

SUMMARY

Combination of anaerobic membrane reactors (AnMBRs) and microalgae membrane photobioreactor (MPBR) appears as an ideal option within the framework of sustainable technologies for wastewater treatment. This combination enables to produce biogas from the organic matter present in wastewater, while the nutrient content of the AnMBR effluent can be recovered from microalgae biomass. In addition, membrane technology allows obtaining a water effluent which can be suitable for reclamation.

Previous studies have proved the capability of a microalgae culture to recover the nutrients present in AnMBR effluent at lab scale. However, up-scaling from controlled lab conditions to varying outdoor conditions could limit the industrial applications of this technology.

This study consists of the assessment of a microalgae culture in an MPBR pilot plant fed by effluent of an AnMBR system. For this, optimal operating conditions of the MPBR plant were evaluated, considering both the microalgae biological process and the membrane fouling rate. The effect of other parameters that have an influence on the process such as light intensity applied to the photobioreactors (PBRs), temperature, organic matter concentration, presence of other organisms, etc., was also studied; as well as the specific weight of each parameter on the process. Another goal consisted of finding new controlling parameters that ease the continuous operation of the system.

The MPBR system used in this study showed appeared to be capable of treating AnMBR effluent, successfully accomplishing legal discharge limits. However, this was only achieved when the following conditions were reached:

- i) PBR light path was as narrow as 10 cm.
- ii) Operating conditions (BRT and HRT) were in the appropriate range.
- iii) Temperature was under the maximum limit of around 30°C.
- iv) Nitrite was not accumulated.
- v) Ammonium was the main nitrogen source.
- vi) Organic matter concentration in the culture was not high.