



# Piloting for Evaluation of Innovative Residuals Dewatering Technologies

Presented By:

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# Agenda

- **Operational overview**
- **Existing process**
- **Dewatering technologies**
- **Bench scale and pilot scale testing**
- **Final selection and design**



# Operational Overview



# City of Gainesville, Georgia

- Located one hour northeast of Atlanta
- Provides drinking water for all of Hall County, GA
- Population: 200,000
- Drinking water source: Lake Lanier, size 37,000 acres
- Industry:
  - Chicken Process
  - Medical
  - Lanier Islands Resort
  - Top 3 Customers account for 33% of revenue

# City of Gainesville Water Treatment System

- Providing water service since approximately 1890
- Two water treatment plants
  - Riverside WTP (Built 1957) & Lakeside WTP (Built 2004)
- 35 MGD max day permitted system total
- 18 MGD system average production
- Dewatering of alum sludge for both plants occurs at same location

# Existing Process

# Existing Dewatering Equipment Characteristics

- Current press building was built in 1991 with a second press installed in 1993
- Two plate and frame presses
  - Age of presses – 24 and 26 years
- Currently only one plate frame press is operational
- Difficult to get parts for the existing presses due to manufacturing outside of US
- Large footprint
- Loud with many mechanical components requiring maintenance
- Dry polymer with mixing tanks

# Dewatering Building





# Existing Plate and Frame Layout



# Existing Dewatering Information

- Alum sludge
- Characteristics of sludge feed to dewatering
  - Solids Concentration: 2.5% - 4.5%, average 3%
  - Design process rate 200,000 gal/month dewatered
  - pH Range: 6.5 – 7
- Dewatered solids concentration
  - 14% - 25%
- Dewatered cake hauled to disposal location within the county at minimal cost
- Filtrate goes to City's Linwood WRF

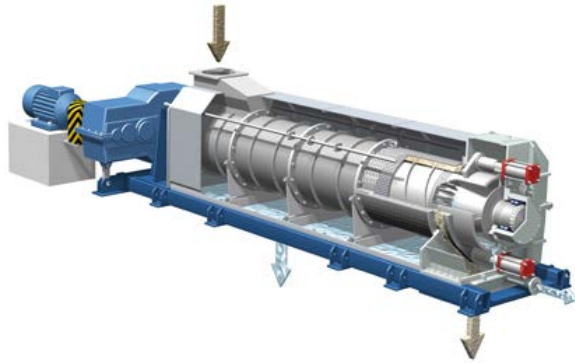
# New Dewatering Technology Design Criteria

- Solids loading rate – 600 lbs/hr
- Hydraulic loading rate – 30 gpm
- Redundancy – 1 duty and 1 standby
- Runtime – 35 hours per week
- Cake solids – 15% to 20% minimum
- Operational constraints
  - One existing plate and frame press needs to remain in service during construction

# Additional Criteria for Consideration

- Equipment manufactured in US and/or spare parts available in US
- Layout (fits in existing footprint)
- Convert to emulsion polymer
- New feed pumps
- Short lead time
- Life cycle cost
  - Capital cost
  - Operating cost
  - Maintenance cost
- Equipment to load truck evenly

# Dewatering Technologies Investigated



Screw Press



Volute Press



Rotary Fan Press



Centrifuge



Belt Filter Press

# Bench Scale & Pilot Testing Experience

# Testing Approach

- Started with bench scale testing. Tried to test at least one manufacturer of each technology
- Narrowed technologies down and then planned site visits
- Pilot tested short-listed technologies

# Bench Scale Testing

- Collected sludge samples and mailed to manufacturers
- Manufacturer's performed sludge dewatering with their equipment at their facilities and provided analysis
- Technologies available for bench scale testing:
  - Screw Press (Andritz, FKC)
  - Rotary Fan Press (Prime Solutions)
  - Centrifuge (Centrysis, Andritz)
  - Belt Press (Andritz)



