



SINERGI

p-ISSN: 1410-2331 e-ISSN: 2460-1217
VOL. 26, NO. 1, FEBRUARY 2022

Accredited **SINTA 2** by KEMENRISTEKDIKTI, Decree No: 10/E/KPT/2019



SINERGI	VOL. 26	NO. 1	PAGES 1-126	FEBRUARY 2022	p-ISSN: 1410-2331 e-ISSN: 2460-1217
----------------	----------------	--------------	------------------------	----------------------	--

pISSN: 1410-2331 - eISSN: 2460-1217



SINERGI

Vol. 26, No. 1, February 2022

-
- Editor in Chief** : Prof. Dr. Andi Adriansyah (UMB, Indonesia)
- Editorial Board** :
- : Prof. Dr. Chenwei Deng (Beijing Institute of Technology, China)
 - : Prof. Dr. Makbul Anwari (King Abdul Aziz Univ., Saudi Arabia)
 - : Prof. Dr. Nangkula Utaberta (Linton University College, Malaysia)
 - : Assoc. Prof. Dr. Ahmad Fithriady (UMT, Malaysia)
 - : Assoc. Prof. Dr. Ahmed Turan Ozdemir (Erviyes Univ., Turkey)
 - : Assoc. Prof. Hasliza A. Rahim (UniMAP, Malaysia)
 - : Assoc. Prof. Mahadzir Ishak (UMP, Malaysia)
 - : Dr. -Ing. Darwin Sebayang (UMB, Indonesia)
 - : Dr. Denny Setiawan (Kementrian Kominfo RI, Indonesia)
 - : Dr. -Ing. Galih Bangga (Univ. of Stuttgart, Germany)
 - : Dr. Ghaida Muttashar Abdulsahib (Univ. of Technology, Iraq)
 - : Dr. Hatsari Mitsudharmadi (Abu Dhaby Polytechnic, UAE)
 - : Dr. Jae Hyun Yun (Sungkyunkwan Univ., Republic of Korea)
 - : Dr. Muchamad Oktaviandri (Universitas Bung Hatta, Indonesia)
 - : Dr. Osamah Ibrahim Khalaf (An-Nahrain University, Iraq)
 - : Dr. Rosyida Permatasari (Universitas Trisakti, Indonesia)
 - : Dr. Setiyo Budiyanto (UMB, Indonesia)
 - : Dr. Teguh Prakoso (Universitas Dipenogoro, Indonesia)
 - : Dr. Zulfa Fitri Ikatrinasari (UMB, Indonesia)
- Editorial Staff** :
- : Feby Febriyanti
 - : Goffari Maulana
 - : Mega Avianti
 - : Yananto Mihadi Putra
- Editorial Address** :
- Fakultas Teknik Universitas Mercu Buana
Jl. Raya Meruya Selatan, Kembangan, Jakarta 11650
Tlp/Fax: 021-5871335
<http://www.publikasi.mercubuana.ac.id/index.php/sinergi>

SINERGI is a peer-reviewed journal published three times a year in February, June and October. The journal is published by Faculty of Engineering, Universitas Mercu Buana. Each publication contains articles comprising high quality theoretical and empirical original research papers, review papers, and literature reviews that are closely related to the fields of Engineering (Mechanical, Electrical, Industrial, Civil and Architecture). The theme of paper is focused on new industrial applications and energy development that synergized with local, green and sustainable technologies.



