Screw Press Dewatering Optimization

By

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Where should your focus be???

What is the objective of your optimization?

- Maximize Capacity: Solids Loading, Flow Rate
- Maximize Cake Solids
- Minimize Polymer Usage
- Stable performance: consistent cake solids
- Reduce Operating Labor
- Lower Energy Costs
- Reduce maintenance costs
- Increase Screw Press availability
- Improve material handling properties
- **Any others you can thinking of???**

Solids Capture!!!

What is Solids Capture:

(Percentage of suspended solids in the feed that ends up in the discharge)

% Capture = (C/F) [(F-E)/(C-E)] x 100%

Where:

C = Dewatered Sludge Total Solids (% TS)

F = Feed (% TSS); excluding any dilution from polymer solution flow

E = Filtrate (% TSS); excluding any dilution from polymer solution and belt wash water flows

Dewatering Optimization usually focuses on Cake Solids, in this effort filtrate clarity, solids capture, takes a back seat.

Tools for Optimization:

- **Chemical Treatment:**
  - **Type**
  - **Dosage**
- **Operator Observations**
- **Equipment settings:**
  - **Flows**
  - **Screw Rpm**
  - **Cone Pressure**
  - **Feed Pressure**
- **Instrumentation:**
  - **Flows**
  - **Suspended Solids**
  - **Turbidity**
  - **Zeta potential**
- **Mechanical Condition of Equipment**

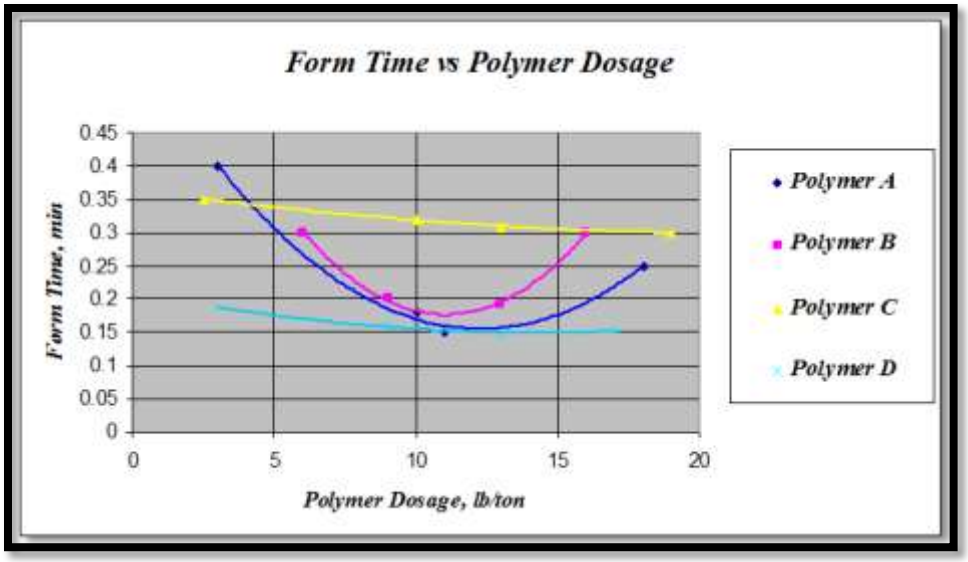
Monterey CA, WWTP, Screw Press

Chemical Treatment:

- **Laboratory:**
  - **Polymer Screening**
    - **Charge, Charge Density, Linear / Branched**
  - **Conditioning:**
    - **Mixing Intensity, Dosage,**
    - **Time**
  - **Bench Simulations**
- **Full Scale Trials**

Chemical Treatment

- Form Time, Sludge Volume Ratio.
- Filtrate Clarity
- Flocc Structure
- Spreading
- Cake Release
- Amount of Solids Expressed



Bench Simulations:

- Bench Simulations:
  - Spreading
  - Cake Release
  - Expressed Solids

Observations:

- **Flocc Structure**

Observations:

- Filtrate Clarity
- Drainage along Screw

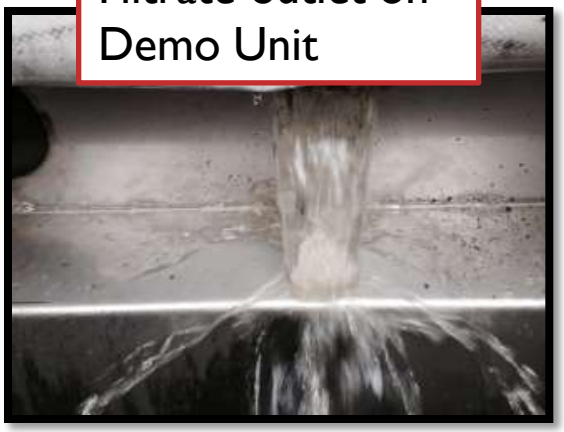
Filtrate and Polymer:

Excess Polymer

Perfect

Observation: Filtrate Clarity:

Filtrate often isn't observable



Filtrate outlet on Demo Unit

Turbidity Instrument on filtrate discharge line.

