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Effect of hot EGR on performance and exhaust gas emissions of EFI gasoline engine fueled by gasoline and wet methanol fuel blends

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Abstract

The aim of this study is to investigate the effect of EGR and wet methanol as the fuel blends on the performance and emission of EFI gasoline engine. The content of wet methanol blended with the gasoline fuel was 5 to 15% by volume. EGR rate was 7.25% by volume of mass inducted into the combustion chamber. Engine speeds were varied in the range of 2500 to 4000 rpm with 500 intervals for constant load of 25% from the maximum achievable load. By comparing the engine equipped by the EGR and without EGR system at the constant engine speed of 4000 rpm, a brake torque increases up to 12.9% for the case of engine fueled by pure gasoline fuel, while it increases up to 10.2% for the engine fueled by 15% wet methanol blend. At the same condition, BSFC decreases approximately 16.6% for the engine fueled by pure gasoline fuel, whilst it decreases up to 15.2% for the engine fueled by 15% wet methanol blend. The increase of brake torque and reduction of BSFC for engine equipped with the EGR system impacts on an engine brake thermal efficiency. The result shows that the brake thermal efficiency increases approximately 19.9% for the engine using EGR system compared with the engine without EGR system at the engine speed of 4000 rpm fueled by neat gasoline fuel, whereas it increases

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Experimental Test of the Effect Wet Ethanol on Decreasing Emissions Exhaust in EFI Gasoline Engine with EGR System

Arief Alfi Ardian, M. , Ardian, A. , Sinaga, D.N. (2019) *Journal of Physics: Conference Series*

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Evaluation of performance and emissions characteristics of methanol blend (gasohol) in a naturally aspirated spark ignition engine

Alexandru, D. , Ilie, D. , Dragos, T. (2017) *IOP Conference Series: Materials Science and Engineering*

Effect of cooled EGR on performance and exhaust gas emissions in EFI spark ignition engine fueled by gasoline and wet methanol blends

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Comparison of lean burn characteristics of an SI engine fueled with methanol and gasoline under idle condition

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[Home](#)[Archive](#)[Submit Paper](#)[Author Guidelines](#)[Editorial Board](#)[Publication Fee](#)**Title:** Irregularity detection in artificial signal using time-frequency analysis**Author (s):** A. Malik Hamat, M. Fairusham Ghazali, Makeen Amin and Fatihah Adnan

Abstract: A typical time signal contain overwhelming amounts of data and some of the signal components represent for irregularity such as crack and leak which greatly important to be identified precisely instead of using traditional method. The strategy can be done using signal processing method through high-quality time-frequency representation (TFR) for analysing such time dependent signals to accurately discover these superposition signal components. A few popular TFR methods such as wavelet transform analysis and relatively new, synchrosqueezed wavelet transform were applied in current study using artificial signal. From the result, both methods successfully discover an irregularity in the signal with different degree of accuracy and it is shown that synchrosqueezed wavelet transform provide the best and detailed time-frequency representation.

[Full Text](#)**Title:** Alternative cooling system of zinc roofed food stall using river water resources**Author (s):** Rosdi Ab Rahman, Masiri Kaamin, Azizul Rahman Abd Aziz, Muhammad Syarafuddin Shariff, Mohd Hadri Mohamed Nor and Mahmud Abd Hakim Mohamad

Abstract: Most personal rural stalls in towns or small cities are using zinc roofs as the top shelter. The material properties itself influence the rate of temperature changes during the afternoon that typically as the peak of daily temperature. Zinc, which is the material of the roof, is a type of good absorbent and heat releasing material. The purpose of this study was to create an alternative system to cool down the area under the roof of zinc-roofed stalls in order to reduce the heat and discomfort during peak temperature periods that believed contributing in customer's satisfaction. An alternative method proposed is the use of corrugated booth cooling system using water resources. This system use natural water resources or the river water as a major resource to cool down the zinc roof which then the space under the stall. The use of river water is natural water gushing and will prevent water shortages. The system sprinkle water on the zinc roof using water sprinkler. This study will analyze two types of data measuring the effectiveness of this system by temperature difference, which is in the space under the stall's roof temperature. Two analyzed spaces divided which are installed system area and space that not installed with the cooling system. The purpose of this two separation data is to compare the temperature differences in the studied area. The system is environmentally friendly and has aesthetic value to afford comfort for the customers.

