

INTERMITTEN AERATION INFLUENCE IN AEROBIC GRANULAR FORMATION USING AIRLIFT REACTOR WITH CONTINOUS FLOW SYSTEM

Andik Yulianto^{a,*}, Astrid Tiara Bening^c, Prayatni Soewondo^b, Marisa Handajani^b, Herto Dwi Ariesyady^b ^a Department of Environmental Engineering, Universitas Islam Indonesia, Yogyakarta ^bDepartment of Environmental Engineering, Institut Teknologi Bandung, Indonesia ^cGraduate Students, Department of Environmental Engineering, Institut Teknologi Bandung, Indonesia * Corresponding author: andik.yulianto@uii.ac.id

Abstract

Domestic wastewater treatment using aerobic granular biomass in a continuous flow reactor is often considered to perform worse than when using SBR. Therefore it is necessary to improve both the operating mode of the reactor design and the operation mode. The purpose of this study is to examine the effect of cintermittent aeration on granular aerobic formation and its performance in treating wastewater with an artificial substrate. Reaserach carried out with providing intermitten aeration variation (3 liters/minute; 2,55 cm/s) in periods of 2, 3, and 4 hours (HRT 6 hours; OLR 2.5 kg COD/m³.day; CH₃COONa as a carbon source) in an Airlift reactor with continuous flow system (H/D 12.5 outside and 20 internal parts). As a result aerobic granular formation was better after giving intermitten aeration variation in the 4 hour period, which biomass was relatively more stable and compact. The aerobic granular characteristics were 85 - 88 mL/g; 32.95 cm/min; 1.87 mm and 0.67 of SVI value, setlling veolicty, diameter and aspect ratio respectively. Removal efficiency of organic, ammonium and nitrate obtained from the variation were the highest among another two variations, which were 58.35%; 26.56%; 25.75% for organic, ammonium and nitrate. The kinetic models used to evaluate the performance of microorganisms were Monod, Contois model, Grau second-order and Stover-Kincannon kinetics models was tested. the second-order Grau kinetics model was more suitable for tracing substrate used by biomass in the intermitten aeration variation, Keywords: airlift reactor, Aerobic Granular Biomass, intermittent aeration



variation	V _s (m/s)	SVI ₃₀ (g/mL)	Dia. (mm)
Continuous	8,4	86,2	1,03
SBR	26,66	58	3
Intermit1	23,2	63	2,25
Intermit2	23,3	61	2,42
Intermit3	23,4	60	2,24





The 4th International Joint Meeting of Advanced Global Program (AGP) in Conjunction with Gifu University 70th Anniversary

August 5, 2019

Letter of Invitation

Dear (Dr. Candidate) Andik Yulianto,

On behalf of the organizing committee, I would like to invite you as an Oral Speaker at the 4th International Joint Meeting of Advanced Global Program (AGP) to be held at Gifu on October 9-10, 2019. This meeting is a satellite meeting in conjunction with Gifu University 70th Anniversary Symposium (to be scheduled on Oct. 7-8, 2019).

Local accommodation during your stay will be covered by the Graduate School of Engineering, Gifu University; the address of the accommodation is:

Comfort Hotel Gifu 6-6 Yoshino-cho, Gifu City 500-8844 JAPAN Tel: +81-58-267-1311 Fax: +81-58-267-1312

You will be informed of the presentation details once the program is finalized. We sincerely hope that you would be able to accept our invitation. Please do not hesitate to contact us for any further assistance you may need.

Sincerely,

欠米输二

Prof. Dr. Tetsuji KUME

Chairperson

The 4th International Joint Meeting of Advanced Global Program (AGP) 2019 Graduate School of Engineering, Gifu University, 1-1 Yanagido, Gifu 501-1193, JAPAN

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<u>Andik Yulianto^{*1}</u>, Astrid Tiara Bening², Prayatni Soewondo³, Marisa Handajani³, Herto Dwi Ariesyady³

¹Department of Environmental Engineering, Universitas Islam Indonesia, Yogyakarta ²Master Study Program, Department of Environmental Engineering,, Institut Teknologi Bandung ³Department of Environmental Engineering, Institut Teknologi Bandung

