

Other Water Treatment Plant Residuals Dewatering Equipment: An Investigation of Screw Press Technology

Lynn Williams, P.E. (WA)

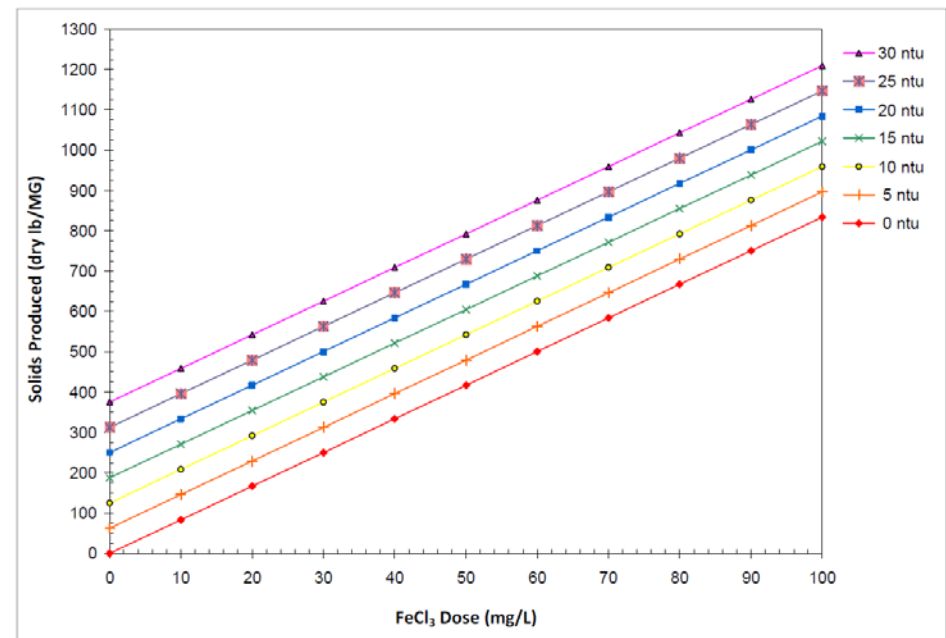


Presentation Roadmap

- Discuss residual handling technologies
- Comparison of capital and O&M costs
- Pilot testing findings
- Water quality and piloting considerations

Types of Residuals

- Sedimentation sludge or spent filter backwash water
 - Removal of both organic and inorganic contaminants
 - Particulate and colloidal
- Chemical softening for removal of calcium and magnesium
 - Remove trace metals, radioactivity, and particles (if surface water)
- Ion exchange processes
 - Remove cations or anions
 - Produce brine residual
- Membrane concentrate
 - Particulates and dissolved solids



Residual Solids Handling Alternatives



- Non-mechanical dewatering
 - Drying beds
 - Geobags
- Mechanical dewatering
 - Belt filter press
 - Centrifuge
 - Screw press