A good plant design should make filtrate clarity observable (preferred) or measured.

Observations:

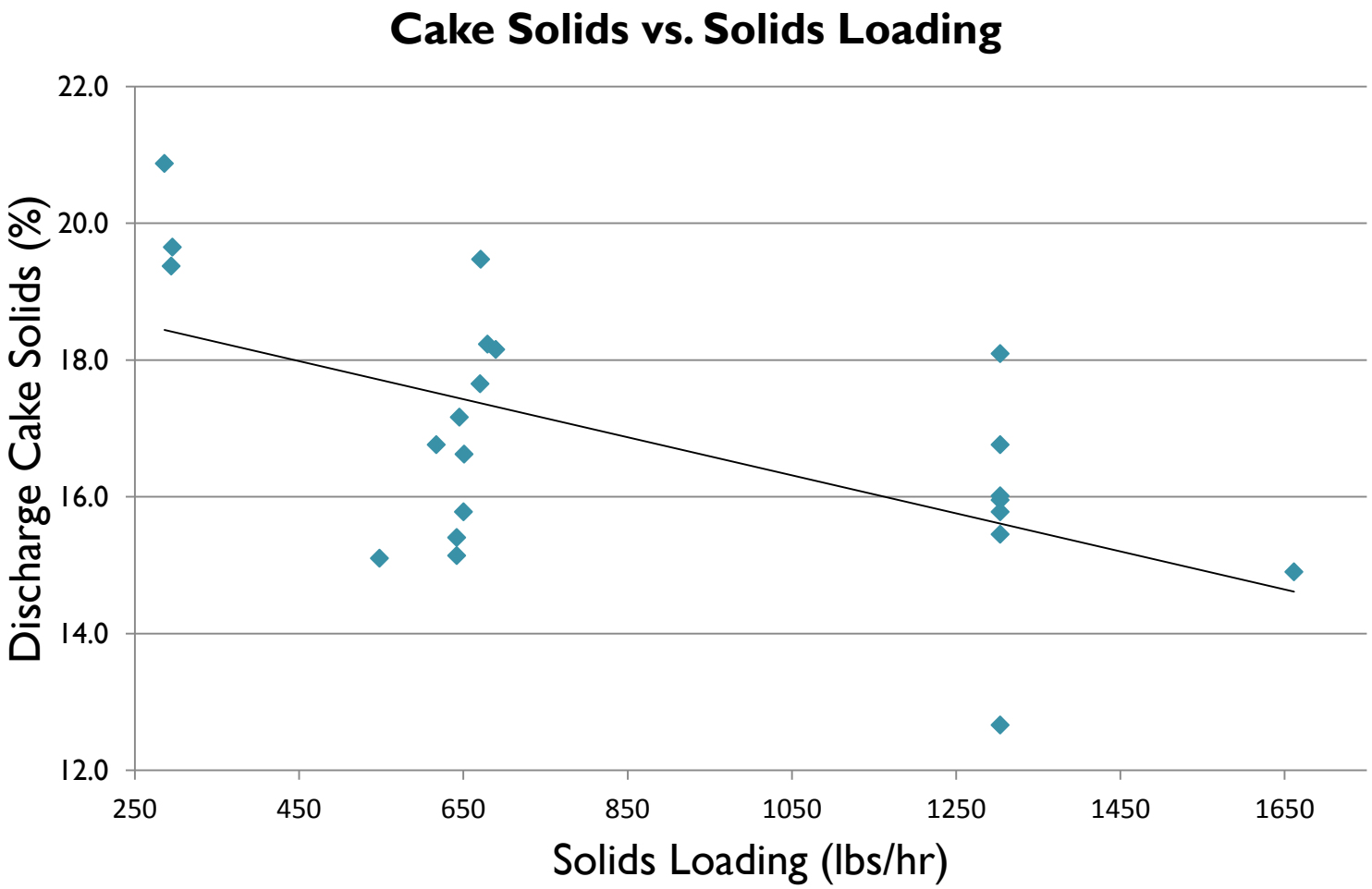
- **Discharge Cake**
  - Scaly look at cone
  - Powdery look on pile
  - Pile Bounce

