Water Environmental Technology, LLC

Dedicated to Deliver Customized Engineering Solutions For Water & Wastewater
Engineering Services Provided by WET

• FOG Resource Recovery System From Poultry, Beef, Pork Processing Plants
• Sustainable Brown Grease Recovery System
• Yellow Grease Production
• Struvite Fertilizer Production
• Animal Feed Production
• Flowback & Produced Water Treatment & Reuse
• Closed Loop Drilling Process
• Oily Sludge Dewatering and Management
• Virgin Pulp Mill & Recycle Pulp Mill
• Mining Wastewater Treatment & Sludge Dewatering System
• Municipal/Industrial Wastewater Treatment And Reuse
Recovering FOG From Wastewater
Circular Zoned DAF Unit
(US Patent Pending Technology)

Features

- Multiple independent annular flotation zones
- Integrated air and ozone dissolving system
- Unique modular machine design allowing splitting during shipping and easy re-assembling onsite to save onsite works and time
- Effectively collect and recover oil at the point-of-source
- Recover oil without chemical additions
- Further remove oil, BOD, TSS, total phosphorus, hardness, and metals with chemical additions
- Concentrated sludge saving disposal costs
The water and oil rises in the center core for the WET DAF, where oil at the top of the core will be recovered using an adjustable decanter that achieves at least 99% oil removal without any chemical addition and allows for maximum clean oil recovery.

Water enters Zone 2 for chemical precipitation to remove metals and other concerned chemicals.

At Zone 3, coagulant/flocculant can be added to remove solids. Chemicals for pH adjustment and disinfection can be injected as needed.

Throughout the flow, material floated to the surface due to dissolved air flotation is removed by a screw conveyor fed by rotating paddles that skim the surface into linear troughs in each zone.

Heavies that do not float are collected in each zone due to the conical bottom design and discharged through ports to sludge processing storage tanks.
Bio-DAF System (US Patent Pending Technology)

 Features

- Integrating physiochemical and biological treatments in one machine
- Primary DAF unit to remove TSS and partial BOD loading
- Anoxic bio-media reactor for denitrification
- Three stage aerobic bio-media reactor for BOD removal and nitrification
- Secondary DAF unit to separate biomass from water
- Internal recycle pump to return third stage bio-media reactor effluent to anoxic bio-media reactor.
- Unique modular machine design allowing splitting during shipping and easy re-assembling onsite to limit and save onsite construction works
- Concentrated sludge saving disposal costs

 Bio-DAF Applications:

- Municipal and domestic wastewater treatment and reuse
- Industrial wastewater treatment and reuse
- Poultry and meat processing wastewater pretreatment
- Brown grease disposal station wastewater treatment
Our patent pending continuous cleaning grease trap (CCGT) is a compact, and state-of-art system to effectively intercept, remove, and recover fat, oil, and grease (FOG) from restaurant and food service establishments wastewater. Coagulant and flocculant are added to maximize removals of FOG, BOD, TSS, and colloidal particulates at the point of source. Small amount of ozone is introduced to improve FOG removal and recovery efficiency as well as for odor control during FOG recovery process. CCGT can be operated continuously. Since the removed FOG can be concentrated up to 12-15% consistency, the FOG trucking costs and disposal costs will be significantly reduced to contribute great savings for restaurants and food service establishment daily operations.
Leaders in Twin Wire Press Technology

Applications:
- Dewatering Industrial Solids
- Pond Dewatering
- Dewatering municipal solids
- Drilling Muds
- Tank Bottoms
- Solids generated in production water treatment
- Mining Dewatering
- Coal Tailings
- Wet Lapping of Pulp
Oil & Gas Technologies

- Flowback/produced water treatment system for re-use/injection well/10-15 pound per gallon Brine & Drilling fluids
- Closed loop drilling system & drilling mud recovery
- Oily sludge and tank bottom dewatering and management
Flowback/Produced Water Treatment and Reuse

