



ColiMinder

rapid microbiology

by
VWM
SOLUTIONS

Semi-Treated Drinking Water

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Microbiological Activity Measurements of Drinking Water



FIGURE 1: COLIMINDER “LORENZ” EQUIPPED WITH TWO SAMPLING UNITS AT SEOUL METROPOLITAN WATER INSTITUTE

Introduction

To demonstrate the suitability of the ColiMinder measurement system for drinking water monitoring several validations have been performed at different locations in different countries.

Drinking water has been measured within the process of production as well as the final drinking water. At some locations, the water has been chlorinated, as usual in many countries.

The measurements have been performed using Alkaline Phosphatase Activity (ALP) as measurement parameter. This parameter is extremely sensitive and provides an activity signal from any kind of living organism. It is comparable to the traditional heterotrophic plate count.

The following measurements have been performed in a governmental utility’s test facility to evaluate the performance of two different activated carbon filtration columns.

The columns have been installed after several treatment steps treating surface water to drinking water. The actual sample did not contain any disinfectant.

Semi treated drinking water - comparison of activated carbon filtration columns

The average microbiological activity was in the range of 40 μ U to 60 μ U which is above the level considered to be drinking water. After backwash of the columns the activity in one column dropped to about 10 μ U/100ml (Figure).

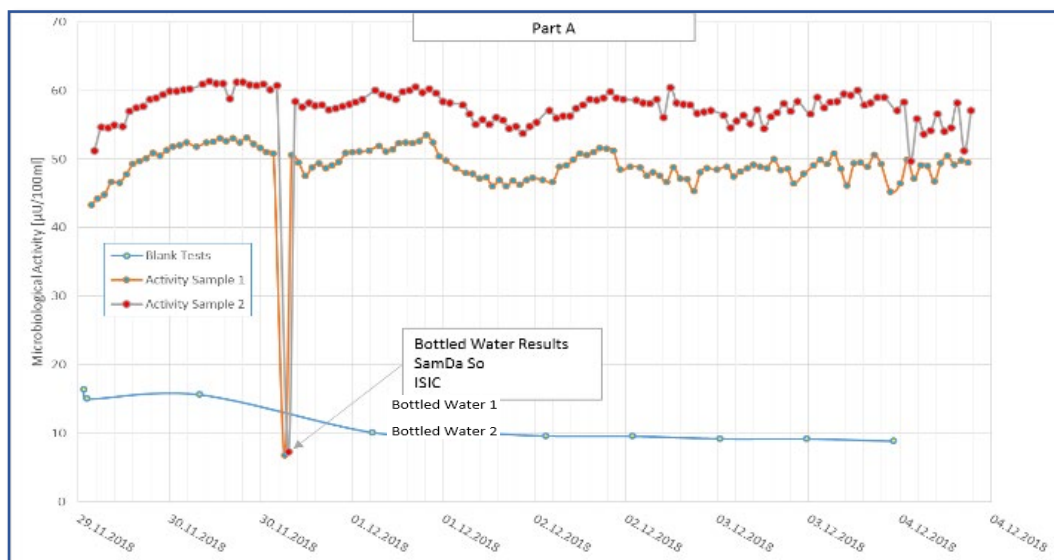


FIGURE 2: TIMELINE OF TWO SAMPLE STREAMS RINSING WATER AND TWO DIFFERENT BRANDS OF BOTTLED WATER

For comparison two different brands of bottled water have been measured, besides the samples and the blank tests using the rinsing water as a sample. The timeline shows a quite constant activity, at least a very constant difference of activity between both samples (Sample 1 - Column B; Sample 2 – Column C).

The activity of the rinsing water – blue line – is significantly lower. The two measurements of bottled water are below the activity of the rinsing water.

Sample Timelines Activity

Both activity timelines run in parallel, even following a diurnal pattern at the beginning and more scattered at sample 1 from December 2nd about 12:00 (Figure 2 / Figure 3). Eliminating the blank and the bottled water measurements from the timeline, this becomes more visible.

