

No. TA 903/S1-TL/0122-P

**VARIASI KONFIGURASI REAKTOR *UP-FLOW ANAEROBIC*  
*SLUDGE BLANKET* (UASB) TERHADAP KINERJA  
PENYISIHAN NITROGEN PADA PROSES ANAMMOX  
DENGAN MEDIA LEKAT AMPAS TEBU**

**TUGAS AKHIR**



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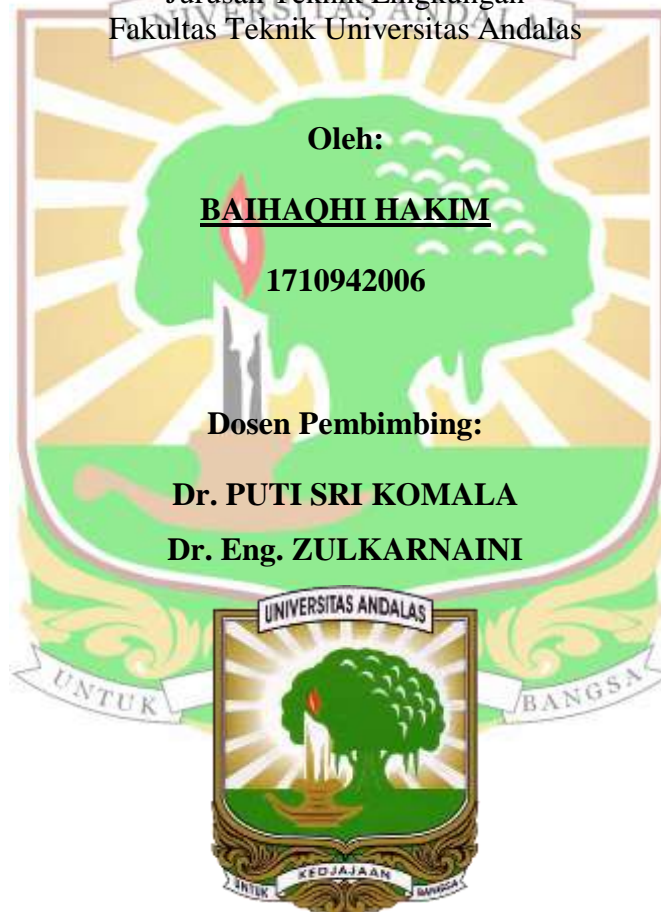
**JURUSAN TEKNIK LINGKUNGAN  
FAKULTAS TEKNIK - UNIVERSITAS ANDALAS  
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Sebagai salah satu syarat untuk menyelesaikan  
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## ABSTRAK

Penelitian ini bertujuan untuk menganalisis variasi konfigurasi reaktor reaktor up-flow anaerobic sludge blanket (UASB) terhadap kinerja penyisihan nitrogen pada proses anammox dengan media lekat ampas tebu. Percobaan dilakukan dengan tiga reaktor UASB yang dioperasikan kontinu pada suhu ambien. Reaktor pertama diisi ampas tebu, reaktor kedua diisi bakteri anammox dan ampas tebu, dan reaktor ketiga diisi bakteri anammox tanpa media lekat. Reaktor dioperasikan selama 47 hari secara kontinu dengan konsentrasi amonium dan nitrit masing-masing  $\pm 150$  mg-N/L dengan hydraulic retention time (HRT) 6 jam. Pengujian konsentrasi amonium, nitrit dan nitrat dengan metode spektrofotometri dan chemical oxygen demand (COD) dengan metode titrimetri. Analisis penyisihan nitrogen dilakukan berdasarkan perhitungan nitrogen loading rate (NLR), nitrogen removal rate (NRR), ammonium conversion efficiency (ACE), dan nitrogen removal efficiency (NRE). Kinerja penyisihan nitrogen dengan parameter NRR, ACE dan NRE pada NLR  $1,32 \text{ kg-N/m}^3 \cdot \text{h}$  yaitu pada Reaktor pertama berturut-turut  $0,151 \text{ kg-N/m}^3 \cdot \text{h}$ ; 13,27%, dan 11,44%, reaktor kedua  $0,599 \text{ kg-N/m}^3 \cdot \text{h}$ , 53,04%, dan 45,26%, reaktor ketiga  $0,528 \text{ kg-N/m}^3 \cdot \text{h}$ , 50,24% dan 39,90%. Penggunaan ampas tebu meningkatkan penyisihan nitrogen dengan distribusi proses anammox pada permukaan media ampas tebu. Rasio COD:NO<sub>2</sub><sup>-</sup>-N pada rentang 0,11-0,53 yang menunjukkan tidak terjadinya inhibisi proses anammox.

**Kata kunci:** Ammonium conversion efficiency, ampas tebu, anammox, nitrogen removal rate, up-flow anaerobic sludge blanket



## ABSTRACT

*This study aimed to analyze variations in the configuration of the up-flow anaerobic sludge blanket (UASB) reactor on the performance of nitrogen removal in the anammox process with sugarcane bagasse as carrier. Experiments were carried out with three UASB reactors which were operated continuously at ambient temperature. The first reactor was filled with sugarcane bagasse, the second reactor was filled with anammox bacteria and sugarcane bagasse, and the third reactor was filled with anammox bacteria without carrier. The reactor was operated continuously for 47 days with ammonium and nitrite concentrations of  $\pm 150$  mg-N/L with 6 hours hydraulic retention time (HRT). Concentration of ammonium, nitrite and nitrate were analyzed using spectrophotometric method and chemical oxygen demand (COD) by titrimetric method. Nitrogen removal analysis was carried out based on the calculation of nitrogen loading rate (NLR), nitrogen removal rate (NRR), ammonium conversion efficiency (ACE), and nitrogen removal efficiency (NRE). Nitrogen removal performance with parameters NRR, ACE and NRE at NLR  $1.32 \text{ kg-N/m}^3 \cdot \text{h}$ , in Reactor 1, Reactor 2 and Reactor 3 were  $0.151 \text{ kg-N/m}^3 \cdot \text{h}$ , 13.27%, and 11.44%;  $0.599 \text{ kg-N/m}^3 \cdot \text{h}$ , 53.04%, and 45.26%;  $0.528 \text{ kg-N/m}^3 \cdot \text{h}$ , 50.24% and 39,90%, respectively. The used of sugarcane bagasse increases nitrogen removal by distributing the anammox process on the surface of the carrier. The ratio of  $\text{COD}:\text{NO}_2^- \text{-N}$  in the range 0.11-0.53 which indicates no inhibition of the anammox process.*

*Keywords: Ammonium conversion efficiency, sugarcane bagasse, anammox, nitrogen removal rate, up-flow anaerobic sludge blanket*

