

Investigation of Carburetor Venturi Bore Size in Internal Combustion Engines Using Ron 95 Fuel Mixed With Bioethanol

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ABSTRACT

The internal combustion engine is one of the main factors contributing to the largest exhaust emissions today. So that the engine produces optimal energy, the right fuel is needed to reduce exhaust emissions. Bioethanol is considered to optimize the combustion reaction in the form of CO and HC produced, but bioethanol contains less energy compared to gasoline. An experimental study was conducted directly on the performance and waste emissions of a four-stroke, 1-cylinder internal combustion engine. The purpose of this study was to analyze shell v-power RON 95 fuel blended with 15% bioethanol fuel with carburetor venturi hole size ratios of 26 and 28. With the addition of bioethanol, at venturi 26 and 28, the average torque increased by 20%, while the power at venturi 26 increased by an average of 13%, and at venturi 28, it increased by 7.8%. In terms of exhaust emissions, the use of venturi 26 decreased CO levels by 30.3% and HC levels by 36.6%, while the carburetor with venturi 28 decreased 18.4% and HC levels by 50.3%.

ABSTRAK

Mesin pembakaran dalam menjadi salah satu faktor utama penyumbang emisi gas buang terbesar saat ini, agar mesin menghasilkan energi yang optimal, diperlukan bahan bakar yang tepat untuk mengurangi emisi gas buang. Bioetanol dianggap untuk mengoptimalkan reaksi pembakaran dalam bentuk CO dan HC yang diproduksi, tetapi bioetanol mengandung lebih sedikit energi dibandingkan dengan bensin. Studi experimental dilakukan secara langsung terhadap kinerja dan emisi limbah dari mesin pembakaran internal empat-langkah, 1-silinder. Tujuan penelitian ini adalah untuk menganalisis bahan bakar shell v-power RON 95 dicampur dengan bahan bakar bioethanol 15% dengan perbandingan ukuran lubang venturi karburator 26 dan 28. Dengan penambahan bioetanol, pada venturi 26 dan 28 torsi rata-rata meningkat 20% sedangkan daya pada venturi 26 meningkat rata-rata 13% pada venturi 28 meningkat 7,8%. Ditinjau dari emisi gas buang penggunaan venturi 26 kadar CO turun 30,3% dan HC turun 36,6% sedangkan pada karburator dengan venturi 28 turun 18,4% dan HC turun 50,3%.

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INTRODUCTION

Exhaust emissions produced by internal combustion engines are the main problem being faced by several countries today. The transportation sector contributes significantly to air pollution and global warming, so the European Union (EU) in 2020 requires 10% of transportation fuel to come from renewable energy (Clairotte et al., 2013; Gadzicka, 2019). It is reported that in 2020–2022, the overall use of motorized vehicles will increase by 6.3% (Badan Pusat Statistik, 2022). Comparatively, fuel consumption is expected to rise to 75.27 million kL (Kementerian Energi, 2021). Fuel is currently one of the objects of research aimed at reducing combustion gases that are considered to have dangerous levels, such as HC and CO, for the survival of living things and the surrounding ecosystem (Tsai et al., 2019), while motorized vehicles require fuel in order to generate power from the combustion process. About 62.3% of petroleum has been utilized by all vehicles (Agrariksa et al., 2013), especially private vehicles. One way to reduce the use of fuel oil is to convert plants that have cellulose content into bioethanol products. Bioethanol (C_2H_5OH) is an alternative fuel that has the properties of pure ethanol, which is flammable and has a high octane value of 118 (Dharmawan & Sudarmanta, 2016; Mićić & Jotanović, 2015; Siregar, 2023; Sudiyani et al., 2019; Thangavelu et al., 2016). The utilization of bioethanol as a substitute for fuel oil can help reduce carbon monoxide (CO) emissions and decrease nitrogen oxide (NO_x) and hydrocarbon (HC) emissions compared to regular gasoline.

Some studies reveal that the use of bioethanol mixtures in vehicle engines can reduce the amount of HC and CO content. Real experimental research was conducted by Aprilyanti et al. (2020) The addition of bioethanol from pineapple crown by 5% to 20% 5% interval to exhaust emissions in 4-stroke motorcycle engines, the results showed that the resulting CO levels decreased by an average of 19.35% along with the addition of bioethanol given; however, the most effective reduction in HC levels was only up to a mixture of 10% on average (31.63%). The higher the bioethanol mixture, the worsened the resulting HC levels. This is almost in line with research conducted by Raja et al. (2015) the addition of bioethanol at 10% can eliminate 50% of the CO and HC levels produced, while the mixture above 10% causes the combustion process to be incomplete because too much oxygen results in increased CO and HC levels. Another study stated that experiments conducted on four-wheeled vehicles found a decrease in exhaust emissions, reaching 93% for CO, 95% for NO_x , 81% for HC, and 62% due to the addition of an ethanol mixture to the vehicle fuel used (Wu et al., 2013). Yudistirani et al. (2019) after conducting research on the performance of a 4-stroke 110cc motorcycle with a mixture of 30% bioethanol and a 70%–20% interval, it was concluded that the addition of bioethanol to gasoline fuel can sufficiently improve performance. The torque seen in the 30% bioethanol mixture compared to fuel without the mixture managed to increase by an average of 0.49%, while power increased by 6.04%. However, the higher the mixture of bioethanol and gasoline fuel, the lower the performance. Bioethanol itself actually contains 30% water, so the combustion reaction between air and fuel becomes imperfect due to moisture in the combustion reaction between air and fuel becomes imperfect due to moisture in the combustion chamber itself. Ozcelik et al. (2015) conducting research by adding a mixture of bioethanol to gasoline by 2% and 5% compared to pure gasoline, CO emissions in the 2% mixture can be reduced by 40.85%, while the 5% mixture drops to 57.19%. Even though HC in the 2% mixture drops to 15% while 5% drops to 30%, the decrease in CO and HC emissions with the use of bioethanol blends is interpreted as an indication that bioethanol contains oxygen. With increasing engine speed, the amount of heat released as a result of fuel combustion in the cylinder increases and combustion increases.

