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**Procedia Environmental Science, Engineering and
Management**

JURNAL INTERNASIONAL BEREPUTASI

Q3 PADA SCIMAGO JR DAN Q4 PADA SCOPUS

**Judul Paper :DEVELOPMENT OF TEAK LEAF PLATE MOLDING
MACHINE FOR PRODUCING PLASTIC ALTERNATIVE PRODUCTS**

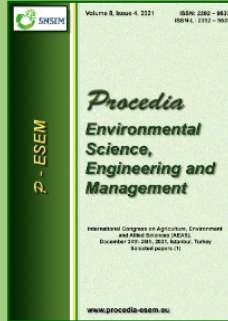


Procedia

Environmental Science, Engineering and Management

P - ESEM

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Procedia Environmental Science, Engineering and Management (P - ESEM) is a journal focusing on publishing papers selected from high quality conference proceedings, with emphasis on relevant topics associated to environmental science and engineering, as well as to specific management issues in the area of environmental protection and monitoring.

P - ESEM facilitates rapid dissemination of knowledge in the interdisciplinary area of environmental science, engineering and management, so conference delegates can publish their papers in a dedicated issue. This journal will cover a wide range of related topics, such as: environmental chemistry; environmental biology; ecology geoscience; environmental physics; treatment processes of drinking water and wastewater; contaminant transport and environmental modeling; remediation technologies and biotechnologies; environmental evaluations, law and management; human health and ecological risk assessment; environmental sampling; pollution prevention; pollution control and monitoring etc.

We aim to carry important efforts based on an integrated approach in publishing papers with strong messages addressed to a broad international audience that advance our understanding of environmental principles. For readers, the journal reports generic, topical and innovative experimental and theoretical research on all environmental problems. The papers accepted for publication in P - ESEM are grouped on thematic areas, according to conference topics, and are required to meet certain criteria, in terms of originality and adequacy with journal subject and scope.

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1. Indeks scopus Procedia Environmental Science, Engineering and Management
2. Indeks scimago Procedia Environmental Science, Engineering and Management
3. Jadwal dan daftar presenter
4. Naskah awal yang disubmit
5. Revisi naskah yang dikirim ke editor
6. Accept paper
7. Pemberitahuan tagihan pembayaran
8. Bukti pembayaran
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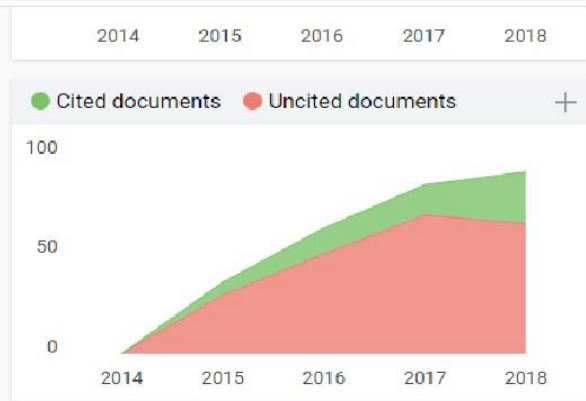
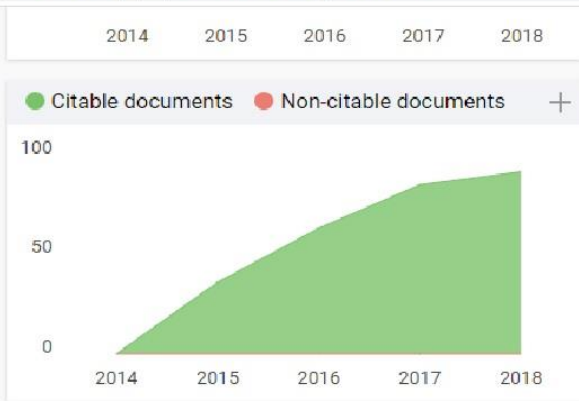
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Scope Procedia Environmental Science, Engineering and Management (P - ESEM) is a journal focusing on publishing papers selected from high quality conference proceedings, with emphasis on relevant topics associated to environmental science and engineering, as well as to specific management issues in the area of environmental protection and monitoring. P - ESEM facilitates rapid dissemination of knowledge in the interdisciplinary area of environmental science, engineering and management, so conference delegates can publish their papers in a dedicated issue. This journal will cover a wide range of related topics, such as: environmental chemistry; environmental biology; ecology geoscience; environmental physics; treatment processes of drinking water and wastewater; contaminant transport and environmental modeling; remediation technologies and biotechnologies; environmental evaluations, law and management; human health and ecological risk assessment; environmental sampling; pollution prevention; pollution control and monitoring etc. We aim to carry important efforts based on an integrated approach in publishing papers with strong messages addressed to a broad international audience that advance our understanding of environmental principles. For readers, the journal reports generic, topical and innovative experimental and theoretical research on all environmental problems. The papers accepted for publication in P - ESEM are grouped on thematic areas, according to conference topics, and are required to meet certain criteria, in terms of originality and adequacy with journal subject and scope.

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13:00 – 13:20 Baena-Moreno

(Local Time Spain 12:00 - 12:20)

Keynote Lecture*

Opportunities for CO₂ utilisation via carbonation

Francisco M. Baena-Moreno

Technical School of Engineering, University of Seville, Sevilla, Spain

This study focuses on describing the most important aspects of CO₂ carbonation processes. Furthermore, a novel proposal for classifying CO₂ carbonation alternatives is presented. The technologies are classified into two main categories: mineral CO₂ carbonation; and hydroxides, salts and waste carbonation.

13:20 – 13:40 Martinus et al.

(Local Time: Indonesia 17:20 - 17:40)

Development of Teak Leaf Plate Molding Machine for Producing Plastic Alternative Products

Martinus, Agus Haryanto, Sugeng Triono, Mareli Telaumbanua

University of Lampung, Bandar Lampung, Indonesia

Single use plastic is one of the biggest problem in the world right now, it is the main source of non-degradable material in the world. The usage of plastic and plastic derivatives in Indonesia most times cannot be avoided as long as no alternatives products are available. Only a small portion of the plastic is recycled, the rest end up in the land and in the ocean. Plastic need hundreds of year to decompose and some even can't decompose like expanded polystyrene. A new machine is in need for in producing an alternative product for plastic. This machine is designed, develop and fabricated in Indonesia. PID control system is used to control both upper and lower die. Set points for both die can be set individually. The temperature of upper and lower die varies by different leaves and how many layer of leaves. The leaf plates made by the machine then tested along with plastic plates, expanded polystyrene plates and plastic laminated paper plates. The result of this test will conclude how good the leaf plates as an alternative for other disposable plates. Teak leaf plate molding machine is built and performing quite well. The temperature from upper and lower die can be controlled precisely. The plates that produce by the machine in tensile strength test also perform quite well. Teak leaf plates tensile break average at 29.3 N, slightly lower than plastic one and higher than expanded polystyrene one.

13:40 – 14:00 Telaumbanua et al.

(Local Time Indonesia 17:40 - 18:00)

Design of insect trap automatic control system for Cacao plants

Mareli Telaumbanua, Agus Haryanto, Febryan Kusuma Wisnu, Budianto Lanya, Wahyu Wiratama

University of Lampung, Bandar Lampung, Indonesia

Insect pests attacks on Cacao (*Theobroma cacao* L) plantations are generally controlled using chemical (non-organic) pesticides. Pesticides that are applied continuously can cause pest resistance, pest resurgence, and environmental pollution. Environmental pollution can disrupt the ecosystem due to increased toxic residues in plant tissue or the soil. Therefore, it is necessary to design a pest trap with charm and an automatic actuator based on a microcontroller on the Arduino board. This automatic insect trap is called the Teptrap v1. Five units of the infrared sensor type E18-D50NK are used to detect insect pests. The attractants used were TL lamps, yellow lights and attractants attached to the trap system. Teptrap v1 shows excellent performance during 33 days of research. As evidenced by the fan actuator system that works stably with a catching accuracy of 82.74%, insect drop time is 6 minutes 33 seconds, and the actuator response speed turns on the light, yellow LED and pumps <1 second (\pm 10 mS). This insect pest control trap can reduce the use of spray pesticides by 20-50%, thereby saving the cost of purchasing pesticides up to IDR 74,468 per hectare of Cacao.

