

PROCESS CONTROL · CARBON MANAGEMENT

FlexZone[®]

Adaptive Process Volume System

**FLEXIBLE PROCESS ENVIRONMENTS
FOR OPTIMIZING
TREATMENT PERFORMANCE**

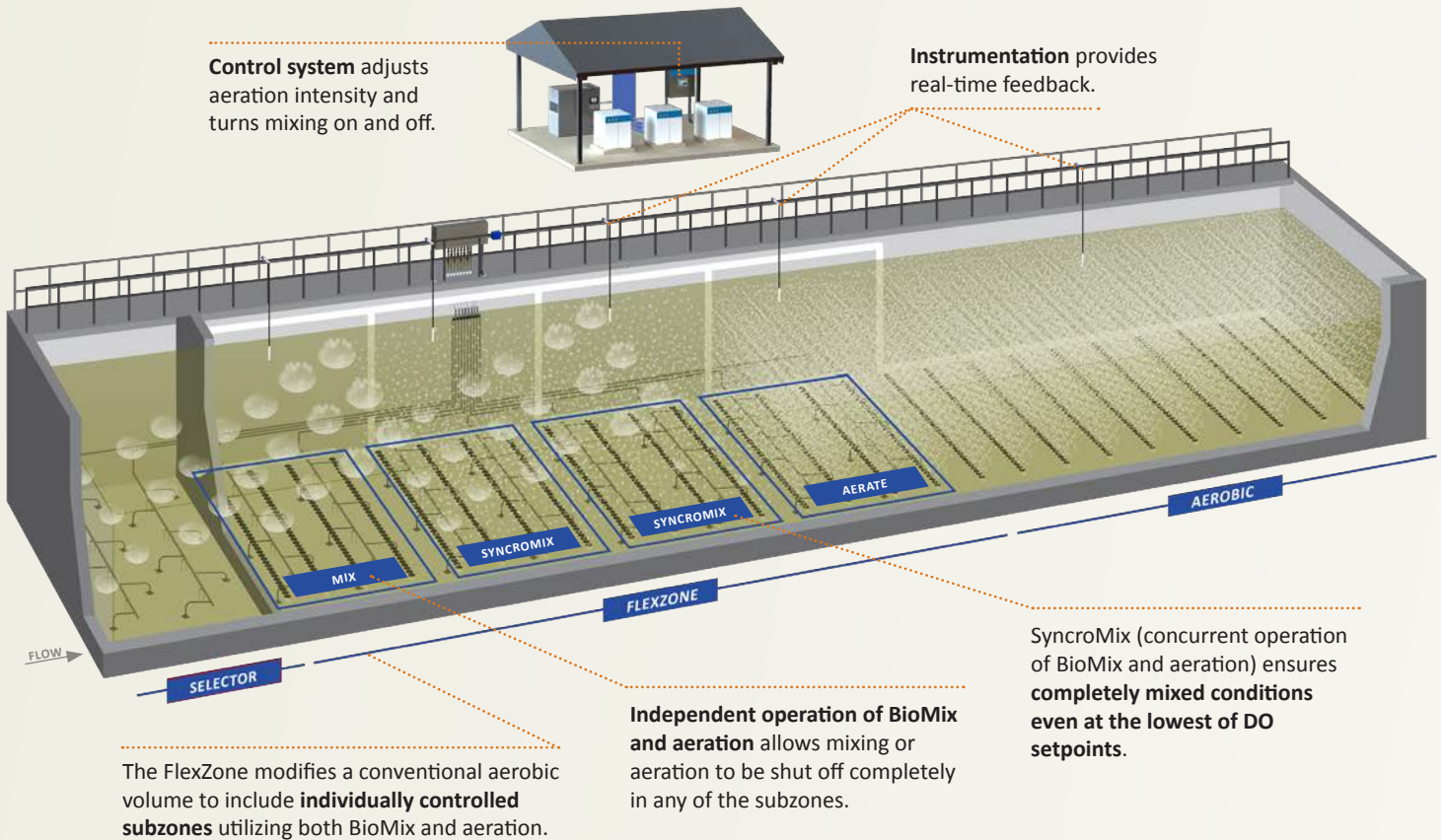
CONTACT ENVIROMIXSALES@XYLEM.COM
TO DISCUSS HOW YOU CAN OPTIMIZE YOUR
ACTIVATED SLUDGE PROCESS WITH FLEXZONE.