[Full Text](#)**Title:** Application of spectrogram in analysing electromyography (EMG) signals of manual lifting**Author (s):** Tengku Nor Shuhada Tengku Zawawi, Abdul Rahim Abdullah, Isa Halim, Ezreen Farina Shair and Saleha Mohamad Salleh

Abstract: The fast Fourier transforms (FFT) is commonly applied in transformation of electromyography (EMG) signals from the time domain to the frequency domain. However, this technique has a limitation to provide the time-frequency information for EMG signals. This paper presents the analysis of EMG signal for contraction of muscle activity by using spectrogram. Spectrogram is one of the time-frequency representations (TFR) that represents the three-dimensional of the signal with respect to time and frequency in magnitude presentations. The contraction of muscle activity was based on manual lifting of a 5 kg load performed by the right biceps brachii at lifting height of 75 cm and 140 cm. Ten healthy volunteers in fresh condition participated as subjects to acquire raw data of EMG signals. The raw data of EMG signals were then analysed using MATLAB 2011 to obtain the TFR. Based on the TFR, this study obtained the instantaneous RMS Voltage ($V_{rms}(t)$) to visualize the trend of the EMG signals performance in window size of 1024. Results of this study evince that the lifting height of 140 cm obtained higher V_{rms} than 75 cm. It concluded that the application of spectrogram is able to counter the limitation of FFT in providing the time-frequency information for EMG signals.

[Full Text](#)**Title:** Dimensional measurement of composite laminates plate thru single crystal immersion transducer and ultrasonic rangefinder transducer**Author (s):** M. F. Mahmud, Elmi Abu Bakar

Abstract: Ultrasonic testing has variety of usage. In composite laminates material, it has been use for defect detection such as flaw, un-bonded, void, micro crack, foreign material occurrences and thickness measurement. In this study, glass fiber composite laminates (GFCL) being used and produced in-housed with dimension 120 mm length x 80 mm width x 2.4 mm thickness. It consist an artificial defect which was drilled 6 mm in diameter. Ultrasonic range finder transducer with frequency 42 kHz and single crystal immersion transducer with frequency 2.25 MHz have been applied in order to study the performance between both transducers. During measurement, gap distance between specimen surface and both transducer had been fixed at 10mm. Moreover, linear motion at x-axis with constant speed being controlled during measurement process. Measurement data from ultrasonic rangefinder and single crystal immersion transducer had been compared to determine the accuracy between both transducer. All the data are required in order to develop ultrasonic

Title: Soil investigation using Multichannel Analysis of Surface Wave (MASW) and borehole

Author (s): Aziman Madun, Muhammad Ersyad Ahmad Supa'at, Saiful Azhar Ahmad Tajudin, Mohd Hazreek Zainalabidin, Salina Sani and Mohd Fairus Yusof

Abstract: Multichannel Analysis Surface Wave (MASW) measurement is one of geophysics exploration techniques to determine the soil profile based on velocity. Meanwhile borehole intrusive technique identifies the changes of soil layer based on SPT N value. Both techniques were applied at the University campus test site and Parit Jelutong as part of soil investigation. A 7 kg of sledge hammer was used as source, 24 units of 4.5 Hz geophones used as detectors (receivers) and Terraloc Mark 8 ABEM was used as a recorder. SeisImager software was used for seismic data processing. The MASW test configuration was 5 m geophones spacing and 5 m source offset distance at Parit Jelutong, and used 1 m geophones spacing and 2 m offset distance at the University campus test site. All the MASW test array was conducted near to the boreholes. The reliable seismic results at Parit Jelutong were from depth 0.5 m to 14 m and 3.7 m to 27 m the University campus test site, respectively. Comparison between MASW and borehole data indicates that a very soft clay shear wave velocity is below than 165 m/s, soft clay at 170 m/s to 195 m/s and firm layer at 194 m/s to 317 m/s. There was not available shear wave velocity result of hard material. In conclusion, the MASW technique is potential to adapt in soil investigation to compliment the intrusive technique, which is non-destructive, non-invasive nature and relative speed of assessment.