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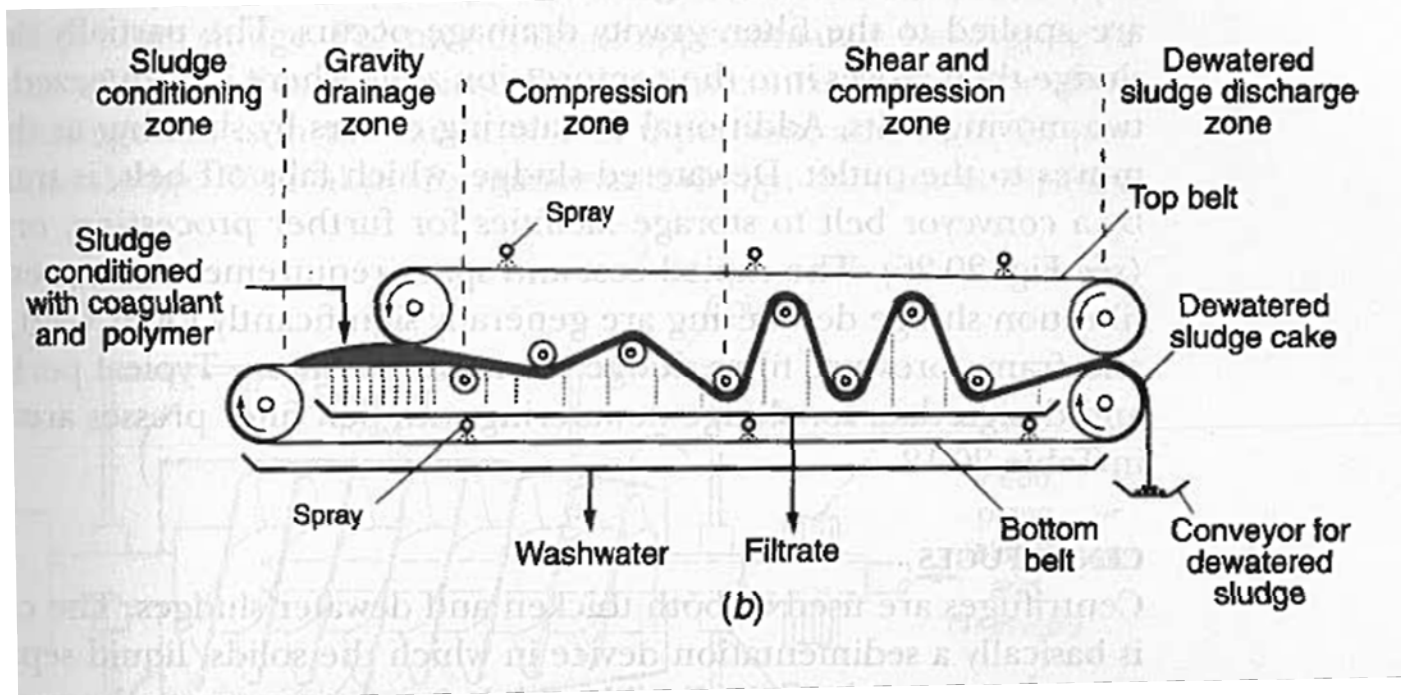
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Mechanical