* Duration of the Keynote Presentations can be increased

14:00 – 14:20 **Morais et al.**

(Local Time Portugal 12:00 - 12:20)

Development of a monitoring device for fruit products transportation in the cold chain

Diogo Morais, Martim L. Aguiar, Pedro D. Gaspar, Pedro D. Silva,

University of Beira Interior, Covilhã, Portugal

C-MAST - Centre for Mechanical and Aerospace Science and Technologies, Covilhã, Portugal

During food transport, products are often subject to conditions which do not benefit the conservation of their biological properties. This condition can lead to food quality and safety issues and ultimately to food waste. Globally, there has been an effort to develop techniques, procedures and technologies that can contribute to reduce food waste of perishable products such as horticultural ones. In this sense, remote monitoring systems, whose fundamental requirements relate to range and autonomy, make use of communications technologies to map characteristic crop parameters to reduce unnecessary application of resources or materials. This paper proposes a monitoring system to record the conservation conditions inside refrigeration plants and vehicles, transmitting them via the internet of Things (IoT). This device is composed of an ARDUINO UNO Rev3 microcontroller that acquires the environment temperature and relative humidity every 5 minutes by means of a DHT 11 sensor, and uses the SIM800L module that provides real time communication data via GSM. It also incorporates a 3.7 V – 2600 mAh battery that provides an approximate 60 hours power range.

14:20 – 14:40 **Aguiar et al.**

(Local Time: Portugal 12:20 - 12:40)

Testing of a resistive sensor with fabric medium for monitoring frost formation in refrigeration systems

Martim L. Aguiar, Pedro D. Gaspar, Pedro D. Silva,

University of Beira Interior, Covilhã, Portugal

C-MAST - Centre for Mechanical and Aerospace Science and Technologies, Covilhã, Portugal

Refrigeration is one of the key elements for food preservation. With global temperatures increasing due to global warming, the efficiency in refrigerated storage systems must be improved. One of the problems that is yet to be solved in these systems is the efficient and accurate removal of the frost formed on the heat exchanger surface. In previous works, a low-cost resistive sensor has been developed to detect frost formation for accurate removal. This paper shows the results of an experimental study carried out to increase the accuracy, by placing different configurations of a fabric medium in between the sensor electrodes.

14:40 – 15:00 **Kumar et al.**

(Local Time Portugal 12:40 - 13:00)

Experimental tests of the thermal behaviour of new sustainable bio-packaging food boxes

Sasi Kumar, Fábio Leitão, Pedro D. Gaspar, Pedro D. Silva,

University of Beira Interior, Covilhã, Portugal

C-MAST - Centre for Mechanical and Aerospace Science and Technologies, Covilhã, Portugal

This experimental task was performed using 8 sustainable Bio-Boxes in the thermal chamber in the laboratory. The air is forced from the refrigerator, and it is used to control the temperature inside the thermal chamber. The goal of the performed task is to evaluate the thermal behaviour of the bio Boxes made from different material, such as sugarcane bagasse and PLA material with respect to time. The test was performed to lower the temperature inside the chamber to its minimum air temperature inside the cold chamber. The results show that the SCB 4 has noticed changes in its mechanical properties (Tensile Strength) and it also shown some moisture absorbing when compared to other Bio boxes. Furthermore, this kind of Bio packaging materials needs more research to improve their mechanical and barrier properties and minimise the use of plastic containers for food packaging industry.

15:00 – 15:20 **Kryvenko**

(Local Time Ukraine 15:00 - 15:20)

Emissions of pollutants into the atmospheric air by stationary sources

Galyna Kryvenko

Ivano-Frankivsk National Technical University of Oil and Gas, Ivano-Frankivsk, Ukraine

Oil and gas companies are one of the main sources of man-made hazards associated with the emission of extremely harmful substances and extreme situations. Emissions of harmful substances during the operation of oil and gas facilities complicate the environmental situation. Environmental issues are always actual. The purpose of this work is to analyze the dispersion of pollutant emissions into the atmosphere by stationary sources. The research was addressing the issues of analysis of ground-level concentrations of pollutants within a sanitary protection zone. The object of the study is the enterprises of the oil and gas complex, the subject of the study is the estimation of emissions of harmful substances into the atmosphere by stationary sources. Emissions of pollutants were calculated using a Gaussian statistical model. Mathematical models for the determination of lateral and vertical diffusion coefficients were constructed. The analysis of pollutant emissions into the atmospheric air by stationary sources of different altitudes was performed. It is established that the concentration of the pollutant from the source decreases monotonically. The bulk of impurities is concentrated in a relatively narrow jet. The lower the source, the closer to it the maximum concentration of air pollutants is, resulting in a negative impact on the health of service personnel.

15:20 – 15:40 **Belokon et al.**

(Local Time: Ukraine 15:20 - 15:40)

Optimal composition of intermetallic catalyst for neutralization of carbon-containing components of gas emissions

Karina Belokon, Volodymyr Pohrebennyk, Artem Sybir, Yevheniia Manidina, Andrii Banakh

Zaporizhzhia National University, Engineering Educational and Research Institute, Zaporizhzhia, Ukraine

*Lviv Polytechnic National University, Lviv, Ukraine
National Metallurgical Academy of Ukraine, Dnipro, Ukraine*

The paper presents the results of the optimization of intermetallic compounds used for catalytic neutralization of carbon-containing exhaust gases. The statistical method of designing active experiments was used to analyze the effect of cobalt, manganese and copper on the catalytic, physical and chemical properties of the catalyst. The catalytic activity, specific surface area, and porosity of the catalyst were taken as the response function. The experimental data were mathematically processed using regression analysis. The work used a symmetric composition second-order design. As a result of mathematical programming, regression equations were obtained that describe the effect of the cobalt, manganese and copper content on the catalytic properties and porosity of the catalyst, and the response surfaces. The optimal combination of catalytic, physical and mechanical properties ensures that the compound contains 30% of nickel, 10% of cobalt, 11% of manganese and 2% of copper. When using such intermetallic compound, the conversion of carbon monoxide is 100%, and that of propane is 95 %, the specific surface area of the obtained catalyst is 110 m²/g, and the porosity is 64 %. The error of the regression equations did not exceed 2%.

15:40 – 16:00 **Mosiyevych et.al**

(Local Time Ukraine 15:40 - 16:00)

The physical and mechanical properties of intermetallic catalysts for the neutralization of carbon-containing components of emission gases

Karina Belokon, Yevheniia Manidina, Aleksandr Fedchenok, Andrii Banakh, Larysa Mosiyevych

Zaporizhzhia National University, Engineering Educational and Research Institute, Zaporizhzhia, Ukraine

The analysis of the study results of the physical and mechanical properties of intermetallic catalysts showed that they differ depending on their composition and processing method. The difference in the physical and mechanical properties of the catalysts is explained by differences in their structure, phase composition, porosity and pore size. When manganese is added, the porosity of the catalyst increases as a result of an increase in the volume of large pores while the structure of small capillaries does not change due to the localization of manganese oxide in the catalyst's pores. Yet, the mechanical strength decreases and can be increased if the copper alloy is added in the Ni-Co-Mn catalyst. A major benefit of thermal self-ignition is that the catalyst's strength is 50% higher than that of sintered materials with the same porosity. High temperatures of the process and low impurity content at the grain boundaries (due to self-cleaning) lead to the formation of strong bonds between grains in the crystallite. The average specific surface area for all investigated catalyst samples is 112 m²/g.

16:00 – 16:20 Manidina et al.

(Local Time Ukraine 16:00 - 16:20)

Using plasma catalysis for oxidation of sulphur dioxide to sulphur trioxide

Yevheniia Manidina, Karina Belokon, Nataliia Berenda, Olena Troitska

Zaporizhzhia National University, Zaporizhzhia, Ukraine

The paper researches the influence of the main properties of streamer discharge on the conversion of sulphur dioxide into sulphur trioxide and the effect of gas exposure to a streamer discharge for the oxidation of sulphur dioxide. It has been defined that the change of peak to peak voltage has the most impact on the efficiency of sulphur dioxide capture. It has been found out that delivery of voltage pulses with a period of 1ms allows having the conversion rate of sulphur dioxide at about 96.7%. It has been detected that with the pulse duration of 350 ns the conversion rate of sulphur dioxide is 98.6%.

