PROGRAM BOOK

icimece 2021

Virtual Conference
October 5th, 2021

Paper Category:

IE **ME** **EE** **CE**

CONTENT

Opening Speech

Dr.techn. Sholihin As'ad
Dean of Faculty of Engineering,
Universitas Sebelas maret

The honourable of keynote speakers, invited speakers, participants, colleagues.

Ladies and gentlemen,

As the Dean of Faculty of Engineering, Universitas Sebelas Maret (UNS), I would like to extend my warm welcome to you all in this 7th International Conference on Industrial, Mechanical, Electrical and Chemical Engineering (the 7th ICIMECE) 2021. Thank you for joining.

Due to the global pandemic of COVID 19, we have to conduct this conference through virtual mode. However, this will not degrade our objective for making the 7th ICIMECE 2021 as the forum to share and to discuss the ideas and research on engineering, science and technology.

This conference was formerly known as IMECE, which was held in November 2015 and transformed to ICIMECE a year later. It is the annual conference which was usually held in Surakarta, Indonesia.

The theme of 7th ICIMECE is "Sustainable technology innovation and commercialization for pandemic recovery". The reason of selecting this theme is Indonesia and the global world have been facing pandemic covid-19 for more than a year with uncertain situation. This made a tremendous impact on quality of life for individuals and community. It takes a lot of efforts to restore it to the previous normal situation. A continuous innovation on technology and commercialization are needed in responding the needs of individuals, society and industries towards the new normal phase.

The committee accepted 101 papers after reviewing 116 papers from various countries including, Canada, China, Estonia, Germany, Japan, Malaysia, Saudi Arabia, South Korea, Thailand, United Kingdom, Vietnam, and Indonesia. All accepted papers will be presented virtually through ICIMECE 2021's website channel and published in reputable proceeding series, AIP Proceeding. Selected papers will be recommended to publish in reputable journals: Evergreen, Jurnal Teknologi, ASEAN Journal of Chemical Engineering and Malaysia Journal of Fundamental And Applied Science.

As the high numbers of papers presented from various contributors, I hope this triggers the collaboration among the researches who participated in this event. International engagement and cooperation are very important in solving the global problem that we are facing. This is in line with vision this conference.

Last but not least, I especially thank all of the keynote speakers, invited speakers, participants, sponsors and partners for their contribution and all committees for their great effort to organize this conference.

With Bismillahirrahmanirrahim, I declare that the 7th ICIMECE 2021 is officially opened.

I wish you a successful and enlightening conference.

ICIMECE 2021

On behalf of the Conference Organising Committee, we invite you to attend the 7th International E-Conference on Industrial, Mechanical, Electrical and Chemical Engineering (ICIMECE 2021), which will be held virtually via Video Conference (for keynote speakers and invited speakers) and by the recorded presentation for presenters via youtube channel. This conference is organized by Engineering Faculty, Universitas Sebelas Maret (UNS).

This conference was formerly known as IMECE which was first held in November 2015. Papers in the former conference have successfully been published in the conference proceedings and also reputable journals for selected papers, which Scopus index. This event will include the participation of renowned keynote speakers, invited speakers, oral presentations, and technical conferences related to the topics dealt with within the Program. The conference theme is "Sustainable Technology innovation and commercialization for pandemic recovery ". The conference will address the practical engineering application (mechanicals, electricals, energy and power engineering, industrial engineering, and chemical engineering). This year, ICIMECE also arranged a II special symposium in the field of material and structural integrity. For more details, kindly visit "Symposium" tab in the main menu.

The aims of this conference are to

● Provides opportunities for the delegates to exchange new ideas face-to-face to bring together leading academic scientists, researchers, and research scholars to exchange and share their experiences and research results on all aspects of engineering, science, and technology

● lead to significant contributions to the knowledge in these up-to-date scientific fields.

Venue

The conference will be held online via Video Conference (for keynote and invited speakers) and by the recorded presentation for presenters.

Committee

Steering Committee
1. Dr. Techn. Sholihin Asad
2. Prof. Dodi Ariawan, PhD
3. Dr. Ari Diana Susanti
4. Prof. Dr. Eng. Agus Purwanto

Organizing Committee
1. Conference Chair : Mujtahid Kaavessina, PhD
   Conference co-Chair (TK) : Dr. Adrian Nur
   Conference co-Chair (TM) : D. Danardono Dwi P. T., PhD
   Conference co-Chair (TI) : Prof. Dr. Bambang Suhardi
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10. Prof. Madya Dr. Syed Ahmad Helmi bin Syed Hassan, Universiti Teknologi Malaysia (UTM), Malaysia

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ICIMECE 2021 Statistics

The number of received and accepted papers

Received Papers: 116

Accepted Papers: 101

| 0 | 20 | 40 | 60 | 80 | 100 | 120 |

% Rejection rate = 12.9%
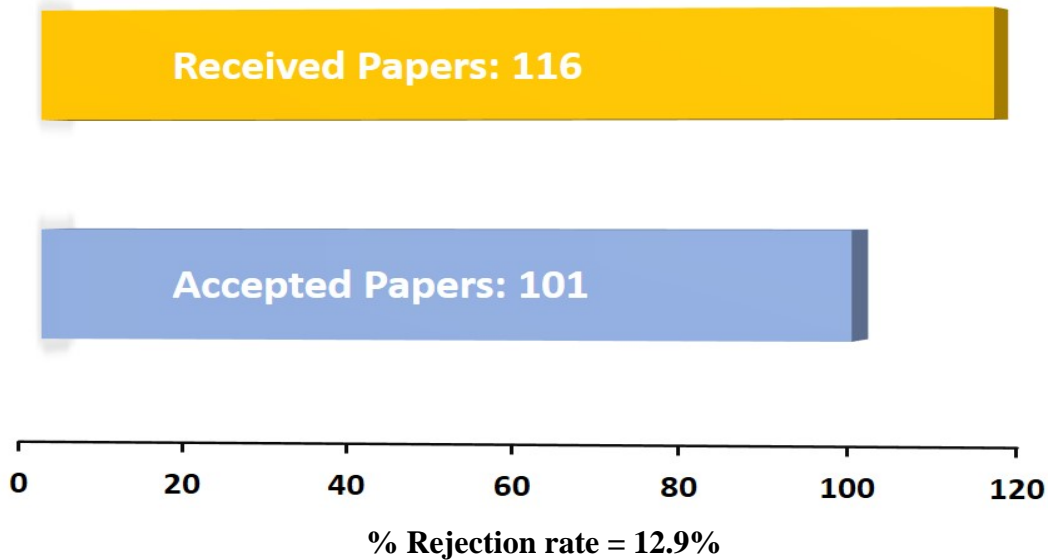
The papers are classified into 5 categories: Industrial Engineering, Mechanical Engineering, Electrical Engineering, Chemical Engineering, and II Special Symposium in Structural Integrity

Papers distribution based on the category

Category	Papers
Industrial Engineering	32
Mechanical Engineering	28
Electrical Engineering	10
Chemical Engineering	17
II Special Symposium	14
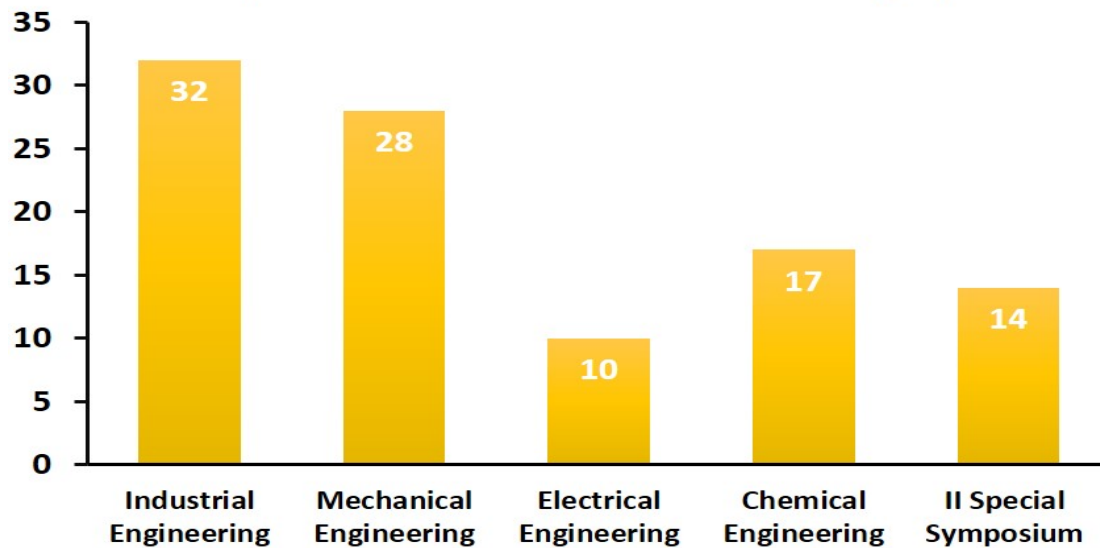
In terms of publication, ICIMECE 2021 partnerised with AIP proceedings and four journals (ASEAN Journal of Chemical Engineering, Jurnal Teknologi, Malaysia Journal Of Fundamental and Applied Science, and Evergreen) for selected papers.

Distribution of Papers Publication
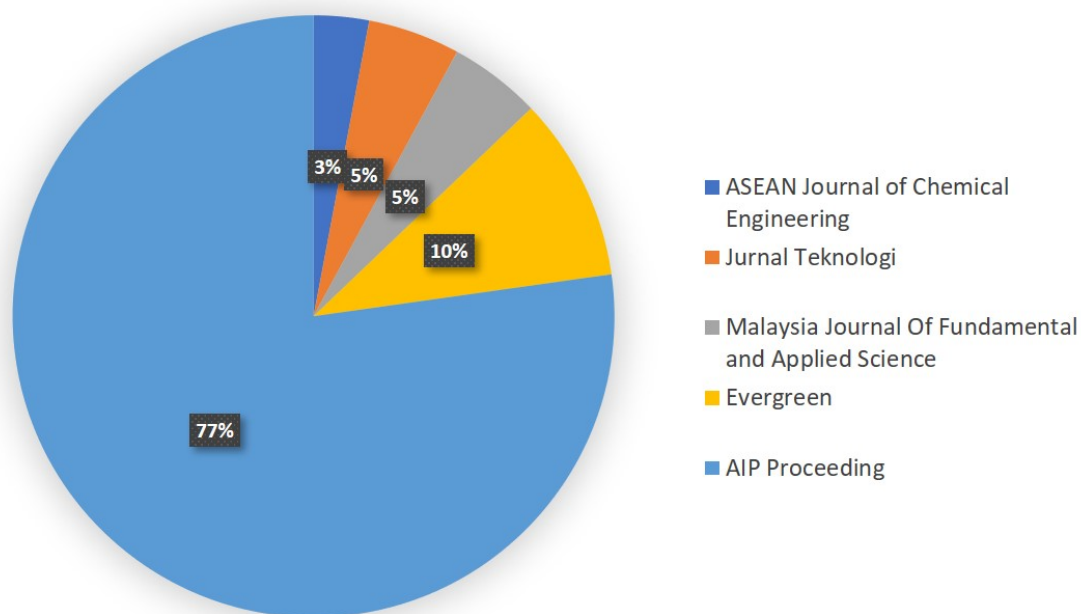
*Total 101 papers

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Author Distributions

Online Presentation

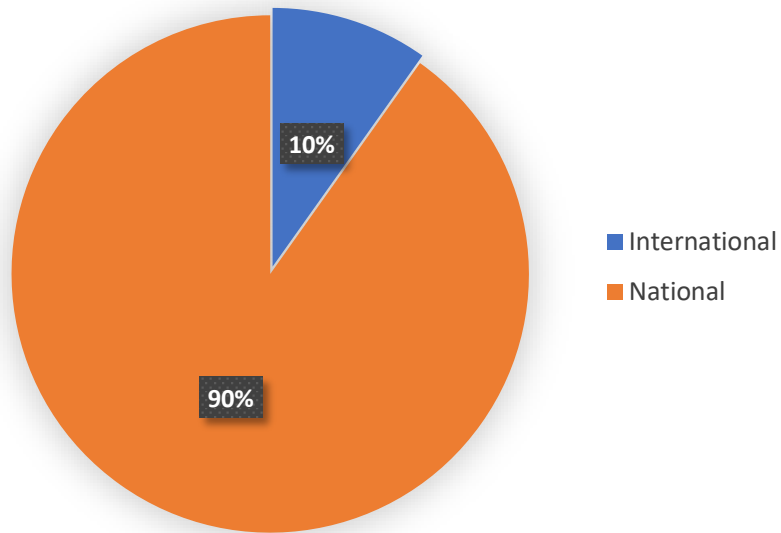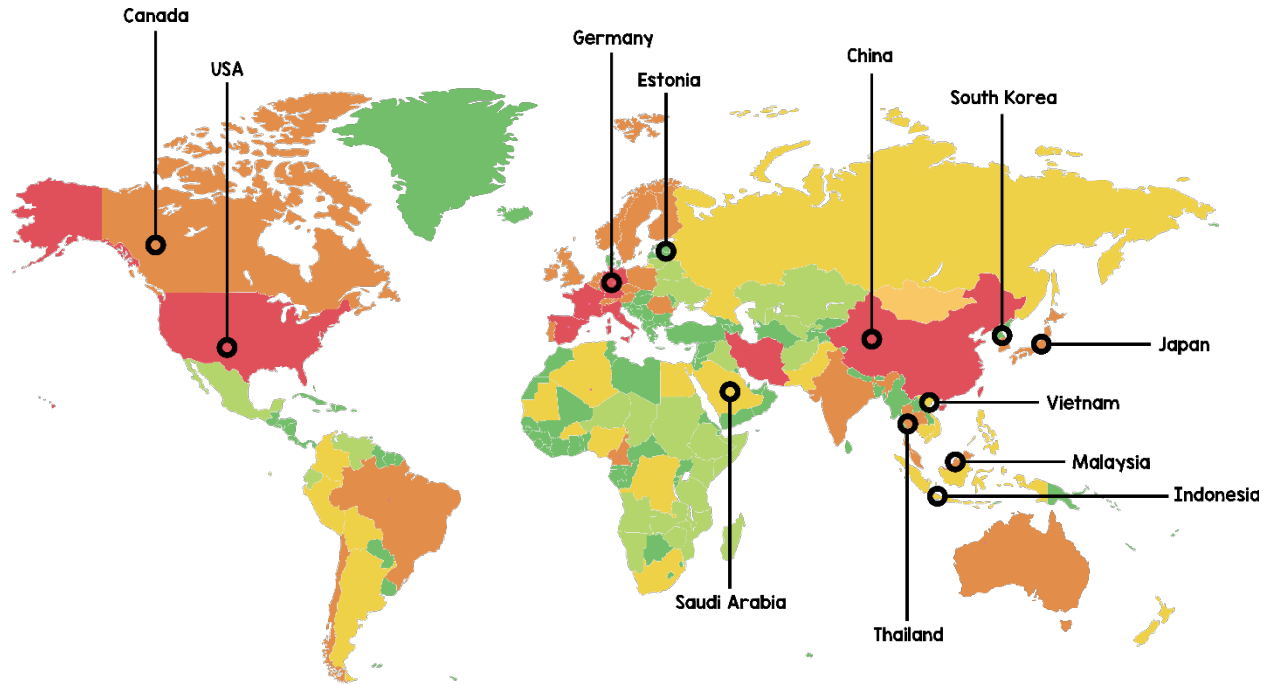Due to COVID 19 pandemic, the oral presentation is conducted through recorded presentation (on video format) which is then uploaded on ICIMECE 2021's Youtube Channel. The discussion related to the presentation can be done on Youtube's comments or via email (the corresponding email is provided on the description).

