Application of Engine hybrid hydrogen supply system to improve engine emissions of hydrocarbon concentration

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Abstract

Engine hybrid hydrogen supply system links to a vehicle's intake manifold and provides the hydroxide in the engine combustion chamber, increasing the burning temperature of the chamber. As a result, the residues of the carbon in the chamber will also be cleaned.

Also, through the analysis of exhaust gas monitored from the vehicle hydrocarbon (HnCm) emissions, we can see how the system can dramatically reduce HnCm emission by providing stable hybrid hydrogen generated from the fixed current supply.

Keywords: residual carbon ,carbon monoxide(CO), Hydrocarbons(HnCm), Nitrogen oxides（NO_X）, carbon dioxide（CO_2）

摘要

氫氧混合供應系統連結車輛進氣歧管，導入引擎燃燒室，當汽油與氫氧混合氣體燃燒時，由於氫氧混合氣體會再提高燃燒室溫度，進而燃燒積碳，並隨著排放而達到清除積碳效果。

使用廢氣分析儀監測車輛一氧化碳(CO)、碳氫化合物(HnCm)、二氧化碳（CO_2）及氮氧化物（NO_X）排放量，在固定電流下的氫氧混合供應系統，會穩定的產生氫氧混合氣體，供給燃燒室，再藉由一氧化碳(CO)、碳氫化合物(HnCm)、二氧化碳（CO_2）及氮氧化物（NO_X）的排放明顯降低，證實本系統效能。

關鍵詞：積碳、一氧化碳(CO)、碳氫化合物(HnCm)、氮氧化物（NO_X）、二氧化碳（CO_2）

1. Introduction

"Hydrogen" is the essential element in this system. We all know that 99 % of the source is from water. Though water is seemly safe, it is very risky to extract this clean energy: hydrogen.

Currently, in the industry, there are several approaches are used to extract hydrogen as followed:

1. Water electrolysis hydrogen: the electrolyzer is consisted of several pieces of positive and negative electrolytic poles and filled with sodium hydroxide electrolyte. When connected to DC power supply, it will produce electrolytic hydrogen and oxygen: the positive pole oxygen and the negative pole hydrogen.
2. Thermochemical hydrogen: the water is heated to the highest temperature (2500 to 3000) and then part of the water vaporization can be broken down into hydrogen and oxygen. However, it costs a lot to install the system.

3. Natural gas hydrogen: it is from a natural gas-based fuel. The main component of natural gas contains methane such as hydrocarbons (HC). When catalytic reaction is in process, it produces benzene and hydrogen gas and does not produce greenhouse gas carbon dioxide (CO_2).
4. Solar Hydrogen: the process is similar to water electrolysis hydrogen but the main source of electricity is different. Generally speaking, water electrolysis hydrogen is powered by converted DC from AC while Solar Hydrogen is powered by sunlight solar panels. Unfortunately, converting heat to electricity is not efficient enough to produce oxyhydrogen gas. This results in not being competitive with conventional energy Hydrogen.

2. Problems

These hydrogen systems are the most commonly used in the industrial and academic fields to extract hydrogen.

In this paper, we will propose a system based on the principle of the most traditional water electrolysis hydrogen, which is quite commonly available for hydroxide mixed supply systems. However, there are differences between the proposed system and the other commonly available ones. The power source of the latter comes is fixed. This will limit the effectiveness of the oxyhydrogen gas performance. Another drawback of commercially available hydroxide device is that it will seriously damage the engine combustion chamber. This is mainly caused by the excessive high temperature steam because there are no filtering devices between the cooling system and the engine. Specifically, the oxyhydrogen gas output to the engine combustion chamber does not have a filtering device to filter the moisture. Without this device, there will be excessive high temperature steam in the engine, causing serious damage to the engine combustion chamber.

3. Possible Solution

The purpose of the proposing supply system is to provide clean oxyhydrogen gas to mix with fossil fuel in the engine to improve combustion efficiency and reduce vehicle emissions of toxic gas concentration, improving the air quality of our environment.

Specifically, when the hydrogen mixture is added to the gasoline mixture, the hydrogen will be sent to the combustion chamber, combined with carbon residues and finally transformed into hydrocarbons (HnCm), commonly known as oil and gas. In fact, this transforming process also improves the combustion efficiency, accelerating the cleavage of the carbon surface including carbon (C), carbon monoxide (CO), hydrocarbons (HnCm), nitrogen oxides (NO_X), carbon dioxide (CO_2), and the water molecule (H_2O).

