Dear Editor of Journal of Drinking Water Engineering and Science
Sep 5, 2021
Re: Manuscript reference No: dwes-2020-37

Please find attached a revised version of our manuscript "**The Evaluation of Reliability Indices in Water Distribution Networks under Pipe Failure Condition**", which we would like to resubmit for publication as a Research papers in **Journal of Drinking Water Engineering and Science**. Reviewer' comments were highly insightful and enabled us to greatly improve the quality of our manuscript. We edited the paper in terms of scientific and language view. In the following pages are our point-by-point responses to each of the comments of the reviewer. Revisions in the text of manuscript are shown using yellow highlight for additions and changing according to suggestions. Reviewer' comments are shown in black color, and the blue color regular font is used for our responses. We hope that the revisions in the manuscript and our accompanying responses will be sufficient to make our manuscript suitable for publication in **Journal of Drinking Water Engineering and Science**. We shall look forward to hearing from you at your earliest convenience.

Anonymous Referee #1

- I recommend to accept the paper as it is.

Many thanks the honorable reviewer for his/her comment.

André Marques Arsénio(cc1)

- In general, I do like to approach followed but a question remains: what is the impact of these solutions in water quality aspects, particularly water age. In fact, the solution for the Iranian network renders low velocities that makes me wonders how would the network perform (in regards to in-pipe velocity) during low consumption periods.

The present paper was aimed at the evaluation of hydraulic reliability indices under pipe failure conditions and the capabilities of these indicators in different hydraulic conditions of the network are discussed. Quality issues that have their own indices and broad topics are specifically discussed in the relevant articles.

- REF denotes that a literature reference should be used.

Many thanks the honorable reviewer, the corrections were made.

- What do you mean difficult? There is not a single solution but a variety of good solution with an optimum? The computation takes too long and there's the need for computation power? Be more specific.

To design a water distribution network, there are different modes for selecting the diameter of a pipe in the network, in all of which the hydraulic constraints can be satisfied, but which mode can be the most optimal is an important one. It is very difficult to choose this mode. The nonlinearity of the hydraulic relationships in the network increases its complexity .For this purpose, we must use optimization methods that have the ability to solve nonlinear problems.
The reference of the above sentence was inserted.

- I don't understand this sentence . I sense that this has a negative connotation and the question is, why? I.e. is the fact that the exercise have become too academic a "bad" thing? Why and to whom?

Many thanks the honorable reviewer, the corrections were made.

- Do you mean since 1990? Because right after you give REFs for the period of 1960-90 so there is a mismatch between these ideas.

Many thanks the honorable reviewer, the corrections were made.

- Can you be more specific?

According to the objective of the present manuscript and the cited study, the field of water network design is purpose of this sentence.

- Is this better? If so why?

Previous studies in this field demonstrated it.

- What is the point of enumerating all these and then selecting GA/DE? Is GA/DE better than these, why? From a narrative perspective these should be enumerated before your selection, not after. Also: are all these algorithms considered GA? It's not clear.

Background of previous research on the optimal design of water distribution network is explained in this part of the manuscript. To achieve this, all the methods used in this regard have been

presented. Also, on page 4, L 78, better performance of the Genetic Algorithm is discussed in comparison to the other mentioned methods.

- You have to better introduce this concept.

As mentioned in the manuscript and referenced to previous studies, two-objective optimization gives the user a broader view of network conditions, ie conditions such as failure, flow uncertainty, etc. can be influenced in choosing the optimum solution for optimal design impact.

- What is the added value of this information? i.e. what was the result of these suggestions?

Indices (Resilience Index (I_r), Network Resilience (I_n), Modified Resilience Index (MRI) and Minimum Surplus Head Index (I_m)) which are discussed in the following manuscript are the top indices proposed by these studies.

- I fail to understand the points made in this paragraph: what's the link between objective functions (and why are these important), singke-objective constrained formulation and reliability? These concepts seem to be somehow linked but it's unclear how exactly.