Equipment Settings:

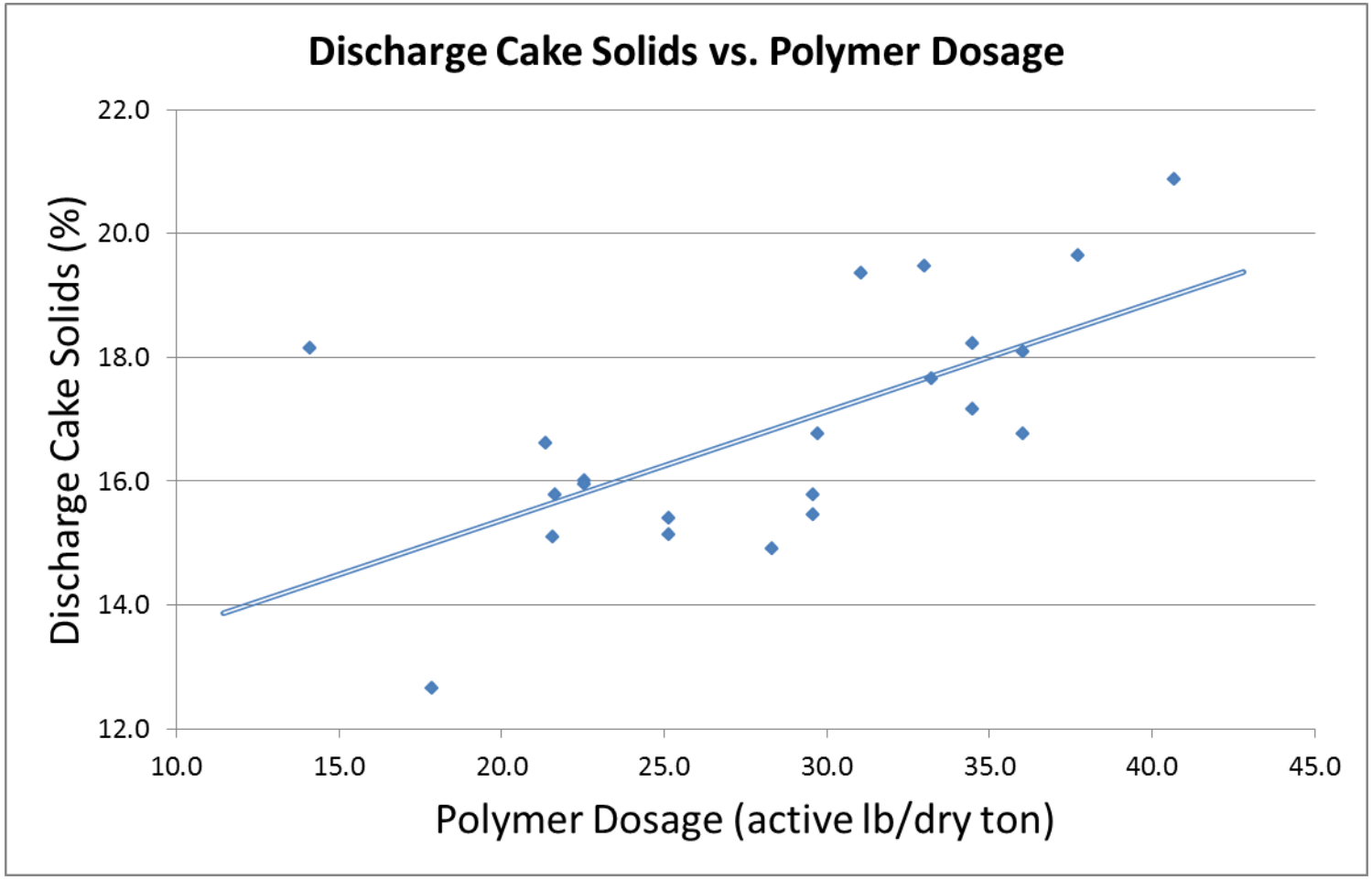
- **Control Panel Setting:**
  - **Flows:**
    - **Feed Flow, gpm**
    - **Polymer Flow, gph**
  - **Screw, rpm**
  - **Screw Torque, amps**
  - **Cone Pressure, psi**
  - **Feed Pressure, psi**
- **Ohaus:**
  - **Feed Suspended solids**
  - **Cake solids**
- **Spread Sheet Calculations:**
  - **lb/hr, lb/ton**

