

Interactive comment on “Verification of filter efficiency of horizontal roughing filter by Weglin’s design criteria and Artificial Neural Network” by B. Mukhopadhay et al.

Anonymous Referee #1

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Review of dwesd-2008-0007 Document titled: Verification of Filter Efficiency of Horizontal Roughing Filter by Wegelinacute;s design criteria and Artificial Neural Network by B.Mukhopadhay et al.

The above named study attempts to evaluate the performance of Horizontal roughing filters-HRF using two different methods; 1) the Wegelinacute;s design criteria and 2) a model or models developed through Artificial Neural Network-ANN. The Wegelins design criteria is a well know prediction model whereas prediction by ANN is a rather new technique which the authors try to explore. Such analysis is essential given that the Wegelins design criteria was developed under more or less controlled conditions

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(e.g. Wegelin used kaolin clay suspensions to make up the SS load while suspended particles in natural waters possess different properties) thus, the need to evaluate its applicability and accuracy for conditions different than those of development. Furthermore the use of ANN to build a model used to how accurate is the prediction of filtration efficiency by Wegelin's design criteria, brings new insights to the discussion. General comments: 1. In the current state, the document misleads the reader to what were the objectives of the study. The claims in the document are not adequately referenced and are presented in a rather speculative manner. I am sure that all the statements and claims made in the study can be duly supported by empirical information. 2. The study objectives may require to be streamlined to what is achievable and permissible in context of the available data. This effort will help improve the articulation of every aspect of the document. 3. A review of the language would help. As a non-English speaking reviewer my inputs in terms of language review would not help a lot but I found the text somewhat confusing in some passages and I believe other readers will have the same problem. Specific comments: 1. The abstract would need to be revised to better highlight of the methodology, findings and recommendations/conclusions of the study. For example, it is not clear from the abstract that the study is based in pilot-plant experimentation, and it is not clearly indicated what the three models used in the study were and which criteria was used for comparison (MSE, STDV etc). In the results section of the abstract it is not clear how the authors concluded that the results from the experimental set-up were coherent with the neural model (MSE experimental setup vs. MSE model?) and incoherent to Wegelin's criteria. Since the objective of the study is to highlight these differences, some figures of criteria used in the abstract would help readers follow the remaining of the document. 2. There are a lot of statements in the introduction that would need to be referenced. For example the criteria for operation of HRF could be referenced. A review of what conventional treatment is and its objectives would help improve the introduction section of the paper. It is not clear for instance what the authors see as the difference between plain sedimentation and prolonged storage used as pre-treatment prior to conventional treatment. As found

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in many text books, conventional treatment refers to the train sequence of chemical-coagulation/flocculation, sedimentation, rapid sand filtration and disinfection. From the definition of the authors it is understood that conventional treatment involves always plain sedimentation and/or prolonged storage which is not the case.

The description of the experimental set-up needs to be improved. An interesting question to the authors. Was the pilot plant run during the 70 days without cleaning??

The formulation of the 1/3-2/3filtration theory described by Wegelin seems to follow reasonably the descriptions found in many text books. It could be improved by using appropriate tools of Ms-word to present mathematical formulas. Also there is mistake in formula 2. There is a missing i (counter) between C and inlet.

3. In my opinion, most of the information provided in paragraph 2.1 of the methodology section should better be placed in the introduction or background section. The information on building and training the ANN model in the methodology section should be streamlined to focus only on what were the procedures to build the model used in this study (e.g. length of the dataset, which data was used for training of the model and for validation).

4. The statement "from table it is observed that HRF effluent has met the required level of SS concentration"in the methodology section should better be placed in the results section of the manuscript. Also an indication of what the required level is should be mentioned and eventually referenced.

5. Table 1, is not referenced in any part of the text. It is also not clear from where this table came from. From literature or from practical results attained by the authors.

6. In the text (methodology) it is stated that the pilot plant was operated for a dry period and a rainy period. It is not clear from data presented in Table 2 which data corresponds to which period. It would help a lot if a horizontal line separating the two sets of data was included. Also it is not clear to which model the results of the third

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column of table 2 refer. Are those the results of the Wegelins Model of the ANN model. Where are the results of the prediction by the other (comparative) model?

7. Fig 2 could be improved to match to the statement made in the methodology section that "the pilot plant was provided with an under drainage system to "... What kind of under drain system was used?

8. The results and discussion section should be improved. There is not a single reference of the results found by wegelins model which are further compared to those of the ANN model. At least it is not clear where they are. Values of MSE, r CE and STDEV obtained from Wegelins model are presented in table 4 but it is not clear from where they came from.

