

Fine Bubble Treatment in Wastewater

Wastewater treatment depends on the characteristics of the water, the process objective and the operating conditions. Fine-bubble equipment can support oxygen transfer, gas-water contact and circulation, but it should be evaluated as part of the complete treatment process rather than as a stand-alone promise of a fixed result.

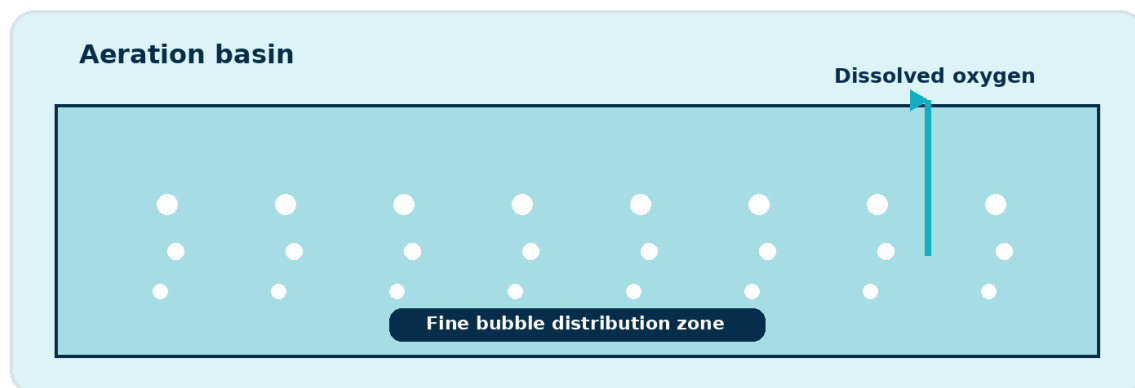
Why wastewater requires site-specific evaluation

Wastewater can vary in organic load, suspended solids, density, temperature, pH, salinity, chemical composition and biological activity. These conditions can affect pump performance, nozzle operation, gas transfer and treatment response. Backpressure, pipe losses and available electrical service also influence the final system design.

Before recommending equipment, Puroxi reviews the water source, wastewater composition, treatment objective, available test results, tank or basin geometry, flow, existing equipment and the proposed gas source.

Activated Sludge Oxygen Transfer

Conceptual diagram for wastewater evaluation



Measure DO before, during and after treatment. Confirm aerobic conditions with site data.

Figure 1. Conceptual oxygen-transfer pathway for activated sludge.

Supporting dissolved oxygen in activated sludge

Aerobic biological treatment requires suitable dissolved oxygen. A fine-bubble system may increase gas-to-water contact and help distribute oxygen through the treatment zone. Actual performance depends on oxygen demand, basin mixing, water temperature, solids loading, bubble distribution and operating time. Dissolved oxygen should be measured at representative locations before, during and after treatment.