Dewatering Alternatives

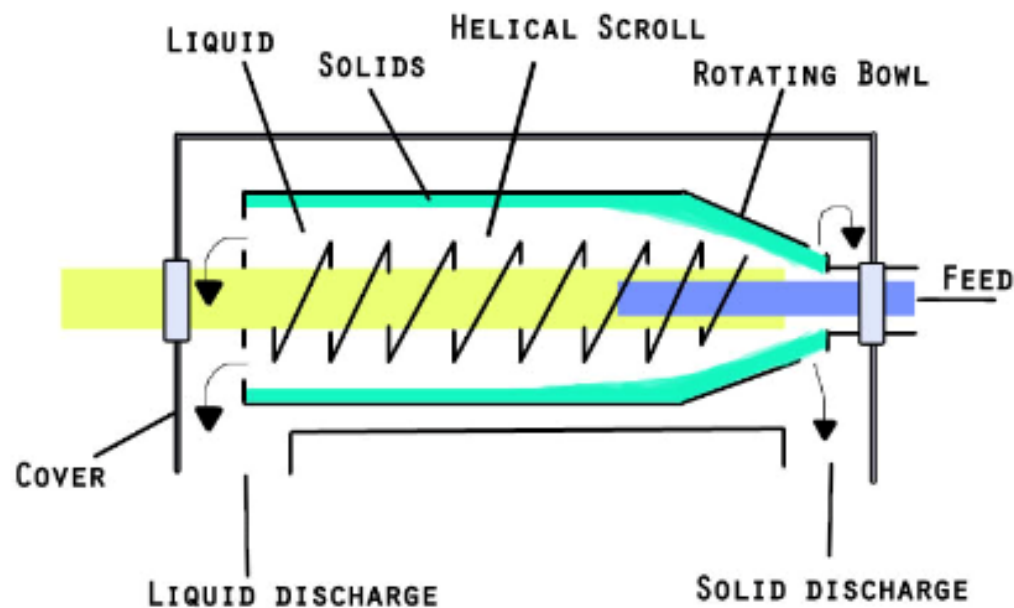
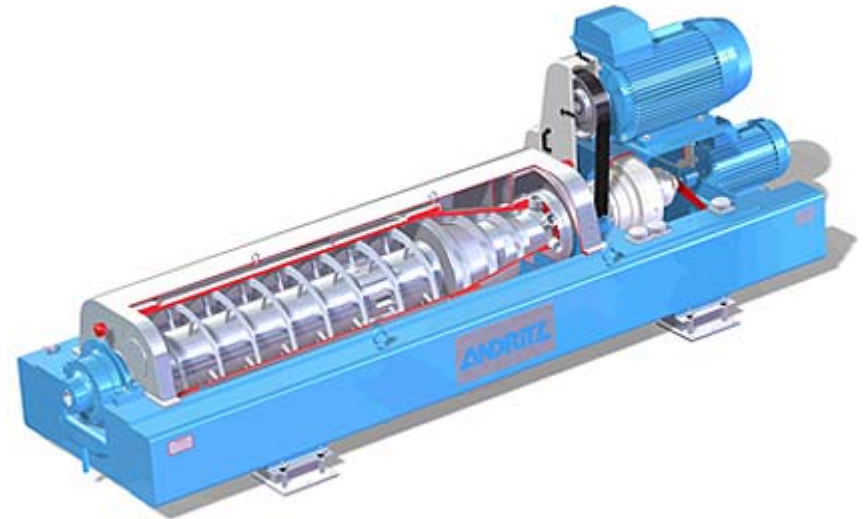
Belt Filter Press

