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The Influence of The Hydrocarbon Cracking System (HCS) on Increased Torque and Reduction of Exhaust Emissions on A 4-Step 1-Cylinder Gasoline Motor

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Abstract

The automotive industry faces challenges in improving fuel efficiency and reducing exhaust emissions. One solution being developed is the Hydrocarbon Cracking System (HCS), which breaks down hydrocarbon molecules in fuel to enhance combustion efficiency. This study aims to analyze the effects of HCS on engine torque and exhaust emissions (CO, HC, and CO_2) in a four-stroke, single-cylinder gasoline engine. The research method involves an experimental factorial design of 6 × 2, testing torque and exhaust emissions at various engine speeds. Measurements were conducted using a dynamometer and a gas analyzer to compare standard conditions with HCS implementation. The results indicate that HCS increases engine torque by 3.40% and reduces CO and HC emissions by 28.12% and 54.35%, respectively. However, CO_2 emissions increased by 12.48%, indicating more complete combustion. Overall, HCS proves to enhance engine efficiency and reduce harmful emissions, making it a potential eco-friendly solution for motor vehicles.

Keywords: Hydrocarbon Cracking System, Engine Torque, Exhaust Emissions,

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INTRODUCTION

In an increasingly aware era of environmental impacts, the automotive industry faces great challenges in developing technology that can increase fuel efficiency and reduce exhaust emissions. One innovative solution that continues to be developed is the Hydrocarbon Cracking System (HCS), a technology designed to optimize the combustion process in the engine. HCS works by breaking the hydrocarbons in the fuel so as to produce more efficient and complete combustion. This is expected to not only improve engine performance, especially in terms of torque, but also reduce dangerous exhaust

emissions, such as carbon monoxide (CO) and hydrocarbons (HC), which are often the main problems in gasoline -fueled vehicles. 4 -step 1 -cylinder gasoline motor, which is widely used in various transportation and industrial applications, often has problems related to energy efficiency and high levels of exhaust emissions. Therefore, the application of technology such as HCS is increasingly important to learn further. This study aims to analyze the effect of HCS on increased torque and identify changes in exhaust emissions, including CO, HC, and CO2, on the gasoline engine. By understanding the impact of HCS as a whole, it is hoped that the results of this study can contribute to the development of engine technology that is more environmentally friendly and efficient in energy.

Hydrocarbon Cracking System (HCS) is a technology developed to improve the efficiency of fuel combustion in vehicle engines, with the main aim of reducing fuel consumption and exhaust emissions that are harmful to the environment. One of the supply systems that can be added to the vehicle is the Hydrocarbon Crack System (HCS) supply system. Hydrocarbon Crack System (HCS) is a fuel supply system that is injection to the combustion chamber [1]. Hydrocarbon Crack System (HCS) is a fuel supply system that is injection to the combustion chamber [2]. The use of HCS systems breaks down hydrocarbon atoms into hydrogen atoms (H) and carbon (C) by using heated catalyst pipes. Making fuel content has a high octane value, larger engine power and low fuel consumption [3]. In the automotive sector, emissions exhausts are very important problems. Especially CO exhaust gas emissions are toxic gas that can affect human health. The main source of carbon gas monoxide is steam vehicles, especially gasoline engines [4]. Low exhaust emissions will occur when the combustion process takes place ideally or perfectly [5].

HCS works by breaking down the hydrocarbons in the fuel before the combustion process, thus allowing a more perfect and efficient burning in the engine combustion chamber, which can ultimately have an impact on vehicle performance. This is to improve engine performance with the installation of a system, so that it can improve the performance of the combustion system and the ignition system. The system used is the Hydrocarbon Crack System (HCS) [6]. Hydrocarbon Crack System (HCS) is a heating system that is used to evaporate fuel that has a greater octane value than the main fuel on

