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2021 5th INTERNATIONAL CONFERENCE

FIRST

FORUM IN RESEARCH, SCIENCE, AND TECHNOLOGY (FIRST)

CONFERENCE PROGRAMS AND ABSTRACT

ADVANCING SUSTAINABLE SCIENCE AND TECHNOLOGY THROUGH EFFECTIVE COLLABORATION

OCTOBER 20-21, 2021

Palembang, Province of South Sumatera
Indonesia

Organized By :

FOREWORD FROM GENERAL CHAIR 5th FIRST 2021 INTERNATIONAL CONFERENCE

Assalamu'alaikum wr wb,

Alhamdulillahirrobbil 'alamin, Thank to the God, almighty, due to His bless and love, we are granted good health and opportunity so that we can meet here in the event of the 5th FIRST and the 3rd SNAPTEKMAS 2021.
The honorable keynote speakers of the 5th FIRST and the 3rd SNAPTEKMAS 2021

Dra. Nana Yuliana, MA., Ph.D., as The Indonesian LBBP Ambassador for the Republic of Cuba, concurrently with the Commonwealth of the Bahamas, Jamaica, the Dominican Republic and Haiti
Prof. Ramaraj Boopathy. from U Alcee Fortier Distinguished Service Professor of Biological Sciences At the Nicholls State University, USA
Dr. Ing. Ahmad Taqwa, the Director of State Polytechnic of Sriwijaya.

The honourable keynote speakers, distinguished guests, all participants, ladies and gentlemen,

For the beginning of my speech, let me welcome all of you with my great warm hug. It is a great honor for me that you choose the 5th FIRST and the 3rd SNAPTEKMAS 2021 as your conference. I am so proud that the authors still become enthusiastic to develop the knowledge although in this pandemic situation. Let us still work hard to support the development of the world through the research, science, and technology in many parts of the knowledge, as what has been purposed by the FIRST conference itself.

In this occasion, I would like proudly to inform you that the 5th FIRST and the 3rd SNAPTEKMAS 2021 as the forum to share knowledge, to search, to find, and to enlarge the link with other industries and universities has attracted so many authors from abroad, such as from: Politeknik Tun Syed Nasir Syed Ismail; MARA University; Politeknik Mukah Sarawak; University Sultan Zainal Abidin, Terengganu, Malaysia; Politeknik Melaka (PMK) Malaysia; Iloilo Science and Technology University (ISAT-U) Philipina; Politeknik Kota Kinabalu; Universiti Teknologi Malaysia; The National University of Malaysia; National Chin-Yi University of Technology (NCUT); Accounting Research Institute UiTM-Malaysia; Management and Science University Malaysia; AlBaha University, KSA, Saudi Arabia; Politeknik Melaka (PMK), Malaysia; Kuantan Community College, Pahang, Malaysia; Universiti Brunei Darussalam; and Ferdowsi University of Mashhad, Iran.

Welcome to all of the researchers that become the collaborators in our research and community service. It is our great honour to have you as our collaborators and participants in the 5th FIRST and the 3rd SNAPTEKMAS 2021.

The honourable keynote speakers, distinguished guests, all participants, ladies and gentlemen,

In this chance, I would like to say thank you very much to the Director of State Polytechnic of Sriwijaya for his full support in the development of the Research and Service Community programs. Due to his hard work and his belief to all of the committee so that this event can be held.

In this occasion, I also would like to convey my big thank to all of the keynote speakers, invited guests, all the participants, all reviewers, and all committee of the5th FIRST and the 3rd SNAPTEKMAS 2021. Without you all, this event will be nothing. May Allah SWT gives His reward for your sincerity. As the time goes by, it is hoped that our cooperation and coordination in the FIRST and SNAPTEKMAS can be maintained and improved. I hope that you can enjoy this conference and can get a big benefit from this event. I also wish that we can meet again in the forthcoming FISRT ad SNAPTEKMAS

Wassalamu'alaikumwaraahmatullahi wabarakatuh

FOREWORD FROM DIRECTOR OF STATE POLYTECHNIC OF SRIWIJAYA

The honorable, FIRST 2021 and SNAPTEKMAS 2021 keynote speakers,

Dra. Nana Yuliana, MA., Ph.D., as The Indonesian LBBP Ambassador for the Republic of Cuba, accredited to the Bahamas, Republic of Dominican, Republic of Haiti and Jamica

Prof. Ramaraj Boopathy., from U Alcee Fortier Distinguished Service Professor of biological sciences at the Nicholls State University, USA

Dr. Ing. Ahmad Taqwa, MT., as Director of Politeknik Negeri Sriwijaya

Assalamualaikum wr wb,

Let us extend our gratitude to Allah SWT, the most gracious, the most merciful. Due to His bless, we can gather here, at the Opening Ceremony of the FIRST 2021 and SNAPTEKMAS 2021

First of all, Please let me deliver my warm welcome to all keynote speakers and all participant of FIRST 2021 and SNAPTEKMAS 2021. It is my great pleasure to meet and see you in this event.