[Full Text](#)

Title: The development of a prediction model of the Passenger Car Equivalent values at different locations

Author (s): Nurul Hidayati, Ronghui Liu and Frank Montgomery

Abstract: This article is focused on determining the Passenger Car Equivalent (PCE) values at different location that divided into road segment and locus. The PCE values are needed to analyse the traffic flows of roads in mixed traffic condition, and differing geometric or environmental conditions. Traffic conditions consist of type and dimension of vehicles, number and percentage of vehicles, time headway, speed and delay. Generally, environmental condition is discussed together with the geometric. These conditions are related to types of road, alignment, characteristics of lanes, design speed, road surface, weather, roadside activities (pedestrians walking and crossing, traders, parking, buses stopping, and slow vehicles). This study aims to develop the model of the PCE values at different segment and locus, and to find the significance of the differences of those values. The basic hypothesis is that the difference will be significant if too different conditions of locations, but it will not be significant if nearly the same conditions. This study is part of the research carried out at nine urban road segments in three cities in Indonesia. Each road segment was divided into four loci corresponding to the locations of camcorder, namely Locus B (before), Locus Z (at zebra crossing), Locus A (after) and Locus O (outside area). The PCE values were analysed by using multi linear regression model that consist of the speed ratio, dimension ratio, percentage of vehicle ratio, and side friction factor as independent variables. Finding so far shows that the standard deviation is nearly same each locus, but there is very noticeable difference each road segment. This is indicated that group data per locus tend to have the same or insignificant difference mean, while group data per road segment, either same or different mean is possible occurred.

[Full Text](#)

Title: The use of sewage sludge ash (SSA) as partial replacement of cement in concrete

Author (s): Doh Shu Ing, Siew Choo Chin, Tan Kim Guan and Adilen Sui

Abstract: The production of sewage sludge (SS) from waste water treatment plant is increasing all over the world. Disposal of sewage sludge is becoming a serious environmental issue to our society. Sewage sludge which contains high heavy metal is no longer suitable to be used as fertilizer. Besides, the land fill, which is the main disposal method, has also posed threat to leachate of heavy metal from the sewage sludge to the soil. Due to fast urbanization, the demand of cement has increased alarmingly. This will lead to increased cement production and emission of carbon dioxide because the cement industry one of the major contributor of carbon dioxide emission. Hence, the research for replacement of cement using sewage sludge ash is essential to reduce both the emissions of carbon dioxide and the disposal problem of sewage sludge ash. In this investigation, sewage sludge ash has been used as partial cement replacement in concrete. The sewage sludge is incinerated at the temperature of 600°C and duration of three hours. The incinerated sewage sludge ash is sieved through sieve size of 150 µm. Four different percentages of sewage sludge ash (SSA) is used to replace the cement in the concrete. XRD and XRF tests were carried to compare the result between SS, SSA and cement. The tests conducted on concrete in this investigation were slump test, water absorption and water absorption. Results show that SSA has the potential to replace cement since there are high similarities in major chemical component of SSA compared to cement. The replacement of cement in concrete with 5% SSA has shown lower water absorption and increase compressive strength of concrete up to 10% as compared with the control samples.

[Full Text](#)

Title: Examining performance of Industrialized Building System (IBS) implementation based on contractor satisfaction assessment

Author (s): Riduan Yunus, Abd Halid Abdullah, Mohd Norazam Yasin, Md Asrul Nasid Masrom and Mohd Hafizal Hanipah

