Innovative Filter Technology
Tool for Reducing Energy,
Expanding Capacity, Wet Weather
Management and Nutrient Control

WWETCO FlexFilter™ and Bio-FlexFilter™
AGENDA

- **WWETCO FlexFilter™ & Bio-FlexFilter™**
- **Multi-Use Technology Approaches**
  - CSO Controls
  - SSO Controls
  - Phosphorous Trimming
  - Treatment Towards Energy Neutrality
- **WWETCO Technology Applications**
Wet Weather Management

Biological Treatment

Physical Chemical Treatment

WWETCO FlexFilter™ & Bio-FlexFilter™
WWETCO FlexFilter™ and Bio-FlexFilter™

*Patented and Patents Pending*

- Passive Down Flow Design
- No Mechanical Parts
- High Solids Loading (up to 50 lbs/day/SF)
- High Rate (5 to 20 gpm/SF)
- Multi Function Uses
  - Raw Sewage Filtration (85% TSS)
  - Biological Treatment (68% CBOD₅)
  - Chemical Floc Filtration (TP < 0.1)
- Low Backwash Water
  (1% to 10%)
- Low Power Requirements
  (10 to 60 KWHr/MG treated)
- Low Capital Costs
  (< $0.25/gal capacity).
WWETCO Compressible Media
Influent

Effluent
A porosity gradient is created by the lateral compression of the media bed.

The result is the stratification and removal of large and small particles throughout the media bed.

This allows the FlexFilter™ to treat high solids laden wastewaters including flush conditions caused by CSOs.
Influent

Effluent

Initiate
Backwash
Waste
Backwash Supply
Initial Air Lifts Water Column and Cleans Fine Screens

Backwash Supply

Waste
PHOTO AFTER PRIMARY INFLUENT FILTRATION IN PREPARATION FOR BACKWASH.

FILTER IS DRAINED PRIOR TO BACKWASH.
PHOTO AFTER PRIMARY INFLUENT FILTRATION IN PREPARATION FOR BACKWASH.
BACKWASH WATER FLOW BEGINS, CLEANING THE TOP PERFORATED PLATE.
Optimized Backwash by Central Draw-off with Minimal Flow and Short Washing Cycle
After 20 minutes, backwash is complete, filter cell is drained to waste and the filtration cycle begins again.
Regulatory Issues

- **CSOs** - Comply with In-Stream Standards
  - Must Demonstrate – No Reasonable Potential to Cause or Contribute
  - Biological Treatment Not Necessarily Required

- **SSOs** – Prohibitive
  - By-Pass Rule and Biological Treatment
Regulatory Issues

- **CSOs** - Comply with In-Stream Standards
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- **SSOs** – Prohibitive
  - By-Pass Rule and Biological Treatment
Wet Weather Treatment Train

Preliminary Treatment

Primary Clarifier

Backwash

Excess Wet Weather Flow (WWF)

FlexFilter™

Wet Weather Filtration (Design Event)

Biological Treatment

Filtered Wet Weather Effluent (TSS<30 mg/l)

Secondary Clarifier

Disinfection
TSS
Primary Influent Filtration - March to September 2011
Average Filter Effluent 13 mg/l
April 2009 Wet Weather Testing (St. Joseph, MO)

E. Coli Count (MPN/100 mL)

Contact Time After 6 mg/L Chlorine Dose (min)

- Compressed Media Filter
- CEPT- Ferric
- CEPT- Alum
- HRC- Ferric
- HRC- Alum

200 MPN/100 mL

WWETCO FlexFilter
April 2009 Wet Weather Testing (St. Joseph, MO)

E. Coli Count (MPN/100 mL)

Collimated Beam UV Dose (mJ/cm²)

- Compressed Media Filter
- CEPT- Ferric
- CEPT- Alum
- HRC- Ferric
- HRC- Alum

WWETCO FlexFilter

200 MPN/100 mL
Dry Weather Treatment Train

Preliminary Treatment

Primary Clarifier

Biological Treatment

Secondary Clarifier

Disinfection

Backwash

FlexFilter™

Secondary Effluent

Metal Salts Option for Phosphorous Trimming

Reuse Quality Filter Effluent

Tertiary Filtration
WWETCO FlexFilter™
Phosphorous Removal versus Alum Dose
Springfield, OH

Phosphorous, mg/l

Alum Dose (mg/l)

y = -0.1x + 2.2
R² = 0.9
Influent and Effluent Total Phosphorous
Columbus GA Tertiary Filtration Testing
Alum Added to WWETCO Filter Influent
Wet Weather Treatment Train

