

Membrane Bioreactor with Micro Stainless Steel Wire Mesh Filtration Module for Wastewater Treatment

Abstract

In order to overcome the problems inherited from conventional membrane bioreactor (MBR), such as membrane fouling, low membrane flux rate, high energy consumption, short membrane life time, heavy work load on maintenance, high membrane cost, etc., this invention used micro metal wire mesh, especially the micro stainless steel wire mesh, as the core filtration element for the MBR, resulting in a new generation of solid-liquid separation technique in the wastewater treatment process. This new technique fills the gap between conventional MBR and dynamic MBR in terms of the pore sizes for the filtration media. The pore sizes for the membranes used for conventional MBR are at the order of $10^{-1}\mu\text{m}$, and the pore sizes for the meshes used for dynamic MBR are at the order of $10^1\mu\text{m}$. In this invention, the stainless steel wire meshes with the pore sizes in the range of 10^0 to $10^1\mu\text{m}$ are employed to fabricate the filtration modules, representing the third option of filtration method in the MBR wastewater treatment process.

The stainless steel mesh can be fabricated into flat type, tube type or other types of filtration device, together with the framework, connection/assembling device, effluent outlet and back washing inlet, a new MBR wastewater filtration module is fabricated. The complete MBR is comprised of an aeration system, a novel filtration module and an automatically controlled effluent suction and back washing system.

Compared with the conventional membrane, the new filtration module has the following advantages when it is submerged in a bioreactor: (1) It can resist to the corrosion from acid, alkaline, resist to high temperature and abrasion; (2) longer life time; (3) low fabrication cost; (4) the filtration module can be cleaned by simple back washing, reducing the operation and maintenance cost; (5) the new filtration module has high and stable flow rate; (6) the filtration module has less fouling; (7) the effluent or permeate has the quality comparable to that from conventional MBR; (8) This invention provides high potential for the extensive application of the MBR technology in wastewater treatment. It is very likely that a new wastewater treatment plant can be built and operated at the cost comparable to that for conventional activated sludge process, but generates effluent with the quality comparable to that for advanced membrane bioreactor.