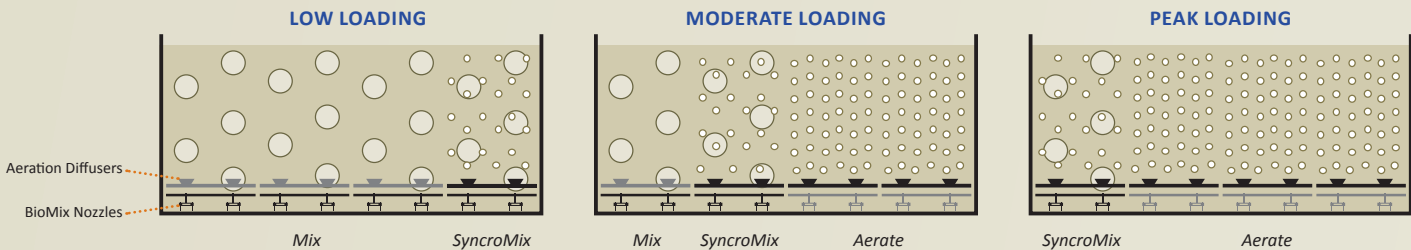
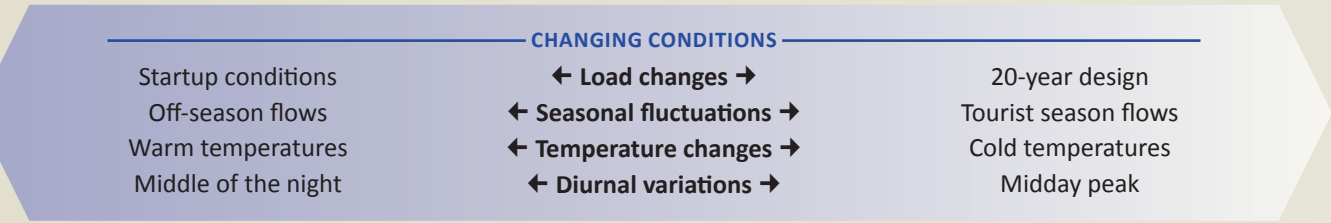
THE FLEXZONE® ADAPTIVE PROCESS VOLUME SYSTEM is a patented, versatile secondary treatment solution that is designed to deliver **next generation activated sludge performance**.

Advancing the conventional approach to aeration and process design, the FlexZone integrates BioMix Compressed Gas Mixing, diffused aeration, instrumentation, and proprietary control algorithms to **ensure precise aeration control and meet treatment objectives**.

The FlexZone **dynamically adapts anoxic, low dissolved oxygen (DO), and aerobic environments to changes in loading and temperature** while optimizing the bioreactor for nutrient removal, carbon management, and energy efficiency.



Utilizing complementary mixing patterns and eliminating the need for separate tanks or baffle walls, **the FlexZone dynamically adjusts subzone operation to address changing conditions**.





