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Optimal control of water distribution networks without storage. (English) Zbl 1441.90047

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Summary: The paper investigates the problem of optimal control of water distribution networks without storage capacity. Using mathematical optimization, we formulate and solve the problem as a non-convex NLP, in order to obtain optimal control curves for both variable speed pumps and pressure reducing valves of the network and thus, propose a methodology for the automated control of real operational networks. We consider both single-objective and multi-objective problems with average zonal pressure, pump energy consumption and water treatment cost as objectives. Furthermore, we investigate global optimality bounds for the calculated solutions using global optimization techniques. The proposed approach is shown to outperform state-of-the-art global optimization solvers. The described procedure is demonstrated in a case study using a large size operational network.

MSC:

90B10 Deterministic network models in operations research

90C29 Multi-objective and goal programming

Keywords:

networks; mathematical optimization; optimal control; variable speed pumps; water distribution systems

Software:

Ipopt; NBI; SCIP

Full Text: [DOI](#)

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