Some of the disadvantages of bioethanol blends that need to be considered include lower energy, the presence of some aldehydes, the difficulty of starting the engine in cold conditions due to lower vapor pressure, and increased corrosion, especially in ferrous metal materials (Manzetti & Andersen, 2015; Saputra et al., 2021). One way to introduce a mixture of air and fuel into the cylinder is through a carburetor (Putra & Malyadi, 2019), We need to know that the venturi hole in the carburetor greatly affects the air flow rate into the combustion chamber caused by the vacuum of the cylinder. The working principle of the carburetor is that fuel is sucked from the float chamber through the venturi hole. Due to changes in pressure and velocity, the fuel will become

fine droplets and mix with air that resembles gas. The mixture is then fed into the combustion chamber as well as possible so that an ideal and homogeneous mixture occurs. The amount of fuel and air mixture entering the combustion chamber is regulated by the opening of the nozzle. Thus, the faster the air rate, the lower the pressure in the combustion chamber (Heywood, 2018).

Gasoline fuel mixed with bioethanol will affect the characteristics of the specific gravity, so that it will affect the fogging process of the air and fuel mixture carried out by the carburetor. Therefore, this study presents a comparison of the use of standard carburetors with 26 venturi holes with carburetor with 28 venturi holes to see the actual AFR and equivalent ratio using RON 95 fuel from v-power shell without mixture and bioethanol mixture 15%. The data analysis of performance includes Torque and Power, while the gas emissions include; CO and HC.

RESEARCH METHOD

The internal combustion engine is a conversion or heat engine that utilizes the combustion process of a mixture of air and fuel in the combustion chamber to convert heat energy into mechanical energy. This process produces combustion gases that can move the piston connected to the crankshaft through the drive rod (Ferguson & Kirkpatrick, 2015; Kirkpatrick, 2020). The mixture of air and fuel is channeled into the combustion chamber in the form of dew mixed with air through the carburetor, as well as several components in the carburetor such as slow-jet and main-jet nozzles that function to control the fuel supply in the combustion chamber at idle and high rotation conditions. Combustion in the combustion chamber comes from the ignition of the spark plug, which sparks so that it triggers the combustion of a mixture of compressed air and fuel in the combustion chamber to turn into heat energy (Yudistirani et al., 2019). The internal combustion engine has a work cycle which is in a process that occurs constantly repeated, the work cycle in the internal combustion engine is divided into two types, namely the four-stroke internal combustion engine requires four piston steps and two crankshaft rotations to produce power, while the two-stroke internal combustion engine requires two piston steps and one crankshaft rotation to produce power. This study uses a four-stroke gasoline engine in one working cycle, namely the suction stroke, compression stroke, working stroke, and exhaust stroke, presenting the specifications of the four-stroke engine as in Table 1, while the specifications of the carburetor used in this study are presented in Table 2.

Table 1. Specifications of 150 cc four-stroke engine

Type	Description
Engine type	Four-stroke (DOHC)
Cooler	Liquid cooled
Cylinders	1 (One)
Cylinder diameter	62 mm
Piston diameter	62 mm
Piston stroke TDC to BDC	48.8 mm
Cylinder capacity	147.3 cc
Compression ratio	10.2 : 1

Table 2. Carburetor specifications

Type spesification	MIKUNI	LIPPO
Carburetor type	Standard (BS26-187)	Non Standard (PE)
Venturi diameter	26 (mm)	28 (mm)
Throttle valve diameter	30 (mm)	30 (mm)
Nozzle slow-jet	12.5 (0.013 mm)	45 (0.045 mm)
Nozzle main-jet	110 (0.110 mm)	125 (0.125 mm)

Bioethanol

Bioethanol is an extraction process from plants such as cassava, corn, and sugar cane that contain sugar, starch, and cellulose components so that they have carbon chain compound elements formulated as C_2H_5OH so that they can be converted into fuel (Aprilyanti et al., 2020). The use of bioethanol aims to reduce the use of fossil fuels and overcome fuel scarcity. One way to optimize this alternative energy is by blending fossil fuels with bioethanol (Yudistirani et al.,

2019). The oxygen content in bioethanol can oxidize the fuel so that it can burn perfectly, the use of bioethanol mixtures in bioethanol fuels that are too much results in incomplete combustion, seen from the carbon chain compounds bioethanol contains water elements so that long-term use can cause corrosion of some engine components (Sutanto & Setianto, 2021). However, judging from the higher auto-ignition temperature and burning point of bioethanol compared to gasoline, bioethanol is safer in storage (Pikūnas et al., 2003). The difference in physical properties of RON 95 gasoline fuel before and after blending bioethanol on density is presented in Table 3.

