



Using Local PI Control Method to Improve the Operation of Main Irrigation Canal with In-Line Storage

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Successful operation of a main irrigation canal system is achieved under condition that differences between supply and demand of all users are eradicated. In the present study, the effect of In-Line Reservoirs on operation and management of a main irrigation canal is assessed. A proportional-Integral (PI) local upstream controller is designed for Dez main Irrigation canal. Total length of this main canal is 45 km (13 pools) with the design discharge capacity at the beginning of the canal is 157 cms. Three pools, one in the upstream and two in the middle of the canal are considered as the in-line reservoirs. Water level deviation from set-point in each pool is controlled by a local PI controller and also is coupled to its upstream in-line reservoir. The first in-line reservoir is coupled to the head gate and control the released flow from the head gate. The controller was tested for an extreme and sudden increasing – decreasing irrigation schedule on two different operation conditions. The first operation condition refers to normal operation of the main canal and the second one refers to operating by using three in-line reservoirs in Dez main canal. Controller performance was evaluated with ASCE indices includes: MAE; IAE; and StE. The results show that by using in-line storage in the main canal, water level deviations are decreased in most of the pools and the improvements is in the range of 13 to 30 percent. Another interesting result is significant decreasing of delay times especially in downstream pools. Stored water level in the reservoirs compensate the delay time of passing flow from head gate to the offtakes. Comparing the ASCE indices values for two irrigation schedule shows that using In-Line storage lead to improving the performance of main canal operation condition in most of the pools by storing some percentage of water in the period of decreasing required water. By increasing water delivery period this stored water is used completely.