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DEWATERING

IWEA Plant Operations

October 26th 2011

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Introduction and Background

- Synagro is a dewatering company
- 47 mobile belt filter presses
- 18 mobile centrifuges
- Operate 38 presses and centrifuges for municipal clients
- Results driven-Optimize the process for desired results
- Operates in 38 states
- Mobile Dewatering, Dewatering Services, Land application, Pelletization and renewable energy.

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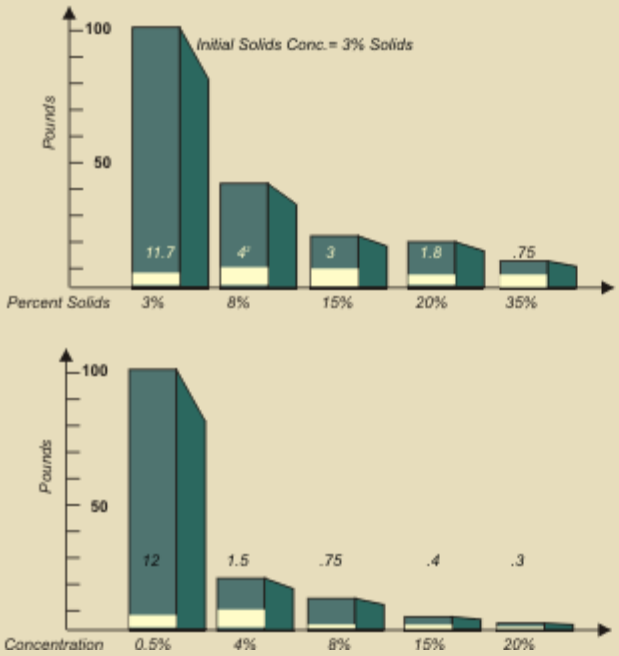
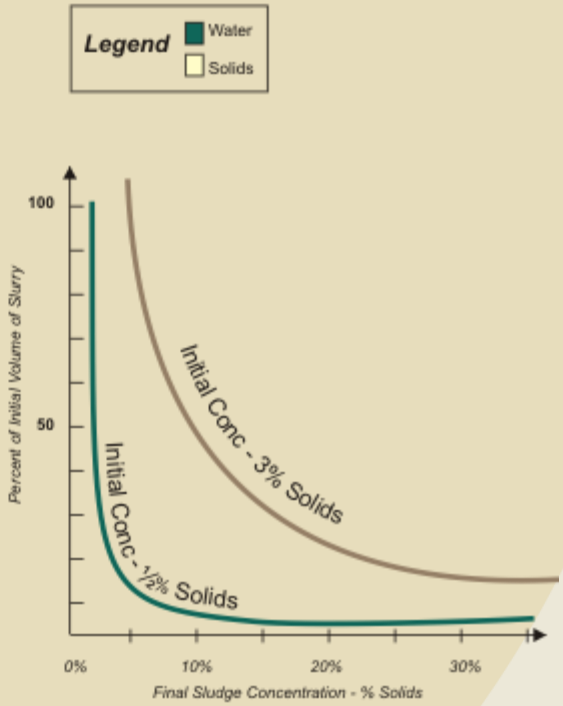
Why Dewater

SLUDGE DEWATERING AND CONCENTRATION



Volume Reduction and Solids Concentration



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Why Dewater

- **Reduced volume of material**
- **Disposal option (landfill)**
- **Allows for more storage**
- **Mitigate weather issues**

