

Part of **SPRINGER NATURE**

[PROCEEDINGS](#) | [JOURNALS](#) | [BOOKS](#)

Search

Series: [Atlantis Highlights in Social Sciences, Education and Humanities](#)

Proceedings of the 4th Forum in Research, Science, and Technology (FIRST-T3-20)

HOME



We would like to warmly welcome you to the 4th FIRST 2020 International Conference. This conference is organized by Politeknik Negeri Sriwijaya, Indonesia. The 4th FIRST 2020 International Conference was held in Palembang, South Sumatera Province, Indonesia, on November 10-11, 2020. FIRST International Conference is so delightful to get involved in research of the COVID-19 by presenting the special issues of COVID-19 in this year's conference. This special issues of COVID-19 consist of research in the field of health, economical effect, and technology in managing the COVID-19.

Please click [here](#) for the conference website.

Atlantis Press

Atlantis Press – now part of Springer Nature – is a professional publisher of scientific, technical & medical (STM) proceedings, journals and books. We offer world-class services, fast turnaround times and personalised communication. The proceedings and journals on our platform are Open Access and generate millions of downloads every month.

For more information, please contact us at: contact@atlantis-press.com

▶ PROCEEDINGS

▶ JOURNALS

▶ BOOKS

▶ POLICIES

▶ MANAGE COOKIES/DO NOT SELL MY
INFO

▶ ABOUT

▶ NEWS

▶ CONTACT

▶ SEARCH

[Home](#) [Privacy Policy](#) [Terms of use](#)



Copyright © 2006-2023 Atlantis Press – now part of Springer Nature

Search

Series: [Atlantis Highlights in Engineering](#)

Proceedings of the 4th Forum in Research, Science, and Technology (FIRST-T1-T2-2020)

PREFACE

First of all, I also would like to say thank you very much for being parts of the 4th FIRST 2020 to all of honourable keynote speakers, authors, and all participants.

As we know, the corona pandemic has hit many sectors in the world. Not only the economic one but also the social, and education. As incredibly crucial to the growth and sustainability of innovation and learning within the academic community, some events, such as: academic conferences, seminars, and even lectures themselves, have also been the worst hit by this corona pandemic. A lot of important events has been adversely affected due to region-wide lockdowns.

Therefore, to accommodate the researchers from all over the world and to be consistent in maintaining the continuity and the development of science and technology, the FIRST 2020 is still held in this year although in virtual way. It is hoped that FIRST 2020 be one of the conferences that support the advance of the science and technology.

As our attention on COVID-19 tragedy, in this year, we also make a cooperation with the ITKJ (Institut Teknologi Kesehatan Jakarta) or now called as JGU (Jakarta Global University) that focuses on the health and health technology. Therefore, in this occasion, We also invite special issues research about COVID-19 to participate in FIRST 2020 and SNAPTEKMAS

2020 conferences.

Thanks to the God, although we are facing the corona pandemic, the researchers are still be able to produce good research and still have great spirit in finding new technique or methods in many areas. The purpose of the FIRST is basically to provide the researchers and academia to exchange, to discuss the results of their study, so that they can meet the industrial needs and government regulations, and also to publish the research. Although, this year conference should be held virtually, however, the FIRST 2020 is still able to facilitate researchers from all over the world to meet and to make opportunities to collaborate.

FIRST has been held for four times and organized by State Polytechnic of Sriwijaya. The previous beginning FIRST conference was a National Conference and it was held on October 27, 2015, with the theme: Peningkatan Kualitas SDM melalui Penelitian Teknologi Tepat Guna dalam Menghadapi Ekonomi Asean. On 2016, the FIRST was upgraded in order to enhance the quality of the conference. The first FIRST international conference was held in State Polytechnic of Sriwijaya, on October 18-19, 2016, while the second FIRST international conference was held on October 30-31, 2019 at Horison Ultima Hotel Palembang, and the 3rd FIRST was held on October 9-10, 2019, at Excelton Hotel Palembang, Indonesia.

This 4th FIRST 2020 International Conference has attracted 8 countries, i.e., from Malaysia, Brunei Darussalam, Japan, Taiwan, Thailand, United Kingdom, Hungarian, and Cambodia.

This year FIRST 2020 conference is held on November 11, 2020, at Beston Hotel. This conference presents:

1. Prof. Chiaki Ogino, from kobe University, an expert in biodiesel field
2. Dr. Wahyu Caesarendra, S.T., M. Eng., from Universiti Brunei Darussalam, an expert in mechanical engineering
3. Prof. Yuliansyah, M.S.A., Ph.D, Akt, CA, from Lampung University, an expert in Accounting
4. Dr. Dodi Reza Alex Noerdin, as Head Regency of Musi Banyuasin, an expert in government policy for technology implementation

5. Assoc. Prof. Dr. Mohammed N Adurazaq, from Management and Science University (MSU), an expert in health technology, and
6. Dr. Muhammad Haikal Satria, IPM, from Jakarta Global University, an expert in health

Finally, I also want to say thank you very much for all of committee for their great contribution.

Atlantis Press

Atlantis Press – now part of Springer Nature – is a professional publisher of scientific, technical & medical (STM) proceedings, journals and books. We offer world-class services, fast turnaround times and personalised communication. The proceedings and journals on our platform are Open Access and generate millions of downloads every month.

For more information, please contact us at: contact@atlantis-press.com

- ▶ PROCEEDINGS
- ▶ JOURNALS
- ▶ BOOKS
- ▶ POLICIES
- ▶ MANAGE COOKIES/DO NOT SELL MY INFO
- ▶ ABOUT
- ▶ NEWS
- ▶ CONTACT
- ▶ SEARCH

Home [Privacy Policy](#) [Terms of use](#)   

Copyright © 2006-2023 Atlantis Press – now part of Springer Nature

Part of **SPRINGER NATURE**

[PROCEEDINGS](#) | JOURNALS | BOOKS

Search

Series: [Atlantis Highlights in Engineering](#)

Proceedings of the 4th Forum in Research, Science, and Technology (FIRST-T1-T2-2020)

ORGANIZERS

General chair

Dr. Rita Martini, S.E., M.Si., Ak.

Head of Research Unit of State Polytechnich of Sriwijaya, Indonesia

Program chairs

Dr. Desloehal Djumrianti

State Polytechnic of Sriwijaya, Indonesia

Dr. Ade Silvia Handayani

State Polytechnic of Sriwijaya, Indonesia

Organizing committee

Prof. Erry Yulian Triblas Adesta

International Islamic University, Malaysia

Prof. Win-jet Luo, Ph.D.

National Chin-Yi University of Technology, Taiwan

Prof. Yasushi Kiyoki

Keio University, Japan

Prof. Eddy Yusuf, Ph.D

Management Science University, Malaysia

Prof. Dr. Werner Rammense

Cologne University, Germany

Assoc. Prof. Dr. Augustus E. Osseo-Asare

University of Sunderland, United Kingdom

Prof. Chiaki Ogino

Kobe University, Japan

Dr. Wahyu Caesarendra, S.T., M. eng

Universiti Brunei Darussalam

Prof Yuliansyah, M.S.A., Ph.D., Akt, CA

University of Lampung

Assoc. Prof. Dr. Mohammed N. Abdulrazaq

Management Science University, Malaysia

Dr. Muhammad Haikal Satria, IPM

Jakarta Global University

Technical committee

Prof. Muhammad Nizam, Ph.D

Universitas Sebelas Maret, Indonesia

Prof. Dr. Mohammad Yeakub Ali

International Islamic University Malaysia

Dr.drh R. Wisnu Nurcahyo, DVM

Universitas Gadjah Mada, Indonesia

Dr. Untung Santoso, M.S

Universitas Muhammadiyah Malang, Indonesia

Assoc. Prof. Ahmad Hoirul Basori

King Abdulaziz University, Saudi Arabia

Prof. Dr. Ir. Siti Nurmaini

Universitas Sriwijaya, Indonesia

Prof. Aldes Lesbani S.Si,M.Si,Ph.D

Universitas Sriwijaya, Indonesia

Yu-Lieh Wu, Ph.D.

National Chin-Yi University of Technology, Taiwan

Dr. Zulhadi Zakaria

Politeknik Seberang Perai, Malaysia

Dr. Ing. Ahmad Taqwa, M.T

State Polytechnic of Sriwijaya, Indonesia

Ir. Jaksen M. Amin, M.Si

State Polytechnic of Sriwijaya, Indonesia

Dr. RD. Kusumanto, MM

State Polytechnic of Sriwijaya, Indonesia

Irsyadi Yani, ST., M.Eng. PhD

Universitas Sriwijaya, Indonesia

Dr. Yuli Yetri, M.Si

Politeknik Negeri Padang

Dr. Marieska Lupikawati

State Polytechnic of Sriwijaya, Indonesia

Dr.Ir.Rusdianasari, M.Si,

State Polytechnic of Sriwijaya, Indonesia

Dr. Yohandri Bow, M.Si

State Polytechnic of Sriwijaya, Indonesia

Prof. Ir. Hasan Basri, Ph. D

Sriwijaya University

Mukhtaruddin, SE., M.Si., Ak., CA

Sriwijaya University

Dr. Aditya Halim Perdana Kusuma,SE.,MM

Univ muhammadiyah makasar

Dr. Dra. Suparni Setyowati Rahayu, M.Si

Politeknik Negeri Semarang

Dr, Nelly Safitri, SST., M. Eng. Sc
Politeknik Negeri Lhokseumawe

Dr. Dodi Reza Alex Noerdin
Chief Regency of Musi Banyu Asin

Ir. Indra Chandra Setiawan, M.T.
PT. Toyota Motor Manufacturing, Indonesia

Editors

Deris Stiawan, Ph.D
Universitas Sriwijaya, Indonesia

Dr. Nyayu Latifah Husni
State Polytechnic of Sriwijaya, Indonesia

Dr. Eng. Tresna Dewi, M.Eng.
State Polytechnic of Sriwijaya, Indonesia

Dr. Ade Silvia Handayani
State Polytechnic of Sriwijaya, Indonesia

Atlantis Press

Atlantis Press – now part of Springer Nature – is a professional publisher of scientific, technical & medical (STM) proceedings, journals and books. We offer world-class services, fast turnaround times and personalised communication. The proceedings and journals on our platform are Open Access and generate millions of downloads every month.

For more information, please contact us at: contact@atlantis-press.com

▶ PROCEEDINGS

▶ JOURNALS

▶ BOOKS

▶ POLICIES

▶ MANAGE COOKIES/DO NOT SELL MY
INFO

▶ ABOUT

▶ NEWS

▶ CONTACT

▶ SEARCH

[Home](#) [Privacy Policy](#) [Terms of use](#)



Copyright © 2006-2023 Atlantis Press – now part of Springer Nature

ORGANIZING COMMITTEE

 Posted on *October 16, 2019* by *ade_silvia*

International Advisory Committee

Prof. Erry Yulian Triblas Adesta, International Islamic University, Malaysia

Prof. Nurul Taufiqurrahman, Lembaga Ilmu Pengetahuan Indonesia (LIPI), Indonesia

Prof. Yasushi Kiyoki, Keio University, Japan

Prof. Drs. Tjiptohadi Sawarjuwono M.Ec., Ph.D., Ak., Universitas Airlangga, Indonesia

Prof. Dr. Rahmat Budiarto, Al Baha University, Saudi Arabia

Assoc. Prof. Dr. Augustus E. Osseo-Asare University of Sunderland, United Kingdom

Prof. Dr. Werner Rammense, Cologne University, Germany

Prof. Eddy Yusuf, Ph.D., Management Science University, Malaysia

Prof. Win-jet Luo, Ph.D., National Chin-Yi University of Technology, Taiwan

Steering Committee

Prof. Muhammad Nizam, Ph.D, Universitas Sebelas Maret, Indonesia

Prof. Dr. Mohammad Yeakub Ali, International Islamic University Malaysia

Dr.drh R. Wisnu Nurcahyo, DVM., Universitas Gadjah Mada, Indonesia

Dr. Untung Santoso, M.Si., Universitas Muhammadiyah Malang, Indonesia

Assoc. Prof. Ahmad Hoirul Basori, King Abdulaziz University, Saudi Arabia

Prof. Dr. Ir. Siti Nurmaini, Universitas Sriwijaya, Indonesia

Prof Aldes Lesbani S.Si,M.Si,Ph.D, Universitas Sriwijaya, Indonesia

Yu-Lieh Wu, Ph.D., National Chin-Yi University of Technology, Taiwan

Dr. Zulhadi Zakaria, Politeknik Seberang Perai, Malaysia

Dr. Ing. Ahmad Taqwa, M.T, Politeknik Negeri Sriwijaya, Indonesia

Dr. RD. Kusumanto, MM, Politeknik Negeri Sriwijaya, Indonesia

Dr.Ir.Rusdianasari, M.Si, Politeknik Negeri Sriwijaya, Indonesia

Irsyadi Yani, ST., M.Eng. PhD, Universitas Sriwijaya, Indonesia

Dr. Yohandri Bow, M.Si, Politeknik Negeri Sriwijaya, Indonesia

Dr. Yuli Yetri, M.Si, Politeknik Negeri Padang

Dr. Marieska Verawaty, M.Si., Universitas Sriwijaya, Indonesia

Dr. Eng. Tresna Dewi, M.Eng., Politeknik Negeri Sriwijaya, Indonesia

Dr. Maya Fitri Oktarini S.T., M.T., Universitas Sriwijaya, Indonesia

Ir. Indra Chandra Setiawan, M.T., PT. Toyota Motor Manufacturing, Indonesia

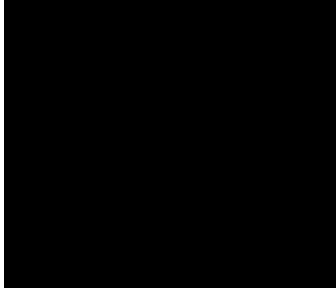
Dr.Rita Martini, SE.,M.Si.,Ak.,CA, Politeknik Negeri Sriwijaya, Indonesia

Dr. Ade Silvia Handayani, ST, MT, Politeknik Negeri Sriwijaya, Indonesia

Dr. Nyayu Latifah Husni, S.T., M.T, Politeknik Negeri Sriwijaya, Indonesia



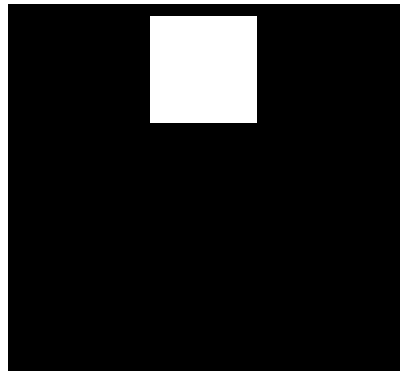
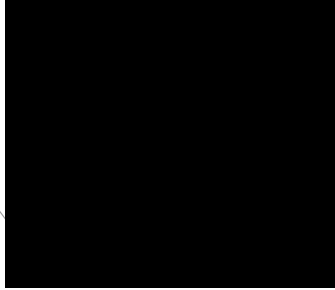
00:00 01:04