1. **Flowback Produced Water Influent**
   - Chemical Reaction Tank
     - Filtrate
     - DAF Unit
   - Sludge Holding Tank
     - Press
       - Dewatered Solids To Disposal
   - Recovered Oil Tank
     - Filter Feed Tank
     - Filters
       - Clear Brine Makeup Tank
         - To Well Workover Or Completion
       - To Injection Well

2. **Recovered Oil Tank**
   - Filter Feed Tank
     - Filters
     - Clear Brine Makeup Tank
       - To Well Workover Or Completion
       - To Injection Well
Flowback/Produced Water Treatment and Reuse

Solid-free Brine Fluids for Completion and Remedial Work:
• Reduced borehole skin damage
• Improved permeability
• Reduced mechanical problems with completion and production equipment
• Solids free fluids for completion and remedial work have resulted in increased production and faster recovery.
• Cost-effective formulations for various densities can be obtained by combining different salts.
• Brine fluids have presented significant productivity gains for oil and gas wells when compared to fresh water or “mud” completions.
• When used in drilling applications, the near solids-free nature of clear brine fluids and the controlled high-densities they achieve, contribute to stabilization of sensitive formations.
Flowback/Produced Water Treatment and Reuse

- Oil Removal/Recovery
- Hardness/metals reduction
- Solids reduction
- Treated effluent for reuse
- Making 10-15 Pound drilling fluids

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<tr>
<th>Parameter</th>
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<th>Fracking Water Limits</th>
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<td>HCO₃⁻, mg/L</td>
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<td>SO₄²⁻, mg/L</td>
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<td>Ca, mg/L</td>
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<td>Mg, mg/L</td>
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<td>Iron, mg/L</td>
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</table>

20,000 BWPD
3,179 m³/d
Flowback/Produced Water Treatment and Reuse

- Oil Removal/Recovery
- Hardness/metal reduction
- Solids reduction
- Treated effluent for reuse
- Making 10-15 Pound drilling fluids

### Parameter Limits

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60,000 BWPD
9,538 m$^3$/d
Flowback/Produced Water Treatment and Reuse

100,000 BWPD
15,897 m³/d

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<tr>
<td>Iron, mg/L</td>
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<td></td>
</tr>
</tbody>
</table>

- Oil Removal/Recovery
- Hardness/metals reduction
- Solids reduction
- Treated effluent reuse for fracking
- Making 10-15 PPG solid-free brine fluids
Flowback/Produced Water Treatment and Reuse

- Oil Removal/Recovery
- Hardness/metals reduction
- Solids reduction
- Treated effluent reuse for fracking
- Making 10-15 PPG solid-free brine fluids

120,000 BWPD
19,076 m³/d

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<td>$\text{SO}_4^{2-}$, mg/L</td>
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<tr>
<td>Iron, mg/L</td>
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</table>
Transportable design, 10,000 bbl/day for water reuse.

Ideal for smaller operations, our three-stage skid-mounted mini DAF system features complete management of liquids and solids. Chemical treatments are tailored to the source of produced water and flowback streams. This design features a twin wire belt press which allows continuous sludge dewatering.
Mobile design, 10,000 bbl/day for water reuse.

Ideal for smaller operations, our three-stage trailer-mounted mini DAF system features complete management of liquids and solids. Chemical treatments are tailored to the source of produced water and flowback streams. This design features a twin wire belt press which allows continuous sludge dewatering.
Oily Sludge Management

1. Oily Sludge
2. Hot-water Washing & Oil Separator
3. CZDAF Unit
4. Boiler
5. Makeup Water
6. Recycled Water
7. Oil Tank
8. Recovered Oil
9. Filters
10. Filtrate
11. DAF Effluent
12. Sludge Holding Tank
13. Biodegradation of Residual Oil
14. Tank Bottom Sludge
15. Filtrate
16. Recycled Water
17. Belt Press
18. Dewatered Sludge
19. Road Pavement & Agricultural Uses
20. Clear Water Tank
21. Water Environmental Technology, LLC

Confidential and Proprietary
Oily Sludge and Drilling Mud Dewatering
WET Twin Wire Press