Abstract: Construction industry is a main contributor to the development of the country. It is vital to ensure the performance of this industry meeting the minimum standards and client requirements. Several studies mainly in developed countries such as Australia, Unites States, and United Kingdom have demonstrated that satisfaction level among the construction players is critical particularly in terms of project performance. Satisfaction on project performance is significant to the players as failure to meet their needs may lead to project delays, cost overruns, poor quality, disputes and conflicts. Nowadays, in Malaysia, construction players are encouraged to shift from the conventional method of construction to Industrialized Building System (IBS). This method is also known as prefabrication has an ability to minimize on-site works and increase the building quality in a controlled environment. However, the take up rate of IBS in developing countries is still low as compared to developed countries. This is due to lack of technical knowledge, negative perceptions and unsatisfactory on its implementation among the contractors. A subjective performance measurement by measuring contractor satisfaction may help to improve their satisfaction level by providing a better understanding on the benefits of IBS. A broad range of satisfaction factors, as perceived by researchers and practitioners, was identified through comprehensive literatures. A questionnaire survey was carried out to examine the relative significance satisfaction factors for contractors in IBS implementation. The analysis showed that there are 36 factors have significant impacts in improving their performance in IBS implementation. Additionally, all significant factors have a correlation with eight performances of a contractor namely 1) cost performance, 2) time performance, 3) product performance, 4) design performance, 5) safety performance, 6) profitability, 7) business performance and 8) relationship performance. Further research will develop a systematic framework based on findings from this paper. It is expected that the framework can serve as a guide to develop appropriate guidelines that will aid the owners to make decisions in selecting appropriate contractors which able to complete proposed IBS project.

[Full Text](#)

Title: Robust controller design for position tracking of nonlinear system using back stepping-GSA approach

Author (s): Sahazati Md Rozali, Mohd Fua'ad Rahmat, Abd Rashid Husain and Muhammad Nizam Kamarudin

Abstract: Electro-hydraulic actuator (EHA) system is highly non-linear system with uncertain dynamics in which the mathematical representation of the system cannot sufficiently represent the practical system. Nonlinearities of the system come from either the system itself or external disturbance signals. These dynamic characteristics are the reasons that cause the

Sound level mapping is a graphic representation of the sound level distribution existing in a given region, for a defined period. The higher sound level indicates more vehicle pass through an area. Number of vehicles and limited street capacities create traffic jam frequently. During a traffic jam, vehicle burn fuel but not moving and cause bad effect to environment. Sound level mapping is needed to know how big the effect of sound level to environment quality. Optimizing environment quality can be made by giving suitable recommendation based on sound level mapping. In this research, sound level mapping is conducted using Geographic Information System (GIS). GIS integrates five key components: hardware, software, data, people and methods. Universitas Gadjah Mada is selected as the research location due to the large amount of vehicles used by students and the areas intersect with public spaces. Data were collected in five areas which have intersections with public spaces such as hospital, shopping center, worship place, food court, and main road. Measurement points will be given for each area. Sound level data is processed using signal processing software, Adobe Audition CS6, then processed using mapping software, Surfer 11.0. This sound level mapping linked with traffic volume data for each street in UGM. Based on sound level mapping, maximum percentage of white acoustic zone for each area is only 18%. Meanwhile, most of the areas are black acoustic zone with sound level over 65 dB (A).

[Full Text](#)

Title: Effect of hot EGR on performance and exhaust gas emissions of EFI gasoline engine fueled by gasoline and wet methanol fuel blends

Author (s): Syaiful, Muhamad Nuryasin and Myung-whan Bae

Abstract: The aim of this study is to investigate the effect of EGR and wet methanol as the fuel blends on the performance and emission of EFI gasoline engine. The content of wet methanol blended with the gasoline fuel was 5 to 15% by volume. EGR rate was 7.25% by volume of mass inducted into the combustion chamber. Engine speeds were varied in the range of 2500 to 4000 rpm with 500 intervals for constant load of 25% from the maximum achievable load. By comparing the engine equipped with the EGR and without EGR system at the constant engine speed of 4000 rpm, a brake torque increases up to 12.9% for the case of engine fueled by pure gasoline fuel, while it increases up to 10.2% for the engine fueled by 15% wet methanol blend. At the same condition, BSFC decreases approximately 16.6% for the engine fueled by pure gasoline fuel, whilst it decreases up to 15.2% for the engine fueled by 15% wet methanol blend. The increase of brake torque and reduction of BSFC for engine equipped with the EGR system impacts on an engine brake thermal efficiency. The result shows that the brake thermal efficiency increases approximately 19.9% for the engine using EGR system compared with the engine without EGR system at the engine speed of 4000 rpm fueled by neat gasoline fuel, whereas it increases up to 18% fueled by 15% wet methanol blend. The use of EGR system, however, impacts adversely to the exhaust gas emissions produced by the engine. By comparing the engine equipped with the EGR and without using EGR system at the constant engine speed of 4000 rpm, CO emission increases approximately 94.7% for the engine fueled by neat gasoline fuel and up to 50% for the engine fueled by 15% wet methanol blend. At the same condition, the work indicates HC emission increases up to 50.7% and 78.6% for the engine fueled by pure gasoline fuel and 15% wet methanol blend, respectively. The brake torque increases small up to 2.9% and 0.4% for the engine fueled by 15% wet methanol compared with that of engine fueled by the neat gasoline fuel without and with EGR systems, respectively, at the constant engine speed of 4000 rpm. At the same condition, CO emission decreases approximately 73.7% and 79.7%, whilst HC decreases approximately 44% and 33.6%, respectively.