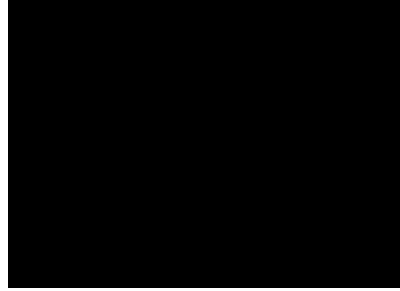
LCON



00:00 00:47



00:00 00:27



REE WORDPRESS TH-

Search

Series: [Atlantis Highlights in Engineering](#)

Proceedings of the 4th Forum in Research, Science, and Technology (FIRST-T1-T2-2020)

ARTICLES

Search

[+ Advanced search](#)

SEARCH

105 articles

Proceedings Article

Characterization of Blending Composition Variations in Fatty Acid Methyl Ester (FAME) Biofuels With Diesel to Biodiesel

Yusabri, Muhammad Yerizam, Aida Syarif

The increase in national fuel consumption has an impact on the decline in fossil energy reserves. Therefore, one of the solutions to overcome this problem is to look for alternative fuels, such as biosolar or biodiesel. This biodiesel is environmentally friendly, has no effect on health, can be used...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Processing Plastic Waste HDPE and PP on Pyrolysis Temperature Using Cu-Al₂O₃ Catalyst Into an Alternative Liquid Fuel

Pamalia Coniwanti, Fitri Hadiah, David Bahrin, Liza Novriani, Gracia Mei Lie Justina, Robinsyah

The crisis of energy reserves in Indonesia, especially in petroleum and high plastic waste usage, causes a very worrying problem in Indonesia. One way to overcome this problem is to process plastic waste into alternative liquid fuels. This study aims to determine the effect of temperature and the effect...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Purification of Biogas with Monoethanolamine (MEA) Solution Based on Biogas Flow Rate

Yohandri Bow, Leila Kalsum, Abu Hasan, A. Husaini, Rusdianasari

Biomass is a plant material which is quite abundant in Indonesia. Utilization is also currently undergoing development. One of the uses for biomass is conversion to biogas. Biogas is a renewable energy source that can be used as a substitute for fossil energy. Biogas can be produced by utilizing organic...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Filtration and Electrocoagulation as a Combined Process for Electroplating Wastewater

Rusdianasari, Yohandri Bow, Adi Syakdani, Muhammad Taufik

Electroplating is a method of using electrolyte solutions to cover solid materials with metal layers. The strong metal waste from the electroplating process is contained in B3 waste (Hazardous Toxic Materials). One of the

methods for electroplating is by combining filtration and electrocoagulation methods....

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Study of Temperature and Use of Catalysts in the Pyrolysis of LDPE Plastic Waste on the Quantity of Oil Fuel Products Produced

Novarini, Rusdianasari, Yohandri Bow, Sigit Kurniawan

Low Density Poly Ethylene (LDPE) plastic waste has no sale value, buried in a landfill. The plastic itself cannot be broken down by microorganisms in the soil, so that people destroy it through incineration. Incineration plastics produce NO_x, CO_x, SO_x, particulates, dioxins, furans, and smoke, which...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Titanium Dioxide Soaking Time Effects on DSSC Powers and Efficiency

Rika Musiana, Abu Hasan, RD Kusumanto

The purpose of this study was to study the power and efficiency of Dye Sensitized Solar Cell (DSSC) using extracts of yellow sweet potato (*Ipomoea batatas* L.) with variations in the soaking time of Titanium Dioxide paste (TiO₂) in dye and light intensity. This research used descriptive method with several...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Effect of Feed Composition and Product Quantity of Co-Processing Refined Bleached Deodorized Palm Oil (RBDPO)

Juarsa, Aida Syarif, Leila Kalsum

The research on Co-Processing Refined Bleached Deodorized Palm Oil (RBDPO) was conducted to examine the Effect of Feed Composition and Product Quantity. It is to provide the competitive renewable fuels in accordance with the government programs to promote Renewable Energy (RE) by utilizing the processing...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Tofu Industrial Wastewater Treatment by Electrocoagulation Method

Ibnu Hajar, Fadarina, Mustain Zamhari, Selastia Yuliaty

Tofu waste liquid contains high levels of organic impurities, such as protein and amino acids. These organic compounds cause the tofu industrial wastewater to contain high biological oxygen demand (BOD), chemical oxygen demand (COD), pH and total suspended solid (TSS) which can pollute the environment....

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Effect of Temperature on Biofuels Production With Catalytic Cracking Process

KA Ridwan, M Aneasari, Taufik Jauhari, Ida Febriana

Biofuel is an alternative fuel that can be produced with organic resources such as vegetable oil and animal fat. One of the items that can be converted into biofuels is waste cooking oil. Waste cooking oil has a long hydrocarbon chain that allows it to be cracked. Biofuels are produced by catalytic cracking...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Effect of Bentonite on the Yield and Composition of Products From Thermolysis of Polystyrene Waste

Lety Trisnaliani, Aida Syarif, Sahrul Effendy, Tahdid, Rima Daniar

Economic growth and population explosion are chronic problems in big cities which trigger an increase in energy consumption in society. The flow of plastic used has been a dilemma for a long time, so there are thoughts on how to turn plastic waste into something that can be useful. One of the polystyrene...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Production of Bio-Pellet Briquettes From Coconut Shell Waste as Alternative Energy for Household Scale

Muhammad Yerizam, Muhammad Zaman, Taufiq Jauhari, Nur Yuli, Riwen Setiawan, Umaidella Afrilla

Biomass is a renewable energy material because it can be produced quickly however, biomass has the disadvantage of being burned directly because of its poor physical properties, such as low energy density, handling, storage and transportation problems. To improve the quality of biomass combustion, biomass...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Catalytic Pyrolysis of High Density Polyethylene (HDPE) and Polystyrene Plastic Waste Using Zeolite Catalyst to Produce Liquid Fuel

Zurohaina, Irawan Rusnadi, Fatria, Arizal Aswan, Rima Daniar

This study aims to examine catalytic pyrolysis with activated natural zeolites. A pyrolysis reactor with three levels of separator as a result of development was used to study the catalytic pyrolysis of plastic waste into liquid fuel at intervals of 200 - 400 oC and operating time of 30-90 minutes. As...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Production of Green Diesel From Crude Palm Oil (CPO) Through Hydrotreating Process by Using Zeolite Catalyst

Ahmad Zikri, Indah Puspita, Erlinawati, M Sutini PLAGus, PB Elbi Zalita, K Andre

Green diesel is an alkane compound produced from vegetables oil by hydrogenation which has properties similar to diesel fuel. The ingredients that can be converted into green diesel is Crude Palm Oil (CPO). Green diesel is produced using a catalytic hydrogenation process with 10-30 psia hydrogen injection,...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Effect of Adding Palm Oil Mill Effluent (POME) and Slurry (Cow Manure) to Produced Methane Gas

Muhammad Hanif Fatin, A. Husaini, Leila Kalsum

Biogas is a renewable energy source that is environmentally friendly and economical. High of Palm Oil Mill Effluent (POME) and cow manure have great potential as a source of raw material for making biogas. The purpose of this study was to determine the effect of the addition of POME and biogas slurry...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Characterization of Thermal Activated Fly Ash Adsorbent by Studying the Effect of Temperature

Aida Syarif, Rusdianasari, M. Yerizam, Sayhirmanyusi

Fly ash is a solid waste resulting from the use of coal as an energy resource. The potential for fly ash presence in Indonesia is considerable with increased coal consumption where the potential availability of coal ash is 10% of total coal consumption, with 80% details being fly ash. The increase in...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Drying Rate of Skim Milk From Virgin Coconut Oil Remaining Water

Abu Hasan, Indah Purnamasari, Muhammad Yerizam, Robert Junaidi

Coconut tree's benefits were not only in flesh that can be processed into coconut milk, copra, and coconut oil but also in all part of coconut plants. Coconut oils were produced from dried coconut by extraction. The oil from

this process is known as virgin coconut oil (VCO). During the VCO production,...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Effect of Sugar, Ammonium Sulfate and Magnesium Sulfate as Supplementary Nutrients in Coconut Water Fermented by *Acetobacter xylinum* to Produce Biocellulose Membranes

Elina Margaretty, Erwana Dewi, Leila Kalsum, Aisyah Suci Ningsih, Jaksen M. Amin

Biocellulose can be made by fermentation of coconut water by *Acetobacter xylinum*. Microorganism. Several developed countries have been starting to research the use of biocellulose as a bio-cellulose that is easily broken down in the world of plastics or membranes, such as edible films and biocellulose...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Effect of Sulfonation Temperature and Time on the Preparation of Methyl Ester Sulfonate Surfactant From Crude Palm Oil (CPO) Based Methyl Ester

Jaksen, Idha Silviyati, Endang Supraptiah, Rima Daniar, Elina Margaretty

Research to study the effect of temperature and sulfonation time on the preparation of Methyl Ester Sulfonate (MES) surfactant using CPO-based Methyl Ester (ME) as raw material has been carried out. The temperature was varied 80 oC, 90 oC and 100 oC; while the observation time is carried out every 1...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Oil Palm Empty Bunches as an Alternative Raw Material for Making Bioplastics

A Husaini, M Zaman, S Chodijah, Hilwatullisan, Ibrahim

The purpose of this research is to obtain bioplastics that are biodegradable and safe if disposed of in the environment. This bioplastic is made using Empty Bunches and white rice and plasticizer. White rice flour as a source of starch with variations in the addition of chitosan additives and glycerol...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Effect of the Catalyst (NaOH) on the Processing of Waste Used Oil Into Liquid Fuel

Azharuddin, Syafei, Didi Suryana, HB Indra, M R Rahmaddy, Y Pratomo, M A Ariasya

The use of lubricating oil is increasing every year the resulting waste is also increase. Based on the waste criteria issued by the Ministry of Environment, used oil is included in the category of B3 waste. Although used oil can still be used, if not managed properly, it can be dangerous for the environment....

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Design and Prototype of Paving Block Making Machine

Ella Sundari, Soegeng Witjahjo, Eka Satria Martomi, Dodi Tafrant

Paving Block (Conblock) is a kind of the building materials used for footi roads. As same as bricks, paving block made from a mixture of cement, s and water. Currently, home industries generally still use manual paving block printing tools. Where the paving block dough is put into the mold, then...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Water Quality Monitoring System in Guorami Fish Cultivation Based on Microcontroller

Sujito, Abdullah Iskandar Syah, Ilham Ari Elbaith Zaeni, Danny Mayrawan, Muhammad Solihul Hadi, I Made Wirawan, Faiz Syaikhoni Aziz

The growth of gourami is not only influenced by food but also by the quality of water as its habitat. Water suitable for use as a habitat for gourami is freshwater. Therefore, goramy farmers need to maintain water quality for the survival of gourami. Water quality is influenced by several parameters...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Optimization of Stroke Rehabilitation Hand Component of 3D Printing With Taguchi Method Approach

Fatahul Arifin, Fenoria Putri, Iskandar, Mulyadi, Suparjo, Franando, Yusuf Dewantoro Herlambang

3D Printing commonly is known as additive manufacturing. It works by adding layer by layer resulting in a three dimensional shape. Using color change filament materials are safe to use for medical purposes. The parameters used in this study are layer height, print speed and print temperature. The most...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Experimental Research of the Influence of Hot Machining Method on AISI 4340 Lathe Machine Process Towards Specific Cutting Energy and Surface Roughness

T Ismail, S Dyos, Y Joni, S Samuel, W Abdurahman, Y Aldi

This research is about the experimental investigation of AISI 4340 turning process using carbide tools with hot machining and dry cutting methods. The workpiece is heated using torch flame gas. Experimental analysis is held at various machining conditions for hot machining and dry cutting methods by...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Study of Capacitor Placement to Improve the Voltage Profile in Contingency Conditions of the 150 kV Madura Electricity Power System

Sujito, Moh Zainul Falah, M. Rodhi Faiz

The contingency is a very important issue in the electricity power system security. The contingency impact can change voltage, particularly the voltage drop on the load bus. This condition can have an impact on the quality of power supplied to the load, system reliability, and system security. The solution...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Investigation of Sea Salt Soiling on PV Panel

Tresna Dewi, Ahmad Taqwa, Rusdianasari, RD Kusumanto, Carlos R Sitor

Renewable energy promises a better future for humankind and more flexible to be installed in a remote area such as a fisher village. The installation of PV panels by the seashore is prone to sea salt soiling. The unfortunate downside of solar energy is that it is highly affected by environmental changes....