a motorcycle by using a heated copper pipe that aims to help high octane fuel supply in the combustion chamber [7]. The development of saving technology with HCS has been found to be approaching optimal dimensions, but performance has not increased and emissions still have not met the automotive industry standards, especially motorcycles that will be implemented starting in 2018 [8]. One way to increase motor power is to install a device that can increase the work of the combustion system and the ignition system. The combustion system is a system on motorbikes that are more often modified. One of the tools that can be used for this is the Hydrocarbon Crack System [9]. Hydrocarbons in fuel are broken down into hydrogen atoms (H) and carbon (C) using a hydrocarbon crack system (HSC) catalyst pipe that is heated from exhaust exhaust (www.forum.detik.com). HCS technology is effectively used for fuel saving. Hydrogen from Pertamax that uses the longest catalyst pipe can save a minimum of 50% to 60% fuel (Roy Union, 2004). The catalyst pipe can save 60-65% fuel in testing conditions not running [10].

In a 4 -step 1 -cylinder gasoline engine, HCS technology is expected to increase engine torque, because more efficient combustion can produce greater power than the same amount of fuel [11]. One of them is by using the Hydrocarbon Cracking System (HCS). This HCS is a system that produces hydrogen as fuel to be burned in the combustion chamber together with oxygen [12]. So, with an efficient combustion, the motor power will increase. HCS has been proven to be able to increase motorcycle power [13]. Several types of alternative fuels have also emerged and designed to improve performance or reduce the purchase price of units; One of them is bioethanol made from molasses. Furthermore, several methods for encouraging fuel efficiency have also been introduced to the market, one of which is HCS or Hydrocarbon Crack System [14]. Through the exhaust in the air freely. The use of hydrocarbon is very beneficial when installed on the motor, especially with the carburetor system because the combustion results will be more perfect, this hydrocarbon is very comfortable when installed in a motorized vehicle that is still wasteful of gasoline that still does not use the fuel technology injection system [15].

In addition to increasing torque, HCS also has the potential to reduce harmful exhaust emissions such as carbon monoxide (CO) and hydrocarbons (HC), which are the result of imperfect combustion and contribute to air pollution. This hydrocarbon is a

container that is presented with fuel mounted on motorbikes to reduce the use of excessive fuel consumption in motor vehicles to be more efficient and reduce exhaust emissions that are harmful to health which include carbon monoxide (CO), hydrocarbons (HC) , carbon dioxide (CO2), and oxygen (O) released through the exhaust in the air freely. The use of hydrocarbon is very beneficial when installed on the motor, especially with the carburetor system because the combustion results will be more perfect, this hydrocarbon is very comfortable when installed in motorized vehicles that are wasteful of gasoline that still do not use the fuel technology injection system [16]. Along with the literature lack of literature above, this study evaluates as a hydrocarbon-based fuel for low-quality prophane mixture that can be found in refineries (for example, waste cracked gas from the pyrolysis unit which includes C1-C4 hydrocarbons or the flow referring to low quality propane). For this purpose, the main focus of this study is (a) to develop a compact dynamic model to simulate integrated operations from the reformer/combustion unit which is combined by the post -sequential H2 processing stage (reactor shift in WGS Air Gas) and (b) to implement a distributed PID controller to ensure stable and realistic operations and in the desired sets that have been predetermined [17]. As a reaction to the increasingly stringent framework of emission regulations, the maritime sector has invested massively in new technology and fuel. Technology steps include ship design and operational changes, engine optimization techniques including remcal gas (EGR), and the installation and operation of the exhaust aftertreatment devices such as scrubber and selective catalytic reduction systems (SCR) [18]. Based on the results of the study, the use of HCS on a 4 -step 1-cylinder gasoline motor is proven to increase engine torque by 3.40%, while reducing CO emissions by 28.12%and HC by 54.35%, despite an increase in CO2 emissions by 12.48%, which shows more complete combustion but produces More carbon dioxide.