Reviewers

- Prof. Dr. Eng. Ahmed Khadim Hussein (University of Babylon, Iraq)
Prof. Dana Santoso, PhD (BRI Institute, Indonesia)
Prof. Dr. -Ing. Mudrik Alaydrus (Universitas Mercu Buana, Indonesia)
Prof. Dr. Awaluddin M. Shaharoun (Universitas Islam Madinah, Saudi Arabia)
Prof. Dr. Muhammad Khairuddin (Universitas Negeri Yogyakarta, Indonesia)
Prof. Dr. Zaharuddin Mohamed (Universiti Teknologi Malaysia, Malaysia)
Assoc. Prof. Dr. Azriyenni Azhari Zakri (Universitas Riau, Perancis)
Assoc. Prof. Dr. Setyawan Widyarto (Universitas Selangor Malaysia, Malaysia)
Assoc. Prof. Dr. Wahyu Mulyo Utomo (UTHM, Malaysia)
Dr. Abdusy Syarif (Universitas of Haute Alsace, Perancis)
Dr. Ade Asmi (Universitas Bakrie, Indonesia)
Dr. Agung Purniawan (Institut Teknologi Sepuluh November, Indonesia)
Dr. Amirullah (Universitas Bhayangkara Surabaya, Indonesia)
Dr. Anton Yudhana (Universitas Ahmad Dahlan, Indonesia)
Dr. Arien Heryansyah (Institut Pertanian Bogor, Indonesia)
Dr. Arif Irwansyah (Electronic Engineering Polytechnic of Surabaya, Indonesia)
Dr. Abdullah Dahlan (Universitas Malikussaleh, Indonesia)
Dr. Devi Fitriana (Universitas Mercu Buana, Indonesia)
Dr. Dini Rosmalina (Universitas Pancasila, Indonesia)
Dr. Dwi Agustina Kurniawati (Universitas Islam Negeri Sunan Kalijaga, Indonesia)
Dr. E. Erwin (Universitas Sriwijaya, Indonesia)
Dr. Herry Agung Prabowo (Universitas Mercu Buana, Indonesia)
Dr. I Made Wiwit Kastawan (State Polytechnic of Bandung, Indonesia)
Dr. Iswadi Hasyim Rosma (Universitas Riau, Indonesia)
Dr. Kontan Tarigan (Universitas Mercu Buana, Indonesia)
Dr. Muhammad Abdillah (Universitas Pertamina, Indonesia)
Dr. Muhammad Ikhsan Setiawan (Universitas Narotama, Indonesia)
Dr. Muhammad Syarif Hidayat (Universitas Mercu Buana, Indonesia)
Dr. Munawar Agus Riyadi (Universitas Diponegoro, Indonesia)
Dr. Nunung Widyaningsih (Universitas Mercu Buana, Indonesia)
Dr. Rini Nur Hasanah (Universitas Brawijaya, Indonesia)
Dr. Eng. Rudi Kurnianto (Universitas Tanjungpura, Indonesia)
Dr. Satria Mandala (Telkom University, Indonesia)
Dr. Sally Cahyati (Universita Trisakti, Indonesia)
Dr. Syahril Ardi (Politeknik Manufaktur Astra, Indonesia)
Dr. Yusnita Rahayu (Universitas Riau, Indonesia)
Dr. (C). Yudhi Gunardi (Universitas Mercu Buana, Indonesia)
Dr. W. Waluyo (Institut Teknologi Nasional, Indonesia)

SINERGI is a peer-reviewed journal published three times a year in February, June and October. The journal is published by Faculty of Engineering, Universitas Mercu Buana. Each publication contains articles comprising high quality theoretical and empirical original research papers, review papers, and literature reviews that are closely related to the fields of Engineering (Mechanical, Electrical, Industrial, Civil and Architecture). The theme of paper is focused on new industrial applications and energy development that synergized with local, green and sustainable technologies.



TABLE OF CONTENTS

<p>Performance analysis of various types of surface crack detection based on image processing</p> <p>Regina Lionnie, Rizky Citra Ramadhan, Ahmad Syadidu Rosyadi, Muzammil Jusoh, Mudrik Alaydrus Department of Electrical Engineering, Faculty of Engineering, Universitas Mercu Buana, Indonesia Faculty of Engineering Technology, Universiti Malaysia Perlis, Malaysia</p>	1-6
<p>Optimal design of energy storage for load frequency control in micro hydro power plant using Bat Algorithm</p> <p>Muhammad Ruswandi Djalal, Nasrun Kadir Energy Generation Engineering Program, Department of Mechanical Engineering, State Polytechnic of Ujung Pandang, Indonesia Mechanical Engineering Program, Department of Mechanical Engineering, State Polytechnic of Ujung Pandang, Indonesia</p>	7-14
<p>The innovative design of automatic speed limiter device for trucks and buses based on road location analysis</p> <p>Hadi Pranoto, Adul Mutalib Leman, Dafit Feriyanto, Andi Adriansyah, Abdi Wahab Department of Mechanical Engineering, Faculty of Engineering, Universitas Mercu Buana, Indonesia Department of Mechanical Engineering, Faculty of Engineering, Universiti Tun Hussein Onn, Malaysia Departement of Electrical Engineering, Faculty of Engineering, Universitas Mercu Buana, Indonesia Department of Information System, Faculty of Computer Science, Universitas Mercu Buana, Indonesia</p>	15-22
<p>Numerical analysis of the vortex flow effect on the thermal-hydraulic performance of spray dryer</p> <p>Fajar Anggara, Dedik Rohmahadi, Alief Avicenna Luthfie, Yosua Heru Irawan Department of Mechanical Engineering, Faculty of Engineering, Universitas Mercu Buana, Indonesia Department of Mechanical Engineering, Faculty of Engineering, National Taiwan University of Science and Technology, Taiwan Department of Mechanical Engineering, Faculty of Engineering, Institut Teknologi Nasional Yogyakarta, Indonesia</p>	23-30
<p>Reducing the punch force in the circular punching process by preheating under the recrystallization temperature</p> <p>Yani Kurniawan, Muslim Mahardika, Muhammad Haritsah Amrullah, Bambang Cahyadi Department of Mechanical Engineering, Faculty of Engineering, Pancasila University, Indonesia Department of Mechanical and Industrial Engineering, Faculty of Engineering, Universitas Gadjah Mada, Indonesia Bangka Belitung Polytechnic for Manufacturing (POLMAN-Babel), Indonesia. Department of Industrial Engineering, Faculty of Engineering, Pancasila University, Indonesia.</p>	31-36

