How BiOWiSH® Helps to Remove Pollutants in Constructed Wetlands

Introduction

The purpose of this document is to educate partners, distributors, and interested environmental officials on the benefits of BiOWiSH® products for constructed wetlands. This technical bulletin describes how BiOWiSH® can help solve operational difficulties, improve efficiency, and increase system tolerance in constructed wetlands.

What Are Natural Wetlands?

Natural wetlands are commonly found where land merges into large bodies of water. In nature, these ecosystems can take the form of marshes, swamps, bogs, floodplains, or meadows. Thanks to a complex network of biodiversity, natural wetlands facilitate the biological interactions required to naturally clean water before it discharges into large bodies. Although these processes happen naturally, it can take years before they reach the ideal conditions to simultaneously support an ecosystem and efficiently clean the water.

What Are Constructed Wetlands?

Constructed wetlands are carefully engineered basins created to optimize the conditions required by a natural wetland to treat water. They are designed to mimic the ecology of a natural wetland while also mimicking the functionality of a wastewater treatment plant. When designed properly, these systems can efficiently remove suspended solids, organic pollutants, and various nutrients from wastewater.

Dense soil at the bottom of the basin is paired with vascular plants to create different environments that facilitate removal of nutrients like ammonia, nitrites, and nitrates. The sporadically placed plants also reduce flow channeling and create a well-mixed environment. Excess sand and rocks are laid at the bottom of the basin to promote the attached growth of microorganisms that feed on organic pollutants. Long retention times and slow flowrates allow the heavy, insoluble pollutants to settle out of the water column. Fore bays are commonly built at the head of the wetland to enhance settling. These systems are designed to maintain a constant volume regardless of flooding or drought.

The Two Main Types Of Constructed Wetlands

The two main types of constructed wetlands are surface flow (SF) and subsurface Flow (SSF) wetlands. SF wetlands are designed for water to flow above the surface of the rocks and sand. These systems are more accommodating to floods and require a very large footprint. SSF wetlands are designed for water to flow through the rocks and sand beneath the surface. SSF wetlands can occupy a much smaller footprint due to the lower water levels and higher concentrations of organisms in the water.

Figure 1: Surface Flow Wetland in Nanning, China

Figure 2: Subsurface Flow Wetland

How BiOWiSH® Helps to Remove Pollutants in Constructed Wetlands

Benefits and Drawbacks

The main benefits of using constructed wetlands are small capital requirement per equivalent flow and low maintenance cost. They offer extra flood storage in extreme rain events and are very aesthetically pleasing.

The drawbacks of wetlands include sensitivity to seasonal temperature changes and high salinity, buildup of settled organic pollutants in the forebay which causes clogging of the growth medium and inhibits flow, inability to degrade fats, oils, and greases (FOG), inconsistent treatment efficiency, and foul odors.

How Can BiOWiSH Help?

- By introducing BiOWiSH® organisms, these systems become more resilient to temperature changes and high salinity
- BiOWiSH® organisms degrade soluble organic carbon and bottom sludge, lowering sludge buildup and reducing clogging of the growth medium
- BiOWiSH® organisms consume FOG that existing plants and microorganisms are not able to.
- Foul odors are biologically mitigated by BiOWiSH® organisms
- Introducing BiOWiSH® organisms increases treatment efficiency because of the higher concentration of more resilient organisms

Figure 3: Surface Flow Wetland in Nanning, China