

Response to Reviewer 1 Comments

Please note that the reviewer's comments are shown in **bold** type and the author's responses are in plain text.

Comments and Suggestions for Authors

The paper is relatively well written and the idea of using a venturi injector is interesting. However, there are several issues to be addressed:

1. the abstract and the introduction is lengthy. the introduction on venturi device may not be necessary as it is basic engineering knowledge.

Both the abstract and the introduction have been significantly shortened. The section on Venturi has also been shortened. However, it would be useful to give some of the relevant literature so that readers can understand the venturi effect more easily and see some of the advantages of using the venturi device.

2. line 370, the authors mentioned the leakage of the reactor, and later fixed the problem. Why not start over the experiment with the sealed reactor again, instead of reporting the possibly flawed data?

Since the reactor, which was produced with rough workmanship, was used in the study, ideal reactor conditions could not be achieved. It has been observed that air leakage into the reactor can occur even through the tiny holes in the welding parts. Again, even the insulation material used in the reactor covers wears out after being used for a while and causes air leakage into the reactor. Therefore, a certain amount of oxygen leaked into the reactor under the influence of the applied vacuum. It is possible to overcome these problems only with quality materials and precision workmanship (for example, parts can be produced by a CNC machine for better compatibility). However, since such problems could not be foreseen beforehand and the budget was limited, such a quality reactor could not be produced in the study. Therefore, the results are given as they are.

3. line 390, 'Negative ORP values 390 between 430 and 450 mV were observed when nitrate removal was well achieved', Figure 7 shows large variations, where do the authors isolate such a small gap on the figure?

These values were reported based on observations in the laboratory rather than Figure 7. However, when Figures 5 and 7 were evaluated again, the values given were modified to 250–500 mV in the manuscript.

4. Figure 9, please explain the data where spikes can be observed, e.g. around day 170? and the slow increase in TMP after that.

It is normal to see small zigzags in the TMP graph since the membrane filtration is performed in the filtration-relaxation mode of 10 min on/1 min off. This indicates some clearing of the membrane during the relaxation period. However, if sufficient flux cannot be obtained from the membrane, the membrane must be chemically cleaned. This situation manifests itself in the form of a vertical decrease to zero on the TMP graph. Therefore, places with vertical drops on the TMP graph indicate chemical washing.

5. line 449, have the authors measured the velocity of liquid and gas flow of the two different setup? Please provide the comparison.

We did not numerically measure the velocity of the current exiting the diffuser ports. However, when the activated sludge is circulated with a peristaltic pump, it is possible to observe that the velocity of the flow coming out of the diffuser ports is very small compared to the velocity of the jet flow when the venturi is used, even without measuring the velocity.

6. line 492, only the data on 170th day was mentioned while the data in other days were not as good. One can see significant fluctuation of data, the optimal value is not representative.

The aim here is not to emphasize the high treatment efficiency. As a matter of fact, it is clearly seen from Figure 5 that the output quality decreases in the next few measurements. What is meant here is that hydrogen gas was not a limiting factor in the treatment process. If the hydrogen gas was a limiting factor in the process, then the treatment efficiency could not be high.

On the contrary, since the hydrogen gas was given in excess, it was measured high in the output gas, which indicated that the hydrogen gas utilization efficiency should be increased.

7. overall, the reactor design is worth studying, while the advantage of the venturi device is not convincingly or comprehensively demonstrated. More detailed works may be carried out in the future work.

I think it would suffice to look at Figure 10 to understand the effect of venturi integration on membrane fouling in the MBR. Figure 10 shows that TMP rises to 160 mbar within minutes when the venturi is not used. In this configuration, where no venturi is used, it was not necessary to continue these experiments for a longer period of time since the membrane was fouled very quickly.

Again, although the measurements were not direct, it was seen that the hydrogen gas utilization efficiency increased to approximately 96% as a result of the venturi integration into the MBR.

Of course, it is acceptable that there are some shortcomings in the study.

Firstly, the lack of a control experiment in which hydrogen gas was given with the help of a diffuser instead of a venturi can be seen as one of the shortcomings of this study. However, this does not detract from the value of the study, because there are already many studies in the literature that show the use of a venturi instead of a diffuser significantly increases gas transfer.

Secondly, the absence of a control experiment on the effect of circulating the upper gas phase with the help of a blower on membrane fouling can be seen as another deficiency in this study. However, in a previous study (Kayaalp and Ozturkmen, 2016; <https://doi.org/10.2166/wst.2016.194>) in an aerobic reactor, it was shown that the use of venturi reduces membrane fouling compared to the use of a diffuser.

Despite all the shortcomings in the study, I think that the proposed system is at least worth developing, since it provides hydrogen gas utilization efficiency of up to 96% and delays membrane fouling. In the future, it will be possible to reach more convincing findings with the integration of venturi and MBR by using a better manufactured reactor setup and better planned experimental studies.