PROCESS OPTIMIZATION

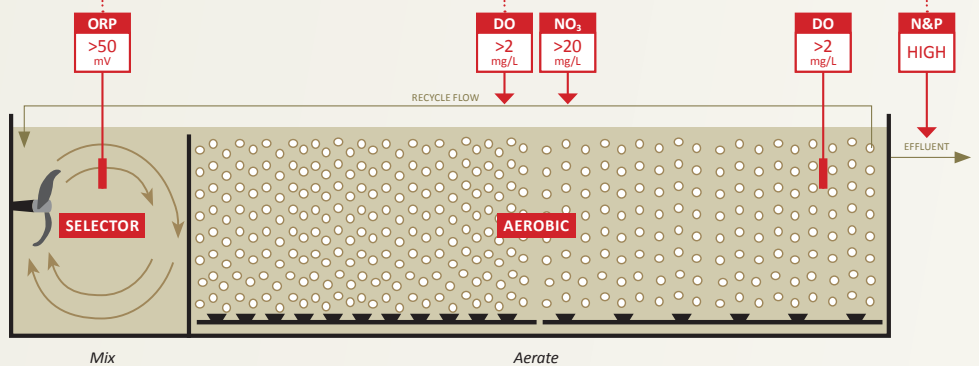
Most activated sludge treatment facilities are designed for future maximum loading, ensuring permitted effluent quality compliance. However, many facilities operate at a fraction of their design loading, creating operational limitations. These limitations result in ineffective carbon management and challenges with biological nutrient removal (BNR) including denitrification and enhanced biological phosphorus removal (EBPR).

CONVENTIONAL APPROACH

Elevated oxidation reduction potential (ORP) in selectors inhibits BNR.

Aeration control limitations result in high DO in recycle streams.

Ineffective utilization of carbon causes excess chemical consumption and leads to elevated N and P in plant effluent.



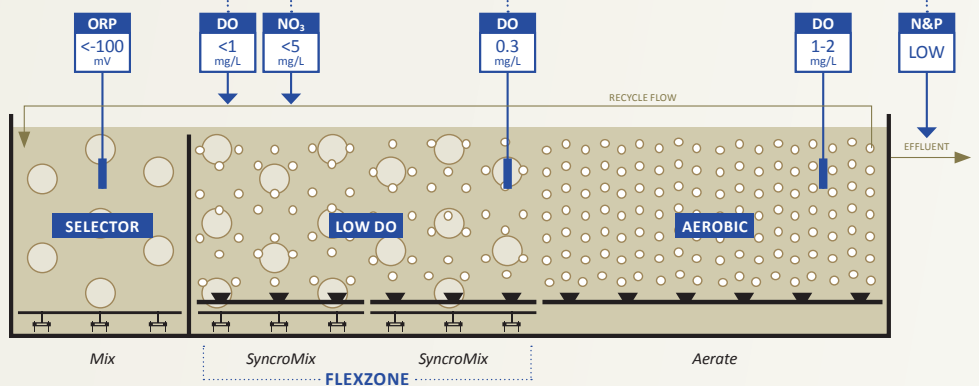
The dynamic nature of the FlexZone system allows for a sustainable and resilient process design that adapts individual subzone operation to ensure precise aeration control and meet treatment objectives. The ability to change anoxic, low DO, and aerobic environments within the reactor in real-time improves carbon management, reduces chemical consumption, and optimizes BNR.

FLEXZONE

Matching aeration control to oxygen demand results in lower DO and nitrate in recycle streams, conserving influent carbon for EBPR and denitrification.

Low DO operation reduces aeration energy while creating an environment for simultaneous nitrification and denitrification (SNDN).

Proper DO control and carbon management deliver low levels of effluent N and P.



