

Exploring TOC as an Alternative to BOD for NPDES Reporting



Thank you WEF Presenters!

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<http://www.wef.org/LabPracticesUsingTOC/>



Definitions

Organic Carbon

- Oxidized by Chemical processes = COD
- Oxidized by Biological processes = BOD
- Independent of Oxidation state = TOC



Definitions

BOD₅

- Biochemical oxygen demand, or BOD, measures the amount of oxygen consumed by microorganisms in decomposing organic matter in stream water.
(<http://water.epa.gov/type/rsl/monitoring/vms52.cfm>)
- Strength of the pollution in the stream
- 48 hour hold time/5 day analysis
- 2 mg/L MDL



Definitions

TOC

- Total Organic Carbon -The gross amount of organic matter ...found in natural water.
(http://www.epa.gov/nerlcwww/documents/m_415_3Rev1_1.pdf)
- Strength of the pollution in the stream
- 28 day hold time/< 4 hours analysis
- 0.1 mg/L MDL



40CFR

§133.102 Secondary treatment.

The following paragraphs describe the minimum level of effluent quality attainable by secondary treatment in terms of the parameters—BOD₅, SS and pH. All requirements for each parameter shall be achieved except as provided for in §§133.103 and 133.105.

(a) **BOD₅**.

- (1) The 30-day average shall not exceed 30 mg/l.
- (2) The 7-day average shall not exceed 45 mg/l.
- (3) The 30-day average percent removal shall not be less than 85 percent.
- (4) At the option of the NPDES permitting authority, in lieu of the parameter BOD₅ and the levels of the effluent quality specified in paragraphs (a)(1), (a)(2) and (a)(3), the parameter

CBOD₅ may be substituted with the following levels of the CBOD₅ effluent quality provided:

- (i) The 30-day average shall not exceed 25 mg/l.
- (ii) The 7-day average shall not exceed 40 mg/l.
- (iii) The 30-day average percent removal shall not be less than 85 percent.



40CFR

§133.104 Sampling and test procedures

(a) Sampling and test procedures for pollutants listed in this part shall be in accordance with guidelines promulgated by the Administrator in 40 CFR part 136.

(b) Chemical oxygen demand (COD) or **total organic carbon (TOC) may be substituted for BOD₅** when a long term BOD:COD or **BOD:TOC correlation has been demonstrated.**



Analysis - BOD

- Minimum sample size 1 L
- Preservation – refrigerate $<6^{\circ}\text{C}$ (do not freeze)
- 48 hour hold time from end of ≤ 24 hour composite sampling event
- Estimate & set up multiple dilutions
- Incubation in dark 5 days @ $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$
- Cross your fingers



Analysis - TOC

- Standard Methods 5310-B 2000
- Minimum sample size 100 mL
- Preservation – acidify to pH <2 with HCl, H₃PO₄ or H₂SO₄ and refrigerate <6° C (do not freeze)
- 28 day hold time from end of up to 24 hour composite sampling event



Analysis - TOC

- HACH
- Add buffer and reagents to sample aliquot, mix
- Digest 2 hours @ $104^{\circ}\text{C} \pm 1^{\circ}\text{C}$
- Perform blank & check standards
- Insert vial into spectrophotometer and read.

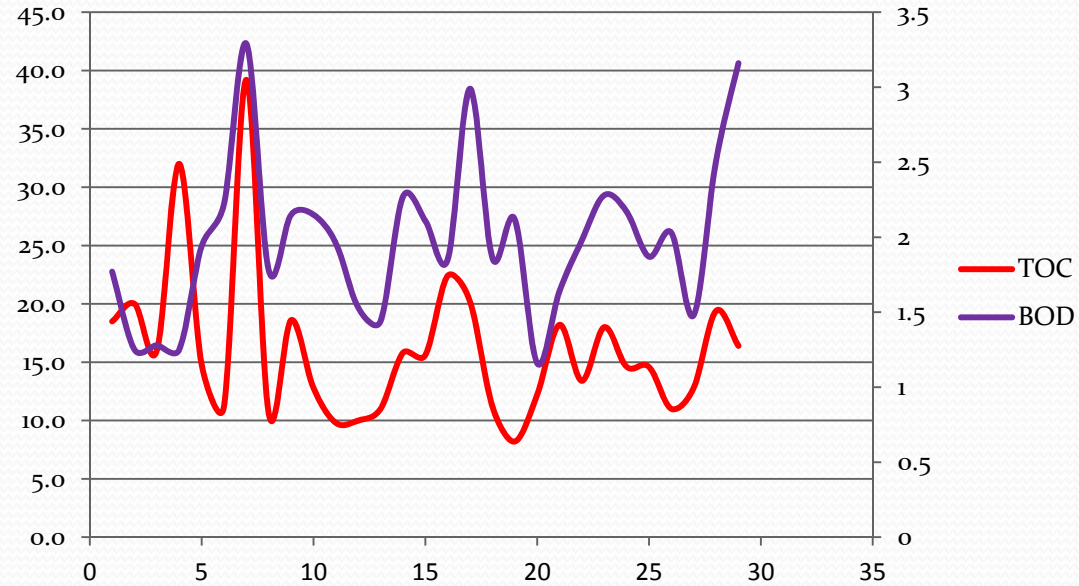


Data



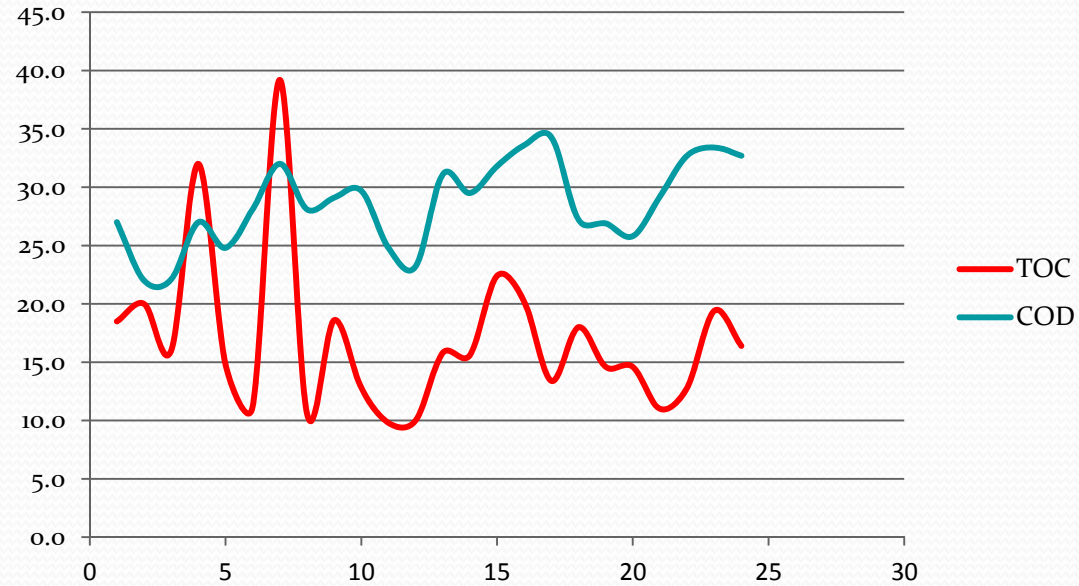
Data

BOD vs TOC



Data

TOC vs COD



Other Considerations

- Return on Investment \$\$
- Space
- Waste stream



Looking Forward

- Data
- Regulators
- Permit Negotiations
- **So Happy Its Thursday!**



Questions



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