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## Experimental and Numerical Investigation of Desalination Plant Outfalls in Limited Disposal Areas

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### ABSTRACT

In this study, experimental and numerical investigations of the dense brine jets are conducted for disposal areas of limited extent. First, a new experimental model representing a section of sea floor with a single port brine outfall is built to study different characteristics of dense jets. Second, a number of numerical experiments have been conducted via Fluent CFD package to compare the numerical results with its corresponding physical observations and measurements. Experimental observations are made for both the terminal height of rise of dense jets discharged vertically from circular outlets into calm and homogeneous environment and for concentration profiles along the dense jet trajectory. Various combinations of port diameters and concentration of effluent salinities are investigated to cover a wide range of conditions. The results from the carried out experiments are compared to different available experimental and field observations from the literature. A new model for the terminal height of rise of dense jets has been derived. The experimental observations of concentrations along the dense jet trajectory are analyzed to quantify the mixing patterns for a given operating condition from the source point to the terminal height of rise. The numerical model has been used to identify the penetration depth and also to get the temporal variation of the brine breakthrough curves at different locations above the disposal port. The numerical model has shown the existence of multipeak breakthrough curves for the farthest points from the port (but the closest to the water free surface).

### KEYWORDS

Desalination, Dense Jets, Plumes, Terminal Height, Densimetric Froude Number, Fluent

### Cite this paper

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