Distributed Generation installed by the Phasor Measurement Unit to improve voltage	37-46
Azriyenni Azhari Zakri, Rangga Eka Saputra, Makmur Saini, Hidayat Department of Electrical Engineering, Faculty of Engineering, Universitas Riau, Indonesia Power Plant Engineering, Politeknik Negeri Ujung Pandang, Indonesia Department of Electrical Engineering, Faculty of Industrial Engineering, Universitas Bung Hatta, Indonesia	
The impact of 3D, 4D, and 5D Building Information Modeling for reducing claims to service providers	47-56
Shanti Astri Noviani, Mawardi Amin, Sarwono Hardjomuljadi Department of Civil Engineering, Faculty of Engineering, Universitas Mercu Buana, Indonesia	
Classification of motor imagery brain wave for bionic hand movement using multilayer perceptron	57-64
Sapto Budi Priyatno, Teguh Prakoso, Munawar Agus Riyadi Department of Electrical Engineering, Universitas Diponegoro, Indonesia	
Optimization of aggregate planning of rice husk charcoal production with Fuzzy Goal Programming approach	65-72
Erni Krisnaningsih, Taufik Djatna, Yandra Arkeman, Marimin, Erliza Hambali Graduate Program of Agroindustrial Engineering, Faculty of Agricultural Technology, IPB University, Indonesia Department of Agroindustrial Engineering, Faculty of Agricultural Engineering, IPB University, Indonesia Department of Industrial Engineering, Faculty of Engineering, Universitas Banten Jaya, Indonesia	
Smart optimization of PV panel output using Fuzzy Logic Controller based solar tracker	73-80
Marhani Rosyadah, RD Kusumanto, Tresna Dewi Applied Master of Renewable Energy Engineering, Politeknik Negeri Sriwijaya, Indonesia Electrical Engineering Department, Politeknik Negeri Sriwijaya, Indonesia	
Influential factors in the application of the Lean Six Sigma and time-cost trade-off method in the construction of the ammunition warehouse	81-90
Albert Eddy Husin, Eko Arif Budianto Department of Civil Engineering, Universitas Mercu Buana, Indonesia	
Computational investigation of various wedges electromagnetic wave absorbers on anechoic chambers	91-98
Naufal Baihaqi Al Afkar Department of Mechanical Engineering, Universitas Negeri Semarang, Indonesia	
Analysis of the effect 3D printing parameters on tensile strength using Copper-PLA filament	99-106
Mahros Darsin, Renald Rochman Mauludy, Intan Hardiatama, Boy Arief Fachri, Mochamad Edoward Ramadhan, Doddy Parningotan Department of Mechanical Engineering, Faculty of Engineering, Universitas Jember, Indonesia Department of Chemical Engineering, Faculty of Engineering, Universitas Jember, Indonesia New Zealand Steel, New Zealand	
Evaluating the effect of using shredded waste tire in the asphalt concrete-binder coarse on Marshall parameters	107-114
Elsa Eka Putri, Yosritzal, Akhyarul-An Agusyaini, Wiwik Budiawan Department of Civil Engineering, Faculty of Engineering, Universitas Andalas, Indonesia Architecture and Civil Engineering Department, Toyohashi University and Technology, Japan	

- Application of the detailed balance model to thermoradiative cells based on a p-type two-dimensional indium selenide semiconductor** 115-120
Muhammad Yusrul Hanna, Ahmad R. T. Nugraha, Muhammad Aziz Majidi
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Indonesia, Indonesia
Research Center for Physics, National Research and Innovation Agency (BRIN), Indonesia
- Effects of 1-hexyl-1-methylimidazolium iodide ionic liquid to poly(vinyl alcohol)-based solid polymer electrolyte** 121-126
Christin Rina Ratri, Qolby Sabrina, Titik Lestariningsih, Salsabila Zakiiyah
Research Center for Physics, National Research and Innovation Agency, Indonesia