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ANALYSIS OF THE EFFECT OF BX 92, BX ULTIMAXX FUEL AND THEIR MIXTURES ON THE PERFORMANCE OF THE R15 MOTORCYCLE

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ABSTRACT

General Background: With the rapid advancement of automotive technology, especially motorbikes, fuel performance has become increasingly crucial in optimizing vehicle efficiency and meeting the demands of rising motorbike usage. **Specific Background:** Among commonly used fuels like BX 92 and BX Ultimaxx, the performance of different fuel types and combinations on power, torque, and specific fuel consumption (SFC) remains underexplored. **Knowledge Gap:** While various fuels are utilized, a detailed comparative analysis of motorbike performance using different fuels and blends, including ethanol mixes, is limited, particularly in the context of octane levels and engine power. **Aims:** This study aims to analyze motorbike performance differences when using BX 92, BX Ultimaxx, a 50:50 blend of BX 92 and BX Ultimaxx, and an 85:15 blend of BX 92 and ethanol, assessing power, torque, and SFC on an R15 motorbike using dynotest equipment. **Results:** The study found that higher octane levels yield improved power and torque, with BX Ultimaxx performing best in terms of power but consuming more fuel. BX 92 proved most efficient in fuel consumption but ranked lower in performance compared to BX Ultimaxx. The BX 92-BX Ultimaxx blend showed moderate improvements in power over BX 92 alone, while the BX 92-ethanol blend exhibited the lowest performance of all fuels tested. **Novelty:** This study provides a novel comparative framework for evaluating mixed fuel impacts on motorbike performance, particularly in utilizing ethanol as an alternative fuel component. **Implications:** These findings suggest that while higher-octane fuels enhance performance, fuel blending strategies could be optimized for specific outcomes, balancing efficiency with performance, thereby contributing to more sustainable fuel use in the automotive industry.

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INTRODUCTION

The increasing number of motorized vehicles in Indonesia is due to the increasing human need for transportation.[1]. Problems of increasing modes of transportation due to the increase in the volume of population mobility as a result of population growth [2].become a major factor in human activity today. The Central Statistics Agency noted that motorcycles in 2018 were already 120 million units in Indonesia[3] Planes, ships, cars, motorcycles and others are part of transportation facilities that have various forms and functions. Cheap prices and cheap operational prices are one of the factors that residents prefer motorcycles [4]

Fuel Oil comes from petroleum for vehicles that use coal and natural gas combustion engines, which are fossil fuels found in the earth [5]The more human needs for motorcycles increase, the more fuel consumption increases. Along with automotive technology.[6] resulting in the increasing use of petroleum fuel.[7] The existence of the petroleum energy crisis that occurred during the [8]. Combustion motors are very demanding of fuel, the calorific value contained in the fuel is a value that indicates the maximum amount of heat energy released when the fuel passes through the perfect combustion reaction [9].

There are several factors that can affect the power and torque of the motor [10]. How much maximum pressure is compressed into the combustion chamber in an internal combustion engine before the fuel ignites in a sporata is the definition of the octane number [11]. The process of combustion with a combustion engine can occur in a timely and optimal manner by using higher octane fuel [12]. And to increase the efficiency of the motor by reducing the occurrence of detonation (knocking) and increasing the compression ratio [13].

METHODS

The research method used is the observation method, this method is used to find out things related to each other. In this observation, the study took power, torque and SFC data from the results of fuel consumption data which will later produce SFC data, with variations in engine rotation with the numbers 2000, 3000, 4000, 5000, 6000, 7000 and 8000 on Bx 92 and Bx ultimaxx fuels and their mixtures.

Fuel consumption:

