

Current Overview of Polyethylene Terephthalate as Biofilm Media in Communal Wastewater Treatment Plants in Indonesia

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Currently, there are two types of community-based (Sanimas) wastewater treatment plants (WWTPs) being developed in Indonesia, namely Anaerobic Baffled Reactor (ABR) and Anaerobic Filter Reactor (AFR). Polyethylene terephthalate (PET) from bottle waste has been used as biofilm media for AFR. The AFR consists of vertical PET-bottle beds, which act as support for biomass. The aim of this study was to overview the effectiveness of PET in organic and nutrient removals in communal WWTPs in Bandung, Indonesia. Raw wastewater samples were taken from eight WWTPs; four ABR (W1-W4) and four AFR (W5-W8), which were located at Kelurahan Neglasari–Kecamatan Cibeunying Kaler, Kelurahan Maleer–Kecamatan Batununggal, Kelurahan Binong–Kecamatan Batununggal, and Kelurahan Sukabungah–Kecamatan Sukajadi. The sites were in low-income communities (Masyarakat Berpenghasilan Rendah, MBR) and densely populated environments (more than 159 people/hectare).

The results show that AFR using PET as support media performed better than ABR. TSS, COD, BOD, and ammonia removal efficiencies of ABR were 29.14%–61.16%, 12.04%–58.99%, 37.52%–78.22%, and 1.39%–20.21%, respectively, while AFR were 49%–81.89%, 42.74%–86.11%, 69.19%–87.20%, and 20.72%–25.58%, respectively. PET has the desired properties as a biofilm media: inert, not easily degraded biologically, easily formed, rust-resistant, lightweight, and enable attachment of microorganisms in large numbers with a small risk of deadlock.

Although the AFR effluent still did not meet the quality standards of the Indonesian Minister of Environment and Forestry Regulation (PermenLHK) No. 68 of 2016, however, the addition of PET media had been able to improve the treated water quality. In general, there is still a need to add an aerobic unit process to the current process, especially for ammonia treatment. Ammonia removal efficiency is still low because all WWTPs do not have aerobic units, so it is necessary to add an aerobic unit.

As pointed out above, different types of ABR and AFR were investigated briefly. The results of this study show that PET is a potential biofilm media for WWTPs. Ultimately, the addition of an aerobic unit or a combination of anaerobic-aerobic with PET media is required to obtain a greater removal than the current condition. Further research and further developments on the applied systems are necessary to overcome challenges on communal WWTPs.

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