

Seasonal Challenges, Smart Solutions: Summer Operation of Wastewater Lagoons

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Overview

- Participants will explore common warm-weather lagoon issues including algae growth, odors, dissolved oxygen concerns, solids management, insect control, and storm-related impacts.
- Discuss realistic strategies to prevent problems before they escalate.
- Highlight operational adjustments, routine monitoring practices, and protective measures that can help maintain stable treatment and extend the life of lagoon systems throughout the hottest months of the year.



Agenda

- Identify key lagoon challenges that emerge during late spring and summer
- Understand practical operational strategies to maintain treatment efficiency in hot weather
- Implement approaches to **managing algae, odors, and low dissolved oxygen**
- Develop seasonal inspection and maintenance practices for lagoon protection
- Take proactive steps to prepare lagoons for summer conditions



Key Challenges during late spring and summer



As water warms, the lagoon turns over bringing smelly, anaerobic bottom gases to the surface



Increased sunlight promotes algae growth, which helps oxidize waste but can cause high pH and excessive algae mats



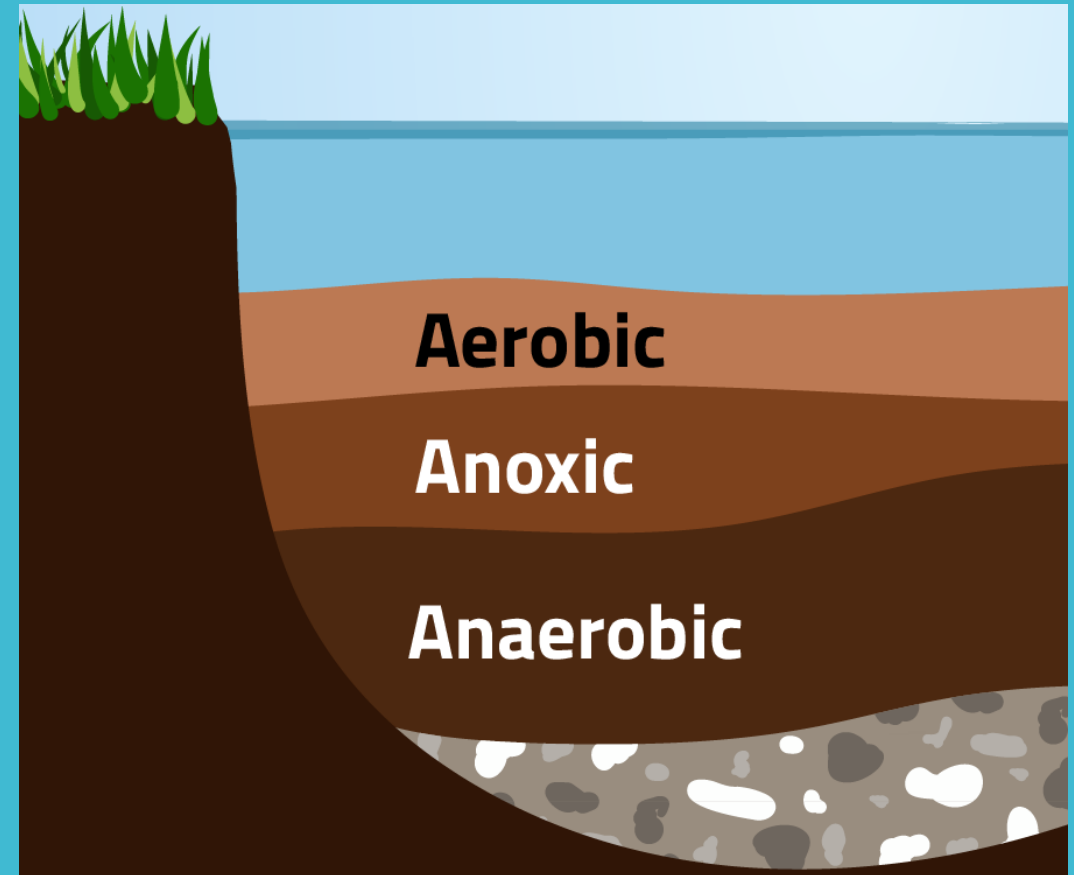
Warmer temperatures increase microbial activity, allowing faster breakdown of waste



