Tutorial for Equipment Selection for Produced Water Treatment
Mechanical Treatment Options

- Filtration
  - Bag
  - Media such as sand or walnut shell
- Oil-Water Separators
- Settlement
  - Uses gravity and residence time, perhaps aided by flocs/coags, to drop solids to the bottom of weir tanks or clarifiers
- Dissolved Air Flotation (DAF)
  - Uses compressed air to generate tiny bubbles that float solids and oil to the surface of the DAF tank
- De-Watering Via Filter Press or Centrifuge
  - Results in a relatively dry filter cake that can be sent to a landfill
  - Allows water to be captured and recycled
We are seeing more operators select DAF over the alternatives so we will focus here on DAF

**Advantages:**
- Greater effectiveness (1 DAF can do the work of 5+ weir tanks)
  - DAF will typically remove oil & grease to < 100 mg/L and TSS to < 100 mg/L
- This effectiveness leads to less need for downstream filtration
- Smaller footprint due to fewer tanks
- Drier slurry with DAFs than with weir tanks so reduced disposal cost
- Self-cleaning capability while continuing to operate

**Disadvantages:**
- Requires a relatively steady inflow of water
- The turndown ratio on a DAF unit may be more limited than weirs
- Lack of oil industry familiarity with DAF which has been in the oilfield since around 2015 but in municipal and industrial use for decades
• DAF uses air bubbles to float solids and oil to the water surface which is faster than relying on gravity and residence time to sink solids to the bottom
• A DAF tank has a V-shaped cross section with 4 chambers – contact chamber, flotation chamber, float hopper, and effluent box made of stainless steel or polypropylene
• Tank has a skimmer on top, a solids auger on bottom, and a whitewater system to create tiny bubbles than dissolve air into water in the contact chamber
• Air bubbles require floc/coag to effectively attach to solid particles and float them to the surface in the flotation chamber
• Skimmer blades push the float matter into the float hopper which is then pumped to a frac tank where a vacuum truck empties the tank weekly
• Clarified water passes through the flotation chamber to effluent box, then flows into an impoundment or first through sand filters
• Major mechanical parts are the recycle pump and skimmer motor drive
Experts in Water Treatment & Oilfield Chemistry

**Solids Removal vs Solids Settlement in Pond**

### Annual Cost of DAF Equipment and Chemicals

- DAF equipment plus flocs/coags: $375,000
- Weekly vacuum truck plus disposal: $300,000
- Total Cost: $675,000

### Annual Cost of Solids Settlement in Pond

- $1MM every 4 years to clean pond: $250,000
- Weekly vacuum truck plus disposal: $300,000
- Pond treat cost to control bacteria: $300,000
- Frac tank and line cleaning cost: $100,000
- Total Cost: $950,000

### Conclusion:

Upfront solids removal can pay for itself, plus it provides the benefit of a clear brine frac water.

Note: The above figures are highly approximate and only indicative.
Oxidation and DAF Process Flow Diagram

PW Tank → Oxidant → Coag → DAF → Clear Brine

DAF → Floc

Frac Tank

Slurry to Disposal

Slurry to Disposal
For additional information, contact:

Joe Abell

(713)-202-1053

jabell@artesia-ecoscience.com