1. BX 92
2. BX 95
3. BX Ultimaxx 50% and BX 92 50% Blend
4. BX 92 85% and Ethanol 15% blend

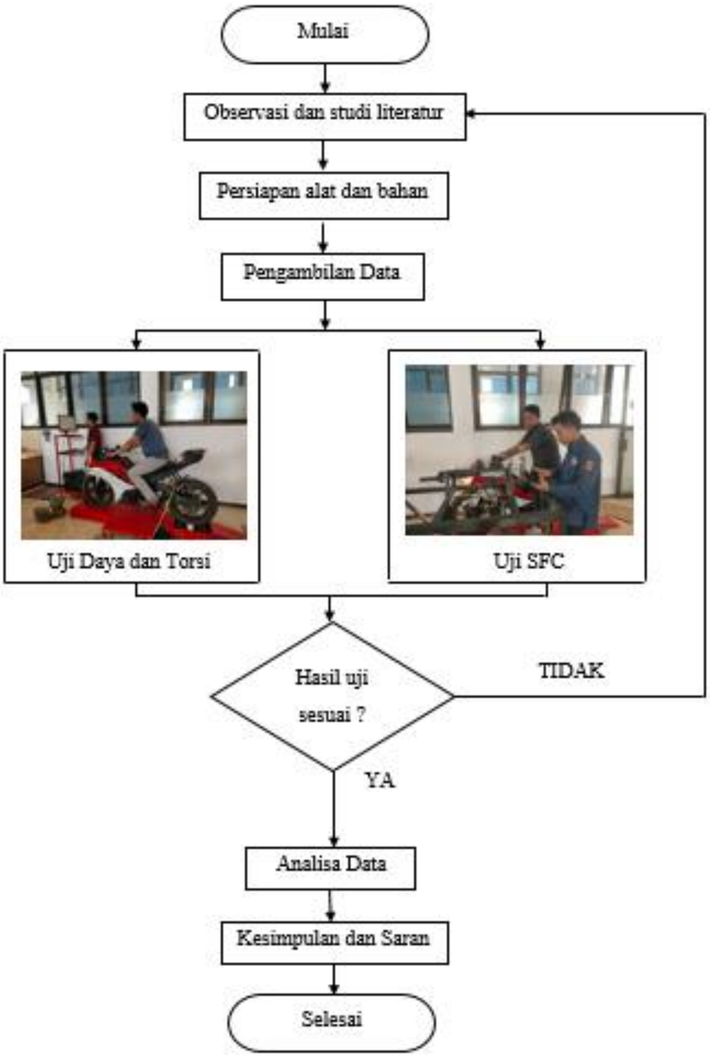

Figure .1 Research Flow Diagram

RESULT AND DISSCUSION

A. Testing procedure

1. Uji Dynotest

Data collection is carried out using the dyno test procedure, Dynotest is a testing process to measure and determine engine performance [14]Where the data used in this study are data, torque and fuel consumption.

1. Place the motor vehicle as a test material with the motorcycle position on the dynotest and the rear tire position located on the roller.
2. Fill the fuel tank.
3. Make sure the vehicle above the dynotest is not moving forward.
4. Turn on dyinotest and dyinotest settings on your computer.
5. Starting the motorcycle.
6. Set the engine to a stationary condition, then leave a few moments to warm up.
7. To obtain torque and power data on RPM and fuel variations.
8. Engine and fuel variations on dynotest are done with maximum RPM.
9. Torque and power values appear on the monitor.

2. Fuel consumption test (SFC)

Fuel consumption is the amount of fuel consumed to the unitary motor of the power unit produced per hour[15].

1. Preparing materials and tools
2. Remove the fuel tank and replace it with an artificial tank connected with a measuring cup
3. Fill the tank until it is full, then fill the measuring cup Turn on the machine
4. Set the RPM according to the desired
5. Turn on the stopwatch to calculate the time of 2 minutes

B. power calculation

$$W = \frac{2\pi nT}{60000}$$

Where

W = Power (kW)

n = Engine Rotation (rpm)

T = Torsi (Nm)

BX 92 calculation at 2000 RPM

W = ?

n = 2000

T = 4.34

W===0.908507 kw=1.21 HP $\frac{2\pi nT}{60000}$ $\frac{2 \,.\, 3{,}14 \,.\, 2000 \,.\, 4{,}34}{60000}$

C. Fuel Consumption Calculation

$$SFC = \frac{F}{P} = (\frac{kg}{jam} . hp)$$

Where

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SFC = Specific fuel consumption (kg/HP-h)

F = Fuel weight in one hour (kg/h)

P = Power (HP)

- Amount of fuel consumed = 4 ml
- In time = 2 minutes
- So that the volume of burnt bahn needed every second

