

INTISARI

Bulaksumur *Residence* (BR) merupakan salah satu dari 8 asrama mahasiswa yang dikelola oleh UGM *Residence* dengan jumlah penghuni 336 orang. Kondisi aktual yang ada, saluran air limbah di BR, yaitu *blackwater* dan *greywater* terpisah. *Blackwater* mengalir pada saluran khusus dan diolah pada *septic tank*, sedangkan *greywater* tidak diolah melainkan langsung dibuang ke drainase, kemudian diteruskan ke sistem drainase kota. *Greywater* yang tidak diolah akan berpotensi mencemari lingkungan dan jika diolah dengan tepat, *greywater* dapat menjadi sumber potensial air daur ulang untuk penyiraman tanaman.

Maka dari itu, dilakukan penelitian mengenai perancangan, pembangunan, dan evaluasi instalasi pengolahan air limbah (IPAL) dengan target efluen aman untuk dibuang ke lingkungan dan air efluen didaur ulang untuk dimanfaatkan sebagai penyiraman tanaman. IPAL dibangun menggunakan kombinasi antara *intermittent aeration* dan penggunaan *microbubble generator* (MBG) sebagai aerator. Evaluasi dilakukan dengan mengamati kinerja IPAL selama 82 hari. Parameter yang diamati adalah beban influen dan *removal* COD, TSS, NH₃-N terhadap hasil desain, serta pemenuhan konsentrasi efluen terhadap baku mutu air limbah Permen LHK No.68/2016 dan baku mutu air kelas IV PP No.82/2001.

Hasil perancangan, yaitu IPAL dengan debit desain 8,06 m³/hari terdiri dari proses ekualisasi, aerasi, *secondary clarifier*, dan resirkulasi. Unit IPAL dibangun menggunakan tangki air HDPE dengan kapasitas 1.050 l serta proses pembangunan IPAL dilakukan selama 14 hari. Hasil *start-up* IPAL dengan *on-off* aerasi 15 menit : 15 menit menunjukkan debit aktual yang masuk ke IPAL sebesar 0,54±0,37 m³/hari dimana debit tersebut lebih rendah dari desainnya karena *start-up* IPAL dilakukan saat pandemi Covid-19 sehingga penghuni yang menetap sedikit. *Removal efficiency* COD, TSS dan NH₃-N masing-masing sebesar 78,6±10,3%, 60,6±22,5%, dan 80,3±12,6%, dimana kinerja tersebut memenuhi target desainnya. Efluen dari IPAL juga terbukti aman baik dibuang ke lingkungan maupun dimanfaatkan untuk penyiraman tanaman yang ditunjukkan dari konsentrasi efluen untuk parameter COD, TSS, dan NH₃-N selalu memenuhi kedua baku mutu.

Kata kunci: IPAL, *greywater*, *intermittent aeration*, *microbubble generator* (MBG)

ABSTRACT

Bulaksumur Residence (BR) is one of 8 student dormitories managed by UGM Residence with a total of 336 residents. The actual condition is that the sewerage in BR, namely blackwater and greywater is separate. Blackwater flows in a special channel and is treated in a septic tank, while greywater is not treated but is directly discharged into the drainage, then forwarded to the city drainage system. Greywater that is not treated has the potential to pollute the environment and if properly treated, it can be a potential source of recycled water for watering plants.

Therefore, research was conducted on the design, construction, and evaluation of wastewater treatment plants (WWTP) with the target of safe effluent being discharged into the environment and effluent water being recycled to be used as watering plants. The WWTP was built using a combination of intermittent aeration and the use of a microbubble generator (MBG) as an aerator. The evaluation was carried out by observing the performance of the WWTP for 82 days. The parameters observed were the loading influent and removal of COD, TSS, NH₃-N on the design results, as well as the fulfillment of the effluent concentration to the wastewater quality standard of Minister of Environment and Forestry Regulation No.68/2016 and class IV water quality standard PP No.82/2001.

The results of the design, WWTP with a design discharge of 8.06 m³/day consisting of equalization, aeration, secondary clarifier, and recirculation processes. The WWTP unit was built using HDPE water tanks with a capacity of 1,050 L and the WWTP construction process was carried out for 14 days. The results of the start-up of the WWTP with on-off aeration 15 min : 15 min show the actual discharge entering the WWTP of 0.54±0.37 m³/day where the discharge is lower than the design because the start-up of the WWTP was carried out during the Covid-19 pandemic, so that the residents who stay are few. The removal efficiency of COD, TSS and NH₃-N were 78.6±10.3%, 60.6±22.5%, and 80.3±12.6%, respectively, where the performance met the design target. Effluent from WWTP has also been proven safe, whether discharged into the environment or used for watering plants, as indicated by the concentration of effluent for parameters COD, TSS, and NH₃-N which always meets both quality standards.

Keywords: WWTPs, greywater, intermittent aeration, microbubble generator (MBG)