MULTIOBJECTIVE DYNAMIC PROGRAMING

AND

DERIVATION OF OPERATING RULES

FOR

RESERVOIR SIMULATION

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ABSTRACT

The development of reservoir system operating rules by mathematical programing is investigated. A procedure that cycles through three main components, a backward looking dynamic program algorithm, a multiple regression analysis, and a simulation model is proposed for the development of optimal operating rules and tested for a single multipurpose reservoir. The proposed optimization algorithm is a discrete deterministic dynamic programing model which is implemented on micro-computer. The dynamic program is solved for multiobjective non-linear convex functions with both one-sided and two-sided quadratic loss functions. Monthly operating rules are derived by regressing the optimal set of releases on important independent variables. These independent variables include reservoir storage at the beginning of each period, current inflow and lagged inflows. Linear and non-linear release policies are developed. Maximum R^2, F-test and minimum sum of squared deviations, are the criteria for selecting the best release policies. The derived operating rules are verified and compared through simulation. It is suggested that the rules developed by such type of methodology may be called Dynamic Decision Rules (DDR) which may be identical to Revelle's Linear Decision Rule (LDR).

Mangla Reservoir which is a multipurpose water resource project, located on river Jhelum is used as a test case. The methodology is found to be effective for the test case. Large gains in agricultral, industrial and social sectors are expected if proposed DDR are implemented by the Government for the system.