Table 3. Density of 100% RON 95 and 85% RON 95 mixed with 15% bioethanol

Fuel type	Density
100% RON 95 of shell v-power	0.8479 kg/l
85% RON 95 of shell v-power + 15% bioethanol	0.8578 kg/l

Methodology

The research method used was experimental observation of a motor vehicle in a horizontal position for normal fuel flow distribution. The fuel used was 100% v-power shell with a value of RON 95 and 85% v-power shell worth RON 95, mixed with 15% bioethanol with a volume of 1 liter. Data collection began with the application of a standard 26-venturi carburetor (Figure 1.a), after which the engine is blown for 1 minute to see its stable condition, enter gear 1 in the transmission, then open the throttle 10% on the carburetor, followed by giving a braking load on the prony disc brake of 10kg to 50 kg, then connect the gas analyzer to the exhaust, then take data at every 10kg interval with a duration of 30 seconds, repeat the steps of the data retrieval process at each throttle opening of 25% and 40% with the same loading given until completion, after which data retrieval uses a 28-venturi carburetor Figure 1.b with the same data retrieval process. The data obtained from the test in the form of RPM and fuel flow rate at a volume of 10 mL are used to analyzer performance data including torque and power while gas analysis obtained CO and HC levels while later lambda to analyze actual AFR values (Air Flow Ratio) and Φ (equivalent ratio) values. The flow of the data collection process is presented in Figure 2.

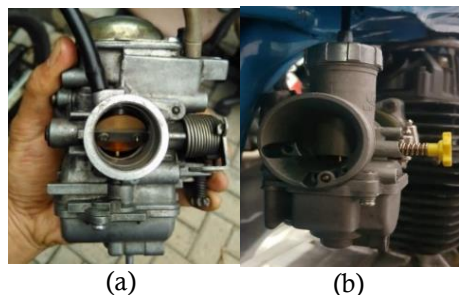


Figure 1. Visual of a carburetor applied to a four-stroke engine (DOHC)

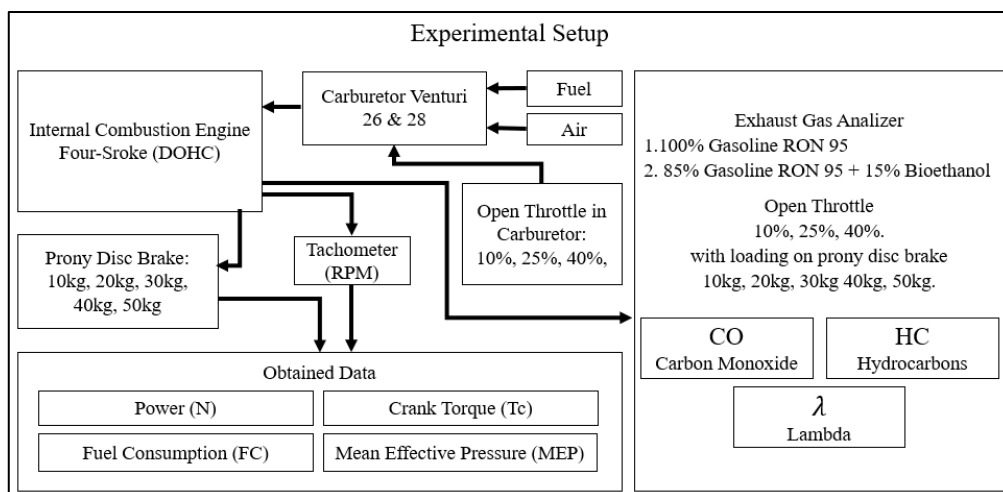


Figure 2. Experimental setup

Measurement of exhaust emissions was carried out for 30 seconds at each throttle opening given loading on the prony disc brake using two different types of fuel, including 100% gasoline RON 95 and 85% gasoline RON 95 mixed with 15% bioethanol. Exhaust emissions testing using a gas analyzer as shown in Figure 4 with test equipment specifications as shown in Table 4.

Table 4. Gas analyzer specifications

Technical Specifications		GASBOX Autopower
Dimensions		460 × 200 × 250 mm
Approximate weight		6.5 kg
External power supply		100-240 V, 50-60 Hz
Temperature range		5 °C a 40 °C
Measurements	Measurements Range	Resolution
CO	0-10% vol.	0,01%
CO ₂	0-20% vol.	0,10%
HC	0-10.000 ppm	1.0 ppm
O ₂	0-22% vol.	0.010%
NO _x	0-5000 ppm	1.0 ppm
Lambda	0-5	0.001
CO _{corr}	0-10%	0.01%



Figure 4. Gas analyzer, a tool for measuring exhaust emissions

RESULT AND DISCUSSION

In the data collection process, every RPM throttle opening is known to increase, but with each opening throttles are loaded on the prony disc brake then the RPM will decrease so that the graphic presented is read from high rpm to lowest rpm. RPM data collection results from the throttler opening 10%, 25%, and 40%, with greasy loading from 10kg to 50kg with 10kg intervals are presented in Table 5 and 6. Whereas fuel flow rate data using fuel shell v-power RON 95 per 10 ml is shown in Table 7 and 8.

