RESPONSE TO REVIEWERS' COMMENTS

applsci-2207888

Application of Radial Type Multifiber Media Filtration Process for Combined Sewer Overflow Treatment

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Reviewer #2

The paper reported the treatment performance of fiber media filtration for combined sewer overflow (CSO). The contents covered well the necessary information and experimental results. However, there are limited novelty and low representativeness of the results. It means that the conclusion seems specific and less generalized due to limited number of wet weather experiments and weak results interpretation. Therefore, it is necessary for authors to improve the paper after major revision.

(1) Limited comparison with other similar media filtration technologies for CSO treatment The paper just reported a specific application of Radial Type Multifiber Media Filtration with limited comparison with other similar media filtration technology for CSO treatment. Many filtration technologies have been implemented in USA, EU and Japan. For example, there was a SPIRIT21 project on CSO treatment technology and JIWET reported their technology performance officially in Japan.

https://www.jiwet.or.jp/spirit21/confluence/eng_01.html

https://www.jiwet.or.jp/spirit21/confluence/eng_02.html

https://www.jiwet.or.jp/spirit21/confluence/eng_03.html

Therefore, the authors need to do several comparisons with other similar technology. In addition, if radial type has any advantage, it is necessary to discuss with regular type at least.

Response: Thank you for your valuable comment. The overflow treatment technology applied in this study is a device-type filtration and removal efficiencies were suggested through physical treatment. Recently various treatment processes have been proposed for CSO treatment. Alice et.al reported that number of publications concerning type of treatment process has recently increased.

However, CSOs treatment technologies are all about chemical treatment(flocculation-coagulation), simple screen facility and advanced treatment as a post treatment (UV). There is no treatment process using a fiber media filter in the website. It seems that comparison is quite difficult due to the different removal mechanisms to CSOs treatment process using fiber media filtration.

(2) Limited information of wet weather flow and no information of treatment plant for CSO sampling. Table 1 shows one example of CSO water quality at an event with 7mm/hr rainfall intensity in Daegu. The samples seemed to be collected at a treatment plant, because first two samples are not CSO. However, there is no information on the drainage area and other rainfall characteristics such as total rainfall and its duration. Table 2 shows dry and rainy weather water quality at a treatment plant in Seoul, whose design and planned information are not available. Similarly. sampling rainfall event characteristics are not reported although the rainfall intensity was reported as 5mm/hr. Sample number is not given in Table 2. Wet weather water quality highly depends on rainfall intensity pattern and drainage characteristic. Therefore, readers want to know more rainfall and drainage system

characteristics to evaluate CSO water quality, although it is good to show both water quality at dry and rainy weathers.

Response: Thank you for your invaluable comment. Table 1 shows to compare the characteristics of CSOs. The CSOs data in Daegu were used in this investigation. The sampling point has been showed as follows:

Division	Description	Sampling point
Name of point	**Gongdan cheon(river) in wolseonggyo bridge**	
Watershed area (km^2)	**12.4**	

The first two samples (not overflowing; see table 1) were also collected at the same point. The characteristics of the wolseonggyo Bridge in Daegu occupy 12,400,000m^2 (12.4km^2) out of 40,831,088 m^2 (40.8km^2) of the area and area ratio is calculated as 30.37%.

Table 2 shows an average result of this investigation for different weather conditions. Based on CSOs water quality in Wolseonggyo, Daegu as a standard CSOs quality, we simulate CSO treatment test in Tancheon, Seoul. Therefore, it was very difficult to set exact rainfall intensity.

The Tancheon sewer treatment plant in Seoul has treatment area of 64km^2, and this area accepts a mixture of CSS and CSOs. The capacity of the Tancheon sewer treatment plant is 900,000 m^3/day.

(3) Limited number of experiments Figure shows removal performance for a rainfall event with 5mm/hr intensity. This only one data for pilot plant. It is necessary to show more treatment results on removal percentage at least n=3 to obtain the average with standard deviation for generalization. Specific comments

Response: Thank you for your invaluable comment. This experiment was performed more than 300 times over about two years. Both figure 3 and 6 show the removal efficiency of pollutants as an average value. The error bars in both figures will be added at the entire manuscript.

Figure 1: Pilot scale treatment process consists of 3.0m in length, 2.3 m in width and 2.0 m in height. This information can be shown in Figure 1. Based on the specification of plant, 3.0 m x 2.3 m x 20 m/hr x 24 hr/day = 3312 m3/day, while 480 m3/day was given. The designed filtration area of 1.00 m2 is not clear. This can be also shown in Figure 1. It would be better to show the photo of radial multifiber, which would be helpful for readers to understand the filtration system.

Response: We greatly appreciate your comment. The treatment capacity of this RMF process is not calculated as the capacity of the filter tank (3,312 ton/day)

To find out the capacity of the process, filtration area of 1.0 m2 with linear velocity (20m/hr) can be calculated as 20 m3/hr and converted in daily capacity (24 hours).

The filtration area of the RMF can be based on the internal filtration area. The designed filtration area of 1.00m^2 can be calculated and shown as below.