# Bench Scale Test Summary Table

	Screw Press	Rotary Fan Press	Centrifuge	Belt Filter Press
Dewatered Cake (% solids)	17 – 19	16 - 18	21 - 26	13 – 14
Capture Rate (%)	95	95	95	96
Solids Loading (lb/hr)	565 - 605	745	605	900 - 1300
Hydraulic Loading (gpm)	36 - 40	30	30 - 60	47 - 68
Polymer Dosing (lb/dt)	5 - 8	17 - 22	5 - 6	4 - 5

# Site Visits

- Engineer and Owner's personnel only no manufacturer or sales representatives
- Visited one of each technology
- Tried to find units in close proximity to City of Gainesville and of comparable size to the desired units for the project.
- Technologies selected for site visits:
  - Screw Press (Seneca, South Carolina)
  - Volute Dewatering Press (Jasper, Alabama)
  - Rotary Fan Press (Tybee Island, Georgia)

# Pilot Testing

- Provides opportunity for all plant personnel to observe technology in operation
- Pilot testing units are typically smaller than design but should be the same mechanically
- Technologies selected for pilot testing:
  - Screw Press (FKC)
  - Volute Dewatering Press (PW Tech)
  - Rotary Fan Press (Prime, performed approximately 1 year earlier)

# Pilot Testing Summary Table

	Screw Press	Volute Dewatering Press	Rotary Fan Press
Dewatered Cake (% solids)	16 – 20	18 - 26	15 - 17
Capture Rate (%)	95	95	95
Solids Loading Rate (lbs/hr)	12 - 50	60 - 90	NP
Hydraulic Loading Rate (gpm)	0.6 – 2.5	3 - 4	NP
Polymer Dosing Rate (lb/dt)	9 - 11	7 - 18	14 - 18

# Volute Press Testing Photographs



Dewatered Solids (Cake)



Pressate (Filtrate) During Dewatering

# Testing Experience Summary

## Bench Scale Testing

- Inexpensive
- Determine potential cake solids
- Required owner to collect and prepare shipments
- Removed outlier technologies
- Early indication for polymer dosing

# Testing Experience Summary

## Site Visits

- Talk with operators who use equipment to obtain operational and maintenance experience
- See full scale equipment in service
- See equipment after it has been in service to evaluate potential maintenance concerns

# Testing Experience Summary

## Pilot Scale Testing

- Multiple days of testing
- Use actual sludge to be processed
- Experiment with polymers
  - Liquid
  - Dry
- Convenient for all staff to observe operation



# Final Selection and Design

# Comparison Tables

Technology	Polymer	Size	Manuf. in US	Building Upgrades
Screw Press	High	Large	N	N
Volute Press	Med	Small	Most	N
Fan Press	High	Small	Y	N
Centrifuge	Med	Med	N	Y