The principle concept of the present design is to use an adjustable current supply to control the amount of hydrogen gas. However, before the hydrogen gas can be used in the chamber, it has to be cooled down by the gas cooler. In the meantime, it also has to be filtered to remove the moisture, a process to ensure that no water residues in the import engine combustion chamber. By doing this, the cooled hydrogen gas will not damage the internal parts of the engine.

The main purpose of this design is not to use toxic and corrosive chemicals. It is one of the most environmentally friendly ways to cleanse the carbon residues in the car engine. The principle is to electrolyze water to produce hydroxide molecules OH molecular gas, to mix with the air and to have a complete burning process into the engine combustion chamber. By using a large number of the hydroxide molecules in the engine combustion chamber, these molecules can produce environmentally friendly exhaust by combining with the carbon

monoxide (CO), hydrocarbons (HnCm), nitrogen oxides (NO_X), and carbon dioxide (CO_2).

The measurement procedures of the hydrocarbons in the engine emissions

There are several steps to measure the toxic emissions in the vehicle emissions:

The first step: keeping a car engine on for 5-10 minutes to reach the engine operating temperature (200 to 300 ° C).

The second step: Keeping the exhaust gas analyzer machine on for two minutes to let the numerical correction at zero.

The third step: Keeping the hydroxide mixed supply system on for five minutes to generate oxyhydrogen gas temperature.

The fourth step: Starting the vehicle engine, putting the measuring rod of the exhaust gas analyzer in the rear exhaust pipe, measuring and recording the concentration of original toxic emissions, as shown in Figure 4.

The fifth step: make sure that the output tube of the hydroxide gas supply system is connected to the negative pressure end of the engine (an intake manifold). Then start the engine and turn on the master switch of the supply system, leading the hydroxide and mixed gas into the engine combustion chamber to burn with the fossil fuel.

The sixth step: measure and record toxic emission values every five minutes, a measurement time of 35 minutes.

The seventh step: After the measurement, turn off the exhaust gas analyzer, the mixed hydroxide supply system and the engine. Then recover the vacuum tube of the negative pressure end of the engine. After that, restart the engine, keep the engine at neutral position and accelerate the engine to the speed between 3000 ~ 5000RPM. This is to make sure that the combustion residues can be fully discharged.

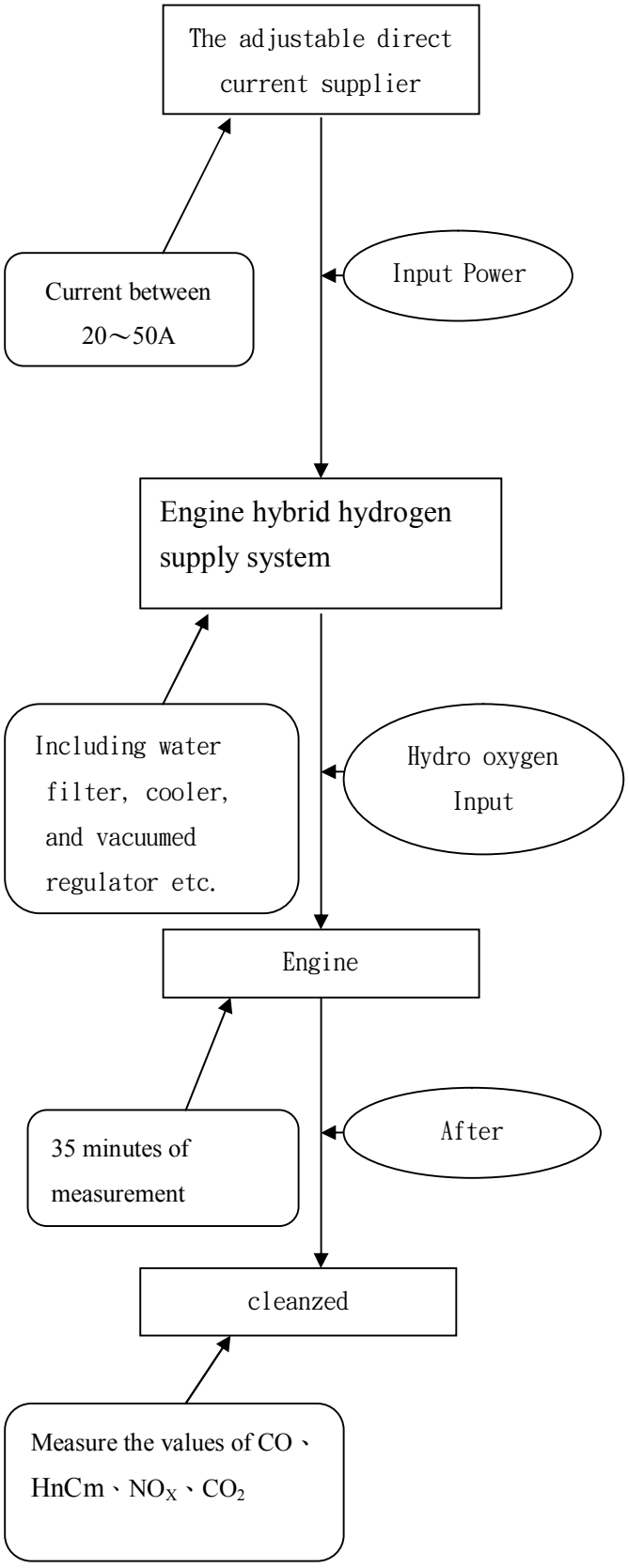
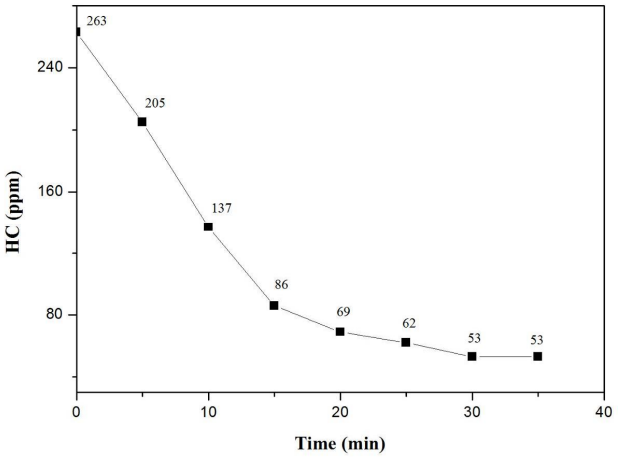