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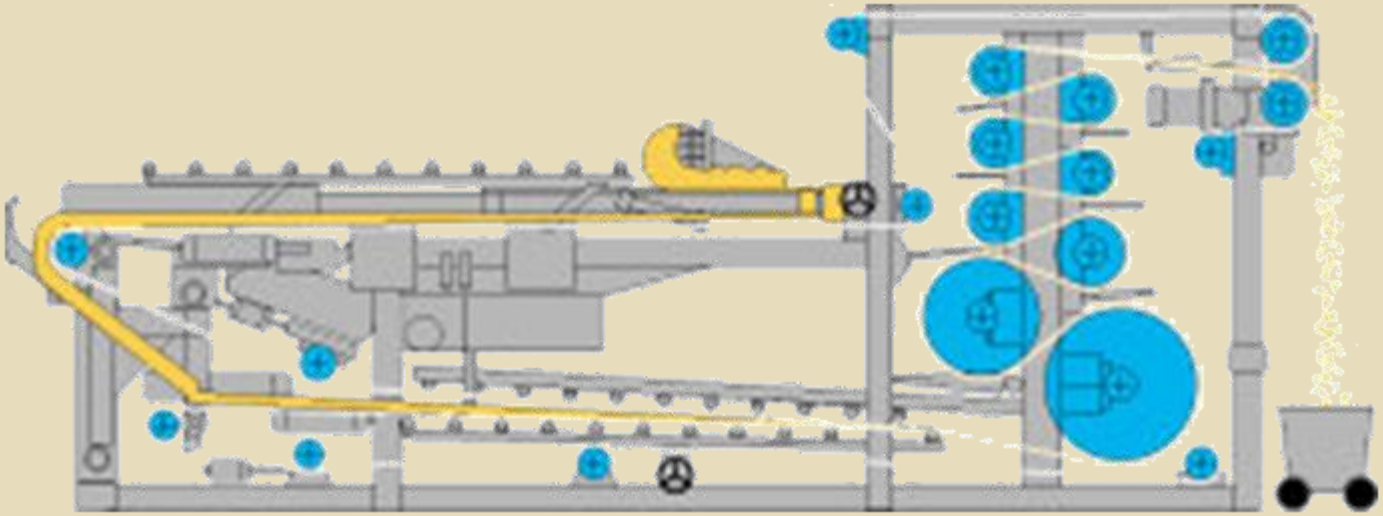
Types of Dewatering

BELT FILTER PRESS



- LOW CAPITAL COST
- EASY TO OPERATE
- HANDLES WIDE VARIETY OF SLUDGE'S
- EASILY MADE MOBILE
- LOW POWER CONSUMPTION

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Types of Dewatering

Belt Press Issues

- Footprint
- Odor
- Water Consumption

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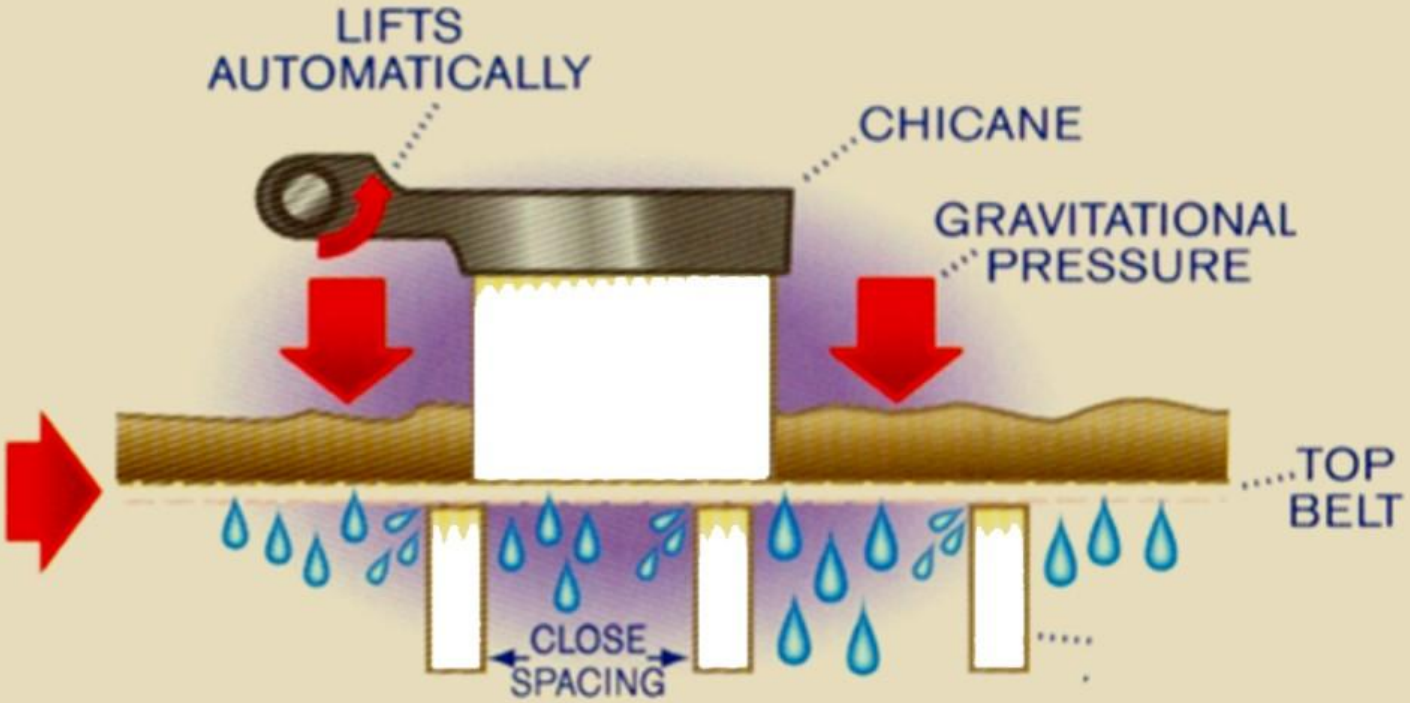
Belt Press Dewatering