Although, there are so many obstacles that should be faced in the pandemic situation, however, as young generation, we should be optimistic, stay strong and be active in searching and finding the solution. The FIRST 2021 and SNAPTEKMAS 2021 as the DIES of State Polytechnic of Sriwijaya annual event will become one of the media to support those activities. The researchers could share knowledge, find partners, and enlarge the collaboration through this event.

Based on the change in the model of the teaching learning activity that focuses on the MERDEKA BELAJAR, State Polytechnic of Sriwijaya has a big desire in getting acceleration in the internationalization of the institution. One of them by improving the overseas and industrial collaboration, especially in joint research and joint publication. In the beginning of 2021, the research and community service unit in Politeknik Negeri Sriwijaya has launched new schemes of research and community service, namely the Overseas Collaboration Research and Overseas Collaboration Community Service. Thanks to God, those schemes have attracted researchers not only from Asia but also several other countries outside Asia, such as: research and community service collaboration with Al Baha University from Saudi Arabia, with Ferdowsi University of Mashhad from Iran, and with Princess Sumaya University of Technology from Jordan, as well as several other foreign universities.

In this occasion, I also would like to welcome all the researchers that become the collaborators in our new scheme of research and community service. It is our great honour to have you as our collaborators.

The honourable participants,

At this time, State Polytechnic of Sriwijaya has held 5 times of FIRST. FIRST publications from previous conferences have been successfully indexed not only in SCOPUS, but also in WOS. This 5th FIRST seminar will be conjugated with the 3rd National Seminar on Community Service SNAPTEKMAS. (National seminar of applied technology for public). All of these are the efforts to improve the quality of Polsri lecturers which significantly have a positive effect on the learning process of Polsri students.

Before ending my speech, I would like to congratulate the participants of The FIRST 2021 and SNAPTEKMAS 2021. May the noble efforts, support, and cooperation of researchers in this conference will continue. Special thanks to the organizer and co-organizer committee of The FIRST 2021 and SNAPTEKMAS 2021 for the hard work and the commitment in realizing this conference. Do maintain the spirit of working in a team and continue to unite in order to display a culture of excellence in the eyes of the country and the world.

With Bismillahirrahmanirrahim, I officiate The FIRST 2021 and SNAPTEKMAS 2021.
Wassalamu'alaikum warrahmatullahi Wabarakatu

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KEYNOTE SPEAKER

Prof. Ramaraj Boopathy

Alcee Fortier Distinguished Service Professor of biological sciences
at the Nicholls State University, USA

Fulbright Scholar Fulbright Senior Specialist World Class Professor-Government of Indonesia. Honorary Visiting Professor, ITB, Indonesia Alcee Fortier Distinguished Service Professor John Brady Endowed Professor in Biological Sciences Nicholls State University Business Address: Alcee Fortier Distinguished Service Professor John Brady Endowed Professor in Biological Sciences Department of Biological Sciences Nicholls State University Thibodaux **EDUCATION:** B.Sc. Zoology, University of Madras, India; 1979 M.Sc. Environmental Biology, Tamil Nadu Agricultural University, India; 1981 Ph.D. Environmental Biology, University of Madras, India; 1986 **UNIVERSITY RESPONSIBILITIES**: Responsibilities include Teaching Environmental Biotechnology, a Senior and Graduate lever course, Marine and Environmental Biology (Graduate Course), Microbiology and Environmental Biology courses. Research interests include Bioremediation of Hazardous Chemicals and Anaerobic Microbiology. Service includes advising students, participate in Departmental and University committees and serving the local and regional communities. Advisor to Masters Program in Marine and Environmental Biology. **PROFESSIONAL EXPERIENCE:** January 2013 – Present: John Brady Endowed Professor in Biological Sciences, Department of Biological Sciences, Nicholls State University, Thibodaux. Teaching, Research, and Service to the University and Community. August 2012 – Present: Alcee Fortier Distinguished Service Professor, Department of Biological Sciences, Nicholls State University, Thibodaux. Teaching, Research, and Service to the University and Community. August 2004 – Present: Distinguished Service Professor, Department of Biological Sciences, Nicholls State University, Thibodaux. Teaching, Research, and Service to the University and Community. **MAJOR AREAS OF RESEARCH INTERESTS:** Anaerobic digestion, Composting, Biodegradation of hazardous chemicals. Antibiotic resistant bacteria and Antibiotic resistance genes in the aquatic ecosystem. Isolation and identification of novel bacteria. Anaerobic degradation of explosive chemicals with particular reference to sulfate reducing bacteria. Design and development of biological reactor systems. Microbial immobilization of