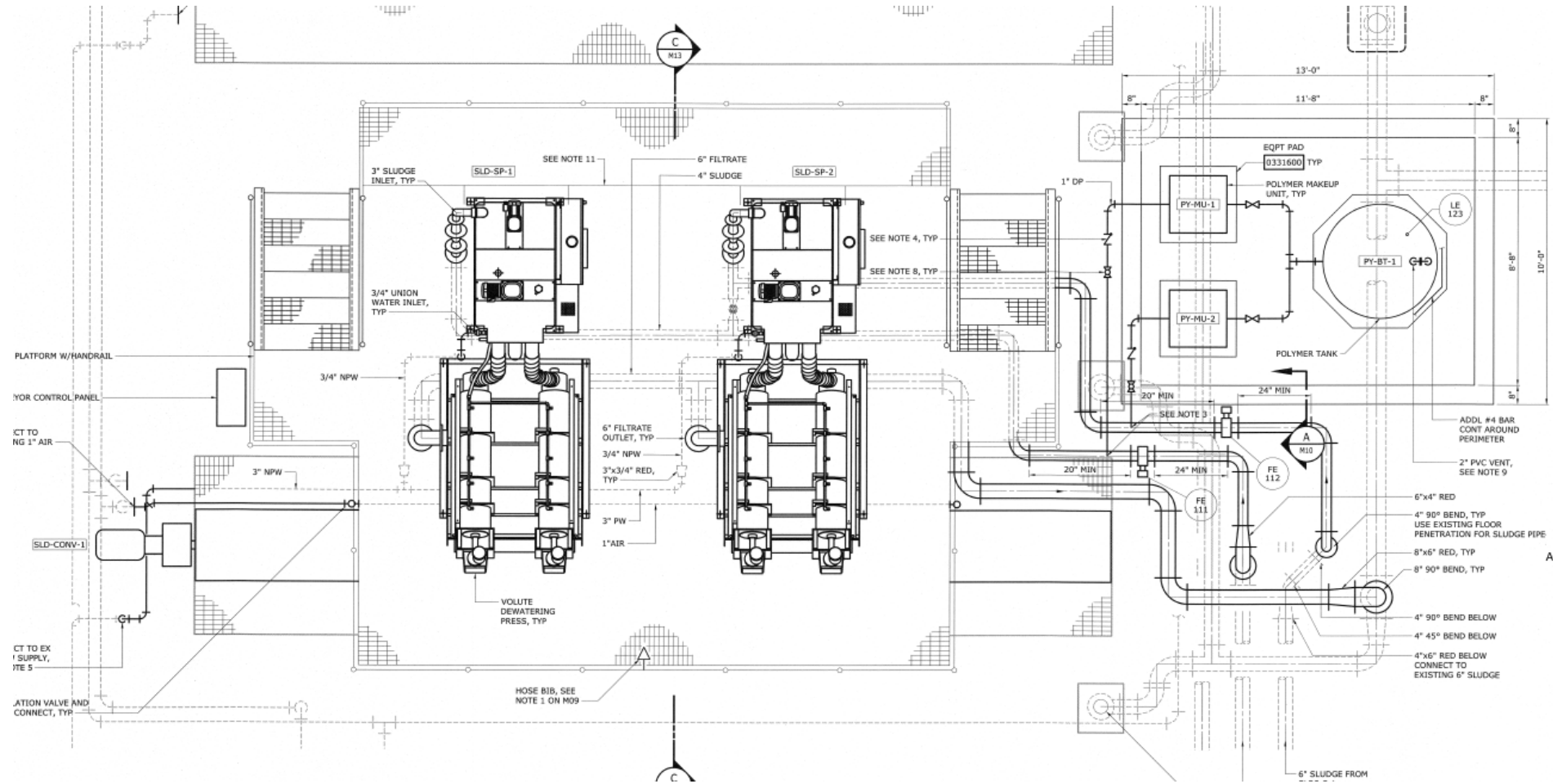
	Screw Press	Volute Dewatering Press	Rotary Fan Press	Centrifuge
Differential Construction Costs	\$1,162,757	\$1,052,130	\$960,467	\$1,328,703
Yearly Operating Costs	\$32,439	\$20,473	\$28,916	\$10,638

Note: Equipment comparison only, not total project cost

# Technology Selected – Volute Press

- Footprint of two units fits in one side of building allowing existing plate and frame to stay in service
- Units have ability to be expanded within design footprint without having to go through a capital improvement type project.
- Future expansion will not require modifications to the ancillary equipment.
- Pilot testing results show lower polymer consumption than other options and still being able to meet cake solids requirements
- Ease of operation and maintenance
- Manufacturing and inventory of replacement parts in the US

# Final Layout



# Key Take Aways

- Bench scale testing, pilot testing and site visits are critical
- Scheduling of testing is important to fit the design schedule
- Bench scale testing may require owner sampling
- Modification may be necessary for pilot testing
- Crucial to get input from operations and maintenance staff
- One technology does not fit all

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