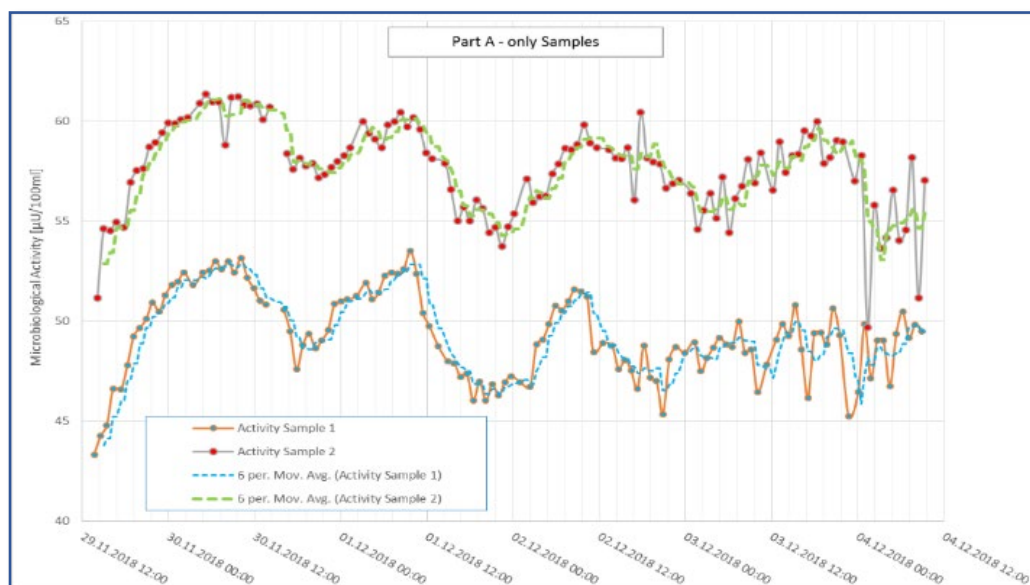


FIGURE 3: TIMELINE OF SAMPLE 1 AND SAMPLE 2 WITHOUT RINSING WATER AND BOTTLED WATER SAMPLES

Rinsing Water Timeline and Bottled Water Measurements

The measurement series started with two blank tests, the second a bit lower than the first. This is usual as there is always some biofilm building up when the device is not used for a while.

The first three results of rinsing water activity (blue line Figure 4) are about the same level which has been considered too high. Therefore, rinsing water has been replaced by fresh deionized water on November 30th after noon (Figure 4).