heavy metals and radionuclides. Alcohol production from agricultural residues. Water quality in the wetlands. Alternative to sugarcane burning, Biological control of termites. Organic ways to control land loss and coastal restoration.

KEYNOTE SPEAKER

Dr. Ing. Ahmad Taqwa, MT.

Director of Politeknik Negeri Sriwijaya Indonesia

Director of State Polytechnic of Sriwijaya, other than that, he is still active at Head of The Research and Publication Commission Forum Director of State Polytechnical In Indonesia, Founder of The Online Journalist Board (IWO) Sumsel, Chairman of The Advisory Board of UKM Nusantara Palembang and Assessor of Higher Accreditation Board. **EDUCATION**: Diplom Ingenieur Electrical Engineering HTL, Ingenieurschule Beider Basel, Switzerland; 1994,Magister (2005) and Doctoral (2010) at Electrical Engineering, Bandung Institute of Technology, Indonesia. **RESEARCH**: Head of Research Assignment "Mini PLTS Periodic Cooling System to Overcome Overheating in Palembang City" (2019), Member of The Research Assignment "Effects of Sea Salt Dust Collection on Output Loss and Solar Panel Output Efficiency" (2020), and Head of Research Assignment "Design and Build of Wireless Sensor Network Prototype Detection Of Landslides Based on IOT and LORA" (2020). **DEDICATION:** "The Design and Evaluation of Virus Scan in The E-Mail System in SMA N 5 Palembang" (2018), Assignment Service "Utilization of WSN Technology in Parking Air Monitoring Foundation SMP Harapan Mulia Palembang" (2019), Development of Teaching Materials with Interactive Multimedia with Education Game for Harapan Mulia Junior High School Students" (2020). **AWARD:** Certificate In Participating In The 200 Hour Advanced Technical Teacher Training awarded by FONTYS and PEDC (1998), Satyalancana Karya Satya X Year 2011 And Satyalancana Karya Satya XX Year 2017 by The President of The Republic of Indonesia. **WORKSHOP**: Seminar and Focus Group Discussion Forum The Rector of Indonesia "Economic Stability In The Vuca Area", Ujung Pandang (2020), Workshop on Using Integrated Resources Information System Applications For Lecturers of State Polytechnical Polytechnic, Palembang (2019) And Workshop of Learning Methodology of Polsri Lecturers and Outside Education Domicile (PDD) as a Source Person, Palembang (2019).

RUNDOWN
The 5th FIRST 2021 INTERNATIONAL CONFERENCE
(FORUM IN RESEARCH SCIENCE AND TECHNOLOGY)
SNAPTEKMAS (Seminar Nasional Aplikasi Teknologi pada Masyarakat) 2021
Palembang, South Sumatera, Indonesia
Thursday, October 21, 20201

Thursday, October 21, 20201					
No.	**Session**	**Person in Charge**	**Time Allotment (WIB)**	**Liaison Officer**	
1.	Registration	Event Section Committee	07.00 – 08.00	Doeslohal Djumrianti, S.E.MIS., Ph.D	
2.	The Opening Ceremony	Event Section Committee	08.00 – 09.00		
3.	Do'a				
4.	Indonesian National Anthem				
5.	Chair Report Speech				
6.	Speech and Opening Remarks by Director of State Polytechnic of Sriwijaya				
7.	Souvenirs Gift, Group Photos				
PLENARY SESSION					
No.	**Keynote Speaker**	**Affiliation**	**Time Allotment (WIB)**	**Moderator**	**Liaison Officer**
1.	Dra. Nana Yuliana, MA., Ph.D.	The Indonesian LBBP Ambassador for the Republic of Cuba, concurrently with the Commonwealth of the Bahamas, Jamaica, the Dominican Republic and Haiti	09.00 – 10.00	Tiur Simanjuntak M.Pd.	Doeslohal Djumrianti, S.E.MIS., Ph.D
2.	Prof. Ramaraj Boopathy	Alcee Fortier Distinguished Service Professor of biological sciences at the Nicholls State University, USA	10.00 – 11.00	Prof. Hasan Basri	Dr. Nyayu Latifah Husni, M.T.
3..	Dr. Ing. Ahmad Taqwa, MT.	Director of Politeknik Negeri Sriwijaya, Indonesia	11.00 – 12.00	Jaksen M. Amin, M.Si.	Dr. Martha Aznury, S.Pd., M.Si.