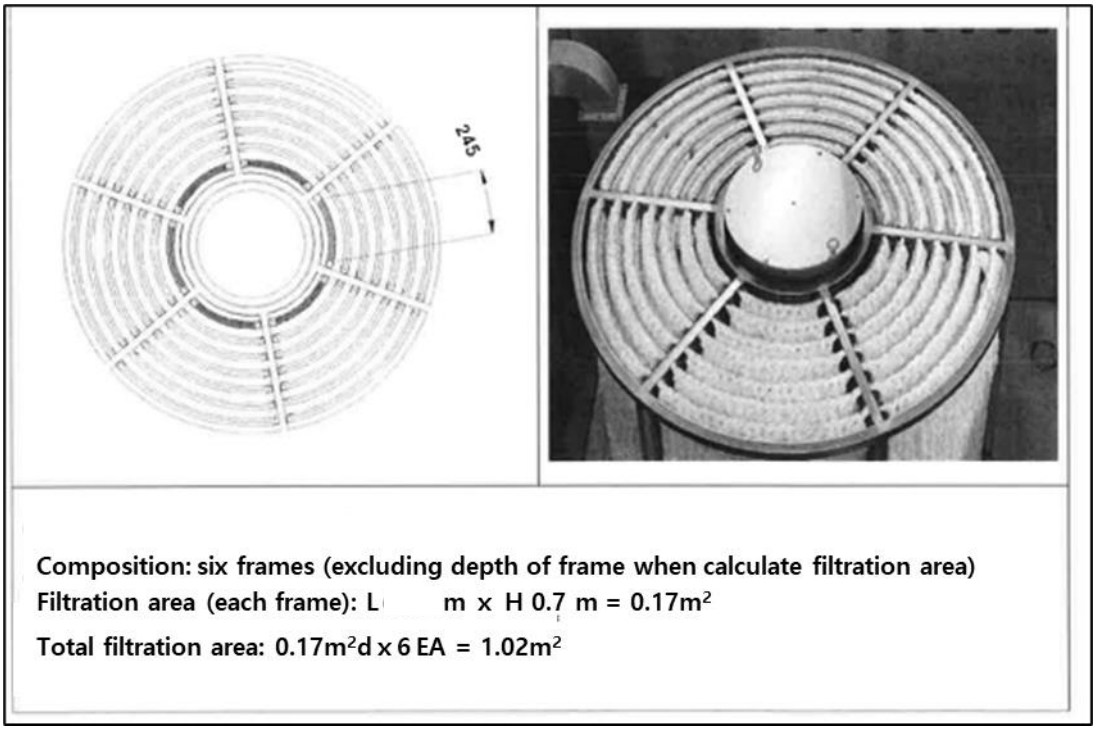


Figure 2: Figure 2a should include the scales. What does Media filter no. mean in Figure 2c ? Why they have different contact angles?

Response: Thank you for your invaluable comment. I understand that scale bar in figure 2 is very small, the scale is 200 ㎛, 10 ㎛ um from left to right. The scale bar will be getting bigger throughout entire manuscript. As shown in Figure 2, fiber media filter consists of thin and countless strands. Furthermore, five random strands were used to find out find out uniformity of the water contact angle more than seven times.

Figure 3: Rainy weather samplings were performed after 30 minutes of an initial 3 hours rainy period. How dry weather samplings was done?

Response: Thank you for your invaluable comment. Sampling in dry weather was performed during every 30 minutes of operation process and samplings were more than 300 times. Also we have confirmed that how the influent concentration of pollutant has changed in different weather condition.

Figure 4: The data was obtained for rainy weather sampling or dry weather sampling?

Response: Thank you for your invaluable comment. The data in Figure 4 was obtained for dry weather sampling.

Figure 5: After and Before was opposite.

Response: Thank you for your invaluable comment. Figure 5 was revised in the manuscript.

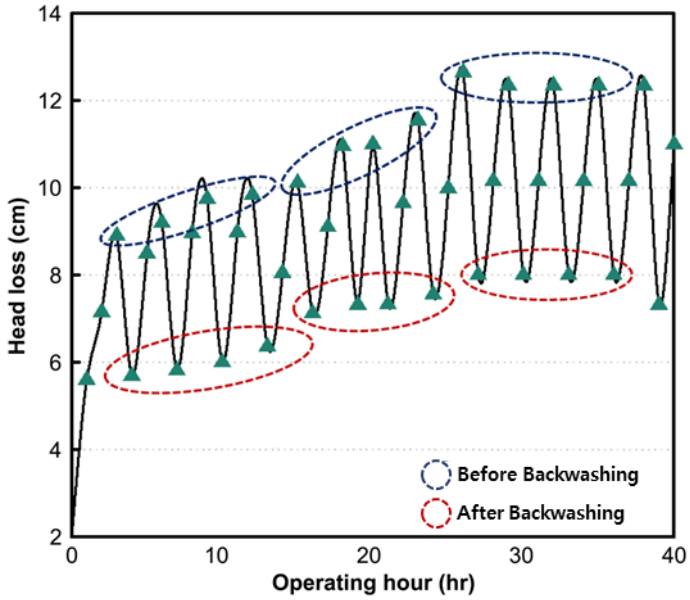


Figure 6: It would be better to explain what kind of chemical treatment for the first drop and recovery at 8-9 hours.

Response: Thank you for your comment. I understand that the range of change in head loss at 8-9 operating hours was quite high. However, no chemical cleaning agent was used in the section you suggested. It seems to be mechanical issues in the filtration tank.

Line 314: The removal efficiencies 313 of SS, TOC and BOD5 in rainy weather are 87.4%, 42.8%

and 48.5% while 89.6% for SS, 314 45.3% for and 58.4% for BOD5 respectively.

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while 89.6% for SS, 45.3% for and 58.4% for BOD5 in rainy weather

Response: Thank you for your correction. The according sentence has been modified in the revised manuscript as follows:

Lines 310-312: The removal efficiencies of SS, TOC and BOD5 in dry weather are 87.4%, 42.8% and

48.5% while 89.6% for SS, 45.3% for and 58.4% for BOD5 in rainy weather respectively