The video links based on the categories are provided as follows:

1. Industrial Engineering: https://bit.ly/3zE3Q6Q

2. Mechanical Engineering: https://bit.ly/3m48Ix6

3. Electrical Engineering: https://bit.ly/39QIKYs

4. Chemical Engineering: https://bit.ly/3ifxaKY

5. II Special Symposium: https://bit.ly/3kT1ugh

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PROGRAM RUNDOWN

ICIMECE 2021 Schedule Program (Tuesday, October 5th, 2021)

Time (GMT+7)	Program/schedule	Room/Link
07.15 - 07.40	Online registration	Main Room http://bit.ly/icimece2021room1
07.45 - 07.50	Opening Ceremony: Dean Speech	
07.50 - 07.59	Sing the National Anthem of Indonesia	
Keynote Session #1		
08.00 - 08.30	Speaker I: **Md Golam Kibria, Calgary,Canada** (07.00-07.30 PM or GMT-6, October 4th, 2021)	Main Room http://bit.ly/icimece2021room1
08.30 - 08.55	Discussion I	
09.00 - 09.30	Speaker II: **Dr. Koji Enoki, Japan** (10.00-10.30 AM or GMT+8)	
09.30 - 09.55	Discussion II	
10.00 - 10.30	Speaker III: **Prof Madya Ir. Dr. Syed Shatir Asghrar S.H, Malaysia** (11.00-11.30 AM or GMT+8)	
10.30 - 10.55	Discussion III	
11.00 - 11.30	Speaker IV: **Assoc. Prof. Dr. Somyot Kaitwanidvilai, Thailand** (11.00-11.30 AM or GMT+7)	
11.30 - 11.55	Discussion IV	
12.00 - 12.25	*Prof. Anton Satria Prabuwono, Ph.D (08.00-08.25 AM, GMT+3)* Main Room http://bit.ly/icimece2021room1	**Break time**
12.25 - 12.45	*Discussion*	

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Keynote Session #2

13.00 - 13.30	Speaker V: **Prof. Dr-Ing. Hendro Wicaksono, Germany** (8.00-8.30 AM or GMT+2)	Main Room http://bit.ly/icimece2021room1
13.30 - 13.55	DISCUSSION V	

Plenary Session#2

Time	Plenary I in Main room http://bit.ly/icimece2021room1	Plenary II in Room #2 http://bit.ly/icimece2021room2	Plenary III Room #3 http://bit.ly/icimece2021room3
14.00 - 14.25	*Break time*	*Dr. Nonni Soraya Sambudi (15.00-15.25, GMT+8)*	*Muhammad Hilmy Alfaruqi, Ph.D (16.00-16.25, GMT+9)*
14.25 - 14.45		Discussion	Discussion
14.45 - 15.10	*Prof. Madya Dr. Syed Ahmad Helmi bin Syed Hassan (15.45-16.10, GMT+8)*	*Assoc.Prof. Abdulhakim Almajid, PhD (10.45-11.10, GMT+3)*	*Assoc. Prof. Anita Pettersson, Ph.D (09.45-09.10, GMT+2)*
15.10 - 15.35	Discussion	Discussion	Discussion
15.35 - 15.50	**Award announcement**		
15.50 - 16.00	CLOSING		

Notes:

-. Keynote and invited speeches will be conducted via video conference **(see the zoom link for each speaker).**

-. Use the following format for your identity during the conference

    Keynote and invited speakers   **:** KIS_full name

    Presenters or other authors   **:** Article code_full name

    Participants   **:** P_full name

-. The zoom background can be downloaded via https://bit.ly/2ZT66uP

-. During break time (12.00-13.00 or 13-14.00), each presenter checks their video channel (youtube) and answers the question (if any in the comments column)

KEYNOTE/INVITED SPEAKERS

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Keynote and Invited Speakers

Dr. Md Golam Kibria
Department of Chemical and
Petroleum Engineering
University of Calgary,
Canada

Dr. Koji Enoki
Department of Mechanical and Intelligent
System Engineering
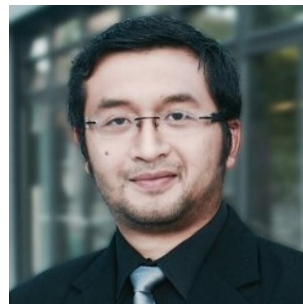The University of Electro-Communication,
Japan

**Prof Madya Ir. Dr. Syed Shatir
Asghrar Syed Hassan**
School of Chemical Engineering,
Universiti Teknologi MARA
Malaysia

Assoc. Prof. Dr. Somyot Kaitwanidvilai
School of Engineering
King Mongkut's Institute of Technology
Ladkrabang
Thailand

Prof. Dr-Ing. Hendro Wicaksono
Industrial Engineering Mathematics & Logistics,
Jacobs University Bremen gGmbH
Germany

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Prof. Anton Satria Prabuwono, PhD
Department of Information Technology
King Abdulaziz University, Rabigh
Saudi Arabia

Dr. Nonni Soraya Sambudi
Department of Chemical Engineering ,
Universiti Teknologi PETRONAS
Malaysia

Muhammad Hilmy Alfaruqi, PhD
Next Generation Battery Laboratory
Chonnam National Unversity
South Korea

Assoc. Prof. Abdulhakim Almajid
Department of Production and
Manufacture, Prince Sultan University.
Department of Mechanical Engineering,
King Saud University
Saudi Arabia

Prof. Madya Dr. Syed Ahmad Helmi bin Syed Hassan
School of Mechanical Engineering
Faculty of Engineering,
Universiti Teknologi Malaysia
Malaysia

Assoc. Prof. Anita Pettersson Ph.D
Swedish Centre for Resource Recovery
University of Borås,
Sweden

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Materials and Systems for the Synthesis of Renewable Feedstocks and Fuels

Dr. Md Golam Kibria

Assistant Professor
Department of Chemical and Petroleum Engineering
University of Calgary
md.kibria@ucalgary.ca

Abstract: Our planet is heading towards an energy famine due to growing population and industrialization. As global carbon emissions continue to grow at unprecedented rates, finding clean and efficient alternative sources of chemical feedstocks and fuels is of increasing importance. On the other hand, the price of renewable electricity continues to drop over the last decade. This opens up an incredible opportunity to develop electrochemical systems for the synthesis of sustainable feedstock chemicals and fuels. The electrochemical process is a promising sustainable technology to recycle anthropogenic CO_2 to make energy-rich fuels or feedstocks and has gained tremendous renaissance in last decade. Through this process, the CO_2 emitted from fossil-fuel based industries can be catalytically hydrogenated in the presence of renewable electrons and H_2O to produce high-energy-density fuels for transportation or as the basic synthetic component for hundreds of chemicals. A means of efficient production of carbon-based fuels from CO_2 will fundamentally transform the current economy of fossil-fuel into a sustainable energy economy. Although significant progress has been made over the last decade, it remains an up-hill task to develop efficient, stable, scalable, and cost-competitive electrocatalyst materials and systems for large-scale practical application of this frontier technology. In this talk, I will present the latest developments in this pacey field for sustainable energy and environment, highlighting the opportunity areas, and crucial milestones achieved to date. I will highlight my critical assessment on the key challenges that need to be addressed to translate this technology from lab scale to large-scale industrial settings, including catalyst discovery, performance matrices, cost, elemental abundancy, stability, system design, informed by life cycle and techno-economic assessments. Given all the current advances in electrochemical CO_2 conversion, it is not hard to imagine a future where we can put to use one of the most important lessons nature can teach us - how to live sustainably for generations to come.

Experimental and Numerical Investigation Into The Heat Transfer and Pressure Drop Performance ff Sintered High Porosity Media

Koji Enoki [1*]

[1]*Department of Mechanical and Intelligent System Engineering, The University of Electro-Communications 1-5-1, Chofugaoka, Chofu-shi, Tokyo 182-8585, Japan*

*Corresponding author: enoki.koji@uec.ac.jp

Abstract: There is a method of using porous media to improve the heat transfer performance of the heat tube. However, there are few studies on the fiber structure, which is one of the porous structures. Furthermore, by sintering the heat transfer tube and the porous media, the thermal resistance can be significantly reduced and the heat transfer can be expected to be improved. Therefore, in this study, we experimentally investigated heat transfer and pressure drop in heat transfer tubes made by sintering fibrous porous media. The length of the test section was 150 mm, and dry air heated at 300 °C inside the heat transfer tube and isobutane (R600a) with saturation temperature of 5 °C outside were flowed in the same direction. Tubes sintered with fibrous porous media, compared to the conventional heat transfer tube, the heat transfer coefficient of porous part was up to about 20 times. On the other hand, the pressure drop was about 50 times higher than that of the conventional pipe. In addition, the pressure drop per unit length was expressed as a quadratic function of velocity, and the permeability was calculated. By defining the pipe friction factor using this permeability, it was confirmed that it can be organized in the same way as porous media with foam structures. Furthermore, the heat transfer tube was scanned by CT and analyzed as a 3D model by numerical simulation software.
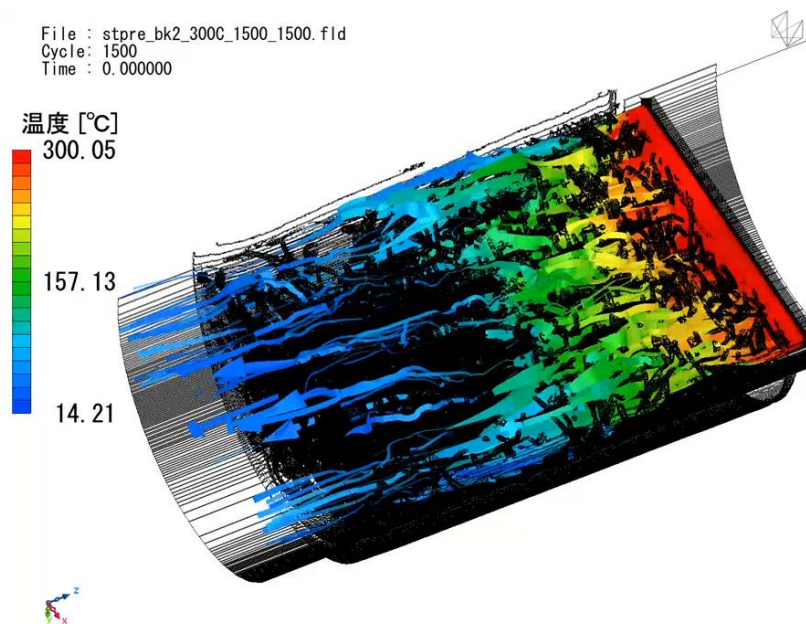
Figure. Example of numerical simulation analysis image

Iron-Loaded Activated Carbon as a Tar Cracking/Reforming Catalyst in the Production of Clean Producer Gas from Oil Palm Biomass

Syed Shatir A. Syed-Hassan[1,a)], Nur Hanina Malek[1,b)] and Rusmi Alias[1,c)]

[1]*School of Chemical Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia*

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[b)]nurhaninamalek@gmail.com
[c)]rusmi@uitm.edu.my

Abstract. The conversion of abundantly available and renewable biomass, e.g. oil palm waste, into combustible gas mixture provides good opportunities for reducing the greenhouse gas effect and the reliance on fossil fuel in energy sector. The use of catalyst in the reforming/cracking of tarry materials, e.g. biomass-derived bio-oil or tar in the gasification outlet gas, helps to achieve the required gas quality for various energy and power generation applications. Catalyst deactivation which leads to shortened catalyst lifetime, however, limits the application of many commercial catalysts in the production of clean producer gas from biomass, especially for a large-scale system, contributing to the increase in operating expenditure and creating waste management issue arising from the disposal of spent catalyst. It is therefore important to develop an environmentally-friendly low-cost catalyst that can efficiently convert biomass tarry materials into clean burnable gas for practical application. This paper reports some of our recent studies on the development and testing of tar cracking/reforming catalyst for the production of low-tar, highly burnable gas from oil palm biomass. Iron-loaded activated carbon was prepared using a stepwise impregnation method that allows high loading of iron without severe deterioration on catalyst dispersion and porosity of the catalyst support. The catalyst was tested in the lab-scale bio-oil reforming as well as in the pilot-scale biomass gasification. Results indicate that this low-cost practical catalyst can reduce tar content in the producer gas with performance comparable to other commercial catalysts

Frontier in AI and IoT Technology to fight COVID-19 : A Case study in KMITL Heated Humidifier *high-flow* nasal cannula (HHHFNC)

POOM Konghuayrob and Somyot Kaitwanidvilai[*]

School of Engineering, King Mongkut's Institute of Technology Ladkrabang,

Corresponding author: somyot.ka@kmitl.ac.th

Abstract. In this paper, the review of the AI and IoT technology to fight COVID-19 is demonstrated and also especially focused on the Heated Humidifier *high-flow* nasal cannula (HHHFNC) to help COVID-19 patients via the method of oxygen therapy. In order to enhance the capability and ability of this system, the IoT and remote sensing is adopted to separate patients and doctors to reduce the infection between them. In addition, doctors can gather all information about patients and also can control the parameters of this machine. By surveying, the satisfactory of this machine is much better than the commercial product. Moreover, the result of standard testing showed that the machine passed the IEC 60601-1 and IEC 60601-2 medical standards. The design of housing and noise suppression is very important and carefully designed circuit board is crucial for both conducted and radiated emission passing criteria. The details are shown in this paper to understand how the process should be designed and forwarded to the next generation of the IoT system in this machine. The behavior of doctor's parameter setting gathered from the sensor feedback and remote monitoring will be studied for automatic tuning of O_2 setting using AI learning in the future.

The Utilization of Carbon Quantum Dots for Photocatalytic Degradation

Nonni Soraya Sambudi

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Abstract. Carbon quantum dots (CQDs) are the organic type of quantum dots that have been utilized as sensitizer for photocatalytic activity. The use of as-synthesized CQDs to degrade 10 ppm methylene blue was performed with photodegradation reached more than 90% after 240 min of lamp irradiation. Similar performance was shown for the N and Bi doped CQDs; hence the performance of CQDs for photocatalytic degradation does not really experience change through its modification in sole used. CQDs are showing increasing in performance when in combination with other photocatalytic agent. The combination of CQDs with TiO_2 could fully degrade acetaminophen after 240 min under lamp irradiation and increase the surface of photocatalyst from 113 to 148 m^2/g. While in combination with WO_3, the CQDs could reduce the band gap of WO_3 further to 1.5 eV, and remove more than 90% of 10 ppm methylene blue after 60 minutes under lamp irradiation. Due to this excellent performance, $CQDs/WO_3$ was then immobilized in polylactic acid (PLA) fibers to be used for oil/water separation. The super-oleophilic film fibers was formed by the inclusion of $CQDs/WO_3$ in PLA fibers, and could separate hexane, heptane, and hexadecane from water with flux of around 8326 L m^{-2} h^{-1}, 11961 L m^{-2} h^{-1}, and 5600 L m^{-2} h^{-1} for hexane, heptane, and hexadecane, respectively. The immobilized photocatalyst could still achieve 70% removal of 10 ppm methylene blue after 240 min lamp irradiation.

Keywords: Carbon Quantum dots (CQDs); TiO_2; WO_3; photodegradation

Emerging Post-Lithium Batteries: Opportunities in Indonesia

Muhammad Hilmy Alfaruqi[a,b]

[a]*Next Generation Battery Laboratory, Chonnam National Unversity, South Korea*
[b]*Sumbawa University of Technology, Indonesia*

Corresponding author: muhammad.hilmy.alfaruqi@uts.ac.id

Abstract. Lithium-based batteries have revolutionized and become an integral part of modern society. However, these technologies show potential safety, energy density, cost, unsustainable resources, and manufacturing issues. On the other hand, post-lithium batteries have emerged as next-generation batteries to offer several advantages, particularly for a future large-scale energy storage system (ESS). While there have recently been significant developments and investments for lithium-based battery technology in Indonesia, this very moment would also be a good opportunity for Indonesian battery researchers to gradually involve in the development of post-lithium batteries. This report mainly focuses on the development of post-lithium battery technologies, including their electrode materials development. The opportunity for Indonesia to become a global player in these battery realms will also be discussed. This may open more avenues and offer insight into the development of post-lithium batteries in Indonesia.