Table 5. Engine speed data (RPM) on the crankshaft with fuel without bioethanol mixture

Breaking load (Kg)	Throttle 10%		Throttle 25%		Throttle 40%	
	Ventury 26 (rpm)	Ventury 28 (rpm)	Ventury 26 (rpm)	Ventury 28 (rpm)	Ventury 26 (rpm)	Ventury 28 (rpm)
10 kg	5176	6846	7177	8891	9205	10193
20 kg	3326	4511	6817	7694	8347	9109
30 kg	2897	3183	6219	6306	7284	7839
40 kg	2331	2892	5556	5972	6879	7113
50 kg	1937	2508	4704	5276	5563	5984

Table 6. Engine speed data (RPM) on the crankshaft with 15% bioethanol blended fuel

Breaking load (Kg)	Throttle 10%		Throttle 25%		Throttle 40%	
	Ventury 26 (rpm)	Ventury 28 (rpm)	Ventury 26 (rpm)	Ventury 28 (rpm)	Ventury 26 (rpm)	Ventury 28 (rpm)
10 kg	6219	7611	8414	9434	10192	11804
20 kg	4102	6219	7603	8093	9473	10518
30 kg	3567	4962	7255	7402	8713	9204
40 kg	2892	4159	5561	5882	7612	8199
50 kg	2325	3624	4836	5136	6894	7107

Table 7. Flow rate data of 15% bioethanol blend fuel with 10 mL volume per second (s)

Breaking load (Kg)	Throttle 10%		Throttle 25%		Throttle 40%	
	Ventury 26 Second (s)	Ventury 28 Second (s)	Ventury 26 Second (s)	Ventury 28 Second (s)	Ventury 26 Second (s)	Ventury 28 Second (s)
10 kg	3.54	2.65	3.11	2.45	2.74	2.17
20 kg	3.77	2.82	3.40	2.63	3.10	2.38
30 kg	3.90	3.11	3.56	2.80	3.23	2.50
40 kg	4.18	3.36	3.75	3.12	3.49	2.75
50 kg	4.34	3.53	4.02	3.24	3.61	2.96

Table 8. Fuel flow velocity data without bioethanol mixture with a volume of 10 mL per second (s)

Breaking load (Kg)	Throttle 10%		Throttle 25%		Throttle 40%	
	Ventury 26 Second (s)	Ventury 28 Second (s)	Ventury 26 Second (s)	Ventury 28 Second (s)	Ventury 26 Second (s)	Ventury 28 Second (s)
10 kg	3.68	2.86	3.24	2.62	2.85	2.46
20 kg	4.05	3.24	3.51	2.84	3.21	2.65
30 kg	4.16	3.59	3.65	3.05	3.43	2.83
40 kg	4.39	3.75	3.84	3.26	3.62	2.98
50 kg	4.56	3.92	4.12	3.52	3.78	3.29

Comparison of the performance of the four-stroke engine based on the venturi hole on the carburetor and the fuel used

Performance on torque is presented in the graph comparison in Figure 5. The addition of bioethanol to conventional fuel results in higher engine speeds compared to unblended fuel. This is because bioethanol fuel has sufficient oxygen content so that the fuel with the bioethanol mixture is compressed homogeneously, which causes a high explosion in the combustion chamber and produces a greater thrust force on the piston during the expansion stroke. The loading on the prony disk brake means that the crankshaft requires sufficient power to move the piston, which results in higher torque. The torque value obtained based on the loading of each test is 4.9 Nm at 10 kg, 9.8 Nm at 20 kg, 14.7 Nm at 30 kg, 19.6 Nm at 40 kg, and 24.5 Nm at 50 kg. The average torque increased by 20% compared to the research of Yudistirani et al. (2019) where the average torque increase only reached 0.4%. While the results of research by Wibowo et al. (2020) show that the higher the level of high bioethanol mixed into gasoline fuel can cause an increase in the octane number of the fuel, the torque produced using RON 88 and 92 fuels with a mixture of 30% bioethanol has increased by 2.8% and 5.7%, along with the increase in bioethanol and ignition levels. The torque obtained based on the comparison of engine speed (rpm) using fuel without mixture is presented in Table 5, and 15% bioethanol mixture is presented in Table 6. fuel without mixture is presented in Table 5, and a 15% bioethanol mixture is presented in Table 6.