[Full Text](#)

Title: Scoping study on the optimum fuel composition and fueling scheme of a pebble-bed HTGR

Author (s): Tagor Malem Sembiring and Peng Hong Liem

Abstract: An optimum fuel composition is a very important parameter in the operation of a pebble bed high temperature gas-cooled reactor (HTGR). In the present scoping study, the optimum ranges of heavy metal (HM) loading per pebble and the uranium enrichment are investigated. The HM loading range covers 4 to 10 g per pebble, while the uranium enrichment covers 5 to 20 w/o. Two fuel loading schemes typical to pebble-bed HTGRs are also investigated, i.e. the OTTO and multi-pass schemes. All calculations are carried out using BATAN-MPASS, a general in-core fuel management code dedicated for pebble-bed type HTGRs. The reference reactor design case is adopted from the German 200 MWth HTR-Module but with core height of half of the original design. Other design parameters follow the original HTR-Module design. The results of the scoping study show that, for both once-through-then-out (OTTO) and multi-pass fueling schemes, the optimal HM loading per pebble is around 7 g HM/ball. Increasing the uranium enrichment minimizes the fissile loading however higher enrichment than 15 w/o is not effective anymore. The multi-pass fueling scheme shows lower fissile loading requirement and a significantly lower axial power peaking than the OTTO scheme. It can be concluded that the optimum range of HM loading and uranium enrichment are found to be around 7 g per pebble and 15 w/o. In addition the multi-pass fueling scheme shows superior BURNUP and safety characteristics than the OTTO fueling scheme.

[Full Text](#)

Title: Feasibility study on 20 MWe Cross linear concentrated solar power plant

Author (s): Taiki Aiba, Kentaro Kanatani, Yutaka Tamaura and Hiroshige Kikura

Abstract: Concentrated solar power (CSP) utilizes solar thermal energy for electric power generation by concentrating the solar radiation with mirrors. The existing solar concentration systems, such as parabolic trough, linear fresnel and tower, have problems of lower concentration efficiency in winter season and high latitude region. Cross linear concentrated solar power (CL-CSP) has been developed to achieve high concentration efficiency even in such conditions. Linear receiver line lies on east-west axis and mirror lines on north-south axis, therefore the both lines are crossed each other at right angles. Since mirrors of CL-heliostat are controlled with dual axes (rotation and elevation) for sun-tracking, high concentration efficiency can be obtained. In order to establish cost competitive and efficient CSP plant, feasibility study on 20 MWe CL-CSP was carried out using computer simulation. Pebbles and air are applied as thermal storage material and working fluid respectively considering the cost competitive system. Heat capacity of the thermal storage tank and the amount of solar concentration were assumed by the estimation of the energy balance of plant operation. The layout of the heliostat field of 20 MWe CL-CSP plant was designed and conversion efficiency from concentrated solar energy to electric power was estimated. High temperature of 600°C and the conversion efficiency of 24% (recovered heat to electricity) and 19% (electricity from concentrated solar energy) were obtained. Configuration design of thermal storage tank was also conducted. Finally the installation cost of the CL-plant was estimated to be compared with the conventional CSP-plant. The result shows the cost competitiveness of the CL-plant.