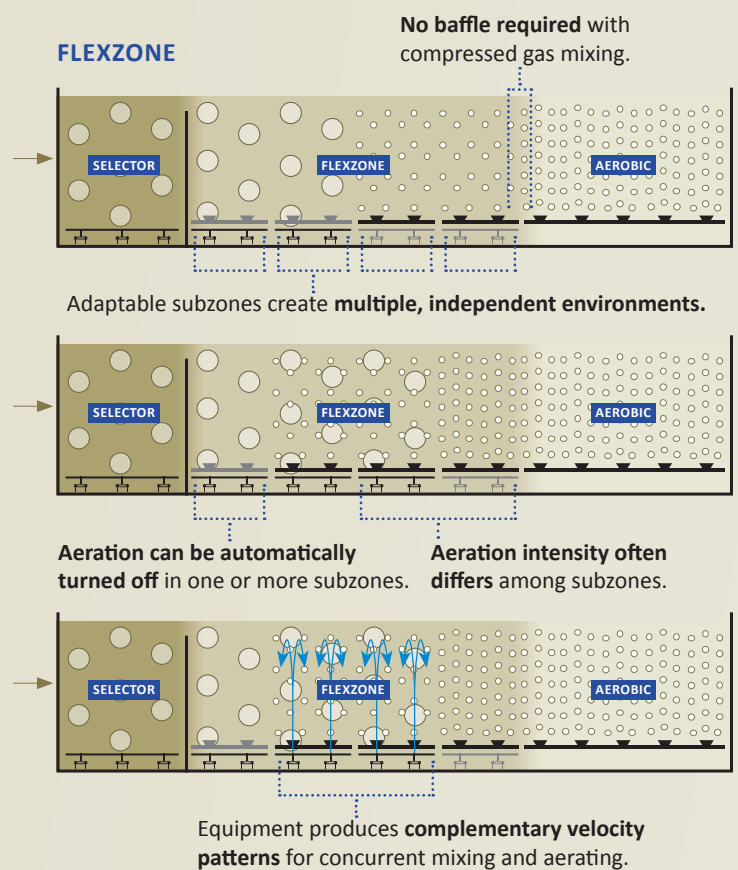
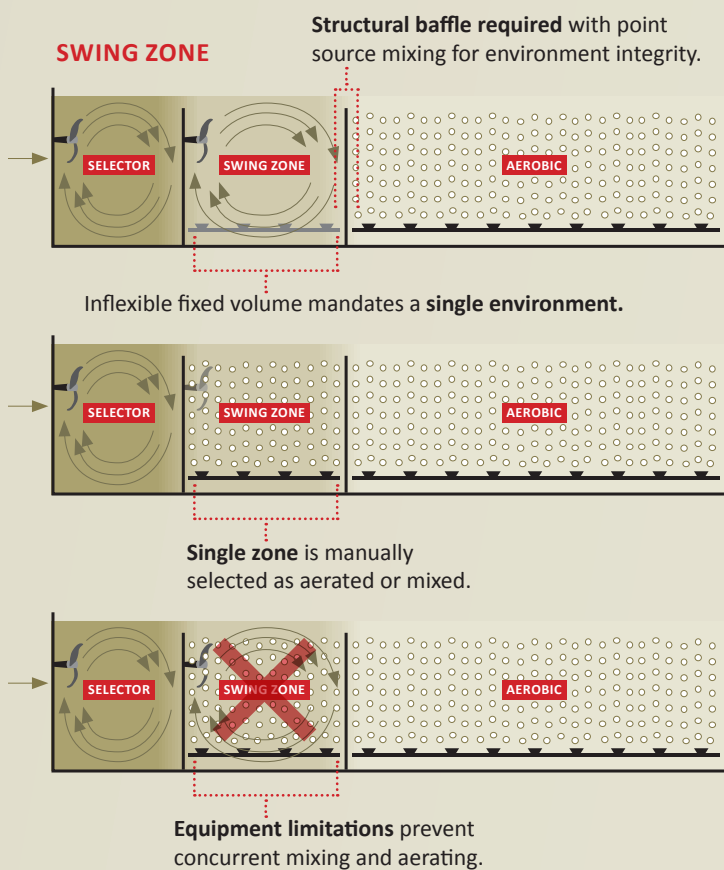


UNPARALLELED FLEXIBILITY

The FlexZone system can be designed for **greenfield treatment facilities or integrated into facility upgrades utilizing existing equipment**, including aeration, blowers, and instrumentation. The volume of the FlexZone and the number of subzones are custom designed based on the plant's specific range of influent wastewater loading conditions to ensure the control system provides the ability to freely adjust the anoxic, low DO, and aerobic volumes to match the process oxygen demand in real time.

