

Research Article

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Proposing an inflatable rubber dam on the Tidal Shatt Al-Arab River, Southern Iraq

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Abstract: Increasing salinity in the Shatt Al-Arab River (SAR), south of Iraq, causes a serious issue with its water quality. In the current work, the proposed inflatable rubber dam was tested and verified for its feasibility and suitability on the SAR, Southern Iraq. The proposed rubber dam investigated its performance in reducing the salt front resulting from the seawater of the Arabian/Persian Gulf. Also, the inflatable rubber dam was feasibly compared with other types of hydraulic structure regulators and discussed the probable effect and benefits for each. Results of performance evaluation on the water quality were expressed in three groups: hydraulic, geotechnical, and economic performance. Results of the analyses of hydraulic indicators showed that the tide phenomenon has a significant impact on the water quality of the SAR. The geotechnical performance was assessed in terms of soil layers and was satisfactory. Analysis of the economic performance indicators showed that the inflatable rubber dam was feasible for the SAR problem compared with other types. Finally, a proposed design indicates the viability of inflatable rubber dam technology in controlling the salt front and improving the quality of the Shatt Al-Arab River water by reducing the salinity.

Keywords: hydraulic level, regulator, rubber dam, salt front, tidal phenomenon

1 Introduction

A rubber dam is an inflatable and deflatable hydraulic structure that can be operated as a regulator on rivers [1]. Indicated advantages and uses of the rubber dam, such as their ease of installation, low cost, and ease of inflating and deflating, rapidly make it very practical in controlling the tidal phenomena and the flood damage [2]. New guidelines for the optimum design of rubber dam deflectors were provided by [3], where other researchers later recommended that the frequent rubber dam sediment cleaning by partial deflation allows fewer overflows [4]. It is not practical to deflate the rubber dam completely, since it needs a long period for the water to reach the required level, especially during low seasons. Comparison of the effectiveness of inflatable rubber dams having a metal gate with other rubber dams is crucial for evaluating the economic aspects. The inflatable rubber dam with a metal gate reveals more economical with an increase in the length proportional to its span(s) than others. The rubber dams are easy to operate and maintain with low cost-effect [5].

The technology of the inflatable rubber dam has been developed by using a rubber dam with a metal gate to be more feasible than other traditional technologies. This modern one allows an increase in the capital cost by approximately (8%) compared with a traditional rubber dam. Also, it is suitable in small and medium river projects for both tidal and non-tidal channel locations [6]. For example, the inflatable rubber dam has been very useful to disallow saltwater from the Caspian Sea during the tide conditions at the tidal Babol river [7]. A number of studies and investigations have been carried out by, in particular, Marine Science Center (MSC) – the University of Basrah, and other research councils to evaluate the environmental impacts of increasing the salt intrusion at the Shatt Al-Arab River (SAR) from the gulf since 2001. As the problems prompted, the Iraqi government has demanded to investigate its causes, risks, and challenges, and to urgently provide various solutions, which contribute to preserving the environment and restoring

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