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Real-Time Wireless Concept of Vehicle to Vehicle Charging System

Yurni Oktarina, Tresna Dewi, Pola Risma, Muhammad Nawawi

The electric vehicle is the automotive future that supports the program of utilizing renewable energy over depleting fossil fuel. The electric vehicle enables us to have a better environment free of CO2 emission. The issue of electric vehicle applications is charging points, not as many as the conventional...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Optimization of FDM 3D Printing Process Parameter for Improving Porosity Accuracy of PLA Scaffold

Zainal Abidin, M. Yanis, M. Zahri Kadir, Astuti, Akbar Teguh Prakoso, Edo Syahrizal, Ardiyansyah Syahrom, Hasan Basri

This study aims to obtain optimal porosity results from bone scaffolding printing using FDM type 3D printing machines using PLA material. In this study, the bone scaffold was modeled using Solid Works. This research's main contribution is to obtain optimal settings in the molding of bone scaffolding...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Fatigue Prediction of Porous Magnesium Bone Scaffold Using Finite Element Method

Risky Utama Putra, Akbar Teguh Prakoso, Amrillah Nugrasyah, Darmawi, Amir Putra Md Saad, Ardiyansyah Syahrom, Hasan Basri

The purpose of this study was to determine fatigue in a porous magnesium bone scaffold. It applies finite element simulation in assessing bone scaffolding's fatigue behaviour with variations in axial loading based on physiological activities in humans. By applying the boundary conditions to the solid...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Grounding System in Feeder Tomat PT. PLN (Persero) ULP Mariana

Bambang Guntoro, Siswandi, Zainuddin Idris, M. Yunus

The function of grounding is to neutralize disturbances that occur in electric voltages such as short circuits and leakage currents in equipment. So the grounding system that already used will be able to drain the disturbance that occurs due to leakage currents or short circuits to the grounding terminal...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Optimization of Production Process Parameters of DLP Type 3D Printer Design for Product Roughness Value

D P Putra, Romli, M Yanis, D Seprianto, N Amrillah, Hasan Basri

Additive Manufacturing (AM) is a breakthrough in manufacturing technology based on a layer by the layer printing process through various raw material input techniques. Objects to be printed using a 3D model design by adding raw materials to a 3D printing machine are opposite to subtractive manufacturing...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Design of Electronic Instruments as Tools Air Pollution Detection

Ali Nurdin, Jon Endri, Ibnu Ziad, Ciksadan

Carbon monoxide gas pollution as exhaust gas increases every year along with the increase in the number of motorized vehicle users. Carbon monoxide has harmful effects on the environment and human health and even leads to death. In this study, a CO gas gauge was created using the MQ-9 CO gas sensor to...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Datalogger Experimental Analysis Based on Arduino Mega 2560 on a 100 Wp Monocrystalline Solar Panel Using Perforated Plate

W. Adipradana, A. Sofijan, Rahmawati, I. Bizzy, R. Sipahutar, M. A. Fajri

This experiment was carried out to reduce excess heat in solar panels and increase the output power generated by the 100 Wp monocrystalline solar

panel by applying perforated aluminum plates as a Passive Cooling Technique on solar panels. The energy source used is 12 W halogen lamp a substitute for...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Effect of Induction Heating on Tensile Test Specimens' Clamping Products Through the Medium Carbon Steel Materials' Engineering Technique

Romli, Karmin, Sairul Effendi, Firdaus, D P Putra

This study aims to determine the effect of induction heating on tensile test specimens' clamping products through the medium carbon steel materials' engineering technique from heating using induction heating to heat the medium carbon steel. The research method used observation, interviews, literature...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Development Internet of Things for Water Quality Monitoring System for Gouramy Cultivation

Sujito, Danny Mayrawan, I Made Wirawan, Faiz Syaikhoni Aziz, Abdulah Iskandar Syah, Maulana Ahmad As Shidiqi

In freshwater fish cultivation, the quality and temperature also affect growth, each type of fish has different characteristics concerning water conditions and pond temperature. In this case, monitoring water quality in Gouramy cultivation. Monitoring of water and pond temperature is usually done manually...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Contingency Analysis on 150 kV Electricity Power System on The Madura Island Based on The 1P1Q Method

Moh Zainul Falah, Sujito, I Made Wirawan

A major factor in the power system operation is the desire to maintain system security. System security involves a design to keep the system operating in the event of interference or failure. Interferences in electrical power systems are divided into generator, transmission, and load. Failure or interference...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Prototype of Small Savonius Wind Turbine

Ozkar F. Homzah, Tri Widagdo, Mardiana, Ibnu Asrofi, Destra A Pratama

Green energy likely wind energy, solar energy, biomass energy, and tidal energy, with the characteristics of being free, natural, and free from pollution problems, and renewable. In this research, we used air conditioner with split (AC Split) model has a large energy potential that could be utilized,...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Formation of Machine Components Using Powder Metallurgy Method Utilizing Metal Powder From Grinding Process

Yahya, Muhammad Rasid, Dicky Seprianto, Siproni

Powder metallurgy is a metal working technology in which parts or components are produced from metal powders. The working process is that the metal powder is pressed into the desired shape. The formation of technical materials using powder from machining is still being developed. In this research, the...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Simulation-Based Analysis on Novel Vacuum Actuation Concept for Soft Robotic Finger Development

Noer Fadzri, Perdana Dinata, Hasan Basri

Grasping of fragile objects, such as agricultural products, is a currently active area of research which is advancing continuously throughout the years. Although proven versatility has been achieved through conventional robotic grippers, the recent favourable option is to utilize soft robotic grippers to...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Failure Analysis and Performance Assessment of Tubular Air Heater at PLTU South Sumatra V

Lulu Khoirunnisa, Hasan Basri

Tubular air heater has a design operational lifespan limit. This lifespan limit, if not monitored and controlled, can accelerate any damage. Tubular air heater damage will result in tube failures that affect the boiler heat transfer system and emission control. This research aims to find out the root...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Automatic Simulation of Moving Products Using Line Follower and Conveyor

Almadora Anwar Sani, S Rachmat Dwi, Irawan Malik, Ali Medi, Agus Nugraha

The manufacturing industry is an industrial technology that uses machinery, equipment and labor in the processing of raw materials into new products that can be used and have a sale value. The manufacturing industry is closely related to engineering or engineering. In the manufacturing industry there...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Monitoring Depth of Discharge of a Valve Regulated Lead Acid Battery in a Standalone PV System

Mirdiansyah, Ahmad Taqwa, Yohandri Bow

The standalone solar power plant system uses batteries as a storage component of electrical energy generated. A charging condition that exceeds the capacity more than 100% and the battery discharging condition exceeds the discharge depth value (dept of discharge 80% or state of charge 20%) of the battery...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Effect of Parameter Process 3D Printer Technology Digital Light Processing to Geometric of Shaft

A Zamheri, D Seprianto, RS Carlos, A Indri, TC Persada

The development of Industrial technology 4.0 was characterized by cybe physical systems. This era make it easier for humans to connect with otl humans, with industrial machines, and with the environment around them. With the industrial revolution 4.0 can be significantly increase the productivity....

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Bending Test Galvalum Cold Formed Steel Beam With Variation Mortar and Reinforcement Bars

Fadhila Firdausa, Sri Rezki Artini, Ahmad Syapawi, Puryanto

Cold formed steel is a material is often used for construction roofs. The advantages of cold formed steel and its large tensile resistance have attracted interest to developing research make cold formed steel as a beams. Galvalum is a type of cold formed steel. Galvalum consists of galvanis material...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Index of Retained Strength and Weight Loss on Flexible Pavement Ac-Wc and Hrs-Wc Using Polymer Products Ethylene-Vinyl-Acetate (EVA) and Styrene-Butadiene-Styrene (SBS)

Mirka Pataras, Edi Kadarsa, Y Debby Permata, Shara Khairunnisa, M. Alief Akbar, Yondhika Pratama

Road pavements in Indonesia often uses a mixture of Asphalt Concrete (AC) and Hot Rolled Sheet (HRS), which frequently occur premature damage to the pavement caused by extreme climate change, and also rapid development of

land transportation causing increased loads on the pavement, causing q1 of...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Utilization of Residual Sand Materials From the Mining of Kaolin and Tin in Bangka Island on Flexible Pavement Structure

A Bimo Brata, Mirka Pataras, K Aztri Yuli, Nadia Wiranda, Widya Wulansari, I Bella Madu

Along with the times, people's needs are also increasing. No exception is the need for road infrastructure, both in urban and rural areas. The road is an important access to carry out daily activities. One of the important processes that must be carried out in the design and formation of roads is the...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Influence of Anadara Granosa's Shell Waste as a Substitute of Fine Aggregate in Mixed Asphalt Concrete Wearing Course (AC-WC)

Ika Sulianti, Ibrahim, Indah Ayu Wiloka, Reta Iftitah Sari

Flexible pavement is pavement which generally uses a mixture of asphalt as the surface layer and grained material as the layer underneath which consists of coarse aggregate and fine aggregate mixed with asphalt. With some research on asphalt in pavement mixing, natural materials can be replaced or mixed...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Analysis of the Impact of Palembang-Indralaya (Palindra) Toll Road to Palembang – Indralaya National Road Service Levels

S Nisumanti, S Mulyaningsih, N Puspita

The Traffic jams are an issue that still an important concern in the world of transportation. The problem which was occurs in Palembang-Indralaya national road section, as it is often experiencing traffic jams on each part of the road. Besides breaking down the jams, Palembang-Indralaya toll road which...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Effect of Fly Ash as a Part Cement Institution on High Quality Concrete FC'35

Herlinawati, Sazili Harnawansyah, Bastoni Hasasi, Radius Pranoto

The development of science and technology, many research has been done on high-quality concrete to overcome the shortcomings of ordinary concrete. To reduce the porosity of the cement, mineral added materials that are pozzolanic and have very fine particles can be used. One of the mineral added materials...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Use of Cold-Formed Steel as a Substitute for Reinforcement on Structural of Lightweight Concrete Bear

Mahmuda, Revias, Siswa Indra, Sumiati

Cold-formed steel has the advantage such as it is not flammable and eaten by termite, its installation is relatively fast and has almost no expansion and shrinkage values. However, it has disadvantages when it is exposed directly, apart from looking less attractive, it can also cause post-buckling behavior...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Effect of Air Pressure on Foamed Mortar Production

Ibrahim, Amiruddin, Ika Sulianti, Agus Subrianto, Istiqomah Fajriani, Nauval Fardha Habib

Foam mortar is a concrete-like material consisting of a mixture of sand, cement, water and foam agent. This material can be used as road embankment material due to its light weight, high enough strength for subgrade, bulk and compressive strength can be designed as desired so as to reduce the impact...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Characteristic of Folding Cyclists on the Selection of Transportation Modes in the City of Palembang

Efrilia Rahmadona, Sudarmadji, Norca Praditya, M. Ade Surya Pratama

Sustainable Transportation is one of the embodiment of sustainable development, sustainable development puts forward the concept of eco-friendly urban, where the concept aims to balance the increasingly rapid

development activities with an eco- friendly transportation system that integrated with other...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Optimization of Public Trasport Service *Bus Papid Transit* (BRT) Trans Musi in the City of Palembang

Moch. Absor, Yusri, A. Latif, A. Fuad Z, R Muhammad Yusri

The Palembang city government in 2018 made apolicy regarding public transpotation in the form of stopping city bus transportation by replacing it with a Bus RapidTrancit fleet. Rejvenation of this transportation requires acomprehensive management and handling. This study aims to find out how to optimize...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Life Cycle Assessment (LCA) in Pulp & Paper Mills: Comparison Between MFO With Biomass in Lime Kiln

Yonki Alexander Volta, Rusdianasari, Syahirman Yusi

Pulp and paper mills keeps trying to take advantage of renewable energy as an energy source. One of utilization is used bark as renewable energy source to substitute fossil fuel. Bark from wood preparation utilized in bark gasifier to produced syngas as primary fuel in lime kiln. The aim of the study...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Effect of Variations Concentration and pH of Liquid Smoke the Immersion With Various Types of Fish

Farida Ali, Lia Cundari, Siti Miskah, Hendri Prasetyo

Rubber seeds contain cellulose and lignin, therefore rubber seed could be used as raw material for liquid smoke. Liquid smoke contains lactic acid and phenol which have antibacterial properties. The purpose of this study is to test the antibacterial activity of liquid smoke shells and rubber seeds on...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Comparison of the Use of Fly Ash dan Rice Husk Ash in the Making of Geopolymer Concrete

Indrayani, Andi Herius, Akhmad Mirza, Ricky Ravsyah Alhafez

The implementation of the acceleration of development is a government program in catching up the backwardness and to improve national competitiveness, but the acceleration of development must still pay attention to environmental aspects that exist. One of the efforts in making environmentally friendly...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Flexural Strength Analysis of Concrete With the Addition B3 Waste as an Additive to Ordinary Portland Cement

Norma Puspita, Yuni Arti, Febryandi

As generally known that concrete has low resistance to acidic and corrosive materials which usually exist in acidic and saline environment. And along the increasing of environment conservation, specifically about reusing a

waste which is residue of an activity and/or a production process of industries...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Simulation of Silage Production From Water Hyacinth (*Eichornia crassipes*) as Ruminants Feed Based on the Increase of *Aspergillus niger*

Agung Budi Santoso, Martha Aznury, Nova Rachmadona, Robert Junaidi, Fertarina Pratiwi

Silage is a fermented high-water content feed given to ruminants. The production of silage from water hyacinth (*Eichornia crassipes*) is carried out by combining the grindery and fermentation processes. This equipment had 1420 rpm of agitation and 0.5 hp of electricity. *Aspergillus niger* was used in the...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Placement Position of Hollow Cores in the Ideal Longitudinal Direction on the Reinforced Concrete Beam

Sumiati, Mahmuda, Ahmad Syapawi

Reinforced concrete beam is a structure that designed to restrain the bending moment, torsional moment, axial force and shear force, made of concrete which functions to withstand compressive strength and reinforcing steel to withstand flexural strength. However, of reality many other utilities as: water...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Production of Biodiesel From Unrefined Plants-Derived Oil by *Aspergillus oryzae* Expressing *Bacillus thermocatenuatus* Lipase as a Whole-Cell Biocatalyst

Nova Rachmadona, Martha Aznury, Chiaki Ogino

In this study, the enzymatic process reaction using a whole-cell biocatalyst was done for biodiesel production of crude plant oils. This work investigated a streamlined technique to convert crude palm oil that consisted high amount of phosphocholine gums. This reaction by using lipase as a catalyst for...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Partial Substitution of Cement Using Fly Ash and Carbite Waste in Normal Concrete Making

Darma Prabudi, Kosim, Zainuddin, Raja Marpaung

Concrete is a mixture consisting of crushed stone or coral, sand, cement, water, and additives if needed. While the concrete to be designed is concrete made from a mixture of cement plus (fly ash + carbide waste), crushed stone, sand, and water. Therefore, it is necessary to make a mixture between cement...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Community Adaptation to Traditional Markets during the Pandemic Period in Palembang City

Hendi Warlika Sedo Putra, Maya Fitri Oktarini, Primadella

The traditional market is one of the main facilities for the community to obtain daily food needs, as a place to sell wet food, dry food, and ready-to-eat food ingredients that is difficult to replace with existing modern markets. During the Covid-19 pandemic, traditional markets have the potential to...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Effect of Fermentation Time and Percentage of Moringa (*Moringa oleifera*) Flour Variations on Vitamin C of Yogurt

Martha Aznury, Elina Margerty, Melianti, Sofiah, Yuniar, Sufi Awwaliyah

This study aims to determine the amount of lactic acid and ascorbic acid/vitamin C content of *Moringa oleifera*'s yogurt. Effect of the concentration of Moringa leaf flour, respectively 0,3;5; and 7%, while the fermentation time was 4,6, and 8 hours. The raw material used are UHT's milk, with 10% of sugar...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Road Damage Conditions Analysis Of Tanjung Api-Api - Gasing District Road Based On Surface Distress Index (Sdi) Method

R. Marpen, A. Hasan, AN. Sari, HWS. Putra, R. Pranoto

One of the potential roads in South Sumatra Province is the Tanjung Api-Api - Gasing road. So that good maintenance is needed so that community activities can run smoothly. In this study, the method used to evaluate the

level of damage to the Tanjung Api-Api - Gasing road section is the Surfa Distress...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Data Model Pattern for Data Warehouse Web Application of Information Portal Case Study: Hidyatullah Integrated Islamic Boarding School, Banyuasin Regency

M Aris Ganiardi, Nita Novita, Indri Ariyanti, Delta Khairunnisa

Data warehouse is a collection of data that is subject-oriented, integrated, timevariant, and non-volatile which can be used to produce useful information for management decision making. In an information system, there are a lot of information that accommodated by both internal and external parties....