The paradigm shift in waste management is carried out to obtain additional benefits from treated wastewater. By using the right processing method, waste water can be converted into resources. The use of aerobic granular biomass (BGA) can be used for this purpose, especially processing nutrients in wastewater. So far, the use of BGA for processing nutrients is mostly based on the Sequencing Batch Reactor (SBR). Research in the use of SBR Reactors for BGA shows satisfactory performance both in its formation and utilization. SBR reactors with BGA have also been applied at full scale. This study aims to analyze the possibility of BGA formation using a continuous reactor based on Biological Airlift Reactor (BAR) with intermittent aeration. Intermittent aeration variation (3 liters/minute; 2,55 cm/s) in periods of 2, 3, and 4 hours (HRT 6 hours; OLR 2.5 kg COD/m³.day; CH₃COONa as a carbon source) in an Airlift reactor with continuous flow system (H/D 12.5 outside and 20 internal parts). The condition of aerobic formation was better after giving intermittent aeration variation in the 4 hour period by using pairwise comparison method. This was because there were 3 aeration patterns per day and 3 patterns without aeration per day, the pattern was relatively fewer than the other two variations, so the biomass was relatively more stable and compact. The biogranular characteristics were 85 - 88 mL/g; 32.95 cm/min; 13.28 g/L; 1.87 mm and 0.67 of SVI value, settling velocity, density, diameter and aspect ratio respectively. Removal efficiency of organic, ammonium and nitrate obtained from the variation were the highest among another two variations, which were 58.35%; 26.56%; 25.75% for organic, ammonium and nitrate respectively. The kinetic models used to evaluate the performance of microorganisms were Monod and Contois model, with parameters Y, Kd, µmaks Monod, Ks, µmax Contois and β. Both kinetic models were less precise in evaluating substrate used by biomass so that the use of second-order Grau and Stover-Kincannon kinetics models was tested. Between two kinetic models, the second-order Grau kinetics model was more suitable for tracing substrate used by biomass in the intermittent aeration variation, with relatively small error compared to the other three models ($\varepsilon = \pm 0.001$ - 0.004 g / L), the confidence index of 65.10%.

Keywords: Airlift reactor, biogranular, continuous, kinetics model, intermittent aeration

Biography of the presenting author:

Andik Yulianto, MT Department of Environmental Engineering, Universitas Islam Indonesia, Yogyakarta E-mail: andik.yulianto@uii.ac.id



Certificate

This is to certify that

Mr. Andik Yulianto

has participated as POSTER PRESENTER

in the

The 4th International Joint Meeting of Advanced Global Program (AGP)

> held on October 9th -10th, 2019 at Gifu University, JAPAN

Organized by Globalization Promotion Office Faculty and Graduate School of Engineering Gifu University, JAPAN

久米佩二

Prof. Dr. Tetsuji Kume Head, Globalization Promotion Office (GPO)

1 岐大工第 17-107 号 令和元 年 9 月 26 日

インドネシア・イスラム大学 講師 Andik Yulianto 殿



出張依頼について(依頼)

このことについて、貴殿に下記のとおり用務をお願いしたいと思います。御多用中とは思いますが、御承諾くださるようお願いいたします。

なお、御承諾の際は、お手数ですが別添の承諾書を御返送くださるよう、併せてお願いいたします。

記

- 1.日 程 自 令和1年10月8日(火)
 至 令和1年10月12日(土)
- 2.内 容 研究打合せと協定大学招聘国際シンポジウムへの参加
- 3.用務先 岐阜大学工学部

岐阜市柳戸1-1

4.費 用 国内旅費·宿泊費·日当当方負担

書類返送先:〒501-1193 岐阜県岐阜市柳戸1-1 岐阜大学工学部総務係 担当:棚橋 TEL:058-293-2366(ダイヤルイン)

(4泊5日)

事 務 連 絡

令和元年9月26日

Andik Yulianto 殿

岐阜大学工学部総務係

旅費等支給事務上必要ですので,お手数ですが,下記の書類に必要事項を 記入の上、御返送くださるよう、よろしくお願いします。

記

1. 旅行命令(依頼)簿 (〇の1箇所に押印お願いします)

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