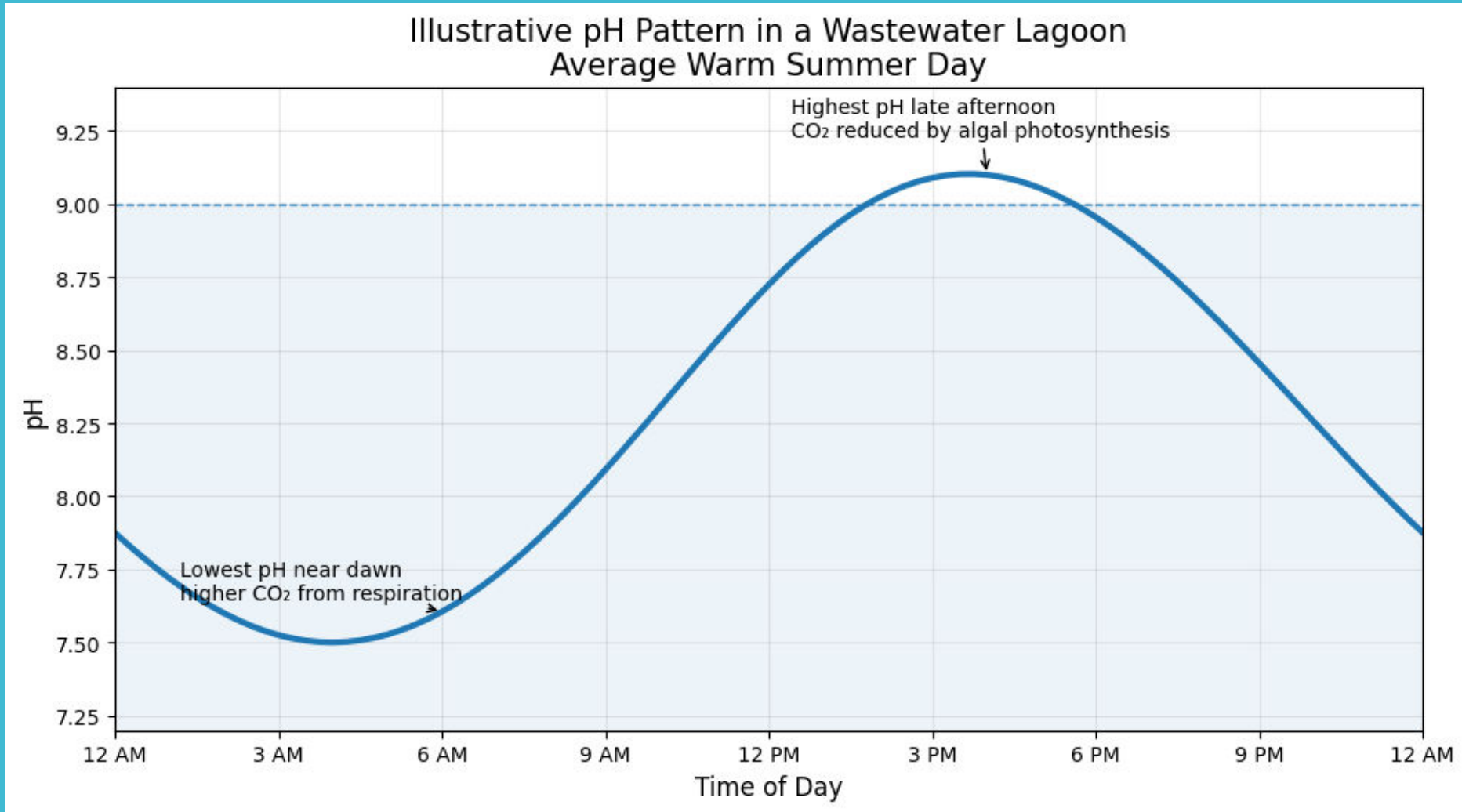
Oxygen level fluctuations



Algae Overgrowth and Layers of Lagoon Sediment