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Inventory Control and EOQ Forecasting Tools as Effective Decision-Making Model

Ahmad Rifai, Dedy Kurniawan, Ariansyah Saputra, Dinna Yunika Hardiyanti

Inventory management is one of the crucial aspects of any business that affects how the company handles the profits and losses. The type of inventory that the management has implemented will either cause problems to the entire supply chain or affect how the overall gains are shared. Through the adoption...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Increasing Sensitivity of pH Detection Using Computer Vision Based Biosensors

Sujito, Faiz Syaikhoni Aziz, Aji Prasetya Wibawa, I Made Wirawan, Aripriharta, Abdullah Iskandar Syah, Tran Huy Duy

This study presents an increase in pH detection sensitivity using computer vision based biosensors. Butterfly pea flower is used as a biosensor to detect pH. Computer vision uses Raspberry Pi 4, camera, and LCD. To increase the sensitivity of biosensor and computer vision, 2 ways will be used. First,...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Model Adaptive Fuzzy Time Series to Forecasting Enrollments of New Student

Ica Admirani, Ikhthison Mekongga, Isnaini Azro, Hidayati Ami, Rian Rahmanda Putra

The estimated enrollments of new student is required in the academic planning of a higher education institution. That can be done by forecasting using the fuzzy time series (FTS) technique. FTS method is an artificial intelligence computation technique that can capture patterns from previous data to...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Room Safety System Using Face Recognition Using Telegram and Raspberry Pi Based Histogram of Oriented Method

Azwardi, Yulian Mirza, Alan Novi Tomponu, Ariansyah Saputra

Face recognition is a biometric technology that has been widely applied security systems. This technology allows us to identify or verify a person's face through images digitally by matching the face texture. Raspberry Pi is a small computer that has been installed completely like a real computer using...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Telemetry Design Accuracy of Patient's Temperature With IoT Approach

Ahyar Supani, Ahmad Bahri Joni, Herlambang Saputra, Indarto, Yuli Andriani

Health is a good condition of body, soul, and society for someone who lives healthy. The examination of vital signs on the patient's body is to determine a person's health. Temperature is a biological parameter and a major factor in vital signs that must be checked. Taking the patient's temperature poses...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Image Processing System for pH Classification Using Biosensors

Faiz Syaikhoni Aziz, Sujito, Aji Prasetya Wibawa, I Made Wirawan, Aripriharta, Abdullah Iskandar Syah, Tran Huy Duy

The biosensor in this study used a butterfly pea flower. Butterfly pea flowers require a classification system because the colors produced in detecting pH are similar. The method used in this research is using image processing to get the RGB value to be analyzed using the Raspberry Pi 4. The operation...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Quality Measurement Evaluation of the POLSRI Learning Management System Website Using Importance Performance Analysis (IPA) Method

Irma Salamah, Lindawati, Asriyadi, M. Fadhli

Technological advances have had an impact on all aspects of human life, one of which is the business world as well as the internet. A website is a means of providing information, promotion and communication to customers. This research tries to analyze the service quality of the POLSRI Learning Management...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

RESTful Web Service as Data Generator for Reporting of Academic Information System

M. Miftakul Amin, Slamet Widodo, Adi Sutrisman, Ervi Cofriyanti, Ali Firdaus

The academic information system in higher education is a system that has an important role in higher education operations. Interoperability between academic information system is needed to bridge the exchange of data and information in heterogeneous environments, where systems are developed using different...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Design and Implementation of Learning E-Scheduling in Sriwijaya State Polytechnic - Telecommunication Engineering Study Program

Abdul Rakhman, Irawan Hadi, Nasron, Martinus Mujur Rose

In this research, the features of the previous research information system. is developed. The development of the system is about how to design and implement an e-scheduling system, to deal with teaching schedule problems which include for example the proportional or fairness of teaching load, the suitability...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

PHP Programming for Achieving Students in Informatics Management Department State of Polytechnic Sriwijaya

Yusniarti, Henny Madora, Ida Wahyunigrum, Muhammad Noval

This research aims to build an information system for achieving students at Management Informatics Department State of Polytechnic Sriwijaya for display useful information. Information System on this research is used to design systems using PHP programming. The application used in this research is to...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Prototype Development of Motorbike Towing Hook Towards Authorized Mechanic Perception and Investigation

Rahman Hakim, Muhammad Hasan Albana, Widodo, Hanifah Widiastuti, Wahyu Caesarendra

The research aims to find the authorized mechanic perception of the towing hook's development to lay at the motorbike's front section. A prototype invention of a motorbike towing hook was found in 2018. However, it has

never been tested for function by an official motorbike dealer in Batam. 7
research...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Investigation Study of Pressure Different Effect at Evaporator in Organic Rankine Cycle Simulator (ORCS) Using Low-grade Waste Heat

Mochamad Denny Surindra, Wahyu Caesarendra

Organic Rankine Cycle (ORC) was presented an efficient solution for low-grade waste heat exploitation, due to its uncomplicated mechanism, required less pressure, simple and compact components, and accessible maintenance. The evaporator has the characteristics of a pressure drop due to irreversibility...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Application of Tracking Letter Disposition at State Polytechnic of Sriwijaya Based on Android Webview

Indra Satriadi, Sony Oktapriandi, Hetty Meileni, Desy Aprianty

Letter disposition is an integral part of the operational activities of an organization. One of the efforts to increase the effectiveness of the letter communication is by using Information and Communication Technology (ICT). This study focuses on making applications that make it easier for users to...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Shortest Path Search Application for Base Transceiver Station (BTS) Using A* Algorithm

Ikhthison Mekongga, Aryanti Aryanti

Looking for the shortest path to a place is very necessary, especially when there is damage that requires immediate repair. This paper shows the design and development of an application of the shortest path search for Base Transceiver Station (BTS) using the A* algorithm. It has been designed an application...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Compatibility of Linux Architecture for Diskless Technology System

Aryanti Aryanti, Ade Silvia Handayani, Ibnu ziad, Ikhthison Mekongga, Farid Jatri Abiyyu

The increasing need for internet-based computers with high accessibility power causes diskless servers to continue to develop. This paper shows the design and development of the diskless server used compatibility of Linux architecture. In the proposed system, the diskless technology system's creation...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Reservoir Irrigation System Design Based Wireless Sensor Network

M. Zakuan Agung, Eka Susanti, R.A Halimatussa'diyah, Susanzefi

The latest development of the robot recently emerged an innovation where the surveillance robot can be controlled remotely via the internet to be more efficient and save time. This innovation is called the Internet of Things or IoT. The Internet of Things has emerged due to technological developments,...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Using Night Vision Camera Robot Based on Internet of Things

Sarjana, Sholihin, Adewasti, Emilia Hesti

One of the positive impacts of human use of technology is the development in the world of robotics which is currently developing quite rapidly, so that it can help human activities in various fields, such as industry, mining, agriculture, security and even entertainment. The robots used are usually reconnaissance...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Biometric Fingerprint Implementation for Presence Checking and Room Access Control System

Salamat Muslimin, Yudi Wijanarko, Lucky Indra Kesuma, Renny Maulidda, Yordan Hasan, Abdurrahman, Hasan Basri

Nowadays, the utilization of using biometric fingerprint is crucial due to improve the security, data checking and room access control system. The function of biometric fingerprint sensor as control to enter the room, by specific person with access. The development of this system is equipped with student's...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Prototype Design of Landslide Early Detection System Using LoRa and IoT

Ahmad Taqwa, Mohammad Fadhli, Sopian Soim, Ade Silvia Handayani, Suroso

This paper proposes a simple and low-cost landslide early detection system design. This system uses two sensors, namely the HC-SR04 ultrasonic sensor, to detect the soil movement and the YL-69 soil moisture sensor to detect soil moisture levels. Sensor data is processed using Arduino Uno. The soil movement...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Search Software for Ustadz, Categories: Preacher, Qari and Qariah in Palembang Using an Android-Based Usability Approach

M. Rudi Sanjaya, Yadi Utama, Dedy Kurniawan, Ariansyah Saputra, Novita Sari, Rahma Destriani, Muhammad Raihan Udda Rahmany

Each Muslim conducts preaching activities and Al-Qur'an Qari, Qariah in Islam in various Islamic activities, but still challenging to determine its location, especially in Palembang itself. There are many mosques which are challenging to get information about the location of the Preaching, location of...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Application of Campus Parking Area for State Polytechnic of Sriwijaya Based on Smartphone

Leni Novianti, Devi Sartika, Dewi Irmawati, Ienda Meiriska

The purpose of this study was to improve the services and information on the availability of parking lots so that there would be no hoarding of two-wheeled or four-wheeled vehicles that caused the congestion in the State Polytechnic of Sriwijaya and also to made it easier for the security officers to...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Android-Base m-Voting Application Development With Simple Additive Weighting Method

Devi Sartika, Leni Novianti, Dewi Irmawati, Ienda Meiriska

This research arranged to build a m-voting android-based application and started the registration by input student's data. The students can use m-voting as a tool to vote one of the student governor candidates on the election executive governor based on their conscience in the campus. The vote count...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Designing a Web-Based Online Tutoring Application in Palembang City Using the SUS (System Usability Scale) Method

M. Rudi Sanjaya, Ariansyah Saputra, Bayu Wijaya Putra, Novita Sari, Rahma Destriani, Muhammad Raihan Udda Rahmany

Nowadays, internet has become a major necessity. Almost all or everyon used the internet in their daily lives, whether for education, business, entertainment, and others, but humans are much or very dependent on the so-called internet. Where, especially in the city of Palembang, the low level of...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Black Box Testing Using Equivalence Partition Method in Sintana Application

Yayuk Ike Melani, Mahmud

The background of testing the Sintana application is to minimize the occurrence of bugs in the application and ensure that the application built is in accordance with customer needs. Sintana or facility and infrastructure monitoring information system is a system used by one of the private universities...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Design of a Tool to Measure the Effectiveness and Efficiency of Users Towards the Application of Polisiku Application

Eko Setiawan, Wiza Yunifa

Polisiku the application is used as a means of police service against msyarakat. A review of the utilization of my police application is necessary to measure the effectiveness and efficiency of the user. The purpose of this research is to design a tool measuring the effectiveness and efficiency of users...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Database Design for Child Special Development Institution's Service Performance E-Dashboard Case Study: Palembang Child Special Development Institution

Hendra Hadiwijaya, Febrianty, Rezania Agramanisti Azdy

The Child Special Development Institute (LPKA) is a place used to foster and educate correctional students (Andikpas). LPKA has a duty to provide services related to the fulfillment of Andikpas rights. In this study, LPKA services that became the focus of research were visits to Andikpas and services...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Extending the Understanding of Business Intelligence and Its Application in Startups

Dedy Kurniawan, Ariansyah Saputra, M. Rudi Sanjaya, Zaqqi Yamani

Modern decision-making processes are guided by acumens retrieved from big data. Contemporary businesses must have means for processing data. Some of the approaches used by companies to manage and analyze data include outsourcing, hiring data analysts, and using tech teams. These approaches have various...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

The Application of Digital Marketing for UKM in Facing the Covid-19 Pandemic

Hetty Meileni, Sony Oktapriandi, Desi Apriyanti

The Covid-19 pandemic has changed many things, in one country and in an economic area that has declined or even collapsed. Social restrictions imposed in an area have decreased the level of sales for UKM. Work From Home (WFH) is one of the factors that cause consumers not to want to make purchases offline....

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Designing Student and Lecturer Attendance System Application Using Progressive Web Apps (PWA)

Hartati Deviana, Mustaziri, Ema Laila, Meiyi Darlies, Demby Pratama

Sriwijaya State Polytechnic currently has a web-based academic information system, namely SISAK. One of the features available in this system is the activity of recording student and lecturer attendance with a lecturer attendance validation system in class. Validation is carried out during lecture activities...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Designing Augmented Reality-Based Computer Devices Learning Media on Android Platform

Dony Novaliendry, Arif Subagia, Titi Sriwahyuni, Fegie Y Wattimena, Axelon S Renyaan, Ceng-Hong Yang, Putra Jaya

IT technology is developing very rapidly. This is proven by the many discoveries about IT-based learning media, one of which is Augmented

Reality. The media for introducing Augmented Reality-based computer devices can be used to overcome the lack of computer equipment used by schools during practice...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Public Service Announcement Implementation of Learning at the Sriwijaya State Polytechnic in Minimizing the Risks and Impacts Caused by the Covid-19 Pandemic

Alan Novi Tompunu, Nelly Masnila, Zakaria, Azwardi, Ainun Nabila

The spread of Covid19 in Indonesia has not shown any signs of decreasing, therefore the Ministry of Education and culture took preventive steps in the educational environment by issuing a decree which agreed that the learning process, especially in higher education, was carried out online for theoretical...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Principal Component Analysis Method for Image Segmentation of Smart Meter Digital

Husnawati, Shinta Puspasari, Rian Rahmanda Putra

The digital kWh meter is a device that can measure the consumption of electrical power in electrical equipment. This paper presents an approach to recognize numeric characters on the kWh meter image by implementing principal component analysis for segmentation. Research methodology contains two phases,...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Design of Solar Powered Vaccine Backpack

Muhammad Haikal Satria, Arie Jaenul, Adhes Gamayel

Covid-19 Pandemic effects rural and indigenous area that is hard and far to reach by vehicles. Most of the medical deliveries to this remote area is done on foot and taken days to reach destination. Vaccine consistency is affected by their ambient temperature and duration of exposure to adverse temperature...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Trainer Module Design of Item Sorting Equipment Based on Height and Plc-Based Traffic Light Prototype in the System Laboratory

Evelina, Amperawan, Dewi Permata Sari, Sabial Rasyad

Technological developments in the industrial world have been very developed and modern. Especially for industries that use automatic or control systems in their production processes, one of them is by using a Programmable Logic Controller (PLC). The world of education today still has quite a gap or gap...