60-70% of Dewatering Occurs Gravity Section

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Types of Dewatering

Centrifuge

- Higher Cake Solids
  (Typical 2-5% than BFP)
- Lower Odor/easier to control
- Low water consumption
- Smaller Foot Print
- Higher Capital Cost

Wear is based on sludge type and operating conditions

Maintenance- Higher, less tolerance for wear

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Centrifuge vs. Belt Press

- **Belt press water consumption 2M: 48,000 gallons**
  - Power Requirements:
    - 5 Days per week
    - 10 hours per day
    - 260 days .065KWH
- **Centrifuge Cost $25,868**
- **Belt Press $6,467**

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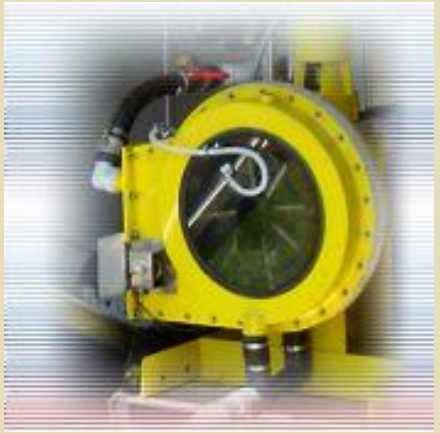
Types of Dewatering

Geotextile Fabric
- Space considerations
- Cake solids
- Time to complete



Rotary Press
- THROUGHPUT
- DRY CAKE
- FLEXIBILITY

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BFP Matrix

Sludge Type	Feed Solids (% TS)	Ash (% of TS)	Dry (lbs/Meter)	GPM (Meter)	Polymer Consumption (lbs ton/TS)	Cake Solids (% TS)	Capture (% TSS)
Mixed Anaerobic Digested	1-3*	30	700	50-100	18-20	15-18	95
Thickened Aerobic Digested	2.5-3.5	15	600	40-50	20-24	12-14	95
ATAD	2-3	15	600	40-50	50-70	12-14	95
100% WAS	2-3	20	700	40-50	18-22	15-16	95
100% Primary	3-5	20	1,600	60-100	6-8	26-30	95
50/50 blend (p/WAS)	3-5	20	1,000	50-75	12-14	20-22	95
Oxidation Ditch	.8-1.2*	20	800	150-200	16-20	12-14	95

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Centrifuge Matrix

D6 SERIES DEWATERING MATRIX

Sludge Type	Feed Solids (% TS)	GPM	Polymer Consumption (lbs ton/TS)	Cake Solids (% TS)	Capture (% TSS)
Mixed Anaerobic Digested	1-3	130-300	15-30	20-25	97
Thickened Aerobic Digested	2.5-3.5	105-275	15-25	18-23	97
ATAD	2-3	105-200	30-70	15-19	97
100% WAS	2-3	150-250	11-25	18-25	97
100% Primary	3-5	90-220	5-15	25-35	97
50/50 blend (p/WAS)	3-5	105-250	12-18	23-32	97
Oxidation Ditch	.8-1.2	150-220	15-20	14-20	97