- Combination of gravity draining and mechanical pressure
- Distribute uniformly across width of belt
- Finished Cake: typically 15-30%



Centrifuge

- High rotational speeds
- Require hearing protection when operators are in the vicinity
- Finished cake: typically 20 to 30%



Screw Press – Emerging Technology

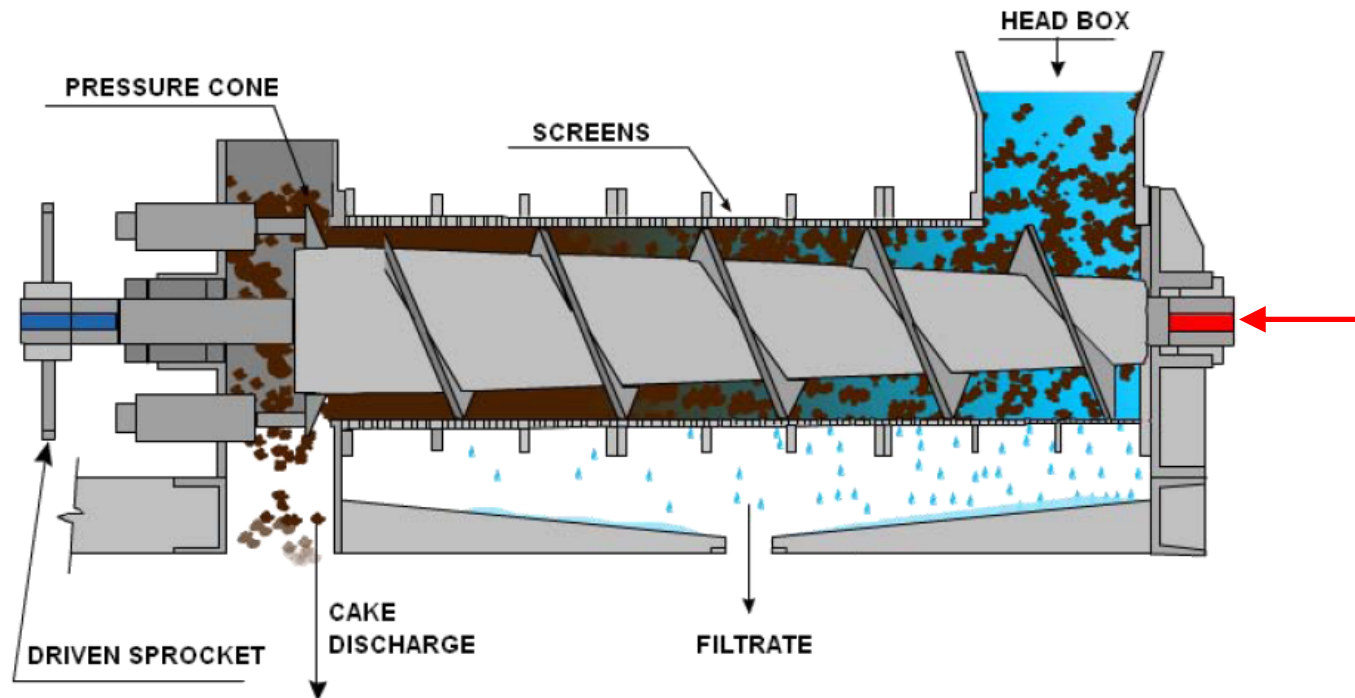


Diagram Courtesy of FKC Co., Ltd.

- Slow moving device
- Cake: 20 to 40%

Pros/Cons

Considerations	Centrifuge	Belt Filter Press	Screw Press
Ease of Use	Moderate	Moderate	Easy
Mechanical Complexity	Moderate	Moderate	Low
Chemical Use	Moderate	Moderate	Slightly higher
Energy Use	High	Moderate	Low
Space	Small	Large	Medium
Reliability	Adequate	Adequate	Superior
Noise	High	Moderate	Low

Parameter	Centrifuge (40 HP)	Screw Press (6.5 HP)
Construction Cost		
Equipment Cost	\$470,000	\$520,000
Building Construction & Installation	\$700,000	\$950,000
Total Constructive Cost	\$1,200,000	\$1,500,000
O&M Cost		
Electrical Cost	\$3,000	\$1,000
Solids Disposal Cost	\$83,000	\$68,000
Polymer Cost	\$6,000	\$8,000
Annual Labor Costs	\$34,000	\$22,000
Maintenance Costs	\$3,000	\$1,000
Total O&M Cost	\$130,000	\$100,000
Net Present Value	\$3,000,000	\$2,900,000

Reference: Lake Oswego-Tigard Predesign Report (MWH)