[+ Article details](#)

[+ Download article \(PDF\)](#)

Proceedings Article

Prototype Development of Heartbeat and Body Temperature Monitoring System Based on Internet of Things

Ahmad Taqwa, Ade Silvia Handayani, Arsyiil Shiddik, Carlos R Sitompul, Yowhandri Bow, Nyayu Latifah Husni, Zakaria

This paper presents IoT-based health care technology in monitoring vital signs in health services. The result designate prototype to detect health parameters is effectiveness for provide real time online information such as heart rate and body temperature This monitoring system is made using the raspberry...

[+ Article details](#)

[+ Download article \(PDF\)](#)

1

2

>

Atlantis Press

Atlantis Press – now part of Springer Nature – is a professional publisher of scientific, technical & medical (STM) proceedings, journals and books. We offer world-class services, fast turnaround times and personalised communication. The proceedings and journals on our platform are Open Access and generate millions of downloads every month.

For more information, please contact us at: contact@atlantis-press.com

▶ PROCEEDINGS

▶ JOURNALS

▶ BOOKS

▶ POLICIES

▶ MANAGE COOKIES/DO NOT SELL MY
INFO

▶ ABOUT

▶ NEWS

▶ CONTACT

▶ SEARCH



HOME

We would like to warmly welcome you to the 4th FIRST 2020 International Conference. This conference is organized by Politeknik Negeri Sriwijaya, Indonesia. The 4th FIRST 2020 International Conference will be held in Palembang, South Sumatera Province, Indonesia, on November 10-11, 2020.

The 4th FIRST 2020 International Conference offers the researchers in academics, industries, and governments, a conference, for exchanging, sharing, following up, and discussing the results of the latest researches, industry's needs, and government regulatory policies. The 4th FIRST 2020 International Conference facilitates the participants from all over the world to meet face to face to open chances in establishing connections and collaboration among them.

FIRST International Conference is so delightful to get involved in research of the COVID-19 by presenting the special issues of COVID-19 in this year's conference. *This special issues of COVID-19 consist of research in the field of health, economical effect, and technology in managing the COVID-19.* Therefore, the 4th FIRST 2020 International Conference makes collaboration with Institut Teknologi dan Kesehatan Jakarta (ITKJ) as one of the 4th FIRST 2020 International

The 4th FIRST 2020 International Conference is also co-organized by Management & Science University (MSU). The theme of the 4th FIRST 2020 International Conference is *"Synergy of applied technology for social- technopreneur based on local resource to generate sustainability development"*.

The 4th FIRST 2020 International Conference is also in conjunction with Seminar Nasional Aplikasi Teknologi untuk Masyarakat 2020 (SNAPTEKMAS), *"Penerapan Sains Teknologi dalam Mendorong Ekonomi Kreatif dan Keterampilan untuk Meningkatkan Daya Saing Masyarakat"*.

SPECIAL ISSUES COVID-19 RESEARCH

Health, Technology, Economical Effect

For Health and Technology of COVID-19, you can choose **TRACK 1** and **TRACK 2**

For Economical Effect, you can follow **TRACK 3**

Important Dates

- Normal Submission Deadline : ~~August 15, 2020~~
- Notification of acceptance : ~~September 15 2020~~
- Camera ready deadline : ~~October 5, 2020~~
- All Registration deadline : October 25, 2020
- Conference date: November 10-11, 2020

Organized :



Co-Organized :



Publication



Flag Counter



KEYNOTE SPEAKER



Prof. Chiaki Ogino
Kobe University, Japan



Wahyu Caesarendra, S.T., M.Eng., Ph.D.
Universiti Brunei Darussalam



Prof. Yuliansyah, M.S.A., Ph.D., Akt, CA.
University of Lampung



Dr. Dodi Reza Alex Noerdin
Bupati Musi Banyuasin

SPECIAL ISSUE KEYNOTE SPEAKER



Assoc. Prof. Dr. Mohammed N. Abdulrazaq
Management and Science University (MSU)



Dr. Muhammad Haikal Satria, IPM.
Jakarta Global University (JGU)

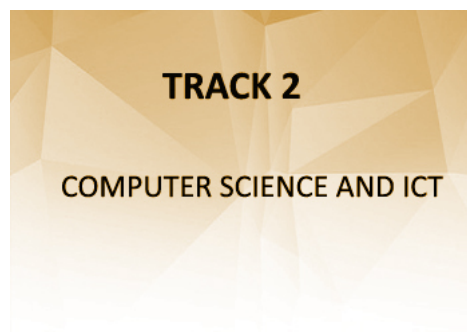


TRACK 1

ENGINEERING AND SCIENCE

TRACK 1

TRACK 1: Engineering and Science Power Electronics and Drive System; Electrical; Control Engineering and Instrumentation; Instrumental and Control Applications; Electronics Devices/Design



TRACK 2

COMPUTER SCIENCE AND ICT

TRACK 2

TRACK 2: Computer Science and ICT Big Data; Internet of Things; Computer security; Deep Learning; Data Mining; Intelligent System; Information System; Natural language Processing;

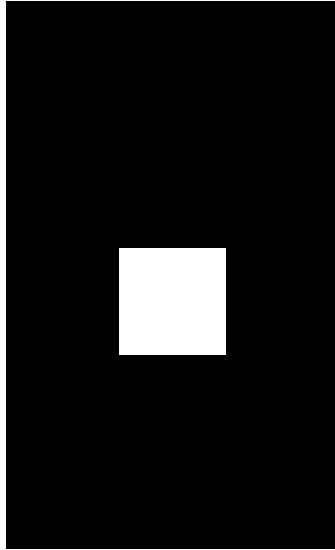


TRACK 3

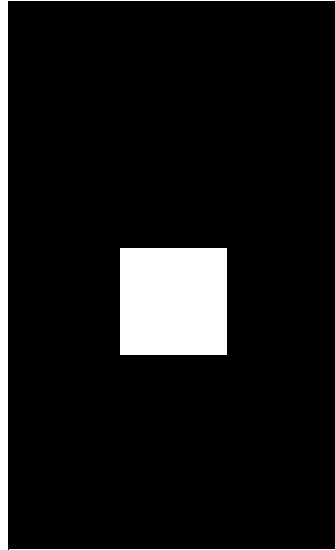
SOCIAL SCIENCE

TRACK 3

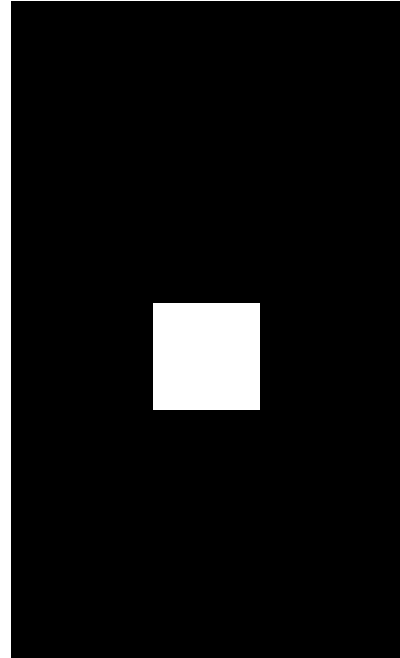
TRACK 3: Social Science (o SCOPUS/ Web of Sci Economics; Development Management; Finance; Ent



00:00 01:04



00:00 00:47



00:00 00:27

Part of **SPRINGER NATURE**

[PROCEEDINGS](#) | JOURNALS | BOOKS

Search

Series: [Atlantis Highlights in Engineering](#)

Proceedings of the 4th Forum in Research, Science, and Technology (FIRST-T1-T2-2020)

PUBLISHING INFORMATION

Bibliographic information:

Title

Proceedings of the 4th Forum in Research, Science, and Technology (FIRST-T1-T2-2020)

Editors

Deris Stiawan, Ph.D

Dr. Nyayu Latifah Husni

Dr. Eng. Tresna Dewi, M.Eng.

Dr. Ade Silvia Handayani

Part of series

[AHE](#)

Volume

7

ISSN

2589-4943

ISBN

978-94-6239-332-5

Indexing

All articles in these proceedings are submitted for indexation in **CPCI**, **CN** and **Google Scholar**. Optionally, we also submit to **Compendex** and **Scopus**. Note that in case you need information about the indexation of these proceedings, please check with the organizers of the conference as we cannot reply to messages received from participants.

Free Access

In order to increase the visibility of this conference and of the papers from its participants, this conference has chosen to sponsor the online publication of the conference papers. Therefore, all conference papers can be read and downloaded **for free**; no subscription or other payment is required.

Copyright

The copyright of all articles published in these proceedings remains with the **Authors**, i.e. Authors retain full ownership of their article. Permitted third-party reuse of the open access articles is defined by the applicable **Creative Commons (CC)** end-user license which is accepted by the Authors upon submission of their paper. All articles in these proceedings are published under the **CC BY-NC 4.0** license, meaning that end users can freely **share** an article (i.e. copy and redistribute the material in any medium or format) and **adapt** it (i.e. remix, transform and build upon the material) on the condition that proper **attribution** is given (i.e. appropriate credit, a link to the applicable license and an indication if any changes were made; all in such a way that does not suggest that the licensor endorses the user or the use) and the material is only used for **non-commercial** purposes. For more information, please refer to the **OA licensing and copyright** section in the Springer Nature **Open Access Policies for books**.

DOIs

Each article that is published in these proceedings is assigned a **Digital Object Identifier (DOI)**. DOIs are standardized digital identities which can be used to cite and link to electronic content. A DOI is guaranteed to never change, so can be used as a persistent identifier to permanently link to an electronic article no matter where it is stored. More information on how to cite and use DOIs can be found **here**.

Permanent Archiving

Atlantis Press is committed to the **permanent availability** and **preservation** of its scholarly research and to ensure **accessibility** to this research by converting and upgrading digital file formats to comply with new technology standards. Besides maintaining its own digital archive, Atlantis Press therefore collaborates with the **National Library of the Netherlands** which permanently archives all Atlantis Press content in their “**e-Depot**”. All proceedings are uploaded to this e-Depot after publication to guarantee permanent archiving of the articles.

Print Copies

In case you wish to have **printed copies** of these proceedings you can order these directly from our partner **Curran Associates**.

Atlantis Press

Atlantis Press – now part of Springer Nature – is a professional publisher of scientific, technical & medical (STM) proceedings, journals and books. We offer world-class services, fast turnaround times and personalised communication. The proceedings and journals on our platform are Open Access and generate millions of downloads every month.

For more information, please contact us at: contact@atlantis-press.com

- ▶ PROCEEDINGS
- ▶ JOURNALS
- ▶ BOOKS
- ▶ POLICIES
- ▶ MANAGE COOKIES/DO NOT SELL MY INFO
- ▶ ABOUT
- ▶ NEWS
- ▶ CONTACT
- ▶ SEARCH



Effect of Variations Concentration and pH of Liquid Smoke in the Immersion With Various Types of Fish

Farida Ali^{1,*} Lia Cundari¹ Siti Miskah¹ Hendri Prasetyo²

¹ Lecturer, Faculty of Chemical Engineering, Universitas Sriwijaya

² Student, Faculty of Chemical Engineering, Universitas Sriwijaya

*Corresponding author. Email: umikrachmi@gmail.com

ABSTRACT

Rubber seeds contain cellulose and lignin, therefore rubber seed could be used as raw material for liquid smoke. Liquid smoke contains lactic acid and phenol which have antibacterial properties. The purpose of this study is to test the antibacterial activity of liquid smoke shells and rubber seeds on the number of bacterial colonies in Mackerel fish (*Euthynus affinis*) (furthermore cited as mackerel). Mackerel fish is a sea fish that has 69.40% moisture content, 100 kcal energy, 13.7 protein, 1.5 g fat, 8 g carbohydrate, 92 mg calcium, 606 mg phosphorus, and 1.7 mg iron. Variations made in this study in the form of raw materials, the concentration of dilution of liquid smoke, and soaking time of the fish in liquid smoke. The raw materials used are rubber seed shells, rubber seeds, and a mixture of both. Concentrations used to dilute liquid smoke are 3%, 6%, 9%, 12%, and 15%. While the fish soaking time is 30 minutes, 60 minutes, and 90 minutes. Identification of qualitative chemical compounds using the GC-MS method, while identification of the number of bacterial colonies using the total plate number (ALT) method. The results of this study are the rubber seed shell is the best raw material in the manufacture of liquid smoke. The 9% concentration can reduce the number of colonies, but better results will be obtained at concentrations of 12% and 15%. Then, the best soaking time is 90 minutes, but at the time of immersion 60 minutes can reduce the number of bacterial colonies. Thus, the best results obtained were rubber seed shell raw material with a concentration of 15% and a soaking time of 60 minutes, with a bacterial colony of 2.12×10^2 CFU/ gram of fish.

Keywords: antibacterial, liquid smoke, rubber seeds

1. INTRODUCTION

Indonesia is one of the largest rubber producing countries in the world along with Thailand and Malaysia. Rubber is one of Indonesia's main non-oil and gas export commodities. National rubber production in 2018 reached 3.63 million tons, which continues to increase from the previous year. According to the Central Statistics Agency, exports of crumb rubber (2018) reached 2.74 million tons.

One form of increasing the sale value of an ingredient is by changing the composition of the material into a high-selling product. Various studies mention that rubber seeds have potential as a raw material in the pyrolysis process because rubber seeds contain components of hemicellulose, cellulose, and lignin, which are then used as preservatives. This is because liquid smoke consists of phenol compounds,

carbonyl, and organic acids that can inhibit the growth of bacteria in food. (Fadillah, dkk. 2015) [2].

At first, rubber seeds were known as less useful material. However, several studies have obtained the results of one of the benefits of rubber seeds as a food preservative through the pyrolysis process. Rubber seeds (which are divided into shells and the contents of rubber seeds) contain a lot of lignin, cellulose, and acids that can be decomposed into phenol compounds and mixtures of organic acids through the process of pyrolysis. The process of pyrolysis of the shells and rubber seeds will produce liquid smoke as a result of condensation with air conditioning media. Liquid smoke can be applied to various types of food ingredients in various ways, such as spraying, dyeing, or mixed directly.

The application of liquid smoke as a preservative can be applied to raw materials, such as fish. Various types of fish, such as the types of mackerel that decline

in quality within a certain time if the fish are stored at room temperature or left in the open, mackerel can only be stored for up to 24 hours at room temperature which is analyzed based on total bacteria, taste, texture, odor, and various other analyzes. This will certainly harm many parties, such as, mackerel which is easily rotten due to long transportation, mackerel fish belonging to traders who do not sell quickly in the morning.

Based on the considerations that have been described before, a study was conducted about the potential of rubber seeds as a preservative for fish through the pyrolysis process. This is intended to prevent the decline in fresh fish so that it can last longer.