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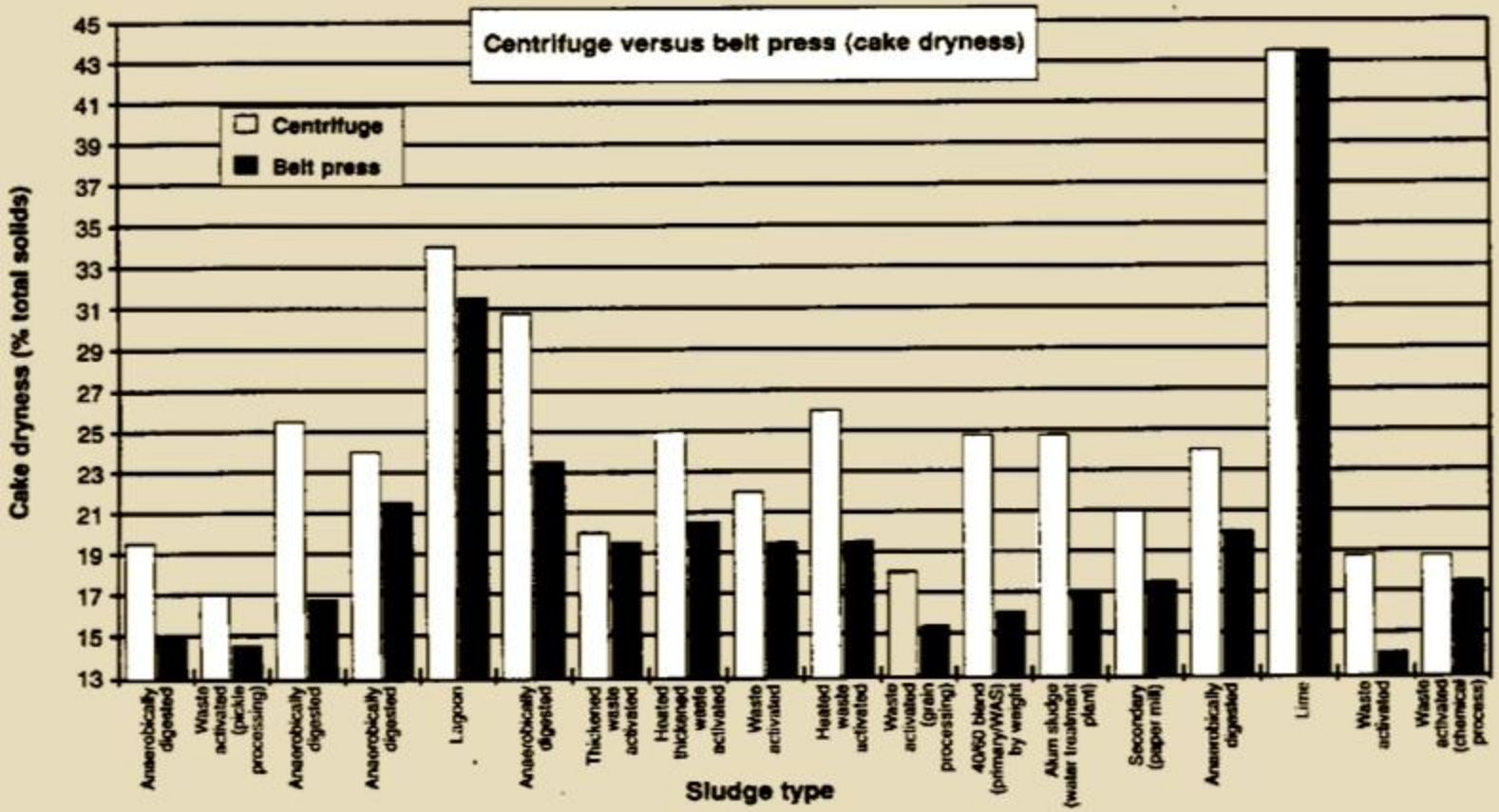