VMS = $\frac{4\ cc}{120\ detik}$ = 0.0333 cc

- then the weight of the fuel needed within an hour

$b = \frac{V_{MS}}{detik}$ × 3600 = 0.333 cc × 3600

= 120 cc for one hour

- then the weight of the fuel that is pumped within one hour is

F = $\rho \times b = 0{,}70\ gr\ cm3 \times 120\ cc$

= 84 gr = 0,084 kg

- SFC for BX 92 at 2000 rpm with 1.21 HP is

$$Sfc_{BP\ 92} = \frac{F}{p}\ kg\ \ jam \times\ HP$$

With p = load = 1.21 HP

So

$$Sfc_{BP\ 92} = \frac{0{,}084}{1{,}21} = 0{,}069421488\ kg - jam$$

D. Analysis Results

Table. 1 Comparison of torque on fuel consumption variations

RPM x1000	Torque			
	BX 92 (N.m)	BX Ultimaxx (N.m)	BX 92 50% & BX Ultimaxx 50% (N.m)	BX 92 85% & Etanol 15% (N.m)
2000	4,34	4,36	4,41	4,42
2500	4,69	4,76	4,76	4,72
3000	5,04	5,16	5,11	5,02
3500	5,39	5,56	5,46	5,32
4000	5,74	5,96	5,81	5,62
4500	6,09	6,36	6,16	5,92
5000	6,44	6,76	6,51	6,22
5500	6,79	7,16	6,86	6,52
6000	7,14	7,56	7,21	6,82
6500	7,49	7,96	7,56	7,12
7000	7,84	8,36	7,91	7,42
7500	8,19	8,76	8,26	7,72
8000	8,54	9,16	8,61	8,02

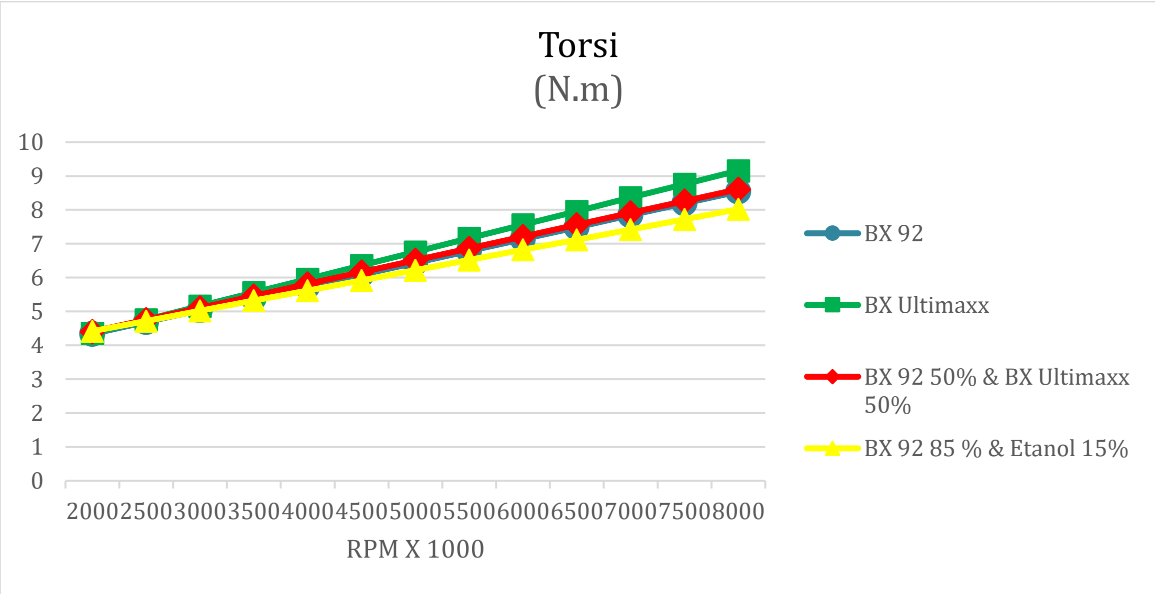

Figure 2. Torque comparison on fuel consumption variations

There was no significant difference in torque increase in each fuel variation, the highest torque produced in the test was higher than BX 92 type fuel, a mixture of BX 92 and BX Ultimaxx and a mixture of BX 92 and Ethanol, with a figure of 9.16 N.m at 8000 rpm. BX 92 8.54 at 8000 rpm. BX 92 and BX Ultimaxx 8.61 N.m at 8000 rpm. BX 92 and ethanol 8.02 N.m at 8000 rpm. This is due to compression, and the ignition time is still the same in the motorcycle engine, there is no variation that has been changed. In each type of fuel that is tested, it is not much different, because the calorific value of the fuel is almost the same. Therefore, what is obtained from the torque is almost the same.

