Chemical Oxygen Demand(COD)

Chemical Oxygen Demand(COD) is a widely used parameter for assessing the pollution strength of wastewater.
It measures the total quantity of oxygen required to chemically oxidize both biodegradable and non-biodegradable organic matter present in water.
Since COD is faster to measure than BOD, it is often used in industrial waste water monitoring and treatment plant design.

1. Significance of COD

- Indicates the overall pollution load of wastewater.
- Measures both biodegradable and non-biodegradable organics.
- Provides quick results compared to BOD (hours vs. days).
- Essential in industrial discharge monitoring.
- Used to assess the efficiency of treatment plants.

2. Factors Affecting COD

- Concentration of organic matter:Higher organic waste → higher COD.
- Presence of toxic chemicals: Industrial effluents increase COD significantly.
- Inorganic reducing agents: Compounds like sulfides and nitrites can also contribute to COD.
- Waste water source: Domestic sewage has lower COD compared to industrial effluents.

3. Measurement of COD

- Closed reflux titri metric method(classical laboratory approach).
- Closed reflux colorimetric method (using spectrophotometers).
- Results expressed in mg/L of oxygen equivalent.
- Faster than BOD→ results in 2–3hours.

4. Typical COD Values

- Unpolluted surface water:<20mg/L.
- Municipal sewage (untreated):200–600 mg/L.
- Industrial waste water:Can exceed 1000mg/L.
- Treated effluent standard(India,CPCB): Usually<250mg/L.

5. Diagram: COD Process in Water Analysis

Organic &Inorganic Pollutants in Water

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Oxidation with Strong Chemical Agent ($K_2Cr_2O_7$ in Acid Medium)

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Oxygen Consumption Measured

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COD Value (mg/L) Indicates Total Pollution Load

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Higher COD → More Pollution → Greater Stress on Aquatic Life

6. Effects of High COD

- Oxygen depletion in receiving water bodies.
- Stress on aquatic organisms and loss of biodiversity.
- Development of anaerobic conditions producing foul gases.
- Indicator of industrial pollution and toxic waste discharge.

7. Control Measures

- Primary treatment: Screening and sedimentation of solids.
- Secondary treatment: Biological oxidation processes.
- Tertiary treatment: Advanced oxidation(ozonation, Fenton process).
- Waste minimization: Cleaner production and recycling in industries.
- Regulation: Strict enforcement of effluent discharge standards.

8. Conclusion

Chemical Oxygen Demand is acrucial water quality parameter that provides rapid and reliable information about the pollution potential of wastewater.
Unlike BOD,COD accounts for all oxidizable matter, making it a comprehensive indicator for industrial and municipal effluents.
Maintaining COD with in permissible limits is essential for protecting aquatic ecosystems and ensuring safe water use.