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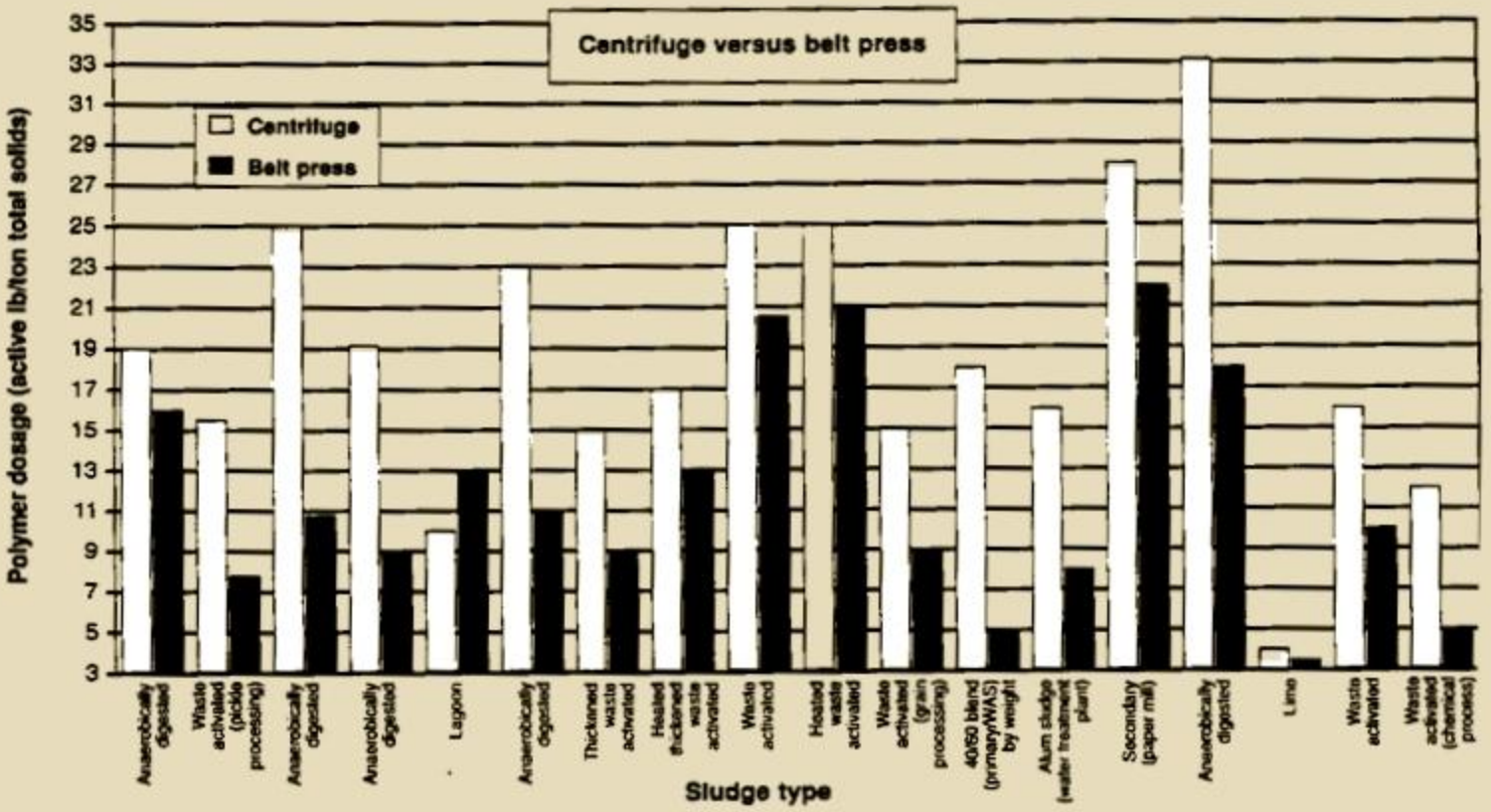
Polymer Dosage Requirements



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Bench Testing

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Samples sent to Baltimore

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Testing for

- Feed Solids
- Cake solids
- Polymer use cost
- Throughput Calculations
- Drainage, Floc strength, Cake quality
- Ash-Inorganic content/Volatile solids
- Capillary suction test
- pH

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Polymer Selection

- Neutral Vendor selection
- Performance and Use cost
- Trial and error based on experience
- Lowest Use cost, Not Price per LB

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Volumes vs. Dewatering

Dewatering sample may not represent the best sample for volume calculations

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Pressed Cake

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Centrifuge

Perform Belt Press Test

- Test with higher polymer dosages
- More stress on floc
- Add dilution water to floc
- Let stand for at least 2 minutes after water added
- Drain for 15 seconds

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Key points for bench tests

- **Ensure sample quality**
- **Use polymer samples from vendor and on-hand supplies**
- **Be consistent-all tests the same**
- **Multiple tests per sample**
- **Match age time and solution strength**
- **Tests are accurate for the sample**

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Differences from Tests

- **Polymer solution strength**
- **Polymer injection point**
- **Proper water pressure-belt press**
- **Proper belts**
- **Polymer system (undersized, gel caps)**
- **Water source for polymer make-up**
- **Weir Plates-Centrifuge**