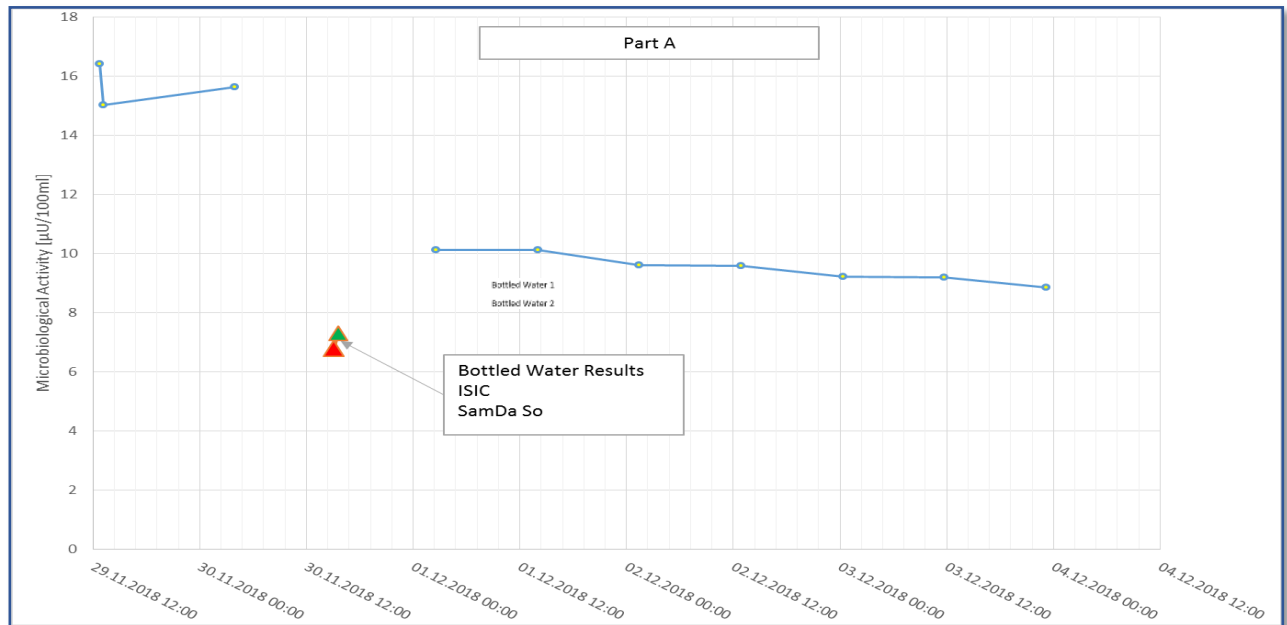


FIGURE 4: RINSING WATER TIMELINE AND COMPARISON TO BOTTLED WATER ACTIVITY

Although the rinsing water has been exchanged to fresh demineralized water, the microbiological activity of the rinsing water has been significantly higher than the activity of both brands of bottled water.

Transmission Signal Timeline Part A

Both samples show about identical turbidity as well as an identical pattern which indicates that the reason for the variation might be the source and not the columns itself.

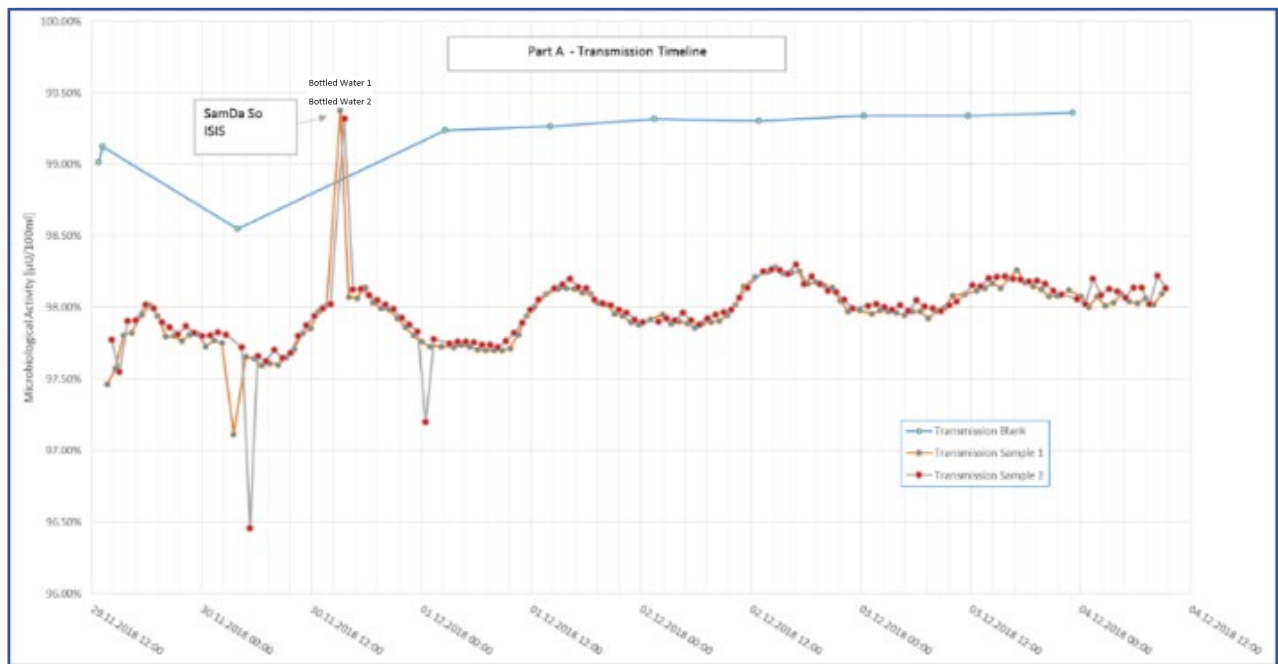


FIGURE 5: TRANSMISSION SIGNAL INTENSITY TIMELINE OF SAMPLES 1/2, RINSING WATER AND BOTTLED WATER

The turbidity of the bottled water measurements is a bit lower than the turbidity of the rinsing water - thus the transmission intensity is a bit higher than the one of the rinsing water (Figure 5).