Keywords: post-lithium battery, secondary battery, next generation battery

Development of 3D Printed Sockets for Unilateral Transtibial Amputees

Abdulhakim Almajid[1,2,a)], Bandar Almeshari[1,2], Jerry Evans[3], Matt Ratto[3,4],
Abdallah Alzeer[5], Eyad Fares Islim[5], Tae Yi[1], Adel Alyahya[1], and Muneer Baig[1]

[1]*Prince Sultan University, P. O. Box 66833, Riyadh 11586, Saudi Arabia*
[2]*King Saud University, P O. Box 800, Riyadh 11421, Saudi Arabia*
[3]*Nia Technologies, Toronto, ON, Canada*
[4]*Faculty of Information, University of Toronto, Toronto, Ontario, Canada*
[5]*Sultan Bin Abdulaziz Humanitarian City, Banban Area, Qassim Highway North Riyadh, Riyadh, 11536, Saudi Arabia*

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Abstract. The research team adopted 3D printing technology to develop a working prosthetic using 3D printing technology that can be considered as a replacement to the current conventional techniques used in the prosthetic industry which are labor-intensive, time-consuming, and expensive to produce. With the advent of new computing technologies, it is deemed important to use other techniques that can overcome some of the drawbacks of conventional ones. The research focused on introducing engineering design and manufacturing concepts using 3D printing technology, to produce prosthetics that can sustain the physical activities of the patient. The research concentrated on the unilateral transtibial prosthetic. The 3D printing process was used to create a three-dimensional model based on a 3D solid model design developed by Computer-Aided Design (CAD) software. There are many advantages to using 3D printers to develop prosthetics. The use of 3D printing in the prosthetic world is promising and it seems the way forward in the prosthetic industry. The research team has developed 3D printed prosthetics for some patients and has assessed the performance of the prosthetic for a certain period. 3D printing offers many additional alternatives in the field of the prosthesis in terms of material, design, color, and appearances. Presently, there are many 3D printable filament materials available in the market. The commonly used 3D printable polymeric filament materials include Nylon, PLA, PETG, and PP. There has been an increasing demand for the development of new materials with improved mechanical properties, especially in the field of the prosthesis. The additional research activities by the research team consist of developing new 3D printable polymeric filaments with improved mechanical properties. The pure 3D printable filament is used as a base material, which is further blended with a high-strength filler material such as Carbon Fibers with suitable additives to improve the mechanical properties of the 3D printed prosthetic. The effect of adding various compatibilizers and stabilizers and their influence on the development of the 3D printable filament is of prime importance and this forms the basis of research activities.

Circular Phosphorus from Sewage Sludge by Combustion or Pyrolysis.

Anita Pettersson[1,*], Naeimeh Vali[1] , Andreas Nordin[1] , Fredrik Niklasson[3] , Anna Strandberg[4], Sana Elbashir[2] , Lars-Erik Åmand[1] and Nils Skoglund[2]

[1]*Swedish Centre for Resource Recovery, University of Borås, Borås, Sweden*
[2]*Department of Applied Physics and Electronics, Umeå University, Umeå, Sweden*
[3]*RISE, Research Institutes of Sweden, Box 857, 501 15 Borås, Sweden*
[4]*Department of Forest Biomaterials and Technology, SLU, Umeå, Sweden*

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Abstract: In recent years, a growing concern about the limited planet's resources and the impacts of greenhouse gas emissions on climate changes has increased. Phosphate rock and phosphorous (P) are together with other elements listed as valuable critical raw materials (CRMs) thus minerals and metals of importance for the European economy because of a high risk for supply shortage [1,2]. The P is among the primary macronutrients for plant growth and plant health, required from the seedling stage to maturity. In addition, P plays a crucial role in complex energy transformations necessary to all living organisms and is a central component of DNA, and is essential for building proteins and other compounds [3,4]. Therefore, to maintain P-based fertilizers' security and sustain the food production chain, developing methods and technologies for P recovery from waste resources has become an essential objective in EU [3]. Sewage sludge produced in the municipal wastewater treatment plants (WWTP) contains large concentrations of P; therefore, a farmland application of municipal sewage sludge (MSS) may be an excellent option for P recovery. However, MSS also contains pollutants as pesticides (DTT, PCB), dioxins, microplastics, resistant bacteria, heavy metals from industries, etc. By thermal treatment of the sewage sludge (like combustion, pyrolysis, gasification, carbonization), all the organic pollutants could be destroyed, and only the metals remain [5,6]. The pyrolysis process may be designed to act as a purification process by separating heavy metals from sewage sludge produced at different WWTPs. In that case, the phosphorous containing residue is converted to a possible soil improver and fertilizer. Therefore, combustion and pyrolysis of MSS is interesting alternatives since they have the advantage of enriching P in the residue. In addition the sludge disposal costs are saved, recovery of energy or valuable chemical products are promoted, harmful organic compounds are destroyed, and heavy metals from the P-rich residue are separated without any complex, costly treatments [7]. In this research both combustion and pyrolysis of MSS were investigated to recover P as fertilizer/soil improver and in the process remove heavy metals as Cd, Hg, Pb, Cu, Ni, Cr and Zn.

Improved Design Solution for Motion Resistance Problem Using Theory of Inventive Problem Solving (TRIZ)

Yeong Sook Yee[1] , Syed Ahmad Helmi[1,2, a)], Muhammad Hisjam[3]

[1] *School of Mechanical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310, Johor Bahru, Malaysia*
[2] *Center for Engineering Education, Universiti Teknologi Malaysia, 81310 Johor Bahru, Malaysia*
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Abstract. Engineers have a lot of difficulties when it comes to solving design problems including technological inconsistencies. Engineers are often faced with design limitations that force them to compromise on certain specifications and requirements. Attempting to address design challenges traditionally has been challenging and has frequently resulted in trial and error. This study aims to improve motion resistance on bin assembly of vacuum cleaner. This study uses the ARIZ tool and the TRIZ technique to develop innovative idea solutions through a systematic problem-solving strategy linked to technical contradiction. According to the study, the incorporation of TRIZ using ARIZ resulted a more competent problem-solving definition and solution generating scheme. Six innovative solution alternatives are generated from this process. Pugh matrix is used to select the top three innovative solutions among the six proposals. Based on Solidworks simulation analysis of these top 3 solutions, Proposal 5 is chosen as the final innovative design concept. Based on this simulation analysis of the Proposal, the structural stress profile has been lowered by more than half, from 613.44N/m2 to 162.59N/m2 . In comparison to the original design, this 73% drop is considered as significant improvement of the motion resistance during bin assembly process.

INDUSTRIAL ENGINEERING

PAPER ID: IE001

Multi-response Optimization in Injection Molding Process of PLA Bone Screw using Taguchi Method and Response Surface Methodology (RSM)

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Abstract. Polylactic Acid (PLA) is one of the biodegradables or bioabsorbable materials, PLA has high tensile strength, modulus, good biocompatibility, which makes it more suitable for load-bearing applications such as sutures, tissue culture, wound closure, and orthopedic fixation. This study aims to obtain the optimal conditions for the combination of factors for PLA material in injection molding experiments to produce the quality of bone screws under the bone screw product specifications. Experiments were carried out using the Taguchi method to obtain a simultaneous optimization process with multi-response cases, namely shrinkage and density. The Taguchi method is done by calculating the S/N ratio to calculate the deviation of the quality characteristics and the objective value (mean). Also, to visually assist the optimal condition of a response, the response surface method is used. Based on the experimental results, the optimal setting level for the Taguchi method is the shot size of 7 mm, melting temperature at 110oC, injection time of 2.5 s, and cooling time of 10 s. Whereas in the response surface methodology method, the optimal level setting in the shot size is 7 mm, the melting temperature is 105ºC, the injection time is 3.5 s and the cooling time is 10 s. Factors that affect the shrinkage response are all factors, namely shoot size, melting temperature, injection time, and cooling time. Meanwhile, for density response there are only 2 factors, namely melting temperature and cooling time.

Link: https://youtu.be/Ve2Ip-Qg39k

PAPER ID: IE014

The Effect of Health Warning Labels on Intention to Repurchase Cigarettes in Surakarta City Using Structural Equation Model Method

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Abstract. In a 2015 Badan Litbangkes Study, Indonesia accounts for more than 230,000 deaths from cigarette consumption each year. Central Java BPS data, the percentage of residents aged 15 years and over who smoked in the last month in Surakarta City in 2020 is 11.72%; 21,80%; 23.12%; and 22.51%. Seeing health cases due to smoking that still need a lot of prevention efforts with the inclusion of health warning labels. Intention to repurchase is a testing goal because previous research has suggested smokers prefer to reduce the number of cigarettes consumed. The approach to solving the problem using the Partial Least Square – Structural Equation Model (PLS - SEM) method. SEM testing results, significant positive factors directly and indirectly on the decline in intention to repurchase, namely attitude toward smoking, socio demographics, subjective norms, perceived behavioural control, perceived health risk of smoking, and tobacco package warning labels. The health warning label on PC1 and PH1 "Smoking causes throat cancer" and the health warning label on PC4 and PH4 "Smoking takes my happiness one by one" has no effect on consumers' perceptions of the health effects of smoking and decreased repurchase intention to repurchase. The dimensions of the health warning label displayed on cigarette packs by 40% have no effect on smoking attitudes and decrease the intention to repurchase.

Keywords: Smoking Behaviour, Health Warning Labels, and Structural Equation Model (SEM)

Link: https://youtu.be/f9Da-g9sMyg

PAPER ID: IE016

Regional Innovation Driving Factors Model (Cianjur Regency)

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Abstract. The West Java Provincial Government focuses on innovation as an element in West Java development in the period of 2018-2023. The elaboration of the development vision resulted in the formulation of the Regional Innovation System (SIDa) for each region in West Java, including Cianjur Regency. One of the activities at SIDa Cianjur that has been carried out in 2019 is an innovation competition. Based on the evaluation of the competition, it is known that the level of participation of the people of Cianjur is very low. This indicates that the level of enthusiasm for innovation is still low in the Cianjur community. This study aims to determine the relationship between the attitude towards innovation and knowledge awareness on the enthusiasm for innovation in the people of Cianjur Regency. The research data collection was carried out on the people of Cianjur Regency with a sufficient number of samples of 400 respondents. Data processing is carried out using a structural equation model with testing on the measurement model and structural model. The results of data processing show that knowledge awareness is a factor that is positively and significantly related to the enthusiasm for innovation in the Cianjur community. Based on this, the low enthusiasm for innovation in the Cianjur community can be caused by the lack of awareness of the importance of the innovation process. Activities are needed to increase awareness of the importance of innovation in the Cianjur community.

Keywords: Attitude towards innovation; Knowledge awareness; Enthusiasm to innovate; Regional innovation

Link : https://youtu.be/-Tv7Xbi4VkE

PAPER ID: IE017

Integration AHP and MOORA for Sustainable Supplier Selection During the COVID-19 Pandemic Era: A Case Study

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Abstract. The global COVID-19 pandemic had a complex impact on the supply chain system. Manufacturing companies always strive to be able to face corporate competition and become superior with one of them through selecting the right supplier. Suppliers have the highest risk in a company, especially during the COVID-19 pandemic era, but with the correct selection of suppliers, the company can provide strength in global competition. The purpose of this research is to be able to solve the problem of sustainable supplier selection in a garment industry in Indonesia during the COVID-19 pandemic through the integration method between AHP and MOORA. AHP as a method that has been proven in many studies, in this study is used to determine the weight of each criterion. Furthermore, MOORA as a method that has good selectivity in choosing the best alternative will be used in the selection process. 12 criteria with 5 alternatives are used to determine the best supplier. The contribution of this research is the integration of the AHP and MOORA methods and the determination of important criteria in the era of the COVID-19 Pandemic. The results show that the criteria for the area with the level impact of COVID-19 (C12) have the greatest weight and supplier 3 becomes the first ranked supplier or the best supplier. The integration method between AHP and MOORA is easy to use and can choose the right sustainable supplier during the COVID-19 pandemic.

Keywords: AHP, MOORA, Pandemic COVID-19, Sustainable Supplier Selection

Link : https://youtu.be/ROU_lWpr45s

PAPER ID: IE021

Assistive Technology on the SS1-V1 Weapon Stock to Support Shooting Stability for DEPOHAR 50 - TNI AU

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Abstract. Depo Pemeliharaan 50 TNI AU (Depohar 50) is a unit in the maintenance of the Air Force Radar Alutsista. Soldier practice in the Depohar 50 unit is always carried out even though shooting exercises are carried out several times a year, resulting in a low average score. This study involved five soldiers with a standing shooting position and using SS1-V1 weapons. Each soldier fires three shots and the firing time is counted for 3 minutes with a target distance of 100 meters. A quantitative method was applied in this experimental study to measure the recoil energy when the stock of the weapon hit the soldier's shoulder. The stock of the weapon is coated with a pad; in this section a force sensitive resistor sensor (FSRS) is installed to measure the recoil effect due to gunfire. A recoil effect was resulting in reduced weapon stability. Assistive technology or better known as a recoil pad is a necessary tool to help maintain weapon stability. This step is to identify the need for recoil pads that have the potential to use the developed material. Three commercially available recoil pads are tested for their ability to absorb the stresses of impact forces during an explosion. The result can increase the stability of the weapon when a soldier is practicing shooting and increase the average target hit rate.

Link : https://youtu.be/T8-BS3d6FYM

PAPER ID: IE022

Analysis of Implementation of Good Manufacturing Practices (GMP) and Sanitation Standard Operating Procedure (SSOP) in Wet Noodle Production Process

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Abstract. The main characteristics of wet noodle products that determine the quality and limits of food safety are the relatively short shelf life of wet noodle products, 10-12 hours at room temperature because they have a relatively high water content and no hazardous materials such as formalin and boric acid are allowed. The shelf life and the level of risk that may arise require the existence of a processing control in the production process so that it is quality and safe when consumed by consumers. The purpose of this study was to analyze the level of application of the basic feasibility of GMP and SSOP for wet noodle production. This research is a quantitative descriptive study using survey methods in collecting data through observation and interviews with questionnaires through case studies in wet noodle producers SMEs and analyzed by gap analysis tools. The percentage calculation using gap analysis tools for each GMP and SSOP aspect shows that the level of compliance is 69% for the GMP aspect and 75% for the SSOP aspect. Compliance with GMP aspects included in category 2 (50% - 74%), so it can be concluded that the program GMP on SMEs still have to be improved to meet the requirements of the regulation of GMP. While SSOP aspect which is also one aspect of GMP compliance has a value of 75% that fall into the category 1 (75% - 100%), which concluded that the p rogram SSOP on SMEs already meet the requirements of SSOP.

Keywords: Small and Medium Enterprises (SMEs), wet noodles, Good Manufacturing Practices (GMP), Sanitation Standard Operating Procedure (SSOP)

Link : https://youtu.be/HrLOvs8yuC4

PAPER ID: IE029

Selection of Materials for The Prosthetic Liner Using Coconut Water Composite as A Substitute for EV

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Abstract. This research was conducted to analyze coconut water composite as a material that can substitute EVA for prosthetic liner products. According to data from the Ministry of Health of the Republic of Indonesia, there are 2.45% of people with disabilities from the total population in Indonesia. From this percentage, there are 10.26% of people with walking disabilities. Some people with disabilities walk using prosthetic leg as a tool for activities. Many prosthetic users in Indonesia use EVA liners as a medium to reduce pressure between the stump and the socket. EVA is used as a liner product because it can reduce the pain of prosthetic users during activities. EVA is a material made from petroleum. Excessive use of EVA will cause environmental pollution. It is hoped that coconut water composites can be a solution to this problem. According to BPS in 2018, the area of coconut plantations in Indonesia reached 3,417,951 ha. Coconut water is used as the basic material for making composites. Composite research was conducted to determine the physical properties through tensile tests to determine the stress and strain of the material and the method of manufacture of the composite. The factors used in the manufacture of composites are temperature, pressure, and pressing time. The composite tensile strength test was carried out according to the ASTM D638 standard. This study uses a factorial design model to determine the significance value of each combination of factorial and factorial using the ANOVA comparison model. The result of the highest tensile stress from research on coconut water composite is 47.20 MPa. The results of the tensile test showed that the coconut water composite treatment had a higher stress value than EVA.

Keywords: Composite, Tensile Stress, Tensile Strain, *ANOVA*

Link : https://youtu.be/usLlzMNph1k

PAPER ID: IE032

Multicriteria Optimization of 3D Printed Flow Restrictor using Taguchi Method and PCR-TOPSIS for Dimensional Accuracy and Printing Duration

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Abstract. Covid-19 outbreak had a great impact on the demand of ventilator. Thus, researches are concern to find solutions to fulfill the high demand within short time. 3D printing has been one of the promising solutions to build complex structure rapidly. However, to achieve the best quality and optimal production time, a further research is needed. In this research, an experiment of 3D printed flow restrictor with various parameters is observed. PLA (Polylatic Acid) is chosen as the filament with 4 responses which are length, inside diameter, outside diameter and printing duration. The experiment is designed based on Taguchi method, since there are 4 responses the PCR-TOPSIS method is used to obtain the optimum parameter setting. Then, the confirmation experiment is required to verify that the parameter is valid and optimal. The result of this research which is the optimum parameter are 225°C nozzle temperature, 75% infill density, and 0,1 mm layer height.