Screw Press Pilot Study Setup and Findings

Comparison of Two Manufacturer's Screw Presses

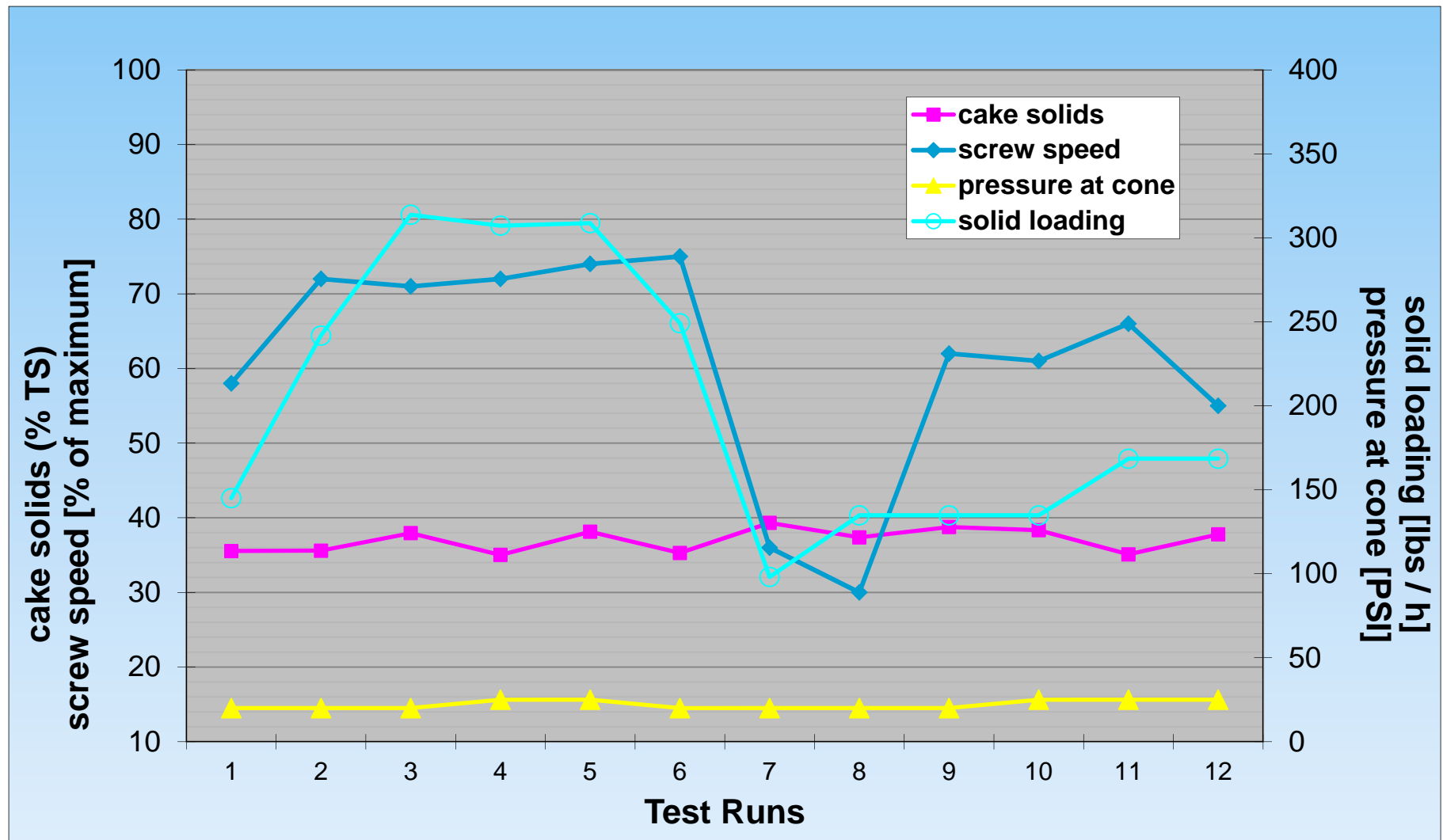
- Feed solids = 1 to 3 percent
- Willamette River Water Treatment Plant solids
- Utilized tanker