This manuscript consists of two parts: single-objective optimization whose function is to minimize costs and two-objective optimization whose function is to minimize costs and maximize reliability. This issue is further discussed in the Materials and Methods section.

- You had already underlined the superiority of GA – why are you doing it again here?
Many thanks the honorable reviewer, the corrections were made.

- Why do you use this particular GA?

According to the conclusion of previous research, it was found that Genetic Algorithm is one of the most powerful algorithms in water distribution network calculations. The tool used in this study also applies this algorithm.

- You have to move this to when you introduce GANETXL for the first time.
Many thanks the honorable reviewer, the corrections were made.

- You have to introduce these drawbacks in the intro

It has been introduced in Section 2.3.2 (Resilience Index).

- This is introduction, it's not M&M

Usually in all papers, software is introduced in the materials and methods section.

The basis of this software, which was a Genetic Algorithm, has been explained in the Introduction.

- Why did you do it like that, is this the common approach?

The purpose of this manuscript is to optimize single-objective and two-objective. This feature is used by the software (GANet Excel), so optimization has been done in two separate stages of single-objective and two-objective optimization.

- Why did you use the parameters?

The presented parameters are the main components of the genetic algorithm and must be set before running the program / algorithm. Sensitivity analysis by during the execution of different iterations of GA and NSGA-II algorithms has been performed to determine the optimal values of these parameters.

- Are these results for the same network from other authors?

Yes. That is true.

- The same as before, are these the costs obtained from other authors?

Yes. That is true.

- Could you quantify this or explain how you reach this conclusion?

The range of numbers presented is based on the minimum and maximum values of the solutions presented in the graphs. The lowest and the highest point on the Pareto front in each of the charts were the criteria for deriving the range of reliability indices and the cost range. Also, the variety of solutions presented in the cost-I_n graph indicates the result.

- Please link this to Figs a-d

Many thanks the honorable reviewer, the corrections were made.

Anonymous Referee #2

In this paper, reliability indicators of water distribution networks are evaluated under pipe failure conditions. The case studies include two benchmark and one real-life water distribution networks in Iran with more hydraulic constraints. Some important reliability indicators are reported and GANetXL is used for one-objective and two-objective optimization.

Manuscript covers an important and critical issue, well organized, and also evaluating Reliability Indicators in Pipe Failure Conditions is one of the strengths of this paper, but there are some comments in my view:

Many thanks the honorable reviewer for his/her comment.

- To summarize the manuscript in the case of benchmark networks, the picture, characteristics of nodes and pipes of these networks can be removed and refer to previously published papers.

Many thanks the honorable reviewer, the corrections were made.

- Use similar studies of the last three years.
Many thanks the honorable reviewer, the corrections were made.

- How Pareto fronts have been interpreted in terms of two objective optimization cost-reliability criteria.
The range of numbers presented is based on the minimum and maximum values of the solutions presented in the graphs. The lowest and the highest point on the Pareto front in each of the charts were the criteria for deriving the range of reliability indices and the cost range. Also, the variety of solutions presented in the cost-I_n graph indicates the result.

- How Optimum GA and NSGA-II values were calculated in table 1?

The presented parameters are the main components of the genetic algorithm and must be set before running the program / algorithm. Sensitivity analysis by during the execution of different iterations of GA and NSGA-II algorithms has been performed to determine the optimal values of these parameters.

- In diagrams of" Surplus pressure of nodes in the networks for solutions of maximum reliability criteria under failure of pipes", only diagrams related to the most critical pipe can be inserted in the main manuscript and the rest of the charts can be moved to supplementary data.

Many thanks the honorable reviewer, the corrections were made.

- Some sentences in the manuscript need to be referenced, for example on page 1 line 35 of the following sentence

  Optimal WDN design is a computationally complex problem because……

Many thanks the honorable reviewer, the corrections were made.

- Please add some relevant citations in your manuscript such as

:https://doi.org/10.1016/j.gsf.2021.101276
https://doi.org/10.1016/j.jwpe.2020.101342
https://doi.org/10.1186/s13568-019-0882-6

Many thanks the honorable reviewer, the corrections were made.