**Drinking Water
Engineering and Science
Discussions**

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Interactive comment on "Removal of both dissolved and particulate iron from groundwater" *by* K. Teunissen et al.

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general comments - Proper explanation of iron removal mechanisms for processes of drinking water treatment. - Suitable setup for the analytics and pilot plant, but the depth of the filter columns (0.25 m) is to low, because a scale up of measured results for the filtrate quality to the full scale filter with 2 m depth is not possible.

specific comments The discussed results for the precipitation kinetics of iron are not in accordance with our experience from many full scale treatment plants with comparable raw water conditions and treatment schemes. Commonly, with a pH > 6.8 Fe2+ is oxidised very fast. In the most water works with an iron removal step this process already starts in the aeration device with a considerable need of man power to clean the device. It is a common and widespread method to avoid any residence time for

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the aerated raw water with the aim to filter Fe2+ directly (contact filtration) with filtration rates up to 50 m/h (!). At a pH of 7.5 and higher essential pH effects can be neglected.

Despite this fact, a retardation phenomenon for the oxidisation/precipitation is obvious in the present study. What is the reason for the drop of the Fe2+/Fe3+ ratio in the supernatant of the filter (Fig. 5) over a period of 400 minutes? What about the content of DOC or phosphorous (not shown in Tab. 1)? Can complexation take place?

The particle count instrument "Pamas Water Viewer" applies a light obscuration method for particle sizing and counting. It is calibrated with a latex standard of spherical particles. Therefore, the measured particle size of a non-spherical particle is a so called equivalent diameter, i. e. the diameter of a latex sphere with the same amount of light obscuration. If those diameters are use to calculate the volume of particles, this can be performed on the basis/hypothesis of a spherical shape. The deviation from a spherical shaped particle leads to a high error for the volume (power of three). So called shape coefficients are usually used to compensate this error. The results of the TIVLS measurements could be used to determine a coefficient as a combination of density and shape factor for the iron particles (mass balance on the basis of particle count data vs. suspended solids results). In the paper, the opposite way has been used, leading to a wide value range for particle densities in Table 6. On the other hand, to calculate frequency distributions for the particle diameter or volume and to discuss the ratio between the volume in single time steps of filtration and its total amount for a filter run, this correction is not necessary. In addition, the particles discussed in this work show a high fraction of agglomerates consisting of dens particles as well as of colloidal and weak mikroflocs with a variety of densities and influences on the accuracy and precision of optical particle sizing.

The discussed results for the particle content in the filter effluent are in accordance with our experience from full scale treatment plants: the total amount of particles in the filtrate during a whole filter run is strongly influenced by start up conditions after backwash and special events like flow rate adjustments. The initial filtrate after a backwash

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is influence by four particle "sources": at first particles from the origin backwash water (negligible), particles indirect from the backwash process caused by a re-suspension effect during bed consolidation after backwash, particles immediate from the backwash process and mainly remaining in the supernatant of the filter bed (bigger particles of higher density preferred) and raw water particles caused by a compromised retention during filter ripening.

technical corrections:

Fig. 1 – 3 show particle count data for the combined filtrate, isn't it? This should be mentioned in their legend.

Interactive comment on Drink. Water Eng. Sci. Discuss., 1, 87, 2008.