Fig. 4 The flowchart of measuring the toxic gases of the engine

5. Results

Analysis of hydrocarbons (HC)

In Figure 5, the engine which does not use imported hydroxide has a mixed gas of hydrocarbons (HnCm) at the value of 263 ppm. However, when the engine uses imported hydroxide for 30 minutes, the value of hydrocarbons (HnCm) was significantly reduced to 53 ppm. In fact, after a long-term use of a hydroxide, the mixed gas of carbon monoxide (CO) was reduced to 2 ppm.



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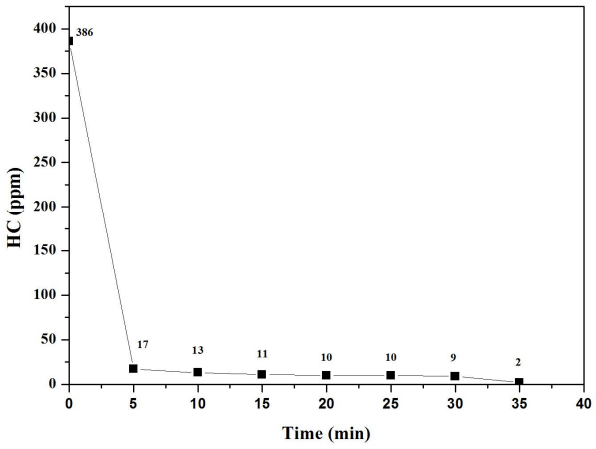

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Fig. 5 The relationship of the value of HnCm and the time when the engine uses imported hydroxide

6. Limitations

There are two types of mixed gas of Hydroxide used in engines. When it is used in vehicles, the electrolytic current is maintained at 20 to 35 amperes (A) to generate sufficient amount of mixed gas for the combustion chamber. However, when it is used in motorcycles, the electrolytic current is maintained at 20 to 30 amperes (A) and this, unfortunately, will not produce enough mixed gas for its combustion chamber. Consequently, emissions of hydrocarbons (HnCm) will also be affected.

6.1 Conclusion

In this paper, we propose a system, the Engine Hybrid Hydrogen Supply System, to clean the residues in the exhaust by increasing the burning temperature of the chamber through adding the hydrogen gas from the manifold. The result of the cleaning is very solid and can be seen from the analysis of exhaust gas monitored from the vehicle hydrocarbon (HnCm) emissions.

7. Suggestions

The hydroxide mixed supply system currently focuses on the study of vehicle emissions of hydrocarbons (HnCm). For future research, the differences of the horsepower and torque of the engine with and without hydroxide can be tested. In fact, the optimum amount of hydroxide can be tested out for better horsepower and clean energy.

8. References

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