Metropolitan Water Reclamation District of Greater Chicago

Welcome to the January Edition of the 2025 M&R Seminar Series

NOTES FOR SEMINAR ATTENDEES

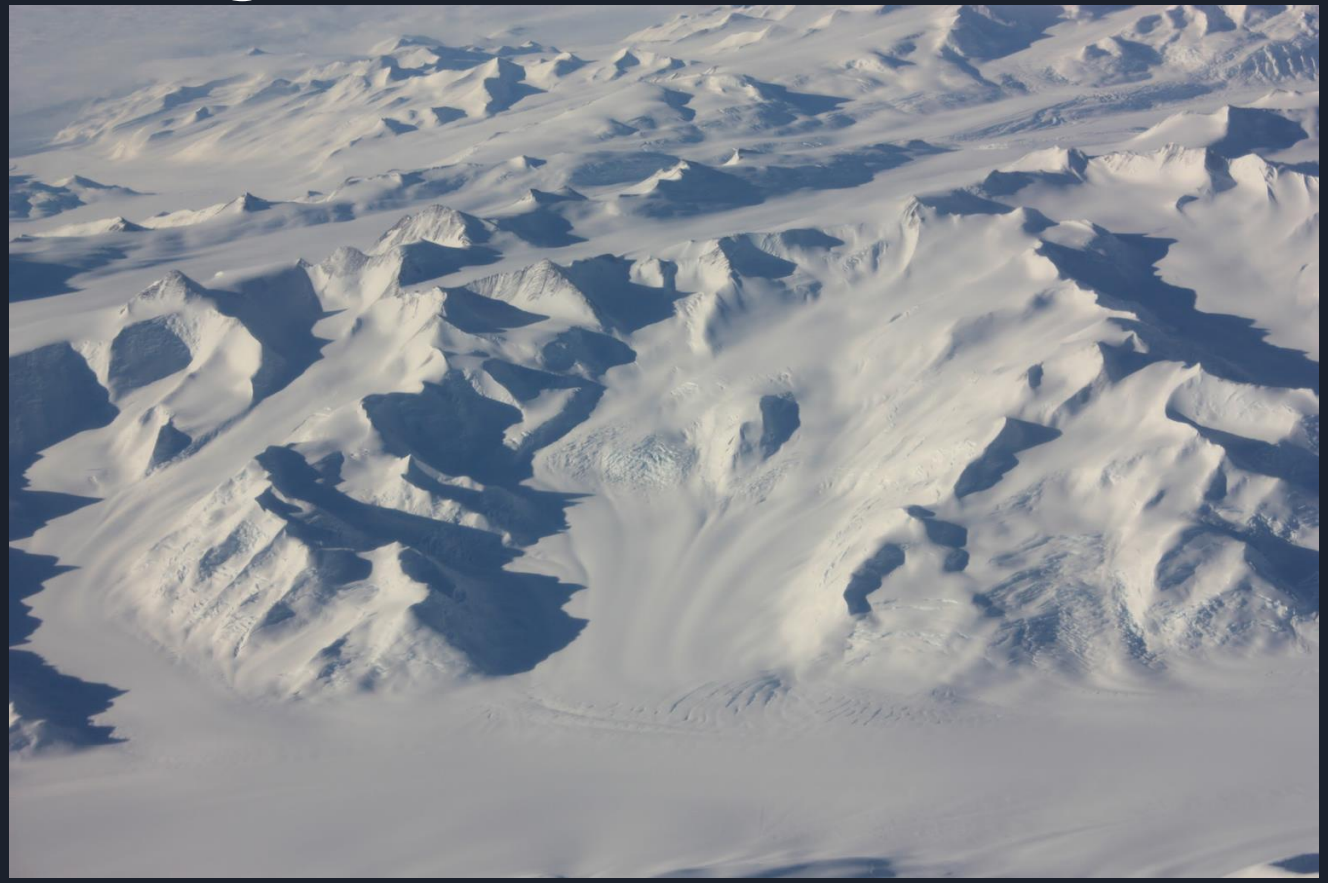
- Remote attendees' microphones are muted at entry to minimize background noise.
  For attendees in the auditorium, please silence your phones.
- A question and answer (Q/A) session will follow the presentation.
- For remote attendees, please use "**Chat**" only to type questions for the presenter. For other issues, please email Pam to SlabyP@mwrd.org.
  For attendees in the auditorium, please raise your hand and wait for the microphone to ask a verbal question during the Q/A session.
- The presentation slides will be posted on the MWRD website after the seminar.
- This seminar has been approved by the ISPE for one PDH and approved by the IEPA for one TCH. Certificates will be issued only to participants who attend the entire presentation.

