



Determination Of The Optimal Guide Curve For A Reservoir, Case Study Copa Dam, Boyacá

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Reservoir operation has been a task that always relate to integrated water resources concepts, the rules of such systems require to adapt to changes in the uses of water or in their prioritization. The storage body of La Copa reservoir, located in the upper Chicamocha river basin in Colombia was originally built with the objective of mitigating the floods over the upper Chicamocha valley. However, an irrigation district was latter established, with the objective of supplying water to farmers. This study presents the analysis and optimization of operational rules to minimize the likelihood of floods and shortages for the irrigation district. This is done by contemplating the uncertainty in the hydrological system.

A methodology is developed to obtain the optimal management and operation of the reservoir, aiming at reducing droughts and flood, which will end up in a regulated basins. A simulation model of the reservoir using the HEC-ResSim tool was used to aim at an optimal guide curve. The guide curve in this study is the base for operational decisions. A continuous simulation hydrological model using the HEC-HMS tool. The model was calibrated using annual series of daily flows as input into the reservoir model. A two-dimensional hydrodynamic model using (HEC-RAS 2D) was used to test the results of regulation through the comparison of the simulations of the current and optimal regulation conditions. Several guide curves were developed for the evaluation of the operation. Four of them among are selected and tested using the HEC-ResSim model through the quantification of the minimum and maximum volumes discharge failures. Finally, the guide curve with the least number of failures was selected as the one that provides the best system operation. The benefits of the selected guide curve were verified by the transit of the regulated hydrographs in the 2D hydraulic model. The simulation was carried out in the most period in terms of flows and maximum rainfall, from April 06 to May 15, 2011. The period between April 15 and 21 has the highest flow through the critical sector. On the other hand, unregulated conditions were evaluated using the flows of the hydrological model. It is found that the channel presents a notable improvement, in the simulation of April 15, through the discharges made in a controlled manner from the La Copa reservoir. The methodology presents a simple and practical way to obtain relative optimal operational rules for a multipurpose storage.