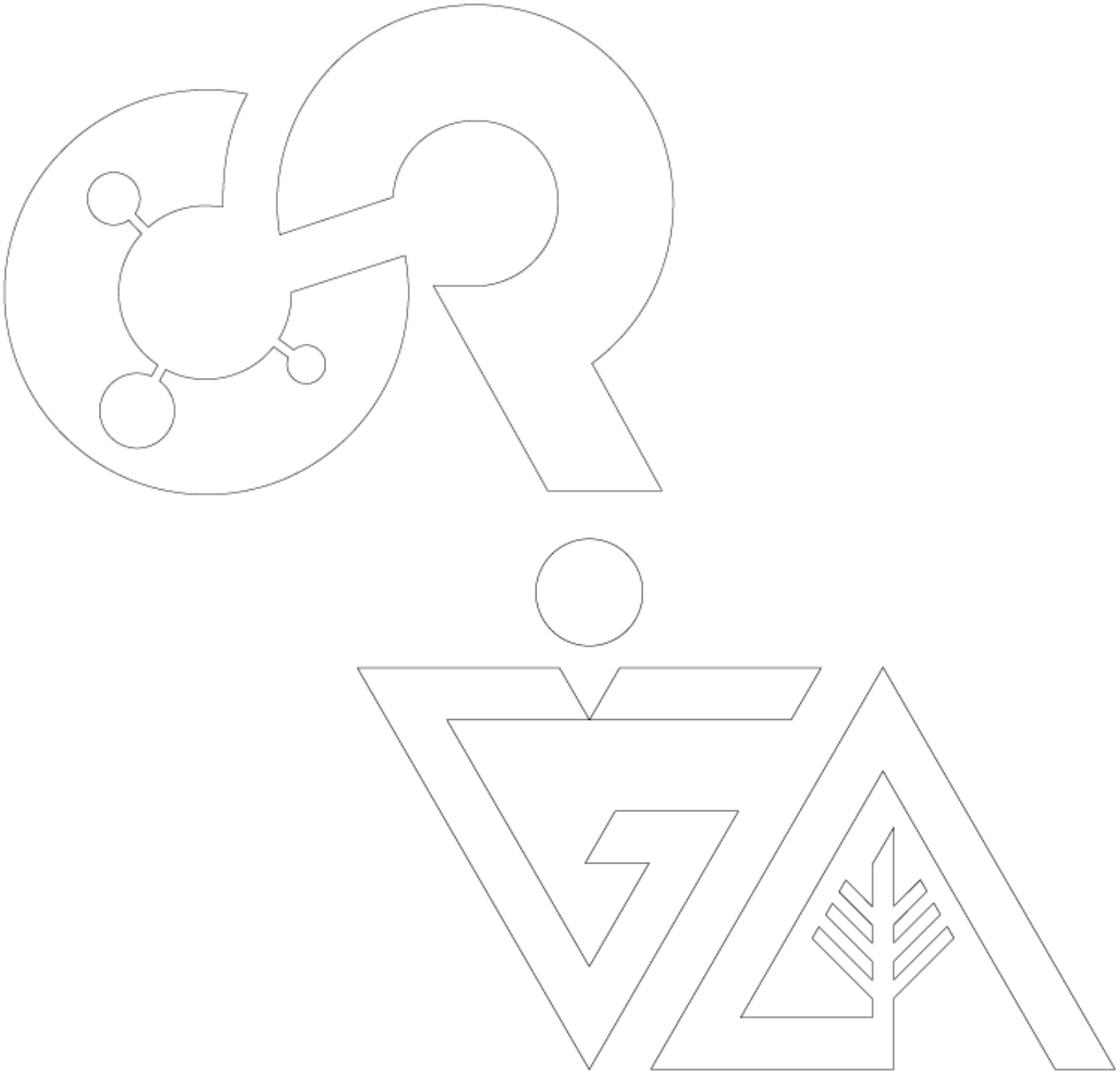
EVERGREEN

Volume.09

Issue.02 June 2022

Joint Journal of
Novel Carbon Resource Sciences & Green Asia Strategy



Evergreen • *Open Access* • Volume 9, Issue 2, Pages 484 - 490 • June 2022

Document type
Article • *Bronze Open Access*

Source type
Journal

ISSN
21890420

DOI
10.5109/4794176

Publisher
Joint Journal of Novel Carbon Resource Sciences and Green Asia Strategy

