

Conveyance efficiency determination of irrigation flumes in Sistan plain

Abstract

Sistan Plain has a great potential in the field of agricultural production due to its alluvial sediments from Hirmand river. water has a great value in this region because of lack of permanent water resources, useless groundwater, low precipitation and high evaporation rates. Area of irrigation and drainage networks in Sistan Plain is approximately 95000 hectares and the shape of irrigation canal for grade 3 and 4 is half-pipe flumed. On the other hand, Sistan plain always has monsoon winds with 120 days duration from late May to late September. One of the main factors of reduction in water transmission efficiency in irrigation networks is overflow from flume wall due to winds. In this study, half-pipes irrigation flumes (Type 1000) are installed in Research field of zabol university. The free board of these flumes was set at the height of 7.5 and 15 cm to measure the loss rate of overflow due to wind and also the maximum free board to prevent overflow losses was measured. Dimensionless values are determined based on π method of dimensional analysis. The results showed that the increase rate of overflow losses to evaporation losses in maximum and average wind velocity is 215.46% and 562.79% in free board of 7.5 cm respectively and the increase rate of overflow losses to evaporation losses in maximum and average wind velocity is 51.62% and 184.56% in free board of 15 cm, respectively. Based on result of this research appropriate free board to prevent overflow losses is 23 cm which is closely triple considered design free board. Therefore according to high amount of overflow losses of wind in Sistan plain, considering a suitable free board can play an important role in increase of the hydraulic efficiency of the Sistan flumes.

Keywords: Conveyance efficiency, Flume, Wind, Overflow losses, Sistan Plain.



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