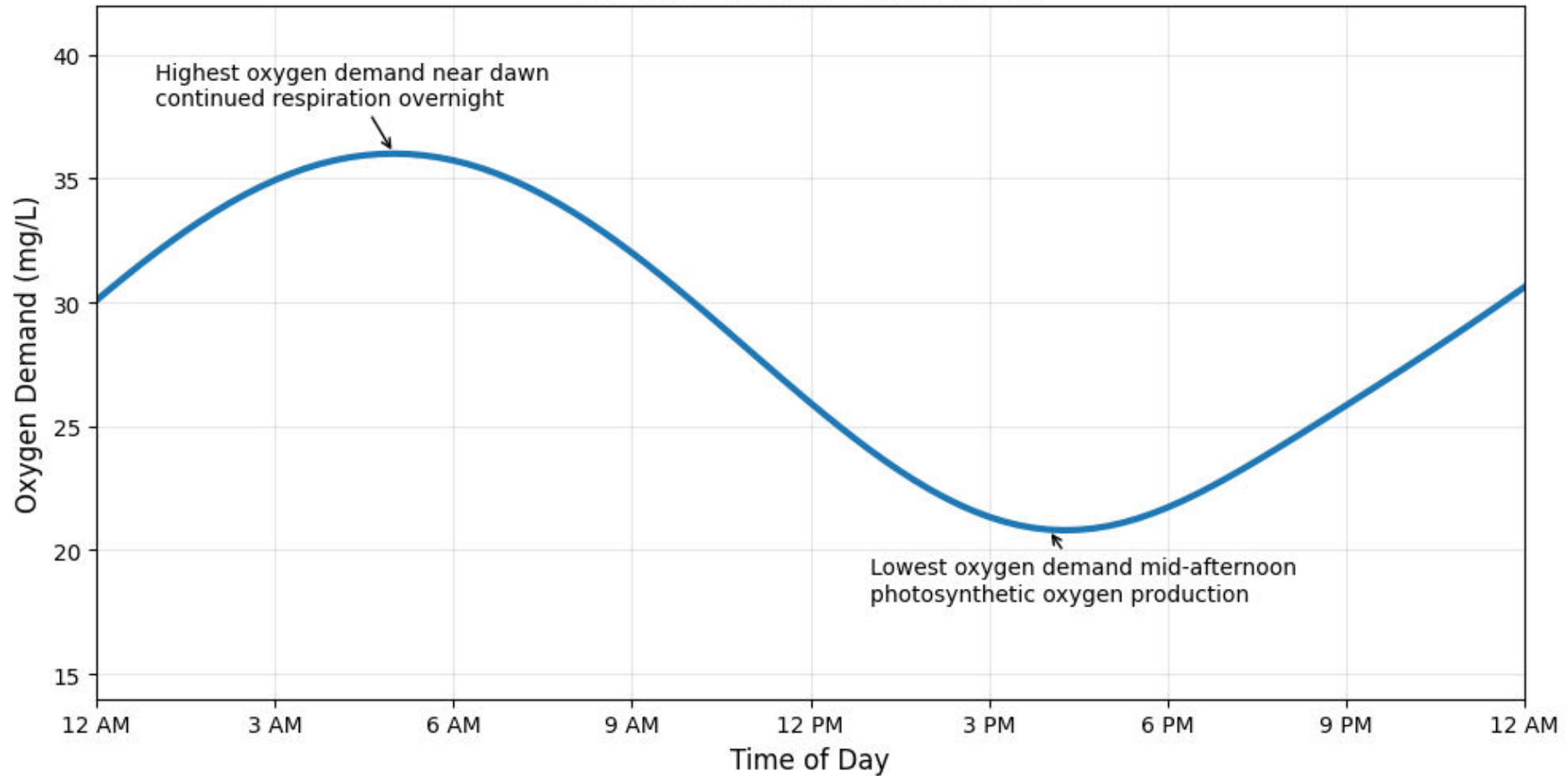


The pH Movement on Typical Summer Days

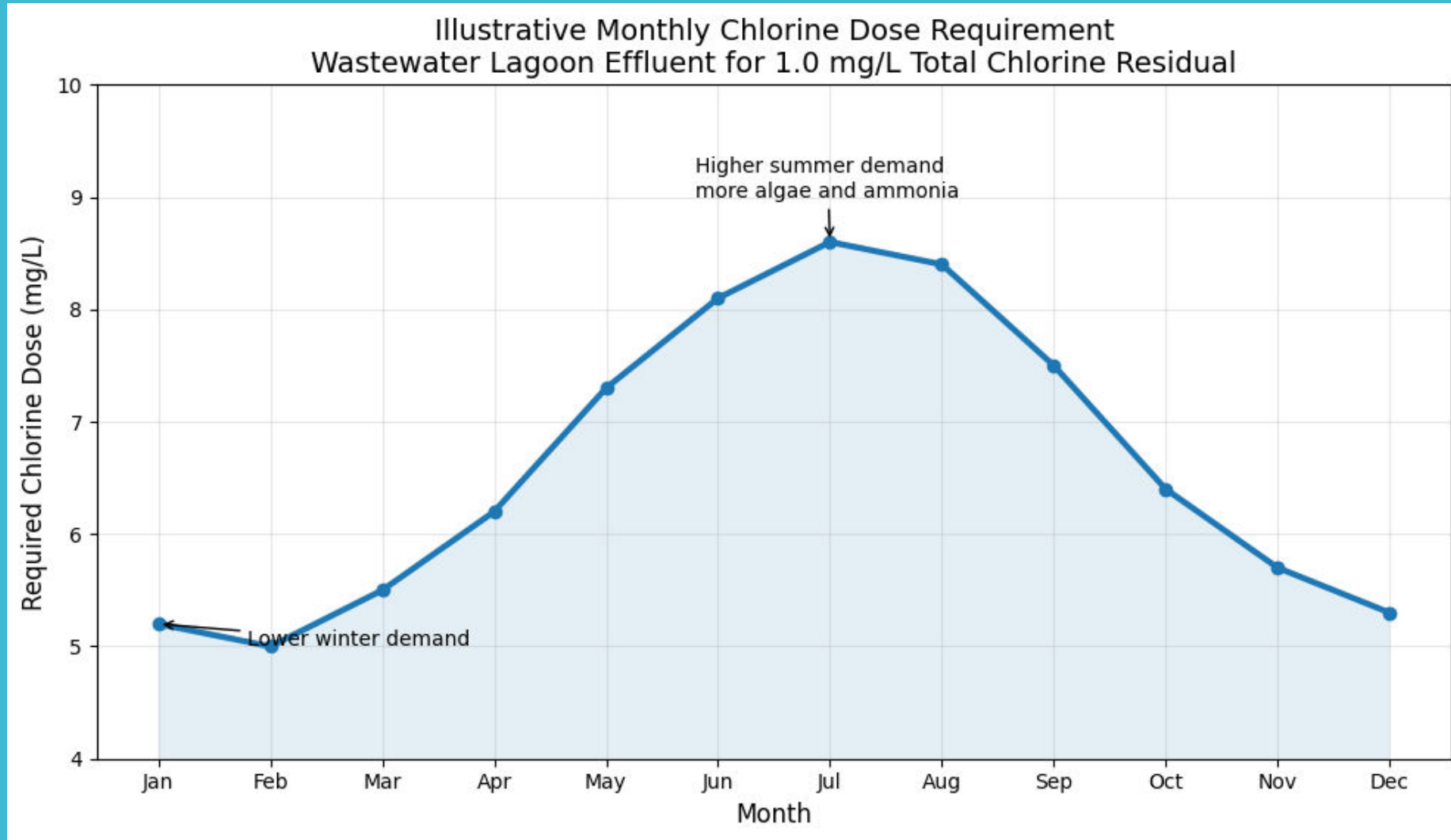


The Oxygen Demand Pattern on Typical Summer Days

Illustrative Oxygen Demand Pattern in a Wastewater Lagoon
Average Warm Summer Day