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Sampling

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Material Volumes Digester/Tanks

- Difficult to Sample
- Sometimes Sealed
- Uneven Material/Layers

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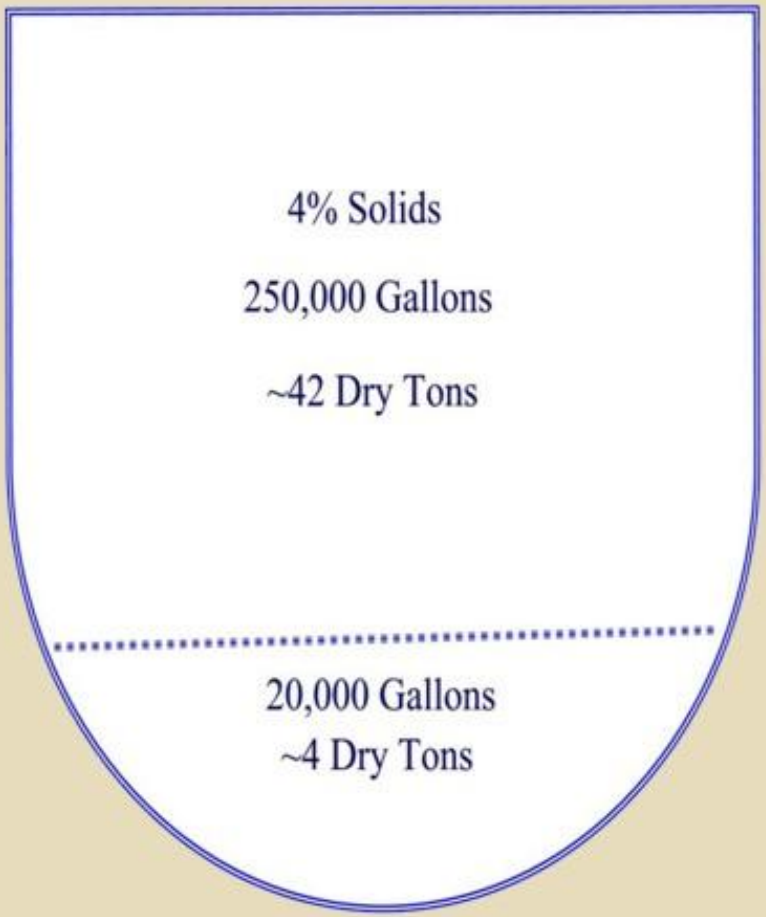

Total of ~46 Dry Tons

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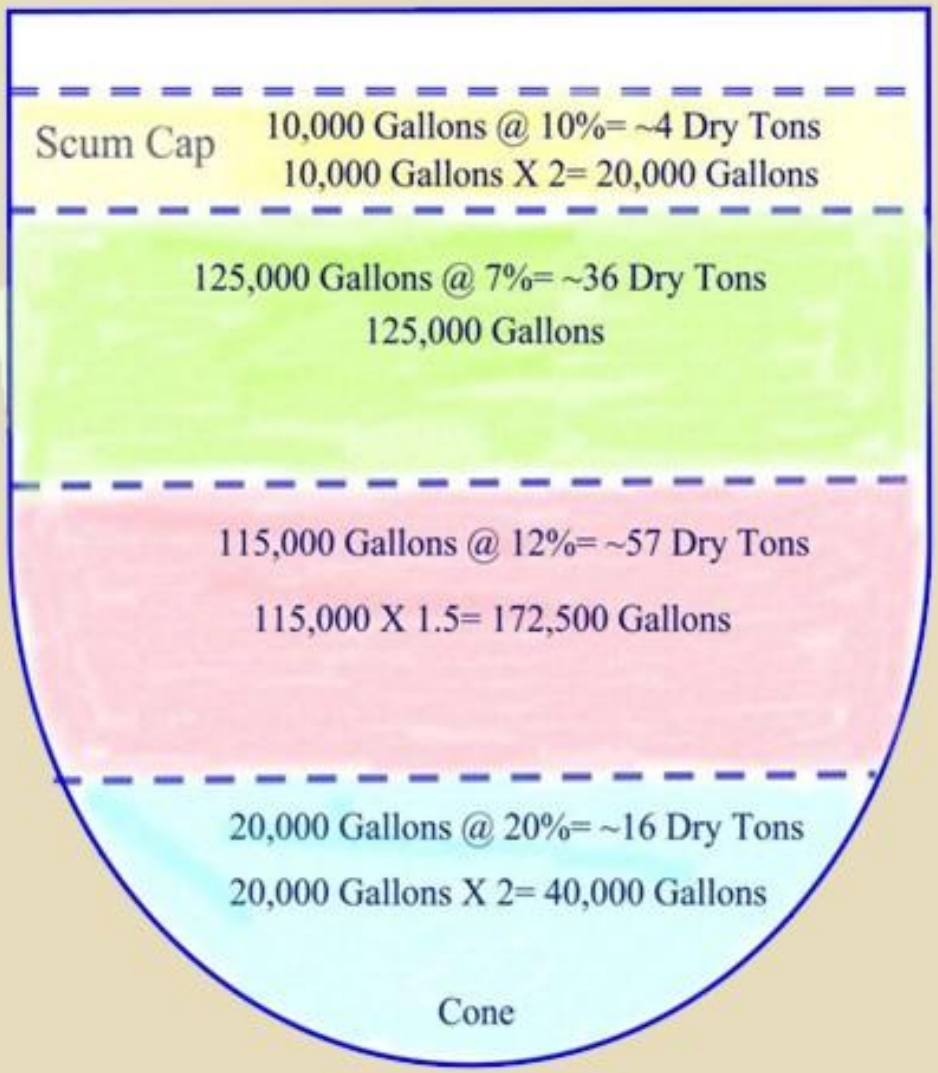