Table 2. Power comparison on fuel usage variations

RPM x1000	Power			
	BX 92 (hp)	BX Ultimaxx (hp)	BX 92 50% & BX ultimaxx 50% (hp)	BX 92 85% & Etanol 15% (hp)
2000	1,21	1,22	1,23	1,24
2500	1,64	1,67	1,67	1,65
3000	2,12	2,17	2,15	2,11
3500	2,64	2,73	2,68	2,61
4000	3,22	3,34	3,26	3,15
4500	3,84	4,01	3,89	3,73
5000	4,51	4,74	4,56	4,36
5500	5,24	5,52	5,29	5,03
6000	6,01	6,36	6,07	5,74
6500	6,83	7,26	6,89	6,49
7000	7,7	8,21	7,77	7,29
7500	8,62	9,22	8,69	8,12
8000	9,58	10,28	9,66	9

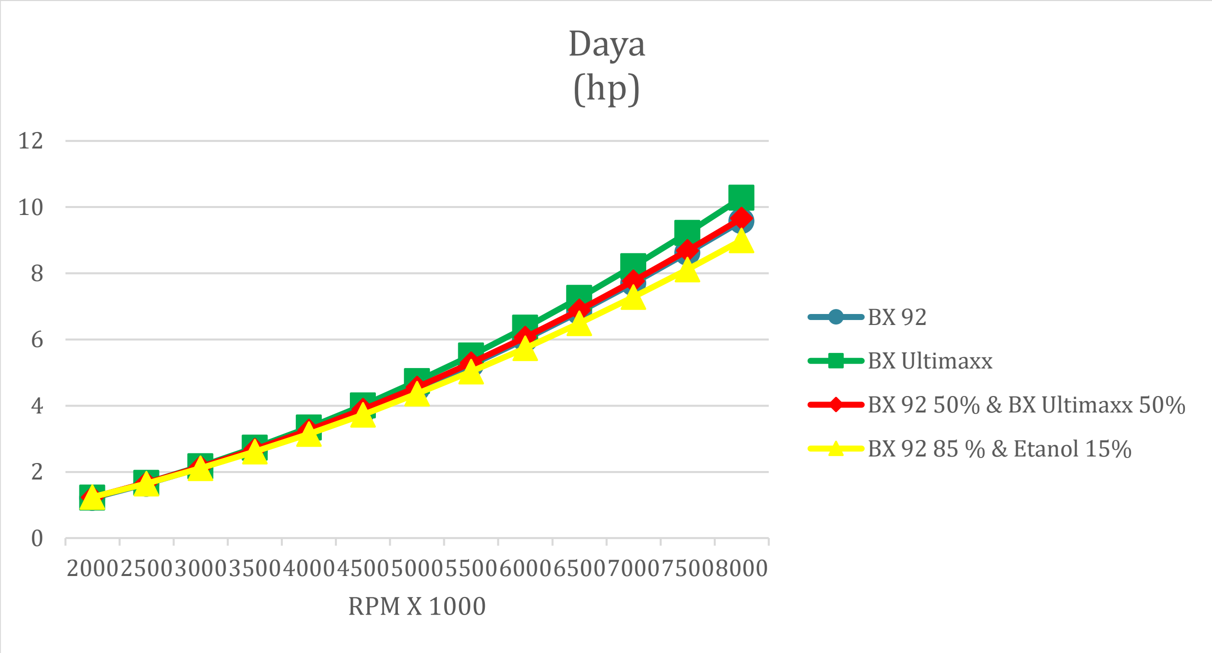

Figure 3. Power Comparison on Fuel Variation Usage

From low to high engine speed was produced between the samples that were used in BX 92, BX Ultimaxx, BX 92 and BX Ultimaxx mixtures and BX 92 and Ethanol mixtures there was no significant increase in value. The power on the motorcycle that was tested was highest in the BX Ultimaxx fuel of 10.28 Hp at 8000 rpm. BX 92 with 9.58 hp at 8000 rpm. BX 92 mix with BX Ultimaxx gets 9.66 hp at 8000 rpm. BX 92 mix with ethanol at 9 hp at 8000 rpm. The torque and spin values affect the power of the motor. A high RPM increase causes a slower decrease in power, so that even though the torque has decreased, the power still rises before finally dropping with the torque.