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Title: Multi-objective constrained algorithm (MCA) and non-dominated sorting genetic algorithm (NSGA-II) for solving multi-objective crop planning problem

Author (s): Sams Jarin, Mst. Khaleda Khatun and Amir Akramin Shafie

Abstract: Crop planning problem is a multi-objective optimization problem. It is related to many factors such as land type, capital, demand etc. From very earlier years, people have been trying to find out a best solution for crop planning to get more profit in exchange of less investment and cost. In this paper, we formulate a crop planning problem as a multi-objective optimization model and try to solve two different versions of the problem using two different optimization algorithms MCA and NSGA. In this two algorithms, they provide superior solutions to maximize total net benefit and minimize total cost. We investigate these algorithms here as a linear crop planning model and use them to acquire the maximum total gross margin according with minimum total working capital in order to satisfy some constraints. We also compare the performance of these two algorithms and analyse the solution from the decision-making point of view.



EFFECT OF HOT EGR ON PERFORMANCE AND EXHAUST GAS EMISSIONS OF EFI GASOLINE ENGINE FUELED BY GASOLINE AND WET METHANOL FUEL BLENDS

Syaiful¹, Muhamad Nuryasin¹ and Myung-Whan Bae²

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ABSTRACT

The aim of this study is to investigate the effect of EGR and wet methanol as the fuel blends on the performance and emission of EFI gasoline engine. The content of wet methanol blended with the gasoline fuel was 5 to 15% by volume. EGR rate was 7.25% by volume of mass inducted into the combustion chamber. Engine speeds were varied in the range of 2500 to 4000 rpm with 500 intervals for constant load of 25% from the maximum achievable load. By comparing the engine equipped by the EGR and without EGR system at the constant engine speed of 4000 rpm, a brake torque increases up to 12.9% for the case of engine fueled by pure gasoline fuel, while it increases up to 10.2% for the engine fueled by 15% wet methanol blend. At the same condition, BSFC decreases approximately 16.6% for the engine fueled by pure gasoline fuel, whilst it decreases up to 15.2% for the engine fueled by 15% wet methanol blend. The increase of brake torque and reduction of BSFC for engine equipped with the EGR system impacts on an engine brake thermal efficiency. The result shows that the brake thermal efficiency increases approximately 19.9% for the engine using EGR system compared with the engine without EGR system at the engine speed of 4000 rpm fueled by neat gasoline fuel, whereas it increases up to 18% fueled by 15% wet methanol blend. The use of EGR system, however, impacts adversely to the exhaust gas emissions produced by the engine. By comparing the engine equipped with the EGR and without using EGR system at the constant engine speed of 4000 rpm, CO emission increases approximately 94.7% for the engine fueled by neat gasoline fuel and up to 50% for the engine fueled by 15% wet methanol blend. At the same condition, the work indicates HC emission increases up to 50.7% and 78.6% for the engine fueled by pure gasoline fuel and 15% wet methanol blend, respectively. The brake torque increases small up to 2.9% and 0.4% for the engine fueled by 15% wet methanol compared with that of engine fueled by the neat gasoline fuel without and with EGR systems, respectively, at the constant engine speed of 4000 rpm. At the same condition, CO emission decreases approximately 73.7% and 79.7%, whilst HC decreases approximately 44% and 33.6%, respectively.

Keywords: hot EGR, performance, exhaust gas emissions, EFI gasoline engine, wet methanol.

INTRODUCTION

Methanol is one of the alternative fuels possessing a higher octane number as compared to gasoline. Vancoillie *et al.* expressed that methanol and ethanol are potential to improve engine performances and reduce exhaust gas emissions [1]. Another study also revealed the advantages of alcohol as a fuel including high heat evaporation, improvement knock endurance and high flame velocity [2]. Balki and Sayin found that methanol and ethanol increase brake mean effective pressure (BMEP), brake thermal efficiency (BTE) and volumetric efficiency at various compression ratio [3]. Bahattin *et al.* represented that the use of pure methanol at the same compression ratio causes the reduction of power and CO, CO₂, NO_x emissions, while BTE and HC emission increase [4]. Eyidogan *et al.* observed that methanol has higher oxygen content than ethanol resulting the increase of combustion efficiency and the reduction of BSFC [5].