- Oil soaked tank bottoms
- Drilling Muds
- Stabilization of oils/solids with WET chemical blends from recycled fiber
Oily Sludge And Tank Bottom Management
1,500 bbl/d or 240 m³/d

- Hot water pre-soak
- Oil sludge washing
- Three phase separation
- CZDAF oil recovery and water treatment
- Belt press sludge dewatering
- Bio-remediation of dewatered sludge
Sustainable Green Blends For Oily Sludge Dewatering

- Natural and Green
- Raw Material from Perennial Crops, Such As Miscanthus growth Year Round and sustainable
- Recycled Fiber
- Blending With Cation Or Anion Polymer per Applications for higher TSS removal when needed

Applications:
- Oil & Gas EP Field Solids Management
- Downhole Process Solids Management
- Oily Sludge & Tank Bottom Sludge Management
- Municipal Sludge Management
- Oil Spills Cleaning
Closed Loop Drilling Process

- Compact and effective
- Easily integrated with existing shale shaker and mud tank
- Intercept and retain the specific compositions of drilling mud
- Maintain the homogenous status of drilling mud
- Effectively remove the super fine particulates and reuse the water
- Dewater wasted fluid up to 45-50% dry solids content
Closed Loop Drilling Mud Management
600 GPM or 3,270 m³/d
Sustainable Brown Grease Recovery Technology

- High Efficiency Continuous Cleaning Grease Trap
- Brown Grease Recovery System
- Wastewater Treatment System for discharge
Challenges For Brown Grease Recovery Industry

- Dispersed brown grease generation sources
- Inefficient brown grease collection and grease trap
- Grease contaminated by food, trash, and dirt
- Water content > 94%
- Heavy emulsification
- Excess sulfur content
- Most of centralized collection facility has old technologies, very low grease removal and recovery rates, no wastewater treatment at all

Fact Check
Brown Grease Recovery Plants

Conventional Grease Interceptor

• Separate FOG by specific gravity
• Poor brown grease removal rate (≤50-70%)
• Lower grease and solid content (≤ 3-5%)
• High liquid hauling and disposal tipping fee
• Larger space required
• Overload to WWTP and landfill
Sustainable Brown Grease Recovery System
Continuous Cleaning Grease Trap
(US Patent Pending Technology)

- Flow-through system
- Continuously remove FOG and store FOG
- Enhanced brown grease capture by micron bubbles
- Excellent Brown grease removal (≥95-98%)
- Higher grease and solid content (≥10%)
- Reduce grease hauling up to 90%
- Save disposal tipping cost
- Compact design
- Reduce effluent FOG/BOD loadings to WWTP and leachate land
Sustainable Brown Grease Recovery System
- Continuous Cleaning Grease Trap
- (US Patent Pending Technology)

**CCGT-12000**
Aboveground Installation

**CCGT-12000**
Underground Installation

<table>
<thead>
<tr>
<th>Model</th>
<th>CCGT-7500</th>
<th>CCGT-12000</th>
<th>CCGT-36000</th>
<th>CCGT-60000</th>
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<tr>
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<td>36,000</td>
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<td>Service Person</td>
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<td>600</td>
<td>2,000</td>
<td>3,000</td>
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<td>Electricity</td>
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<td>3 Phase, 240/480 VAC</td>
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Sustainable Brown Grease Recovery System

- Continuous Cleaning Grease Trap
- (US Patent Pending Technology)

CCGT-36000 Aboveground Installation

CCGT-36000 Underground Installation
**Major Components**

<table>
<thead>
<tr>
<th>Major Components</th>
<th>Functions</th>
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<tbody>
<tr>
<td>Inlet Screen</td>
<td>• Remove grit, rocks, debris, trash</td>
</tr>
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</table>
| Primary Circular Zoned DAF Unit | • Enhance FOG recovery by adding coagulant/Flocculant  
• Enhanced BOD/TSS removal |
| Recovered FOG Tank | Holding recovered FOG and particulates from 1st Zone |
| Pick Heater      | Heating recovered FOG and particulates from 1st Zone |
| Tricanter        | • Processing recovered FOG and particulates from primary CZDAF unit  
• Produce biodiesel feedstocks  
• Produce fertilizer  
• Returning stick water to primary CZDAF unit |

