Iced!
The Water Utility vs. the Polar Vortex

Avon Lake Regional Water at One Water
3:30-4:00 p.m. Thurs., August 28, 2014
System background

- Provide water to 200,000 people in a 680-square-mile area
- 85% of water produced goes to bulk customers
- Produce 21 mgd on average day (50 mgd rating)
- Only charge 10% more to bulk customers
- Two major transmission lines (ETLs)
- Pressure system
Frazil ice

Occurs as supercooled water enters an intake and builds ice because:

- Intake surfaces in contact with supercooled water can cool below freezing.
- Once cooled, ice can adhere to surfaces.
- Frazil ice contained in water can adhere to growing ice on surfaces.
- Heat convection from frazil ice to surfaces enables further growth.
### Frazil ice evolution

<table>
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<th>PHASE:</th>
<th>Formation</th>
<th>Transformation and Transport</th>
<th>Stationary Ice Cover</th>
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<tr>
<td>ICE TYPE:</td>
<td>Seed Crystals</td>
<td>Disk Crystals</td>
<td>Flocs and Anchor Ice</td>
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**PROCESS:**
- Seeding
- Frazil Ice Dynamics
- Flocculation and Deposition
- Transport and Mixing
- Floe Formation and Induration
- Ice Cover Formation and Under Ice Transport

*Figure 3. Evolution of frazil ice in natural water bodies.*
If supercooled water is entering intake, frazil will adhere to intake bars. Blockage will occur when ice can bridge between bars.
The story begins

A few days into the new year, Lake Erie is experiencing low-to-normal ice coverage, but utility staff note weather conditions could produce frazil ice.
January 7

~9 p.m. WFP manager is called in because plant is unable to draw in enough water into wet well. He calls in several staff members to resolve issue.
January 7-8

**Overnight:** As intake flow decreases, plant backwashes (@ 250K gallons per) and air-sparges intake. These measures increase incoming flow, but do not entirely clear blockage. We conduct bulk-customer conference call to alert them to the event, mandate switch to alternate water sources.
Early morning: Turned off ETL pumps to bulk customers. Reversed flow from Sheffield Lake to draw in some water.

~8-9 a.m.: Issued first call-to-conserve to retail customers via Facebook and reverse 911 call.

Throughout day: interacted with bulk customers, some Avon Lake commercial customers, OEPA, media.
The media trigger

- Unknown to us, a bulk customer is mid-water-main break and, with the added impact of the frazil ice, issues a water-conservation alert to their residential customers.

- Cleveland media sees alert and assumes a dire, entire-region water emergency, sending a deluge of reporters to our phones and front door.
• **Midday:** OEPA suggests brine solution. Initially promising, but could not sustain gains. OEPA helps by trying to locate ice breaker/airboat. (None are available.)

• **Mid-afternoon into night:** Began devising a possible pump-around solution. Determined it was best solution and began focusing all resources on implementing.
January 8

- Xylem Dewatering Solutions (Painesville), Kendera Construction (Avon Lake), Lake Erie Diving (Mentor) all worked hand-in-hand with staff to implement solution.
- ~11 p.m. First bypass pump operational, pumping ~2 mgd.
January 9

- Got 2\textsuperscript{nd} & 3\textsuperscript{rd} pumps running between 2-3 a.m., yielding ~7 mgd – 8 mgd.
- During next 2 hours, the changed pumping rate allowed intake ice to dislodge/melt.
- Emergency pumping not only supplied water it helped by putting extra head on intakes.
January 9

- **5 a.m.**: Pumping ~25mgd.
- **6 a.m.**: First electronic message sent to residents regarding resumption of normal water consumption (~7:45 a.m. CodeRED call).
- **During next few hours**, got bulk customers back online.

![Facebook Post](image)

*Avon Lake Municipal Utilities*

January 9

Success during the night! We are removing our water restrictions and pumping to our neighbors. They will det. when they can remove theirs.

Like · Comment · @AvonLakeWater on Twitter · Share
Crisis averted

Social media was just as important as our quick operational response: We were at a critical pressure point in the delivery system, and the immediacy (and viewership of) our Facebook campaign resulted in decreased demand.

Entire event was begun and done in less than 36 hours (<42 hours including tank refills).
The power of social media

- Social media turned a nightmare into victory.
- Avon Lake Water Facebook “likes” skyrocketed from 250 to 1,750.
- Hundreds thanked us.
- 63,000 were reached.
- We had the opportunity to directly hear from (and communicate with) thousands of customers.

Avon Lake Regional Water
The power of social media

- Facebook allowed customers (and state regulators) to stay updated on their water status in real time.
- The prompt availability of updates elicited compliments from regulators and customers alike.
- Utility staff gained a new understanding of the power of social media.
- In a usually silent service, customers were interested in and able to see what we do for them.
After effects

frazil ice blockage of water intake

frazil ice remnants washed into wet well
After effects

We received dozens of letters from local school children thanking us for our quick resolution of the frazil ice event.
Lessons learned: Ops

- Make sure your emergency plans are updated and relevant.
- If possible, pre-determine an emergency pumping solution.
- Go to emergency pumping sooner than you want to.
Lessons learned: Communications

- Ensure your municipality/public services are in the loop sooner rather than later. (i.e. Don’t assume your fire chief was on the emergency-services group conference call you just had.)
- Create event-specific messages and give to front-office staff so they know what to say. (i.e. fill tubs or *not* to fill tubs)
- Ask bulk customers to keep you copied on their media communications.
Suggestions

- Conduct semi-annual intake maintenance/inspections, ideally using video.
- Conduct an annual test of your emergency plan to be sure your communications cascade is intact.
- Notify bulk customers once a significant change in production is experienced, even before you’re sure there’s a problem.
Suggestions

- Feed and rest your employees as much as you can during a crisis.
- Use your relationships in time of crisis—whether supplier, expert, regulatory, or media. (And continue to develop them when things are calm.)
- If you haven’t already, embrace social media, specifically Facebook, to help you quickly communicate with customers in a crisis situation.
Path forward

Immediate

- Modifying ability to backwash intakes.
- Modifying intakes and intake structures.
- Modifying operations regarding filling and drawing from tanks.
- Renting one pump as on-site backup.
Path forward

Long term

- Improve ability to bubble air at intakes.
- Consider other grate modifications, possibly heating.
- Add intake (required beyond 60mgd).
- Add clear-well capacity (required beyond 50 mgd).
- Add elevated storage within Avon Lake.
- Increased interconnection with other water producers.
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