

REINHOLD ENVIRONMENTAL[®]



2022 Reinhold/PCUG Round Table Presentation

Hosted by Duke Energy in the Charlotte Sheraton/Le Meridien
Hotel, Charlotte, NC on June 27-28, 2022

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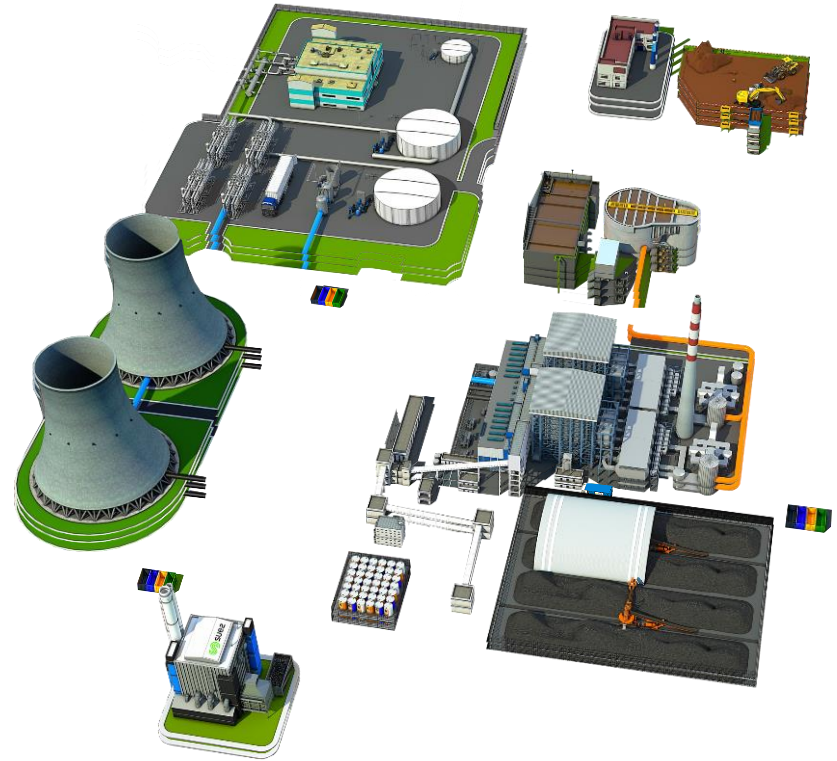
CCR WASTEWATER TREATMENT SOLUTIONS

Workshop 17
2022 Reinhold Round Table
Charlotte, NC
June 28th, 2022

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SUEZ Water Technologies & Solutions

Workshop 17 Agenda

- ✓ Case Study Introduction
- ✓ De-watering Treatment Selection
- ✓ Project Execution
- ✓ Performance
- ✓ Considerations for Similar Projects
- ✓ Question / Answer



CCR Pond Re-Lining at Zero Liquid Discharge Plant

Undisclosed Power Plant

- Coal-Fired Power Plant
- 40+ years old
- Approximately 2,000 MW
- Multiple Ash Ponds
- ZLD - Zero Liquid Discharge

Challenge

- Re-line the largest ash pond
- Dewater 1,200 acre-foot pond
- High salinity water
- 90 days to de-water