Link : https://youtu.be/eSVB4LdL3t4

PAPER ID: IE033

Manufacturing Green Hybrid New Material Made from Rice Husk Ash, Sugar Cane Bagasse and Reinforced Glutinous Glue as Noise Absorption

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Abstract. For those who live in urban areas or on the outskirts of urban areas, they feel the declining quality of health due to the impact of environmental noise from increased mobility and industry. Engineering materials for their homes to protect and reduce exposure to environmental noise is becoming important. House wall materials are needed in the ability to absorb sound and good air insulation effect. One of them is fibrous material as a natural material and is effective in reducing sound compared to synthetic materials. The material for noise reduction in this study was made from a mixture of bagasse and rice husk ash with glutinous glue adhesive. The purpose of this research is to make a composite from a mixture of bagasse and rice husk ash with glutinous glue as a new green hybrid material for noise absorption in a room. The pultrusion method was used in the manufacture of specimens with random fiber orientation, the ratio of the percentages of the volume variation fractions of bagasse and rice husk ash were (70:30), (50:50), (30:70), core thickness 1.5 cm and compaction. 3, the input frequency is 10KHz. Mix of glutinous glue adhesive as much as 10%, 12.5%, and 15%. The test results showed that there was a difference in noise absorption for each specimen variation between the volume fraction of fiber and glutinous glue adhesive to the value of the noise absorption coefficient. Materials that have a good noise absorption coefficient on compaction specimens 3:4, 2.5 cm thick at a frequency of 4.8 KHz of 0.58 with a class D category (highly absorbent) in the range of 0.40 to 0.64 based on ISO 11654: 1997.

Link: https://youtu.be/Ko3jQmwAvao

PAPER ID: IE034

Power Efficiency Analysis by Using UBEC for Prosthetic Hand

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Abstract. The prosthetic hand is an amputee hand disability aid. Assistive devices can make it easier for people with hand disabilities to carry out their activities to carry out daily activities. Research on prosthetic hands at the P3 UNS Laboratory has been going on for a long time, but the batteries used in prosthetic hands are wasteful when used. This study analyses the prosthetic hand's power supply using power analysis on DC voltage when moving the finger. Data collection by measuring the voltage and current on the prosthetic hand system. The results of the power analysis on the prosthetic hand, the UBEC regulator has several advantages over conventional regulators, namely being able to stabilize the voltage supplied to the system despite changes in load.

Link : https://youtu.be/-BgIvNtf1Hg

PAPER ID: IE035

Implementation of Lean Six Sigma Reducing E-DOWNTIME Waste and Proposed Improvement of Flooring Board Production at PT. LBB

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Abstract. Exports are crucial to support the country's economy during pandemic. The important requirements for export competition are the conformit of the product with the standards of the destination country and improving the quality of the product. PT. LBB as an industry that produces and export flooring boards has quality problems where there is a lot of waste that will be solved using lean six sigma method. There are nine wastes identified at PT. LBB called E-DOWNTIME waste. The nine wastes have a sigma value range of 2.74-4.83 sigma and there are interrelated wastes. The selection was made using a priority matrix and resulted the most critical waste was defect. Each type of defect at PT. LBB analyzed by fishbone diagram followed by FMEA. The results were down grade and rejected defects had the highest RPN values, 426.67 and 320 points because there were knots or bores, chipped, and holes that pass quality control due to negligence of quality control officers. However, wood detection equipment is very expensive with a range of hundreds to billions of rupiah. For this reason, a proposal for improvement using poka yoke method is given by making a simple defect detection device using arduino nano to detect knots, bores, and chips on the wood surface before entering the next advanced production process. After testing, it was found that this simple tool was able to correctly detect 75% of sample. The tool, which costs only IDR. 300.000, can be further developed and can be integrated with manual sorting by quality control officers to improve defect prevention.

Keywords: Defect, E-DOWNTIME Waste, Lean Six Sigma, Simple defect detection tool

Link : https://youtu.be/vi6pufOTf3Q

PAPER ID: IE036

Formulating Strategic Purchasing Strategy: A Case Study

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Abstract. This research aims to formulate a strategic purchasing strategy in a manufacturing company. A case study was conducted in PT DIM, which is located in Indonesia. The company's core production is in the manufacturing of components for turbine engine, such as guide vanes, canesters, turbine water filters and also make portable turbine maintenance machine. Due to pandemic situation happened in 2020, the company experienced a significant decrease in net income by 63%! The company decided to cut the budget for purchasing activity by 80% and obviously, this policy affected the company's image in the eye of the suppliers. Therefore, a strategic purchasing strategy is needed for the sake of the company. To formulate the strategy, several steps proposed in this study. The first is identifying valid indicators for supply risk dimension, profit impact dimension, and supplier selection using content validity index. The analytic hierarchy process then was used to calculate the weights for each valid indicator. The selected items were then plotted on the Kraljic matrix. Before doing so, the technique for order performance similarity to ideal solution (TOPSIS) was used to identify the coordinate points for each item. Strategies according to each quadrant in the Kraljic matrix were derived; then, the decision-making tree laboratory (DEMATEL) was used to prioritize valid supplier selection criteria. The result of the criteria of supplier selection for strategic items are reputation, quality, and current customer feedback; and for bottleneck items are cooperation, flexibility, and delivery performance.

Link : https://youtu.be/QwNQ4ethvR0

Rice Husks and Baggase as Composite Materials Characterized by Heat Resistance

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Abstract. The use of natural fibers has the potential to replace the synthetic fibers as composite materials. Rice husks and baggase waste can be found in nature. The fiber has the potential to be a heat resistance composite. In this study aims to evaluate the composition factors of composite materials and particles size. This study using 3 compositions of material, among others 50% of rice husk and 50% of baggase; 40% of rice husks and 60% baggase; 30% of rice husks and 70% of baggase. And 3 levels of factors in particles size is used in this study, there are mesh 10, mesh 20, and mesh 30. The method that used in this study is factorial design completely randomized design experiment. The conductivity thermal testing using thermal conductivity machine. The result of the experiment is that each factors affect the heat resistance value. The highest heat resistance value is 20,393 °C/W which made from 30% of rice husks and 70% baggase with perticles size mesh 10

Keywords: Heat Resistance Value, Rice Husks, Baggase, ANOVA

Link : https://youtu.be/VnJQGGUIsWc

PAPER ID: IE041

Development of Ceramic Jewellery Industry in the form of necklaces with Indonesian Batik motifs

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Abstract. Naruna Ceramic Studio (NCS) is a company located in salatiga city, Central Java, Indonesia, engaged in the innovation and manufacture of handmade ceramic products. Presently, the company has carried out various studies to accelerate production by converting conventional technology into CARESystem technology in the manufacture of Jewellery Ceramic to meet the multiple needs of consumers in the market. Therefore, this research aims to determine the utilization of CARESystem technology to increase the capacity and time allocated to the production of jewelry in NCS using the Indonesian batik pattern. The design and optimization processes were carried out using CAD technology, PowerShape 2019, and CAM Rhinoceros 4.0, respectively. Furthermore, PowerMIll 206 software was used to obtain NC-code, while CNC retrovit engine was used to determine the machining process on CV. SIBAD Engineering. The combination of machining toolpath strategies can speed up the production process time to meet the production capacity in NCS. Post-processor Mach 3 in PowerMILL 2016 software supports CNC retrofit to get detailed, accurate, precise, and consistent textures and ornaments, thereby meeting the NCS consumer demand for jewelry ceramic products.

Keywords: Manufacturing industry, creative economy, Jewellery Ceramic

Link : https://youtu.be/uByIxzIWDKY

PAPER ID: IE048

Design of Work Aids on Temporary Storage Stations Based on Karakuri Kaizen Principles (Case Study: Industri Tahu Sari Murni)

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Abstract. Industri Tahu Sari Murni is a Micro, Small and Medium Enterprises in Surakarta that produces tofu. This industry was founded in 1984. The production line includes soaking, washing, grinding, boiling, washing, curing, molding, temporary storage, cutting, storage and final storage. The temporary storage process has non-ergonomic body posture, such as bend down and looking up repeatedly for a long time. The repetitive and poor body posture are the main problems that lead to the possibility of musculoskeletal disorders (MSDs). The probability of the occurrence of MSDs is high as indicated by the REBA analysis with a result of 9 which means it has a high risk and requires repair as soon as possible. In addition, according to the analysis of the Nordic Body Map questionnaire, it has an average of 72,250 which means it has a high level of risk so that immediate action is needed to avoid the risk of injury. A study must be carried out on the rack at the temporary storage station to improve the employee's working posture. Karakuri kaizen used to make some design of the new rack. The selection of the 2 designs that have been made is using TOPSIS method.

Keywords: ergonomics, work posture, REBA, Nordic Body Map, anthropometry, karakuri kaizen

Link : https://youtu.be/9TyHZF0xBuI

PAPER ID: IE049

Multiresponse Optimization on The Process of Roof Tiles Manufacture Using The Taguchi PCR-TOPSIS Method

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Abstract. Most people on Java Island in Indonesia use roof tiles as roofs for their buildings. The advantages of tile include the availability of various models, cheaper price, light weight, easy installation process, absorb heat, low noise when exposed to rain, and durable. Most of the tiles produced by small and medium industries have not met the quality requirements. This research was conducted to improve the quality of roof tiles, among others, by adding glass powder and wood ash as the additional materials in the making process of roof tiles. At average, glass powder and wood ash contain of silicon dioxide of about 85% The silicon dioxide is an important substance to increase the strength of the tile. Beside those two materials we also consider the position of the tile on the kiln as the factors in this research. Meanwhile the responses measured in the study were compressive strength, visual testing, water absorption test, and water permeability test. Taguchi method is used to improve the product quality and production processes with high efficiency in both cost and the number of treatments. PCR-TOPSIS Multiresponse Optimization Method was used to determine the optimal setting of the process parameters. From the optimization results, the optimum combination of level factors is $A_1B_1C_1$ (4% of glass powder, 4% of ash, and first level of the kiln placement).

Link: https://youtu.be/k6F73iQ3aW8

PAPER ID: IE050

Warehouse Design under Class-Based Storage Policy Based on Entry-Item-Quantity Analysis: A Case Study

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Abstract. In an effort to minimize the impact of unpredictable demand, the company will make an inventory policy. The warehouse as a place for storing goods before being distributed to consumers has an essential role in ensuring supply sustainability in the supply chain system. Many problems occur in the warehouse which causes a decrease in warehouse performance which has an impact on the company's operations. One of the things that play an essential role in increasing the efficiency of warehouse operations is the warehouse layout design. Class-based storage policies are used to regulate the procedures for storing goods into 3 classifications. Classification is obtained based on Pareto's law by considering the level of storage and retrieval activity. Entry-Item-Quantity (EIQ) analysis is an analysis that involves three main factors of logistics distribution, namely, E (Order Entry), I (Item), and Q (Quantity) which is applied to further analyze frequently ordered products, so that it can support the layout warehouse. UD. XYZ is a distributor that sells many kinds of materials for roofs. This study considers determining the number of racks needed by Entry Item Quantity-Class Based Storage analysis. Furthermore, this study will compare the warehouse layout based on IK, IQ, EN, and EQ. It aims to obtain the best improvement in the warehouse layout that has the smallest expected distance. Based on the analysis that has been done, the warehouse shall provide 14 type 1 racks and 16 type 2 racks. The smallest expected distance, the best warehouse layout design. EQ analysis results in the best warehouse layout design.

Keywords: Class-Based Storage analysis, EIQ analysis, EQ analysis, warehouse.

Link : https://youtu.be/WAsCfVKPedY

PAPER ID: IE060

A Game Theory Model of Salt's Price Stabilization Using Warehouse Receipt System

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Abstract. In Indonesia, salt production is fulfilled by PT Garam and salt from farmer. Salt from farmer contributes 87,9% for the total of National Salt Production. From the proportion, it can be concluded that salt from farmer has a bigger contribution for the National salt production. However, salt from farmer mostly produced traditionally which still depends on condition of weather that causes supply disparity and price fluctuation. To overcome this problem, Government completes The Law No 9 of 2011 about warehouse receipt system (WRS). Previous researchs has proven that warehouse receipt system (WRS) is able to maintain price stability of commodity with several distribution scheme such as monopolistic distribution scheme and controlled wholesaler distribution scheme. This research is aimed to discuss which disctibution scheme can give more benefits to Farmer. Game theory is used to analyze interactions between Farmer and Warehouse in application of warehouse receipt system (WRS). Farmer and Warehouse strategies are built based on the monopolistic and controlled wholesaler WRS schemes. Result of this research shows that game theory is able to describe the interactions between Farmer and Warehouse in application of WRS. From this research, it can be concluded that monopolistic distribution of WRS scheme gives more benefit with payoff IDR 58.090.962.000 for Farmer and IDR 11,122,735,000 for the Warehouse.

Keywords: Salt Farmer, Supply Disparity, Price Fluctuation, Warehouse Receipt System, Game Theory

Link : https://youtu.be/UPNKvKnQP04

PAPER ID: IE064

The Optimization for CNC Turning Process of Aluminium 6061 Using Taguchi Method to Minimize Energy Consumption

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Abstract. Industrial sector used most of the world's total energy, that much of the amount used of energy has negative impacts for the environment. According to the Paris Agreement, limits in the increase of earth's temperature at $1.5^{o}C$ to $2\ ^{o}C$ and it is not in accordance with Indonesia's increasing temperature at $3^{o}C$ to $4^{o}C$. This can be overcome by reducing the energy consumption, especially in industrial activities such as CNC turning process. The energy reduction of CNC turning process can be done by implementing sustainable manufacturing. This study aims to determine the optimal process parameters for CNC turning process in minimizing the energy consumption which directly related to the reduction of environmental burden using Taguchi method. The material used in this research is Aluminium 6061 which widely used in many applications. This study resulted the optimal process parameters for spindle speed at 1,500 rpm, feed rate at 3 mm/rev, and depth of cut at 2 mm.

Link : https://youtu.be/326HJ57My6w

PAPER ID: IE065

Measuring User Experience of a Decision Support System for Operating Room Scheduling Using the User Experience Questionnaire

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Abstract. Operating room scheduling has an important role in providing on time services and ensuring a balance in the use of resources in hospital. Currently, operating room scheduling at Surgical Unit in Universitas Sebelas Maret Hospital is still done manually, which causes the scheduling are not optimal. To overcome this problem, a Decision Support System (DSS) for operating room scheduling was developed based on the optimization model. The developed DSS allows to generate a better schedule with shorter time and the scheduling results of the patients and the usage of each operating room are distributed evenly and meet with the objectives and the constraints of the model. This research is aimed to evaluate the developed DSS by measuring its user experience. A good user experience is a key to successful product development. Measuring user experience is carried out by using a User Experience Questionnaire (UEQ). The benefit using UEQ are fast in measuring, easy to use, and all materials required to work with are free of charge. The user experience result from the developed DSS give a positive evaluation for each scale. The developed DSS has a good user experience when compared to other products based on benchmark tests on the UEQ.

Keyword: Operating Room Scheduling, Decision Support System, User Experience, UEQ.

Link : https://youtu.be/7YzSILxVtqc

PAPER ID: IE072

Consumer preferences of electric motorcycles in Indonesia: A choice-based conjoint analysis

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Abstract. The ambition of Indonesia's government to improve technology and reduce CO_2 emissions through electric motorcycles has been compiled into several programs and policies. However, the growth of adoption of it is slow. Therefore, a study was conducted to see the intention to use electric motorcycles so the process can run properly. This study developed an adoption model considering technical costs and purchase intention factors through an online survey involving 304 respondents, comparing battery-electric motorcycles, electric conversion motorcycles, and internal combustion engine motorcycles. Choice-Based Conjoint (CBC) Analysis is used to measure consumer responses by presenting how consumers make decisions. The results showed that the majority of respondents are interested in using electric motorcycles, with specification charging duration of 0-10 minutes, a maximum range of 70-100 km, a maximum speed of 40-60 km/hour, has accessibility to charging at home, and has energy costs in the range of Rp 15-50 /km. This study also described the distribution of consumer segmentation of electric motorcycles in Indonesia, which could be used as a reference for electric vehicle manufacturers and distributors to adjust product sales according to the needs of prospective consumers.