Original language
English

View less

Functions of Water Bodies as Mitigation of the Impact of Urban Heat Island in Kampung Luar Batang and Kampung Pulo Geulis

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Abstract

Uncontrolled urban development can cause urban areas to be warmer than the surrounding rural areas, known as the Urban Heat Island . This study aims to determine the microclimate conditions formed in residential areas that have water bodies and to determine the function of these water bodies as an effort to reduce the temperature of the area. A detailed discussion of temperature, humidity and wind speed shows evidence of an increasing trend in temperature in the area (UHI phenomenon) and shows that temperatures in areas far from the sea and close to rivers are lower than the surrounding areas. © 2022 Novel Carbon Resource Sciences. All rights reserved.

Author keywords

body of water ; Microclimate; Urban Heat Island

SciVal Topics

Funding details

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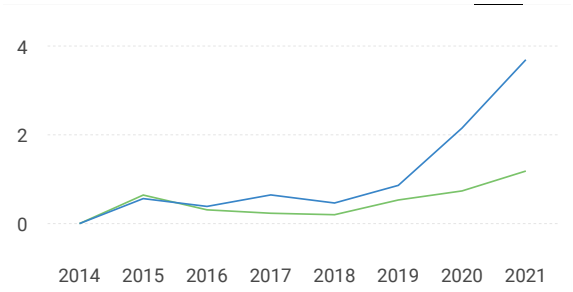

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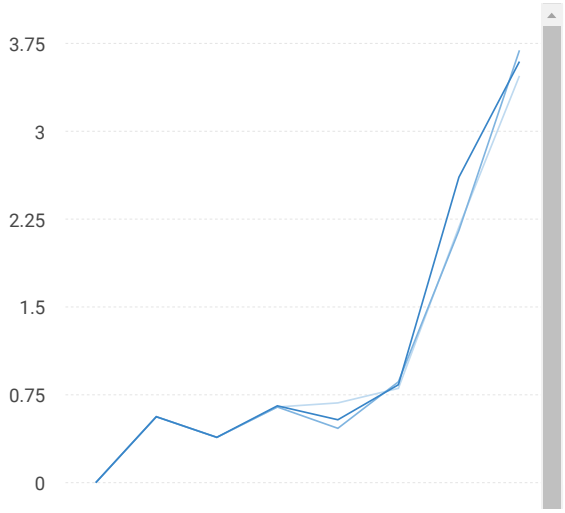

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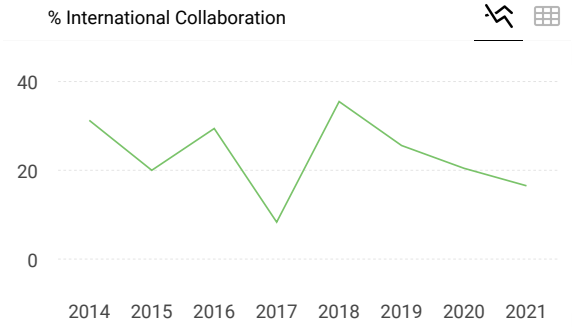

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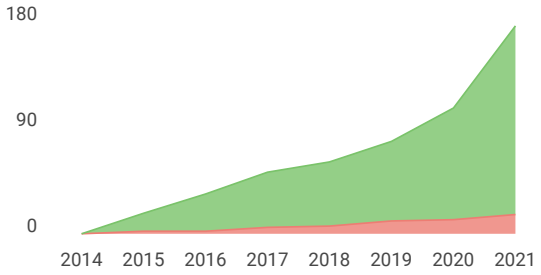