**Benefits**

- Providing sustainable and environmental sound disposal measures for restaurant trap grease
- Recovering brown grease for biodiesel feedstocks
- Using dry solids from the system to make fertilizer
- Reducing BOD, TSS, and FOG Loadings to meet city sewer or downstream WWTP discharge limits
- Bringing brown grease processing plant into compliance
- Eliminating exceeding limit surcharges for BOD/TSS
Sustainable Brown Grease Recovery System

(US Patent Pending Processing)

Inlet Screen → Trap Grease Hauler → EQ Tank → Primary DAF Unit → Bio-DAF Feed Tank → Bio-DAF System → Treated Effluent to WWTP

Primary DAF Unit → Tricanter

Tricanter → Bio-DAF Feed Tank

FOG Pre-heating Tank → Finished Oil Tank

EQ Tank → Treated Effluent to WWTP

Dry solids to composting or fertilizer

Recovered oil to biodiesel feedstock

Slick Water → Finished Oil Tank

Recovered oil to biodiesel feedstock

Dry solids to composting or fertilizer

Inlet Screen → Tricanter

Treated Effluent to WWTP

Recovered oil to biodiesel feedstock
Brown Grease Recovery Plants – Approach

• **Building multiple plants for the large city’s** and **haul recovered oil to a central location normally hauling within a 60 mile radius**

• **Use container/Mobile systems in remote area for oil recovery**
Services Provided by WET — Turnkey
Brown Grease Recovery Facilities

Typical Primary DAF Units Below

Brown Grease Recovery & Wastewater Treatment Plant
60,000-100,000 GPD
**Sustainable Brown Grease Recovery System**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Influent</th>
<th>Discharge Limits (No Surcharges)</th>
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<tbody>
<tr>
<td>Flow, GPD</td>
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<tr>
<td>TSS, mg/L</td>
<td>12,300</td>
<td>250</td>
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<tr>
<td>BOD, mg/L</td>
<td>5,525</td>
<td>250</td>
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<tr>
<td>FOG, mg/L</td>
<td>4,840</td>
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</table>

- Separate FOG from brown grease trap influent
- Remove/Recover brown grease
- Recovered oil used as biodiesel feedstock
- Biological treatment system for wastewater
- Significantly reduce FOG, BOD and TSS loadings to WWTP
- Treated water meeting discharge limits
- Sustainable green technologies

Brown Grease Recovery Plant 100,000 GPD as shown above
Sustainable Brown Grease System
100,000 GPD, FL Installation oil recovery

Primary DAF FOG Collection
(Click on photo to play video clip)
Sustainable Brown Grease System
60,000 GPD, FL Installation discharge to WWTP after oil recovery

Parameter | Influent | Primary DAF Effluent
--- | --- | ---
Flow, GPD | 60,000 | 
TSS, mg/L | 12,300 | 60 |
BOD, mg/L | 5,525 | 1,850 |
FOG, mg/L | 4,840 | 

Primary DAF Effluent
(Click on photo to play video clip)
Sustainable Brown Grease System
100,000 GPD, FL MBBR Wastewater Reactor

Bio-media Reactor Startup
(Click on photo to play video clip)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Primary DAF Effluent</th>
<th>Discharge Limits (No Surcharges)</th>
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<tr>
<td>TSS, mg/L</td>
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<tr>
<td>BOD, mg/L</td>
<td>1,850</td>
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Sustainable Brown Grease Recovery System Engineering Design 200,000 GPD

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Sustainable Brown Grease Recovery Plant 200,000 GPD

EQ Tank
Inlet Screen #1
Inlet Screen #2

Primary DAF Unit

Bio-DAF Feed Tank

Treated Effluent to WWTP

Bio-DAF System #1

FOG Pre-heating Tank

Tricanter

Dry solids to composting or fertilizer

Bio-DAF System #2

Slick Water

Finished Oil Tank

Recovered oil to biodiesel feedstock

Tricanter

Dry solids to composting or fertilizer

Bio-DAF System #2

Slick Water

Finished Oil Tank

Recovered oil to biodiesel feedstock
Sustainable Brown Grease System – Mobile system
15,000 GPD for Small Communities
Sustainable Brown Grease System – Container Plant
5,000 GPD for Small Communities
Proposed Tampa Brown Grease Recovery Plant 100,000 GPD

