An expanded optimal control policy for a coupled tanks system with random disturbance

ABSTRACT

In this paper, an expanded optimal control policy is proposed to study the coupled tanks system, where the random disturbance is added into the system. Since the dynamics of the coupled tanks system can be formulated as a nonlinear system, determination of the optimal water level in the tanks is useful for the operation decision. On this point of view, the coupled tanks system dynamics is usually linearized to give the steady state operating height. In our approach, a model-based optimal control problem, which is adding with adjusted parameters, is considered to obtain the true operating height of the real coupled tanks system. During the computation procedure, the differences between the real plant and the model used are measured repeatedly, where the optimal solution of the model used is updated. On this basis, system optimization and parameter estimation are integrated. At the end of the iteration, the iterative solution approximates to the correct optimal solution of the original optimal control problem, in spite of model-reality differences. In conclusion, the efficiency of the approach proposed is shown.

Keyword: Expanded optimal control; Coupled tanks system; Model-reality differences; Iterative solution; Adjusted parameters