Solution

- Mobile Water Treatment Equipment
- Reuse Treated Water for Makeup to Plant



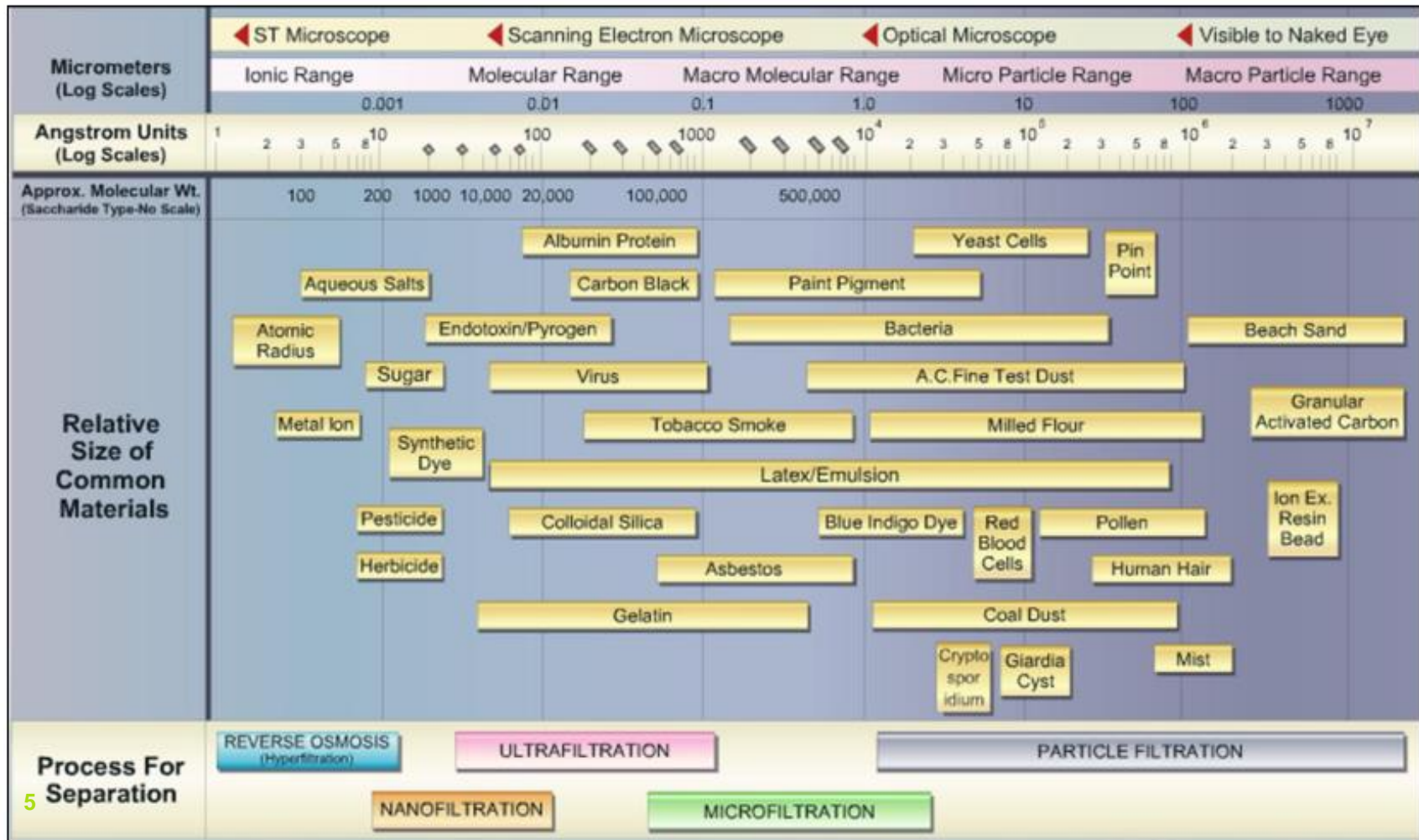
Parameter	Pond Water	Water Reuse Requirement
pH	8.8	7.5 – 8.5
TDS - mg/L	32,041	400
TSS - mg/L	156	2.2
TOC - mg/L	201	-
Mn - mg/L	2.34	0.05
Moly - mg/L	2.26	0.03
Cd - mg/L	1.70	0.005
Ni – mg/L	1.44	0.005
Lead - mg/L	1.24	0.01
Se – mg/L	0.90	0.02
Sb – mg/L	0.73	0.02
As – mg/L	0.70	0.01
Cr – mg/L	0.04	0.01

Design Constraints



- Dewater Volume: 64 MM gallons
- Reuse Water Volume: 44 MM gallons
- Wastewater Volume: 20 MM gallons
- Duration: 90-day
- Space Constraint: 10 acres
- Power Supply: 2000 Amp; 480V
- Mobilization: 30 days

Particle Size







Preliminary Bench-Scale

Filter column tests

SUEZ' proprietary filter media was utilized in the column trials below.

