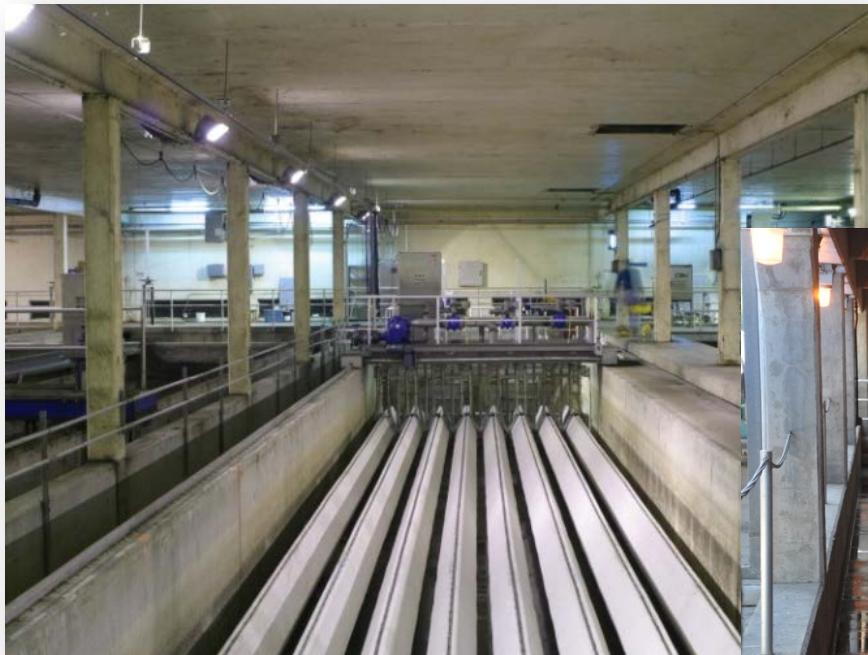
# Mechanical Configurations

Mid-sized to Large Flows



# Mechanical Configurations

Mid-sized to Large Flows

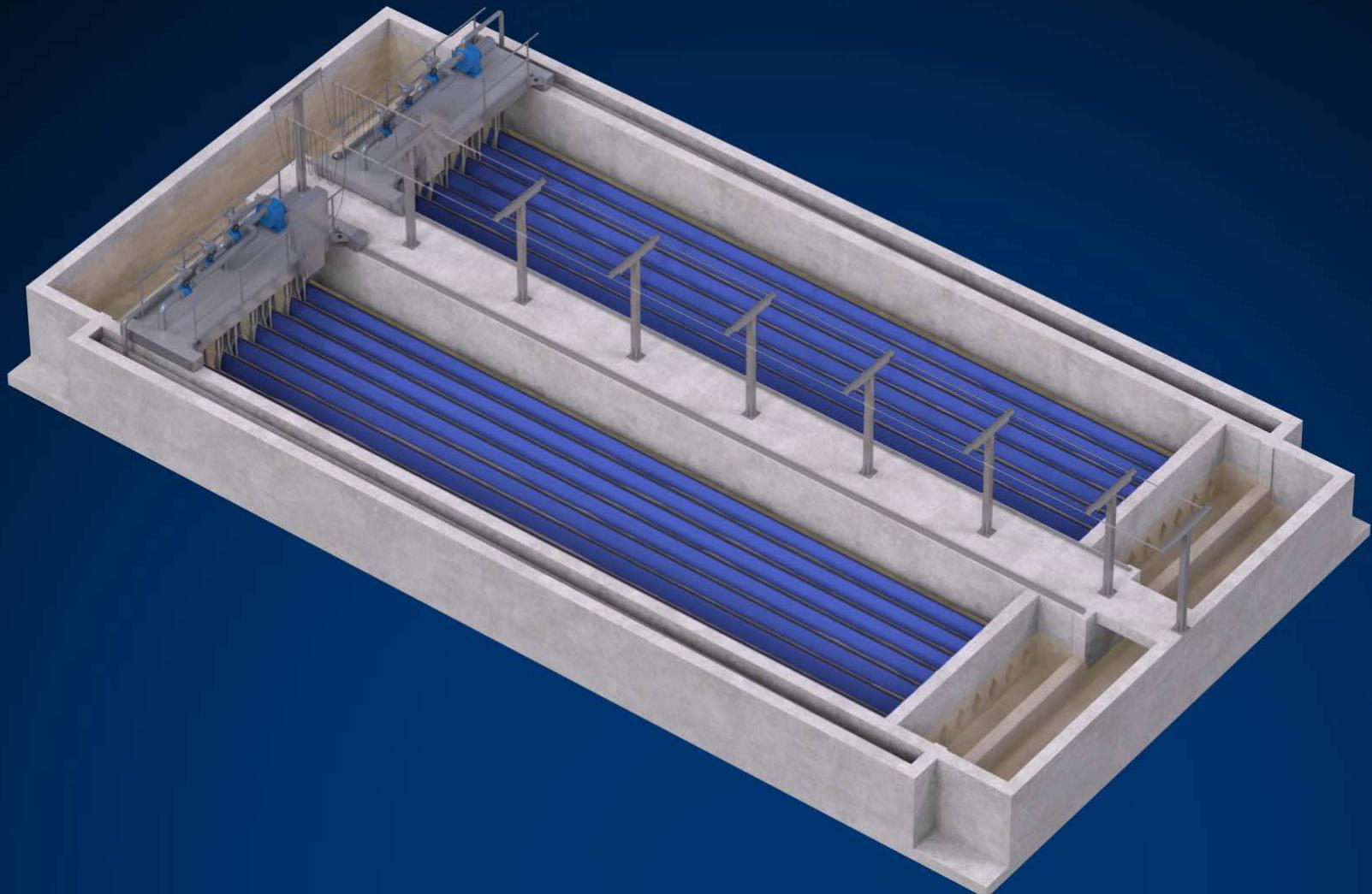


- **AquaDiamond®**



# Mechanical Configurations

AquaDiamond® Cloth Media Filter



# Mechanical Configurations

## Summary

- Aqua MiniDisk®
  - AquaDisk®
  - Aqua MegaDisk®
  - AquaDiamond®
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- 
  - OptiFiber® Cloth Filtration Media
  - Outside-In flow path
  - Vacuum backwash

# Pile Cloth Media Filter Applications

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# Pile Cloth Media Filter Applications