Coby Forth, Wastewater Operator
Fox River Water Reclamation District

Coby Forth graduated from Vermilion Community College in Ely, Minnesota with an associates degree in Water Quality Science. He worked as an intern/ part-time employee for the city of Ely's water and wastewater plants while still in school. He has operated various plants throughout the Midwest. In 2021, he spent almost 8 months on the ice operating the drinking water plant at McMurdo Station, Antarctica. Since May 2, 2023, he has been a wastewater operator at Fox River Water Reclamation District. He has an Illinois Class A Drinking Water operator license and Illinois Class 1 Wastewater Operator license. In February 2025, he will teach a wastewater class with material purchased from WEF and hosted by the ISAWWA. He is excited to help others along on their journey to be operators and especially eager to share his unique experience living and working on the most remote continent on the planet.

Working at the Bottom of the Water Industry

We’ll get the FAQs out of the way



How did you find out about this job opportunity?

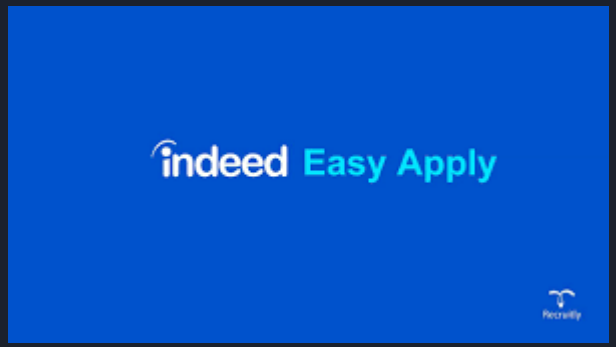
- Surfing Indeed

How were the polar bears?

- Polar bears are only found north in the arctic
- In Antarctica we saw three different kinds of animals: penguins (2 species Emperors and Adelie), Weddell seals, and Skua birds

Initial applying and hiring process is quite normal and painless

- Applied directly on Indeed
- Had 3 over the phone interviews
- Accepted the job and that's where the fun starts



Getting Physically Qualified

- Very extensive list of medical exams/tests to get done to be PQd
- 3 remaining wisdom teeth had to be removed
- Heart EKGs
- 9 panel blood work
- Typical physical
- Completely updated on vaccines (including COVID-19)

COVID-19 test and quarantine

- Flew from O'Hare airport to San Francisco
- Followed by a 4 day quarantine at a hotel in San Fran
- 2 covid test given to us. First one upon arrival and second one was the day before departure
- Flew from San Fran to Christchurch, New Zealand where we would be quarantined for 10 days
- Upon arrival they tested us all again
- We had to use a self test on day 2, 6, and 8.
- On the day before we flew out we had another test they administered and once we got to the airport on departure day they did one final rapid result test before we left for the ice

Arriving at McMurdo

- Landed at McMurdo station on what would prove to be the warmest day I'd see down there at 27°F
- The "airport" is one small building for receiving and departing people
- It's built on permanent sea ice
- It's an almost hour bus ride back to McMurdo Station from phoenix air field

New surroundings, new schedule, ...new everything

- McMurdo has a very college town feel to it
- All dormitory style living
- 3 meals a day served in the cafeteria
- Different gyms and common areas host different setups for activities
- 6 day 54 hour work week Monday-Saturday from 7-4 pm

Drinking Water Treatment at McMurdo Station

- Raw seawater intake
- Two submersible 5 stage pumps 35’ and 50’ down
- Run continuously even when not treating water
- Saltwater freezes at about 28.4℉ and average seawater temperature was about 30℉
- Fun fact: the jetty pictured has washed away in years past and alternate seawater intake sources had to be improvised

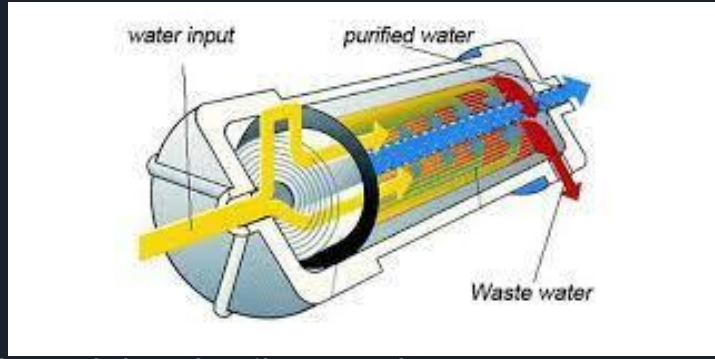
Water Treatment Process Nearly the Same as Home

- All above ground infrastructure
- 8” water main now looks like 24”
- More heat trace wire than a trailer park
- Ironically the potable water supply line to the water plant froze
- Heat exchangers play a big roll