Table 1

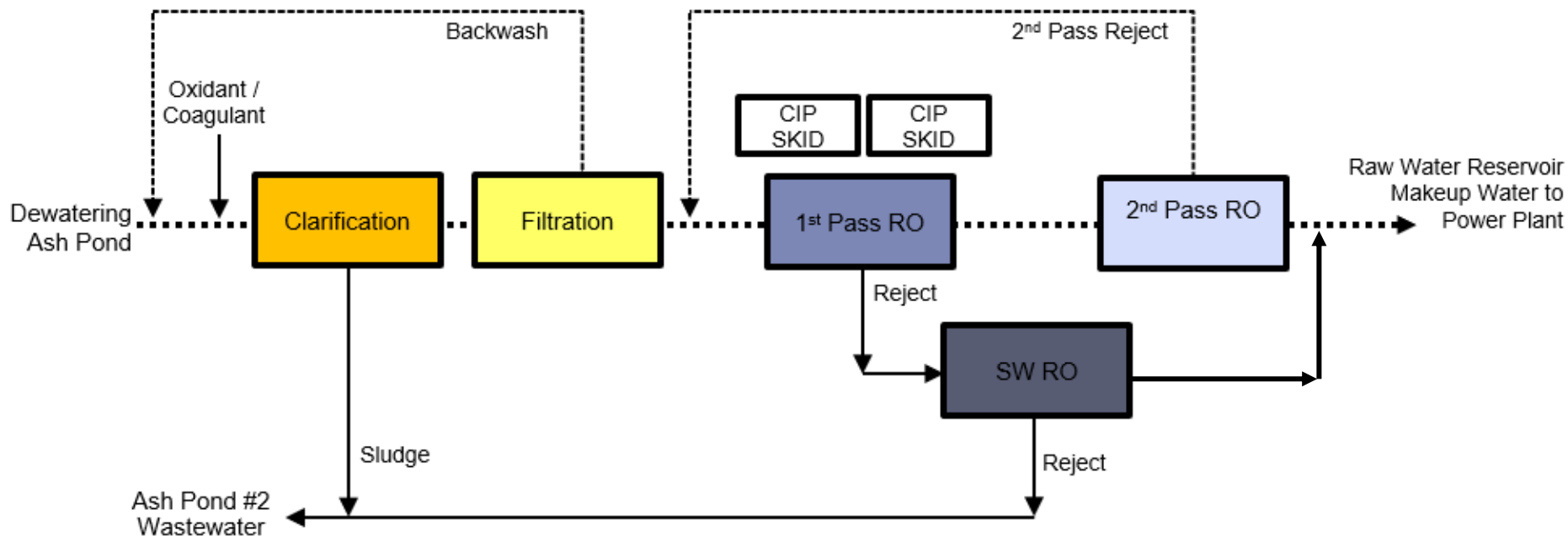
Trial #	Chemical Injection	pH Change/ Temp (°C)	Turbidity (NTU)	Time through 0.45µ filter	TOC (ppm)
--	<i>Corresponding 0.45µ filter pads:</i>				
A					
B					
C					
	Raw sample 7 mL in 49:00	15 ppm Cl ₂ 80 ppm KlarAid CDP1348	15 ppm Cl ₂ 20 ppm NatClear MR2405 80 ppm Solisep MPT134	15 ppm Cl ₂ 100 ppm KlarAid CDP1336	



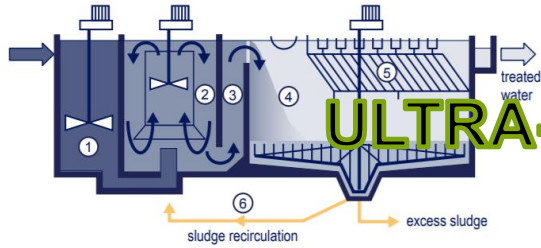
Left to right: Raw sample / 80 ppm CDP1336 / 100 ppm CDP1336 / 20 ppm MR2405 + 80 ppm CDP1336 / 80 ppm CDP1360 / 80 ppm CDP1348