Table 3. Comparison of SFC on the use of fuel variations

RPM x1000	SFC BX 92 (kg-jam)	SFC BX Ultimaxx (kg-jam)	SFC BX 92 50% & BX ultimaxx 50% (kg-jam)	SFC BX 92 85 % & Etanol 15% (kg-jam)
2000	0,069421	0,120492	0,170732	0,084677
3000	0,059434	0,077419	0,117209	0,059716
4000	0,065217	0,100599	0,115951	0,066667
5000	0,111752	0,11519	0,101316	0,163761
6000	0,111814	0,118868	0,103789	0,131707

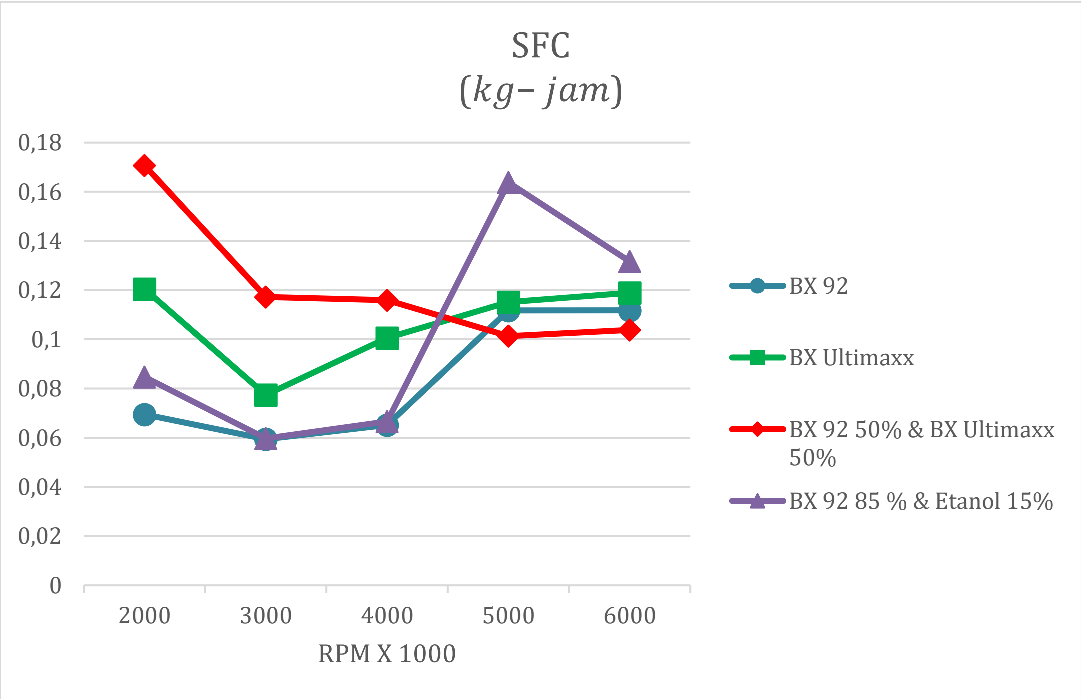

Figure 4. Comparison of SFC on the use of fuel variations

Of all the fuel variations, there is no significant increase in specific fuel consumption as well, at low to medium rpm. In all fuel variations, specific fuel consumption tends to initially increase due to the beginning of the motor that starts and then runs the power in the engine and low engine rpm conditions. After the motor revolution is increased on the motorcycle engine at 3000-6000 rpm and above, the specific fuel consumption (SFC) will decrease because the required power will increase. Fuel consumption will continue to increase due to the increase in rpm, so it tends to increase in specific fuel consumption. a decrease in power at high revs may increase SFC

CONCLUSION

Fundamental Finding: This study demonstrates that fuel type significantly influences motorbike performance, with BX Ultimaxx providing the highest power and torque, albeit at the cost of increased fuel consumption, while BX 92 offers better fuel efficiency but lower performance. Mixed fuels, such as the BX 92 and BX Ultimaxx blend, achieve a moderate balance between performance and efficiency, whereas the BX 92 and ethanol blend showed the lowest performance of all fuels tested. **Implication:** These findings suggest that choosing the appropriate fuel type or mixture could optimize performance or efficiency depending on user needs, providing insights for both consumers and fuel manufacturers in improving fuel options for motorbikes. **Limitation:** This study was limited to testing on a single model (R15 motorbike) and a specific range of fuel mixtures, which may not fully represent variations in engine compatibility or broader performance impacts across different motorbike models. **Further Research:** Future studies could expand on this work by examining a wider variety of motorbike models, exploring additional fuel types or blends, and assessing the long-term effects of various fuels on engine durability and emissions, offering a more comprehensive understanding of fuel performance in automotive applications.

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