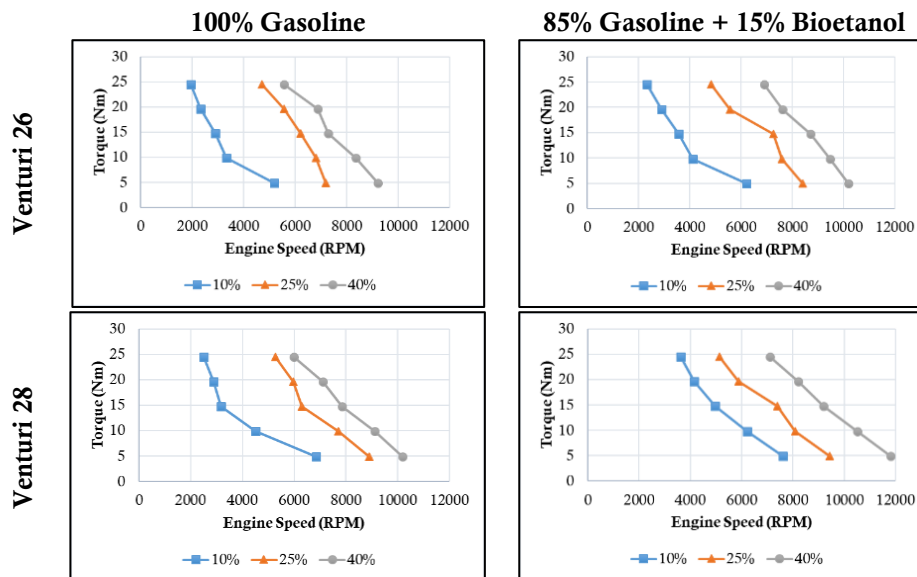


Figure 5. Comparisons of torque values with fuel and venturi

While the power generated in the test based on the comparison graph of Figure 6, the power generated is higher in the use of fuel with a mixture of bioethanol compared to fuel without mixture. In terms of the use of carburetors on venturi 28 is superior compared to venturi 26. This is due to the level of fuel consumption in the carburetor venturi 28 is higher than the use of venturi 26. The magnitude of the comparison can be seen in tables 7. and 8. So that from this fuel consumption that affects the power generated higher, of course, it is also necessary to pay attention to the regulation of air flow and fuel in the carburetor. At venturi 26, the use of fuel with a 15% bioethanol mixture can increase power by 13.1%, while at venturi 28, the use of fuel with a 15% bioethanol mixture can increase power by 7.8%. compared to research belonging to Yudistirani et al. (2019) the average power increase only reaches 6.47%. Although at venturi 26 the increase is very significant, but in fact the use of venturi 28 is superior in producing power.

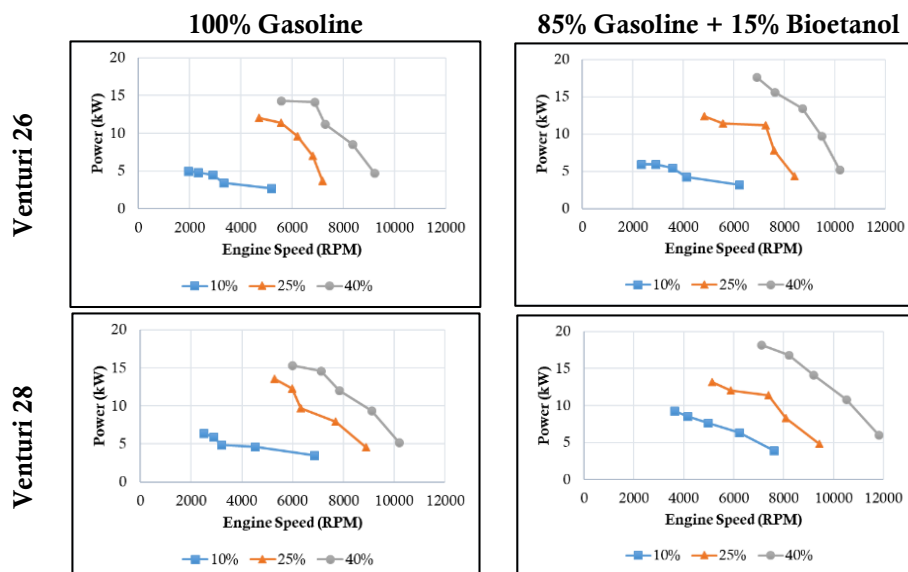
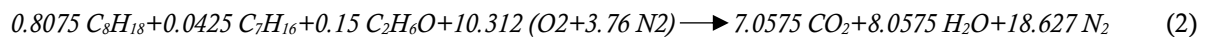
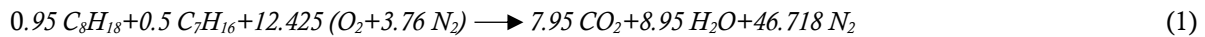


Figure 6. Comparison of power values with fuel and venturi

Comparison of exhaust gas emissions on a four-stroke engine based on venturi holes on the carburetors and the fuel used

Exhaust gas emissions are pollutants that come from the remaining combustion gases from incomplete combustion, and the remaining combustion products are flowed into the free air through the exhaust gas ducts on motorized vehicles. The perfect combustion reaction equation,

or stoichiometry The chemical reaction equation to know the stoichiometric AFR value of the combustion of 95 RON gasoline in equation (1) and 85% RON 95 gasoline mixed with 15% bioethanol in equation (2) can be calculated as follows:



The greater the throttle opening, the higher the actual AFR value obtained. With the variation of braking load at each throttle opening causing rpm to decrease, this is thought to maximize the mixture of air and fuel entering the combustion chamber so that the actual AFR value increases.

