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A Brief Report on Analysis of Wastewater Treatment Facilities

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Introduction

Although WWTP energy reductions have been the subject of recent research, there is currently a lack of published information regarding their operating costs. Process optimization takes precedence over cost reduction. In order to fully comprehend the nutrient removal, polishing treatments, and operational costs of nature-based wastewater treatment solutions, studies have demonstrated the need for additional research. Even though there are a lot of chemical and biological ways to get rid of nutrients, these methods often cost a lot to run and invest, which hurts profit margins. In order to determine the most efficient way to manage WWTPs, studies that compare the operating costs of various wastewater technologies are necessary.

Description

The process of treating wastewater uses a lot of resources, most of which are electricity, and it costs between 15% and 40% more to run than conventional wastewater treatment facilities. Due to the anticipated demographic growth and the tightening trend in quality criteria for effluent disposal, the energy consumption tends to rise further if processes are not modified. The literature compiles data on the energy consumption of various wastewater treatment systems in an effort to map the processes and aid in decision-making when looking for more efficient options. One of these options is to extract energy from sewage. The hybrid treatment system, which simultaneously treats wastewater and generates electricity, is a global trend. The energy viability of anaerobic-aerobic systems that include the production of algae has been demonstrated by recent Brazilian research. In an effort to better comprehend and manage the processes, this study compares the energy consumption of several wastewater treatment facilities. The findings revealed that there are few published statistics from Brazil, indicating that the country still requires additional research to improve its procedures. The aerobic process is found to be the primary energy consumer in the majority of studies on wastewater treatment. The traditional system is the primary focus of efforts, which have so far met with little success. Plans for water supply and environmental goals are not well integrated with energy management, resulting in wasteful use and negative effects on the economy and the environment [1-3].

New technologies based on microalgae that use one or more microalgae species or collaborate with bacteria that have been colonized in photo bioreactors (PBRs) have recently emerged for the treatment and reuse of wastewater. PBRs include things like tanks, channels, and reactors in lagoons or ponds. Especially for a microalga of 1:5: microalgae consortiums are better at removing organics, nitrogen, and phosphorous through biodegradation, assimilation, and plant uptake than bacteria alone because they require less energy. Additionally, these technologies make it possible to produce products with added value from biomass in the context of CEBMs. Algae-based wastewater treatment technologies, such as high-rate algal pond systems, which can effectively remove organics and nutrients from wastewater and produce algae biomass that could be valued, are attracting more and more attention. There are few studies on HRAP operational costs and comparisons to traditional systems, especially in terms of population equivalent and treated wastewater quantities. HRAPs are shallow ponds with low-power paddle wheels that circulate wastewater to produce high algal biomass and swift nutrient removal, in contrast to typical pond systems. However, because a larger surface is required for a given effluent flow, a shallow depth operation reduces the overall volume of the pond but also increases operating costs [4,5].

Conclusion

According to the findings of the study, HRAP-based solutions might be a promising alternative technology for wastewater treatment, particularly for small settlements. By valorizing algal biomass, they can reduce energy costs by 0.05-0.41 EUR/m^3, 15.4 EUR/person, and 180.8 EUR/person, in addition to being efficient at removing pollutants. In addition, this method not only provides financial benefits but also reduces carbon emissions by saving approximately 45 kg CO_2 equivalent per person per year. This suggests that biotechnology is beginning to emerge as an important option for the wastewater treatment industry in the future.

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Conflict of Interest

The authors declare that there is no conflict of interest associated with this manuscript.

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