



# Simple Oxidant Demand Test

## *MIOX Laboratory Test Protocol*

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### Purpose

Determining the required oxidant dosage required to produce a desired Free Available Chlorine (FAC) residual for waters with unknown composition is typically achieved using an Oxidant Demand Test. Used appropriately, the data generated using this procedure will give MIOX and the customer information regarding the Mixed Oxidant Solution (MOS) or hypochlorite dose level needed to provide the desired FAC residual as well as to allow MIOX to provide accurate information regarding equipment sizing for the desired application.

### Required Laboratory Equipment

- Source of oxidant to be used in the test, including MIOX-MSR disinfection pen, MIOX commercial system, or commercial hypochlorite solution
  - If MOS or hypochlorite from a MIOX system is to be used in this test, the exact FAC concentration of the oxidant needs to be measured prior to beginning this test
  - If commercial hypochlorite is to be used in this test, the solution should be diluted to a FAC concentration of ~1% and the exact FAC concentration measured prior to this test
- FAC spectrometer (colorimeter) test kit, for example the Pocket Colorimeter II from HACH (HACH part number 5870012)
- Micropipette with a 10 to 100  $\mu\text{L}$  range and clean, disposable micropipette tips
- Supply of oxidant demand free water (if oxidant demand free water is not available, deionized, ultrapure, or distilled water can be used)
- Beakers or other similar laboratory glassware for dosing small samples of the raw water
- Volumetric flasks as needed to dilute test samples

### Testing Protocol

#### Water Sample Acquisition

- Approximately one gallon of water should be collected to ensure an adequate supply for an oxidant demand test
- Water should be collected in a sealable, plastic container
- If there is more than an hour before the sample is to be analyzed or shipped, the water sample is to be stored in a laboratory refrigerator





## Shipping Water Samples

- Water samples shipped to MIOX **must be coordinated** with MIOX laboratory staff prior to shipment to ensure that the samples are treated properly upon arrival to MIOX
  - Contact Andrew Boal ([andrew.boal@miox.com](mailto:andrew.boal@miox.com)) to make these arrangements
- Collected samples are to be packed in a cooler along with sufficient blue ice packs (or similar cooler pack) to keep the sample chilled for the duration of the shipping
- Samples are to be shipped overnight to the attention of Andrew Boal at MIOX Corporation, 5601 Balloon Fiesta Parkway, Albuquerque, NM 87113
- Tracking number is to be emailed to Andrew at [andrew.boal@miox.com](mailto:andrew.boal@miox.com) once it has been obtained from the shipper
- Upon arrival at MIOX, samples will be immediately unpacked and stored in a laboratory refrigerator until the oxidant demand test is preformed

*It is critical that sample acquisition and shipping instructions are followed as above to preserve the integrity of the sample and accuracy of the subsequent oxidant demand test.*

## Conducting the Oxidant Demand Test

- All results obtained from this test, as well as sample and oxidant information, are to be recorded in the data table below
- Measure the FAC concentration of 1% hypochlorite produced by dilution of bulk hypochlorite, MIOX generated MOS, or MIOX generated hypochlorite
  - For 1% hypochlorite produced by dilution of bulk hypochlorite:
    - Transfer 50  $\mu$ L of this solution into a 500 mL volumetric flask
    - Fill volumetric flasks to the fill line with oxidant demand free, ultrapure, deionized, or distilled water
    - Mix sample thoroughly
    - Measure the FAC concentration of the dilute sample and multiply by 10,000 to determine the FAC content of the 1% hypochlorite solution
  - For MOS or hypochlorite produced by a MIOX generator:
    - Transfer 100  $\mu$ L of this solution into a 500 mL volumetric flask
    - Fill volumetric flasks to the fill line with oxidant demand free, ultrapure, deionized, or distilled water
    - Mix sample thoroughly
    - Measure the FAC concentration of the dilute sample and multiply by 5,000 to determine the FAC content of the 1% hypochlorite solution
- Fill six beakers or flasks with 200 mL of the raw water
  - Beakers or flasks should have a capacity of at least 250 mL
- Add MOS or hypochlorite to each flask to achieve a target chlorine dose
  - For waters with an expected low oxidant demand, a good series of initial chlorine doses is 2, 3, 4, 6, 8, and 10 mg/L
  - If the water is known to contain ammonia, hydrogen sulfide, iron, or manganese, higher target chlorine doses may be required to achieve a free chlorine residual





- Calculate the amount of MOS or hypochlorite to added to the sample using the following equation:  $V_{\text{oxidant}} = (C_{\text{sample}} * 200,000) / C_{\text{oxidant}}$  where  $V_{\text{oxidant}}$  is the volume of oxidant to add to the 200 mL raw water sample in  $\square$ L,  $C_{\text{sample}}$  is the target chlorine dose of the sample in mg/L, and  $C_{\text{oxidant}}$  is the FAC concentration of the MOS or hypochlorite solution in mg/L
- Allow the sample to react for 20 minutes, swirling the sample occasionally to ensure the water is thoroughly mixed
- After 20 minutes, measure and record the FAC residual of the sample
  - Depending on the detection limit of the FAC measurement kit, the dosed water may need to be diluted using oxidant demand free, ultrapure, deionized, or distilled water
- If required or desired, additional target chlorine doses can be used to treat additional samples
  - Thoroughly clean the beakers or flasks used in the first sample set with oxidant demand free, ultrapure, deionized, or distilled water before reuse
- Calculate the oxidant demand of the water by subtracting the residual FAC concentration from the target chlorine dose
  - Ideally, this calculation should be made on several samples where a FAC residual is observed and then averaged from these calculations to provide the most accurate oxidant demand measurement





<b>Oxidant Demand Test Data Table</b>			
<b>Water Source</b>			
<b>Date and Time Water Sample Collected</b>			
<b>Oxidant Source</b>			
<b>Oxidant FAC Concentration (mg/L)</b>			
<b>Date of Oxidant Demand Test</b>			
<b>Additional Sample Notes</b>			
<b>Flask/Beaker Number</b>	<b>Target Chlorine Dose (mg/L)</b>	<b>Oxidant Volume (µL)</b>	<b>FAC Residual (mg/L)</b>
1			
2			
3			
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