16:20 – 16:40 Zhang

(Local Time: USA 09:20 - 09:40)

Keynote Lecture*

Membrane technologies for CO₂ capture

Zhien Zhang

The Ohio State University

CO₂, as a major greenhouse gas emission, has attracted the global attention. In order to achieve the CO₂ reduction target by 2050, carbon capture technologies have been widely investigated all over the world. Membrane technology as an emerging approach is used to capture CO₂. Compared with the conventional amine method, membrane technology provides modularity, flexibility and no flooding, foaming or entrainment. In this work, membrane gas absorption (MGA) technology is proved to capture more than 95% CO₂ from the power plant flue gas. This technology shows great potentials to remove CO₂ and other acidic gases from biogas, syngas, natural gas, and coalbed methane.

* Duration of the Keynote Presentations can be increased

14:00 – 14:20 **Zhelnovach et al.**

(Local Time Ukraine 14:00 - 14:20)

Researching the degradation of roadside plant communities

Ganna Zhelnovach, Karina Belokon, Yevheniia Manidina, Inna Tkalich

*Kharkiv National Automobile and Highway University, Kharkiv, Ukraine
Zaporizhzhia National University, Zaporizhzhia, Ukraine*

Biodiversity loss is one of the global problems of mankind. The article studies the impact of the road use on biodiversity loss and, as a result, the degradation of plant communities which occupy large areas and are the basis of ecosystem development. It is defined that they degrade due to man-made soil salinisation, physical vegetation destruction, dust and chemical pollution. The paper assesses the level of such degradation of the roadside plant community at the representative road section in terms of quantity and quality. A significant level of destructive impact has been detected which results in the loss of species composition, displacement of glycophytes by halophytes, reduction of grass density by over 70 % compared to the checkpoint as the highway nears. Practical approaches to the development and implementation of a roadside vegetation management system are proposed.

14:20 – 14:40 **Triyono et al.**

(Local Time Indonesia 18:20 - 18:40)

Effects of organic compost doses and regulated irrigation on growth and yield of organic Red Rapid Lettuce (*Lactuca sativa* L var. Red Rapids)

Sugeng Triyono, Aldi Riski Wibowo, Dermiyati, Jamalam Lumbanraja

University of Lampung, Bandar Lampung, Lampung Province, Indonesia

Organic vegetables have gotten an increasing interest, but organic fertilizers and irrigation water used to produce them could be significant issues of economic calculation to be considered for some locations. This study was aimed to determine the optimum doses of organic compost and irrigation level for growing organic red lettuce in a greenhouse. Completely Random Design (CRD) coupled with factorial arrangement was implemented in this study. Treatments consisted of two factors; doses of organic compost (D) and regulated irrigation levels (I). The factor of doses included 0% (D0), 10% (D1), 30% (D2), and 50% (D3) organic compost of the total weight of the growth media (3 kg per pot). The factor of regulated irrigation levels included 40% (I1), 70% (I2), and 100% (I3) of available water. Three replicates were used, making total of 36 experimental units. Plants were cultivated in a greenhouse, using pots each of which contained 3 kg media, and watered regularly based on the treatments assigned. The data set was analyzed by using Analysis of Variance (ANOVA) and followed by least significant differences (LSD) at $\alpha = 5\%$. The result showed that Effect of interaction between organic compost doses and irrigation levels on the growth, yield, and water productivity of the red rapid lettuce was significant at $\alpha = 0.05$. However, the treatments were not significant on some chemical properties of the rapid red lettuce. The most optimum scheme was found to be the treatment combination between the organic compost dose of 300 g plant⁻¹ (D1) and the regulated irrigation level at 100% (I3) of available water.

14:40 – 15:00 **Harahap et al.**

(Local Time: Indonesia 18:40 - 19:00)

Active versus passive cooling systems in increasing solar panel output

R. Harahap, S. Suherman

Universitas Sumatera Utara, Medan, Indonesia

Energy availability will remain an issue whole years as energy is the primary human need to live in this planet. Fossil energy is no longer the primary choice as its availability decreases every year, although it dominates the energy source used today. Solar cell is increasingly installed throughout the world even though initial cost is still expensive for many developing and poor countries. For them who have connected the solar system generators to grid, sunlight to electrical conversion efficiency is the primary concern. On the other hand, system output optimization such as by using maximum power tracking method and cooling system are non material efficient solutions. Maximum tracking system may be costly as mechanical system should be developed well for large solar system. Cooling system on the other hand, is much simpler but limited in efficiency increment. Even though, beside efficiency increment, the cooling system assists system to avoid excessive surface temperature, which in some cases may lead to panel destruction. The active cooling system requires some electric current from the solar panel output to enable cooling system works. The system achieves better surface temperature reduction than passive cooling system, but the current absorption should be as low as possible to avoid deficiency. This work proposed water based cooling system energized by batteries and compared the output performance to passive cooling system. The result shows that the periodic water sprinkler results better temperature decrement about 13.6% higher power than passive cooling system for sprinkler period of 20 minutes and sprinkle duration of 20 second. The performance decreases when sprinkler period is set 60 minutes. By using the applied water tank, water is available up to 24 hours for sprinkle period of 20 minutes but last longer for 60 minutes. Horizontal sprinkler position results larger cooled area than vertical position which generates 2.45% higher output power.

15:00 – 15:20 **Adoniev et al.** *(Local Time Ukraine 15:00 - 15:20)*

Increasing the uniformity of metal heating in chamber furnaces by influence of the electric field

Andrii Cheilytko, Yevhen Adoniev, Alina Yerofieieva

Zaporizhzhia National University, Zaporizhzhia, Ukraine

The article is devoted to the possibility of increasing the energy of efficiency of gas chamber furnaces. For high-quality metal heating in a chamber furnace is proposed to use spatial electric field. It is empirically proved that there are optimal values of electric field control factors for chamber furnaces with a pull-out hearth, which reduce fuel consumption and produce quality of heating of metal, namely: high uniformity of heating.

15:20 – 15:40 **Yousef et al.** *(Local Time Russia 15:20 - 15:40)*

Experimental investigation of a two-zone dry low emission gas turbine combustor

Wisam Yousef, Vitaliy Sychenkov, Nikolay Davydov, Vladislav Varsegov, Ruslan Khaliulin

A.N.Tupolev Kazan National Research Technical University – KAI, Kazan, Russia

A new design of a two-zone combustor with sequentially located pilot and main zones is described. The pilot zone provides: the required range of stable combustion at leaner conditions, heating and initiation of combustion in the main zone. The main zone provides burnout of the fuel-air mixture at leaner conditions with low emission values. Combustion in both zones is formed by supplying air through the double tangential swirlers with co-rotation in the pilot zone and counter-rotation in the main zone, while the fuel is supplied between the swirlers vanes. It is shown that the investigated combustor ensures the simultaneous minimization of emissions (CO and NO_x) at acceptable values of non-uniformity of the outlet temperature field and a wide range of stable combustion.

15:40 – 16:00 **Evdokimov et al.** *(Local Time: Russia 15:40 - 16:00)*

Emission characteristics of bidirectional vortex combustors operating on gaseous, liquid and pulverized solid fuel

Oleg Evdokimov, Alexander Guryanov, Sergey Veretennikov

Soloviev Rybinsk State Aviation Technical University, Rybinsk, Yaroslavl Region, Russia

The paper reports on a comparison of emission characteristics in the bidirectional vortex combustor operating on different types of fuel. Gaseous propane, liquid kerosene, and solid pulverized peat are suggested. It is shown that emission curves differ from classical ones corresponding to gas turbine combustion. Comparative analysis of the emission curves shows that NO_x emission is similar for all three fuel types whereas CO emission differs significantly. The use of all types of fuel gives minima of CO emission for lean combustion. However, optimal ranges for solid and liquid fuel are smaller than for gas because of the strong influence of evaporation and devolatilization processes. Additionally, there is an increase in CO emission for kerosene and peat above the upper limit of the optimal λ range which corresponds to the most environmentally friendly combustion. CO emission for gaseous fuel remains minimal up to the lean flameout boundary.

