



Optimal Reservoir Operation Using Goal Programming for Flood Control

Changwon Choi (1), Hye Jin Kim (2), Jaeung Yi (3), MyungSu Yu (4), and Dong Hoon Lee (5)

(1) Ajou University, Suwon, Republic of Korea (itsme99@ajou.ac.kr), (2) Kwater, Asan city, Republic of Korea(khj0913@kwater.or.kr), (3) Ajou University, Suwon, Republic of Korea (jeyi@ajou.ac.kr), (4) Ajou University, Suwon, Republic of Korea (niceguy-03@ajou.ac.kr), (5) Ajou University, Suwon, Republic of Korea (octation@ajou.ac.kr)

The purpose of multipurpose reservoir operation in flood season is to reduce the peak flood at a control point by utilizing flood control storage of the reservoir or to minimize flood damage by controlling release and release time. Therefore, one of the most important things in reservoir operation for flood season is to determine the optimal release and release time. Usually, reservoir operation is carried out by using reservoir simulation or optimization technique according to the purpose of water use or flood control. In this study, goal programming that is one of the multipurpose optimization techniques is used for the optimal reservoir operation in flood season. Multipurpose optimization technique is method to obtain the optimal alternative using nondominated set theory when it is difficult to make decision because of conflicting several conditions needed to obtain the optimal alternative for the problem with two or more purposes. The goal programming minimizes a sum of deviation from the target value using linear programming or nonlinear programming to obtain the optimal alternative for the problem with more than two objectives. In this study, to analyze the applicability of goal programming for multipurpose reservoir operation in flood season that consider conservation storage security at the end of flood season, the historical storm data are utilized. The goal programming is applied to the reservoir system operation as well as single reservoir operation. Chungju reservoir is selected for single reservoir operation and Andong and Imha reservoirs are selected for reservoir system operation. In the reservoir simulation, one-hour interval, 120 hours(5 days) data was used for single reservoir operation and 10-minute interval, 4,000 minutes(67 hours) data was used for multi reservoir system operation because the time of concentration between the reservoir and control point is short. The result of goal programming is compared with that of HEC-5. As a result, water surface level exceeded flood control level at some section in the simulation using HEC-5, but goal programming could maintain the reservoir level within flood control level at the end of a flood season and also maintain flood discharge within a design flood at a control point for each time step. The goal programming operation is different from the real operation in the sense that all inflows are assumed to be given in advance. However, flood at a control point can be reduced by calculating the optimal release and optimal release time using suitable constraints and flood forecasting system.

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