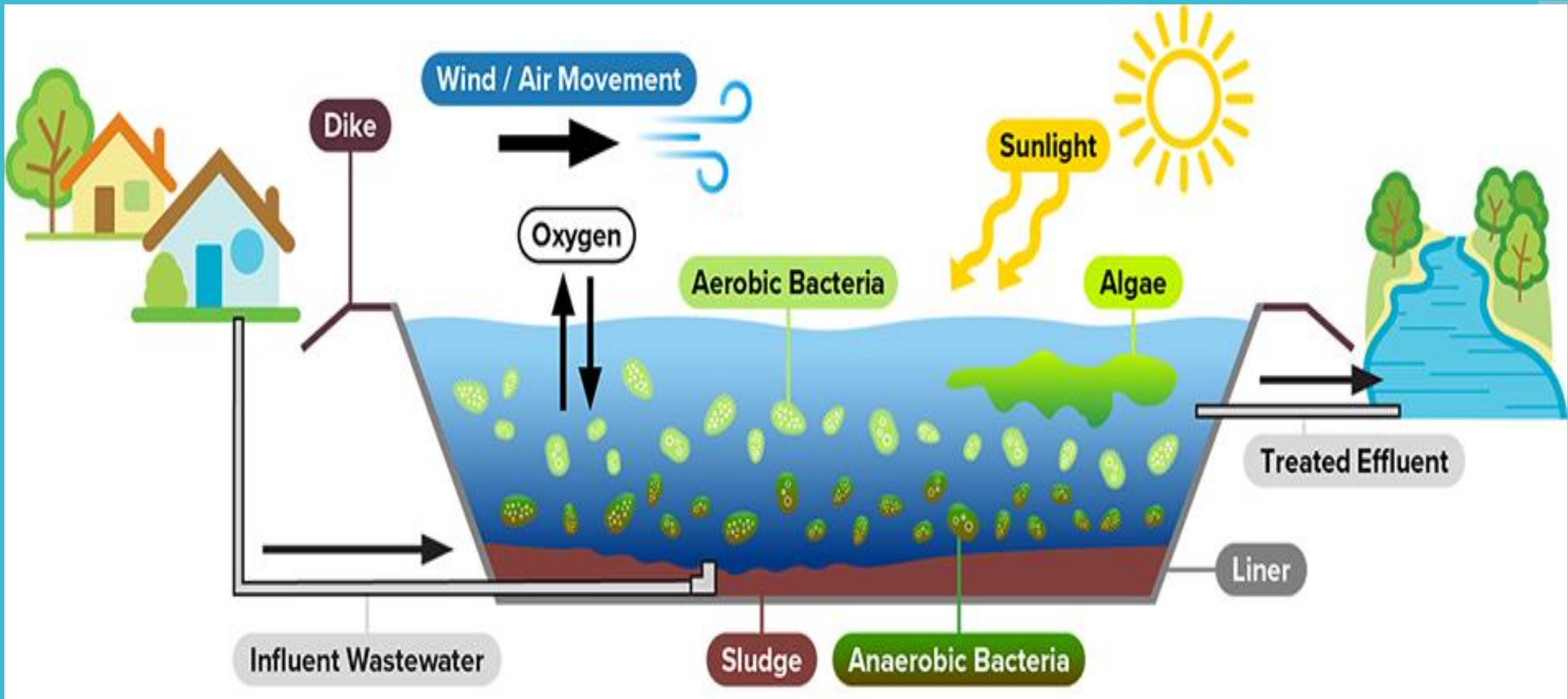
Chlorine Demand to Achieve Permit Limits



Strategies to Prevent Problems

- Increase aeration - warmer water holds less oxygen but increases microbial activity, requiring higher DO levels (ideally 2 mg/L or higher).
- Cycle aerators - cycle aerators on and off to optimize electricity usage while maintaining necessary dissolved oxygen.
- Control algae bloom – algae can cause high TSS in the effluent
- Control duckweed – ensure it covers no more than 40% of the surface to prevent odor and excessive oxygen fluctuation
- Monitor pH - optimal pH range for nitrification in warm weather is 7.5-8.0
- Maintain insects – implement mosquito control if needed
- Monitor water levels regularly





Managing Algae

- Reduce excess nitrogen/phosphorous entering the lagoon
- Maintain balance because healthy algae supports oxygen production during the day
- Use shading or depth management because this can limit excessive sunlight
- Monitor and watch for rapid color changes (bright green = bloom risk)



Duckweed on a wastewater lagoon pond.