Ozone Assisted Dye Water Evaluation

Ozone is a separate oxidant supplied to the gas line

Water loop

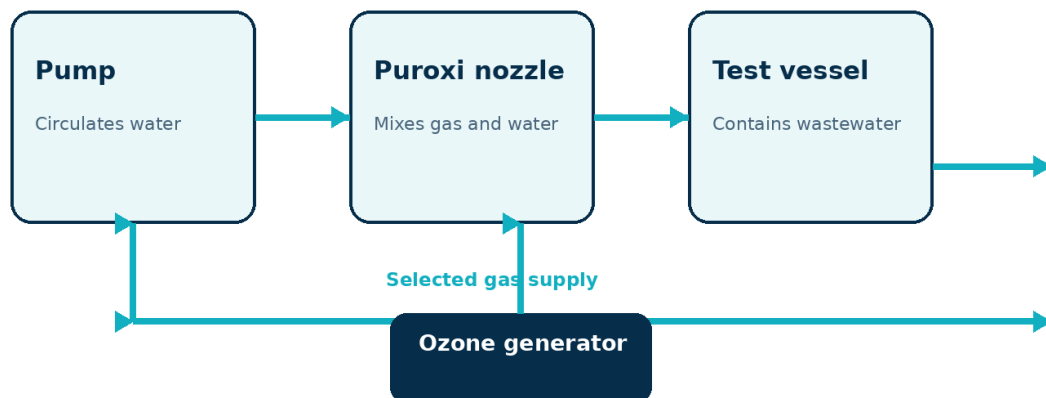


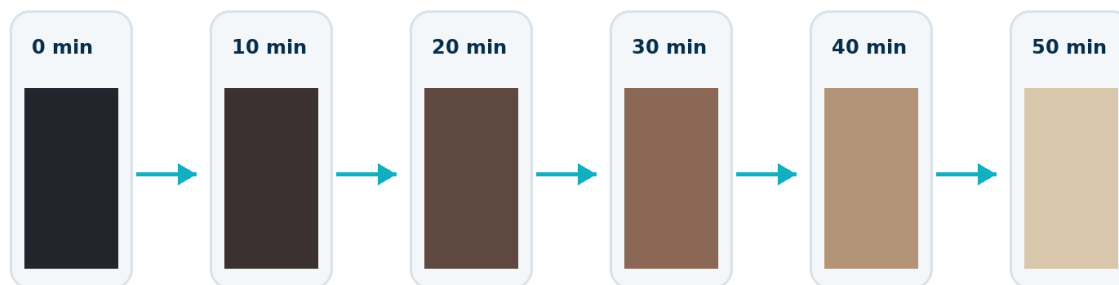
Figure 2. Conceptual ozone-assisted wastewater evaluation.

Ozone-assisted treatment

When ozone is selected, the ozone generator supplies a separate oxidizing gas to the fine-bubble system. The nozzle supports mixing and gas transfer; ozone provides the oxidation chemistry. Results from an ozone-assisted test must not be described as proof that air-only fine bubbles will produce the same response.

Visible Colour Change During Treatment

Collect samples at defined times under controlled conditions



Photographs show appearance only. Also measure COD, BOD, pH, temperature and treatment conditions.

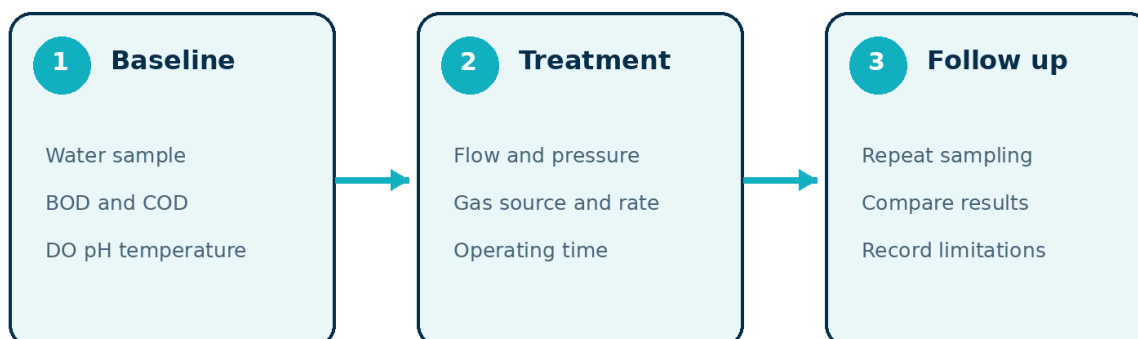
Figure 3. A controlled sample series can document visible change over time.

Visible colour change and water quality

A sequence of photographs can document visible colour change during treatment. Appearance is useful observational evidence, but it does not by itself establish reductions in chemical oxygen demand, biochemical oxygen demand, toxicity or specific contaminants. Laboratory analysis and a recorded operating protocol are required for those conclusions.

Monitored Wastewater Evaluation

Baseline, controlled treatment and documented follow up



Results from one wastewater cannot be assumed for another. Pilot testing may be required.

Figure 4. Recommended structure for a monitored wastewater evaluation.

Reported reference observations

Reference material supplied to Puroxi reports two 48-hour biochemical oxygen demand observations involving wastewater described as organic binder and ceramic powder. The reported values changed from 40 to 15 mg/L in one test and from 30 to 8 mg/L in another. These figures are source-reported observations only. The complete analytical method, controls, operating conditions and independent verification were not supplied, so the results must not be generalized to other wastewater.

A monitored Puroxi evaluation

Puroxi can help organize a preliminary evaluation using documented baseline conditions and follow-up measurements. Depending on the application, the program may record BOD, COD, dissolved oxygen, pH, temperature, turbidity, suspended solids, flow, pressure, gas source, gas rate and operating time. Additional parameters may be required for the specific industry or discharge requirement.

Some customers may begin with a monitored evaluation or pilot installation. Others may purchase equipment for their own testing program. In either case, final equipment selection must be based on actual site information and the selected pump curve.

Information to send Puroxi

- Wastewater source and process
- Current laboratory results and sampling dates
- Tank or basin dimensions and operating volume
- Current flow, circulation and aeration equipment
- Treatment objective and required discharge or reuse standard
- Available power, pump information and piping details
- Photographs or drawings of the installation area
- Proposed gas source, if any
- Operating schedule and seasonal variation

Important technical notice

This information is educational and is not a final process design, regulatory determination or performance guarantee. Results depend on wastewater characteristics, hydraulic design, gas source, equipment selection, operating conditions and monitoring. Ozone and other oxidizing gases require suitable materials, controls, ventilation and safety review. Confirm all discharge, reuse, workplace and environmental requirements with appropriately qualified professionals and authorities.