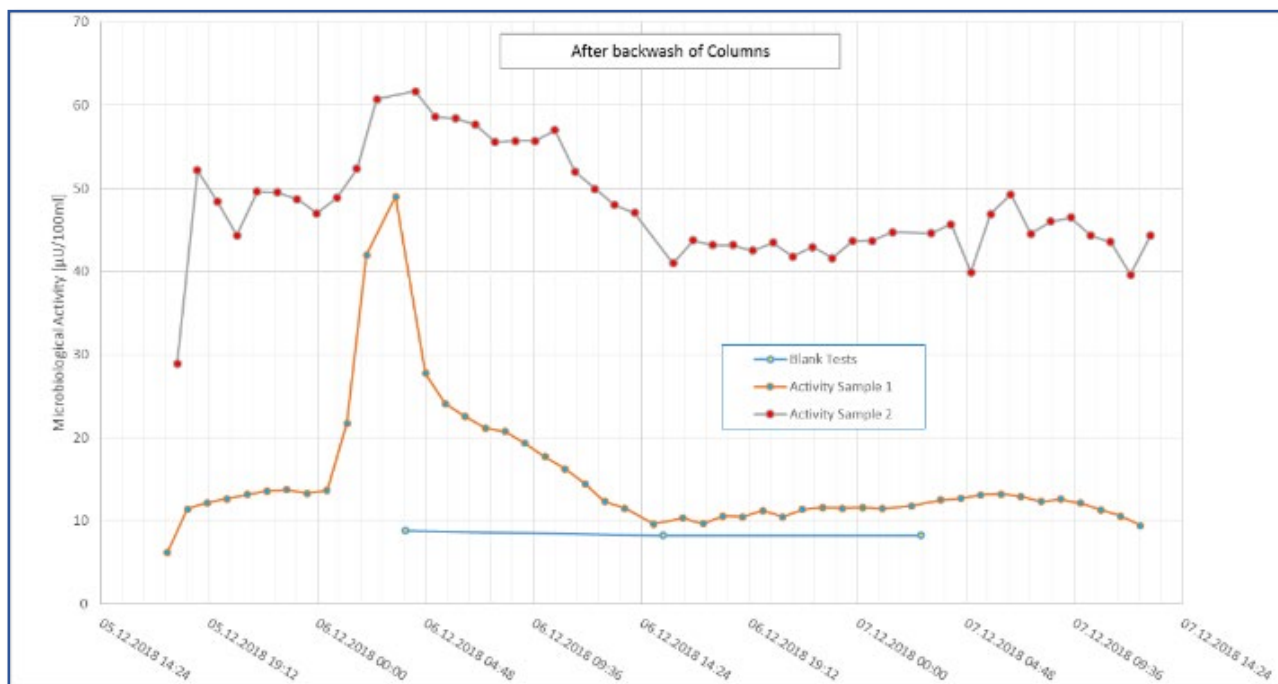


FIGURE 6: ACTIVITY TIMELINES OF BOTH SAMPLES AND RINSING WATER AFTER BACKWASH WITH CHLORINATED WATER

After backwashing both columns with chlorinated water, the activity of the water produced by Column B – Sample 1 has been clearly lower than the activity of Column C – Sample 2 but still higher than the activity of the rinsing water.

Measurement Units and Definition

The ColiMinder has been measuring Alkaline Phosphatase Activity (ALP) which reflects the metabolic activity of all living organisms in the sample. The device measures ALP activity and delivers results according to the scientific definition of ALP activity.

The ColiMinder devices are delivering results in the respective scientific definition of the target enzyme.

The second parameter is the transmission intensity as a measure for turbidity of the sample.

Unit Definition Alkaline Phosphatase Activity (ALP) [μ U/100ml]

Total Activity: bulk parameter representing activity of all living organisms within a sample

Result: Alkaline Phosphatase activity/Volume

[μ DEAU/100ml] – 10^6 (-6) Diethanolamin Units per 100 ml of sample

Unit definition -DEAU (Diethanolamin Unit): One DEAU will hydrolyze 1 μ mole of 4-nitrophenyl phosphate per minute at pH 9.8 at 37 °C.

Besides the activity measurements the ColiMinder also produces a transmission measurement timeline. The “transmission” signal represents the amount of light transmitting the sample in comparison to the transmitted intensity when measuring the rinsing water (without reagents).

Transmission Intensity [%]

The transmission intensity is given in percent [%] of light intensity permeating the sample. 100% would be the light intensity permeating the rinsing water without any reagents added. The value of transmission intensity given in the result table represents the average transmission intensity during the measurement of the respective sample.