PARALEL SESSION					
No.	**Theme**	**Room**	**Time**	**Moderator**	**Articles**
1.	TRACK 1 (Engineering and Science)	1	13.00 – 16.00	Dr. Eng Tresna Dewi, M.Eng./ Ika Sulianti, ST, MT	15
2.	TRACK 1 (Engineering and Science)	2	13.00 – 16.00	Dr. Martha Aznury, M.Si./ Indah Purnamasari, M.Eng.	14
3.	TRACK 1 (Engineering and Science)	3	13.00 – 16.00	Fatahul Arifin, M.Eng, Ph.d./ Dr. Indrayani, S.T., M.T.	13
4.	TRACK 2 (Computer Science, Computer Engineering, Information System, Informatics Management)	4	13.00 – 16.00	Rika Sadariawati, M.Si./ M.Miftakhul Amin, S.Kom., M.Eng	13
5.	TRACK 2 (Computer Science, Computer Engineering, Information System, Informatics Management)	5	13.00 – 16.00	Dr. Nyayu Latifah H, MT./ Lindawati, S.T., M.TI	12
6.	TRACK 3 (Social Science)	6	13.00 – 16.00	Doeslohal Djumrianti, S.E.MIS., Ph.D/ Dr. Marieska Lupikawati	13
7.	TRACK 3 (Social Science)	7	13.00 – 16.00	Dr. Sari Lestari ZR/ Dr. Rita Martini	14
8.	SNAPTEKMAS 1	8	13.00 – 16.00	Yurni Oktarina, ST, MT/ Mouland Irwadi, SE. M.Si.	15
9.	SNAPTEKMAS 2	9	13.00 – 16.00	Leni Novianti, M.Kom./ Maivi Kusnandar, M.Kom	15
10	SNAPTEKMAS 3	10	13.00 – 16.00	M Husni Mubarok, M.Si./ Martinus Mujur, ST, MT	15
11	SNAPTEKMAS 4	10	13.00 – 16.00	Dr. Ade Silvia H, MT./ M. Sopian Soim, ST, MT	13

CLOSSING SESSION		
Event	Time	Room
– Closing Ceremony – Announcement of: 1. Best Paper FIRST IC 2021 2. Best Paper SNAPTEKMAS 2021 3. Best Presenter FIRST IC 2021 4. Best Presenter SNAPTEKMAS 2021 – Quiz Online	16.00– 17.00	Main Room

TRACK 3 (Social Science)

ROOM : 6
TIME : Thursday, 21 October, 2021/ 13.00 - 16.30
ARTICLES : 13
MODERATOR : Doeslohal Djumrianti, S.E.MIS., Ph.D/ Dr. Marieska Lupikawati