The test results of the actual AFR value on the use of carburetors with venturi 28 are higher than using venturi 26, this is because the venturi 28 hole is larger so that more air enters the combustion chamber. In the content of bioethanol has the element oxygen so that the mixture of air and fuel is more homogeneous besides that it can facilitate the process of fogging the mixture of air and expert material into the combustion chamber. So that the use of bioethanol in the 26 venturi carburetor can reduce the average 44.2%, while the use of venturi 28 can reduce the average 32.8%.

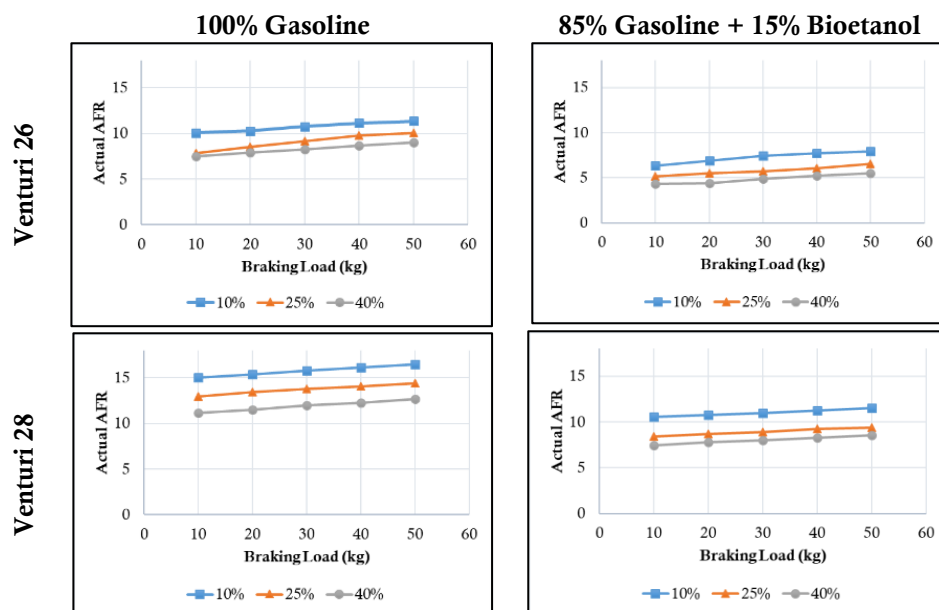


Figure 7. Comparison Of Actual AFR Values Against Fuel And Venturi

The equivalence ratio (Φ) indicates the mixture content of air and fuel. If $\Phi > 1$, it is a rich mixture where more fuel is less than air. Meanwhile, if $\Phi = 1$, it is said to be a stoichiometric mixture or an ideal air-fuel mixture (Heywood, 2018).

Fuel characteristics of bioethanol are higher than those of gasoline, so the density of fuel with a mixture of bioethanol is slightly higher than that of gasoline, which affects the fogging process on the fuel. Due to the fact that the diameter of the venturi 28 is greater than the diameter of the venturi 26, the test results show the equivalence ratio value using a 28 venturi carburetor is greater than the venturi carburetor 26, so that the process of fogging fuel into the combustion chamber is more perfect and can be compressed more optimally. So that the use of bioethanol in the 26 venturi carburetor can reduce an average of 26.8%, while the use of 28 venturi can reduce an average of 11.9%.