Block Flow Diagram



Technology, Equipment, Availability



ULTRA-FILTRATION



ADSORPTION



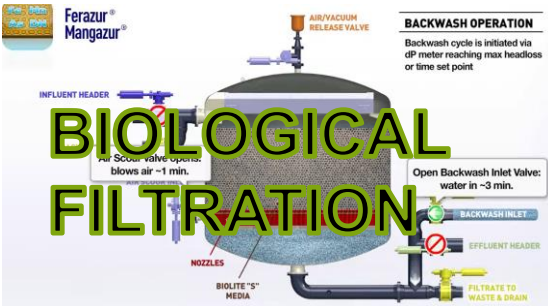
DAF

REVERSE OSMOSIS



MOBILE

BIOLOGICAL FILTRATION



ION EXCHANGE



RAPID RATE CLARIFIER



Mobile Solution Deployment



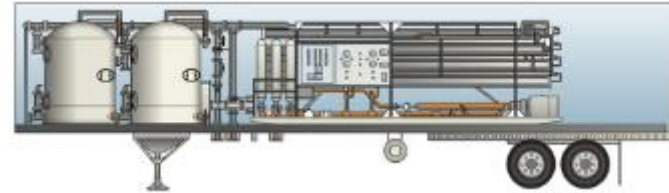
- ❑ (8) 20,000 gallon tanks / weir / clarifier



- ❑ (12) pumps for a combined 4000 gpm
- ❑ (4) chemical feed systems; acid, coagulant, oxidant, flocculant
- ❑ power distribution
- ❑ lighting system
- ❑ office trailer



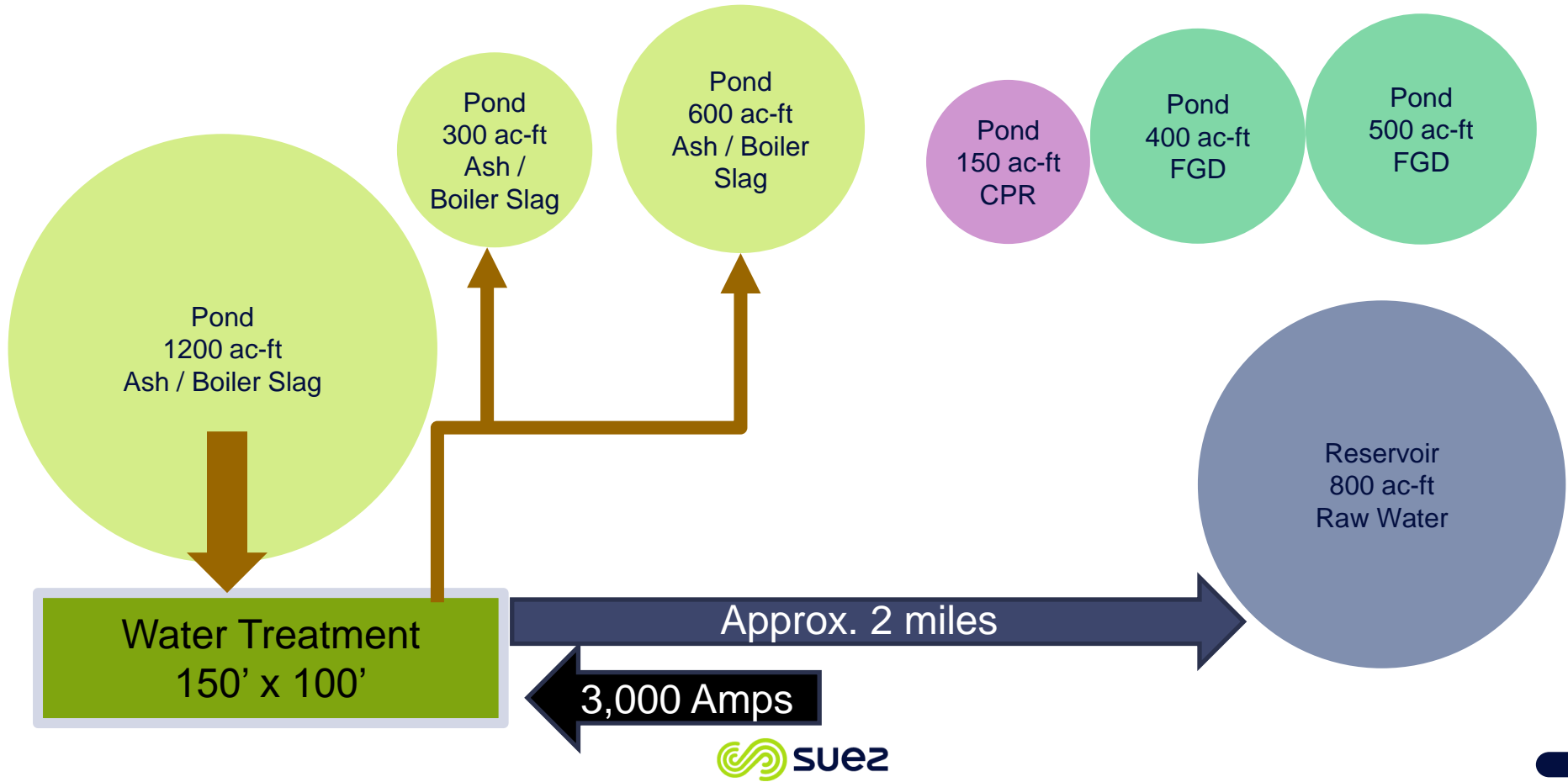
- ❑ (4) filtration trailers combined 400 ft²



