Oxygen Demand: Distinguishing COD and BOD Methods of Analysis

4/25/2023, Ver #2

Introduction

Oxygen demand measurements are used to estimate water pollution levels entering and leaving wastewater treatment and industrial facilities. Particularly close attention is paid to effluents as high oxygen demand levels indicate a danger to aquatic life. Since treatment facilities are considered point sources, they are regulated under the Clean Water Act (CWA) which in turn sets facility specific pollutant release targets as part of the National Permit Discharge Elimination System (NPDES) permitting process. NPDES permits usually specify limits related to oxygen demand based on either the Chemical Oxygen Demand (COD) or Biochemical Oxygen Demand (BOD) testing methods.

BOD Testing

BOD measures how much dissolved oxygen (DO) is consumed by microorganisms to decompose organic matter under aerobic conditions. Since BOD is a measurement based on a biological process, testing for it can take a few days. How is BOD tested? Incubate a sealed water sample at 20°C for five days, followed by measuring the difference in oxygen content before and after incubation.

Figure 1: An operator filling a BOD bottle.

COD Testing

COD measures how much DO is consumed by the chemical oxidation of organic matter under controlled conditions. Since COD is based on a chemical process testing for it will only take a few hours. COD testing

typically involves digestion of the water sample in a sealed vial with potassium dichromate and sulfuric acid at 150°C for 2 hours. Vials are read in a spectrophotometer to determine results.

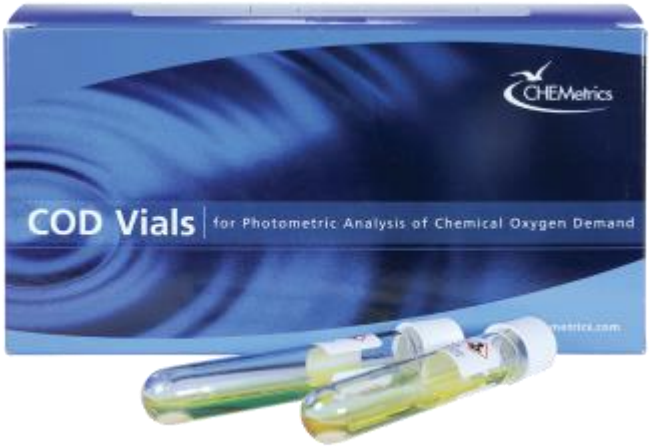

Figure 2: A 25 pack of CHEMetrics COD vials

COD vs. BOD Methods for Testing Water Quality

Of the two tests, COD analysis is more commonly performed as it takes less time and is more replicable. Furthermore, treatment operators can quickly react to changes in oxygen demand and modify treatment processes appropriately. COD measurements will always be higher than BOD measurements because COD is measuring everything that can be oxidized in the sample, where BOD is measuring only what can be oxidized through biological processes. Plant engineers may establish a statistically validated COD/BOD ratio to demonstrate their ability to reliably predict a BOD value based solely on a COD measurement to their permitting authority. The COD value may be used as justification for BOD removal from a plant permit.

Conclusion

CHEMetrics offers a comprehensive line of USEPA-accepted COD vials. **K-7350S** is for low range measurements (0-150 ppm) while **K-7360S** is for high range measurements (0-1,500 ppm). While not USEPA-accepted, **K-7370S** can measure up to 15,000 ppm. CHEMetrics also offers a line of mercury-free vials (**K-7351S**, **K-7361S**, and **K-7371S**) that are more convenient for disposal.