

Pengaruh debit influen terhadap karakteristik hidrodinamika kolam fakultatif Bojongsoang: tanpa pengaruh angin

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Abstrak

Telah dilaporkan bahwa kinerja pengolahan di kolam fakultatif di Instalasi Pengolahan Air Kotor (IPAK) Bojongsoang adalah tidak stabil. Salah satu penyebabnya adalah karakteristik hidrodinamika yang tidak sesuai dengan criteria. Yang termasuk dalam karakteristik hidrodinamika yang tidak tepat antara lain kehadiran daerah mati, aliran pendek, dan turbulensi oleh arus eddy. Penelitian ini bertujuan untuk menganalisa pengaruh variasi debit influen terhadap karakteristik hidrodinamika menggunakan model matematis. Model hidrodinamika dua dimensi dibangun dari dua persamaan hidrodinamika, yaitu persamaan kontinuitas dan persamaan momentum. Kedua persamaan diselesaikan dengan metoda numerik beda hingga semi implisit (Crank-Nicolson). Dari hasil simulasi, dianalisa nilai bilangan Froude aliran serta waktu tinggal efektif dan luas efektif kolam fakultatif untuk melihat kehadiran daerah mati.

Hasil simulasi menunjukkan bahwa daerah mati terdapat di tengah kolam. Apabila debit influen semakin besar, waktu tinggal efektif dan luas efektif semakin besar. Selain itu, distribusi nilai bilangan Froude menunjukkan bahwa nilai 10-10 semakin berkurang bila debit influen semakin besar. Dapat dikatakan bahwa daerah mati akan berkurang pada debit influen yang lebih besar. Dengan demikian debit influen yang semakin besar akan memperbaiki karakteristik hidrodinamika di kolam fakultatif.

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The Effects of Influent Debit on Hydrodynamic Characteristic of Bojongsoang Facultative Pond: Without Wind Effects. The performance of facultative pond in Bojongsoang WWTP have reported to be unstable. One of the cause of the unstable performance is the hydrodynamic characteristics that not met the criterion. The improper hydrodynamic characteristics are included the existence of dead-zone, the short-circuiting, and the turbulence due to eddy current. The study was to analyze the effect of the influent debit variation on the hydrodynamic characteristics of the pond using mathematical model. The two-dimensional hydrodynamic model was built from two hydrodynamic equations which are continuity and momentum equations. The equations were solved by finite-difference numerical method of semi-implicit (Crank-Nicolson).

From the simulation results, the Froude number of the water flow was analyzed. Beside that, the effective residence time and the effective area were calculated. All of them were done to analyzed the existence of the dead-zone in the pond. The simulation results show that the dead-zone was exist in the center of the pond. when the influent debit was larger, the effective residence time and the effective area become larger. The distribution of the Froude number value shows that the area with the value of 10-10 become reduced in the larger influent debit. The existence of the dead-zone was reduced since the influent debit become larger. It can be said that the larger influent debit can improve the hydrodynamic characteristics of the pond.