2. LITERATURE REVIEW

2.1. Rubber Plants

The rubber plant is a tree that grows tall and has a trunk with a size large enough. Adult rubber tree height can reach 15-25 m. Plant stems grow straight and have a high branching, but some rubber trees are slightly tilted. Strong winds can release broken or fallen stems.

The stems of rubber plants contain sap known as latex. Rubber plants need sunlight with a high enough intensity, which is between 5-7 hours every day. Green rubber leaves, which will turn yellow or red when falling. The rubber leaf consists of the main leaf stalk and sapling. The length of the main leaf stalk is 3-20 cm and the growth media of rubber plants is the type of soil that is per the conditions for growing rubber plants, namely young volcanic soil, old volcanic soil, or peat soil. (Setyawardhani dkk, 2010)[4].

2.2. Rubber Seed

Productive rubber plants can produce 0.8-1.2 tons/hectare in 1 year. Rubber seeds or (*Hevea Brasiliense*) in Indonesia are still a by-product that can be categorized as not being utilized optimally, because only a small portion is used as seeds. (Eka dkk, 2010)[5] Rubber seeds have a proportion of parts that can be consumed around 57%.

The nutritional content contained in rubber seeds has been studied by several previous researchers who showed the results of the rubber seed proximate test conducted by Eka et al. (2010)[6]. Besides, rubber seeds contain high levels of cyanide acid (HCN) so that it can endanger human health. Therefore, it is necessary to carry out a process of reducing HCN on rubber seeds before it is processed into food raw materials.

Rubber seeds in various regions have not been used maximally as a useful product. However, several studies have mentioned that rubber seeds can function as an alternative food ingredient, for example as a basis for making tempeh. While the rest, rubber seeds are only

allowed to fall to the ground and are not used directly by the community as a material that has a sale value.

Table 1 Proximate rubber test results

Nutrient Content	Content (g/100g)
Protein	17,41 ± 0,01
Carbohydrate	6,99 ± 0,01
Ash	3,08 ± 0,01
Fat	68,53 ± 0,04

Table 2 Chemical components contained in rubber fruit shells

Constituent Components	Percentage
Cellulose	48,64
Lignin	33,54
Pentosan	16,81
Ash Content	1,25
Silica Content	0,52

2.2.1. Pyrolysis

Pyrolysis is the process of decomposition or breakdown of raw materials which produce a product in the form of liquid smoke, which occurs in the presence of combustion heat and limited oxygen so that from the process gas, liquid and charcoal are obtained which are affected by the type of material, method, and operating conditions. Pyrolysis can be interpreted as incomplete combustion because it causes complex carbon compounds not to be oxidized to carbon dioxide in raw materials that contain cellulose, hemicellulose, and lignin compounds (Girard, 1992 in Atmaja, 2009)[9].

The pyrolysis process involves various reactions in the form of decomposition, oxidation, polymerization, and condensation reactions. The reactions that occur during wood pyrolysis are removal of water from wood at 120-150°C, pyrolysis of hemicellulose at 200-250°C, pyrolysis of cellulose at 280-320°C, and pyrolysis of lignin at 400°C. Pyrolysis at 400°C produces compounds that have high organoleptic quality and at even higher temperatures condensation reactions will occur and formation of new compounds and oxidation of condensation products are followed by linear increases in tar compounds and aromatic polycyclic hydrocarbon compounds. (Girard, 1992 in Atmaja, 2009)[11].

According to Purwaningtyas (2010)[12], the decomposition event in the pyrolysis process can be divided into five zones. Zone I at a temperature of less than 100oC, the evolution of water content generally occurs, zone II at a temperature of 200-250oC raw material begins to decompose, zone III at a temperature of 250-350oC predominantly hemicellulose decomposition, zone IV at 350-500oC occurs cellulose and lignin decomposition, and zone V at temperatures above 500oC lignin decomposition.

Pyrolysis process results in three types of product classifications namely gas, distillate, and residue. The gases released are mostly CO₂ and some flammable gases such as CO, CH₄, or H₂ and other low-level hydrocarbons. The resulting distillate is liquid smoke and tar. The main composition of the products stored is methanol and acetic acid. The other part is a minor component, namely phenol, methyl acetate, formic acid, butyric acid, and others. Residues (carbon), cellulose, hemicellulose, and lignin content have different amounts based on the raw material used. However, wood generally contains two parts cellulose, one part hemicellulose, and one part lignin.

2.3. Liquid Smoke

Liquid smoke is obtained from burning materials that contain lots of cellulose, hemicellulose, and lignin which contain phenols, acid compounds, and their derivatives. Raw materials that can be used to produce liquid smoke include shells, coconut fibers, organic waste, coffee shells, bamboo, rice straw, or various other raw materials (Sutin, 2008)[16]. The nature of liquid smoke is influenced by the main components namely cellulose, hemicellulose, and lignin which have proportions that vary depending on the type of material to be hydrolyzed.

Liquid smoke can be used as a latex coagulant with the functional properties of liquid smoke such as antifungal, antibacterial, and antioxidants so that it can improve the quality of the rubber product produced. When compared to agglomerating with formic acid, the use of liquid smoke is superior, because the lumpy rubber sap does not smell. The addition of formic acid triggers the growth of bacteria so that ammonia and sulfide appear. It is this compound that causes the gum to coagulate and stink.

2.4. Liquid Smoke Components

Liquid smoke is obtained by burning hardwood and softwood which contain a lot of components of cellulose, hemicellulose, and lignin. More than 300 compounds can be isolated from the pyrolysis process smoke from a total of more than 1000. The compounds that have been detected in the smoke can be grouped into several groups such as phenols, carbonyls, acids,

alcohols, esters, lactones, and various other hydrocarbon compounds.

The compounds found in liquid smoke can affect the taste, pH, and storability of the product. The carbonyl compound will react with proteins to produce a product color. Phenols which are the main source of flavor will show bacterial and antioxidant activity. The smoke composition is influenced by various factors, including wood type, wood moisture content, and combustion temperature used. The type of raw material (wood or other plants) used in the pyrolysis process determines the composition of smoke. For example, hardwood generally has a different composition from softwood.

2.5. Liquid Smoke Classification

Liquid smoke produced from the pyrolysis process needs to be carried out a purification process in which this process determines the type of liquid smoke produced. The types of liquid smoke are divided into several grades, namely grades 1, 2, and 3. Grade 1 liquid smoke is liquid smoke resulting from distillation and filtering with zeolites which are then continued with fractionation distillation, and then proceed with filtering with activated charcoal. This liquid smoke has a pale yellow color and is used for fast food ingredients such as wet noodles, meatballs, tofu, and various other foods (Yulstiani, 2008)[20].

2.6. Liquid Smoke Purification

When steam is produced from a mixture, it contains more volatile components so that the process of separating the components from the mixture can occur (Astuti, 2000)[24]. The compounds contained in liquid smoke have different boiling points so that liquid smoke can be fractionated to obtain the desired functional properties. One method of fractionation that can be done is by liquid smoke redistillation. The liquid smoke distillation process can also eliminate unwanted compounds, namely tar compounds and aromatic polycyclic hydrocarbons (PAH) (Atmaja, 2009)[25].

2.7. Phenol

Phenol or carboic acid or benzenol are colorless crystalline substances that have a characteristic odor. Its chemical formula is C₆H₅OH and its structure has a hydroxyl group (-OH) that binds to the phenyl ring. The word phenol also refers to several substances that have an aromatic ring that binds to the hydroxyl group. Having an aromatic ring with one or more hydroxyl groups, often joined with glucosides and usually found in the cell cavity.

Phenol or carboic acid or benzenol are colorless crystalline substances that have a characteristic odor. Its chemical formula is C₆H₅OH and its structure has a hydroxyl group (-OH) that binds to the phenyl ring. The word phenol also refers to several substances that have

an aromatic ring that binds to the hydroxyl group. Have an aromatic ring with one or more hydroxyl groups, often joined with glucosides, and are usually found in cell cavities.

2.8. Liquid Smoke Application

One of the advantages of liquid smoke is that it can be applied to foods that are usually not smoky. Liquid smoke has been widely applied to the processing, including processed meat, fish, and cheese. Liquid smoke is also used to add a sense of smoke to sauces, soups, canned vegetables, and spice mixes. The new application of liquid smoke is to add flavor to foods that are reduced in fat. According to Varnam and Sutherland (1995)[29], liquid smoke is easier to use, more economical and can be applied at the desired temperature, it is also possible to fractionate liquid smoke to obtain the desired organoleptic properties. Liquid smoke can be applied to products in various ways.

Liquid smoke mixing can be done by adding directly to products such as sausages, salami, topical cheese, roasted meat emulsions, and others. The amount of liquid smoke that is added to the product is between 0.1-1% of the weight of the product ingredient to be preserved with liquid smoke.

3. METHODOLOGY

3.1. Tools and Materials

The tools used in this study are balance sheets, filter paper, Erlenmeyer, dropper pipettes, measuring cups, Petri dishes, test tubes, pyrolysis devices, and distillation devices. The materials used in this study are mackerel fish, rubber seeds, rubber seed shells, and distilled water.

3.2. Procedure

3.2.1. Pyrolysis Reactor Preparation

The main components of pyrolysis reactors consist of furnaces and condensers. The furnace functions as fuel combustion and charcoal combustion (rubber seeds and rubber shells), which then produces smoke through the pyrolysis process, while the condenser is a cooling chamber to convert vapor-based smoke into a liquid with the help of cooling media.

3.3. Pyrolysis Tool Design

The process of making liquid smoke is carried out using a pyrolysis tool consisting of 2 components, namely furnace and condenser. The furnace is used as a kiln, so it produces smoke from raw materials. While the condenser is used to condense the smoke produced and convert it into a liquid phase. Materials used in the manufacture of pyrolysis devices are plates and pipes made of stainless steel and copper.

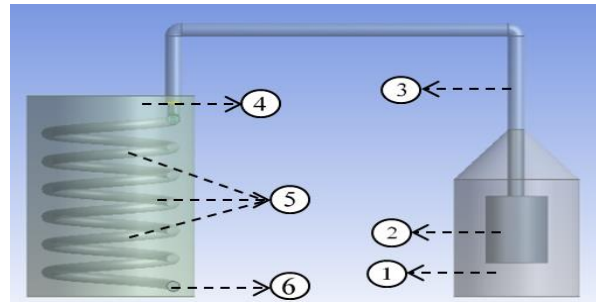


Figure 1 Pyrolysis Tool Series

Information :

- 1) Furnace (Combustion Room)
- 2) Raw material’s room
- 3) Smoke Exit Pipe
- 4) Condenser
- 5) Coil (spiral column)
- 6) Liquid Smoke Exit Pipe

This pyrolysis tool is made with a batch system, which aims at a simpler process. The raw material needed for one batch is 1 kg of rubber seeds or rubber seed shells with a time of 2 hours to produce liquid smoke with different amounts according to the raw material.

3.3.1. Description of the Toolkit

The furnace is divided into 2 parts, namely the combustion chamber and material chamber. The combustion chamber functions as a fuel, the fuel used is dry wood. Furnace made of stainless steel with the following dimensions:

- Tube diameter: 30 cm
- Tube height: 50 cm
- High connecting pipe: 30 cm
- Connecting pipe diameter: 4 cm

The combustion chamber is made using a zinc plate which is connected directly to the smoke outlet pipe, the combustion chamber has the following dimensions:

- Tube diameter: 15 cm
- High tube: 20 cm

The condenser functions as a cooling chamber to convert the saturated vapor phase into a liquid phase. The cooling media used is water. Condenser tubes are made of stainless steel with the following dimensions:

- Tube diameter: 40 cm
- Tube height: 60 cm
- Connecting pipe height: 20 cm
- Connecting pipe diameter: 4 cm

The inside of the condenser has a spiral pipe (coil) that functions as a place for the flow of smoke from the vapor phase to the liquid phase. The coil is made of copper with a diameter of 3 cm and a length of 6 meters.

Several things must be considered to produce a good pyrolysis process. For example, the position of the appropriate charcoal room, so that the smoke can go directly to the smoke exit pipe. The heating in the combustion chamber must be stable. The temperature of the cooling water must be maintained so that the condensation process can be maximized so that the product produced is smoke that has changed phase to become liquid. Finally, the position of the coil must decrease, it is intended that viscous liquid smoke can still flow.

3.3.2. *Raw Material Preparation*

The raw material preparation is rubber seeds. The raw material preparation is 2 kg for each sample, so it needs to be prepared for about 6 kg of raw material. Rubber seeds soaked in water for 24 hours which serves to eliminate the content of cyanide acid. Then the rubber seeds are crushed and separated between the contents and the shell.

3.3.3. *Liquid Smoke*

Raw materials that are converted into liquid smoke are divided into 3 types, namely rubber seeds, rubber shells, and a mixture of both. Making liquid smoke is done by inserting 1 kg of raw materials into the furnace which is carried out for 2 hours so that liquid smoke is produced from the pyrolysis process.

3.3.4. *Liquid Smoke Purification*

Purification of liquid smoke serves to take the compounds needed for food preservation (in the study will use mackerel), which must be separated from tar in the liquid smoke. Thus, liquid smoke that was originally dark in color will turn to a more transparent color and can be a food preservative.

3.3.5. *Liquid Smoke Analysis*

The GCMS test functions to determine the component compounds present in liquid smoke qualitatively. The GCMS test is conducted at the Integrated Testing Laboratory of the Faculty of Mathematics and Natural Sciences.

ALT test was conducted to determine the ability of liquid smoke as a food preservative. ALT test was carried out on mackerel, namely by comparing the number of bacteria in the sample without soaking liquid smoke and with soaking liquid smoke with various variations of immersion time.

The pH test is performed on each liquid smoke sample after the distillation process before it is used as a

food preservative. The pH test is carried out using a pH indicator paper.

4. RESULT AND DISCUSSION

4.1. *Raw Materials Preparation*

The raw material used in this study is rubber seeds obtained from rubber plantations in South Sumatra. Rubber seeds obtained from these plantations are sorted beforehand to separate rubber seeds that are feasible and not feasible. The next step is the process of removing cyanide acid (HCN) content in the rubber seeds. Because this rubber seed will be used as a food product, the cyanide acid removal process is very important to eliminate the toxin content. The cyanide acid removal process is carried out in 3 stages, namely washing, soaking, and boiling stages. Washing is done using clean water 3-5 times, soaking rubber seeds for 24 hours, while boiling rubber seeds is done for 1.5 hours. After washing, soaking, and boiling, it is necessary to do a drying process that affects the process of reducing cyanide acid levels and avoiding mold growth and decay.

