Variation Ignition Timing Against Environmentally Friendly Gas Exhaust Emissions on 7K Gasoline Engine and Its Dissemination Using Website

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Abstract. The purpose of this research is to know the exhaust emissions generated due to changes in ignition and type of fuel. And expected to get various advantages, among others, in terms of environmentally friendly and health terms. In this research is to test directly by using tools that have been provided with mancatat data obtained from the test results and make observations. The results that can be in carrying out this research are the results of different exhaust emissions. However, the results of the study of exhaust emissions generated pertamax (Gasoline RON 92) fuel is less than the emissions of gas produced in gasoline RON 88, ranging from 1% - 3%. The results of this research will be disseminated using the website.

1. Introduction

In the present investigation, the effect of the system of reforming ignition spark plugs. The spark plug reformer system includes two spark plugs, three supersonic sprays, a control device, and a dispenser.
The vehicle was tested in 1988, cc 4-cylinder Nissan Sentra with spark timer 16 BTDC (Before Top Dead Center)[1]. Research [2] considers the wide spread of propane in the Russian Federation at low cost and the reduction of pollutant emissions in the exhaust gas. In addressing its major limitations: the reduction in engine power and torque when used in the gas phase, it is proposed to add parts of gasoline to propane. Since the parameters of this mixture differ from gasoline or propane itself, the paper represents a control method that includes the IC engine process model, algorithms for setting the control parameters (ignition and fuel systems), and a knockdown probability approach. The top positional position in the cylinder is used as the optimal criterion for calculating the ignition timing, and the propane / gas ratio variation algorithm allows for optimal splintering performance and prevents knocking as long as possible. The proposed control method is confirmed by tests on the MAHA LPS 3000 dyno racks. Experiments showed an increase in engine power and torque, sinking emissions and fuel costs have been reduced. The results of emissions test conducted by the Institute of Environmental Health Engineering and Disease Control (BTKL & PP) Medan City in 2008 stated that 12% of gasoline-fueled vehicles and 54.22% diesel-fueled vehicles did not meet the emission quality standard. While in 2010 there were 28.22% of gasoline-fueled vehicles and 53.33% diesel-fueled vehicles that did not pass the emissions test.

The exhaust emissions of each motor vehicle are not the same as each other. Differences in the composition of the chemical compound content of the vehicle exhaust gas are influenced by several factors such as the type of fuel used, driving conditions, machinery (year of manufacture and type), fuel emissions control, operating temperature, and various other factors.

How to drive and maintain a motor vehicle has a direct impact on fuel consumption and the resulting carbon emissions. It is estimated that the average fuel savings and decrease in emission levels are in the range of 10% to 15%. Potential individual fuel savings even up to 25%. On the machine there is often a burning or incomplete combustion in the cylinder, which can produce imperfect emissions as well. therefore, the importance of anticipating the problem, in this study will discuss or seek the right moment of ignition in order to produce environmentally friendly exhaust emissions. Incomplete combustion can reduce the output of the engine[3] and also emissions that harm many people[4] and should the local wisdom typical of the Indonesian nation is also taken into consideration[5]. So it takes the benchmarking principle of the vehicle[6] and the use of fuel into resources[7]. The results of this study need to be socialized through the website so that it can be known to many people. So it can be used as a reference in decision making especially to reduce contamination[8]. Information on the website needs to be well classified so that information can be obtained rarely or minority class[9]. Dissemination of existing information also means to pay attention to the sensitivity[10] and diversity of information[11].

2. Related Works
One of the major challenges associated with the ignition of homogenous charge compression combustion engine applications is the lack of direct control at the time of ignition[12]. One characteristic that differentiates HCCI machines is that the ignition is controlled by chemical kinetics, unlike a diesel engine or ignition engine, whose ignition timing can be controlled externally by fuel injection or spark. As a result of being controlled by chemical kinetics, the HCCI ignition timing is highly significant with changes in operating conditions, and this variation may limit the practical range of operation of the machine[13]. The behavior of the fuel spray ignition can be well explained by considering the effects of the stagnation gradient on the tip of the fuel spraying at the time of the fuel and system ignition. The fuel spraying delay time is divided into two parts: the time required to reduce the gradient of the spraying speed under a critical gradient of the ignition speed; the second part is the reaction time for the ignition at a given speed gradient. Because this is much smaller than the predecessor, the gradient at the tip of the fuel spraying is below the critical speed gradient for ignition[14].

3. Research Methodology
In the implementation of research on gasoline engine 7k need to follow the steps as follows:
1. Position the machine in a safe place, then prepare the gas emission test equipment (gas analyzer)
2. Turning on the engine at 2000 rpm
3. Turn on the exhaust emission test apparatus
4. Press the power button then wait about 2 minutes for the tool to be used
5. Insert the exhaust gas tester hose on the exhaust channel approximately 30cm
6. Press enter then wait about 4 minutes of exhaust gas into the hose. Next go into the gas analyzer
7. Press menu button, then data will appear, then press 3 to print, then press button 4 to print last page
8. Then press enter to eject the paper data on the emission gas emissions
9. Then change the degree of ignition
10. Press the enter key then wait about 4 minutes for the exhaust gas into the hose then go into the tool
11. Press menu button, then data will appear, then press 3 to print and then press button 4 to print last page. Then press enter to extract the emission gas emission data.