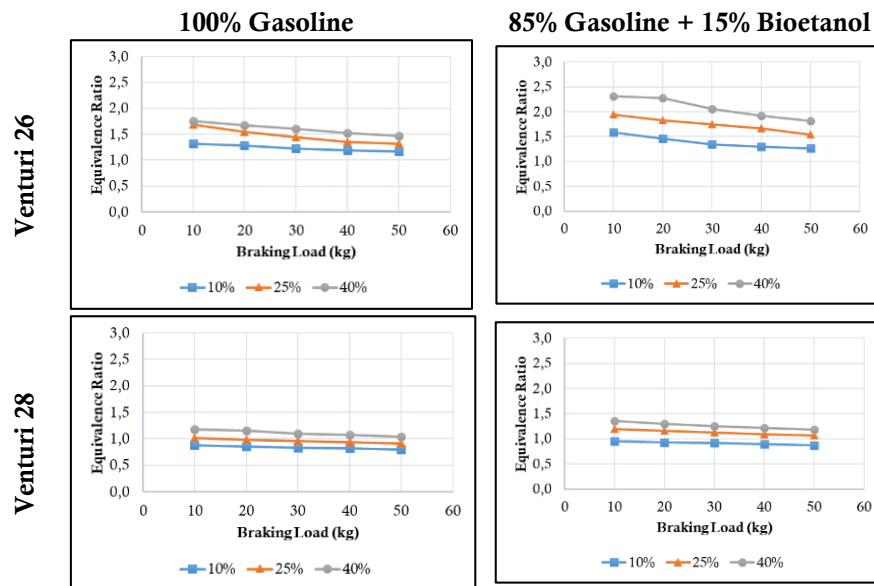


Figure 8. Comparison Of Equivalence Ratio (Φ) Values Against Fuel And Venturi

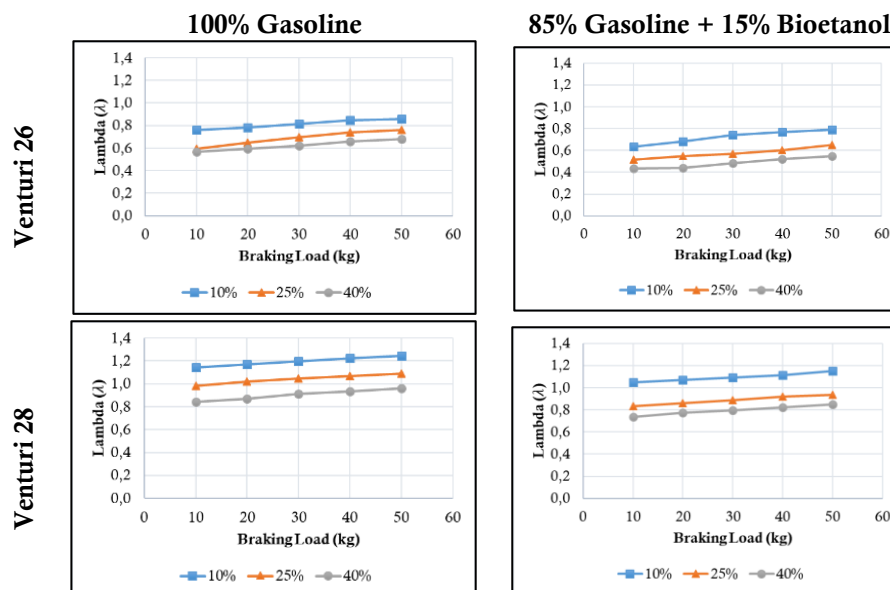


Figure 9. Comparison Of Lambda Values Against Fuel And Venturi

Carbon dioxide CO_2 and the water element H_2O are created after complete combustion. However, complete combustion is very difficult to achieve in the combustion chamber, resulting in several pollutant compounds. Hydrocarbons (HC) arise from unburned carbon compounds, causing them to change into other forms of carbon compounds. Carbon monoxide (CO) arises from incompletely burned gasoline due to a lack of air in the combustion chamber. The results of testing and measurement of exhaust emissions in four-stroke internal combustion engines can be concluded that the use of a mixture of bioethanol in gasoline can reduce HC gas and CO. In bioethanol itself, there is 35% oxygen, which can increase the efficiency of engine combustion (Rahmawati, 2020), while more perfect combustion will burn O_2 into the combustion chamber and will not produce residual O_2 that is not burned, so that O_2 levels come out lower but CO_2 levels will be higher.

According to (2019) The use of ethanol blended fuel can significantly reduce CO emissions (30-37%) compared to using gasoline. In this study, the use of bioethanol in a 26 venturi size carburetor can reduce CO levels by an average of 30.3%, while the use of a 28 venturi size can reduce an average of 18.4%. This is because carbon monoxide gas is well oxidized by oxygen, considering that bioethanol fuel already contains oxygen and will be able to help meet the needs

of air in the combustion process so that it will further enhance combustion and reduce CO emissions. In addition, the carbon molecule content of bioethanol fuel is lower than that of gasoline. The safe threshold of CO gas exhaust emissions in Indonesia is a maximum of 4.5%, based on research conducted by Aprilyanti et al. (2020) CO emissions experienced a higher decline that reached 19.35% this is because his research bioethanol used is made from pineapple crown which is considered to have better characteristic properties.