Total Dry Ton 113 Total Gallons 357,000

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Alexandria Digester

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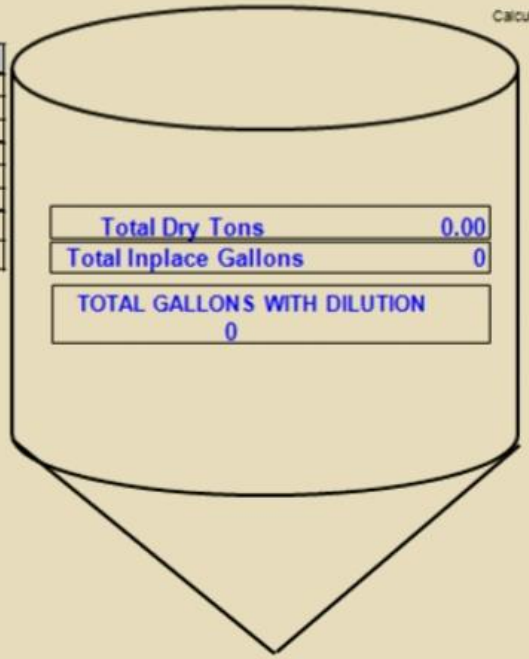
DIGESTER VOLUME CALCULATIONS

Digester Diameter 0.00 Total Sidewall Depth 0.00

ZONE 1		ZONE 2		ZONE 3		ZONE 4		ZONE 5	
Depth	0.00	Depth	0.00	Depth	0.00	Depth	0.00	Depth	0.00
% solids	0.00	% solids	0.00	% solids	0.00	% solids	0.00	% solids	0.00
Gallons	0	Gallons	0	Gallons	0	Gallons	0	Gallons	0
Dry Tons	0.00	Dry Tons	0.00	Dry Tons	0.00	Dry Tons	0.00	Dry Tons	0.00
% Dilution	0.00	% Dilution	0.00	% Dilution	0.00	% Dilution	0.00	% Dilution	0.00
Total Dilution	0	Total Dilution	0	Total Dilution	0	Total Dilution	0	Total Dilution	0
Total Gallons	0	Total Gallons	0	Total Gallons	0	Total Gallons	0	Total Gallons	0

Calculations are rounded

CONE CALCULATION	
Depth of cone	0
Diameter	0.00
% solids	0.00
Gallons	0
Dry Tons	0.00
% dilution	0.00
Total Dilution	0
Total Gallons	0