Keywords: internal combustion engine motorcycles, electric motorcycle, adoption model, Choice-Based Conjoint, consumer segmentation

Link: https://youtu.be/xTexXCHwfKI

PAPER ID: IE075

The Optimization of Polytetrafluoroethylene (PTFE) Cutting Parameters for Minimizing Energy Consumption in CNC Turning of Using Taguchi Method

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Abstract. PTFE is one of the important materials in the manufacturing of various products. This material is widely used in various fields because of its lightweight, corrosion resistance. Materials with good machinability require little energy to cut, less processing time, and tools. Along with the development of machining technology that requires high accuracy and precision, the development of the turning machine has become a modern machine by involving a computer program whose machine is called CNC turning. The cost required to use a CNC lathe is very high, besides that the machine also consumes a high level of energy 99% of the environment. Reducing the energy consumption of a CNC turning process can be done by implementing sustainable manufacturing. This study aims to determine the optimal process parameters for the CNC turning process in minimizing energy consumption. The method used to minimize energy consumption is the Taguchi method. This study resulted in the optimal process parameters for the depth of cut is 2 mm, the spindle speed factor is 1250 rpm, and the feed rate is 0.5 mm/rev.

Link: https://youtu.be/5HgqBp2uKcs

PAPER ID: IE088

Workload Analysis of Non-Wheat Noodle Production with Standard Time Approach (Case Study: Youngster SME, Subang West Java, Indonesia)

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Abstract. To achieve the non-wheat noodle production process as its expected the production capacity it requires planning, starting from machines, raw materials, labors, production facilities and production standards. One important factor is the regulation of labor requirements according to each workstation's load. The Youngster SME produced non-wheat noodles with a capacity of 12 kg /day, 3 worker were working on it, but there were unbalanced load of the workstations. The high load of work occurred from the forming station to the untangling station. This situation forced the works to be handle by labor from other station. Another problem is that there are employees who complain of musculoskeletal complaints and fatigue experienced due to the high workload. This is presumably because the workload of each labor is not balanced. This study aims to analyze the workload of each workstation and labor in order to obtain optimal labor arrangements. Workload analysis method used time study and standard time calculation. Workload analysis was conducted by recording the production time of each workstation, calculating the cycle time and standard time, finally calculating workload so the optimal number of workers could be proposed. The results showed that the workloads of the weighing station, mixing station, steaming station, noodle forming station, cutting station, winding station, untangling and rewinding station were 3508 seconds, 2886 seconds, 2713 seconds, 10879 seconds, 74 seconds, 1503 seconds, and 6211 seconds respectively. Based on the calculation of the workload of each worker, there was unbalanced workload. The highest workload was worker A which was 16458 seconds, followed by worker C at 6286 seconds, and the lowest workload was worker B with 5030 seconds. After adjusting the work position setting, the workload of worker A decreased to 11018 seconds, and worker C increased to 11725 seconds, so that the workload balance was achieved.

Keywords: Non-wheat noodle, workload analysis, production time

Link: https://youtu.be/qlRtxX3HSmQ

PAPER ID: IE090

Demographic and Behaviour Clustering on Chicken Meat's Seller Using K-means Method

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Abstract. The supply chain for halal chicken meat in Indonesia is a unique and more complex than in other countries since there are so many actors who take a part in each chain. Study on behaviour for breeders, distributors, sellers and customers become essential to be carried out to obtain a comprehensive understanding of the critical point of halal chicken supply chain. The common study only discusses segmentation behaviour on the customer's perspective, while the critical point of halal lies more crucially on the sellers. Therefore, reviewing the sellers becomes important in the halal chicken meat supply chain. This paper presents a computational segmentation of halal chicken meat's sellers using a clustering method. The clustering is based on demographic and behavioural attributes. The essential attributes of demographic cover gender, age, education, selling location, selling quantity, selling duration, and source of chicken while behaviour attributes are adapted from Theory of Planned Behaviour framework that involves knowledge, attitude, intention, and action. Data were collected through a quantitative questionnaire from 249 chicken meat's sellers in Yogyakarta province in Indonesia. K-means cluster is used to group seller with the same interest in attributes and the number of clusters is optimized using the Elbow Method. From the calculation of Elbow Method, there is a sharp decline and shapes an angle between k=2 and k=3, so chicken meat sellers are grouped into three clusters. The composition shows that about 23.2% is included in the apathetic cluster, 45.7% belongs to religious, and 31.1% fits to rationalist. Cluster 1 and 3 have insignificant difference in halal behaviour but not with cluster 2. Based on analysis, the level of education is the most important demographic sub attributes in configuring halal behavioural pattern.

Keywords: K-Means Clustering, Seller, Behavior, Chicken Meat

Link: https://youtu.be/SqgB3ieyMh0

PAPER ID: IE095

Rattan as an Alternative Material for Elementary School Furniture to Support Active Learning

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Abstract. A proper rattan chair and table design may support the elementary school students' active learning activities. Rattan is often used as a furniture material due to its lightweight, long-lasting, strong, and attractive characteristic. Since Indonesia is blessed with large amount of natural resources as well as rattan, Indonesian designers have the privilege to explore or develop it. This study aim to analyze the advantages of rattan furniture design as a local material for active learning activities in elementary school. This study conducted visual experiment and made various chair designs recommended by previous literature and compared them to the chairs usually used in Indonesian elementary schools. In this study, we analyze existing school chairs and develop them into rattan elementary school furniture. The rattan was selected proportionally based on the users. The physical structure of elementary school rattan chair was proposed to be efficient in supporting the learning activities by providing easier mobility.

Link: https://youtu.be/UfMgznGUo0g

Determination of Optimal Distribution Center Location for Covid-19 Pandemic Social Assistance: A Case In South Jakarta

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Abstract. In determining the optimal distribution centre, it is necessary to look at how a product can arrive at consumers in the right amount, the right time and the right target. Similarly, during the COVID-19 pandemic, Jakarta, with all its problems when enacting PSBB (Large-Scale Social Restrictions), distributed social assistance to poor families and affected families. This study aims to determine the optimal distribution centre in the distribution of social assistance in South Jakarta as a case study. The method in this research is to use the Center of gravity method. And the results obtained are at the coordinates (0.02; 0.03) of the Cilandak District Office as the optimal distribution centre. With a minimum cost of Rp 28,869,235, this cost is smaller than the first iteration, which is calculated to reduce costs by 16.73% per one distribution.

Keywords: facility location problem, center of gravity method, distribution of social assistance, Covid-19 Pandemic

Link: https://youtu.be/HgCpxFCY65E

PAPER ID: IE102

The Effect of Furniture Type and Working Position When Drawing with Laptop on Musculoskeletal Pain among Students and The Desk Design Strategy

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Abstract. The present study analyzed undergraduate students' working methods when working on drawing assignments on a laptop to obtain a comfortable table design by considering their working habits. To this end, 155 respondents from different majors were recruited (58 interior design students, 34 Visual Communication Design students, 29 Civil Engineering students, and 13 mechanical engineering students). The data were obtained through observation and deployment of questionnaires to undergraduate students from several universities. The questionnaire consisted of multiple-choice questions and open-ended questions. The questions in the questionnaire explore the students' habits when working on digital drawing assignments using a laptop, the type of their table and chair used for drawing, their position, and pain in certain areas of the body they felt. This study showed that the students' habit, table, chair types, and position affect their pain. The result of this study could be used as a reference to consider the table and chair design that supports their working positions, thus reducing their pain and fatigue when working on drawing assignments. This study recommended a personal table design that supports students' sitting position, both sitting on the chair or sitting on the floor, by considering their habit in order to reduce the pain when working on drawing assignments.

Link: https://youtu.be/bIw9CS-QyHY

PAPER ID: IE103

Cost Analysis of Electric Motorcycle and Conventional Motorcycle With Comparative Method: A Case In Indonesia

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Abstract. The road transport sector usually appears as one of the main sources of air pollution due to high energy intensity and the use of fossil fuels. Electric motorcycles (EV) are getting more attention because these motorcycles are environmentally friendly. The government and several social institutions are working on the development and prospective planning of a de-carbonization strategy oriented towards sustainable transportation. Increasing the use of alternative fuels is one of the iterative approaches to energy planning that will be used later. The acquisition of strong techno-economic data is still a challenge for energy planners, modelers, analysts and policy makers when building their prospective models to support the decision making process. There are several things done by researchers in order to provide a good alternative for consumers. Converting conventional motorcycles (CVs) to electric motorcycles (EVs) is one of the promising options to reduce the negative environmental impact of motorcycles today. Situational factors such as economic factors, size and performance become very important for motorcycle buyers in their motorcycle choice. The researcher wants to explore the total cost of consumers to investigate the possible differences between the costs incurred in using conventional motorcycles and electric motorcycles. The comparative method reveals that the calculation can be one of the challenging considerations for consumers because it can predict future conditions and potential that will be accepted by consumers. From this research we will get the optimal choice for consumers in choosing a motorcycle.

Keyword: Cost Analysis, Electric Motorcycle, Comparative Method

Link: https://youtu.be/nGQwIb9XeJI

PAPER ID: IE107

A Cooperative Manufacturer-Retailer Inventory Model with Carbon Tax Regulation, Imperfect Production, and Rework

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Abstract. In this paper, a mathematical inventory model is formulated for a supply chain system composed of single manufacturer and single retailer. Market demand is probabilistic in nature and replenishment lead time is formulated by addressing production time and shipment time. A hybrid system made of a regular production and a green production is used by the manufacturer to produce end products. The manufacturer's production facility is imperfect and produces some defective items when it is in out of control state. The reworking process is operated to improve the quality of defective products. Tax regulation is imposed by the regulator to control the emissions resulting from some activities, namely transportation, storage, rework, and production. We consider a situation in which the emissions from the production and rework, and the number of defective items can be controlled by production rate adjustment. The objective of the proposed model is to minimize the joint total cost by simultaneously determining the number of shipments, shipment quantity, safety factor, production allocation factor, and production rate. An efficient procedure is proposed to obtain the optimal values of decision variables and a numerical example along with sensitivity analysis are presented to show the applicability of the model and to study the model's behaviour. The results show that by allowing the production rate to be adjusted and setting the production factor appropriately, the emissions and the defects resulting from manufacturer's activity can be controlled. In addition, the increasing of the carbon tax and regular's production cost will lead to the increasing of production allocation to greener production.

Link : https://youtu.be/de-12hInI3w

PAPER ID: IE112

Designing an E-commerce Success Factor Model Based on Inputs from Practitioners and Entrepreneurs to Evaluate The E-commerce Website (A Case Study: Magetan Leather Crafts SMEs)

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Abstract. Today, the rapid development of IT and economic globalization have drastically changed consumption patterns and consumer demands, thus encouraging the emergence and development of e-commerce. This situation makes business owners consider customer-centric strategies apart from retail strategies to generate revenue. This study aims to develop a model of measuring tools to improve an e-commerce website for the Magetan leather crafts SMEs. This study employed a model of e-commerce success factors to explain in detail what factors influence the success of an e-commerce. This model was then developed by interviewing practitioners and entrepreneurs involved in the e-commerce business. The final step was to compare e-commerce websites of Magetan leather artisans and e- \commerce websites the authors consider to have been successful in the market. From the results of the data analysis, it could be concluded that there are several attributes which are critical factors in the success of e-commerce websites. After conducting interviews and literature studies on the model, this study showed that Branding, Flexibility, Professional Social Media, Electronic Word of Mouth, Consistency, Support Multi-payment are factors that can be used as references for the success of e-commerce websites. Further research may be conducted by improving the e-commerce website with the proposed model based on answers from customers. The findings of this study provided a measuring tool for achieving a competitive advantage over competitors. This study had managerial implications that can be used by agencies and managers of e-commerce owners, thus suggesting some improvement steps to get the customer market. Here, this study develops a model of e-commerce success factors by considering the unique combination of several factors obtained from practitioners and entrepreneurs in practice.

Keywords: E-Commerce, Success Factors, Small Medium Enterprises

Link: https://youtu.be/SNH8-gHj4C8

PAPER ID: IE113

An Operational Model Design of Leather Bag Consumer Needs to Increase the Sales of Leather Bag Products (A Case Study of Magetan Leather Industry)

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Abstract. The Small and Medium Enterprises (SME) of leather bags in Magetan just used only a small amount of the products of the MSEs of tanning leather. One of the ways to solve this problem is to increase production and sales volume so that more leather raw materials may be absorbed. To increase the sales, a design that suits to the consumer intention is a necessity. For this reason, a research is required to determine the design of leather bags the consumers need. This study was aimed at making an operational model of the consumers' need for leather bags. The basic model used is the Functional, Expressive, and Aesthetic (FEA) consumer needs model designed by Lamb and Kallal. This model was then developed to be used to assess the consumers' needs for leather bags. This development process was conducted by examining what leather bags consumers saw at the reviews of leather bags made by the influencers on You Tube, then it was coupled with inputs from the manufacturers of leather bags. The operational models of consumer needs of leather bags made are expected to help redesign and brand leather bag products so as to increase the sales of finished leather products in the form of leather bags.

Keywords: small and medium enterprise (SME), operational model, sales, leather bags

Link: https://youtu.be/JJftrAm9c78

MECHANICAL ENGINEERING

PAPER ID: ME004

Modeling of a Pellet Biomass Furnace of 200 kW

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Abstract. The usage of renewable fuels, such as biomass pellets, is gaining popularity among the general public since it offers several benefits in both the short and long term. The study's goal was to conduct numerical research on cube-shaped furnaces with capacities ranging from 200 to 300 kW. The air-to-fuel ratio and its influence on speed distribution, temperature distribution, heat flow, and exhaust emissions have been examined as critical elements. For its combustion, ANSYS FLUENT software was used to conduct numerical study with a probability density function technique. The results revealed that the modeling correctly approximated the combustion process with air fuel ratios of 5.4, 7.2, and 9.0, and that the temperature and heat flow findings were supported by the experiment data. Increased air-to-fuel ratios improve combustion efficiency all the way to the furnace's top and center. Depending on the air fuel ratio, the velocity of the gas on the output side ranges from 8.9 to 12.9 m/s. Furnace combustion emissions have also been consistent. The heat rate generated by the furnace is 235-245 kW for a capacity of 75 kg of fuel/hour. Further research to optimize furnace combustion is required in order to increase heat output while decreasing emissions.

Link: https://youtu.be/dXtlMYvwkso

PAPER ID: ME006

Lithium-ion Cylinder Battery Power Cooling: A Review

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Abstract. Electric vehicles (EVs) are an environmentally friendly energy source. One EV application uses Lithium-ion (Li-ion) battery cells. In practice, li-ion operation generates heat which will burden battery performance. Therefore, this review paper will discuss the battery thermal management system (BTMS). There are several methods of BTMS, but this paper review will only focus on air-cooled and liquid-cooled BTMS, where it is still rare to find a comparison of these two cooling methods. The goal is to know about the best cooling method. The results show that liquid-cooled BTMS is superior in uniform temperature distribution but is more complex, and fluid leakage can occur. In comparison, air-cooled BTMS has the advantage of a more accessible system, but the temperature distribution between batteries is less even.

Link: https://youtu.be/cDHxthyGigM

PAPER ID: ME009

Effect of Injection Moulding Processing Parameters on Tensile Properties of Recycled Polypropylene based Composites Reinforced with Bamboo Fibers

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Abstract. This research utilizes recycled Polypropylene (rPP) as a composite matrix with bamboo fiber reinforcement that has been treated with 5% alkaline process for 1 hour. The manufacture of bamboo fiber reinforced rPP composites is carried out using two machining processes, namely the extrusion machine and the injection molding machine. The focus of this research is on optimization analysis using the Taguchi method on the effect of variations in barrel temperature with settings of 165, 170, and 175 °C, molding temperature with settings of 45, 60, and 75 °C, and cooling time. with settings 12, 18 and 24s on the ASTM D638 Type V tensile test object. The results showed that the ANOVA calculation showed that statistically the barrel temperature, molding temperature, and cooling time parameters did not affect the tensile strength response value. However, the results of the S/N ratio show that the temperature parameter at level 1 is 165 °C, the mold temperature parameter at level 3 is 75 °C and the cooling time parameter at 18 seconds where this third level produces tensile strength. with minimal variance to the target value. Responding to tensile modulus, ANOVA shows that statistically the barrel temperature and mold temperature parameters have a significant effect because they have sufficient evidence to reject H0. While the cooling time parameter does not affect the tensile modulus response value. The results of the S/N ratio of the tensile modulus also show the same optimum value as the tensile strength S/N ratio.