- ❑ (6) reverse osmosis (BWRO) trailers combined 1600 gpm
- ❑ (1) reverse osmosis (SWRO) trailer
- ❑ (2) CIP - Clean-In-Place skids

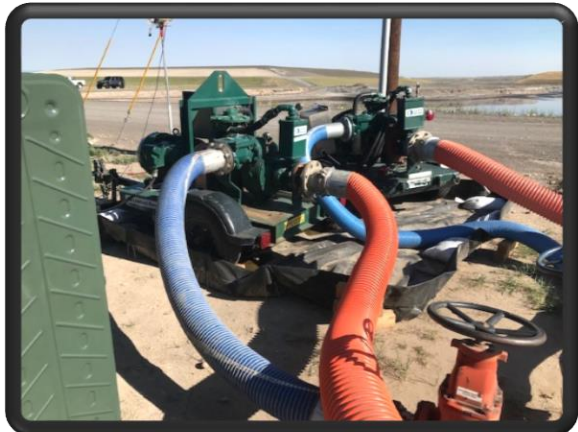


Site Conditions



Dewatering Treatment Schedule

Pre-Bid Meeting	November, 2019
Contract signature – April 22	Project Start: April 22, 2020
Final Equipment Selection: <ul style="list-style-type: none">- Weir Tanks / Frac Tanks- MMF Filter Trailers- Reverse Osmosis Trailers- Chemical Feed Systems- Booster Pump Skid	Week 1: April 29, 2020 <ul style="list-style-type: none">- Assets Limited- Pulled from Western & Central Regions of US- Selected high pressure RO & Large SWRO- Off shelf units- 3rd Party assets
Operation Staff Selection	Week 2: May 6, 2020
Equipment Delivery	Week 2: May 6, 2020
Covid Quarantine Delay	Week 3 & 4: 14-day state restriction quarantine
Installation	Week 5 - 7: May 20, 2020 - June 3, 2020
Commissioning w/ Installation	Week 8 - 11: June 3, 2020 – June 30, 2020
90-day operation	Week 12 - 24: July 7 – October 2
Contract Extension	Week 25 - 27: October 3 – October 20







Start-up Appeared Different

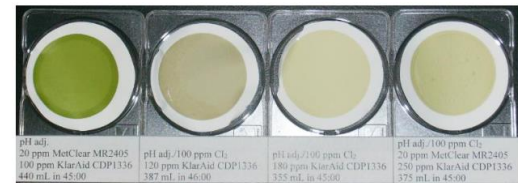
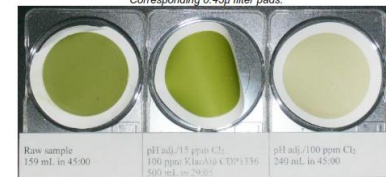
@ 10 minutes



@ 30 minutes



Corresponding 0.45µ filter pads:



Let's find some more pieces to the puzzle



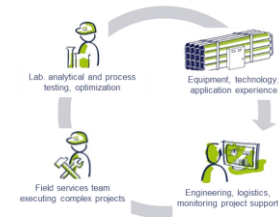
Analytical testing



Lab process/pilot testing



On-site testing & piloting

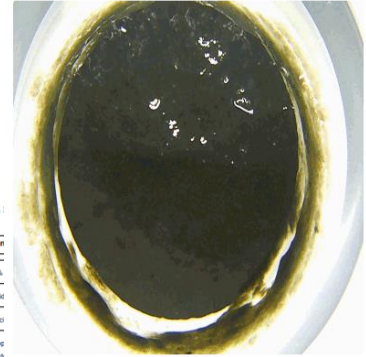


Growth in Front End of Plant



Deposit Analysis

Major Compon	
LOI	55%
Organic	Amid
Inorganic	Calc
Microbiology	Exp Back



Photograph of as-received sample

General Composition



Performance Outcome



Table 1: Influent and Final Treated Permeate Water Quality from SUEZ's treatment system.