Therefore, it is generally assumed that the relevance of gas engines will remain high in the future, especially in the context of power plants. Because natural gas consists mostly of methane (CH4) which shows the highest hydrogen-to-carbon ratio of all hydrocarbons, CO2 emissions can be reduced up to 35% when replacing conventional fuel with natural gas [19]. Various strategies aim to improve the nature and performance of biodiesel fuel, including mixing with additives and engine modification such as low heat

rejection (LHR) engines. The LHR engine uses thermal barrier coatings to reduce heat loss and increase thermal efficiency [20]. The main pollutants of the SI engine are CO2, NOX, and Nitrate Hydrocarbons. This pollutant causes adverse effects on the environment and human health. Many previous studies have reported that cardiovascular and breathing health problems are caused by excessive concentrations of pollutants in the human body [21].

Not many studies have explored the effect of HCS on fuel efficiency in heavy or high load conditions, which can provide more detailed information about how much performance improvement in real world scenarios. By breaking down hydrocarbons, HCS is able to reduce harmful exhaust emissions such as carbon monoxide (CO) and hydrocarbons (HC), because more complete combustion produces less fuel residues that are not burned. Therefore the purpose of this study is to analyze the influence of the Hydrocarbon Cracking System (HCS) on increasing torque and reduction of exhaust emissions on 4-step 1-cylinder gasoline motorcycles, in order to evaluate the effectiveness of HCS in improving engine performance and reducing air pollution.

Research Methods

The study was conducted using the experimental method. The experimental method is a method of data collection through direct observation of the object of study in a certain time and recording in the form of data systematically in certain matters observed. The experimental method cannot be done if the researcher does not examine the research directly in the field, because the data sought will be obtained when observation directly and carefully.

Figure 1. 2 Research Procedures

Figure 1 shows a few steps before conducting torque testing and exhaust emissions. The first step to fill the HCS tube with fuel in this study using Pertamax, then attach the catalyst to the exhaust using clamps and wrapped around using copper. For the final step installing a hose from the catalyst to the HCS tube and intake manifold on the engine, then the motorcycle can be tested to torque and exhaust emissions.

In this study for the measurement of torque and exhaust emissions (CO, HC, CO2) produced by the machine used a factorial experimental design of 6 x 2, the definition of the experimental design is all (almost all) the level of a particular factor combined in the experiment, on This research has two free variables that then the experimental designs are called factors. The first factor (A) has four levels, namely without the use of Hydrocarbon Crack System (HCS), the use of Hydrocarbon Crack System (HCS). While the second factor (B) has 6 levels of engine speed variation / rpm, namely 3000, 4000, 5000, 6000, 7000, 8000. different. In each treatment three times a replication, so that each treatment was obtained three data. Because each treatment is carried out replication three times, then the factorial experiment of 6 × 2 will be obtained as many as 24 data. For data analysis used in this study is a two -way ANOVA, namely the process to determine the effect between the independent variables (X) on the dependent variable (Y).

RESULT AND DISCUSSION

Figures 2 and 3 show the results of torque testing and gas emissions using a dynamometer and gas analyser.

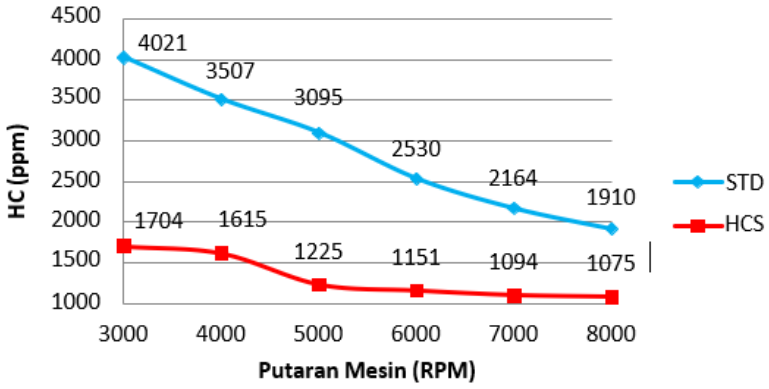

Figure 2. HC exhaust gas Test

Figure 2 shows that there is an effect of using HCS on HC exhaust levels. In the standard condition of the highest HC exhaust gas content of 4021 ppm won at 3000 rpm engine speed and gradually decreased to 8000 rpm engine speed with the lowest HC content of 1910 ppm. After installing HCS there is a decrease in the level of the Narcotics gas at each engine speed starting from the 3000 rpm rotation to 8000 rpm. Dimakanakujadarhc's highest gas after the installation of HCs of 1704 ppm won at 3000 rpm engine speed and gradually decreased to 8000 rpm engine speed with the lowest HC content of 1075 ppm. After that, from the results of the testing above, a comparison of presentation of HC gas emission levels can be taken between standard conditions and conditions using HCS decreased by -54.35 %.