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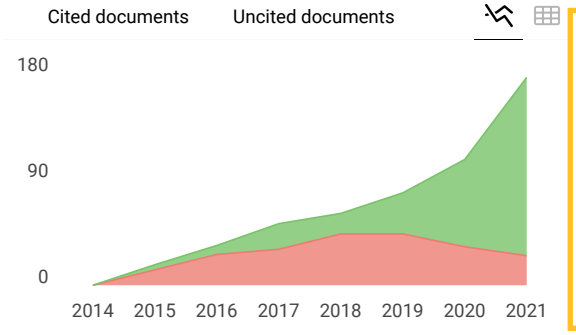

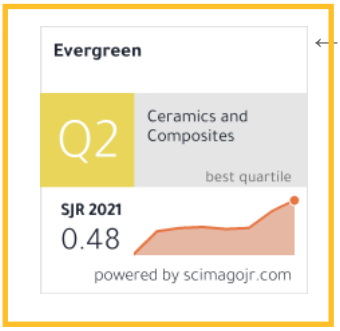

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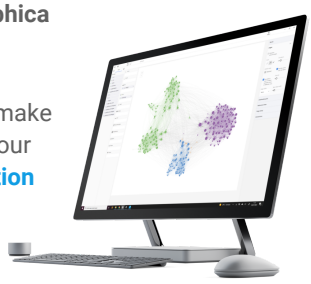

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Volume 9 Issue 2 (June 2022)

Published by

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6-1 Kasuga-koen, Kasuga, Fukuoka 816-8580 Japan

Tel: +81-92-583-7823

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Journal Website: http://www.tj.kyushu-u.ac.jp/leading/en/c_publication/evergreen.php

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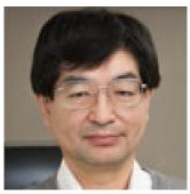

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♦ The International Conference on Energy Storage Technology and Applications 2021 (ICESTA-2021)
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Tribological Behavior of Organic Anti-Wear and Friction Reducing Additive of ZDDP under Sliding Condition: Synergism and Antagonism Effect

Anthony Chukwunonso Opia[1,3]*, Mohd Kameil Abdul Hamid[1], Samion Syahrullail[1], Audu Ibrahim Ali[1,2], Charles N. Johnson[3], Ibham Veza[4], Mazali Izhari Izmi[1], Che Daud Zul Hilmi[1], Abu Bakar Abd Rahim[1],

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(Received February 20, 2022; Revised May 8, 2022; accepted May 10, 2022).

Abstract: The effect of eichhornia crassipes carbon nanotubes (EC-CNTs) as additives in both base mineral oil (MOO) and vegetable rapeseed oil (ROO) alone and also together with ZDDP additive under sliding condition was studied. The investigation shows that both on individual and in combine state enhanced tribological properties. The coefficient of friction reduction was 40 % and 37.5 % for EC-CNT inclusion against ROO and MOO respectively under 80 N. The study revealed that enough tribofilm were generated thereby separating the two surfaces leading to low COF. In the case of wear effect, combination of the two additives gives substantial reduction of 65.5 % and 70.2 % against MOO and ROO respectively. The study shows that more reduction was obtained with RO + EC-CNT + ZDDP than the other. The use of two additives in combine lubrication shows synergistic effect, however, observed antagonistic effect if MO + EC-CNT + ZDDP is used for long period of time. The study further revealed that EC-CNT does more of anti-wear service while ZDDP improves friction reducing effect as well as anti-wear.

Keywords: EC-CNTs and ZDDP additives, Lubrication, friction and wear, synergism and antagonism

1. Introduction

In industry, damages on the machine elements and loss of energy during lubrication, has sparked a lot of concern in maintaining smoother sliding and improving the energy quality of all machines during operation. As a result, a need to minimize wear and excessive friction in machine lubricated components attracts researcher's attention. The outstanding technique in solving these challenges caused by friction and wear is by incorporating base lubricants with adequate anti-wear additives [1–4]. Several additives have been tested on their anti-wear lubricating enhancement like silica nanoparticles [5], carbon nano-onion [6], ZDDP [7], MWCNTs [8], WS2 nanosheets [9,10], shows great results on sliding surface protection. Yu et al., [11] studied on nano-mechanical features of tribo-films from Cu anti-wear nanoparticles additives. The study observed that two mechanisms were responsible for the anti-wear film achievement. The operation was through chemical reactions by electrochemistry and electrostatic adhesion brought by frictional forces, thereby makes Cu nanoparticles settle on the valleys or worn surface of the sliding element [11].