NO	Time	ID	AUTHORS	TITLE	AFFILIATION
1	13.00-13.10	3847	Ayu Chotibah, Bainil Yulina, Desi Apriyanty, Evada Dewata, Pridson Mandiangan	THE INNOVATION OF SOUTH SUMATERA TRADITIONAL BATIK E-COMMERCE APPLICATIONS	State Polytechnic of Sriwijaya
2	13.10-13.20	3683	M. Thoyib, Riza Wahyudi, Firmansyah, Darul Amri	THE ANALYSIS OF COST QUALITY ON PRODUCTIVITY OF IRON RAILING PRODUCTS IN SMALL AND MEDIUM BUSINESS IN PALEMBANG	State Polytechnic of Srwiwijaya
3	13.20-13.30	3757/3756	Nelly Masnila, Firmansyah, Jovan Febriantoko, Riana Mayasari, Jamaliah Said	Quality of Financial Reporting and Impact of GGG Implementation: Study on Local Government in Indonesia	State Polytechnic of Sriwijaya
4	13.30-13.40	3796	Evi Agustina Sari, Sri Gustiani, Yusri, Tiur Simanjuntak	An Error Analysis of English Sentence Construction in Writing Subject Made by the Students of the English Department at Sriwijaya State Polytechnics	State Polytechnic of Sriwijaya
5	13.40-13.50	3827	Edwin Frymaruwah, Farah Aida Ahmad Nadzri, Periansya, Evada Dewata	DISCLOSURE OF SUSTAINABLE PERFORMANCE IN HIGHER EDUCATION IN INDONESIA	State Polytechnic of Sriwijaya, UiTM
6	13.50-14.00	3976	Hendra Hadiwijaya Febrianty Rezania Agramanisti Azdy	Improvement of LPKA Class 1 Palembang Electronic Dashboard with Field Performance Monitoring	Palcomtech Polytechnic, STMIK PalComTech
7	14.00-14.10	3853/4034	Neneng Miskiyah, Purwati, Yulia Pebrianti, Keti Purnamasari, Nyimas Miftahul Jannah,	OPTIMIZATION OF INCOME PARAMETERS OF SONGKET CRAFTSMEN ON KOPERASI SONGKET PALEMBANG	State Polytechnic of Sriwijaya

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Atlantis Highlights in Engineering, volume 9
5 th FIRST T1 T2 2021 International Conference (FIRST-T1-T2 2021)

Analysis of Syngas Results of the Maindepth Coal Gasification Process with Gasification Downraft Methods

Erlinawati Erlinawati[1,*] Aida Syarif[1] Arizal Azwan[1] Tahdid Tahdid[1]

[1]*Energy Engineering Applied Undergraduate, Sriwijaya State Polytechnic*
[*]*Corresponding author. Email: erlinawatiakil @yahoo.co.id*

ABSTRACT
According to the Geological Agency (2015), Indonesia's resources total are 106.845 billion tons and coal reserves are 32.263 billion tons. Behind the reasons for choosing coal as an energy source, there are still some disadvantages of using coal directly. One of them is the coal contains a lot of pollutant that are harmful to the environment. Coal releases gases (CO_2, N_2O, NOx, SOx and Hg) that caused global warming and pollution. The process of solid convert to gas is called Gasification is. In contrast to combustion, the process of is a breaking of the carbon chain into the form of other elements or chemical compounds. In this study, the gasification process was carried out using the downdraft method. Gasification of coal will be produce producer gas in the form of synthetic gas (syngas) with the main components consisting of CO, H_2, CO2 and N_2 and low in pollutants. This study aims to determine the effect of the type of coal seam on the syngas produced, the calorific value of the syngas, and the effect of the air flow rate.

Keywords: *Gas Fuel, Downdraft Gasification, Coal, Syngas Results*

1. INTRODUCTION

Indonesia has potential resources and coal reserves which are spread mostly on the islands of Kalimantan and Sumatra, and a small portion of the rest is spread across several locations on the islands of Java, Sulawesi and Papua. According to the Geological Agency (2015), Indonesia's total resources are 106.845 billion tons and coal reserves are 32.263 billion tons. The quality of Indonesian coal resources is quite varied in terms of caloric parameters, ash content, sulfur content, total moisture, and other parameters (BAPPENAS, 2019). Behind the reasons for choosing coal as an energy source, there are still some disadvantages of using coal directly. One of them is that coal contains a lot of pollutants that are harmful to the environment. Coal releases gases (CO2, N2O, NOx, SOx and Hg) that cause global warming and pollution.

The development of coal conversion in Indonesia is basically an inseparable part of encouraging the increase in added value of coal that must be carried out by coal entrepreneurs as stipulated in Government Regulation Number 23 of 2010 articles 94, 95, and 96 and national energy policies based on Government Regulations of the Republic of Indonesia. Number 79 of 2014 concerning energy diversification (article 18 paragraph 2 point b) states that one of the energy diversification is through increasing the use of low quality coal for gasified coal.