Ohaus

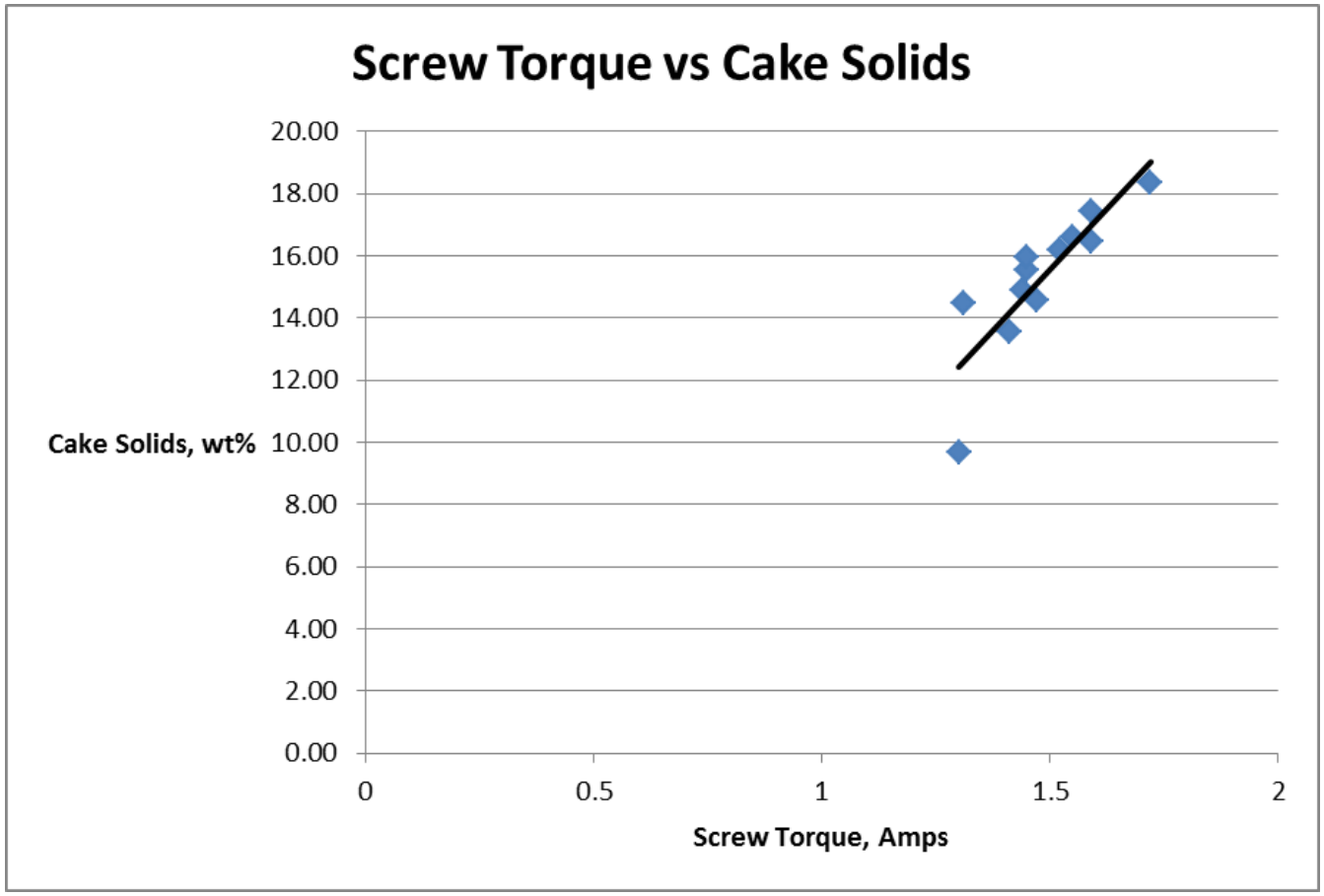
Screw Press Optimization



Screw Press Optimization



Screw Press Optimization



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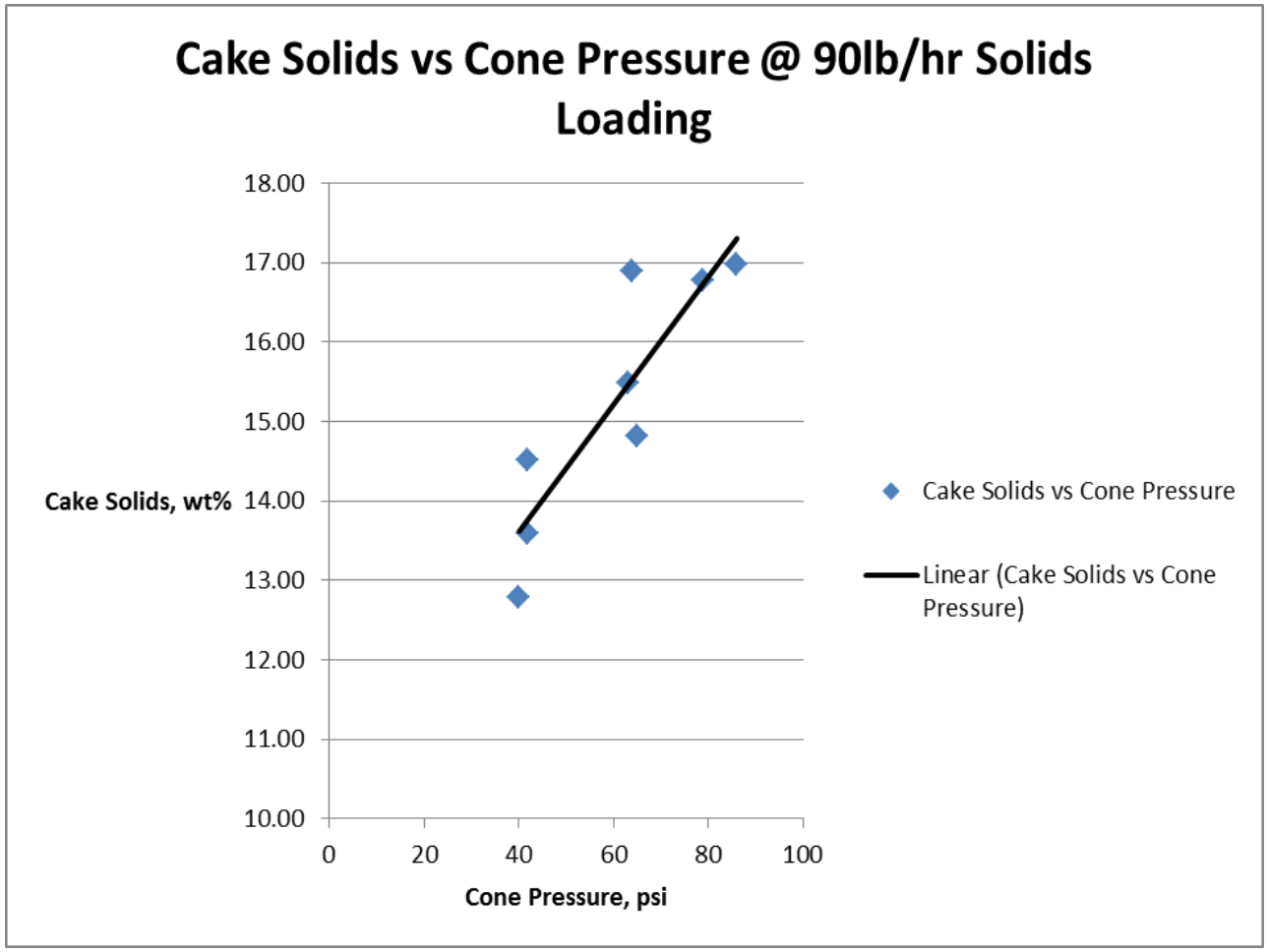


Instruments:

- Magnetic Flow Meters: highly recommended.
- Pump rpm
- Turbidity Sensors
- Pressure / Weight Sensors: Sludge Levels in Chutes / Pumps etc.
- Belt Scales
- Others, not recommend: Viscosity, Streaming current, zeta potential

Mechanical:

- Flight brushes: required to keep cake heel from developing.

Shower Assembly:

- Important the shower assembly has:
- adequate pressure
- nozzles are clean.
- Frequency is optimum.
- Batch or Continuous.