16:00 – 16:20 **Isaza-Ruiz et al.** *(Local Time Colombia 08:00 - 08:20)*

Thermal properties of hitec salt-based nanofluids synthesized by new two-step method

Marllory Isaza-Ruiz, Francisco Bolívar Osorio

Centro de Investigación, Innovación y Desarrollo de Materiales CIDEMAT, Medellín, Colombia

The use of molten salt-based nanofluids as a thermal storage medium, the evaluation of their thermophysical properties, and the development of new more efficient synthesis methods, have attracted great interest from researchers. In this way, this work focuses on the development of a new two-step method in which the use of water in the process is eliminated, without affecting the stability and homogeneity of the particles within the salt. Molten salt-based nanofluids with Hitec as base fluid and alumina nanoparticles as an additive in three different proportions 0.5, 1.0, and 1.5 wt% with a 13.6 nm nominal size. The thermal properties, melting point, specific heat capacity, and thermal stability were evaluated, as well as, the microstructural analysis to determine the good distribution of the nanoparticles in the salt. The increase of up to 14.6% of the specific heat of the molten salt-based nanofluids compared to the base salt, as well as the decrease in the

melting point without affecting the thermal stability demonstrate the viability of the proposed method for the synthesis of nanofluids for thermal energy storage in CSP plants.

16:20 – 16:40 **Guryanov et al.**

(Local Time Russia 16:20 - 16:40)

A study of multifuel bidirectional combustor

Alexander Guryanov, Oleg Evdokimov, Sergey Veretennikov, Marina Guryanova

Soloviev Rybinsk State Aviation Technical University, Rybinsk, Yaroslavl Region, Russia

The results of experimental studies of the multifuel liquid-gas combustion in the bidirectional vortex combustor are presented. Propane is used as gaseous fuel and kerosene is used as the liquid. The transition between fuels of the different states of matter and molecular mass defines a change in flame geometry and combustion zone length. Depending on the degree of the airflow expansion, the experimentally measured values of the lean limit of stable combustion correspond to the range of the air-fuel equivalence ratio from 3.3 to 7.0. Additionally, the bidirectional vortex combustor provides sufficient stability at the repetitive transitions “liquid-to-gas-to-liquid”. Measured values of the total thermal power of the combustor at five consecutive transitions define a change in the total thermal power of no more than 3%.

16:40 – 17:00 **Kovalnogov et al.**

(Local Time: Russia 17:40 - 18:00)

Simulation of the processes of combined fuel combustion and analysis of harmful substances emission

Vladislav Kovalnogov, Ruslan Fedorov, Andrei Chukalin, Usama Mizher

Ulyanovsk State Technical University, Ulyanovsk, Russia

Prevention of further atmospheric air pollution and reduction of toxic substances emission is one of the goals of state policy in the field of energy. In this regard, the search for new solutions that prevent negative impact on the environment is one of the priority tasks for modern society. An alternative, but less efficient fuel compared to natural gas is biogas extracted from organic waste. The high content of carbon dioxide in biogas reduces the calorific value, while flame detachment from the burner is also observed. One of the promising options for reducing the negative impact of energy on the environment is the combined burning of natural gas and biogas. For the combined burning of natural gas and biogas in operating power-generating boiler, it is necessary to reconstruct the burner devices installed on them. For a high-quality reconstruction of burner devices, it is important to have theoretical data on the effect of combustion combinations on the content of toxic combustion products in the flue gases of power-generating boilers. In this paper, a turbulence model $k - \epsilon$ (realizable) is presented, which allows simulating the combustion process of a fuel-air mixture. The quantitative content of NO_x, CO₂ in the products of combustion of fuel combinations - natural gas, biogas, natural gas / biogas is presented.

17:00 – 17:20 **Pérez et al.**

(Local Time Colombia 09:00 - 09:20)

Implementation of clean production in cups and dishes with coffee grounds

Daniel Alberto García Pérez, Hanleidy Ibarguen Zúñiga, Alex Aparicio Alvarado Díaz, Anderson Manuel Trespalacio González, David Alberto García Arango

Corporación Universitaria Americana, Barranquilla, Atlántico, Colombia

In this paper, a methodology for the sustainable creation of MDF-type products based on coffee beans is presented. This type of production must be profitable, sustainable and environmentally friendly. Therefore, the relationship between the biomass content and drying temperature of the medium density chipboard plates and the physical characteristics that have low time and constant drying pressure is determined. For this purpose, an experiment is carried out at the laboratory level to determine the relationship between biomass at different levels of binders in a percentage way with respect to coffee grounds, in specimens of a size already determined for experimentation. This process makes possible to determine possible differences in levels of similarity with respect to a wooden MDF pattern.

17:20 – 17:40 Chernyavskyy et al. (Local Time Ukraine 17:20 - 17:40)

Scientific bases, experience of production and combustion of coal mixtures at thermal power plants of Ukraine

Mykola Chernyavskyy, Oleksii Provalov, Oleksii Kosyachkov, Igor Bestsenny

Coal Energy Technology Institute (CETI) of National Academy of Sciences of Ukraine, Kyiv, Ukraine

It is substantiated that in conditions of termination of supplies of Donetsk anthracite the expansion of fuel base of anthracite power units, which make up half of generating capacities of thermal power plants (TPPs) of Ukraine, is possible due to use of mixtures of anthracite with local bituminous coal and petroleum coke. The issues of production, pulverizing, combustion of mixtures and environmental aspects of their use are considered. Based on the numerical analysis of the ratio of specific combustion rates of fuels, it is shown that 30-35% of bituminous coal significantly contribute to the ignition and combustion of anthracite in the pulverized coal flame. The criteria of homogeneity of mixtures are established and the methods of production and testing the homogeneity of mixtures at the TPP coal storage place are worked out. The experience of coal mixtures combustion at three power plants of Ukraine is generalized.

17:40 – 18:00 Repelewicz et al. (Local Time: Poland 16:40 - 17:00)

Gypsum composites with woodchip and sawdust fillers

Aleksandra Repelewicz, Katarzyna Regulska

Czestochowa University of Technology, Czestochowa, Poland

Gypsum composites have been gaining increasing interest during last years. The focus on increasing their production in Poland results from the rich, countrywide natural gypsum sources and the growing amounts of synthetic gypsum derived from flue gas desulfurization in domestic power plants. Nowadays, the environment-supporting options are in game. Comparison of results of tests concerning the physical and mechanical properties of gypsum composites with organic fillers: wood sawdust and chips is described in the paper.

18:00 – 18:20 Peceño et al. (Local Time Chile 12:00 - 12:20)

Influence of particle size of mussel shells in physical, mechanical and insulating properties of fireproof materials

Begoña Peceño, Bernabe Alonso-Fariñas, Celia Arenas, Carlos Leiva

*Universidad Católica del Norte, Coquimbo, Chile
Universidad de Sevilla, Seville, Spain*

In this study, the behavior of mussel shell as a component of passive fire protection materials was evaluated. To investigate the performance of mussel shell waste, different gypsum replacement ratios were analyzed from 40 to 80 %wt. Two different kinds of shells, separately or as a mix, were employed. In addition, two different particle size distributions, smaller than 320 µm and bigger than 320 µm, were used. Physical, mechanical, insulating capacity and leaching properties were thoroughly analyzed. Our results indicate that replacements lower than 60 %wt comply with all mechanical demands and have no reduction in insulating capacity. Additionally, no leaching problems were detected. Mortars made by combination of mussel shell and gypsum have the potential to be used as a component in construction materials for passive protection against fire.