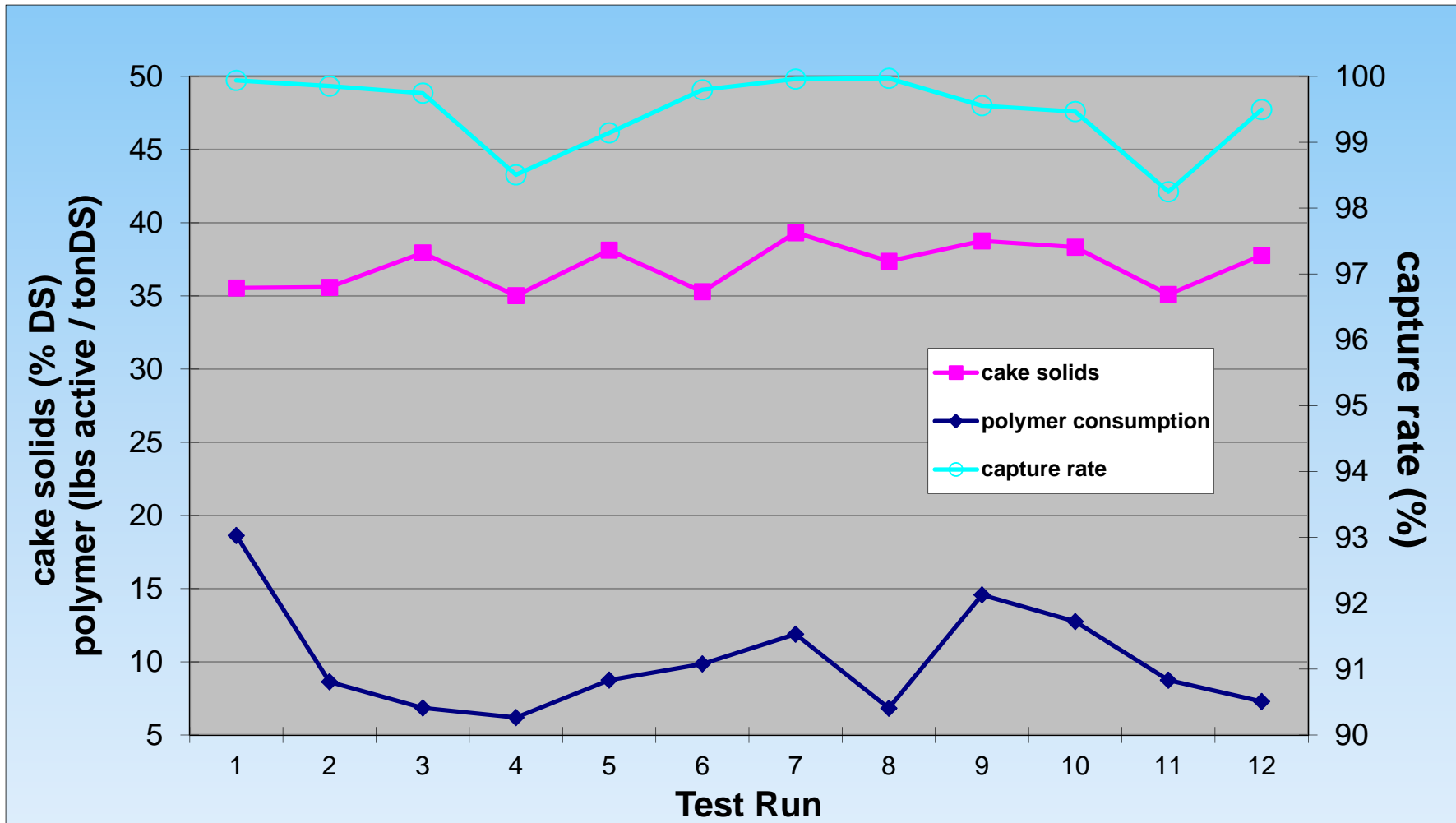


Video

Pilot Testing Results – Mfr 2



Pilot Testing Results – Mfr 2



Pilot Testing Results

Parameter	Mfr 1		Mfr 2	
	Average	Range	Average	Range
Inlet TS (%)	1	(1-2)	5	(2-6)
Outlet/Cake TS (%)	37	(29-43)	37	(35-39)
Polymer Dose (lb/dry ton)	9	(7-11)	10	(6-19)
Speed (rpm)	0.45	(0.3 - 0.75)	0.9	(0.5-1.1)
Solids Loading Rate (kg/hr)	14	(12-16)	91	(70-140)

Water Quality and Piloting Considerations

Water Quality Considerations for Residuals Disposal

- Consider what your facility is removing
 - Arsenic, identify type of residuals created when selecting arsenic removal technologies
 - Residuals will be different for filter backwash water compared to membranes
 - Concentrate disposal with nanofiltration, RO, and desalination
- Dewatered liquid
 - Do you recycle liquid stream or waste it?

Pilot Study Considerations

- Certified cleaned tanks and mixing
- Identify solids align with future processes
- Work with equipment vendors to capture data appropriate for design



Conclusions and Findings

- Screw press technology is an emerging technology and viable alternative that should be considered when examining mechanical dewatering technologies.
- Recommend bench or pilot scale study
- The new Lake Oswego-Tigard WTP will have screw press technology.
- Importance of water quality considerations when helping vendors transition to the water industry.

Acknowledgements

- Lake Oswego-Tigard Water Partnership
 - City of Lake Oswego
 - City of Tigard
- Brown and Caldwell Program Management Team
- MWH Design Team
- Willamette River Water Treatment Plant



Questions and Discussion

Thank You