MAXIMIZING FLEXIBILITY: HOW A FLEXZONE IS MORE ADVANCED THAN A CONVENTIONAL SWING ZONE

The wide spectrum of operation provided by the FlexZone is more advanced than the binary, manual operation of a swing zone due to the complementary equipment, process response capabilities, and automated control features.



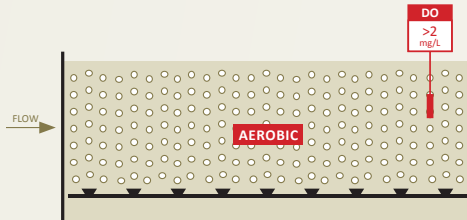
STRAIGHTFORWARD OPERATION

Using industry standard instrumentation, proprietary control algorithms, and automation, the FlexZone system automatically adjusts aeration and mixing parameters to create a bioreactor environment to match the full range of process oxygen demand. The control system **adjusts target DO concentrations within the FlexZone using dynamic DO algorithms**, ensuring that the DO at the end of the aeration train is consistent and always meets the operator selected setpoint.

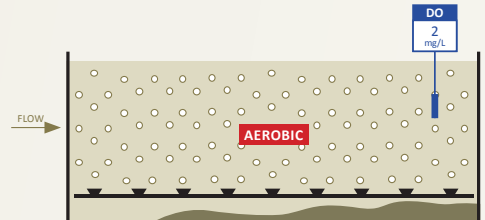


ENERGY EFFICIENCY

An efficient aeration system matches air delivery to meet oxygen demands. However, due to inherent equipment limitations, aeration turndown is often restricted. Aeration systems are typically designed to supply oxygen as well as maintain proper mixing. **When the air supply for mixing exceeds the air required to meet oxygen demands, the aeration equipment airflow is restricted by mixing requirements — this condition is known as mixing limited.**



Maintaining airflow to satisfy mixing demand results in excess aeration and high DO in the return streams.

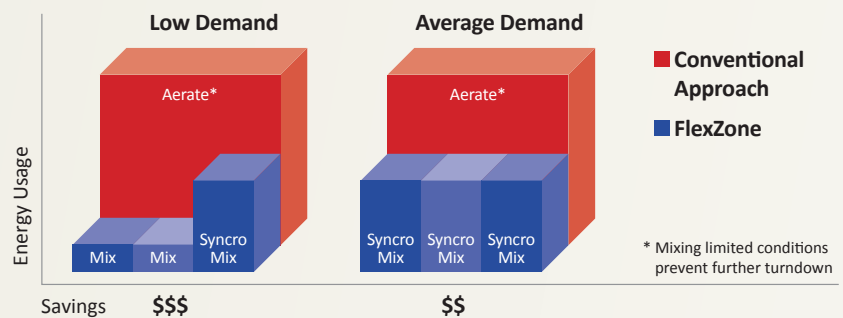


Restricting airflow to satisfy the oxygen demand while not maintaining optimal mixing can lead to solids deposition, as well as diffuser fouling.



The FlexZone eliminates airflow constraints by integrating a BioMix system with diffused aeration equipment. The combination of independent, complementary mixing with aeration equipment allows for unrestricted aeration turndown, supporting environments with non-aerated mixing and SyncroMix (concurrent operation of BioMix and aeration).

The example below compares the operation of a treatment plant using a fixed conventional aeration approach with limited turndown (red) versus the FlexZone system (blue). **The FlexZone provides unmatched turndown and energy savings** by automatically transitioning the aerated volume to mix and/or SyncroMix to meet the oxygen demand.



EnviroMix focuses on delivering solutions that reduce energy costs and enhance process performance in the water and wastewater industry. We design and manufacture performance-proven technologies that improve water quality and reduce energy consumption in critical areas of the treatment process. Utilizing patented and proprietary technology, we provide equipment and process control solutions to enhance plant performance for both the municipal and industrial markets.



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