Dissolved Oxygen Uptake Rate (DOUR) & Standardized Oxygen Uptake Rate (SOUR)

Dissolved oxygen uptake rate (DOUR) is the weight of oxygen consumed by microorganisms per unit of time and is reported as mg/L/hour. Reference method is modified from 2710 B Standard Methods, 18th edition, using a YSI Model 51B oxygen meter.

CALIBRATION

1. Place the BOD probe in a BOD bottle partially filled with deionized H_2O. Allow temperature to stabilize.

2. Switch instrument to "Temperature" and read. Refer to attached table to determine calibration value.

3. Correct for altitude, if needed.

4. Switch to appropriate mg/L range and adjust to read calibration value in step 2. Wait 2 minutes to assure stability, readjusting as necessary.

UPTAKE MEASUREMENT

1. Sample should be collected and tested within an hour. Vigorously shake approximately 500 ml (in a 1 Liter container) sample to completely aerate. Immediately pour into a BOD bottle and insert probe into sample. Switch on the stirrer.

2. Record the dissolved oxygen (DO) reading where the needle lags briefly. This is the initial reading. The first time a DOUR is performed, it is useful to graph the DO vs. time. It is proper **to begin recording during the linear portion of the curve**. The lag portion lasts 30 seconds to 1 minute followed by the linear portion.

3. Set time. At the end of this time, record the DO reading. Stop recording if DO is <1.0 mg/L. This is the final reading. We usually run the test between 5 and 6 minutes for most wastewater samples.

4. Calculate DOUR as follows:

$$\text{Mg } O_2\text{/L/hour} = \frac{\text{Initial DO - Final DO}}{\text{Time Tested}} \times 60 \text{ min.}$$

5. The Specific Oxygen Uptake Rate (SOUR) accounts for the MLSS/MLVSS having endogenous respiration. It is calculated as:

DOUR/g MLVSS = SOUR

Interpreting SOUR Values

> 20 mg O_2/g MLVSS/hour	High	High F/M, young sludge
12 to 20 mg O_2/g MLVSS/hour	Normal	Normal decline phase sludge
< 12 mg O_2/g MLVSS/hour	Low	Low F/M, old slduge

The lower respiration rates indicate less soluble organics and lower microbial activity. In cases with toxicity, you will see higher COD and lower respiration rates as microbes adjust and inhibitory compounds are diluted or decompose.

Modifications on DOUR

Testing new waste stream for impact on system

Often operators want to evaluate the impact on biomass of a new waste stream. With DOUR testing, we can discover the immediate impact on microbial respiration rates. The most rapid way to use this test is called a "Spiked OUR" where we add the new influent to existing MLSS. Testing immediately may not be the best way to run the test as it may take more time to see impact on microbial respiration rates via acute toxicity or even microbial respiration rates.

Proposed use of Spiked OUR to test for acute toxicity.

- Collect MLSS from existing system and keep aerated in lab using an air store.
- Add new influent at predetermined dilution factor.
- Aerated the mixed sample for 1 hour or longer if you want to do a more complex simulation.
- Perform standard DOUR test. Run a minimum of three samples:
    - Current MLSS (control)
    - Diluted adjustment new influent (correction factor for possible abiotic oxygen demand)
    - Test MLSS with added influent
- % inhibition can be calculated as:

  1 – [Control - (Test – Adjustment)]/Control * 100