- Preliminary Treatment
- Primary Clarifier
- Biological Treatment
- Secondary Clarifier
- Disinfection

Excess Wet Weather Flow (WWF)

Backwash

Wet Weather Filtration (Average Events)

Secondary Effluent

Tertiary Effluent

Filtered Wet Weather Effluent (TSS<30 mg/l)
Regulatory Issues

- **CSOs** - Comply with In-Stream Standards
  - Must Demonstrate – No Reasonable Potential to Cause or Contribute Biological Treatment Not Necessarily Required

- **SSOs** – Prohibitive
  - By-Pass Rule and **Biological Treatment**
Intermediate Wastewater Treatment

- 2 kW-Hr/MGD for Filter versus 62 kW-Hr/MGD for Aeration
- Reduced Aeration Power, or
- Increased Plant Organic Capacity
- Increased Methane Gas Production
- Up to 50% Energy Savings
- Pays for itself in < 8 years
CBOD$_5$
Primary Influent Filtration - March to September 2011
Average Filter Effluent 25 mg/l

Filter Run Composite Tests
Total and Soluble CBOD5 Removal

\[ y = 0.3154x \quad R^2 = 0.499 \]

\[ y = 0.6242x \quad R^2 = 0.8821 \]
Wet Weather Treatment Train

Excess Wet Weather Treatment

Preliminary Treatment

Primary Clarifier

Biological Treatment

Secondary Clarifier

Disinfection

Bio-FlexFilter™

Backwash

Thickening & Anaerobic Digestion

Provides Biological Treatment to Excess Wet Weather Flow
Springfield, Ohio, WWTP
100 MGD WWETCO FlexFilter™
High Rate Treatment (HRT) Facility For CSO Treatment

11-Cell Filter Matrix

Single Cell Traverse Section

Single Cell Longitudinal Section
WWETCO ½ MGD FlexFilter™ - Mobile Pilot
Closed Top Filter with Media Viewing Panels
Complete with Auto Operation Controls
Pumps, Samplers, Chemical Feed,
Variable Gravity Head Testing and
Remote Monitoring Capability
Lamar, MO
2 MGD Wastewater Lagoon
WWETCO FlexFilter™
319(h) Grant
Stormwater BMP
Columbus, GA, Vehicle Maintenance Yard

Testing under 319(h) Grant Requirements
10 MGD WWETCO FlexFilter™
Retrofit of Traveling Bridge Tertiary Filter
Manila, Philippines - Esteros Treatment - Bio-FlexFilter™

Before

After

Simplified Wet Weather and Tertiary Treatment

A Subsidiary of WestTech Engineering, Inc.
Talayan, Philippines
MGD Enhanced Primary FlexFilter™
Remote CSO Application
WWETCO FlexFilter During Dry Weather

Base Sewage Flow

Blower

Disinfection

Underground Covered Structure Left Empty During Dry Weather
No residuals; no odors
Remote CSO Application
WWETCO FlexFilter During Wet Weather

- Auto Operation on Level Control
- Filter Screenings and Filtered Solids Returned in Pumped Backwash
- No On-site Residual Removal
- No odor issues
Remote SSO Application
WWETCO Bio-FlexFilter During Dry Weather

- Auto Operation on Timer
- Flow Created by Air Lift
- No On-site Residual Removal
- No odor issues
Remote SSO Application

WWETCO Bio-FlexFilter During Wet Weather

- Auto Operation on Level
- Screenings and Filtered Solids Returned in Pumped Backwash
- No On-site Residual Removal
- No odor issues

WWETCO FlexFilter™

Sanitary Sewer
Wet Weather
Flow

Intermittent Low
Head Blower

Bio-Treated
Discharge with
Disinfection

Pumped Backwash

SSO
Summary

• Flexible multi-use treatment plant processes are the future to meet regulatory issues associated with wet weather and nutrient controls.

• Future treatment technologies will focus on energy savings and alternative ways to increase capacity with less capital and lower O&M.

• The WWETCO FlexFilter™ and Bio-FlexFilter™ offers these flexibilities and capabilities today.
Simple Hydraulic Control and Treatment Solutions to Wet Weather & Wastewater Pollution Problems:

- CSOs, SSOs and Stormwater,
- Biological Treatment
- Tertiary Filtration & Nutrient Control

WWETCO FlexFlow™

WWETCO FlexFilter™ and Bio-FlexFilter™

Drainage Network Stormwater Controls