Gasification is a process of converting solid fuel into gas. In contrast to combustion, the gasification process is the process of breaking the carbon chain into the form of other elements or chemical compounds. The gasification process requires little oxygen and water vapor is often used for the combustion process [2]). By converting coal into gas, unwanted materials contained in coal such as sulfur compounds, carbon dioxide (CO2), and ash can be removed from the gas using certain methods so that clean gas can be produced. Coal gasification will produce producer gas in the form of synthetic gas (syngas) with the main components consisting of carbon monoxide (CO), hydrogen (H2), carbon dioxide (CO2) and nitrogen (N2) which are low in pollutants. So that energy experts have focused on developing coal gasification to meet future energy consumption. (Sutrisna, I.P., 2007). The research that I will take focuses on the syngas gasification results from the mine depth coal downdraft method, types of coal seams (A1, A2, B and C), and the effect of air flow rate.

1.1. Characteristics of Coal

Each type of coal has a different composition. Factors that cause this include the initial decomposition of coal origin through diagenetic processes and coalification [3]. The heterogeneity of coal properties is estimated in various relationships of its constituent components, such as the relationship between hydrogen and carbon content, oxygen and carbon content, and volatile content and calorific value. The quality of each coal deposit is determined by temperature and pressure and the length of time it forms, which is referred to as 'organic maturity'. Proximate coal content testing is needed to determine the character and composition of coal. Coal proximate analysis can be seen in Table 1:

Table 1. Proximate Analisys from each coal sample

Type of Analisys		Type of Coal Seam			
		Tipe A1	Tipe A2	Tipe B	Tipe C
Proximate	TM (%)	6,57	6,63	2,09	2,10
	VM (%)	42,96	42,47	35,20	34,99
	Ash (%)	4,77	4,78	8,57	8,58
	FC (%)	45,70	46,12	54,14	54,34

Table 2. Caloric Value of Coal Sample

Type of Coal Seam	Caloric Value (Cal/gr)
Tipe A1	3481,6153
Tipe A2	4541,4801
Tipe B	4651,2393
Tipe C	5217,9419

1.2. Coal Gasification

The thermochemical conversion of coal can be in the form of pyrolysis, gasification and combustion (combustion). The difference in the type of conversion lies in the amount of air (oxygen) consumed and the output during the conversion process. Gasification technology is a form of increasing the energy contained in coal through a conversion from a solid phase to a gas phase using a thermal degradation process of organic materials at high temperatures in incomplete combustion using limited air (20%-40% air). stoichiometry) [4]

The fuel used for the gasification process uses materials containing hydrocarbons such as coal and biomass. The entire gasification process occurs in the gasifier. In this gasifier, a heating process occurs to a certain reaction temperature and then the fuel goes through a combustion process by reacting with oxygen to produce combustible gas and other combustion products. Water vapor and carbon dioxide from combustion are reduced to flammable gases, namely carbon monoxide (CO), hydrogen (H2) and methane (CH4) which can then be used as power plants or stoves.

1.3. Downdraft Gasification

The development of gasification technology makes the process of research and development of gasifiers continue to be carried out. The development was carried out with various considerations, including reducing the tar and sulfur content in the syngas product. The downdraft gasifier is a reactor with the direction of the flow of air and raw materials both going down. Syngas flows down and gasifier. [5]. Stated that the reason for choosing the downdraft type gasifier was due to 4 things, namely:

1. Lower manufacturing costs,
2. The gas produced is hotter than the updraft system
3. Easier to proceed to the combustion process
4. Lower tar than updraft. This is because the tar which is the result of pyrolysis is carried along with the gas and then enters the combustion area (combustion) and then gasification which has a higher temperature. In this area of gasification and combustion, tar will then decompose.

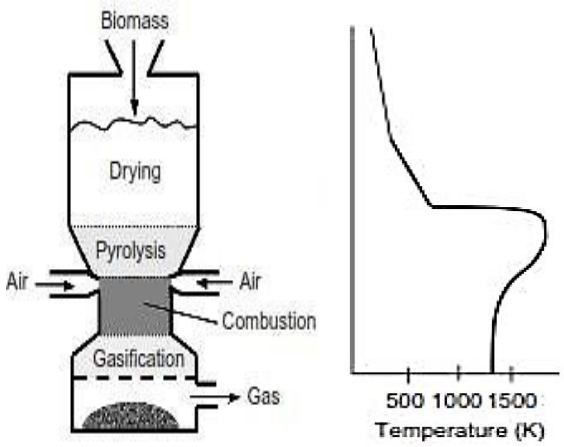


Figure 1. Scheme of Downdraft [6]