## Tertiary Filtration

- Discharge to surface waters
- Reuse
- Phosphorus Removal



# Reuse Experience

Cloth Media Filter Installations

**60 California Title 22**

**25 Arizona A+ Water**

**100+ Texas TCEQ 217**

**120+ Florida Class 1**

# Phosphorus Removal

Cloth Media Filter Installations

**100+ Installations for Phosphorus Removal**

**Piloting for < 0.043 mg/L-P**

**With and Without Tertiary Chemical Addition**

# Calera Pilot Study

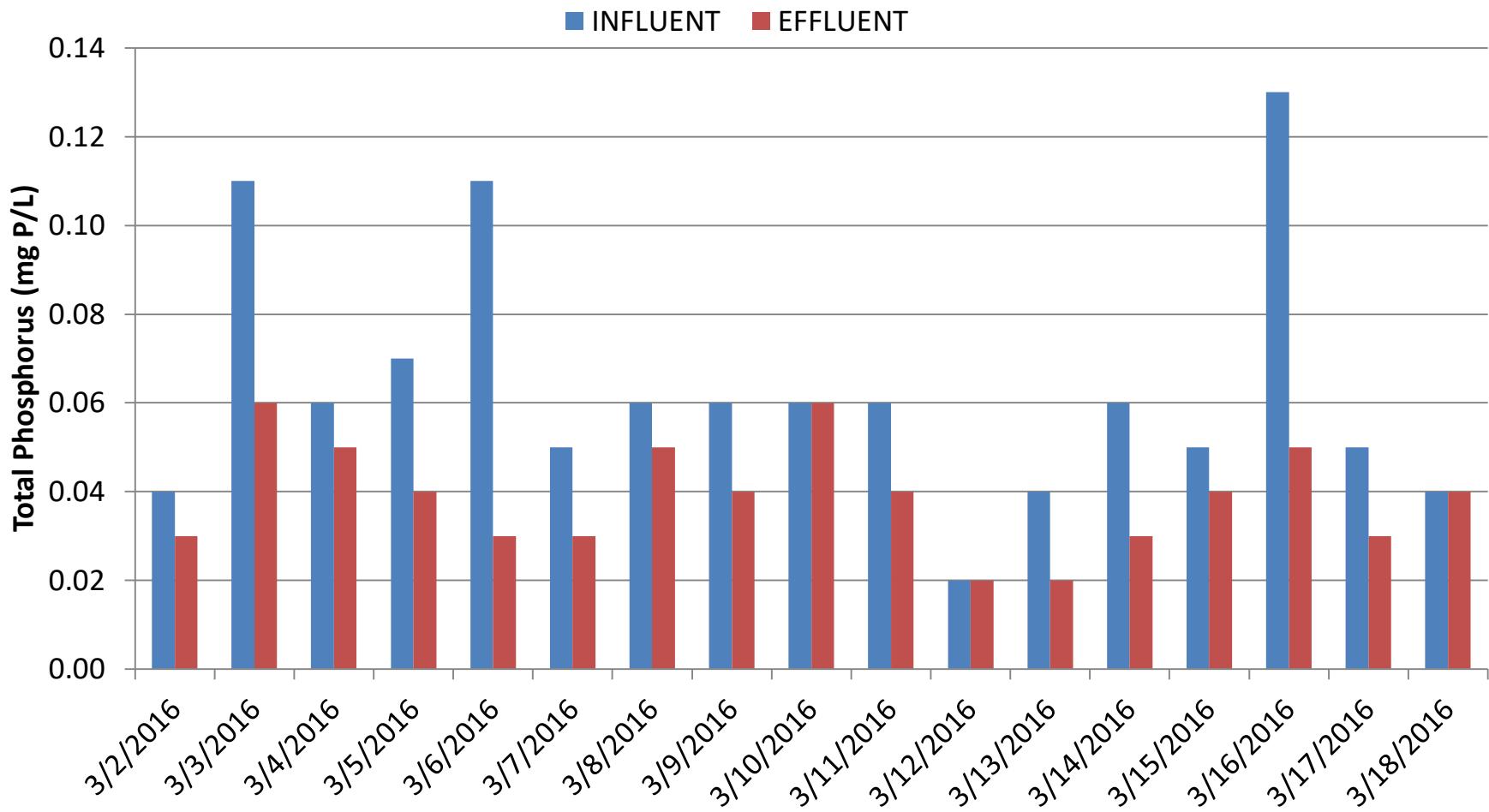
## Setup

- Facing 0.067 mg/L TP Effluent Limit
- AquaSBR followed by AquaDisk cloth media filters
- Tested filters in series



# Calera Pilot Study

## Preliminary Results



# Microplastics

## Definitions

- Plastic < 5 mm in diameter.
- Primary microplastics were manufactured as microplastics (*i.e.* microbeads)
- Secondary microplastics are a result of the breakdown of larger plastics.