The preparation of the next raw material is to reduce the size of the rubber seeds. This study uses 3 variations of raw materials, the first using a shell of rubber seeds, the second uses the contents of the rubber seeds, and when using a combination of shells and the contents of rubber seeds. The raw material preparation is 1 kg of raw material for each sample variation in each batch of process. The function of this process is to facilitate the combustion process of raw materials to be converted into liquid smoke, the smaller the size of raw materials, the ability of raw materials to burn until they run out the better. Meanwhile, if the size reduction process is not carried out, it is feared that it will cause raw materials to be difficult to burn in the pyrolysis process. There is no specific size for the raw material before it is put into the furnace, the most important thing is that every part of the raw material has broken so it can be more easily converted to smoke.

4.2. *GCMS Analysis*

This study uses rubber seeds (which are separated into rubber seeds and rubber seed shells), due to the cellulose, lignin, and hemicellulose content of the rubber seeds. So that when assessed based on the content of rubber seeds, the rubber seeds can be converted into liquid smoke as in general. The content of rubber seeds is 33.54% lignin, 48.64% cellulose, and 17.82% other compounds.

Gas Chromatography-Mass Spectroscopy (GCMS) analysis is a method of separating organic compounds using two compound analysis methods, gas chromatography (GC) to separate compounds into singles, and mass spectroscopy (MS) to analyze the

molecular structure of analyses. In this study, GC-MS analysis of rubber seed shell samples was carried out. The results of the GC-MS analysis of liquid smoke from rubber seed shells are as follows:

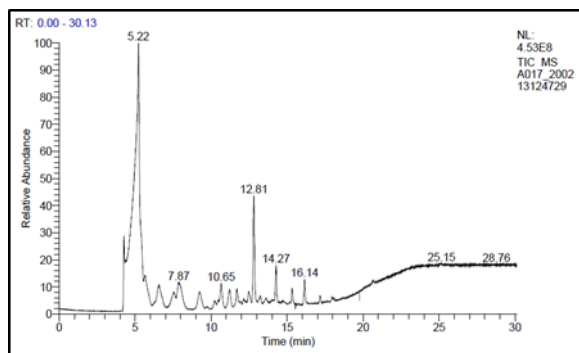


Figure 2 GCMS Analysis Results

GCMS analysis on liquid smoke was carried out with a total retention time of 30.09 minutes with an operating temperature of 300 OC. Based on the table above, it can be seen that the product content of the pyrolysis of rubber seeds into liquid smoke consists of hydrocarbon compounds with fractions C1 to C19. GCMS analysis results in this sample contain various kinds of compounds that are dominated by phenol, furan, ketone, and acid compounds. This indicates that the liquid smoke produced can be used for food preservatives because it is dominated by phenol group compounds, which is around 33.15%.

Table 3 Area Results in GC-MS Analysis

No	Molecular Formula	Component	Area (%)
1.	C ₉ H ₁₁ O ₃	Phenol, 2-methoxy	23,45
2.	C ₅ H ₆ O ₂	3-Furanmethanol	12,31
3.	C ₈ H ₁₀ O ₂	Creosol	7,38
4.	C ₉ H ₁₈ O ₂	Ethyl 2-heptanoate	6,9
5.	C ₆ H ₈ O ₃	2-Cyclopenten-1-one,2-hydroxy-3-methyl	4,54
6.	C ₈ H ₁₀ O ₃	Phenol,2,6-dimethoxy	4,53
7.	C ₆ H ₅ OH	Phenol	4,82
8.	C ₄ H ₈ O ₂	1-Hydroxy-2-Butanone	3,96
9.	C ₆ H ₁₀ O ₂	1H-Imidazole, 2,4,5,-trimethyl	3,12
10.	CH ₃ COH	Acetic Acid	2,78

Acid compounds are formed due to long time and high temperatures, especially acetic acid. While phenol compounds derived from lignin in the rubber seed samples that degraded at high temperatures. The content of phenol compounds in liquid smoke functions as an antioxidant that can extend the shelf life of a food ingredient and can inhibit and prevent the growth of a microbe in a food ingredient.

4.3. Analysis of pH Values

The pH value is one of the indicators or parameters used to determine the freshness level of fish. In fish pH usually is between 6.4 - 6.6 or close to neutral. If the pH exceeds 7, the fish will be easily damaged, due to low glycogen reserves in fish meat (Buckle, 1987)[30]. So, if the liquid smoke produced has an acidic pH, it will maintain the pH of the mackerel in acidic conditions. If the liquid smoke produced has an alkaline pH, then it will make the pH of mackerel fish more easily to become alkaline and experience decay and physical damage.



Figure 3 PH testing

Based on the pH test conducted on all liquid smoke samples, the following pH values are obtained:

Table 4 Analysis of pH of Liquid Smoke samples

Raw Material	pH
Rubber Shell	3
Rubber Shells and Seeds	4,5
Rubber Seed	8

Table 4 shows the results that liquid smoke with rubber shell raw material and the combination of shell and rubber seeds have an acidic pH, whereas for liquid smoke with rubber seed raw materials have a basic pH. So that when viewed from the pH, rubber seeds have a lower quality.

4.4. Analysis of Total Plate Numbers (ALT)

As a preservative, liquid smoke has many advantages, including phenol, carbonyl, and acids. The phenol content in liquid smoke acts as an antioxidant to prevent damage caused by the oxidation process. The acid in liquid smoke will affect the taste, pH, and shelf life of products preserved with liquid smoke. While carbonyl in liquid smoke that reacts with the protein in the product affects the color of the preserved product so that it will produce a uniform color and taste in the preserved product.

Purification of liquid smoke aims to minimize the amount of tar in liquid smoke. Purification can be done by the distillation process. Distillation is the process of separating a solution based on differences in boiling points. Using the basis that some components can evaporate faster than other components. In the process of distillation of liquid smoke, which is used as a preservative is the distillate which is part of raw liquid smoke that has evaporation. According to Darmaji (2002)[32], the distillation temperature of liquid smoke can be carried out from a temperature of 100oC to 150oC. So in this study, the distillation temperature used is 150oC.

4.4.1. Results of Analysis of Total Plate Figures

This study uses mackerel (*Euthynus affinis*) as ingredients to be tested as a preservative product using liquid smoke. This study had 45 samples, consisting of 3 variations of the time immersed mackerel in liquid smoke (30 minutes, 60 minutes, and 90 minutes) and 5 variations in concentration (3%, 6%, 9%, 12%, and 15%) so that the total sample is 45 samples.

Based on table 4, there is a sample used as a comparison sample. The treatment of this sample is sufficient to be allowed to stand for the specified time (30 minutes, 60 minutes, and 90 minutes), and then an analysis of the total plate count is carried out.

Table 5 Number of Colonies in Samples Without Soaking Liquid Smoke

Sample Code	Time (s)	Σ ALT (CFU/g)
A0	30	2,97 x 10 ⁴
B0	60	5,24 x 10 ⁴
C0	90	2,17 x 10 ⁵

The number of colonies gained is greater with increasing time. When the sample was allowed to stand for 30 minutes the number of colonies was 2.97 x 10⁴ CFU / gram, 60 minutes had the number of colonies

5.24 x 10⁴ CFU / gram, and 90 minutes had the number of colonies 2.17 x 10⁵.

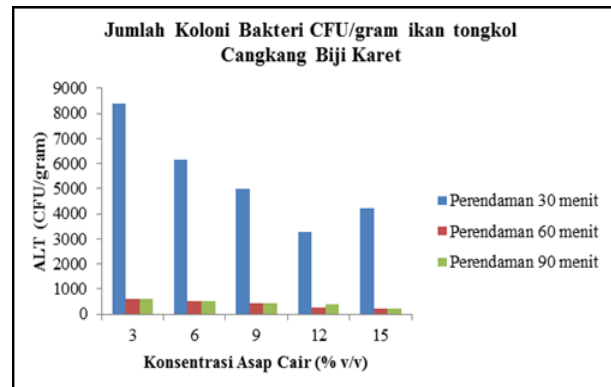


Figure 4 The number of bacterial colonies in rubber seedling shell raw material with variations in immersion time and concentration

The first sample tested was mackerel fish soaked in liquid smoke originating from a rubber seed shell. Samples soaked for 30 minutes showed a decrease in each concentration, the number of colonies in the 30-minute control variable was 2.97 x 10⁴ CFU / gram to 3.28 x 10³ - 8.4 x 10³ CFU / gram. The best results for rubber seed shell samples with a soaking time of 30 minutes is at a concentration of 12%.

The second sample tested was fish soaked for 60 minutes showing a decrease in each concentration, the number of colonies in the 60-minute control variable was 5.24 x 10⁴ CFU / gram to 2.115 x 10² - 5.91 x 10² CFU / gram. The best results for rubber seed shell samples with 60 minutes soaking time is at a concentration of 15%.

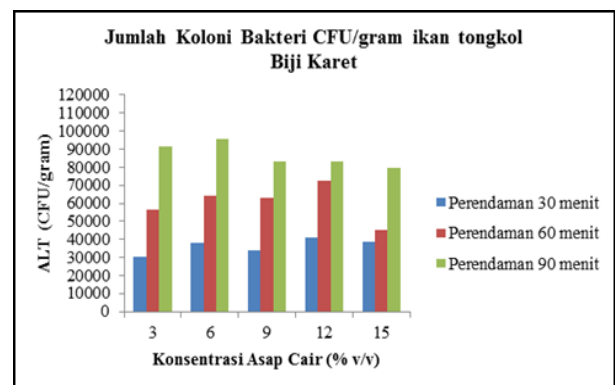


Figure 5 The number of bacterial colonies in rubber seed raw material with variations in immersion time and concentration

The third sample tested was mackerel fish soaked for 90 minutes showing a decrease in each concentration, the number of colonies in the 90-minute control variable was 2.17 x 10⁵ CFU / gram to 2.12 x 10² - 6.1 x 10² CFU / gram. The best results for rubber seed shell samples with 90 minutes soaking time were at a concentration of 15%.

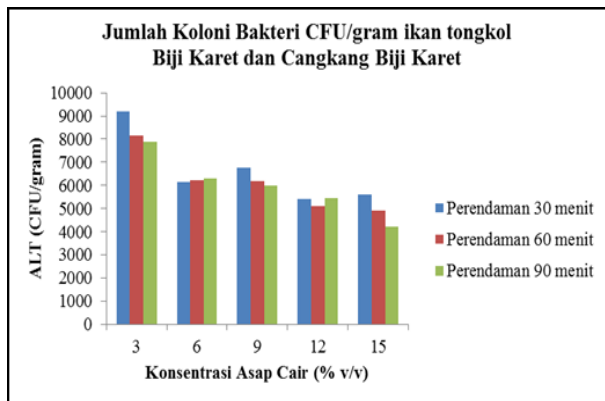


Figure 6 The number of bacterial colonies in the raw material of rubber seeds and rubber seed shells with variations in immersion time and concentration

4.4.2. Application of liquid smoke as a preservative

The utilization of liquid smoke is applied as a preservative for mackerel, which is analyzed based on the number of bacterial colonies. Fish has a threshold (Indonesian National Standard) SNI for quality requirements and food safety of fresh fish if the number of bacterial colonies does not exceed 5×10^5 CFU / gram of fish. Based on research that has been done, all samples meet Indonesian national standards. However, if sorted based on the efficiency of liquid smoke to become a preservative for mackerel, then the best liquid smoke is from the raw material of the rubber seedling shell, followed by a raw material consisting of a rubber seedling shell and a rubber seed, then liquid smoke with a rubber seed raw material. This is based on the content of the rubber seed shell which contains a lot of phenols, and liquid smoke from the rubber seed shell has a more acidic pH than the others.

The best concentration of almost all samples is 15%, so it can be concluded that the higher the concentration of liquid smoke, the better. Especially in rubber seed shell raw material. However, some samples have good results at 9%. So it can be concluded that at a concentration of 9% it has been able to become a fish preservative, due to a concentration of 12% and 15% only a slight decrease in the number of bacteria.

The best soaking time for mackerel in liquid smoke is 90 minutes. However, soaking 60 minutes is good enough to reduce the number of colonies. Whereas the 30-minute immersion is not good enough, because the number of reduced colonies is still relatively small. So that if concluded, then the 60 minute soaking time is enough to reduce the number of colonies in fish, but at 90 minutes has better results. Therefore, the best result is a 90 minute soaking time, a concentration of 15%, with the raw material of a rubber seedling shell.

Some things that must be evaluated from this research are, the incubation time which is only 24 hours can be extended to 48 hours, so we get control variables that have colony values exceeding SNI so that the effect of liquid smoke on the number of colonies will be more apparent.

Research that has been done refers to various previous studies. The first research that became a reference was from a study entitled "Preservation of Bloating Fish Using Liquid Smoke from Rubber Wood Branches (*Hevea Brasiliense*)" (Ali, Farida, and Joni Iskandar, 2020)[33][34]. In this study using a pyrolysis tool in PT. Sumbawa Banyuasin Plantation, while in this study using a simpler pyrolysis design.

The study varied the incubation time, while our study varied the immersion time of the fish before being tested using a Total Plate Number (ALT) analysis to determine the number of microbes in each gram of fish that had been soaked by liquid smoke. The study conducted variations in the concentration of liquid smoke that is 5%, 10%, and 15%, while research conducted using liquid smoke concentrations of 3%, 6%, 9%, 12%, and 15% to obtain optimal results due to the number of variables more.

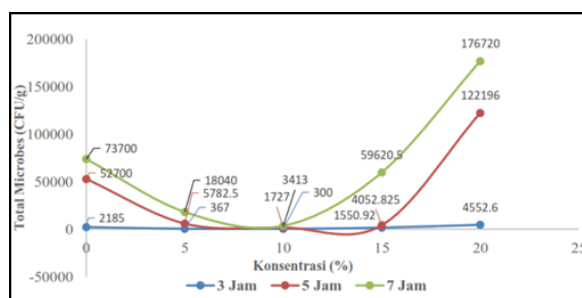


Figure 7 Effect of Concentration on Total Microbes in Bloating Fish

The best results obtained in the study were at a concentration of 10% with an incubation time of 3 hours with a total plate count of 3×10^2 CFU / gram. So it can be concluded that liquid smoke from rubber-wood material can reduce the number of bacteria found in mackerel and can be used as a preservative.