1.4. Effect of Coal Rank on Syngas Products

The type of coal is very important to the desired syngas yield. Riza Abrar (2017) states that the conversion of H2 gas resulting from gasification is mostly produced

by lignite type coal compared to subbituminous and anthracite coal types. However, for the type of coal that produces CO conversion, anthracite has the highest maximum CO conversion rate, followed by bituminous and lignite. This condition is based on the carbon content of the type of coal. Based on these levels, gasification is divided into 3 products, namely: Low-Btu gas (150-300 Btu/scf), Mediu-Btu gas (300-550 Btu/scf) and High-Btu gas (980-1080 Btu/scf). The product composition is shown in Table 3:

Table 3. Classification of Gasification Product

Product	Composition
Low-Btu gas (150-300 Btu/scf),	50% ≥ nitrogen smalles component H_2 dan CO, CO_2 dan sedikit gas metana
Medium-Btu gas (300-550 Btu/scf)	Dominantly CO dan H_2, and small unburnerd gas, smallest methane gas
High-Btu gas (980-1080 Btu/scf).	Pure all methane gas

2. RESEARCH METHODS

2.1. Tools and Material

The tools and materials used in this research are a set of downdraft type coal gasification equipment, bomb calorimeter (Parr 6200), electric sieve shaker (Ziaulhaq Solution), furnace (Naberthem), gas analyzer, PTBA coal, and air.

2.2 Flow Diagram

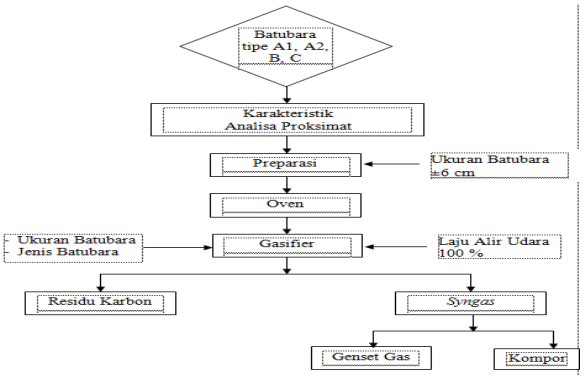
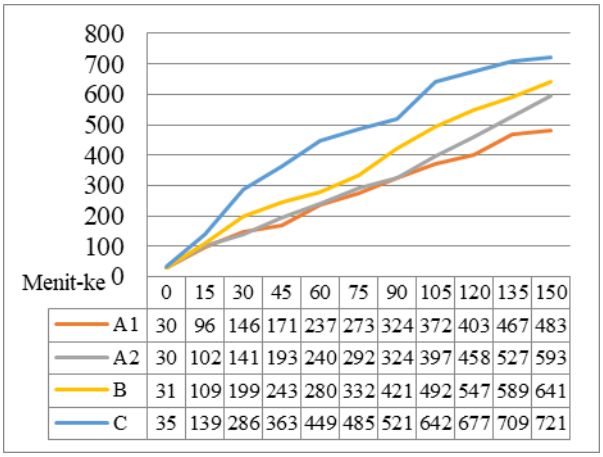


Figure 2. Flow diagram Of Gasification Process

3. RESULT AND DISCUSSION

3.1. The Effect of Coal Layer Types on the Increase in Temperature and Flash Time



Menit-ke	0	15	30	45	60	75	90	105	120	135	150
A1	30	96	146	171	237	273	324	372	403	467	483
A2	30	102	141	193	240	292	324	397	458	527	593
B	31	109	199	243	280	332	421	492	547	589	641
C	35	139	286	363	449	485	521	642	677	709	721

Figure 3. Graph of the relationship between coal types and temperature rise

In Figure 3. it is shown that the highest temperature is type C coal seam, this is because type C coal has the highest heating value, which is 5217.9419 Cal/gr, and the water content in type C coal is low enough so that the temperature achieved higher than coal with a calorific value below 5217.9419 Cal/gr.

Pratama (2019) stated that the lower the water content of the raw materials and the higher the carbon value of the raw materials, the longer the flame of the syngas produced. Based on the research that has been done, the effect of the type of coal seam on the length of the flame is shown in Figure 4. there is an increase in the length of the flame from 2 minutes to 13 minutes. The shortest flame time is in type A1 coal with a heating value of 3481.6153 Cal/gr and the flame time is 2 minutes. While the longest flame time is in type C coal with a calorific value of 5217.9419 Cal/gr and a long flame time is 13 minutes.

