Drinking Water
Engineering and Science
Discussions

Interactive comment on "Inclusion of Tank Configurations as a Variable in the Cost Optimization of Branched Piped Water Networks" *by* Nikhil Hooda and Om Damani

Anonymous Referee #2

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The manuscript considers the interesting problem of optimal design of water supply systems, with the inclusion of tank locations and configurations as decision variables. The authors are concerned only with gravity fed branched networks. In such cases the problem can be formulated as an integer linear program (ILP). However, in this reviewer's opinion, the level of scientific contribution of the present manuscript is limited. The literature review should be expanded with previously published studies on the subject - e.g. see [1]. In addition, the clarity of the notation needs be significantly improved, as detailed in the following.

The objectives considered for minimization are total pipe cost and total tank cost. Since in gravity fed branched network these are conflicting, the authors minimize the sum of

the two objectives, implying that total pipe and tank costs are equally important. It would be interesting to show the trade-offs between the two objectives, by solving a sequence of ILPs where each problem considers a weighted sum of pipe cost and tank cost, with weights varying between 0 and 1 – see [2, Sec. 3.1] . In addition, also other objectives functions like operational cost (related to the action of valves and pumps) can be included in such multiobjective framework, providing the decision maker with a tool for a complete cost-benefits analysis of different design solutions. Note also that each ILP can be solved efficiently by standard MILP solvers like Gurobi [3] , which is freely available for academics. In this reviewer's opinion, the inclusion of a multiobjective analysis tool in JalTantra would improve the level of contribution of the manuscript.

Finally, the manuscript presents several issues in terms of clarity of notation.

1. The authors should number the equations, this helps the readability of the problem formulation.

2. The objective function related to total pipe cost is denoted by the same symbol as the composite objective function resulting from the sum of pipes and tanks cost. This should be avoided and two different symbols should be used.

3. When involved in mathematical equations, quantities like flow, roughness, diameter, demand, head and headloss should be represented by symbols and not by the entire word.

4. The symbol L is used both for pipe length and tank lower capacity, this is confusing and two different symbols should be used.

5. The table at page 5 is not very clear. The authors should check the indices i and n, in this reviewer opinion they roles have sometimes been confused.

References

[1] C. Bragalli, C. D'Ambrosio, J. Lee, A. Lodi, and P. Toth, "Water Network Design by

MINLP," 2008.

[2] K. Miettinen, Nonlinear Multiobjective Optimization. Springer US, 1998.

[3] Gurobi Optimization, "Gurobi Optimizer Reference Manual." 2016.

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