Exhaust gas recirculation (EGR) is one of the potential techniques for controlling NO_x emissions. Jinyoung *et al.* found that the use of EGR decreases NO_x emissions and improves the fuel economical aspect [6]. Zhang *et al.* represented that EGR decreases BSFC and NO_x emissions [7]. Wei *et al.* exhibited that the use of hot

EGR in SI engine improves the combustion quality and thermal efficiency [8]. Syaiful *et al.* studied wet and pure methanol effects on the performance and smoke emission of diesel engine in the cooled EGR system [9].

Based on the references above, methanol blended with gasoline increases engine performance, decreases fuel consumption and decreases exhaust gas emissions. EGR usage is able to reduce NO_x emissions, fuel consumptions and increases thermal efficiency. Pure methanol price, however, is more expensive than gasoline, approximately 31 times more. Therefore, this study explores wet methanol as fuel blend for gasoline engine since it has a lower price than pure methanol (wet methanol and gasoline prices are similar).

EXPERIMENTAL SET UP

In order to investigate the influence of fuel blends on the performance and exhaust gas emissions of gasoline engine, the physical properties of fuels are very important to be understood. Several physical properties for fuel blends are expressed in Table-1. From Table-1, it is shown that the water content in the wet-methanol is approximately 25%, which is very high as compared to pure methanol. The octane number of wet-methanol is



ALTERNATIVE COOLING SYSTEM OF ZINC ROOFED FOOD STALL USING RIVER WATER RESOURCES

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ABSTRACT

Most personal rural stalls in towns or small cities are using zinc roofs as the top shelter. The material properties itself influence the rate of temperature changes during the afternoon that typically as the peak of daily temperature. Zinc, which is the material of the roof, is a type of good absorbent and heat releasing material. The purpose of this study was to create an alternative system to cool down the area under the roof of zinc-roofed stalls in order to reduce the heat and discomfort during peak temperature periods that believed contributing in customer's satisfaction. An alternative method proposed is the use of corrugated booth cooling system using water resources. This system use natural water resources or the river water as a major resource to cool down the zinc roof which then the space under the stall. The use of river water is natural water gushing and will prevent water shortages. The system sprinkle water on the zinc roof using water sprinkler. This study will analyze two types of data measuring the effectiveness of this system by temperature difference, which is in the space under the stall's roof temperature. Two analyzed spaces divided which are installed system area and space that not installed with the cooling system. The purpose of this two separation data is to compare the temperature differences in the studied area. The system is environmentally friendly and has aesthetic value to afford comfort for the customers.

Keywords: cooling system, natural resources, water, rural, zinc roof.

INTRODUCTION

Various types of stalls that use different roof type materials such as zinc, tiles, polycarbonate roofing, and others. However, the lunch period with sunny and hot weather in the afternoon causing inconvenience to customers especially the stalls using zinc roof. The system also does not require a high cost as it uses natural water resources (Rosdi *et al.*, 2014). Results from this project will help trader's stalls that use corrugated iron as stated in Table-1 to use this system to help cool and provide more comfort to the visitors.

Thatched roofs of zinc are indeed hot especially in the afternoon. Scorching hot weather conditions coupled with rising global temperatures will greatly felt and this causes inconvenience to customers of zinc-roofed stalls because they had to eat in the heat and warm conditions. Therefore, this project is using river water as a coolant to their zinc roof. A zinc roof cooling can reduce the internal temperature under the booth and solve problems of overheating and heat as well as providing more convenience environment for customers.

Table-1. Approximate weight of different roof types.

Type of food stalls	Number
Zinc Roof Food Stalls	64
Not Roof Zinc Food Stalls	20
Type of Food Stalls	small stalls

This research is purposely to implementing the natural resources cooling system to the rural food stall in Batu Pahat Johor Malaysia. The analyses involved are measuring the effectiveness of the cooling system considering the natural river water as the cooling medium. The sample case study been done at the food stall name Warung Asam Pedas-Pakat Pakat in Sri Gading. The food stalls in Sri Gading chosen as the next to the river.

The impact of this project is it indirectly helps cooling zinc roof, thereby lowering the temperature in the booth and give more comfort to the visitors. Results from this project will help trader's zinc-roofed stalls to attract more customers and provide comfort for them to eat in the booth.