Reverse Osmosis

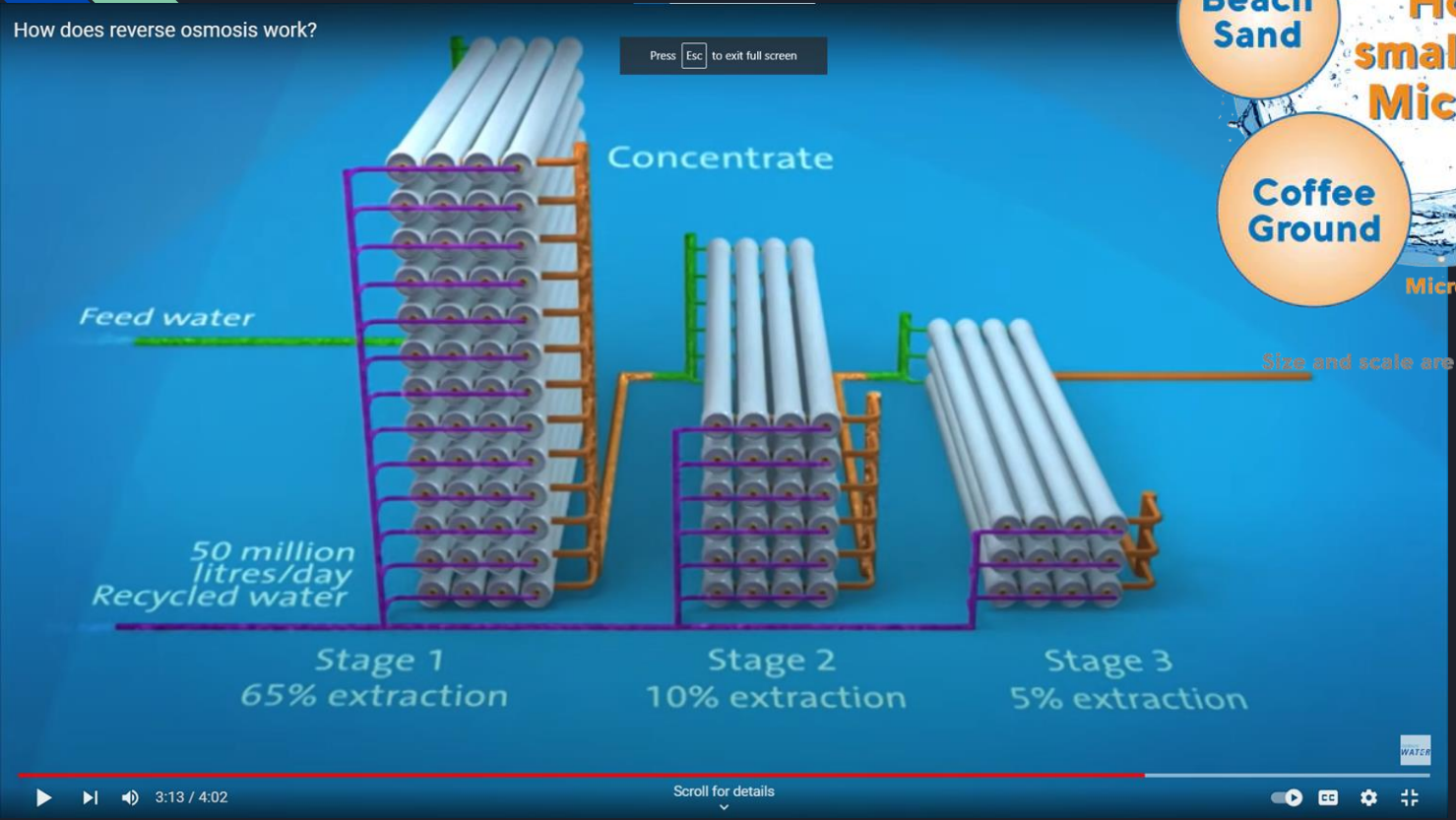
- First step is the water gets warmed to about 36°F as to not shock the RO membranes
- Then the water goes thru a multimedia filter to remove any larger debris that would harm the high pressure pump or foul the membranes quickly
- After initial filtering the water goes thru a high pressure pump that forces the seawater (feed water) thru the RO membranes
- The discharge line from the high pressure pump is injected with carbon dioxide The injection of CO_2 into seawater essentially reduces the carbon footprint of the RO process

