Biological Filtration: Sustainable Water Treatment Using Bacteria

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While the use of microbial biomass for the degradation of contaminants, nutrients, and organics has been commonly used in the wastewater field since the early 1900s, the biological treatment of drinking water has been limited, particularly in the United States. However, recent developments in the drinking water treatment field are beginning to broaden the applicability, feasibility, and favorability of biological drinking water treatment technologies. These developments include 1) the increasing costs and complexities of handling water treatment residuals (e.g., membrane concentrate), 2) the emergence of new contaminants that are particularly amenable to biological degradation (e.g., perchlorate), 3) the push for green technologies (i.e., processes that efficiently destroy contaminants instead of concentrating them), 4) regulations limiting the formation of disinfection by-products (DBPs), 5) the emergence of membrane-based treatment systems, which are highly susceptible to irreversible, biological fouling, and 6) limitations on available water resources and the need for high recovery processes.

The use bacteria to help produce potable water goes somewhat against conventional wisdom, given that one key objective of drinking water treatment is the inactivation or removal of microorganisms from raw water. However, biological drinking water treatment processes utilize indigenous, non-pathogenic bacteria and are always followed by downstream processes such as final disinfection. Thus, well-designed biological treatment systems pose no significant marginal threat to the health or safety of distributed water. Instead, they often offer a cost-effective, efficient alternative to conventional processes.

This presentation will cover:

- Process fundamentals
- Emerging contaminant applications
- Technology configurations
- Benefits over conventional systems

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