18:20 – 18:40 Oliveira et al. (Local Time Brazil 11:20 - 11:40)

A new microbicial pervious concrete pavement to be used in hospital parking-lots: assessment of the modulus of elasticity by the finite element method

Evailton Arantes de Oliveira, Justice Kofi Debrah, Maria João Correia de Simas Guerreiro, Maria Alzira Pimenta Dinis

University Fernando Pessoa, Porto, Portugal

In the coronavirus pandemic (COVID-19), it is important to articulate a safeguard against urban contamination originating from hospitals, mainly the tires of vehicles that travel in the hospital parking-lots and contaminating the various parts of the city through traffic on urban roads. With the purpose of disinfecting the pavement of hospital parking-lots to prevent diseases, this research proposes the use of a new pavement composed of pervious concrete

with calcium hydroxide (Ca(OH)₂) additive, i.e., lime powder. The well-known powder lime becomes a disinfectant with a microbicidal effect which increases the pH of the pavement, being a low cost and an abundant material. Studies have shown that this additive affects the mechanical strength of pervious concrete when added to its mixture. Accordingly, the objective of the study is to find a balance between mechanical strength and the ideal proportion of lime powder additive in the pervious concrete mixture through finite element prototypes subjected to vertical loads of 10,000 N with variation in the modulus of elasticity. The results of the structural simulations indicate the prototype with the best performance ratio is 1:0.8:4 (cement:Ca(OH)₂:limestone), compressive strain of 15.70 kg/cm², density of 1,971.42 kg/m³ and modulus of elasticity of 1,480.22 MPa, with demonstrates a satisfactory mechanical performance for the use of this new pavement in hospital parking-lots.

18:40 – 19:00

Guryanov et al.

(Local Time: Russia 18:40 - 19:00)

The structure of nonreactive bidirectional and direct swirling flows and its effect on mass transfer intensification and mixing efficiency

A.I. Guryanov, A.V. Kosonogova, M.M. Guryanova, O.A. Evdokimov, S.V. Veretennikov

*Soloviev Rybinsk State Aviation Technical University, Rybinsk, Yaroslavl Region, Russia
Public JSC "UEC-Saturn", Rybinsk, Yaroslavl Region, Russia*

One of the most promising methods of low-emission methane combustion is in a lean fully pre-mixed flame. A key characteristic of such an (non-stoichiometric) approach is the ability to directly control the air-to-fuel ratio. This can be achieved in the pre-mixing stage of fuel and oxidizer. The focus of the present paper is to study uniformity of fuel distribution in fully pre-mixed flame module of a concept lean bi- and mono-directional fuel- and air-flow combustion chamber. Numerical and experimental studies of fuel and air mixing have been carried out. Four configurations were considered, differing in presence/absence of flow swirl and relative flow directions of mixing components. It is found that the configuration with highest mix uniformity is one with bi-directional swirling air-flow with respect to injected fuel.

19:00 – 19:20

Moumane et al.

(Local Time Ukraine 19:00 - 19:20)

Specifics of coal-water fuel heat transfer at the fuel pre-heating stage

Valeriya Pinchuk, Mohammed Moumane, Tatiana Sharabura, Yulia Shishko, Andrey Kuzmin

*National Metallurgical Academy of Ukraine, Dnipro, Ukraine
Institute for Engineering Thermal Physics of National Academy of Sciences of Ukraine, Kiev, Ukraine*

Renewable energy sources are currently unable to meet the growing energy demand. Therefore, fossil fuels are continued using for energy generation. Coal is one of the most used resources for this purpose. However, its combustion leads to huge environmental pollution. The usage of coal in the form of coal-water fuel allows significantly decreasing the volume of harmful emissions. Scientific research in this area became of high-interest last decade. The usage of coal-water fuel requires some preparations and activation of the fuel before combustion. One of the preparation stages is coal-water fuel's thermal activation which improves the burning processes of such a fuel. This manuscript considers specifics of the coal-water fuel pre-heating in the feeding pipe. The results show that wide used Graetz solution for Newtonian fluids cannot be used for calculation of the heat-transfer parameters in the case of coal-water fuel. An empirical equation was obtained for use in practical applications

Development of Teak Leaf Plate Molding Machine for Producing Plastic Alternative Products

Martinus, Agus Haryanto, Sugeng Triono, Mareli Telaumbanua

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Abstract

Single use plastic is one of the biggest problem in the world right now, it is the main source of non-degradable material in the world. The usage of plastic and plastic derivatives in Indonesia most times cannot be avoided as long as no alternatives products are available. Only a small portion of the plastic is recycled, the rest end up in the land and in the ocean. Plastic need hundreds of year to decompose and some even can't decompose like expanded polystyrene. A new machine is in need for in producing an alternative product for plastic. This machine is designed, develop and fabricated in Indonesia. PID control system is used to control both upper and lower die. Set points for both die can be set individually. The temperature of upper and lower die varies by different leaves and how many layer of leaves. The leaf plates made by the machine then tested along with plastic plates, expanded polystyrene plates and plastic laminated paper plates. The result of this test will conclude how good the leaf plates as an alternative for other disposable plates. Teak leaf plate molding machine is built and performing quite well. The temperature from upper and lower die can be controlled precisely. The plates that produce by the machine in tensile strength test also perform quite well. Teak leaf plates tensile break average at 29.3 N, slightly lower than plastic one and higher than expanded polystyrene one.

Keywords: Teak leaf, Teak leaf plate, Molding machine, Disposable plate, Plastic alternative

1. Introduction

Single use plastic is one of the biggest problem in the world right now, it is the main source of non-degradable material in the world. The usage of plastic and plastic derivatives in Indonesia most times cannot be avoided as long as no alternatives products are available. Single use plastic made crockeries and containers are found end up in the sea. Every year 4.8-12.7 tons of new plastic waste end up in the ocean (Jambeck et al. 2015) and becoming micro plastic debris with bad impact to the marine life (Isensee and Valdes 2015).

Only a small portion of the plastic is recycled (less than 10%) (Geyer et al., 2017), the rest end up in the land and in the ocean (AC et al. 2014). Plastic need hundreds of year to decompose (Webb et al., 2013) and some even can't decompose like expanded polystyrene (Kroeker et al., 2016)(Kannan et al., 2007).

A new machine is in need for in producing an alternative product for plastic. One of the machine is a teak leaf plate molding machine for producing leaf plates made of teak leaves (Martinus, Mohammad, and Djausal 2019). Similar type of machine has developed in India(Mohanraj et al. 2017). But, in India they use different type of leaves mostly on sal and siali leaves(Gaikwad and Kalokhe 2016). This machine is designed, develop and fabricated in Indonesia to suite teak leaves as the main plate material. The teak leaf plates made by the machine then tested along with plastic plates, expanded polystyrene plates and plastic laminated paper plates. The result of this test will conclude how good the teak leaf plates as an alternative for other disposable plates.

2. Methodology

In this research we design a new machine, build it and produce a product using it. The process in building a new machine is following this steps.



Figure 1. Steps in Building the New Machine

On the preliminary research we choose what kind of the leaves to be used in the machines(Martinus et al. 2019). The teak leaves then chosen as it is widely available in teak tree plantation (Suroso 2018) and as production goes there will not be material shortage.

The design of the teak leaf plate molding machine need to provide a good structure to withstand more than 2 Tons pressure. Control system also need to be precise as leaves are very thin and prone to charred and burnt. A charred and burnt product is not desirable. Control system then develop to precisely control upper and under die temperature.

Teak leaf plate is made using hot press molding (Shamsuri 2015), a process that use both pressure and heat to mold the leaves into plates. Materials for the machine are frame made of IWF beam, steel upper and lower die, hydraulic pressure delivery system, thermocouples, PID controller, SSR, heating elements, and power supply unit.

The plate itself then tested using a tensile strength test apparatus. This test will compare the teak leaf plates against plastic plate and expanded polystyrene plate. From this test we will know how the teak leaf plate perform against other product (other product it tries to replace). Below shown how the test is done.

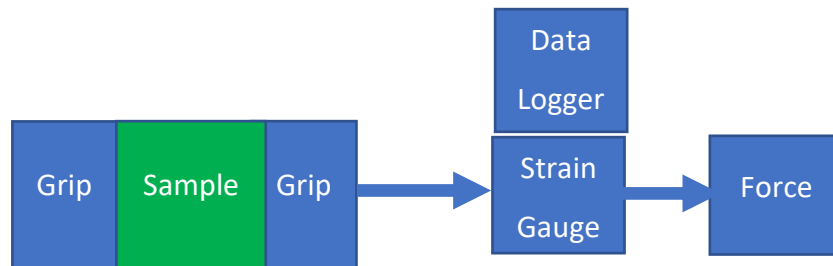


Figure 2. Tensile strength test

3. Result and Discussion

Machine is design to withstand greater pressure as preliminary research some of the frames bent under pressure. The new machine start with the new frame using IWF steel with 400kg/mm^2 tensile strength (PT Lintech 2019), then the temperature control of the opposing dies, pressure delivery system and then assemble them in one final unit.

