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An Overview of Phenomenon of BOD and COD

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Abstract - Real-time monitoring of water quality for sewer system is required for efficient sewer network design because it provides information on the precise loading of pollutant to Wastewater treatment facilities and the impact of loading on receiving water. In this study, biochemical oxygen demand (BOD) and chemical oxygen demand (COD) phenomenon discussed. The temporal variations in BOD and COD for urban areas whereas they were relatively irregular for non-urban areas. Irrespective of the sewer pipes and the types of the areas, it will be changes.

Key Words: BOD, COD, Chemicals required, THOD, Limitation of BOD and COD etc.

1. INTRODUCTION

Biochemical Oxygen Demand

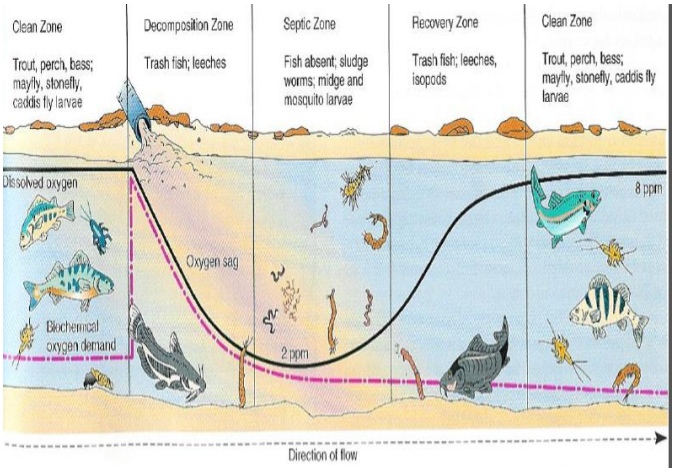
The Quantity of Oxygen Used in the Biochemical Oxidation of Organic Material.
Under:

Specified Time	5 Days
Specified Temperature	20
Specified Conditions	In the Dark

In the Presence of Bacteria

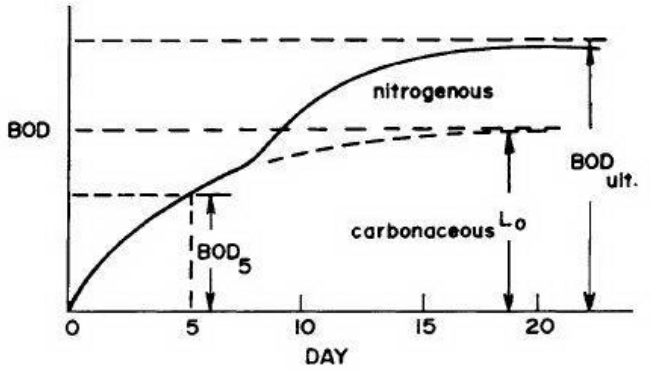
(to prevent algae growth and photosynthesis of O2)

1.1 Impact of BOD on dissolved oxygen in a river



1.2 Stages of BOD

First stage BOD- Carbonaceous
Second stage BOD-Nitrogenous



2. THEORITICAL OXYGEN DEMAND (THOD)

Degradable organic matter is broken down by **microbes**, usually with the help of **oxygen,** although in the absence of oxygen also anaerobic reactions (fermentation and methanogens) are possible. $C_2H_5OH + 3\ O2$
$2\ CO_2 + 3\ H_2O$ ThOD of C_2H_5OH = = 2.08 mg O_2/mg ethanol

THEORITICAL OXYGEN DEMAND (THOD)

THOD is the total amount of oxygen required to completely oxidize a known compound to CO2 and H2O. It is a theoretical calculation that depends on simple stoichiometric principles. It can only be calculated on compounds of known composition.

2.1 Seeding

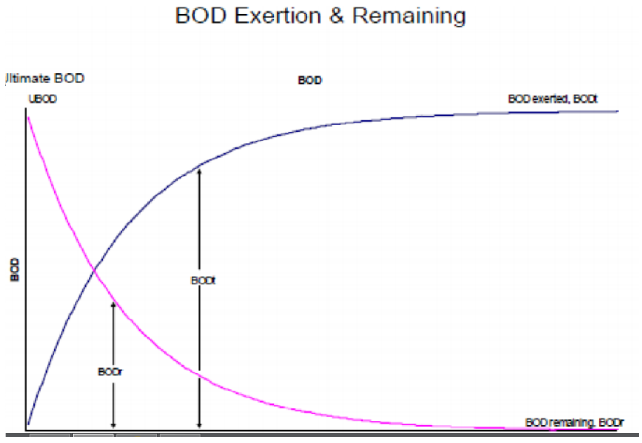
Samples of domestic sewage and industrial effluents mixed with sanitary sewage, in the pH range of 6 to 8.5 themselves, contain enough living microorganisms and do not require seeding.