Managing Odors

- Maintain aerobic conditions by increasing aeration or mixing to prevent anaerobic conditions
- Break up surface crust
 - Prevent gas buildup that causes strong odors
- Avoid overloading
 - Keep organic input within design capacity
- Act early



Managing Low Dissolved Oxygen (DO)

- Add or increase aeration
 - Mechanical aerators or diffused air systems
- Promote natural mixing by wind exposure or circulation systems
- Control organic load
- Monitor DO levels frequently
 - Especially early morning when DO is lowest



Seasonal Inspections and Maintenance



Frequent Inspections

- **Critical Equipment Status:** Evaluate status of critical equipment including influent pumps, disinfection systems (UV lights), chemical inventories, aerators, etc.
- **Flows and Meters:** Confirm flows throughout the system are within expectations for current conditions
- **Solids Monitoring and Freeboard:** Observe that lagoon cells show a uniform appearance with no beaching or cresting sludge
- **Auto Samplers:** Clear intake lines of blockages. Check sample cycle matches the volume in the bottle and confirm all samples have been drawn.
- **Water Conditions:** Observe if there is an unusual odor, excessive foam, sheen to the water, or discoloration of the surrounding vegetation within the lagoon and outfall.
- **Treatment Issues:** Identify treatments issues from high effluent biological oxygen demand or total suspended solids, bulking sludge, increased vector attraction (e.g., waterfowl, midge flies), excessive algae and vegetation growth (e.g., duckweed, cattail, etc.)
- **Safety:** Be aware of trip hazards, personal protective equipment availability and condition.



Occasional Inspections

- **Equipment Calibrations:** Items like autosamplers, dissolved oxygen and chemical probes (including pH) drift out of range over time and will need to be recalibrated to a standard to ensure that the equipment is reading accurately.
- **Collection System:** Lift stations and manholes throughout the service area will need to be inspected periodically for condition assessment and potential fats, oils, and grease or wipes buildup that can lead to blockages and malfunctions causing sanitary sewer overflows.
- **Pump and Motor Maintenance:** Most pumps and motors require lubrication, belt replacement, or oil changes. Identify assets that need additional maintenance above manufactures estimates due to the demanding conditions experienced at wastewater systems.
- **Alarms:** Confirm alarms and other active monitoring systems are operational.



Annual & Biannual Inspections

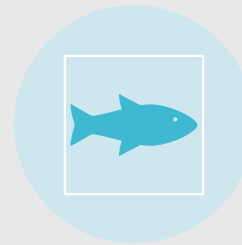
- Solids Accumulation: Measure sludge depth throughout the lagoon. Sludge levels should be maintained at < 30% of the total lagoon depth.
- Valve Operations: All valves need to be exercised at least annually as part of operation and maintenance requirements and as part of an emergency management program.



Preparing for Summer Conditions



Maximize Volume – keep liquid levels high in spring to manage the increased nutrient loading and sludge turnover expected in warmer weather



Manage Turnover – avoid adding excessive fresh waste when the lagoon is turning over



Odor Management – if odors persist, use ammonium or sodium nitrate to encourage beneficial biological activity (100 lbs/acre)



Delay irrigation – delay pumping or irrigating until mid-May to ensure stability and capitalize on maximum nutrient uptakes by plants



Preparing the Lagoon for Summer

1

Mow all bank vegetation to 6 inches or less to allow wind to supply oxygen to the wastewater and control mosquitos

2

Remove cattails and cattail roots entirely

3

Remove trees and shrubs near the bank to maximize sunlight and airflow

4

Inspect dikes for erosion, leaks, or burrowing animals, and ensure they retain their original height



Potential Solutions

- Design lagoon so that the bottom is as flat as possible, and any corners are rounded to improve flow
- Install baffles, curtains, or other engineered barrier devices, to redirect flow, enhance turbulence and mixing, and avoid short circuiting between inlet and outlet
- Adjust location of inlets and outlets to opposite corners of cell and/or introduce through a manifold to distribute flow more evenly



Questions?



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