Reverse Osmosis



- High pressure pump forces water into the pressure tube and thru the filter membrane
- Feed water travels in spiral thru the .2 micron filter membrane until it reaches the center tube
- Clean water is discharged from center tube for further treatment
- The reject water or concentrate flows outside the membranes but in side the pressure tube until it reaches the discharge line
- The concentrate is then introduced to a new stage of membranes and will continue to be until it is no longer efficient to filter the concentrate (typically 3 stages)

Reverse Osmosis



pH adjustment and Disinfection

- Calcium Hypochlorite powder is mixed per a set ration in the mixing container, transferred to the holding tank, and then from there injected into the water line
- Sodium Bicarbonate added to raise the alkalinity
- Treated water sent to the finished water storage tanks
- Maximum storage of finished water is 204,000 gallons
- Required to keep 160,000 gallons at all times
- If finished water falls below 160,000 gallons the station goes on water restrictions and suddenly everyone is concerned about the water plant

Big Job to pull an intake pump

I thought this was a wastewater conference?

Wastewater Treatment Throughout Antarctica

- Most countries' research stations don't have any form of wastewater treatment
- No governing body or regulations for effluent quality
- Only requirement in the Antarctic Treaty is to macerate/ grind the waste before discharging
- USA palmer station on the peninsula just has one macerator pump before being discharged into the ocean
- South Pole houses it's waste in bulb shaped cavities several hundred feet down. These same cavities were previously used as drinking water wells.

The Wastewater Plant

- $6 million, 170-by-140-foot indoor facility to treat the station’s wastewater to Colorado standards (PAE headquarters in CO, bought by Amentum, VA headquarters)
- 3 train activated sludge plant
- 2 lift stations throughout the station
- Licensed operator preferred but not required

The Wastewater Process at McMurdo

- Preliminary treatment consist of a muffin monster grinder and a simple bar screen
- The influent is then diverted into 1 of the 3 trains
- The first baffled section of the train is an anoxic zone
- After being starved for oxygen the hungry bugs go into the aeration basin where they are introduced to D.O levels of 3-3.50 mg/L
- The D.O levels slowly decrease as the flow moves down the train
- Once to the end there's a single clarifier
- RAS and WAS airlift lines are in the clarifier

The Wastewater Process at McMurdo

- The effluent that flows over the clarifier weirs then flows to the basement
- Here there is a medium intensity UV disinfection system set up
- After being disinfected the effluent travels through a heated discharge line that is about 6ft under the ocean




What about the solids?

- The WAS is sent to one of two aerobic digesters
- When one digester is full of treated digested sludge and ready to be drawn down it's time to fire up the single Ashbrook belt press
- Once the sludge goes thru the press it drops down a chute in to a plastic lined cardboard box
- The use of the cardboard box and liners makes having a good dry cake even more of a must
- When the big icebreaker ship comes in January the boxes are loaded up and shipped back to the states, California to be specific


NON POTABLE WATER
HOT WATER
CAUTION
DO NOT DRINK
ASHBROOK

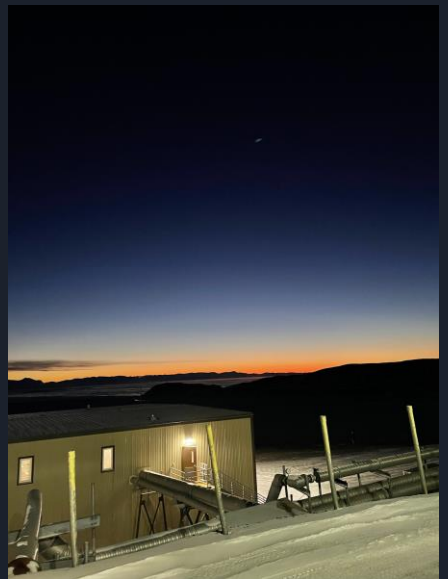
No regulatory agency, no problem?

- There is a bypass that can send flows right to the ocean after being ground up
- There is no fine or punishment
- The National Science Foundation does not like to see this happen. They spent the money on the plant and hire responsible operators to prevent raw sewage discharge
- If it does happen they are understanding and you need to communicate with them what the cause was
- In the case of high flows ultimately it’s better to bypass then to washout an aeration train because reseeding is extremely hard with the low solids load coming in

A tale of two seasons

Winter one big maintenance crew

- Population 126 from March until August
- August they start flying people in to ramp up for summer season. When I left in October the population was about 325
- Sun sets permanently in April and doesn't rise until until mid August. Vitamin D is a must
- keeping the lights on for when the scientists come back



A tale of two seasons

Summer a season for science

- Population can peak at over 1200 people
- Scientist, grant workers, and contractors flock in
- Wastewater plant goes from about 7-12 thousand gallons a day to average almost 35 thousand gallons a day

Thank you and any Questions?

Was it worth it?