



ORIGINAL RESEARCH PAPER

Calorific and greenhouse gas emission in municipal solid waste treatment using biodrying

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ABSTRACT

BACKGROUND AND OBJECTIVES: Urban intensity and activities produce a large amount of biodegradable municipal solid waste. Therefore, biodrying processing was adopted to ensure the conversion into Refuse Derived Fuel and greenhouse gases..

METHODS: This study was performed at a greenhouse, using six biodrying reactors made from acrylic material, and equipped with digital temperature recording, blower, and flow meters. The variations in airflow (0, 2, 3, 4, 5, 6 L/min/kg) and the bulking agent (15%) were used to evaluate calorific value, degradation process and GHG emissions.

FINDINGS: The result showed significant effect of airflow variation on cellulose content and calorific value. Furthermore, the optimum value was 6 L/min/kg, producing a 10.05% decline in cellulose content, and a 38.17% increase in calorific value. Also, the water content reduced from 69% to 40%. The CH₄ concentration between control and biodrying substantially varied at 2.65 ppm and 1.51 ppm respectively on day 0 and at peak temperature. Moreover, the value of N₂O in each control was about 534.69 ppb and 175.48 ppb, while the lowest level was recorded after biodrying with 2 L/min/kg airflow.

CONCLUSION: The calorific value of MSW after biodrying (refuse derived fuel) ranges from 4,713 – 6,265 cal/g. This is further classified in the low energy coal (brown coal) category, equivalent to <7,000 cal/g. Therefore, the process is proven to be a suitable alternative to achieve RDF production and low GHG emissions.

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CONTENTS

Volume 7, Number 1, Winter 2021

1. Geographic information system and process-based modeling of soil erosion and sediment yield in agricultural watershed 1
G.R. Puno; R.A. Marin; R.C.C. Puno; A.G. Toledo-Bruno (PHILIPPINES)
2. The effect of short-term of fine particles on daily respiratory emergency in cities contaminated with wood smoke 15
R. Torres; N. Baker; G. Bernal; F. Peres; A. Maldonado; D.D. Caceres (CHILE/ USA/ PUERTO RICO/ BRASIL)
3. Calorific and greenhouse gas emission in municipal solid waste treatment using biodrying 33
B. Zaman; W. Oktiawan; M. Hadiwidodo; E. Sutrisno; P. Purwono (INDONESIA)
4. Willingness of end users to pay for e-waste recycling 47
H.T.T. Nguyen; C.-H. Lee; R.-J. Hung (VIETNAM/ TAIWAN)
5. The ability of layered double hydroxides for nitrate absorption and desorption in crop and fallow rotation 59
M. Mohammadi; A. Mohammadi Torkashvand; P. Biparva; M. Esfandiari (IRAN)
6. Genotoxic potential induced by marine cage culture 79
F. Turan; M. Turgut (TURKEY)
7. Palm oil plantation waste handling by small holder and the correlation with the land fire 89
H. Herdiansyah; E. Frimawaty (INDONESIA)
8. The effects of glucose, nitrate, and pH on cultivation of *Chlorella* sp. Microalgae 103
H. Nouri; J. Mohammadi Roushandeh; A. Hallajisani; A. Golzari; S. Daliry (IRAN)
9. Using multivariate generalized linear latent variable models to measure the difference in event count for stranded marine animals 117
R.E. Caraka; R.C. Chen; Y. Lee; T. Toharudin; C. Rahmadi; M. Tahmid; A.S. Achmadi (TAIWAN/ SOUTH KOREA/ INDONESIA)
10. Application of environmental bacteria as potential methods of azo dye degradation systems 131
G. Manjarrez Paba; R. Baldiris Ávila; D. Baena Baldiris (COLUMBIA)