

Desalination: Key Elements Towards Improved Sustainability

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As water demand increases and freshwater sources are becoming increasingly stressed in the US, there is an impetus for water utilities to treat impaired water sources (e.g. brackish groundwater, irrigation return water, and seawater) to meet increasing demands. The efficiency of desalination technology used to treat such waters has improved over the last decade. However, there are key elements that need to be addressed to make this technology more sustainable and cost effective. This paper will provide an overview of the pertinent issues.

Energy Efficiency: Although the desalination industry had made significant reductions in energy usage over the past few decades, energy use remains as one of the largest component to the total cost of desalination. Key avenues to improved energy efficiency include further advancements in energy recovery devices, use of alternative energy sources, and use of waste heat. Increased use of alternative energy sources should also lead to a reduction in the carbon footprint. These avenues will be overviewed.

Improved Recovery/Concentrate Management/Beneficial Reuse: Currently the recovery from desalting processes is limited such that typically 20 to 50 percent of the feed stream is wasted as concentrate. The disposal of such quantities of concentrate is not only a loss of valuable resource and energy, but also a challenge in itself, especially for inland facilities, and with regards to environmentally sustainable disposal options. The emerging and promising approaches to desalination and its concentrate management that aim to enhance overall recovery and reduce concentrate volume are of key interest to the future success of this technology and will be overviewed.

Intakes: Improvements in intake structures for feed water and outfall structures for concentrate will result in mitigation of environmental impacts of desalination. Such improvements would focus on better approaches for intake structures to minimize impingement and entrainment. Better diffusers would allow improved dispersion of the concentrate.

Keywords: Desalination, efficiency, energy, concentrate management

Challenges: Population growth and land use change impacts to water resource sustainability

Issues: Water availability and allocation