- Compact & centralized facility
- Separate FOG from brown grease
- Remove/Recover brown grease
- Recovered oil used as biodiesel feedstock
- Biological treatment system for wastewater
- Significantly reduce FOG, BOD and TSS loadings to WWTP
- Treated water meeting city sewer discharge limits
- Sustainable green technologies

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Answers To Small Restaurants, strip malls, bakery's Wastewater Treatment & Reuse

Pressurized WWTP System

- Treat 5-30 m³/d (1,320-8,000 gpd)
- Ideal for strip malls, Restaurants, bakery’s, small food processors.
- Plug and play system
FOG Resource Recovery Technology for Poultry, Beef, Pork & Diary

- Recovering high valuable yellow grease
- Reducing BOD, TSS, and FOG Loadings to city sewer or downstream WWTP
- Bringing in Compliance with the city sewer or WWTP discharge limits
FOG Resource Recovery Technology For Poultry, Beef, Pork & Dairy

Features

- Meat and food processing plants wastewater treatment, including poultry, pork, beef and dairy plants
- Recovery system for high quality yellow grease
- Dry solids for high protein animal feed
- BOD reduction for wastewater treatment
- Phosphorus recovery for struvite fertilizer
- Reduce the solids hauling for the meat and food processing plants

Typical Meating Processing Wastewater Characteristics

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<th>Parameter</th>
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Note: "*" Effluent is discharged to city sewer or WWTP limits; With further biological treatment, the final effluent can meet secondary discharge limits.
FOG Resource Recovery Technology
(US Patent Pending Process)

From Meat or Food Processing Plant

Treated Effluent to Sewer or City WWTP

1st Zone FOG Scum

2nd Zone Coagulant/ Flocculant

3rd Zone MgCl₂/ Flocculant

Circular Zoned DAF Unit

Decant To CZDAF

Decant To CZDAF

Decant To CZDAF

Decant To CZDAF

Recovered FOG Tank

Recovered Yellow Grease

Stick Water To CZDAF

Recovered Biodiesel Feedstocks

Dry solids to Fertilizer

Granular struvite fertilizer

Water Environmental Technology, LLC
Confidential and Proprietary
Yellow grease can be used as livestock feed and animal feed additives, fatty acids for surfactant, plastics, resins, textiles, and cosmetics, biodiesel feedstocks.
FOG Resource Recovery Technology –
Poultry Processing Facility/TP Removal - 2 MGD
Engineering Design Stage For Client in Missouri

- FOG Removal
- Yellow Grease Production
- TSS and BOD Loading Reductions
- P Removal and Recovery
- Struvite Fertilizer Production
- Lagoon Discharge

<table>
<thead>
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<th>Parameter</th>
<th>Influent (mg/L)</th>
<th>Lagoon Discharge Limits (mg/L)</th>
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<tbody>
<tr>
<td>Flow, MGD</td>
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<tr>
<td>TSS, mg/L</td>
<td>800</td>
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<tr>
<td>BOD, mg/L</td>
<td>2,000</td>
<td>1,000</td>
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<tr>
<td>FOG, mg/L</td>
<td>1,500</td>
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<tr>
<td>TP, mg/L</td>
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<td>5</td>
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<tr>
<td>Parameter</td>
<td>Influent</td>
<td>Discharge Limits (No Surcharges)</td>
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<tr>
<td>Flow, MGD</td>
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<td>TSS, mg/L</td>
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<td>BOD, mg/L</td>
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<td>250</td>
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<tr>
<td>FOG, mg/L</td>
<td>2,000</td>
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</tbody>
</table>

**FOG Resource Recovery Technology**

*Beef Processing Facility Proposal - 1.325 MGD*  
*Nebraska (Engineering Design Stage)*

