



User-friendly denitrification for sustainable seawater use

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According to the United Nations, global freshwater demand will exceed supply by the year 2050. Water conservation is both an environmental and fiscal imperative for public aquariums, especially where seawater must be manufactured. Despite the need to conserve water, 'blowdown' (water replacement) continues to be the most common means of nitrate reduction in life support systems. Advances in denitrification systems continue to be made, however risks associated with narrow system tolerances and operational complexity have prevented their widespread use.

Heterotrophic (methanol-based) systems experience problems with high levels of bio-growth and bio-fouling, and erratic nitrate removal rates. Autotrophic (sulfur-based) systems can be oversized due to inefficient removal rates. The National Aquarium in Baltimore employed an efficient sulfur-based denitrification system that attained >80% reduction in nitrate in an 890 m³ mixed-species exhibit over four months. More than 450 m³ of water was saved during that period. Nitrate removal rates were high while bio-growth and bio-fouling remained low. The total footprint of the system was <5 m². Operation did not require elaborate control equipment, and was user-friendly, requiring only three operator functions: manual adjustment of system flow rates, filter backwashing and purging of nitrogen gas.