HC emissions are imperfect combustion, the more fuel that is not burned in the combustion chamber can cause HC content in exhaust gas to increase. With the addition of gasoline vapor that has been heated to the intake manifold will have an impact on the higher temperature of the fuel mixture almost reaching the self -ignition point temperature causes the fuel will be flammable and cause the ignition delay to fall. Increasing the temperature of the mixture of air fuel will also affect the speed of the combustion process (flame velocity) which will be faster. When the ignition process will begin with a high mixture, it will be easier to burn so that the ignition delay is shorter, which means the time for the combustion process is longer so that the unburned fuel is discharged when the exhaust step becomes less or in other words The level of HC content in exhaust gas becomes smaller.

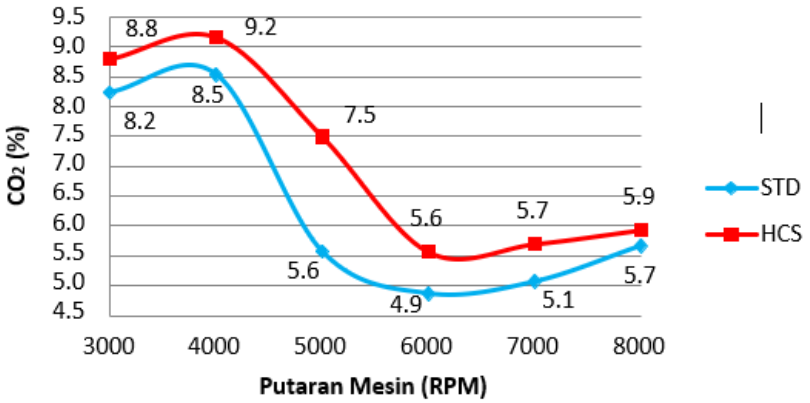

Figure 3 CO_2 Exhaust Gas Testing

Figure 3 shows that there is an influence of the use of HCS on CO2 exhaust gas levels. In the standard condition of the highest CO2 exhaust gas content of 8.5 % won at 4000 rpm engine speed and gradually decreased to the engine speed of 6000 rpm with the lowest CO2 content of 4.9 %. After installing HCS there is a decrease in CO2 exhaust gas levels at each engine speed starting from 3000 rpm to 8000 rpm. Where the highest CO2 exhaust gas content after the installation of HCS is 9.2 % won at 4000 rpm engine speed and gradually decreases to the engine speed of 6000 rpm with the lowest CO2 content of 5.6 %. After that, from the test results above, a comparison of the percentage of CO2 gas emission levels can be taken between standard conditions and conditions using HCS has increased by 12.48 %. CO2 emissions are the result of perfect combustion, the lower the CO gas emission level, the higher the CO2 gas emission levels from the combustion and vice versa. In this test, an increase in CO2 gas emission levels when using HCS is due to the addition of oxygen, resulting in perfect combustion in the combustion chamber. Based on the graph at the 4000 rpm to 6000 rpm rounds, it has decreased in all conditions, because the higher the rpm, the oxygen levels that enter the combustion chamber will decrease.

CONCLUSION

Installation of HCS (Hydrocarbon Cracking System) in the engine causes a decrease in HC emission levels by 54.35%, indicating that combustion becomes more perfect with less fuel fuel. In addition, the Co_2 content increased by 12.48%, which indicated that combustion was more efficient due to an increase in oxygen supply in the combustion chamber. Overall, HCS contributes to the reduction of harmful exhaust emissions and increases the efficiency of combustion in the engine.

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