4. Results and Discussion

4.1. Results

After conducting research and testing of variations when ignition of environmentally friendly exhaust emissions at 7k gasoline engine then the authors get the data as shown in table 1, 2, and 3.

Table 1. Research Results Concerning Gas Exhaust CO on Gasoline RON 88 and Pertamax (Gasoline RON 92)

| No | Rotation (RPM) | Ignition Timing (degree) | Exhaust Gas Contents CO Gasoline RON 88 | Pertamax (Gasoline RON 92) |
|----|----------------|--------------------------|-----------------------------------------|---------------------------|
| 1  | 2000           | 8˚                       | 0.06%                                   | 0.04%                     |
| 2  | 2000           | 10˚                      | 0.07%                                   | 0.05%                     |
| 3  | 2000           | 15˚                      | 0.08%                                   | 0.06%                     |

From the research results can be explained or noticed how much the level of CO gas emissions that are removed by the machine with the degree of ignition as follows:
1. In the 2000 round and at 8˚ ignition before the TMA CO2 emissions levels are released by the engine that uses gasoline of 0.06% and pertamax of 0.04%
2. At 2000 rpm rotation and when ignition is changed to 10˚ before TMA CO emission level of exhaust gas by engine that uses gasoline of 0.07% and pertamax equal to 0.05%
3. At 2000 rpm and at ignition before 15˚ before TMA CO2 emission level which is output by engine using gasoline by 0.08% and pertamax equal to 0.06%

Table 2. Research Results Concerning Gas Exhaust HC on Gasoline RON 88 and Pertamax (Gasoline RON 92)

| No | Rotation (RPM) | Ignition Timing (degree) | Exhaust Gas Contents HC Gasoline RON 88 | Pertamax (Gasoline RON 92) |
|----|----------------|--------------------------|-----------------------------------------|---------------------------|
| 1  | 2000           | 8˚                       | 180ppm                                   | 105ppm                     |
| 2  | 2000           | 10˚                      | 195ppm                                   | 132ppm                     |
| 3  | 2000           | 15˚                      | 225ppm                                   | 160ppm                     |

From the research results can be explained or noticed how much the level of exhaust emissions HC which is removed by the machine with the degree of ignition as follows:
1. In the 2000 round and at 8˚ ignition before the TMA HC exhaust emissions levels are removed by the engine that uses gasoline fuel of 180ppm and pertamax of 105ppm
2. At 2000 rpm rotation and when ignition is converted to 10° before TMA HC exhaust emissions levels are removed by a machine that uses gasoline fuel of 195ppm and pertamax of 132ppm.

3. At 2000 rpm rotation and ignition time before 15° before TMA HC exhaust emission level is removed by the engine that uses gasoline fuel of 225ppm and pertamax of 160ppm.

| No | Rotation (RPM) | Ignition Timing (degree) | Exhaust Gas Contents CO2 (Gasoline RON 88) | Exhaust Gas Contents CO2 (Pertamax) |
|----|----------------|--------------------------|-------------------------------------------|-----------------------------------|
| 1  | 2000           | 8°                       | 2.5%                                      | 2.4%                              |
| 2  | 2000           | 10°                      | 2.4%                                      | 2.3%                              |
| 3  | 2000           | 15°                      | 2.0%                                      | 1.8%                              |

From the results of the study can be explained or noticed how much the level of CO2 exhaust emissions are removed by the machine with the degree of ignition as follows:

1. In the 2000 round and at 8° ignition before the TMA CO2 emissions levels are removed by engines that use gasoline by 2.5% and pertamax of 2.4%.

2. At 2000 rpm rotation and when ignition is changed to 10° before TMA CO2 emission level exhausted by engines that use gasoline at 2.4% and pertamax 2.3%.

3. At 2000 rpm and at ignition before 15° before TMA CO2 emission levels released by engine that uses gasoline by 2.0% and pertamax 1.8%.

4.2. Website Design

The design of dissemination website is done by using SDLC method. The stages of the SDLC method can be seen in Figure 1.

![Figure 1. SDLC Method](image_url)

5. Conclusion

After conducting the research, field testing of variations when ignition of environmentally friendly exhaust emissions on a 7k petrol engine hence there is an effect on exhaust emissions if it reverses or advances when ignition as Table 4.
Table 4. Result of exhaust emissions on gasoline and pertamax overall

| Rotation (RPM) | Ignition Time (derajat) | Exhaust Gas Contents | Pertamax |
|---------------|-------------------------|----------------------|----------|
|               |                         | CO       | HC       | CO₂   | CO       | HC       | CO₂   |
| 2000          | 8°                      | 0.06     | 180      | 2.5   | 0.04     | 105      | 2.4   |
| 2000          | 10°                     | 0.07     | 195      | 2.4   | 0.05     | 132      | 2.3   |
| 2000          | 15°                     | 0.08     | 225      | 2.0   | 0.06     | 160      | 1.8   |

Obtained at the correct ignition on the test machine is 8°-12° before the upper dead point for the lower emissions produced and environmentally friendly.

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