

Interactive comment on “Optimization of coagulation-flocculation parameters using a photometric dispersion analyser” by S. Ramphal and M. Sibiya

Anonymous Referee #2

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General Comments

The title claims the paper concerns ‘optimization’. Unfortunately, the approach taken by the authors on their sample of raw water did not result in optimization of the coagulation of that sample. The paper reflects a lack of experience and understanding of the practical application of coagulation. Consequently, the paper does not represent a distinct step forward in the subject.

Specific Comments

1 The first set of tests was based on an alum dose of 10 mgAl/l to identify the sample pH they would use in the subsequent tests. The next set of tests used this sample
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pH to identify the optimum alum dose for this pH. First, it is unclear why such a high alum dose was used for the first test, when the sample would appear to relate to a treatment works that generally applies a dose of about 3 mgAl/l. Secondly, the concept of optimising pH for coagulation applies to the ‘coagulation pH’, i.e. the pH of the water after rapid mix of the coagulant and any acid or alkali added to adjust the pH. By fixing the pH of the sample prior to addition of the alum, they have given the water additional alkalinity to be addressed by the acidity of additional coagulant, i.e. excess alum has to be dosed. Consequently, the authors found that what they considered to be ‘optimum dose’ was much greater than the alum dose applied by the treatment works. It follows that some of the graphs may need to be re-interpreted.

2 Whilst the results produced by the authors may well be relevant for the protocol they followed, the results are not of practical relevance to the treatment plant. This suggests that the authors did not have adequate experience or appreciation of how coagulation dosage is selected and applied in practice.

3 The references indicate that the authors had done a reasonable amount of relevant reading. However, their test protocol may have been better if they understood the application of coagulation in practice better. It would seem that the authors had not referred to the likes of: ‘Flocs in Water Treatment’, Bache & Gregory, IWA 2007 (ISBN: 1843390639); ‘Coagulation and Flocculation’, Bratby, IWA 2006 (ISBN: 1843391066); and ‘Coagulation and Flocculation’ Letterman & Yiacoumi, Chapt 8 in Water Quality & Treatment (6th Edtn), AWWA 2011 (ISBN: 978-0-07-163011-5).

4 P102-10: The authors say ‘optimal pH also coincided with minimum solubility of alum (aluminium)’ when they cannot actually claim this because they did not measure aluminium concentrations. It is dangerous to refer to a published aluminium solubility diagram with such accuracy. This is because aluminium solubility depends on water chemistry and temperature. The authors have not reported water test temperatures. Additionally, the authors should understand that in the first instance the performance of coagulation should be determined through measurement of residual coagulant, with

turbidity and colour regarded almost as either or both surrogate and secondary parameters. These three parameters do not always reflect the same optimum coagulant dose and pH and appropriate compromises have to be made.

5 The authors investigated the pH range 6 to 9. Because their coagulant was alum, they would have been better investigating the range 6 to 8.

6 The authors have not reported the quality of the test water as sampled. They used the appropriate measurements in the calculation of CCPP, but have not given them. These are needed so that readers might be able to put the authors' results into perspective with respect to the kind of waters that they deal with.

7 Because the authors adjusted the raw water to pH8, the results from the calculation of CCPP concerning final adjustment of pH will not be the same as if coagulation pH had been optimized.

8 Light absorption of test samples has been measured at 300nm and referred to in the paper as measurement of colour. The norm for measurement of visible colour is measurement at 400nm. Use of 300nm (UV range) will be a measure of non-visible colour.

9 The authors have not stated how many measurements or test runs were used for determining each point in their graphs.

Technical Comments

1 Colour has been used in the figures. Choice of colour, symbols and line pattern should be appropriate for printing the paper in black and white. The figures would also be more reader friendly if the graphs in each set of four had been scaled and aligned the same. (suggested method: scale each graph in excel to be the same, set up a 2x2 table with hidden boundaries and insert each graph into the table.) Also make sure the axes of each graph agree with the figure title.

2 You have used the word 'significant/significantly' a number of times. In scientific and

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technical papers it should be used only when statistically appropriate. It should not be used for emphasis or the likes of 'distinct/substantial/much' should be used.

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