Keywords: rPP*,* Bamboo Fiber, Tensile Strength, Taguchi Method, ANOVA

Link: https://youtu.be/3Dy8YhhcscY

PAPER ID: ME010

Effect of Bamboo Fiber Alkalization Treatment on Water Sorption Characteristics and Mechanical Properties of Recycled Polypropylene-Bamboo Composites

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Abstract. Natural fibers are currently attracting many researchers, because of their strong structural properties, low density, and environmentally friendly properties. One of the natural fibers that are widely used is bamboo fiber. In addition, one of the thermoplastic polymers, polypropylene (PP) is the most studied and commonly used because it is relatively light, has a low price, and is easy to recycle. The method used in this research is experimental. The material used is recycled polypropylene (rPP) with bamboo fiber reinforcement. The independent variables used were variations in the alkaline concentration of 0%, 3%, and 5%. This research focuses on the analysis of water absorption characteristics and tensile strength at each variation of alkali concentration. The manufacture of bamboo fiber reinforced recycled polypropylene composites is carried out using Extrusion Molding and Injection Molding machines. The results showed that 5% NaOH concentration had a more optimal value for the diffusion coefficient with a value of 0.019 m2/s compared to 3% alkali concentration which was 0.02 m2/s and specimens without alkali treatment had a value of 0.021 m2/s. Then for the tensile strength of the composite, the 3% NaOH concentration has a more optimal value of 21.1 MPa with 5.8% strain compared to 5% alkali which has a value of 20.9 MPa with 6.4% strain, and the lowest value is in the specimen without alkali concentration with a value of 18.0 MPa with a strain of 4.3%. This implies that in the selection of chemical treatment, it is necessary to pay attention to the right concentration of NaOH for natural fibers targeted for polymer-based composites.

Link: https://youtu.be/ncVb68URAIw

PAPER ID: ME011

Mini Review of Thermoelectric and their Potential Applications in Vehicles

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Abstract. Thermoelectric is a phenomenon of the temperature difference conversion into electrical energy or vice versa. The phenomenon has been developed into a module so that it can be used as a power generator or as a cooling/heating device. The use of thermoelectric can be further expanded as a system for generating small electrical energy and as a component for compact cooling and heating. If a unidirectional voltage is applied to the thermoelectric module, a temperature difference occurs between the two sides of the module. The cold side can be used as a cooler and the hot side can be used as a heater. Thermoelectric refrigeration technology has been applied in various applications such as beverage coolers and electronic coolers. However, the application of this technology in the vehicle still needs attention because it has good potential. Reviews relating to the application of thermoelectric cooling in vehicles are still not widely discussed, especially in terms of vehicles such as the performance of electric motors and braking. So in this study, the use of thermoelectric as coolants in large components such as cooling in electric vehicles and braking components are discussed. Basic knowledge of the history, characteristics, performance of thermoelectric are also covered. Studies that had been carried out in several reported topics prove the potential and reliability of thermoelectric.

Link: https://youtu.be/KFSd_oIt_QM

PAPER ID : ME013

Preliminary Design for Manufacturing and Assembling Bread Dough Mixer Machine

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Abstract. The bread-making industry is currently very developed due to the increasing demand for bread by the community, which is used as an alternative staple food. Large-scale enterprises dominate the bread-making industry. MSMEs (Micro, Small, and Medium Enterprises) are unable to compete because of the use of technology in the dough mixing process. This study focuses on product planning for a dough mixing machine using the Design for Manufacturing and Assembly (DFMA) method. The planning is based on design, materials, analysis, and equipment and manufacturing process planning. In this study, the method used is Action Research, engineering, and used software is the SolidWorks simulation design. The design of the machine can be used for a mixing capacity of 10 kg and a rotation speed of 40 rpm. The results of the design consist of several main parts, namely the frame, container, stirrer, and motor.

Link : https://youtu.be/fSBQMWkfZUo

PAPER ID: ME019

The Effect of Electrospinning Precursor Flow Rate on ZnO Nanofiber Manufacture Using Rotating Drum Collector on Double-Layered Dye-Sensitized Solar Cell Performance

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Abstract. DSSC solar cells are predicted to be energy conversion devices for the next generation, therefore various developments are carried out to improve the performance of DSSC solar cells. A research is conducted in this paper on the process of making ZnO nanofiber as a DSSC photoanode using an electrospinning machine. Direct deposition method is used to spray ZnO precursor solution on conductive glass directly. The rotating drum collector is used to uniform the resulting nanofiber structure. Variations of precursor discharge 2, 4, 6, and 8 µL/minute were used to determine their effects on the morphological arrangement of the resulting ZnO nanofibers. From the results of this study, the highest efficiency value was obtained 2,72% at the precursor discharge variation 2 µL/minute. The uniformity of the nanofibers and the reduction in the size of the nanofibers resulting from the use of a rotating drum collector also increases the overall efficiency value.

Link: https://youtu.be/2-oHmTWpgw8

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PAPER ID: ME028

The Gravitational Water Vortex Turbine: a review and application development

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Abstract. The increasing rate of population growth in Indonesia has resulted in an increase in the rate of energy demand each year. Indonesia has the potential for quite abundant energy sources, one of which is the potential for water energy. The po-tential of water energy is one of the most widely used renewable energy sources and provides a sizeable contribution in the world. Micro hydro and picohydro power plants are quite popular in various countries and are considered suitable for application in remote areas that have a potential source of water energy. The Gravitational Water Vortex Power Plant (GWVPP) is a micro-hydro power plant for low-head and low-flow applications. GWVPP was first developed by Franz Zotlöterer since 2006 to produce surface runoff created in an open space with an orifice located at the bottom of the basin resulting in a water vortex. This paper presents a theoretical review, performance evaluation, and findings of previous research on GWVPP. GWVPP is a relatively new technology in micro hydro power generation. GWVPP works by means of a water vortex induced by a gravitational force which is then absorbed by a Gravitational Water Vortex Turbine (GWVT) which is connected to a generator to produce electricity. In GWVT the water energy hits the blade at the same time, so the active area of the blade is relatively larger. The average efficiency of this GWVT is 53%. Various experimental studies as well as numerical simulations on turbine design and parameters have been carried out to improve their efficiency. Further research is still being carried out by researchers to get the most optimal efficiency. Below, various parameters that affect the per-formance of GWVT are described which are expected to meet the electricity needs of regions in Indonesia.

Link : https://youtu.be/yX5ewiXqe_E

PAPER ID: ME031

Design And Testing Of Thermosiphon Passive Cooling System To Increase Efficiency Of Floating Photovoltaic Array

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Abstract. Temperature increase in photovoltaic (PV) causes reduction of PV efficiency. Some cooling technologies, were proposed by researchers, both active and passive method. However, until now, there is no implementation of PV passive cooling technology intended toward commercial application. The objective of this study is determine performance of the thermosiphon passive cooling system for floating photovoltaic (PV) array. Location selected to conduct experiment was at water reservoir facility of Saguling hydro power plant, West Java, Indonesia. Experiment results shows that floating PV array fitted with thermosiphon passive cooling system has lower module temperature of 41.11°C compared to floating PV array without thermosiphon cooling system, i.e. 49.57°C, and PV on ground temperature of 51.61°C. The lower PV temperature improves electric efficiency of floating PV array with thermosiphon by 11.02% compared to floating PV array without thermosiphon by 7.49%, both relative to ground PV array efficiency.

Keywords: Photovoltaic; Floating PV; Efficiency; Passive cooling; Thermosiphon

Link : https://youtu.be/_lBED9p0DTA

PAPER ID: ME052

Study of Middle Interceptor Implementation on Patrol Boat

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Abstract. Issues regarding energy efficiency issued by IMO EEDI (Energy Efficiency Design Index) encourage researchers to study how to improve ship resistance. Interceptor is one of the performance-improving devices on a planing hull. Interceptor is a vertical plate symmetrically placed on the stern. In this study, the interceptor will be applied to planing hull to understand its effect on drag, trim, and heave. Computational Fluid Dynamics (CFD) will be used in this study, with Navier Stokes equations use DFBI (Dynamic Fluid Body Interaction) 2 DoF motions. The interceptor will be placed in varied positions and angles to observe a ship's characteristics in a calm water condition. The result shows that the interceptor position tends to cause more drag for the ship. That is caused by higher momentum force, followed by higher trim angle, leading to WSA increment. Interceptor installed 4 meters behind midship in 80° angle shows the lowest resistance compared to other interceptor variations used in the present study. Keywords: Patrol boat, Middle Interceptor, Resistance, Trim, Sinkage

Link: https://youtu.be/nb0VwvFz16I

PAPER ID: ME053

CFD Simulation: Study the Effect of Amount Collectors on Photovoltaic Thermal Collector Temperature

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Abstract. The utilization of solar energy began to be widely developed because it is available everywhere and does not run out. Development of solar energy utilization devices by combining photovoltaic (PV) and thermal (T) components so that they can produce electricity and thermal simultaneously. Photovoltaic thermal collectors (PVT) are designed to dissipate heat on the PV surface so as to produce higher electrical energy. In this study, Computational Fluid Dynamics (CFD) simulation of collector design in PVT is carried out using Solidworks 2017. The modeling is carried out on a variety of collectors, namely the number of collectors 5, 10, 15 with edge angles of 90º and 180º to determine the temperature difference of the photovoltaic thermal collector. The use of 15 collectors with an edge angle of 90º has the lowest average temperature of 329.51 K and is evenly distributed. The heat generation rate for each variation of the collector can affect changes in the collector temperature with a P value Anova of 0.48. Meanwhile, the volume flow rate has a P value Anova of 0.03 so that it does not result in temperature changes in each variation of the collector.

Link: https://youtu.be/eJ1TC3eeMfU

PAPER ID: ME054

Simulation Computational Fluid Dynamics: The Effect of Adding Rear Wing Airfoil Eppler 423 Gurney Flap on Speed and Pressure Distribution Value

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Abstract. Fastback car is the type of car that has the smallest wake area which makes the fastback car type the type of car that has the lowest drag coefficient. aerodynamic forces contribute to increasing downforce at the front of the car and reducing downforce at the rear. This disturbs the balance by reducing the yaw angle on the front tires but at the same time increasing the yaw angle on the rear, which causes the car to become unstable. With the installation of a rear wing, it is able to increase the downforce on the rear tires and reduce the yaw angle. The research was conducted by simulating the addition of a rear wing with an Eppler423 airfoil attached to a Gurney flap. The simulation is carried out with 3d Computational Fluid Dynamic modeling to determine the value of the velocity and pressure distribution by varying the angle of attack. The rear wing design will be modified with an angle of attack of 0°, 7.5°, and 15°. The difference in pressure at the top and bottom of the wing creates downforce on the rear wing. The study found that the addition of a rear wing with an Eppler423 airfoil attached to a Gurney flap with an angle of 15º had the highest downforce.

Link: https://youtu.be/vEsAKbGESPI

PAPER ID: ME055

New Operating Mode of Magnetorheological Fluids (MRFs) Simulation Studies with Finite Element Methods for Magnetics (FEMM)

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Abstract. This study aims to observe Magnetorheological Fluids (MRFs) potential in terms of mechanical pressure that arises due to the application of a magnetic field. The research was conducted by simulating using Finite Element Methods Magnetics (FEMM) software. The MRF was placed in a U-type channel, on one side of which a magnetic coil was placed to generate magnetic fields. Observations were made on changes in force due to variations of electric currents of magnetic coil through FEMM simulation. The results have been obtained, and it was found that the force of Y-axis direction that will cause the magnitude of the fluid mechanical pressure in the U-type channel will be greater if the greater the current was given to the magnetic coil.

Keywords: magnetorheological fluids, pressure, current, simulation

Link: https://youtu.be/N_xXvJ7y85g

PAPER ID: ME059

Tensile Strength Assessment of Recycled Polypropylene Filament (rPP) as 3D Printing Material

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Abstract. Most of the plastic waste is actually thermoplastic type and can be printed with 3D print technique. This study aims to evaluate the mechanical properties of specimens made by 3D printing using recycled Polypropylene (rPP) filaments extruded from post-consumer instant noodle (Indomie) plastic packaging waste. The work was initially processing the plastic packaging to be shredded and extruded into the rPP filament. Then, the dogbone samples following the type V ASTM D638-14 standard were prepared by printing the rPP filament in the FDM 3D printer. There are 5 types of rPP filaments used, and each was extruded at a nozzle temperature of 180ºC, 190ºC, 200ºC, 210ºC and 220ºC. As a benchmark, another set of dogbone samples made from the commercial filament of Polypropylene (PP) and Polylactic Acid (PLA) were prepared. All samples were tested through tensile testing to obtain each variant's tensile properties (Ultimate Tensile Strength and Young's Modulus). The results showed that rPP (210ºC) filament has the average value of Ultimate Tensile Strength and Young's Modulus of 20.73 MPa and 806.35 MPa, respectively, the highest among other rPP filaments. The results are also comparable to the commercial PP filament results, while the commercial PLA results are nearly twice the PP results. However, with the increase of extrusion temperature, the deviations of testing results also increase, indicating the increased amorphous fraction in the rPP when extruded at higher temperature.

Keywords: tensile strength, recycled polypropylene filament, 3D printing

Link : https://youtu.be/Cs2zGdMitXQ

PAPER ID : ME062

Performance Comparison of Position and Swing Angle Control System on a Gantry Crane

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Abstract. A gantry crane is a device used for transporting heavy loads in many industrial areas. The device has a crucial challenge in the positioning of the trolley that can reduce work efficiency and cause work accidents. Many studies have proposed to solve that problem using Linear Quadratic Regulation (LQR), Proportional Integral Derivative (PID), and Particle Swarm Optimization (PSO) control methods due to their simplicity and robustness. However, these three methods are required further research to find the performance comparison. This study aims to compare the performance and robustness of LQR, PID-Manual and PID-PSO. This research was conducted by simulating the dynamic model of a gantry crane using MATLAB software. A dynamic model of the 2-D gantry crane prototype is derived using Newton's 2nd Law and the simulation results show that the LQR is better than the PID-Manual and PID-PSO in all performance but with a specific flaw in the rise time value. The LQR controller is also able to maintain the performance of the gantry crane for various conditions, i.e. load mass and cable length variations.

Keywords. gantry crane, linear quadratic regulation (LQR), proportional integral derivative (PID), particle swarm optimization (PSO)

Link : https://youtu.be/mE3vbi2iuEg

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PAPER ID : ME063

Identification of Design Requirements for Noodles Untangling and Cutting Machines on Non-Wheat Noodle Production Line: a QFD Approach

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Abstract. The non-wheat noodles production line was developed to increase productivity. A case study of line balancing was carried out on Aitami SMEs. Aitami SMEs used an extrusion system in the non-wheat noodles production process. There were bottlenecks in the process flow especially on the manual processes of untangling and cutting the noodles which were done by human power. To design the noodle untangling and cutting machine based on the customer's requirements, a preliminary study is required by identifying the design requirements for the machine. The method used in this study is the 1st phase of Quality Function Deployment (QFD) called the House of Quality (HOQ). HOQ is a diagram that connects customer requirements (CRs) with engineering characteristics (ECs). The HOQ is described as a matrix that helps to identify which customer requirements affect engineering characteristics, what the relationship between engineering characteristics (ECs) and the column of weights added below the relationship matrix to indicate which engineering requirement is more important. The HOQ will result in recommendations that should be considered in designing the machine. The data of customer requirements was acquired by the questionnaire. The respondents were those who had practiced or participated in the production of non-wheat noodles. The HOQ analysis revealed that the three highest ranks of ECs were dimension of machine, assembly time, and accuracy with relative weights of 12.3%, 9.8%, and 8.7%, respectively. These ECs will be the main focus of design and critical parameters in the next QFD stage to design the untangling and cutting machines.

Link : https://youtu.be/KSBb-KlP-4Q

PAPER ID : ME066

Mathematical modeling of fluidized bed drying kinetics of unhulled rice in a swirling fluidized bed dryer with bed ratio 1.25

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Abstract. Drying of unhulled rice was investigated at an air temperature set of 45 °C and for 60 minutes. Different masses of unhulled rice (150 gr, 200 gr, 250 gr, and 300 gr) were dried using a swirling fluidized bed dryer. The experiment drying data of unhulled rice were applied for six drying models, namely Lewis, Page, Henderson and Pabis, Logarithmic, Midili et al., and Linear-plus-exponential. The model performance was evaluated by comparing the Root Mean Square Error (RMSE) and the coefficient of determination (R^2) of the experimental and predicted moisture ratios using non-linear regression analysis. The linear-plus-exponential model is the most suitable/appropriate model to describe the drying kinetics of unhulled rice with 0.012930738 of RSME and 0.998794312 of R^2. The lowest and highest values of RMSE and R^2 respectively from a particular model are the best models in predicting unhulled rice drying behaviour.