- FOG Removal
- Yellow Grease Production
- Animal Feed Production
- TSS Loading Reductions to WWTP
- BOD Loading Reductions to WWTP
- City Sewer Discharge
Installations for FOG Recovery
East Coast FOG Resource Recovery Plant
Poultry Process
– 4 MGD or 15,200 m³/d

Process Flow Diagram

Influent
4 mgd

Existing Inlet Wetwell

Circular Zoned DAF Unit

To Existing DAF System

Decant

Tricanter Feed Tank

Dewatered Solids

Desuperheater

Tricanter

Finished Oil Tank

Finished Oil

Stick Water
East Coast FOG Resource Recovery Plant
Poultry Process
4 MGD or 15,200 m³/d

WET Multi-Zoned DAF (US Patent Pending Process)
From Meat or Food Processing Plant

Treated Effluent to Sewer or City WWTP

Circular Zoned DAF Unit

1st Zone FOG Scum

2nd Zone Sludge

3rd Zone Sludge

Decant To CZDAF

Sludge Holding Tank

Steam

Pick Heater #1

Recovered FOG Tank

Decant To CZDAF

Stick Water To CZDAF

Recovered Yellow Grease

Recovered Biodiesel Feedstocks

Recovered Coagulant

MgCl₂/Flocculant

Granular struvite fertilizer

Dry solids to Fertilizer

Dry solids to animal feeds

Tricanter #2

Decant To CZDAF

Steam

Tricanter #1

Decant To CZDAF

Pick Heater #2

Steam

Decant To CZDAF

Stick Water To CZDAF

Recovered Yellow Grease

Water Environmental Technology, LLC Confidential and Proprietary

East Coast FOG Resource Recovery Plant

Poultry Process

4 MGD or 15,200 m³/d
East Coast FOG Resource Recovery Plant
Poultry Process
4 MGD or 15,200 m³/d
Municipal/Industrial WWTP Engineering Services

- Municipal/industrial wastewater treatment and reuse
- Turnkey Facility design
- Nutrient/TP removal
- Advance oxidation
- Filtration
- Disinfection system
Design/Installation for
10 Million GPD China Facility
Municipal/Industrial Wastewater Treatment Plant

10 MGD BNR Plant

- MBBR process
- Biological phosphorus removal
- Nitrification/denitrification
- Cold weather performance
## Bio-DAF System - One Machine, Multiple Functions, Primary DAF, Biological Treatment, Secondary DAF

- BOD and TSS Removal
- Total nitrogen removal
- Total phosphorus removal

### Answers To Small Community Wastewater Treatment & Reuse

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Influent</th>
<th>Secondary Discharge Limits</th>
<th>Tertiary Discharge Limits</th>
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<tr>
<td>Flow, GPD</td>
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<td>BOD, mg/L</td>
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<td>TSS, mg/L</td>
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<td>Turbidity, NTU</td>
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<td>Total Coliform, MPN/100 mL</td>
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<td>23</td>
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Industrial Applications
Pulp Mill Installation - Burley Idaho
1.73 MGD or 6540 m³/d

Process Flow Diagram

Influent → Flocc Tube (By Client) → Circular Zoned DAF Unit

- Zone 1
- Zone 2

→ 1.0 M Belt Press (By Client) → Solid Reject Tank (By Client)

PAC/Polymer

Polymers

→ Reuse

Solids Disposal
Pulp Mill Installation – Burley Idaho
-1.73 MGD or 6540 m³/d

Plant Isometric
Pulp Mill Installation 24 Foot multi-stage DAF
- 1.73 MGD or 6540 m³/d
Pulp Mill Installation – Burley Idaho
1.73 MGD or 6540 m³/d

Fiber Recovery and Water Reuse for Pulp Application
Pulp Mill Installation DAF Operation – Burley Idaho
1.73 MGD or 6540 m³/d

System in Operation
Pulp Mill Installation Burley Idaho
-1.73 MGD or 6540 m³/d

Influent

Effluent
THANK YOU

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