



ONTARIO POWER GENERATION

# Zebra Mussel Control – 16 Years of Ozone Treatment at Lennox GS

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# Overview

- How did we get to ozone.
- Ozone Pilot Program (and beyond).
- 2017 ozone study.











# How did we get to ozone

- 1992-2000 → Sodium Hypochlorite

*“The use of sodium hypochlorite is considered an interim means of offsetting the accumulation of zebra mussels in water supply piping”*

- OPG Chlorine Reduction Program
- Pilot ozone system installed in the summer of 2000.

# Ozone Pilot program

- Initial capital cost of \$620K with annual operating cost of \$140K.
- Continuous injection rate of 500ppb with residual of 100-200ppb throughout piping system.
  - Pilot study showed 98-100% mortality of adult mussels after several weeks of exposure.
- Several operational issues with the system.
- Short half life of ozone makes it environmentally friendly downstream.

# Ozone Regulatory Requirements

- Provincial Environmental Approvals:
  - Air discharged from ozone destruction unit
  - Effluent discharged from CCW channel
    - Discharge limit of 10ppb, objective of 2ppb
      - » In situ toxicity testing
      - » Requirement for Tempering Water Pumps
    - Annual performance report to ministry
- Pest Management Regulatory Agency
  - Ozone is considered a Pesticide in Canada



# Ozone Occupational Issues





# Dosing Strategy

- Over the past several years, the dose rate has been dropped to approximately 250ppb.

→ The problem with this strategy is that it hasn't been backed by scientific research....

## 2017 Ozone Study – RNT Consulting

- **Are we doing anything with current dosing rate of 250ppb to deter mussels?**
- Prior to system start up, veligers / juvenile mussels were observed on settlement plates in bio-box.
- After 2 months of intermittent injection, no settlement observed in bio-box with 30% mortality of adult mussels near injection point.
- Bio-box further downstream showed no adult mortality.



# 2017 Ozone Study – RNT Consulting

- Massive settlement has been observed in the forebay during the same time period in 2017.

So.....

- Preliminary results indicate that lower dosage rate can be an effective treatment strategy to prevent veliger settlement.



# Summary

- No matter the system, continual improvement will be required.
  - ➔ Make decisions based on science where possible.
- Engage and educate your regulators early when planning your treatment strategy.
- Ozone is expensive to operate. The real benefit of an ozone system is the ENVIRONMENT.