The operation and performances from the above mentioned additives were partially different, though some tribological benefits could be achieved if blended together for lubrication [12,13]. Due to their molecular behaviors and some other properties, some of the additives if used with another could yield enhanced lubrication [14,15], otherwise referred to as synergism. More so, inability for two blended additives to contribute in reducing friction and

Performance Characteristics of a Deformed 120-Degree Partial Bearing with Couple Stress Lubrication

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(Received February 8, 2022; Revised May 18, 2022; accepted June 4, 2022).

Abstract: The influence of using a fluid with couple stresses as lubricant on the performance of 120° partial bearing is studied here. The effect of variation in liner deformation is also considered. Modified Reynold's equation along with the elasticity equation is solved by using an FEM approach to predict the properties in static and dynamic form. The properties studied are peak pressure, carrying capacity of load, stiffness characteristic, damping characteristics. Based on the results it is concluded that for a deformed bearing liner dynamic performance of 120° partial bearing are enhanced by using the fluid with couple stresses.

Keywords: Couple stress fluid, liner deformation, partial arc bearing, elastohydrodynamic lubrication, static characteristics, dynamic characteristics.

1. Introduction

The classically used lubrication phenomenon is hydrodynamic which plays a major role in the operation of rotating machines. For smooth functioning of interrelated parts of any machine, the journal bearing is a key element used from past decades for transmission of power and to withstand loads between mating parts. The properties of Newtonian lubricant, used classically can be improved by adding some chemical compounds (additives) in the base fluid. The addition of these long chain polymer additives into the Newtonian fluids makes them to be non-Newtonian. One such kind of non-Newtonian lubricant is a fluid with couple stresses popularly known as couple stress fluid. The rheological behaviour in fluid with couple stresses is based on the theory of micro continuum[1)] The effect of fluid with couple stresses was studied by many researchers to predict its effects on the performance of journal bearings. The load capacity was improvised, and friction coefficient reduced on addition of polymer particles to lubricants[2-3)]. An action of squeezing in bearing with partial arc[4)] was presented by authors for fluid with couple stresses. The load capacity of cylindrical bearing operating with liner deformation and couple stresses were enhanced[5)]. The key factors: bearing geometric features, factor of couple stress and magnetic based parameters governs the load capacity and film thickness[6)]. The wear and friction near edges decreased by using couple stresses in finite line contacts[7)]. A 3-D elasticity model was used for couple stresses and elasticity parameter to evaluate the static, dynamic and stability characteristics of cylindrical bearing[8)]. The rheological effects of a fluid with couple stresses improved the dynamic performance[9)] of hydrodynamic bearings. The influence of textured surfaces observed to be more significant compared to non-textured surfaces for a fluid with couple stresses[10)]. The load carrying capacity, attitude angle, friction coefficient, side leakage of journal bearing was improved for a combined effect of the turbulence and elasticity of bearing liner[11)]. The new material constant η is completely responsible for the couple stress property of fluid. The effect of variation in viscosity of fluid on bearing performance was studied by many researchers from a long decade. A combined influence[12)] of viscosity variation, velocity slip and couple stresses studied for pressure and the load capacity. A review study of micropolar fluids, power-law fluids and couple stress lubricants resulted that the non-Newtonian lubricants gives better results compared to Newtonian[13)]. The selection of right lubricant with appropriate couple stress properties resulted an enhancement in the stability range and damping abilities[14)] for two lobe non-circular journal bearings. A lubrication model considering the effect of misalignment, couple stress and shear thinning impacts the sensitivity of fluid lubrication in proportion to couple stress parameter, such that for an area of minimum film thickness, the sensitivity is maximum[15)].