A. Frame

The new frame design need to withstand 375kg/cm^2 of pressure. This is the maximum force that the pressure delivery system can deliver. The new frame is developed using IWF steel for the main part in pressure delivery system.

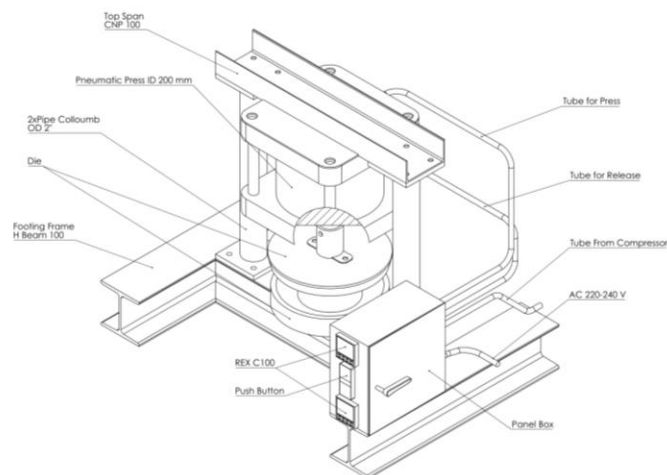


Figure 3. Frame Design

B. Automatic Die Temperature Control

Temperature on upper die is a very crucial factor in forming a perfect leaf plate. Heat that transferred from the heating element to the die and finally to the leaves. Heat will dry and evaporate the leaves, dry the starch glue between the leaves. While it is heated the form of the plate will be done by pressure. Overheating on upper die resulting on charred product. Charred and burnt products are not desirable at all. Control system then needed to regulate (Martinus et al. 2018), (Telaumbanua et al. 2019) the temperature for both dies.

PID control system is used to control both upper and lower die. Set points for both die can be set individually. The temperature of upper and lower die varies by different leaves and how many layer of leaves. In Picture 4. shown how the dies temperature are controlled. The temperature control for the machine done by PID (Proportional, Integral and Derivative) analog control system(Li et al., 2006). This type of control system will assure the temperature of upper and lower dies are accurately controlled according to the set points.

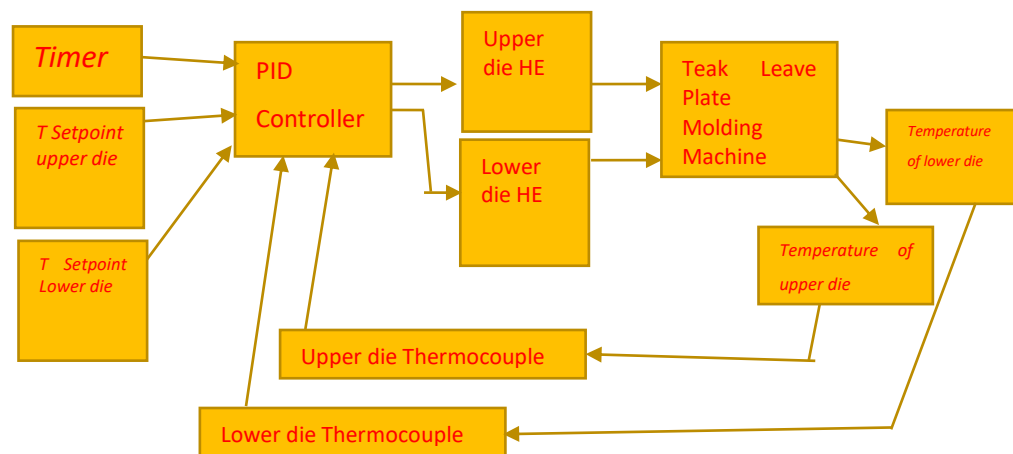


Figure 4. Automatic Temperature Control System

Temperature curve of upper and lower dies shown in figures below.

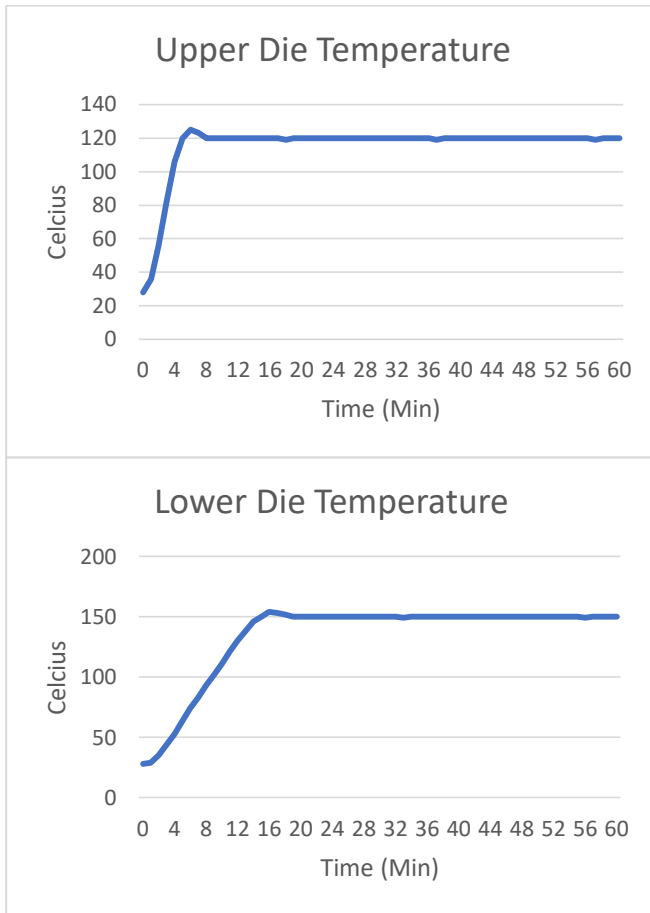


Figure 5. Temperatures at Lower Die and Upper Die

The upper die can be maintained at 120 ± 1 Celsius at all time after 15 minutes of preheat. The lower die can be maintained at 150 ± 1 Celsius at all time after 15 minutes of preheat. This two set points are chosen best for three layer of teak leaves.

C. Teak Leaf Plate Molding Machine Assembly

The parts then assembled into working machine. The frame has mountings that used to mount different type of dies. After the dies are mounted, the heating system then installed along with the control system. The pressure delivery system then slides in the frame. The final result is shown on the picture below.



Figure 6. Assembled Teak Leaf Plate Molding Machine

D. Teak Leaf Plates

The finished teak leaf plate molding machine then test on making teak leaf plates. The plates are tested for leakage, how long it can be stored, tensile strength of the plates, and the food capacity it can hold. In this paper shown how the tensile strength of the leaf plate produce compared to other disposable products.



Figure 7. Teak Leaf Plate

E. Tensile Strength of the Plates

Tensile strength test is a common test (Kora 2019) to compare similar products. The test is done on teak leaf plates also on expanded polystyrene and plastic plates. This test will prove how the teak leaf plate perform in comparison to other product. The testing conduct using sample from each product. The size of sample test is 5cm x10cm material that cut from the leaf plate, the plastic plate and the expanded polystyrene plate. The test then repeated 5 times for each plates.

Shown graphics below how each plates perform under tensile strength test.