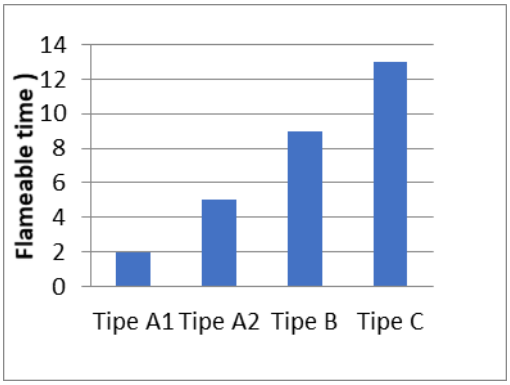
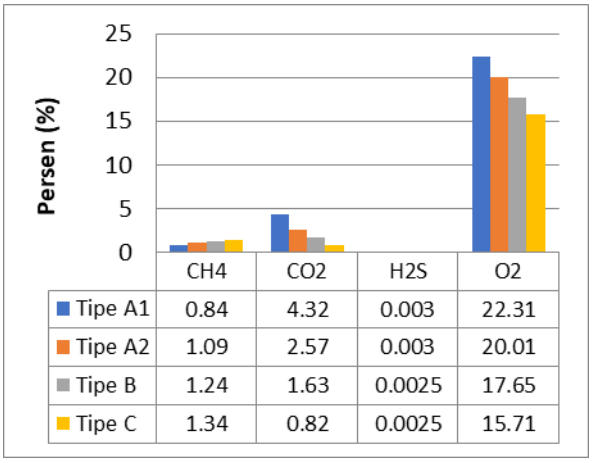


Figure. 4. Graph Relationship Between Type Of coal With Flameable

3.2. The Effect of Coal Types on Syngas Composition



	CH4	CO2	H2S	O2
Tipe A1	0.84	4.32	0.003	22.31
Tipe A2	1.09	2.57	0.003	20.01
Tipe B	1.24	1.63	0.0025	17.65
Tipe C	1.34	0.82	0.0025	15.71

Figure 5. Graph Of SyngGas Composition

Based on Figure 5, it can be seen that the high calorific value of the coal used can indicate the amount of carbon content in the coal. [7] in his research shows that the value of the CH4 composition depends on the ultimate and proximate composition of the type of fuel used. Based on these factors, the higher the carbon value contained in a fuel, the more CH4 compounds will be formed. Meanwhile, the smaller the H2 value of the raw material causes the low H2 contained in the raw material.

The high composition of oxygen in syngas is caused by the large diameter of the circle of the air intake pipe used, causing a lot of air to enter the combustion chamber.

3.3. The Effect of Coal Types on Heat Heating Value Syngas

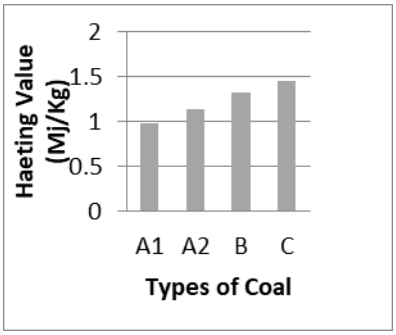


Figure 5. Graph Relationship Between Type Of coal With Heating Value

Heating Value or calorific value is an important indicator in all fuels. Heating value is an indicator that indicates how much heat the fuel can produce. The heating value of syngas affects the type of coal used. In Figure 5. based on the calorific value analysis data that has been carried out, it can be seen that the type of coal affects the heating value of the resulting syngas. This is because the lower the calorific value of coal causes the lower composition of the gas capable of combustion.

The heating value is influenced by the number of combustible gas compositions in a fuel, the combustible gas is CH4. With the higher value of CH4 composition, the heat of formation of gas capable of burning in the reduction chamber is also high. This is directly proportional to the higher the heating value, the higher the required heat requirement. [8] states that the higher the energy content of the fuel, the higher the syngas gasification results because the energy converted is also high.

4. CONCLUSION

From the results of observations and tests that have been carried out, the following conclusions are obtained:

1. The fastest increase in temperature is shown by Type C coal with a heating value of 5217.9419 Cal/gr with a flame time of 13 minutes. The increase in temperature and duration of flame is caused by the low value of moisture contained in the coal.

2. The type of coal seam is one of the factors that affect the syngas produced. This factor is caused by the composition in the coal that affects the high and low value of CH4 gas that will be formed. Type C coal seam is a type of seam

AUTHORS' CONTRIBUTIONS

In this writing, the research team commits that the author respondents are ERLINAWATI.

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