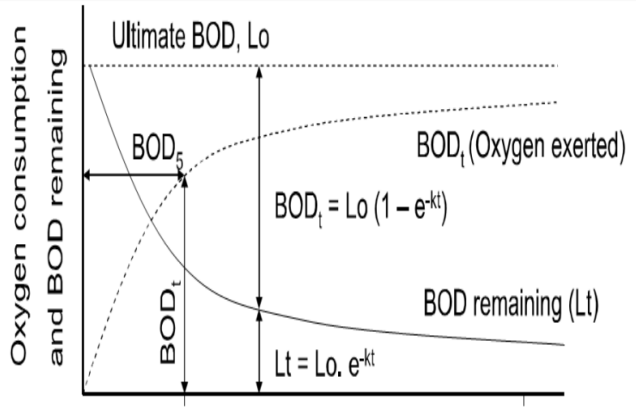
- Samples of industrial organic wastes, such as sugar factory wastes, paper & pulp mill wastes, textile wastes, distillery wastes etc. require seeding particularly when their pH is outside the range of 6 to 8.5.
- Samples, that are acidified and stored below 100 C for preservation for some days before BOD determination, require pH correction and seeding at the time of test.

• The seed may be bacteria from organically rich soil or the supernatant of aerated domestic sewage or an extract from the aerator mixed liquor of a successfully working ASP.

- Carbonaceous matter oxidation -5 days 20^0C
- Nitrogenous matter oxidation-6-7 days
- BOD 5 days oxidation of organic matter is about 68-70%
- 20 days oxidation of organic matter is about 95-99%.

2.2 Kinetics of BOD-





2.3 BOD Rate Constant (K_D)-

K_D determines the rate of BOD reaction. It varies with temperature. Therefore, K_D for some other temperature can be worked out

• K_D (T_0) = KD (20^{0C}) (1.047) T-20^0C

• At 200C, K_D value for municipal wastewater is 0.1/day. The range of K_D value is 0.05-0.2/day.

2.4 Significance of BOD-

Determining degree of H2O pollution.

•Important measurement in operation of sewage treatment plant.

•Comparing BOD of incoming sewage & effluent efficiency, effectiveness of treatment is judged.

• For example, in a typical residential city raw sewage has a BOD value of around 300 mg/L. If the effluent from the sewage treatment plant has a BOD. of about 30 mg/L, the plant has removed 90 percent of the BOD.

2.5 Limitation of BOD-

Dilution is required.

• Measurement fails if dilution is too much or too less

• Pretreatment if toxic wastes.

• Long period of time.

• Seeding for industrial water.

3. COD

3.1 Definition-

Measure of the oxygen equivalent of organic matter in a sample that is susceptible to oxidation by a strong chemical oxidant. Rather than biologically decompose / oxidize organic waste, here chemically decompose/oxidize organic waste is done.

3.2 Principle behind COD-

A known volume of a potent oxidizing agent is used to oxidize all oxidizable matters in the waste sample as completely as possible. Oxidation is carried out for extended period at 150 C.

•The residual oxidizing agent is estimated using a suitable reducing agent. The amount of oxidizing agent consumed is a measure of the overall pollution load of the waste.

3.3 Apparatus and Chemical Required-

Reflux apparatus comprising of 500 ml capacity RB flask with ground glass joint and a water condenser.

•Chemicals

1. Standard 0.25 N $K_2Cr_2O_7$ (1 ml ≡ 2mg of oxygen)

2.H_2SO_4-$AgSO_4$ reagent

3. Standard 0.1 N $Fe(NH_4)2(SO_4)2.6H_2O$

4. Ferron indicator-color of oxidized form is pale blue and of reduced form is red

5. HgSO4 AR grade

3.3 Procedure of COD-

In RB flask-water sample + HgSO4 + distilled

Water + K2Cr2O7 + H2SO4-AgSO4 reagent. Heat it under reflux for at least 2 hours. Cool the solution, dilute it and titrate the unreacted K2Cr2O7 with FAS solution using Ferroin as Indicator and get b ml

•Color at end-point changes from blue green (oxidized form) to wine red (reddish brown complex) (reduced form)

•Perform blank experiment with Distilled water instead of the water sample and get a ml.

3.4 Accuracy of Test-

It is important that no outside organic material be accidentally added to the sample to be measured. To control for this, blank sample is used created by adding all reagents (e.g. acid and oxidizing agent) to a volume of distilled water. COD is measured for both and the two are compared i.e. COD of blank -COD of sample.

3.5Advantages-

- Correlates with BOD well
- Toxic chemicals do not interfere
- Short time for analysis

3.6 Limitation-

- Chemical Oxidant is not specific to oxygen-consuming chemicals that are organic or inorganic, both of these sources of oxygen demand are measured in a COD assay.
- It does not distinguish between Biodegradable and Non-Biodegradable organic matter.
- The test does not measure the oxygen demand caused. by the oxidation of ammonia into nitrate.

4. Conclusion:

The water qualities of all surface water bodies that may be river, reservoir, lake, stream, delta, and creek are very important. Various researchers explained their views about water quality parameters. The physical chemical and Biological factors are investigated in this study to assess the water quality and it is clear that all parameters are equally important and broad range of parameters is to be studied with more details for water quality modeling. Also, those parameters were selected due to their simple, fast and continuous measurement at water quality monitoring stations. So it can be conclude that Temperature, pH, TDS, EC, DO, BOD, COD are the broad range of water quality parameters for drinking, irrigation, aquatic life for surface water.

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