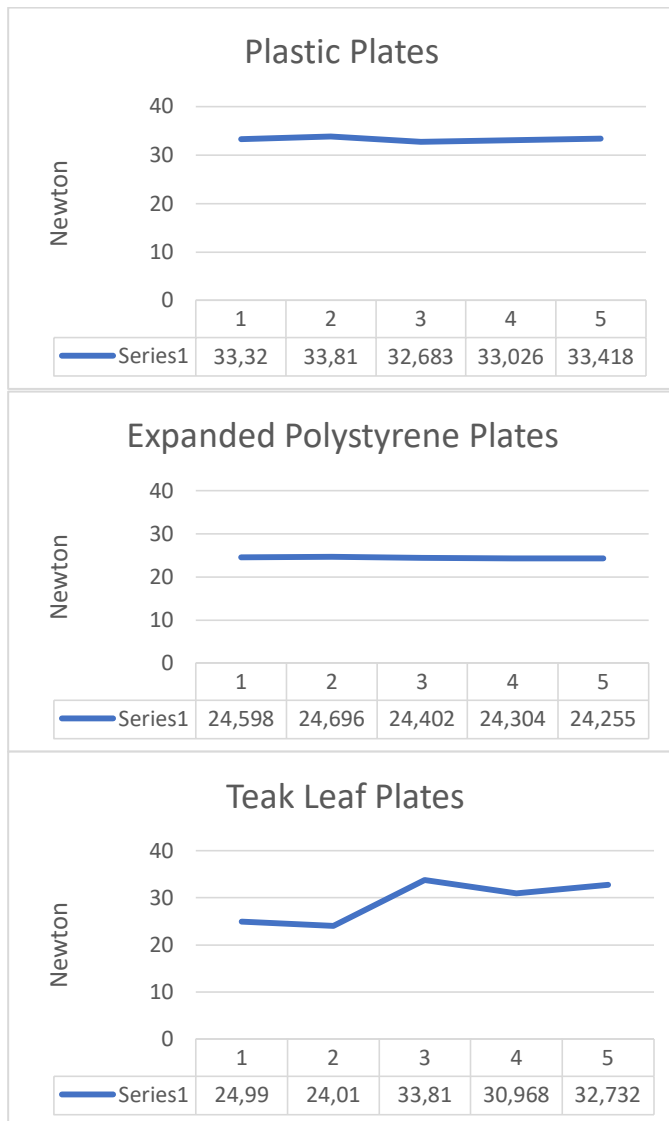


Figure 8. Each Plates Tensile Strength Test

From the test we know that the teak leaf plates strength is not consistent from one plate to another. This was caused by different age, thickness and leaf bone structure that vary from one sample to another. Test results shown in below is average force to break for each plates:

- a. Teak leaf plates average: 29.3 N
- b. Plastic plates average: 33.2 N
- c. Expanded polystyrene plate average: 24.5 N

Even for its inconsistency the teak leaf plate performs quite well against plastic plate and expanded polystyrene plate. Teak leaf plate break at 29.3N slightly lower than plastic plates and higher than expanded polystyrene one. This also prove that the machine is able to produce competitive leaf plates as alternatives.

4. Conclusion

Teak leaf plate molding machine is built and performing quite well. The temperature from upper and lower die can be controlled precisely. The plates that produce by the machine in tensile strength test also perform quite well. Teak leaf plates tensile break average at 29.3 N, slightly lower than plastic one and higher than expanded polystyrene one.

Acknowledgement

The researcher would like to acknowledge Universitas Lampung for financial support in this research. We would also acknowledge mechatronics lab in mechanical engineering department for its constant support.

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Martinus Paper "Development of Teak Leaf Plate Molding Machine for Producing Plastic Alternative Products"

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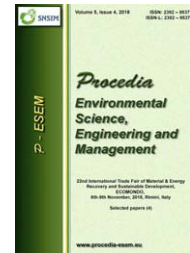


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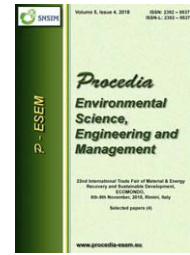


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Development of Teak Leaf Plate Molding Machine for Producing Plastic Alternative Products*

Martinus^{1**}, Agus Haryanto², Sugeng Triono², Mareli Telaumbanua²

¹Department of mechanical Engineering, Faculty of Engineering, University of Lampung

²Department of Agricultural Engineering, Faculty of Agriculture, University of Lampung

Abstract

Single use plastic is one of the biggest problem in the world right now, it is the main source of non-degradable material in the world. The usage of plastic and plastic derivatives in Indonesia most times cannot be avoided as long as no alternatives products are available. Only a small portion of the plastic is recycled, the rest end up in the land and in the ocean. Plastic need hundreds of year to decompose and some even can't decompose like expanded polystyrene. A new machine is in need for in producing an alternative product for plastic. This machine is designed, develop and fabricated in Indonesia. PID control system is used to control both upper and lower die. Set points for both die can be set individually. The temperature of upper and lower die varies by different leaves and how many layer of leaves. The leaf plates made by the machine then tested along with plastic plates, expanded polystyrene plates and plastic laminated paper plates. The result of this test will conclude how good the leaf plates as an alternative for other disposable plates. Teak leaf plate molding machine is built and performing quite well. The temperature from upper and lower die can be controlled precisely. The plates that produce by the machine in tensile strength test also perform quite well. Teak leaf plates tensile break average at 29.3 N, slightly lower than plastic one and higher than expanded polystyrene one.

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1. Introduction

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* Selection and peer-review under responsibility of the EIAETM

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In this research we design a new machine, build it and produce a product using it. The process in building a new machine is following this steps.



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On the preliminary research we choose what kind of the leaves to be used in the machines(Martinus et al. 2019). The teak leaves then chosen as it is widely available in teak tree plantation (Suroso 2018) and as production goes there will not be material shortage.

The design of the teak leaf plate molding machine need to provide a good structure to withstand more than 2 Tons pressure. Control system also need to be precise as leaves are very thin and prone to charred and burnt. A charred and burnt product is not desirable. Control system then develop to precisely control upper and under die temperature.

Teak leaf plate is made using hot press molding (Shamsuri 2015), a process that use both pressure and heat to mold the leaves into plates. Materials for the machine are frame made of IWF beam, steel upper and lower die, hydraulic pressure delivery system, thermocouples, PID controller, SSR, heating elements, and power supply unit.

The plate itself then tested using a tensile strength test apparatus. This test will compare the teak leaf plates against plastic plate and expanded polystyrene plate. From this test we will know how the teak leaf plate perform against other product (other product it tries to replace). Below shown how the test is done.

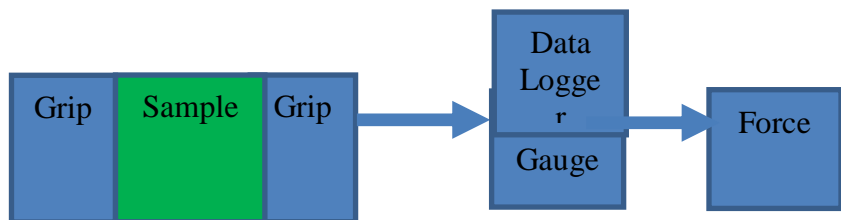


Figure 2. Tensile strength test

3. Results and discussion

Machine is design to withstand greater pressure as preliminary research some of the frames bent under pressure. The new machine start with the new frame using IWF steel with 400kg/mm^2 tensile strength (PT Lintech 2019), then the temperature control of the opposing dies, pressure delivery system and then assemble them in one final unit.

3.1. Frame

The new frame design need to withstand 375kg/cm^2 of pressure. This is the maximum force that the pressure delivery system can deliver. The new frame is developed using IWF steel for the main part in pressure delivery system.

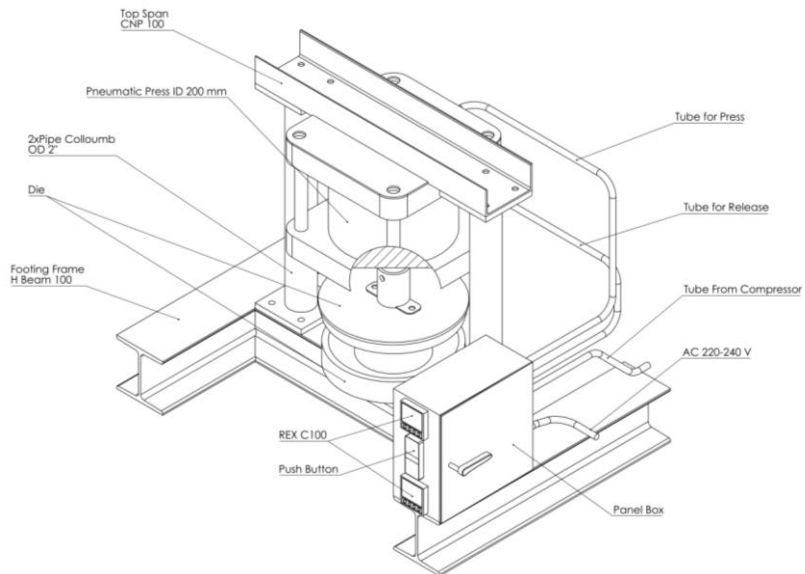


Figure 3. Frame Design

3.2. Automatic Die Temperature Control

Temperature on upper die is a very crucial factor in forming a perfect leaf plate. Heat that transferred from the heating element to the die and finally to the leaves. Heat will dry and evaporate the leaves, dry the starch glue between the leaves. While it is heated the form of the plate will be done by pressure. Overheating on upper die resulting on charred product. Charred and burnt products are not desirable at all. Control system then needed to regulate (Martinus et al. 2018), (Telaumbanua et al. 2019) the temperature for both dies.