Link : https://youtu.be/lheWg50PIwE

PAPER ID : ME067

The Effect of Adding Heatsink Cooling with Concentrator on Increasing Photovoltaic Performance

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Abstract. Solar energy is utilized by converting it to electrical energy using solar photovoltaic (PV). Solar energy is absorbed and converted by PV up to 30%. The remaining energy is wasted in the form of heat which raises the surface temperature and causes damage to the solar photovoltaic. So that it can affect the performance produced by solar photovoltaic. Lowering the temperature of solar photovoltaic using a heatsink as a heat transfer medium. The effectiveness of the heatsink is influenced by the air flow so as to facilitate heat transfer. Therefore, the study conducted experiments with the addition of an air concentrator to be installed as a support for heatsink performance in the solar photovoltaic cooling process. The addition of a concentrator at the peak intensity of the solar panel can reduce the working temperature by 4.8^oC. Solar panels with concentrators can increase the maximum power value by 1.45 W and efficiency by 0.38% higher than panels without concentrators.

Link : https://youtu.be/0WiVNg4vlWA

PAPER ID: ME071

Analysis Of Gear Fault Based On Acoustic Signal And Least Square Support Vector Machine

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Abstract. Gear damage is among the faults which are often encountered in the transmission system of a mechanical equipment or a machine. To guard against the occurrence of a catastrophic failure, early fault detection is required to discover the existence of gear damage. The aim of this study is to analyze gear damage using the acoustic signal. The gear data are obtained from five gear conditions. They are normal gear, 25% broken tooth, 50% broken tooth, 75% broken tooth, and missing one tooth gear. The gear data are divided into training and testing data. The training data are employed to set up the classification model and the testing data are utilized to determine the performance of the model. The analysis of gear fault is carried out using a machine learning technique, known as least square support vector machine (LS-SVM). The One-Against-One (OAO) and One Against-All (OAA) multiclass classification strategies are applied in this study. The results reveal that the LS-SVM could be used to analyze the condition of the gear faults with an accuracy more than 95% after using 4 selected features and the OAO strategy give better results than the OAA strategy for analysis of gear fault.

Link: https://youtu.be/2gDv6fFCsKE

PAPER ID: ME073

Natural Weathering on Recycled Polypropylene-Bamboo Fiber Composites

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Abstract. The main objective of this study was to analyze the effect of Natural Weathering on the tensile strength and microstructure of recycled polypropylene (rPP) composites with bamboo fiber reinforcement. The rPP-bamboo composite specimens were made using extrusion molding and injection molding machines. The weight fraction used in the manufacture of the specimens was 10% bamboo fiber and 90% rPP. The rPP- bamboo samples were tested with 3 variations of exposure time, 0 months (without exposure), 1 month and 2 months according to ASTM D1435 standard. Of the 3 variations of exposure, a tensile test was carried out with the ASTM D638 type V standard to evaluate the value of tensile strength, modulus of elasticity and elongation. Furthermore, SEM (Scanning Microscopy Electrone) was performed to see the microstructure of the composite. The results showed that the tensile strength at exposure time of 0 months, 1 month and 2 months was 18.1 MPa with an elongation of 5%, 19.5 MPa with an elongation of 6.4% and 19.3 MPa with an elongation of 6.6%. Young's modulus values showed a decrease with increasing exposure time, ranging from 222 MPa in the sample without exposure to 141 MPa at 2 months of exposure. With SEM it is known that, the microstructure of the composite at the beginning of exposure shows a strong bond between the fiber- matrix even though there are some voids in the specimen. In 2 months of exposure, it was seen that there was a gap between the matrix and bamboo due to the hydrophilic nature of bamboo fiber.

Keywords: Natural Weathering, Recycle Polypropylene, Bamboo Fiber, Tensile Strength, Scanning Electrone Microschophy

Link: https://youtu.be/1hE_Hwgckvw

PAPER ID: ME076

The Effect of Volume, Ball Diameter, and Milling Time through the Ball Mill Process of Corncob

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Abstract. This research was conducted to determine the effect of working volume, ball mill, and milling time during milling process. Ball mill with a capacity of 5 kg was used with various ball mill media with diameters of 10 mm, 20 mm, and combined sizes of 10 mm and 20 mm, respectively. The next variation was the working volume starting from 20, 30, 50, and 70% with milling time of 30 and 60 minutes. Corn cob was the material used in this research. The milling process was carried out at room temperature with an engine speed of 100 Rpm. The working volume produced 70% smaller powder sizes compared to 20, 30, and 50% working volume for 60-minute milling time; while the working volume produced 50% smaller powder sizes compared to 20, 30, and 70% working volumes for 30-minute milling time. For the ball mill variation, a combined ball with diameters of 10 mm and 20 mm was the most effective ball mill at producing a powder with a small size compared to using only a ball with a diameter of 10 mm and a ball with a diameter of 20 mm only.

Link: https://youtu.be/GEQgTPkMwhM

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INTRODUCTION

In the last decade, maize production has increased quite considerably, although it has fluctuated somewhat. In 1989-1993, maize production reached 6.7 million tons/year with a productivity of 2.2 tons/day. In 2003, it reached 9.66 million tons/year, an increase of 1.42% compared to 2002 which was 9.53 million tons/year. In addition, in 2007, the government targeted maize production of 13 million tons/year with a productivity of 3.8 tons/day (1). Corn cobs have only been used as cattle feed or industrial products that have not been reprocessed into something that has high economic value (2). Corn cobs have a lignin content of 15%, cellulose content of 45%, and hemicellulose content of 35%. With its abundance and high content of hemicellulose and cellulose, corn cobs have great potential to be processed into products that are economically valuable (3).

In several studies, corn cobs powder can be used in various fields, for instance, corn cobs powder can be used as a fiber (4); it can be used as a basic material for making bio-plastics (5); it can be used as a substitute for some cement in the manufacture of concrete (6); it can be used as a source of functional chemicals (7); and many more functions of corn cobs powder.

The ball mill process has received tremendous attention for decades because it is effective in reducing material sizes (8)(9). This process has been well applied in practical use for various materials (10). This process has also been combined with other types of processes (11–14). Ball mill is equipment that has an important role in the production sector in an industry. Ball mill is widely used by the industry as a material milling, including cement, silicate products, refractory materials, chemical fertilizers, glass, and ceramics. This mill is highly suitable for materials with high hardness because the work of the ball mill itself grinds the material continuously so that the material is ground until it becomes smooth.

METHODOLOGY

The experimental procedures involve: (i) specimen preparation (including slicing and drying process) and (ii) ball milling process. Figure 1 is shown to clarify the experimental procedures carried out in this study.

Specimen Preparation

Corn cobs, obtained from Sapaya Gowa, are washed, dried, and sliced into small pieces. The first step is washing the corn cobs by using fresh water, then drying the corn cobs for 12 hours in 2 days under the hot sun. After the drying process is carried out, the corn cobs are cut into small pieces with a size of approximately 1 cm to facilitate the milling process.
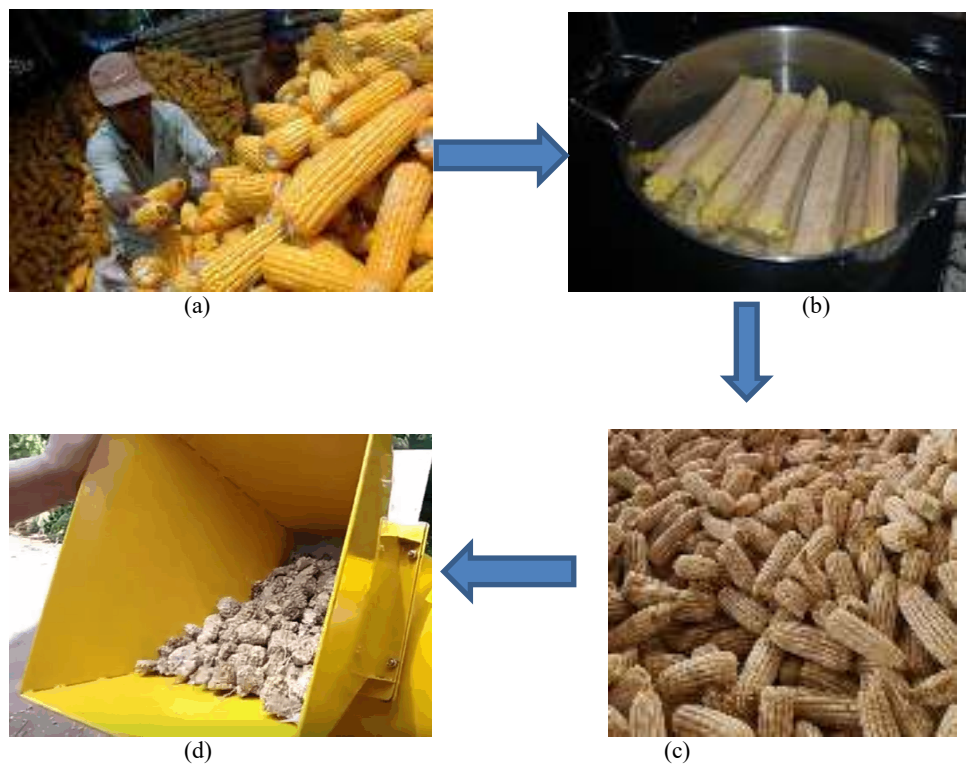

(a) (b)

(d) (c)

FIGURE 1. Preparing specimen process of corn cobs (a) collecting, (b) washing, (c) drying, and (d) cutting

Ball Milling Process

The milling process is carried out by inserting the corn cobs, which have been cut into small pieces, into a ball milling tool. In general, the ball milling tool itself comprises of a cylindrical milling tube (St. 37; diameter = 22.86

cm; length = 38 cm). The ball milling process is carried out at room temperature; the rotation speed of the milling tube is 100 rpm. In this study, the milling time varies from 30, 40, and 60 minutes, then the working volume varies from 20, 30, 50 to 70% and the ball mill sizes are from 10 mm and 20 mm. In addition, to obtain yield, product mass is compared to the initial mass of the specimen. The powder will be filtered by using a sieve with a mesh size of 14, 17, 70, and 140.

RESULTS AND DISCUSSION

In this section, the results of the ball milling of corn cob will be explained clearly and will be accompanied by discussion.

Effect of Milling Time and Working Volume

The distribution of the mesh size and the comparison of the mills for all working volumes can be seen in graphical form. The graphs of mesh sizes of 14, 18, 70, and 140 for working volumes of 20, 30, 50, 70% and milling time of 30 and 60 minutes can be seen in Figure 2 for the graphs of mesh sizes of 14, 18, 70, and 140 for the 60 minute milling time and Figure 3 for the mesh sizes of 14, 18, 70, and 140 for the 30 minute milling time using a variety of balls with a diameter of 20 mm and 10. mm as many as 100 seeds as follows :
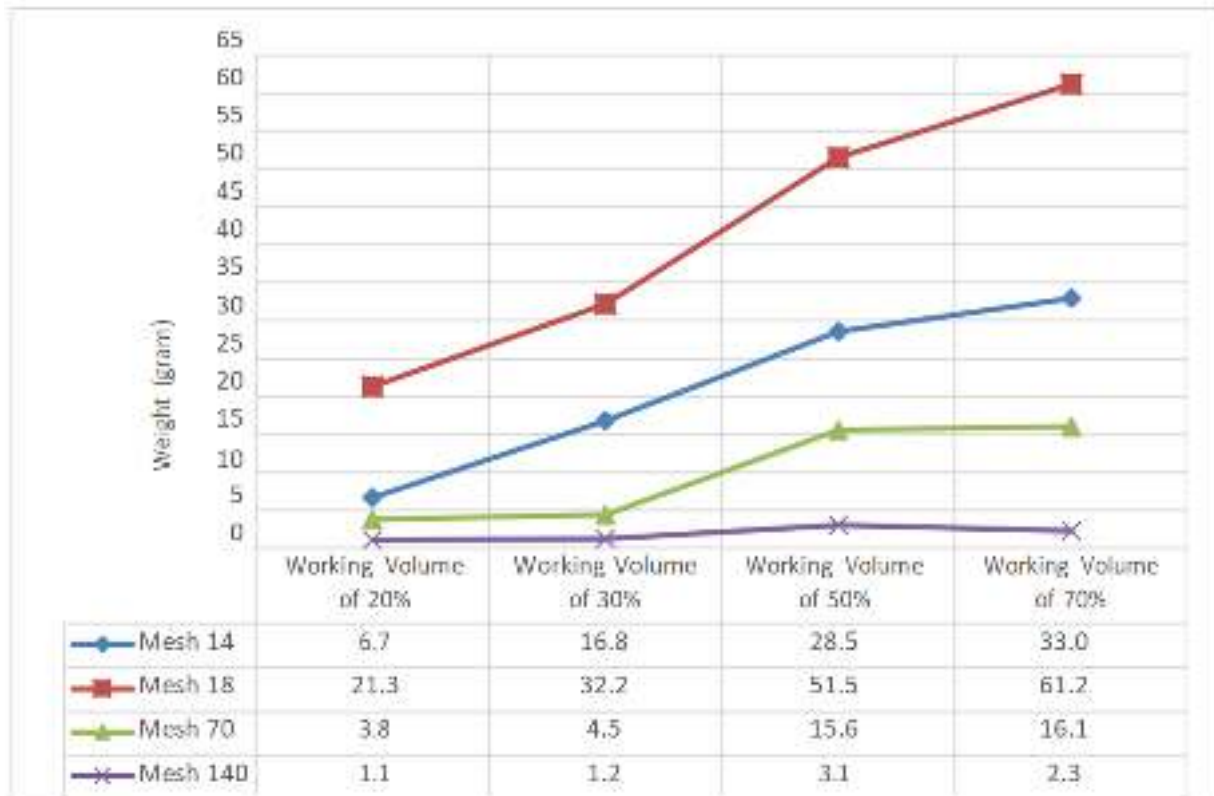

	Working Volume of 20%	Working Volume of 30%	Working Volume of 50%	Working Volume of 70%
Mesh 14	6.7	16.8	28.5	33.0
Mesh 18	21.3	32.2	51.5	61.2
Mesh 70	3.8	4.5	15.6	16.1
Mesh 140	1.1	1.2	3.1	2.3

FIGURE 2. The weight of corn cob after 60-minute milling time for different of mesh sizes and working volume

Figure 2 shows the results of milling with a time of 60 minutes and working volumes of 20, 30, 50, and 70% for mesh sizes of 14, 18, 70, and 140. It can be stated that the increasing working volume at 60 minutes of milling time makes the powder obtained with mesh 14, 18, 70, and 140 also increase. Viewed from mesh 14, at 20% working volume, it produces 6.7 grams of powder, increases in 30% working volume as much as 10.1 grams, then it increases again in work volume of 50% as much as 11.7 grams, and work volume of 70% also increased by 4.5 grams. The average increase in each additional working volume on mesh 14 is 8.7%. For mesh 18, working volume of 20%, it produces 21.3 grams of powder; an increase in the working volume of 30% is 10.9, then it increases again in the working volume of 50% by 19.3 grams, and working volume of 70%, it also increased by 9.7 grams. The

average increase of each additional working volume on mesh 18 is 13.3%. Furthermore, for mesh 70 at 20% working volume, it produces a powder as much as 3.8 grams, increasing at 30% working volume by 0.7 grams, then it increases again in 50% work volume as much as 11.1 grams, and at 70% working volume, it increases by 0.5 grams. In addition, for mesh 140, the working volume of 20% produces 1.1 grams of powder high has an increase in the working volume of 30% as much as 0.1 gram; then it increases again in the working volume of 50% as much as 1.9 grams; the working volume of 70% has experienced a decrease of 0.8 grams due to an increase in the amount of loss or wasted in the filtering process. The average increase in each increase in working volume from 20% to 50% by 1% and a decrease from 50% to 70% by 1.1%. They was performed through ball milling of corn cob in the presence of trace oxalic acid and then treated by the hydrothermal treatment under microwave (15)
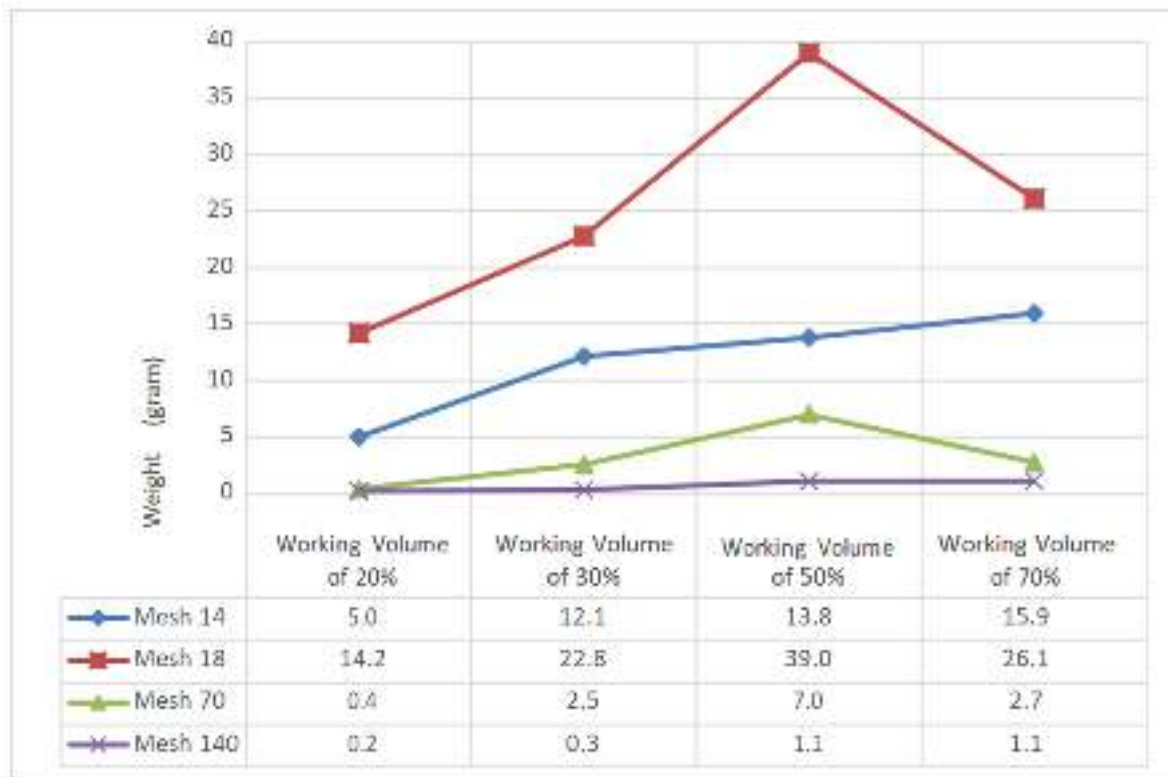