Why is Solids Capture Critical?

- Industry standard 95%, many below 80% and some as low as 60%.
- Dirty filtrate means accelerated wear on dewatering unit
- Increase labor in keeping facility clean
- Recycled solids wear on pumps and other equipment.
- Increases dewatering chemical costs and lowers cake solids.
- More important with Smaller size wwtp.

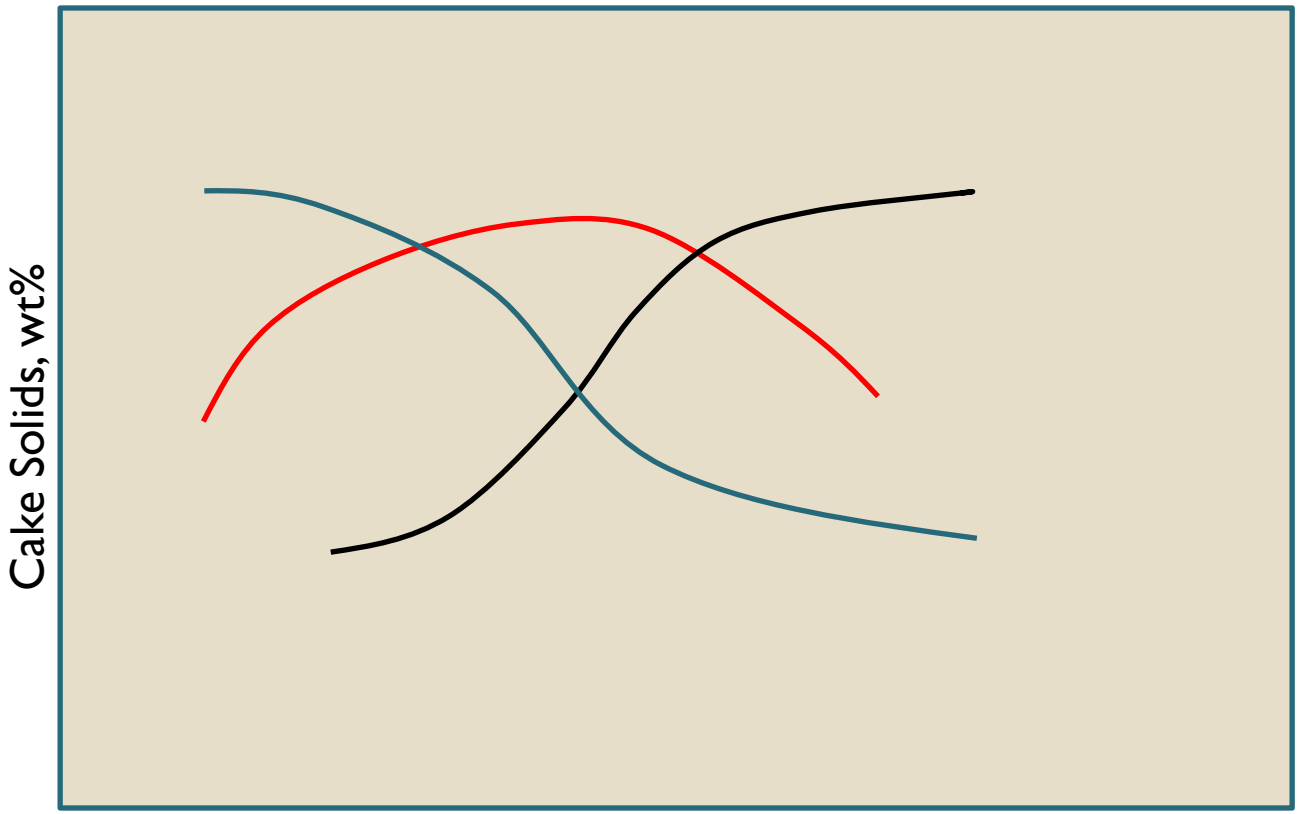
On a Broader Scale Poor Solids Capture Causes:

- Higher energy costs for plant
- Lowers plant performance
- **Creates additional particles that are difficult to dewater.**
  - Bacteria type, filamentous
  - Colloidal Particles
  - Particles with poor surface chemistry for flocculation
- **Best to get these out in the first pass**

Sulfur Springs WWTP Texas

- 17% cake solids was maximum possible
- New Dewatering System with improved capture
- 3 months later, 23% cake solids.