9. In a study like this it is always helpful to represent the results of your models graphically. Normally fitting curves are used in which results obtained by models are fitted to results obtained experimentally to evaluate how results from the models deviate from practical results. This would help interpretation of the findings from the authors.

10. During development of ANN models, a portion of data is used for training of the model and a portion for validation. This is correctly stated and used by the authors but there is no indication whatsoever in the text or tables, of which data was used for training and which was used for validation and what the criteria used for selection.

11. Authors are encouraged to refer also to related work previously published in the same or similar subjects. There are very few peer-reviewed references on similar work done by other researchers in the same or similar subjects. A quick search on internet has revealed the following possibility: Verification of Wegelin8217;s design criteria for horizontal flow roughing filters (HRFs) with alternative filter material" by GM Ochieng and FAO Otieno. Water SA, Vol. 32 No 1, pp. 105-110. This can be accessed through: <http://www.wrc.org.za>. A reference to the Standard Methods is needed in the reference list. Authors should bear in mind that not all readers knows the Standard methods (of what?) and also that there are many standard methods and editions.

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12. The conclusions would need to be succinctly summarised to reflect the key findings. Also, there are claims made in the conclusions that were not discussed in the manuscript. To which parameters the authors refer that are affected by changes in climatic and experimental conditions which makes the Wegelins model different than the ANN model?. Why the authors only comment on this in the conclusions?. Shouldn't this be also in the methodology or discussion section of your manuscript?. I hope you will find the above comments in order As to dwesd review criteria

1. Does the paper address relevant scientific questions within the scope of DWES?
Yes

2. Does the paper present novel concepts, ideas, tools, or data?

Yes when it refers to the use of ANN to validate Wegelin's prediction model of the efficiency of HRF.

3. Are substantial conclusions reached? No. the conclusions should be substantially improved to reflect the findings and limitations of the study.

4. Are the scientific methods and assumptions valid and clearly outlined? No. The authors should re-work the introduction section of the manuscript with inclusion of a background section to clearly discuss the state of affairs regarding the subject studied and a clear indication of the objectives of the study.

5. Are the results sufficient to support the interpretations and conclusions? No. the results focus only on how the ANN model performed with little said on the Wegelin's model. In the conclusions the authors stress a comparison between two models of which one was not sufficiently discussed in the manuscript.

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? No. The description of the experimental set-up is incomplete and the assumptions made to run the experiment not clearly justified. Fellow scientists would find it difficult to reproduce

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the experiment discussed in this paper.

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? No. there is very few peer-reviewed references listed in the paper.

8. Does the title clearly reflect the contents of the paper? The title seems to indicate clearly what the objective of the authors was. The text and analysis done needs to be slightly improved to reflect the title.

9. Does the abstract provide a concise and complete summary? No. The abstract should be improved to better highlight of the methodology, findings and recommendations/conclusions of the study

10. Is the overall presentation well structured and clear? Yes to a certain extent. The introduction section should perhaps include a background paragraph whit clear indication of the objectives of the study.

11. Is the language fluent and precise? Since lacute;m not a native speaking English my criticism to this matter would be unfair.

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? No. the presentation of formulae and symbols need to be improved. Authors should use proper Ms-word tools to improve the presentation. At least one formula needs to be corrected.

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated?

Titles in the tables should explain better the content of the tables and explain how they were generated. For example, the title in Table 2 could perhaps be "SS concentrations in the filtrate of the HRF according to measurements (column x) and predictions by Wegelins model (column x) and AAn models (column x)". A similar explanatory title for table 1 would also help improve the reading. The title or Table 3 does not reflect

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the content of the table. It seems to be that the table compares validation parameters for four ANN models tested and further highlights the criteria used to select the best model. The title in Table 4 needs to be improved to better reflect its content.

Fig 1 is not self explanatory so the legend should help in that respect. What is and what the purpose of the cylinder on the back of HRF, where does one compartment of the HRF starts and finishes etc?. The picture of Figure 1 should also be improved.

Figure 2 could have some dimensions (length, height) indicated in it and a better legend.

14. Are the number and quality of references appropriate? No. more references on similar work would help support the findings and conclusions of the study.

Recommendation and other comments

The manuscript needs to be extensively revised. More references to similar studies are needed. The introduction part of the manuscript needs to be improved. More illustrations of results obtained are need. A graphical representation comparing the three models should be included. The conclusions need to be reformulated to reflect all findings of the study.

Interactive comment on Drink. Water Eng. Sci. Discuss., 1, 117, 2008.

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