# Force Main Treatment Case Studies

**Force main treatment with ozone and oxygen is an on-site, chemical-free method to control corrosion and odors in pressurized wastewater pipelines (force mains) and lift stations by targeting the root cause: anaerobic sulfate-reducing bacteria (SRB) and their byproduct hydrogen sulfide (H2S).**

## TREATMENT TECHNOLOGY

Oxygen is generated on-site with an oxygen concentrator from ambient air using pressure swing adsorption (PSA) technology. Ozone is generated from oxygen under pressure using a corona discharge ozone generator. Ozone and oxygen are bubbled into a lift-station basin, and/or injected into a pressurized force main to dissolve ozone and oxygen into wastewater. Ozone oxidized H2S into $SO_4^{2}$ + $H_2O$ + $O_2$. The balance oxygen maintains an aerobic environment to prevent downstream H2S production by promoting an aerobic state.

## BENEFITS

- Lower operating costs by reducing chemical usage
- Reduce H2S and other SRB's for lower odors and lower corrosion
- Eliminate or reduce odor at the source and down-stream vents
- Ozone is highly reactive and soluble into wastewater
- Can reduce color in wastewater

## APPLICATIONS

- Wastewater Odor
- Force Main
- Lift Station
- Digestor

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## CASE STUDIES - Ozone-Based Odor Control & Hydrogen Sulfide ($H_2S$) Reduction in Municipal Wastewater Systems

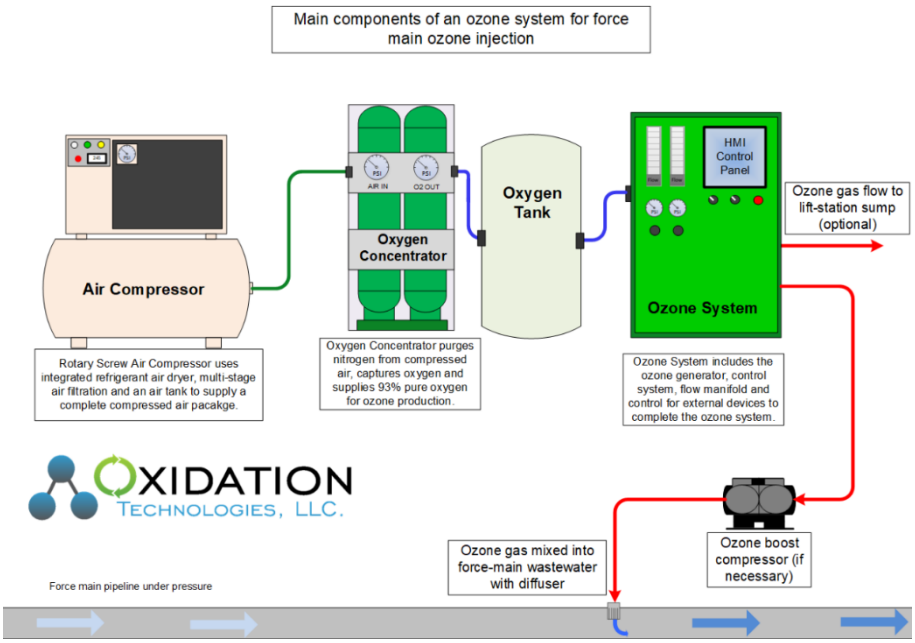
### Case Study 1 Summary:

- A municipal wastewater customer implemented ozone treatment technology to replace continuous Bioxide® chemical dosing for force main odor control and hydrogen sulfide ($H_2S$) reduction. The system treated wastewater flowing through a 1,000-foot force main where anaerobic conditions had created recurring odor concerns and measurable $H_2S$ levels at the downstream manhole.
- A 30 g/hr ozone injection system was installed to directly oxidize hydrogen sulfide within the force main. Following implementation, the municipality achieved consistent near-zero to 0 ppm $H_2S$ readings while eliminating bulk chemical handling and simplifying daily operations.
- The ozone system reduced annual operating costs from approximately $3,800 per year in chemical expenses to roughly $960 per year in electrical costs, while improving odor control performance and operational efficiency. The project highlights ozone's effectiveness as a sustainable and reliable solution for smaller wastewater force main applications.

### Case Study 2 Summary:

- A municipal wastewater system in Green Bay, Wisconsin implemented ozone treatment to replace continuous Bioxide® chemical dosing for force main odor control and hydrogen sulfide ($H_2S$) reduction. The system treated approximately 800,000 gallons per day flowing through a 12-inch, 7,800-foot force main where septic conditions were causing recurring odor issues, corrosion concerns, and elevated $H_2S$ levels.
- A 200 g/hr ozone injection system was installed to directly oxidize hydrogen sulfide within the force main under pressures up to 50 PSI. Following implementation, the municipality eliminated bulk chemical usage while improving odor control performance and reducing $H_2S$ concentrations.
- The ozone system reduced annual operating costs from approximately $316,000 in chemical expenses to about $19,200 in electricity and maintenance costs, while improving operational efficiency and simplifying system operation. The project demonstrates ozone's effectiveness as a high-capacity, cost-saving solution for large municipal force main applications.

### Main ozone system components




### CAUSES OF WASTEWATER ODORS

- Hydrogen Sulfide (H2S)
- Sulfate Reducing Bacteria (SRB)
- Ammonia
- Mercaptans
- Other Organic Compounds

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