SOURCES OF HEATING

Direct sun radiated heat

Global warming is a phenomenon of entrainment gas that known as the greenhouse gas where the gas blocked and trapped the earth's heat from escaping into space. The nature of the gas is allowing sun radiation to pass through but prevent the release of radiation of the earth into the atmosphere. Global warming also affects the temperature and air environment where the temperature and the surrounding air to heat up. It causes people to carry on their daily activities with less comfortable conditions.



THE DEVELOPMENT OF A PREDICTION MODEL OF THE PASSENGER CAR EQUIVALENT VALUES AT DIFFERENT LOCATIONS

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ABSTRACT

This article is focused on determining the Passenger Car Equivalent (PCE) values at different location that divided into road segment and locus. The PCE values are needed to analyse the traffic flows of roads in mixed traffic condition, and differing geometric or environmental conditions. Traffic conditions consist of type and dimension of vehicles, number and percentage of vehicles, time headway, speed and delay. Generally, environmental condition is discussed together with the geometric. These conditions are related to types of road, alignment, characteristics of lanes, design speed, road surface, weather, roadside activities (pedestrians walking and crossing, traders, parking, buses stopping, and slow vehicles). This study aims to develop the model of the PCE values at different segment and locus, and to find the significance of the differences of those values. The basic hypothesis is that the difference will be significant if too different conditions of locations, but it will not be significant if nearly the same conditions. This study is part of the research carried out at nine urban road segments in three cities in Indonesia. Each road segment was divided into four loci corresponding to the locations of camcorder, namely Locus B (before), Locus Z (at zebra crossing), Locus A (after) and Locus O (outside area). The PCE values were analysed by using multi linear regression model that consist of the speed ratio, dimension ratio, percentage of vehicle ratio, and side friction factor as independent variables. Finding so far shows that the standard deviation is nearly same each locus, but there is very noticeable difference each road segment. This is indicated that group data per locus tend to have the same or insignificant difference mean, while group data per road segment, either same or different mean is possible occurred.

Keywords: passenger car equivalent, location of survey, significant difference.

INTRODUCTION

Generally the performance of each vehicle influences the performance of the traffic stream in terms of road capacity, traffic congestion and air pollution (Sugawara, 1995; Ajgaonkar, 1974). Lee (2007) wrote that motorcycles can be travelling alongside other vehicles in the same lane, following in an oblique position, with a small gap and a short time headway compared to vehicles which influence the performance of other vehicles in the stream. Traffic conditions are measured in terms of average flow, speed, etc., and traffic analysis for mixed traffic is conducted by comparing values of different vehicles, with a passenger car as the standard vehicle. The vehicular unit is named a Passenger Car Unit (PCU), and the conversion value is Passenger Car Equivalent (PCE) (TRB, 2000).

Many factors have been used in PCE analyses, such as time headway, speed, traffic flow, and the percentage of trucks. Vehicle percentage is sometimes used together with time headway, delay or speed, and vehicle size is used together with speed, to anticipate if there are similar speed values between two different vehicles of different sizes (Craus *et al.*, 1980). This research was conducted in some cities of Indonesia that used the vehicle speed as the main factor to determine the value of PCE. It was because generally the impact of different condition of roads (including physical road side facilities) would be directly felt by driver on the vehicle

speed (fast or slow moving). Also, it was difficult to define and measure headways in Indonesia, where motorcycles could create unique movement patterns and had a high percentage, and low awareness of drivers on discipline of the traffic lane.

This article is part of author research that aimed to determine the effect of physical facility of ZoSS (Zona Selamat Sekolah or School Safety Zone) to the PCE values for mixed traffic condition in several road segments of Indonesian urban road. Indonesian mixed traffic conditions are related to the high proportion of motorcycles and the presence of non-motorised in traffic flow and various roadside activities. Beside different road segments, each segment was divided into four loci with different condition. Therefore, this article aims to determine the PCE values at different segment and locus, and to find how significant the difference.

PASSENGER CAR EQUIVALENTS

Factor affecting passenger car equivalent (PCE)

PCE values are also used to analyse the performance of road network in term of road segment capacity and intersections saturation flow. There are similar factors affecting PCE values and road capacity or saturation flow, such as vertical and horizontal alignment, lane width, shoulder width, traffic conditions and side