Contaminant	Influent (mg/L)	Final Permeate (mg/L)
Total Dissolved Solids (TDS)	24,000	< 29
Chloride	2,970	< 9.8
Sulfate	12,500	< 7.8
Boron	8.3	< 1.5
Total Organic Carbon (TOC)	115 ppm	< 1.0 mg/L
Calcium	472	< 025
Magnesium	1,400	< 0.8
Sodium	4,740	< 7.3
Potassium	676	< 2.3
Strontium	14.5	< 0.007
Silica	4.2	< 0.014

Dewatering Progression

DAY 1



DAY 85 – DEWATERED 80MM GALLON



DAY 100

Dewatering Summary

- ❑ Expect to Adapt to Challenges
 - ❑ Monitor
 - ❑ Implement
 - ❑ Observe
- ❑ Prepare for Setbacks
 - ❑ Lead Times
 - ❑ Equipment Downtime
 - ❑ Less than Ideal Conditions
- ❑ Culture is Key
 - ❑ Goal Focused
 - ❑ Cooperation
 - ❑ Prepare for Success





Questions & Answers



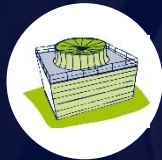
SCOPE

water
wastewater
desalters
analyzers



SERVICES

commissioning
mobile assets
advisory
outsourcing



INSTALL

corrosion inhibitors
emulsion breakers
H2S scavengers
fuel additives



CONTINGENCIES

+



MONITORING

InSight*
TrueSense*
COMS

+



TECHNOLOGY

in-house r&d
industry partners
training



REFERENCES

global customers
local service &
support across
industries

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Case Study: Coal Pile Runoff, Rapid Deployment with Evolving Solutions Cr (+6) & Mo

Application (45MM Gals)

- 5MM gallon coal pile with cap breach
- Chromium (+6) & Molybdenum
- Discharge Limits Cr 16 ppb, Mo 950 ppb

Solution

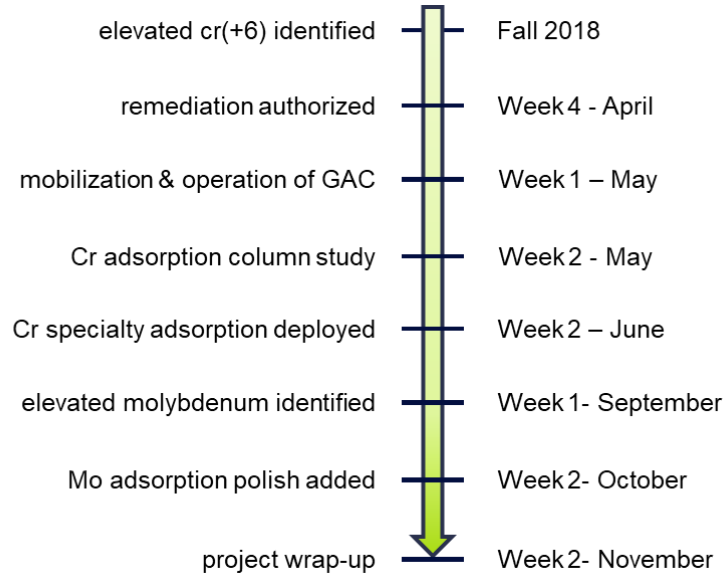
- Emergency mobilization of assets
- Remote, no power supply
- Filtration & 2-pass adsorption
- Specialty adsorption media identified with onsite testing

Benefits

- Rapid deployment of assets
- Project savings in GAC exchanges \$300k



Case Study: East Coast Coal Plant, Chromium (+6) and Molybdenum Discharge Limits



Thank you. Questions?

- ✓ Collaboration with customers
- ✓ Experience and flexibility in complex projects
- ✓ The right project support structures
- ✓ Treatment expertise
- ✓ The right technology and equipment
- ✓ Complete solutions

