

## Analisis pengaruh penambahan enzim selulase dalam resirkulasi air lindi terhadap karakteristik air lindi dalam bioreaktor landfill = Effect of cellulase addition in leachate recirculation for leachate qualities using bioreaktor landfill method

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### Abstrak

Material lignoselulosa yang mengandung tiga komponen utama, yaitu selulosa, hemiselulosa, dan lignin, diketahui sulit untuk didegradasi melalui proses biologis. Selulase telah terbukti mengkatalis degradasi selulosa dengan menggunakan hidrolisis enzimatik. Namun, penambahan selulosa diperkirakan bisa mempengaruhi kualitas air lindi yang dihasilkan. Tujuan dari penelitian ini adalah menganalisis efek penambahan enzim terhadap kualitas air lindi. Dua 1,5 meter bioreaktor disediakan untuk dua perlakuan, yaitu 1 resirkulasi air lindi dengan penambahan enzim, 2 hanya resirkulasi air lindi sebagai kontrol. Penambahan enzim selulase sebanyak  $15 \times 10^6$  U/ton menghasilkan konsentrasi COD lebih rendah 29,100 mg/L dengan penambahan enzim dan 31,900 mg/L pada kontrol, TS 17,800 mg/L dan 22,100 mg/L, TDS 15,900 mg/L and 19,800 mg/L. Hal ini mungkin disebabkan oleh percepatan hidrolisis menggunakan proses enzimatik. Namun, nilai BOD lebih tinggi ketika penambahan enzim dilakukan 16,100 mg/L dan 11,600 mg/L disebabkan karena penambahan enzim mendorong pembentukan glukosa, sehingga meningkatkan nilai BOD. Nilai pH meningkat seiring waktu menuju netral, mengindikasikan landfill telah menuju fase metanogenik. Dari penelitian ini, bisa disimpulkan bahwa penambahan enzim pada landfill mempunyai dampak pada kualitas air lindi yang dihasilkan.

*Lignocellulose material which consist of three main component, including cellulose, hemicellulose, and lignin, was known hard to degrade using biological process. Cellulase has proven to catalyze the degradation of cellulose by enzymatic hydrolysis. However, the addition of enzyme might affect leachate qualities that was emitted from landfill. The aim of this research is to analyse the effect of cellulase addition on leachate qualities. Two 1.5 m height bioreactors was provided for two different treatment including 1 leachate recirculation with cellulase addition 2 leachate recirculation only as control. The addition of cellulase at  $15 \times 10^6$  U tonne was resulting lower concentration for COD 29,100 mg L in cellulase addition and 31,900 mg L in control, TS 17,800 mg L and 22,100 mg L, respectively, TDS 15,900 mg L and 19,800 mg L, respectively. This was likely caused by acceleration of hydrolysis using enzymatic process. However, BOD value higher when cellulase addition was conducted 16,100 and 11,600 mg L, respectively because the addition of cellulase was supported formation of glucose, therefore escalate BOD value. pH value was increasing over time towards neutral, indicates landfill has been headed toward methanogenic phase. From the experiment, it can be concluded that addition of cellulase has impacts towards leachate qualities.*