

ZENON

Immersed membrane ultrafiltration for treatment of sewage

Microfiltration and ultrafiltration membranes can remove particulate and colloidal materials from wastewater. They are seldom used by themselves to filter untreated wastewater since fouling prevents the establishment of steady-state conditions and because water recovery is too low. However, membrane filtration has successfully been used in combination with biological processes. A biological process converts dissolved organic matter into suspended biomass, reducing membrane fouling and allowing recovery to be increased.

In a typical configuration, the two processes are integrated into a single step membrane bioreactor. This configuration offers real synergies between the two processes. Because the membrane confines the biomass in the bioreactor, the biological process can be run under conditions that maximize the removal of organic carbon and nutrients. Also, the plant footprint is minimized because secondary clarification is eliminated and the biomass is concentrated by a factor of three to five when compared to conventional activated sludge.

ZeeWeed* as immersed membrane

Key features of the ZeeWeed* ultrafiltration immersed membrane are illustrated in figure 1. The membrane is a hollow fibre with filtration from the

outside-in under gentle suction. The module is shell-less and immersed directed in the water to be filtered. Air is used to scour the membrane surface and de-concentrate the hollow fibre bundles. Feed and purge operations are done at the tank level.

ZeeWeed* are asymmetric ultrafiltration membranes that reject all suspended and colloidal solids, including viruses. They are made from a chlorine-tolerant, hydrophilic proprietary polymer. The ZeeWeed* 500 series are built with a reinforced, large diameter hollow fibre. The 1.9 mm outside diameter hollow fibres are flexible and have a very high tensile strength, two properties that allow vigorous air scouring in difficult applications. Modules are rectangular frames containing thin bundles of hollow



Fig. 2: ZeeWeed* ZW 500c immerse membrane cassettes.

fibres. The hollow fibres are mounted vertically between headers with some slack to allow movement, air penetration and water renewal within the bundle. Modules are assembled side by side into cassettes, leaving space for water circulation and air scouring. Cassettes have integrated headers for permeate collection and air distribution. Cassettes are the building blocks that are immersed into the filtration tank and connected to permeate and air headers.

Characteristics

A ZeeWeed* 500c cassette is shown in figure 2. In the development for the ZW 500c there are no changes in the membrane material, only to the physical configuration. Each cassette consists of 24 fibre bundle elements; each element potted into a top permeate header. Each fibre bundle element is 60% of the thickness of the ZW-500a fibre bundles, meaning substantially less fibre packing density and increased process stability. Each element contains 20 m² of surface area, meaning that an individual cassette contains 440 m² of surface area, as opposed to 370 m² for a ZW-500a based cassette. In essence a much greater geometric efficiency results.

The aeration grid for the membranes is isolated from the cassette and is located approximately five inches below the base of the membrane cassette. This provides a plume for the airflow before contacting the fibre bundles and reduces the potential for poor spatial airflow distribution. The bottom of each fibre bundle element is potted into a dead end potting cup. The absence of the bottom header allows for

Fig. 1: The ZeeWeed* immerse membrane principles of operations.

- Outside-in hollow fibre
- Shell-less module
- Open tank
- Gentle suction
- Air scouring
- Feed & purge at tank level