PID control system is used to control both upper and lower die. Set points for both die can be set individually. The temperature of upper and lower die varies by different leaves and how many layer of leaves. In Picture 4. shown how the dies temperature are controlled. The temperature control for the machine done by PID (Proportional, Integral and Derivative) analog control system(Li et al., 2006). This type of control system will assure the temperature of upper and lower dies are accurately controlled according to the set points.

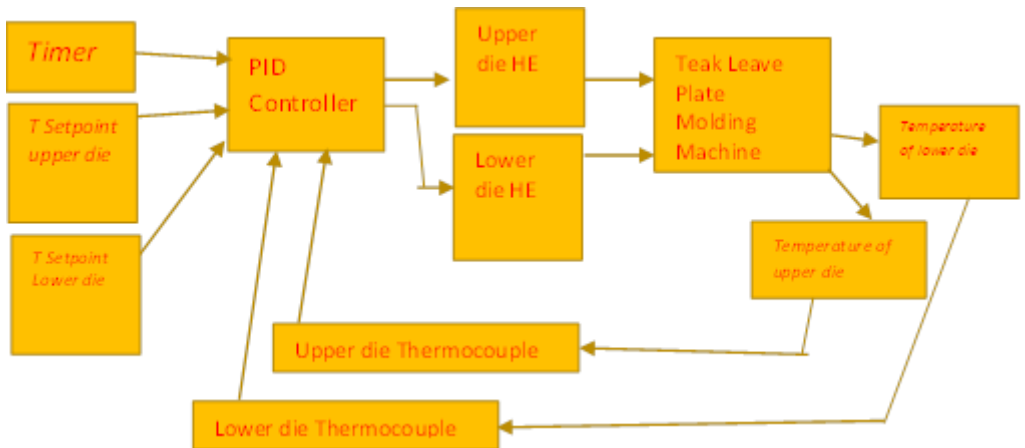


Figure 4. Automatic Temperature Control System

Temperature curve of upper and lower dies shown in figures below.

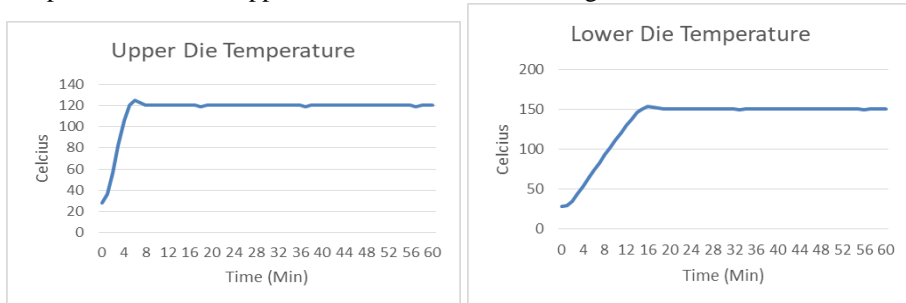


Figure 5. Temperatures at Lower Die and Upper Die

The upper die can be maintained at 120 ± 1 Celsius at all time after 15 minutes of preheat. The lower die can be maintained at 150 ± 1 Celsius at all time after 15 minutes of preheat. This two set points are chosen best for three layer of teak leaves.

3.3. Teak Leaf Plate Molding Machine Assembly

The parts then assembled into working machine. The frame has mountings that used to mount different type of dies. After the dies are mounted, the heating system then installed along with the control system. The pressure delivery system then slides in the frame. The final result is shown on the picture below.

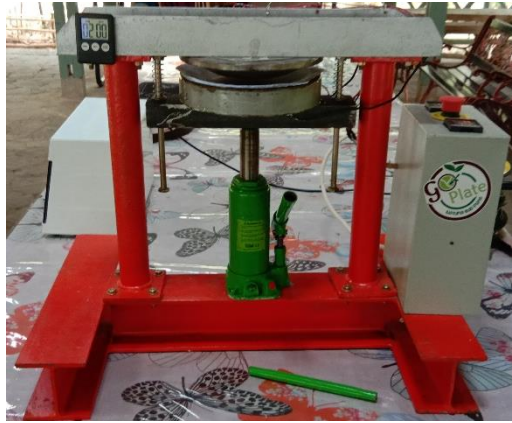


Figure 6. Assembled Teak Leaf Plate Molding Machine

3.4. Teak Leaf Plates

The finished teak leaf plate molding machine then test on making teak leaf plates. The plates are tested for leakage, how long it can be stored, tensile strength of the plates, and the food capacity it can hold. In this paper shown how the tensile strength of the leaf plate produce compared to other disposable products.

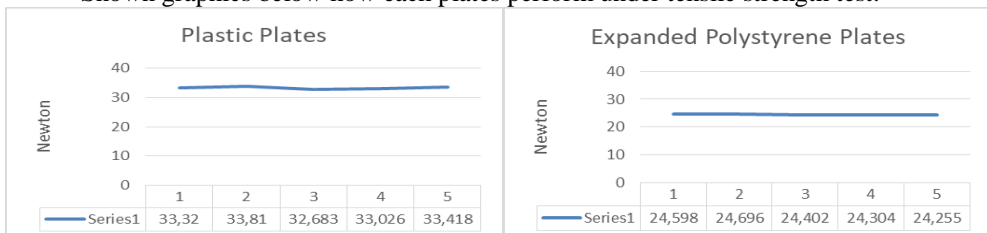


Figure 7. Teak Leaf Plate

3.5. Tensile Strength of the Plates

Tensile strength test is a common test (Kora 2019) to compare similar products. The test is done on teak leaf plates also on expanded polystyrene and plastic plates. This test will prove how the teak leaf plate perform in comparison to other product. The testing conduct using sample from each product. The size of sample test is 5cm x10cm material that cut from the leaf plate, the plastic plate and the expanded polystyrene plate. The test then repeated 5 times for each plates.

Shown graphics below how each plates perform under tensile strength test.



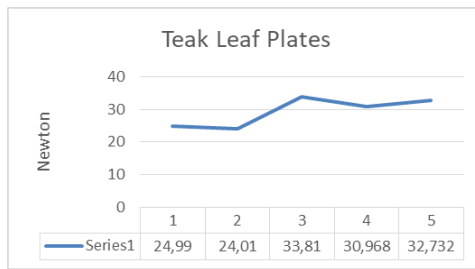


Figure 8. Each Plates Tensile Strength Test

From the test we know that the teak leaf plates strength is not consistent from one plate to another. This was caused by different age, thickness and leaf bone structure that vary from one sample to another. Test results shown in below is average force to break for each plates:

- Teak leaf plates average: 29.3 N
- Plastic plates average: 33.2 N
- Expanded polystyrene plate average: 24.5 N

Even for its inconsistency the teak leaf plate performs quite well against plastic plate and expanded polystyrene plate. Teak leaf plate break at 29.3N slightly lower than plastic plates and higher than expanded polystyrene one. This also prove that the machine is able to produce competitive leaf plates as alternatives.

5. Conclusion

Teak leaf plate molding machine is built and performing quite well. The temperature from upper and lower die can be controlled precisely. The plates that produce by the machine in tensile strength test also perform quite well. Teak leaf plates tensile break average at 29.3 N, slightly lower than plastic one and higher than expanded polystyrene one.

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