Optimization is multi dimensional and intricately related:



Increasing: Chemical Dosage / Cone Pressure / Solids Loading

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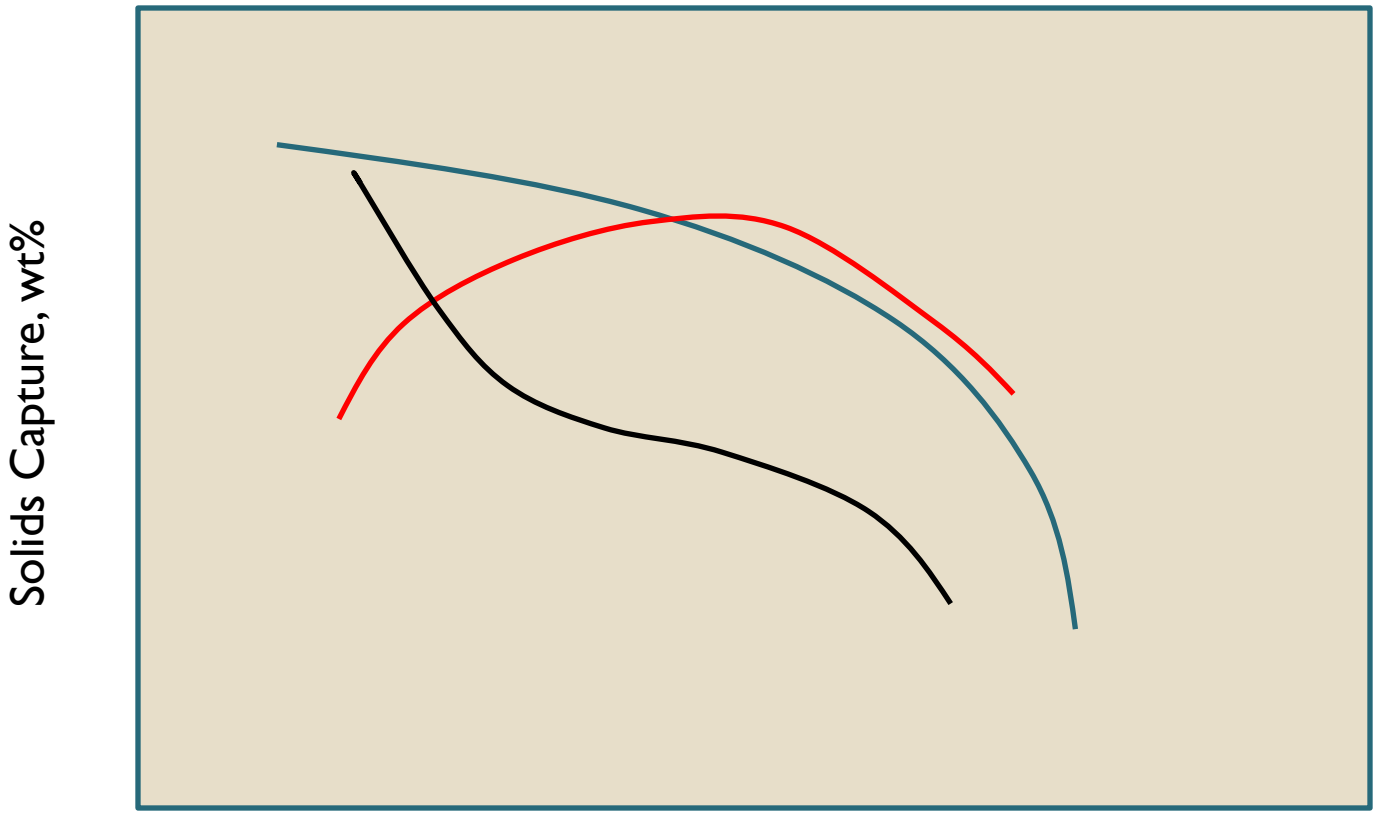

Increasing: Chemical Dosage / Cone Pressure / Solids Loading

Stable "Feed Solids Concentration" is of Critical Importance and Often poorly designed.

- **Mixed surge tank.**
  - **60 minutes**
  - **Dampens out changes**
  - **Operators have time to react.**

- ***Chemical dosage***
- ***Solids Loading***
- ***Cone Pressure***
- ***Etc.***

Consistency in monitoring all the factors key

- Develop Relationships that consider all the factors.
- Effort will yield improved overall plant performance.
- It is worth the effort.

Questions?