SAF®
A New Pretreatment Technology
Case Study: Suspended Air® Flotation
Presentation by Simmons
*A New Pretreatment Technology Case Study: Suspended Air® Flotation*

Simmons Foods in Siloam Springs, Arkansas
* SAF® = Suspended Air® Floatation
* Uses froth made from an anionic surfactant, water, and air instead of air bubbles for flotation.
* One gallon of froth = 0.8 ml soap = 0.6 gal water and 0.4 gal (0.05ft³) air.
* Bubbles have an anionic charge so are attracted to the floc.
* Increases flotation rate so units can float 20-40 lbs (spec’ed at 30lbs) of solids per square foot per hour (lbs/hr/ft²).
* Decreases the size of the unit vs. DAF; no lamella style plates
* Less Maintenance
* More Highly Dewatered Skimmed Solids
* Better Results - Water Clarity

*What is SAF®?
* Installed two new units in *Siloam Springs*
  * One primary
  * One Secondary
* Installed one new unit in *Van Buren*
  * Primary treatment.
* Converted two existing DAF units to SAFs in *Southwest City*.
  * One primary
  * One Secondary
*New SAF® Units for Siloam Springs.*
ClearFloater Model CF250

* 35ft² Float Cell - rated for 700 gpm @ 3000Mg/L TSS
* 350 gpm - current actual flow
* From Secondary SAF.
* Influent flow contained 3000 mg/L MLSS.

*Siloam Springs SAF® Effluent
Froth Generator

Model F-200 Froth Generator Shown
*Froth Flow Meter and Froth.*
* Tote of Anionic Surfactant.
  * Froth Generator.
    * Surfactant metering pump.
    * Water line.
    * Froth pump.
    * Holding tank.
    * Flow meter.
    * Flow control valve.
  * Floc Mixer - Active Mixing Chamber.

* Froth Generation Summary.
DAF to SAF Conversion: Froth Generator & Floc Mixer

Floc Mixer - replaces previous connection from floc tube to DAF inlet flange

* DAF to SAF Conversion: Froth Generator & Floc Mixer
* Secondary DAF
* 216 ft² of surface area.
* At 1.8 MGD before SAF conversion it could handle 1500 mg/L influent suspended solids.
* It now handles 3500 mg/L with no carry over
  Average effluent TSS = 15 mg/L.
* Specified Maximum Flow @ Current Loading ~3500 gpm
Secondary SAF® Effluent.
## Secondary DAF to SAF® Cost Comparison

<table>
<thead>
<tr>
<th>Secondary DAF</th>
<th>SAF® Retrofit</th>
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</thead>
<tbody>
<tr>
<td>* 60 HP Recirculation Pump $31,367/yr @ $0.08/KWHR</td>
<td>Equivalent - 10HP; $5,230/yr @ $0.08/KWHR</td>
</tr>
<tr>
<td>N/A</td>
<td>Frothing Agent Consumption @ 25 GPM Output; (1)-tote/6wks; $38,780/yr</td>
</tr>
<tr>
<td>Coagulant Consumption: $350,000/yr</td>
<td>Coagulant Consumption: $140,000</td>
</tr>
<tr>
<td>Cationic Polymer Consumption: 120Lbs/Day; $87,600/yr</td>
<td>Cationic Polymer Consumption: 60Lbs/Day; $43,800/yr</td>
</tr>
<tr>
<td><strong>Total O&amp;M Costs/yr: $468,967</strong></td>
<td><strong>Total O&amp;M Costs/yr: $227,810</strong></td>
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<tr>
<td></td>
<td><strong>Net Savings/yr: $241,157</strong></td>
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</tbody>
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*Difficult to quantify savings associated with directly reclaiming water vs requiring additional treatment*
Converted Primary DAF.

- It was maxed out at 1250 gpm and 2000 - 2500 mg/L influent solids.
- It now treats an additional 700 gpm.
- Specified to treat a maximum 2400 gpm.
- Cost effective way to increase capacity.

* Primary DAF to SAF® Conversion.
### Primary DAF to SAF® Cost Comparison

<table>
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<tr>
<th><strong>Primary DAF</strong></th>
<th><strong>SAF® Retrofit</strong></th>
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<tr>
<td>40 HP Recirculation Pump $20,920/yr @ $0.08/KWHR</td>
<td>Equivalent - 10HP; $5,230/yr @ $0.08/KWHR</td>
</tr>
<tr>
<td>N/A</td>
<td>Frothing Agent Consumption @ 25 GPM Output; (1)-tote/6wks; $38,780/yr</td>
</tr>
<tr>
<td>Organic Coagulant Consumption: 700Lbs/Day; $130,000/yr</td>
<td>Organic Coagulant Consumption: 350Lbs/Day; $65,000/yr</td>
</tr>
<tr>
<td>Cationic Polymer Consumption: 120Lbs/Day; $87,600/yr</td>
<td>Cationic Polymer Consumption: 120Lbs/Day; $87,600/yr</td>
</tr>
<tr>
<td>Anionic Polymer Consumption: 110Lbs/Day; $50,000/yr</td>
<td>Anionic Polymer Consumption: 0-Lbs/Day; $0.00/yr</td>
</tr>
<tr>
<td><strong>Total O&amp;M Costs/yr: $288,540</strong></td>
<td><strong>Total O&amp;M Costs/yr: $196,610</strong></td>
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<tr>
<td></td>
<td><strong>Net Savings/yr: $91,930</strong></td>
</tr>
</tbody>
</table>
SAF is mechanically simpler than a DAF:

- Removes recirculation pump, header, compressor, and air lines.
  (No more air lines plugging in header which would also cause packing to blow out on recirc pump.)
- No requirement for lamella style plates
- Less maintenance

It’s operator friendly.

- It’s 6 times more efficient than a DAF (20-40 lbs/hr/ft\(^2\) vs. 5 lbs/hr/ft\(^2\)).
- You can adjust the froth flow (i.e. floatation air) to the loading.
- Feed less chemical (less polymer mixing).
- Better results
- Thicker Solids