A new efficient water energy dissipator for improving the irrigation water quality

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Abstract:

The present experimental study was executed to investigate a new and untested shape of curved dissipators with different angles of curvature and arrangements from the following two points of view: (i) To examine its efficiency in dissipating the kinetic water energy; (ii) To examine the most effective shape and arrangement obtained from the above mentioned step in enriching the flow with dissolved oxygen for enhancing the irrigation water quality. The study was held in the irrigation and hydraulic laboratory in the Civil Department, Faculty of Engineering, Assiut University, using a bed tilting channel 20 m long, 30 cm wide and 50 cm height, using 20 types of curved dissipators with different arrangements. A total of 660 runs were carried out with different discharges. Results, in general, showed that, for the same angle of curvature, the dissipator performance is more tangible in dissipating the water energy when the curvature is in the opposite direction of the flow. Also, the energy loss ratio increases with the increase of the dissipator curvature angle (θ), till it reaches (120°), then it decreases again. The study also showed that using four rows of dissipators gives nearly the same effect of using three rows concerning both, the relative energy dissipation and dissolved oxygen content. So, it is recommended to use not more than three rows of the introduced curved dissipator with an angle of curvature equals (120°) in the opposite direction of the flow to obtain the maximum percentage of water energy dissipation downstream head structures and maximum dissolved oxygen content. Also, the study showed that, using the new introduced curved dissipator in three rows in the staggered-separate manner gives the best formed hydraulic jump characteristics, less relative depth and less relative length than all other tested dissipators, which reduces the cost of construction of the solid apron on the downstream side of head structure.

Keywords:

Energy dissipation, Water quality, Dissolved oxygen, Aeration, Curved sill dissipator

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