	Working Volume of 20%	Working Volume of 30%	Working Volume of 50%	Working Volume of 70%
Mesh 14	5.0	12.1	13.8	15.9
Mesh 18	14.2	22.8	39.0	26.1
Mesh 70	0.4	2.5	7.0	2.7
Mesh 140	0.2	0.3	1.1	1.1

FIGURE 3. The weight of corn cob after 30-minute milling time for different of mesh sizes and working volume

Figure 3 reveals the milling results with a time of 30 minutes and working volumes of 20, 30, 50, and 70% for mesh sizes of 14, 18, 70, and 140, it can be concluded that 50% working volume is the most efficient for milling time of 30 minutes. If it is viewed started from mesh 14, at 20% working volume, it produces 5 grams of powder, increasing in 30% working volume by 7.1 grams, then it experiences an increase again in 50% working volume as much as 1.7 grams, and at 70% working volume, it also has an increase of 2.1 grams. The average increase of each additional working volume on mesh 14 is 3.6%. For mesh 18, at the working volume of 20%, it produces powder as much as 14.2 grams, an increase in the working volume of 30% is 8.6; then it has an increase again in the working volume of 50% as much as 16.2 grams, and at the work volume of 70%, it experiences a decrease of 12.9 grams. The average increase of each additional working volume from 20% to 50% in mesh 18 is 12.4% and the decrease from working volume of 50% to 70% is 3.3%. Furthermore, for mesh 70 at a working volume of 20% with a milling time of 60 minutes, it produces powder as much as 0.4 grams, increases in 30% working volume as much as 2.1 grams; then it experiences an increase in the working volume of 50% as much as 4.5 grams, and at 70% working volume, it decreases by 4.3 grams. The average increase of each additional working volume from 20% to 50% in mesh 70 is 3.3% and the decrease from 50% to 70% working volume is 0.2%. Besides, for mesh 140 at a working volume of 20% with a milling time of 60 minutes, it produces powder as much as 0.2 grams, an increase in the working volume of 30% was 0.1 gram, then it experiences an increase as well in the working volume of 50% as much as 0.8 grams; at the working volume of 70%, it does not increase or decrease. The average increase of each

additional working volume from 20% to 50% is 0.4%. From the test results, it is concluded that the milling time of 30 minutes on mesh 14 shows a graph that tends to increase directly proportional to the addition of working volume; while in mesh 18, 70, and 140 above 50% of the working volume has decreased, this is due to the free fall motion of the ball in accordance with the collision equation where the height of the fall (h) is lower than the working volume of 50% down. This is in accordance with the collision analysis shown in Equation 1.

$$m \times v = \sqrt{2 \times g \times h} \tag{1}$$

Where:

m = Ball mass (kg)
v = Collusion speed (m/s)
g = Gravity (9,8 m/s^2)
h = The distance between the ball and the corncob (m)

Because the values of *g* and *m* are fixed, what affects the *h* value is the height of the ball, with *h* value being directly proportional to the magnitude of the value of collision velocity (v). The collision speed is influenced by the height of the ball falling according to the above equation which shows that at 50% volume, the value of the fall height (h) is greater than 70%. With an engine speed of 100 rpm, the engine rotates 3000 times. Meanwhile, the 60 minute milling time shows the relation between working volume and milling time which is directly proportional to the powder produced. This is because the machine rotates 6000 times. It can be illustrated in Figure 4.
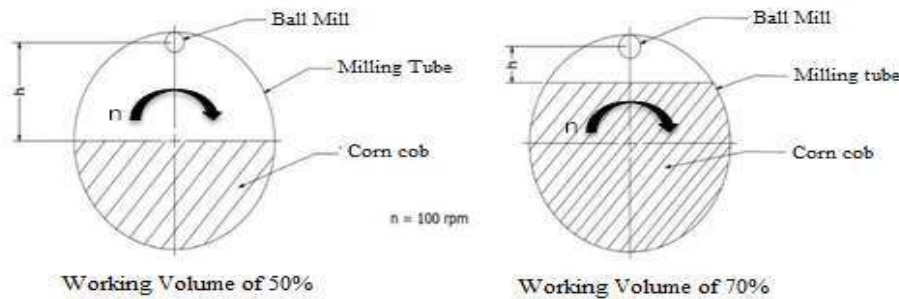

FIGURE 4. Illustration of collision distance for working volumes of 50 and 70%.

Effect of Ball Size

The size of the milling ball is extremely influential on the size of the powder produced. The variation of the 20 mm and 10 mm balls of 100 seeds is more optimal in producing powder with a mesh size of 18 compared to mesh 14, 70, and 140. It is compared to using only 20 mm ball variation and variation of 10 mm ball is more optimal in producing powder with mesh size 14 than mesh 18, 70 and 140. The effect of the milling ball size on the resulting powder is also described in milling rate (16). The milling data using balls with a diameter of 20 mm and 10 mm are shown in Figures 5 and 6.

FIGURE 5. The weight of corn cob after 60-minute milling time using 20 mm ball for different of mesh sizes and working volume
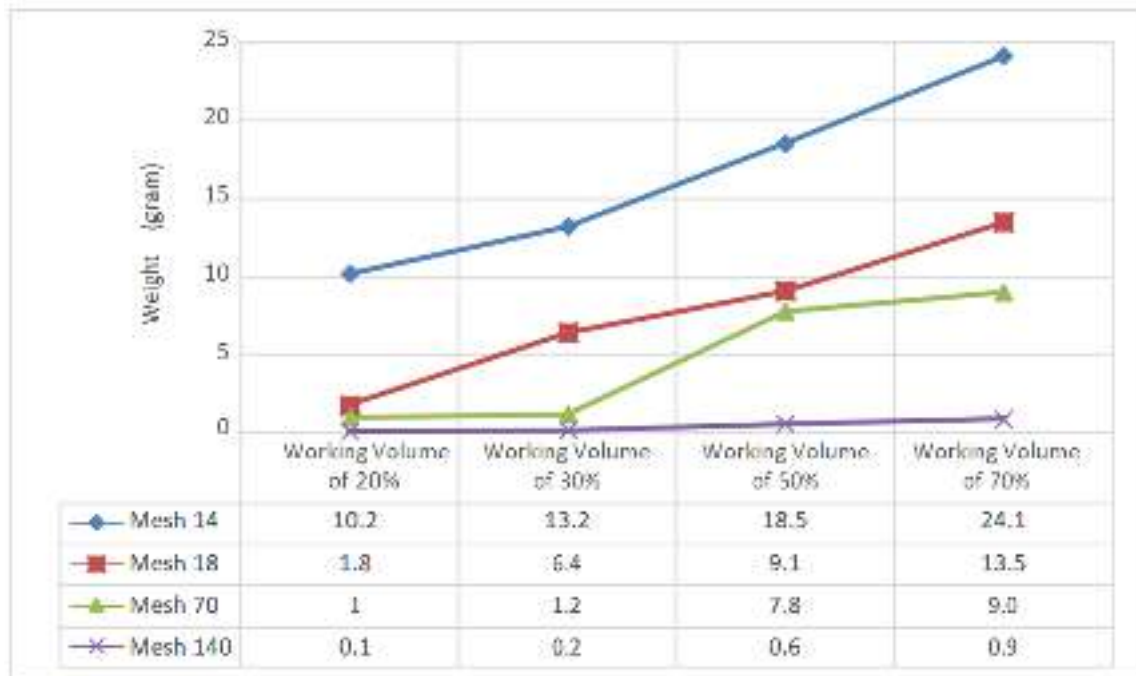
	Working Volume of 20%	Working Volume of 30%	Working Volume of 50%	Working Volume of 70%
Mesh 14	18.6	23.9	38.2	43.1
Mesh 18	4.6	13.9	24.4	31.8
Mesh 70	1.8	2.5	13.5	14.6
Mesh 140	0.5	0.7	1.2	1.8

FIGURE 6. The weight of corn cob after 60-minute milling time using 10 mm ball for different of mesh sizes and working volume

	Working Volume of 20%	Working Volume of 30%	Working Volume of 50%	Working Volume of 70%
Mesh 14	10.2	13.2	18.5	24.1
Mesh 18	1.8	6.4	9.1	13.5
Mesh 70	1	1.2	7.8	9.0
Mesh 140	0.1	0.2	0.6	0.9

From the results of milling using 10 mm and 20 mm balls, respectively, it shows that the most produced powder is powder with a mesh size of 14, then 18, 70, and 140. The increase in the amount of working volume is directly proportional to the increase in the size of the resulting powder according to with the respective mesh sizes. The graph above also proves that the size of the milling ball has a big influence on the size of the powder produced. Other study presents that combination ball milling and ultrasonic pretreatment was efficient method to destroy the corncob structure (17).

CONCLUSION

It can be concluded that the results of Ball Mill reveal that the working volume of 50% produces most powder on mesh sizes of 14, 18, 70, and 140 for 30 minutes of milling compared to the working volume of 20, 30, and 70%. For milling time of 60 minutes, the 70% working volume produces most powder on mesh sizes of 14, 18, 70, and 140 compared to the working volumes of 20, 30, and 50%. It is influenced by the collision speed which is obtained from the height of the fall (h), indicating that at 50% volume, the value of the fall height (h) is greater than 70%. The ball mill will be rotates 3000 times for milling time of 30 minutes when using the speed of 100 rpm,. The working volume of 50% also has a large number of corn cobs compared to the working volume of 20 and 30%; while the 60-minute milling time shows the relation between working volume and milling time is directly proportional to the resulting powder. This is because the machine rotates 6000 times for 60 minutes. The size of the milling ball extremely affects the size of the powder produced. The variation of the 20 mm and 10 mm balls of 100 seeds is more optimal in producing powder with a mesh size of 18 compared to mesh 14, 70, and 140.

ACKNOWLEDGMENTS

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ICIMECE 2021 acceptance notification for paper 76

1 pesan

ICIMECE 2021 <icimece2021@easychair.org>   19 Agustus 2021 22.20
Kepada: Rusdi Nur <rusdinur@poliupg.ac.id>

Dear Rusdi Nur, Ahmad Nurul Muttaqin, Baso Nasrullah, Dermawan Dermawan

We are pleased to inform you that the paper entitiled " The Effect of Volume, Ball Diameter, and Milling Time through the Ball Mill Process of Corncob " , submitted to the 7thInternational Conference on Industrial, Mechanical, Electrical and Chemical Engineering (ICIMECE 2021) has now been accepted and you are invited to attend the conference virtually to present your paper.

- Review Remarks from the reviewer can be found below
- Review Remarks from similarity check and formatting check will be sent to you immediately
- Please resubmit revised full paper through easychair system before August 30th, 2021
- The registration fee can be paid via Virtual Account that can be found in conference web
https://icimece2021.ft.uns.ac.id/index.php/registration/

Within this email, on behalf of the committee of ICIMECE 2021, We would like to kindly remind you that this conference will be held virtually due to the global pandemic situation.
For that reason, all participants are required to submit a powerpoint file (PPT) and a recorded presentation in the format of video by September 5th, 2021.

Details of the format of the video can be seen in https://icimece2021.ft.uns.ac.id/index.php/video-ppt-submission/

Your interest in ICIMECE 2021 is very much appreciated.

We are looking forward to meeting you at the conference.

SUBMISSION: 76
TITLE: The Effect of Volume, Ball Diameter, and Milling Time through the Ball Mill Process of Corncob

----------------------- REVIEW 1 --------------------
SUBMISSION: 76
TITLE: The Effect of Volume, Ball Diameter, and Milling Time through the Ball Mill Process of Corncob
AUTHORS: Rusdi Nur, Ahmad Nurul Muttaqin, Baso Nasrullah and Dermawan Dermawan

----------- Topic -----------
SCORE: 4 (good)
----------- Abstract -----------
SCORE: 2 (poor)
----------- Goal -----------
SCORE: 2 (poor)
----------- Structure -----------
SCORE: 2 (poor)
----------- Tools and Methods -----------
SCORE: 3 (fair)
----------- Discussion and Conclusion -----------
SCORE: 4 (good)
----------- Literature and References: -----------
SCORE: 2 (poor)
----------- Author´s knowledge -----------
SCORE: 3 (fair)
----------- Length -----------
SCORE: 3 (fair)
----------- Figures and Tables -----------
SCORE: 3 (fair)
----------- Writing style -----------
SCORE: 2 (poor)

----------- Reviewer comment -----------
The manuscript need to undergo major corrections to satisfy the minimum standards of a scientific paper. There are no keywords in the abstract, the objective is not specifically mentioned in the introduction, the methodology are not clear and coherent to the objective (as there are no mentioned objectives), some figures are attached but never specifically mentioned in the text. The references are mostly outdated as only 3 references dated from 2018 out of 14 references.
----------- Recommendation -----------
SCORE: 0 (borderline paper)

---------------------- REVIEW 2 --------------------
SUBMISSION: 76
TITLE: The Effect of Volume, Ball Diameter, and Milling Time through the Ball Mill Process of Corncob
AUTHORS: Rusdi Nur, Ahmad Nurul Muttaqin, Baso Nasrullah and Dermawan Dermawan

----------- Topic -----------
SCORE: 4 (good)
----------- Abstract -----------
SCORE: 4 (good)
----------- Goal -----------
SCORE: 3 (fair)
----------- Structure -----------
SCORE: 4 (good)
----------- Tools and Methods -----------
SCORE: 4 (good)
----------- Discussion and Conclusion -----------
SCORE: 4 (good)
----------- Literature and References: -----------
SCORE: 4 (good)
----------- Author´s knowledge -----------
SCORE: 4 (good)
----------- Length -----------
SCORE: 4 (good)

----------- Figures and Tables -----------
SCORE: 3 (fair)
----------- Writing style -----------
SCORE: 4 (good)
----------- Reviewer comment -----------
The work is well written and organized, and this paper are well supported by the experimental test. However, some points should be concerned, such as:

1. The paper format should be referred to the template style, the paper should be revised.
2. The citation and reference formats should be referred to the template style.
3. The speciment preparations in figure forms need to be checked because in Fig. 1, the images is blurry and unclear.
4. If the authors write a formula or equations, then the formula and equations needs to be mentioned in the paragraph
5. The authors should mention figure 4 in the paragraph

They authors are also invited to correct the minor revisions mentioned above, and the work is acceptable for publication.

----------- Recommendation -----------
SCORE: 2 (accept)