Previous research that was also a reference for this study was from a study entitled "Preservation of Tilapia Using Liquid Smoke from Rubber Wood Branches" (Ali, Farida, and Roval Al Fiqri, 2019)[35]. The best results were shown at incubation time for 3 hours. Liquid smoke with a concentration of 6% has experienced an increase in bacterial population growth from 0 CFU / g to 3×10^2 . At a liquid smoke concentration of 8%, an increase in the total plate number to 7.5×10^2 CFU / g, and the concentration of liquid smoke 10% causes an increase in the total plate number to 1.83×10^3 CFU / g. Based on the results of the total plate count test for 7 hours, the ability of liquid smoke to inhibit bacterial growth is best at a

concentration of 6% with the total plate count is 3×10^2 CFU / g.

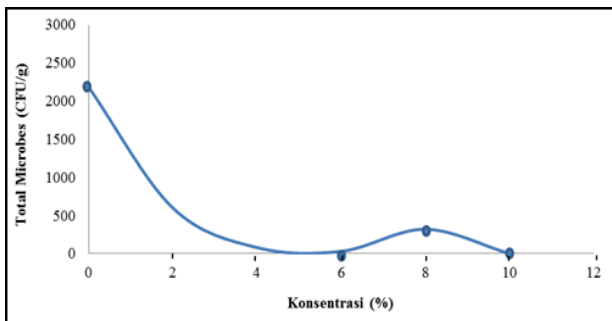


Figure 8 Effect of Concentration on Total Microbes in Parrotfish

The study varied in the incubation time, which when observed from the research data had unstable results. This is concluded from the number of microbes that tend to increase at certain concentrations in a longer soaking time. However, it can be concluded that liquid smoke from rubberwood can reduce the number of microbes in parrotfish.

Another research that is being referred to is from a study entitled "Liquid Smoke Application from Pyrolysis Process of Shells and Rubber Seeds as Fish Preservatives" (Ali, Farida. et al., 2020)[35] This research uses various variables (immersion duration and concentration of liquid smoke) the same and uses catfish as a type of test material from liquid smoke from rubber seeds. Variable duration of fish immersion before analysis of the total plate number was carried out to obtain the optimum immersion time in using liquid smoke as a preservative, compared to the variation of the incubation time because the number of microbes would continue to increase along with the incubation time increase in the total plate rate analysis process.

Table 6 ALT analysis of mackarel and patin (CFU/gram)

Bahan Baku	Konsentrasi Asap Cair	Variasi Waktu Perendaman					
		30 Menit		60 Menit		90 Menit	
		Tongkol	Patin	Tongkol	Patin	Tongkol	Patin
Cangkang Biji Karet	0%	29.700	11.150	52.400	37.800	217.000	520.000
	3%	8.400	7.420	591	715	610	724
	6%	6.140	6.510	530	600	528	680
	9%	5.000	5.540	431	570	413	511
	12%	3.280	5.550	262	517	383	518
	15%	4.216	5.520	212	526	212	512
Cangkang Biji Karet + Biji Karet	0%	29.700	11.150	52.400	37.800	217.000	520.000
	3%	9.200	11.100	8.140	7.213	7.890	6.290
	6%	6.130	89.520	6.210	6.200	6.320	6.300
	9%	6.756	7.856	6.200	6.317	6.000	5.000
	12%	5.410	5.200	5.100	5.100	5.440	5.125
	15%	5.620	5.320	4.920	5.420	4.210	5.276
Biji Karet	0%	29.700	11.150	52.400	37.800	217.000	520.000
	3%	30.500	21.800	56.400	32.600	91.200	24.100
	6%	38.100	31.620	63.900	35.900	95.400	25.200
	9%	34.000	36.400	63.000	41.820	83.000	31.700
	12%	41.100	28.200	72.200	51.300	83.200	24.100
	15%	38.900	30.000	45.200	31.280	79.700	38.000

Based on the table, some discussions were obtained on the comparison of mackerel and catfish in liquid smoke applications with the same concentration and immersion time. The liquid smoke in catfish has optimum conditions on the raw material of rubber seed shells with a concentration of 9% and a soaking time of 90 minutes. While the application of liquid smoke on mackerel has optimum conditions on the raw material of rubber seed shells with a concentration of 15% and a soaking time of 60 minutes.

The results of the analysis of total plate numbers in the two types of fish have a slightly different graphic pattern, but it can be concluded that liquid smoke has shown good results at a concentration of 9%, and then proceed at a concentration of 12% and 15%, especially in raw material for seed shells rubber because of its lignin content. The immersion duration variable indicates that the liquid smoke is optimum at 60 minutes, but it will be better if it is soaked in 90 minutes.

Based on several studies that have been carried out and then compared, the results are obtained that liquid smoke from rubber wood raw material and rubber seed shells (as well as various other raw materials that contain lignin), can be converted to liquid smoke which will then be used as a preservative for fish (parrotfish, mackerel, catfish, and mackerel).

5. CLOSING REMARK

5.1. Conclusion

The conclusions of this study are:

- 1) A simple pyrolysis tool is designed using a batch system of stainless steel for furnaces and condensers.
- 2) The best raw materials are raw materials with rubber seed shells because they have higher lignin content.
- 3) GCMS analysis results on shell smoke and rubber seeds containing various compounds such as phenols, furans, ketones, acids, etc.
- 4) The total plate number decreases with each additional concentration, ie at a concentration of 9% it has been able to reduce the number of bacterial colonies, and for concentrations of 12% and 15% also decreased but not too significant.
- 5) Liquid smoke products from rubber seed shells have the most optimum ability to inhibit bacterial activity with a total plate value of 2.12×10^2 CFU / gram of mackerel.
- 6) The pH value of the liquid smoke product is the liquid smoke with rubber seed shell (ie acidic pH), while the rubber seed raw material has a basic pH..

5.2. Suggestion

- 1) We recommend adding a variable in the form of temperature variations during the pyrolysis process.
- 2) The incubation time should be extended to 48 hours so that the results of the reduced number of colonies can be more visible.
- 3) We recommend that the length of the coil inside the condenser must be considered, so that smoke that has changed phase into liquid is not clogged because liquid smoke has a high viscosity.
- 4) Further research should be carried out on products that have been soaked with liquid smoke so that a food eligibility test can be carried out.

REFERENCES

- [1] [1] (Kementrian Pertanian, 2018).
- [2] Fadillah, H. dan Alfiarty, A. 2015. The influence of Pyrolysis Temperature and Time to the Yield and Quality of Rubber Fruit Shell Liquid Smoke. Prosiding Seminar Nasional Teknik Kimia.
- [3] Setyawardhani, D. A., Distantina, S., Henfiana, H., dan Dewi, A. S. 2010. Pembuatan Biodiesel dari Asam Lemak Jenuh Minyak Biji Karet. Prosiding Seminar Nasional Rekayasa Kimia dan Proses. Semarang: Univesitas Diponegoro.
- [4] Setyawardhani, D. A., Distantina, S., Henfiana, H., dan Dewi, A. S. 2010. Pembuatan Biodiesel dari Asam Lemak Jenuh Minyak Biji Karet. Prosiding Seminar Nasional Rekayasa Kimia dan Proses. Semarang: Univesitas Diponegoro.
- [5] Eka, H. D., Aris, T. Y., dan Nadiyah, W. A. 2010. Potential Use of Malaysian Rubber (*Hevea brasiliensis*) Seed as Food, Feed, and Biofuel. *Int Food Res Journal*. Vol.17 (1): 527-534.
- [6] Eka, H. D., Aris, T. Y., dan Nadiyah, W. A. 2010. Potential Use of Malaysian Rubber (*Hevea brasiliensis*) Seed as Food, Feed, and Biofuel. *Int Food Res Journal*. Vol.17 (1): 527-534.
- [7] Safitri, E. S. 2003. Komposisi Kimia Cangkang Buah Karet. *Jurnal Penelitian Karbon Aktif*. (Skripsi). Indralaya: Universitas Sriwijaya.
- [8] Atmaja, A. 2009. Aplikasi Asap Cair Redestilasi pada Karakterisasi Kamaboko Ikan Tongkol (*Euthynus affinis*) Ditinjau dari Tingkat Keawetan
- [9] Girrard. J.P. 1992. *The Technology of Meat and Meat Product Smoking*. Ellis Harwood.
- [10] Atmaja, A. 2009. Aplikasi Asap Cair Redestilasi pada Karakterisasi Kamaboko Ikan Tongkol (*Euthynus affinis*) Ditinjau dari Tingkat Keaweta
- [11] Purwaningtyas, A. 2010. Kajian Optimasi Proses Pirolisismackarel Jagung untuk Produksi Asap Cair. (skripsi). Bogor: Institut Pertanian Bogor
- [12] Girrard. J.P. 1992. *The Technology of Meat and Meat Product Smoking*. Ellis Harwood.
- [13] Maga, J.A. 1987. *Smoke in Food Processing*. Boca Raton: CRC Press.
- [14] Sutin. 2008. Pembuatan Asap Cair dari Tempurung Kelapa dan Sabut Kelapa secara Pirolisi serta Fraksinasinya dengan Ekstraksi. Bogor: IPB.
- [15] Sutin. 2008. Pembuatan Asap Cair dari Tempurung Kelapa dan Sabut Kelapa secara Pirolisi serta Fraksinasinya dengan Ekstraksi. Bogor: IPB.
- [16] Atmaja, A. 2009. Aplikasi Asap Cair Redestilasi pada Karakterisasi Kamaboko Ikan Tongkol (*Euthynus affinis*) Ditinjau dari Tingkat Keawet
- [17] Yulstiani, R. 2008. Monograf Asap Cair sebagai Bahan Pengawet Alami pada Produk Daging dan Ikan. Surabaya: UPN Veteran Jawa Timur
- [18] Luditama, C. 2006. Isolasi dan Pemurnian Asap Cair Berbahan Dasar Tempurung dan Sabut Kelapa secara Pirolisis dan Destilasi. (skripsi). Bogor: Institut Pertanian Bogor.
- [19] Yulstiani, R. 2008. Monograf Asap Cair sebagai Bahan Pengawet Alami pada Produk Daging dan Ikan. Surabaya: UPN Veteran Jawa Timur
- [20] Yulstiani, R. 2008. Monograf Asap Cair sebagai Bahan Pengawet Alami pada Produk Daging dan Ikan. Surabaya: UPN Veteran Jawa Timur
- [21] Astuti. 2000. Pembuatan Asap Cair dari Tempurung Kelapa. Laporan Penelitian. Jakarta
- Yulstiani, R. 2008. Monograf Asap Cair sebagai Bahan Pengawet Alami pada Produk Daging dan Ikan. Surabaya: UPN Veteran Jawa Timur
- [22] Astuti. 2000. Pembuatan Asap Cair dari Tempurung Kelapa. Laporan Penelitian. Jakarta
- Yulstiani, R. 2008. Monograf Asap Cair sebagai Bahan Pengawet Alami pada Produk Daging dan Ikan. Surabaya: UPN Veteran Jawa Timur
- [23] Astuti. 2000. Pembuatan Asap Cair dari Tempurung Kelapa. Laporan Penelitian. Jakarta

- Yulstiani, R. 2008. Monograf Asap Cair sebagai Bahan Pengawet Alami pada Produk Daging dan Ikan. Surabaya: UPN Veteran Jawa Timur
- [24] Atmaja, A. 2009. Aplikasi Asap Cair Redestilasi pada Karakterisasi Kamaboko Ikan Tongkol (*Euthynus affinis*) Ditinjau dari Tingkat Keawetan
- [25] Darmadji, P. dan M. Izomoto. 1995. Antibacterial effects of spices on fermented meat. The Scientific Reports of The Faculty of Agriculture Okayama University. Vol. 83 (1): 9-15.
- [26] Karseno, dkk. 2002. Daya Hambat Asap Cair Kayu Karet terhadap Bakteri Pengkontaminan Lateks dan Ribbed Smoke Sheet. Agritech. Vol.2 (1): 10-15.
- [27] Ahmad, SS, Mubarik, N.R, Nursyamsi., R, and Septiaji, P., Characterization of Redistilled Liquit
- [28] Vranama, H.A. dan Sutherland J.P. (1994). Beverages (Technology, Chemistry, and Microbiology). London: Chapman and Hall.
- [29] Vranama, H.A. dan Sutherland J.P. (1994). Beverages (Technology, Chemistry, and Microbiology). London: Chapman and Hall.
- [30] Buckle, K.A, 1987, Ilmu Pangan, Jakarta, UI Press.
- [31] Darmadji, P. dan M. Izomoto. 1995. Antibacterial effects of spices on fermented meat. The Scientific Reports of The Faculty of Agriculture Okayama University. Vol. 83 (1): 9-15.
- [32] Ali, Farida., Joni Iskandar. 2020. Pengawetan Ikan Kembung Menggunakan Asap Cair dari Ranting Kayu Karet. Jurnal Jurusan Teknik Kimia Fakultas Teknik Universitas Sriwijaya.
- [33] Ali, Farida., Roval Al Fiqri. 2019. Pengawetan Ikan Nila Menggunakan Asap Cair dari Ranting Kayu Karet. Jurnal Jurusan Teknik Kimia Fakultas Teknik Universitas Sriwijaya.
- [34] Ali, Farida., M. Syahrul Sandra, Ryan Reza Fahlepy. 2020. Aplikasi Asap Cair dari Proses Pirolisa Cangkang dan Biji Karet sebagai Bahan Pengawet Ikan. Jurnal Jurusan Teknik Kimia Fakultas Teknik Universitas Sriwijaya.
- [35] Ali, Farida., M. Syahrul Sandra, Ryan Reza Fahlepy. 2020. Aplikasi Asap Cair dari Proses Pirolisa Cangkang dan Biji Karet sebagai Bahan Pengawet Ikan. Jurnal Jurusan Teknik Kimia Fakultas Teknik Universitas Sriwijaya.



The 4th FIRST 2020

(FORUM IN RESEARCH, SCIENCE, AND TECHNOLOGY)

CERTIFICATE OF APPRECIATION

Present to

LIA CUNDARI

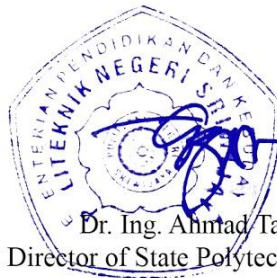
in recognition & appreciation of contribution as

Co-Author

FIRST International Conference

“SYNERGY OF APPLIED TECHNOLOGY FOR SOCIAL-TECHNOPRENEUR BASED ON LOCAL
RESOURCE TO GENERATE SUSTAINABILITY DEVELOPMENT”

Held on November, 10-11, 2020



Dr. Ing. Ahmad Taqwa, M.T.
Director of State Polytechnic of Sriwijaya



Dr. Rini Marlina, S.Ei, M.Si., Ak., CA.
Chair of the 4th FIRST 2020

Organized By :



Collaborate With :

