High Surface Area Biofilm Structure with Multiple-Pass Recirculation for Biological Treatment

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The water treatment field is increasingly moving towards membrane bioreactors (MBRs) for a variety of applications due to their many advantages, including generation of biogas that can be used to offset the system’s energy and heat requirements. Dynamic MBRs represent the next evolution of membrane bioreactor technology and are actively being investigated by researchers and engineers. These devices use coarser mesh from significantly cheaper materials to support the active biofilm, which both filters and treats the permeate.

A high surface area dynamic membrane bioreactor for wastewater treatment

The available technology is a new design for a dynamic membrane bioreactor for wastewater treatment. The technology uses a high surface area design that increases the space efficiency of the dynamic MBR by 5-10 times and promotes robust biofilm formation, thereby significantly improving bioreactor efficiency. Furthermore, the bulk liquid within the reactor is continuously recirculated, ensuring maximal exposure of the waste to detoxifying biofilms. The mesh and attached biofilm can be routinely backwashed to ensure that the reactor continuously operates at optimal efficiency.

The technology offers an attractive decrease in operating costs of the bioreactor due to several factors. One, mesh used as the biofilm substrate is composed of inexpensive materials. Two, the lifetime of the filters in the design is anticipated to be approximately 2-4 times that of conventional polymer ultrafiltration membrane filters. Lastly, the space-efficient design may be incorporated into existing bioreactors to improve efficiency and treatment capacity without the need to upgrade to a larger system.

When used in anaerobic MBRS, the methane-producing biofilms are sequestered from effluent outlets, which reduces the amount of dissolved methane present in the final reactor product. This increases the rate of biogas capture and reduces the amount lost to the atmosphere (thereby minimizing the harmful environmental effects of methane, a potent greenhouse gas).

Finally, there are currently no commercially available dynamic membrane bioreactors making the technology an attractive opportunity to bring such a device to market ahead of potential competitors.

Applications

- Industrial wastewater treatment
- Municipal wastewater treatment
- Treatment of brewery wastewater

Advantages

- Increased bioreactor efficiency from maximized surface area for biofilm formation
- May be retrofitted into existing bioreactors to improve performance
· Suitable for aerobic or anaerobic operation
· In anaerobic MBRs, reduces dissolved methane in effluent and increases biogas capture

Inventors

Steven J Skerlos, Ph.D.