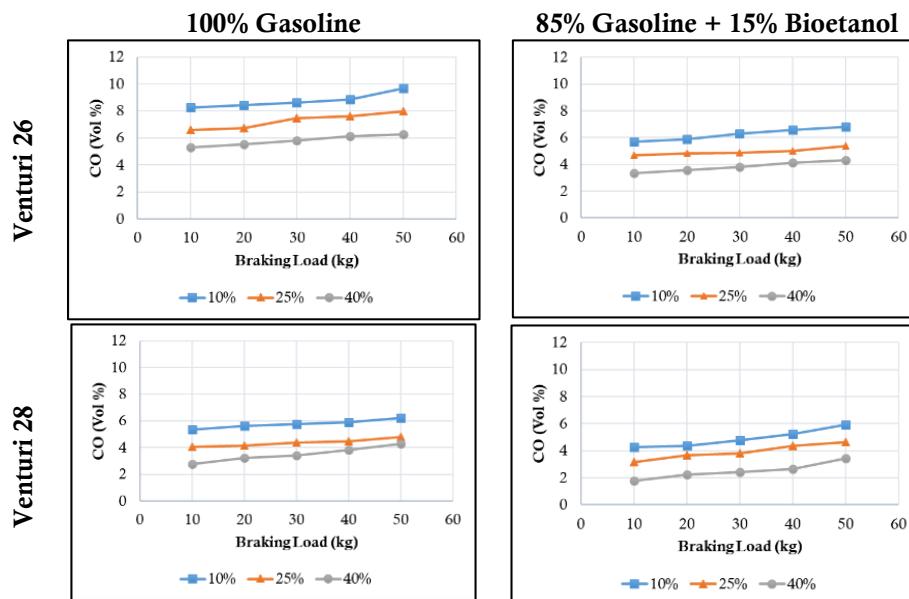


Figure 10. Comparison Of CO Values Against Fuel And Venturi

Hydrocarbon (HC) exhaust emissions occur due to incomplete combustion, which can cause unburned fuel to come out still in the form of hydrocarbons along with residual combustion gases in the exhaust stroke. This is in line with the research of Mara et al. (2019) who found that HC emissions are the result of incomplete combustion due to fuel trapped in narrow gaps or the quenching effect on the cylinder wall. research conducted by Ozcelik et al. (2015) resulted in HC at a mixture of 2% down to 15% while 5% down to 30%, according to Aprilyanti et al. (2020) the most effective reduction in HC levels is only up to a mixture of 10% on average 31.63%, the higher the bioethanol mixture, the worse the HC levels produced, while the results of this study used a mixture of 15% bioethanol, based on the HC gas emission levels obtained in the 26 venturi carburetor without a mixture of bioethanol and with a mixture of bioethanol obtained an average of 36.6%, while in the use of 28 venturi carburetors without a mixture of bioethanol and with a mixture of bioethanol obtained an average of 50.3%. Judging from the results of the two graphs above, it shows that the levels of hydrocarbon (HC) gas emissions in the 28 venturi carburetor HC gas emissions are lower than those using 26 venturi. This is because the diameter of the venturi on the 28 venturi is larger than the standard venturi diameter, so that the process of fogging the fuel entering the combustion chamber is more perfect. The safe threshold for HC gas exhaust emissions in Indonesia is a maximum of 1,200 ppm.

Fuel using bioethanol blends produces lower HC values compared to gasoline fuel at all loading levels. This is due to the higher characteristics of bioethanol fuel, so gasoline fuel with a bioethanol mixture has a slightly higher density value compared to fuel without a mixture. This affects the fuel fogging process so that the fuel entering the combustion chamber will be compressed completely before combustion occurs, reducing the risk of carbon residue in the combustion chamber.

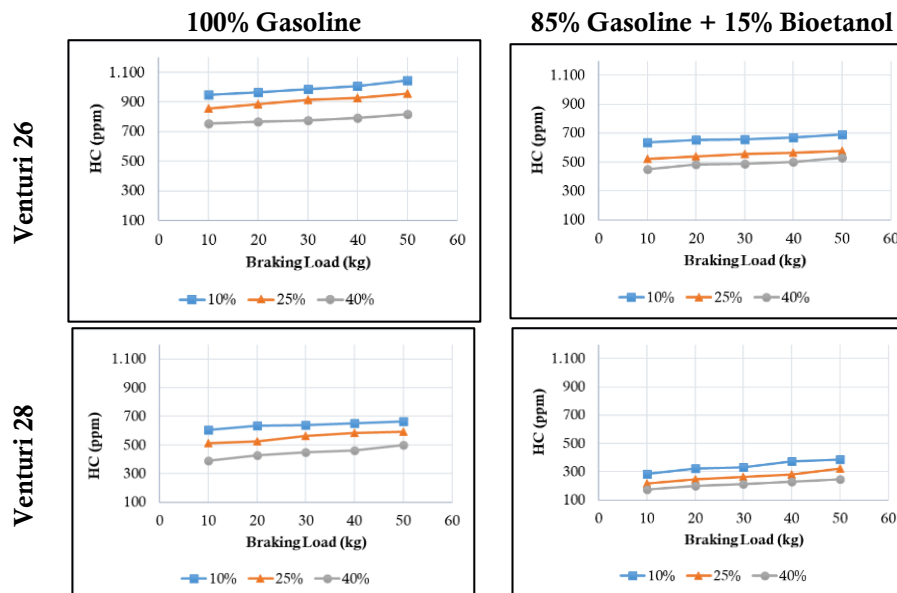


Figure 11. Comparison Of HC Values Against Fuel And Venturi

CONCLUSION

Based on fuel motor testing conducted by comparing the use of carburetors that have venturi 26 and 28, which are tested using fuel without mixture and fuel with a mixture of 15% bioethanol, it is concluded:

- Based on its performance, the use of fuel with a mixture of bioethanol is superior to fuel without a mixture. This is due to the fact that bioethanol itself has an oxygen content so that it is able to provide a more homogeneous chemical reaction to conventional fuels and can create more perfect combustion. This torque increases by an average of 20% based on the loading given, while the power generated is able to increase by an average of 13% on the 26 venturi carburetor, while the use of 28 venturi carburetors increases by an average of 7.8% with an engine capacity of 150 cc.
- While the impact of the use of 15% bioethanol on conventional fuel in 1 liter proved to be able to reduce exhaust emissions, namely carbon dioxide (CO) and hydrocarbon (HC), which are considered to pollute the environment and endanger human survival, based on some exhaust emission testing data obtained through Texa Gas Analyzer tools, in carburetors with venturi 26 the use of fuel mixed with bioethanol dropped to CO levels down 30.3% and HC down 36.6% while carburetors with venturi 28 were down 18.4% and HC down 50.3%.

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