# Microplastics

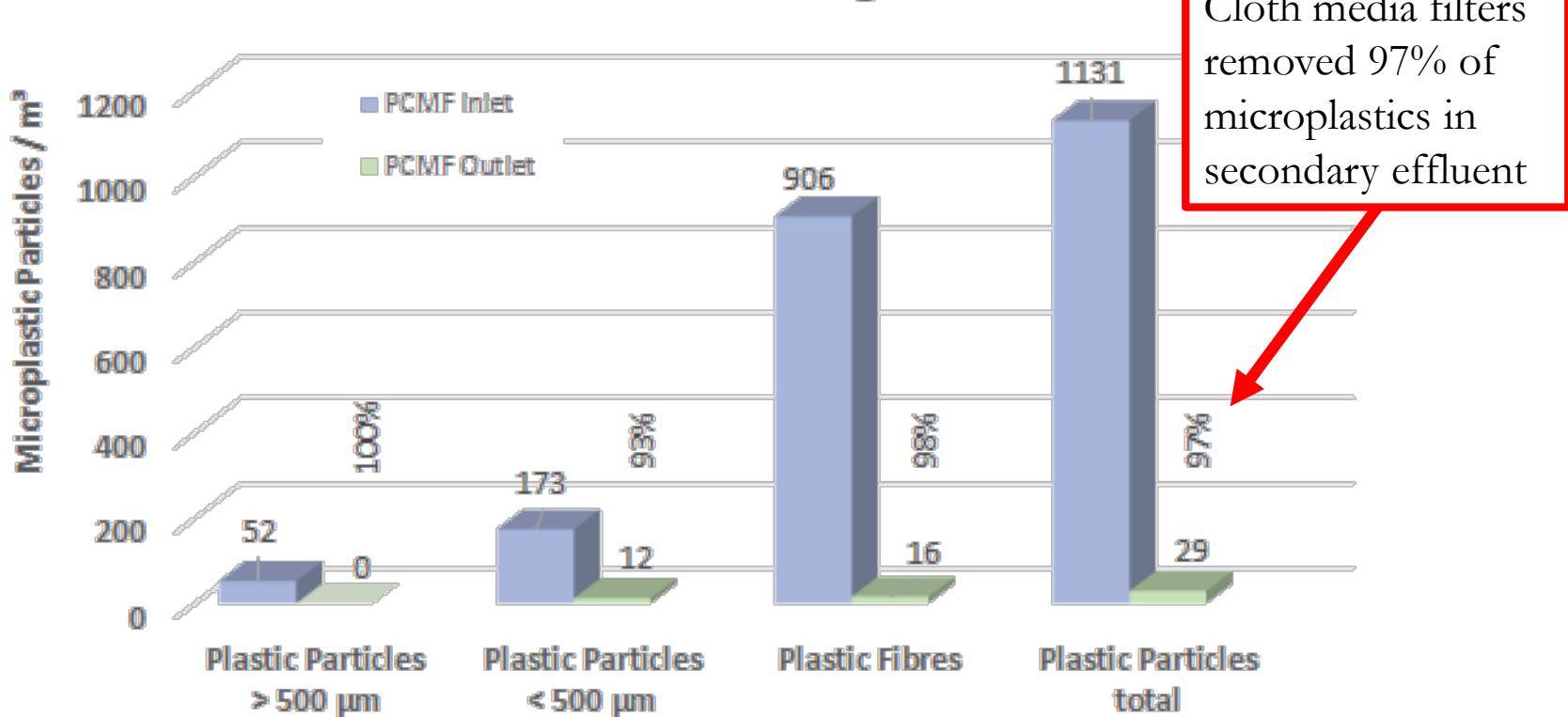
## Removal with Cloth Media Filtration



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### Microplastics Removal by Pile Cloth Media Filtration

#### WWTP Oldenburg



(Mintenig *et al.*, 2016)

# Pile Cloth Media Filter Applications

## Industrial

- Power
- Refinery
- Food



# Innovative Applications

- Primary filtration
- Stormwater/CSO
- Micro-contaminant removal
- Microplastic removal



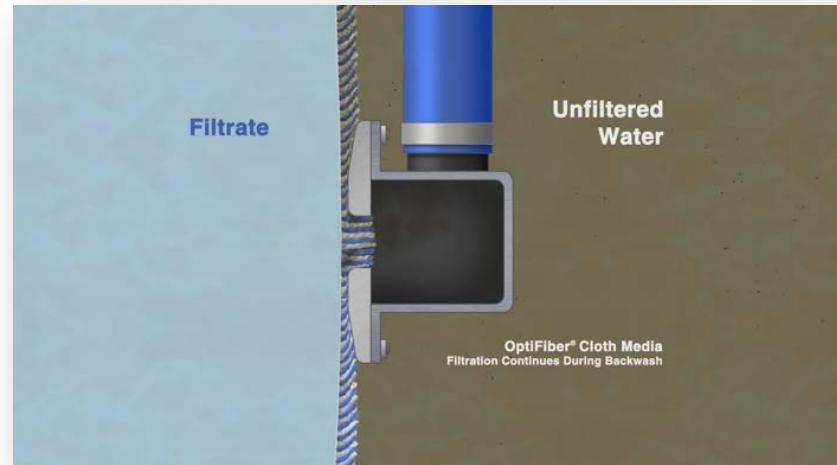
# Summary

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# Summary



Media



Backwash



Flow Path



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# Thank You!

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