Difference Between BOD and COD

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Difference Between BOD and COD

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Main Difference – BOD vs COD

The aquatic organisms depend on the oxygen present in water or **dissolved oxygen (DO)** for their respiratory needs. The amount of DO in a water body depends on water temperature, the quantity of sediment, the amount of oxygen taken out from the system, and the amount of oxygen put back into the water. Respiration and decaying of organisms take oxygen out of the system, and photosynthesizing organisms, aeration, and stream flow return oxygen to water. Bacteria decompose natural organic detritus as well as organic waste in water by using DO. BOD and COD are two measurements which describe the demand of DO by bacteria in the water. BOD refers to the biochemical oxygen demand and COD is the chemical oxygen demand. The **main difference** between BOD and COD is that **BOD is the amount of oxygen which is consumed by bacteria while decomposing organic matter under aerobic conditions** whereas **COD is the amount of oxygen required for the chemical oxidation of total organic matter in water.**

Key Areas Covered

1. **What is BOD**
   – *Definition, Test Method and Procedure, Purpose*
2. **What is COD**
   – *Definition, Test Method and Procedure, Purpose*
3. **What is the difference between BOD and COD**
   – *Comparison of Key Differences*

Key Terms: BOD, COD, DO, Biochemical Oxygen Demand, Chemical Oxygen Demand, Dissolved Oxygen, Oxygen in Water


BOD
VERSUS
COD
BOD is the amount of oxygen consumed by bacteria while decomposing organic matter under aerobic conditions
COD is the amount of oxygen required for the oxidation of total organic matter in water
Biological oxidation process
Chemical oxidation process
The common test method is method 5210B
The common test method is method 410.4
Determined by incubating a sealed water under specific temperature sample for five days and measuring the loss of oxygen from the beginning of the test
Determined by incubating a closed water sample with a strong oxidant like potassium dichromate in combination with boiling sulfuric acid under specific temperature for a specified period of time
Five days are taken for the determination
COD measurement can be taken from few days
The permissible limit is 30 mg/L
The permissible limit is 250 to 500 ppm
Value is lower than the COD value
Always greater than the BOD value
Capable of oxidizing natural organic detritus and the organic waste in the water
Capable of degrading industrial sewage, but does not measure the oxygen consumption of acetate
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What is BOD

BOD refers to the **biochemical oxygen demand**, which measures the amount of dissolved oxygen (DO) required by aerobic organisms to break down organic material present in a given water sample at a given temperature and specified time. Since BOD is a biochemical process, it is not a precise quantitative test. But, BOD is a widely used test method, indicating the organic quality of water. BOD is determined by incubating a sealed water sample for five days and measuring the loss of oxygen from the beginning of the test. Two measurements are to be taken for the calculation of BOD of a sample. One is the initial DO and second is the final DO after five days. BOD is expressed in milligrams of oxygen consumed per liter of the sample for five days (BOD_5) of incubation at 20 °C. BOD directly affects the DO of rivers and streams.

The sources of BOD are leaves, woody debris, topsoil, animal manure, food-processing plants, wastewater treatment plants, feedlots, failing septic systems, urban stormwater runoff, and effluents from pulp and paper mills. The rate of the oxygen consumption depends on the temperature, pH, present in microorganisms, and the type of organic material in water. The greater the BOD in a particular water body, the lesser oxygen is available for the aquatic life forms in that particular water body. Aquatic life forms would be stressed, suffocate and ultimately die due to high BOD. The BOD test bottles at a laboratory of a wastewater treatment plant are shown in *figure 1*.

Figure 1: BOD test bottles

What is COD

COD refers to the chemical oxygen demand, which measures the amount of DO, required by the decomposition of organic matter and the oxidation of inorganic chemicals like ammonia and nitrite. COD measurements are commonly made with the samples of wastewater or natural water, which are contaminated by domestic and industrial wastes. A closed water sample is incubated with a strong oxidant like potassium dichromate ($K_2Cr_2O_7$) in combination with boiling sulfuric acid (H_2SO_4) under a specific temperature for a specified period of time. COD is related to BOD. But,

COD is the only method to measure the amount of industrial wastes in water, which cannot be measured under BOD. The amount of cellulose in water is only measured by COD. The plants which treat wastewater from the commercial operations measure COD. Ariel view of a wastewater treatment plant is shown in *figure 2*.

Figure 2: Wastewater Treatment Plant

Difference Between BOD and COD

Definition

BOD: BOD is the amount of oxygen consumed by bacteria while decomposing organic matter under aerobic conditions.

COD: COD is the amount of oxygen required for the oxidation of total organic matter in water.

Decomposition

BOD: BOD is a biological oxidation process.

COD: COD is a chemical oxidation process.

Test Method

BOD: The common test method for BOD is method 5210B.

COD: The common method for COD is method 410.4.

Test Procedure

BOD: BOD is determined by incubating a sealed water under specific temperature sample for five days and measuring the loss of oxygen from the beginning of the test.

COD: COD is determined by incubating a closed water sample with a strong oxidant like potassium dichromate ($K_2Cr_2O_7$) in combination with boiling sulfuric acid (H_2SO_4) under specific temperature for a specified period of time.

Time Taken for Determination

BOD: Five days are taken for the determination of the BOD.

COD: COD measurement can be taken from few days.

Permissible Limit of Test

BOD: The permissible limit of BOD is 30 mg/L.

COD: The permissible limit of COD is 250 to 500 ppm.

Values of Measurement

BOD: BOD value is lower than the COD value.

COD: COD value is always greater than the BOD value. Therefore, the more organic material can be oxidized by COD.

Oxidation Ability

BOD: Biological oxidation is capable of oxidizing natural organic detritus and organic waste in the water.

COD: Industrial sewage is only degraded by COD. But, COD does not measure the oxygen consumption of acetate.

Conclusion

BOD and COD measurements are taken to determine the pollution level of wastewater. COD value is always greater than the BOD value of a particular water body. BOD measures the oxygen demand for the decomposition of organic

material by the microbes in the wastewater. COD measures the oxygen demand for the decomposition of both organic and inorganic materials in wastewater. This is the main difference between BOD and COD.

Reference:

1.”Biochemical Oxygen Demand – BOD.” YSI – a xylem brand. N.p., n.d. Web. Available here. 02 June 2017.
2.”Biochemical Oxygen Demand (BOD).” Real Tech Inc. N.p., n.d. Web. Available here. 02 June 2017.
3.”Chemical Oxygen Demand.” Cod, Bod, Waters, and Organic – JRank Articles. N.p., n.d. Web. Available here. 02 June 2017.
4.” Chemical Oxygen Demand (COD).” Real Tech Inc. N.p., n.d. Web. Available here. 02 June 2017.

Image Courtesy:

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2. “Marlborough East Wastewater Treatment Plant Aerial” By Nick Allen – Own work (CC BY-SA 4.0) via Commons Wikimedia

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Lakna, a graduate in Molecular Biology & Biochemistry, is a Molecular Biologist and has a broad and keen interest in the discovery of nature related things

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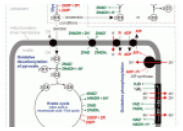

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