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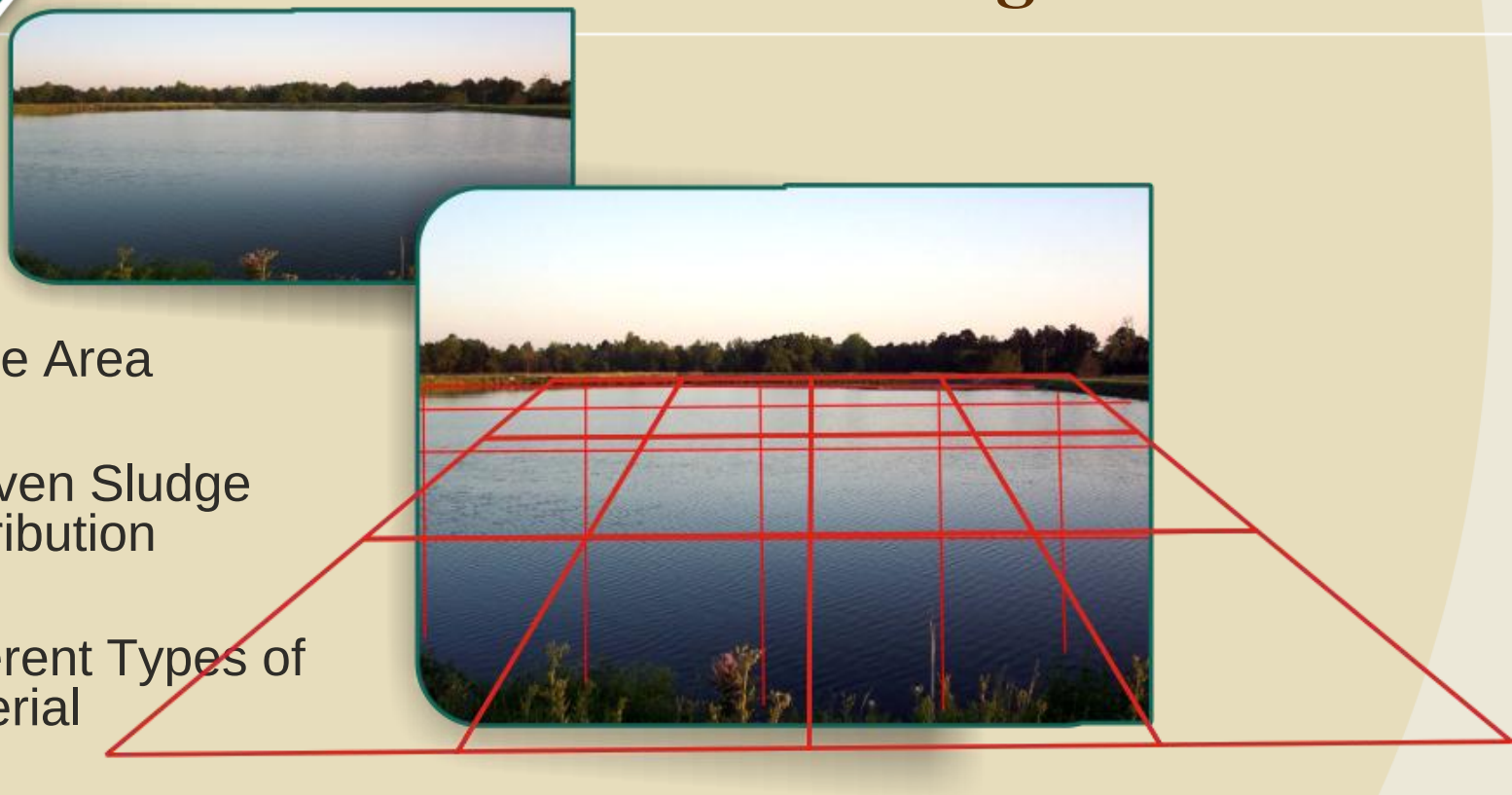
Lagoon Volumes



- Large Area
- Uneven Sludge Distribution
- Different Types of Material
- Difficult Access

Rectangular Pond with Sloping Sides

$V=ABh-(A+B)SH2+1.33S2H2$

V=Volume
A=Length of Liquid Surface
B=Width at Liquid Surface
S=Side Slopes
H=Depth of Liquid

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Processing Throughput

- Dewatering Equipment Process in Dry Tons
- Equipment has Hydraulic Limitations

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Dry Tons vs. Gallons

200 GPM @ 2% Solids= 1 DT/HR

200 GPM @ 6% Solids= 3 DT/HR

1 DT/HR at 1% is 400GPM

Belt Press Hydraulic Capacity 250-275GPM

Centrifuge 29” machine 250-325GPM

Varied % Solids on Clean Outs

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Questions

Questions and Troubleshooting.

Know your process and process key drivers!