



## Modeling of Brine Discharge from Desalination-Power plant in Bandar Abbas to Reach an Optimum Outfall Design

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### Abstract

Long-term desalination is considered as a very expensive technology for countries and regions with a dry climate and low rainfall, except for rich countries with great deals of energy resources. Recent progress in desalination technology and severe lack of surface water resources and decrease in ground water resources has increased use of desalination plants. Along with this, using desalination plant in southern regions of Iran is paid lot of attention due to their adjacency with Persian Gulf. However, using desalination plant will lead concentrated effluent that is referred to as brine or brine-blow down. The brine is generally more salty than seawater and its temperature is higher than ambient which results in undesirable effects on marine ecosystems. Therefore, the brine should be discharged in away that induce minimum effect on the discharge ambient. In Bandar Abbas power plant development plan, by adding two units to the existing plant, the amount of the inlet seawater into the desalination plant has increased from 50 m<sup>3</sup>/s to 75 m<sup>3</sup>/s for which the heated effluent of them will increase up to 0.15 m<sup>3</sup>/s. In this research, simulation of brine plume dispersion has been considered, regarding to the heated effluent from Bandar Abbas thermal power plant and an optimum outfall design different scenarios of simulations and optimum outfall design were compared by applying CORMIX and mixing behavior of surface, submerged single-port and submerged multi-port outfalls were assumed along with temperature. (According to the environment standard) The results showed that effluent discharge in surface channel is not suitable because of low dilution rate, harmful environmental effect and the lack of temperature drop below 1°C at a distance of 300m from the discharge point and needs on efficient multi-port outfall design.

**Keywords:** Brine effluent, CORMIX, Desalination, Persian Gulf, Discharge outfalls.

### 1. INTRODUCTION

In dry and low rainfall regions like Southern Iran near the Persian Gulf, encounter lack of extractable water resource with good quality, including surface or ground sources, urbanization growth which has resulted in industry growth and need to electricity and energy consumption and also water supply for them is becoming a critical issue [9].

In order to supply water in these regions adjacent to the sea using seawater has been considered to provide required water for coastal thermal power plant to produce electricity. Since seawater is saline, first it should be desalination to use in power plant units. At first, using desalination plant seems to be an appropriate way, of course when the extracted water from them is low, but when it is high financial and executive costs to supply the land, construction the structure and other related installation (like intake, transform lines, effluent discharge system, ...) are also considered. Another aspect of using desalination plant is there harmful environmental impacts around their effluent discharge which include dangers from salinity increase for fish and the other animals in the sea which can kill them or cause them to escape. Another risk is plant cover destruction of the region by disrupting chemical properties and salinity and seawater heating and the final risk is over salinity of ground water resources of the region because of seawater high salinity, which threatens residents of coastal regions and cities [7].