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A Hydrolysis System Design and Analysis for Vehicles with Microprocessor Based and PWM Controlled Card

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A hydrolysis system is designed by pulse width modulation controlled card, powered by hydrogen gas, contained of 24 pcs which were $11 \times 11 \times 0.5$ cm^3 sized, made of 316L stainless steel, 6 pcs anode, 6 pcs cathode, 12 pcs neutral and contained of 12 pcs which were $0.8 \times 0.7 \times 0.03$ cm^3 sized, made of resistant caoutchouc. 1 liter of pure water and 120 g KOH were used for hydrolysis system solution. As a result of hydrolysis 4 l/min hydrogen has appeared. This gas is directly connected to the fuel cell at vehicles. In this way the risks are removed that arise during compression and fuel savings are achieved. Pulse width modulation control card is made with microprocessor. Hydrolysis system is powered by 12 V DC 1.5i GLS in 1995, 1495 cm^3/91.2 cui, 65 kW/88 PS/87 hp (DIN) 5 speed manual power train vehicle used for test drive. Test drive was conducted on 100 km and results were 10 A at 1000–1500 rpm, 20 A at 1500–3000 rpm, 30 A and over at 3000 and over rpm. So that 35% saving in fuel consumption was measured. This system will be employable water heater at the next tests.

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1. Introduction

The fossil fuels (oil, coal) and natural gas reserves which play important role in the industrial revolution are limited and are also in the greatest environmental problems one of the factors. Alternative fuels revealed need for resources and all these reasons. Hydrogen is this alternative candidate which is unlimited, clean, and efficient [1, 2]. In this study, a hydrolysis system was designed by pulse width modulation (PWM) controlled card. PWM controlled card was designed with PIC16F877A and this card has 3 mosfets for PWM control which were named Q1, Q2, Q3 (Fig. 1) [3–5]. TLP250 is an optocoupler which run to the mosfets. The voltage value is set to the hydrolysis blog, according to the value from the gas potentiometer.

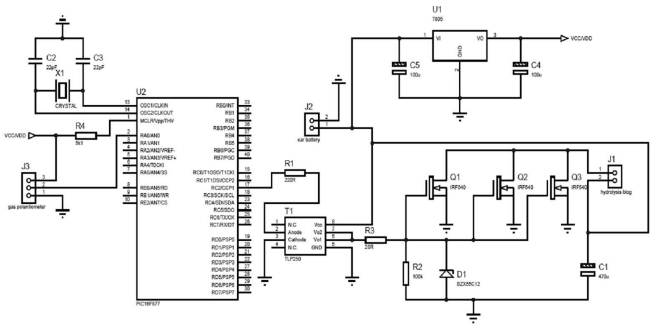

Fig. 1. PWM Control Card with PIC16F877A.

This system is powered by hydrogen gas, contained by 24 pcs which were $11 \times 11 \times 0.5$ sized, made of 316L stainless steel (Fig. 2), 6 pcs anode, 6 pcs cathode, 12 pcs neutral and contained of 12 pcs which were $0.8 \times 0.7 \times 0.3$ sized, made of resistant caoutchouc (Fig. 3) [6].

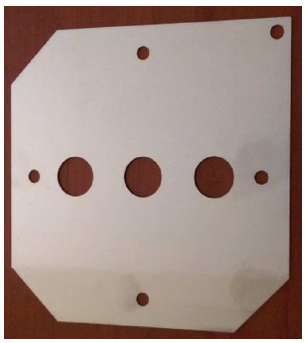

Fig. 2. Stainless steel.

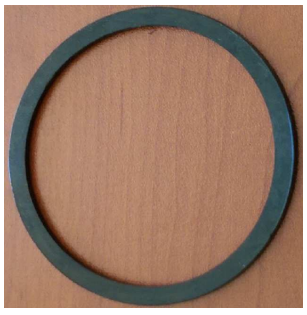

Fig. 3. Resistant caoutchouc.

1 liter of pure water and 120 g KOH was used for hydrolysis system solution. As a result of hydrolysis 4 l/min hydrogen appeared. This gas is directly connected to the fuel cell at vehicles. In this way the risks are removed that arise during compression and fuel savings are achieved (Figs. 4, 5)[7, 8].

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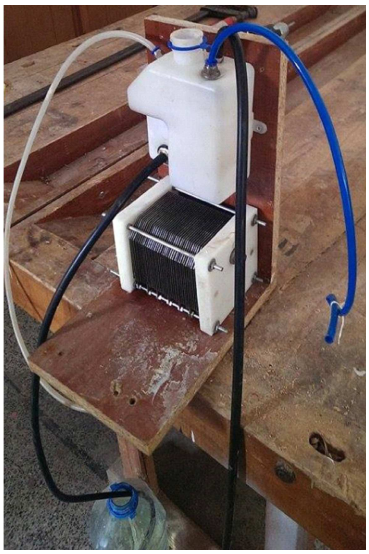

Fig. 4. Hydrolysis system connection.

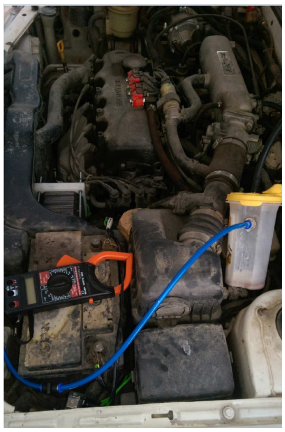

Fig. 5. Hydrolysis blog.

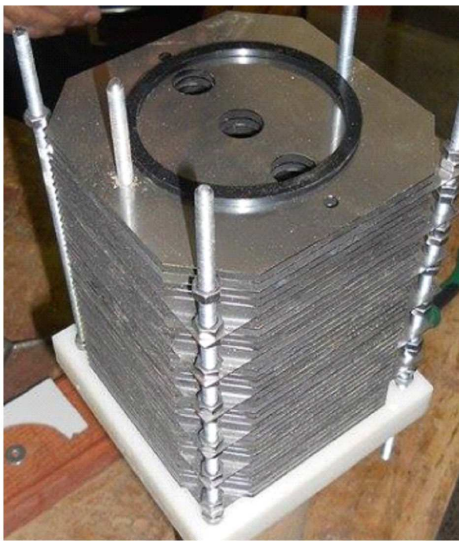

Fig. 6. Hydrolysis system.

Hydrolysis system is powered by 12 V DC (Fig. 6). 1.5i GLS in 1995, 1495 cm^3/91.2 cui, 65 kW/88 PS/87 hp (DIN) 5 speed manual power train vehicle (Hyundai Accent GLS) was used for test drive. Test drive was conducted on 100 km and results were 10 A at 1000–1500 rpm, 20 A at 1500–3000 rpm, 30 A and over at 3000 and over rpm (Table).

TABLE

Table of rpm–current relationship.

rpm	Current [A]
1000–1500	10–12
1500–3000	20–22
3000–over	30–35

2. Conclusion

Test drive was conducted on 100 km and results were 10 A at 1000–1500 rpm, 20 A at 1500–3000 rpm, 30 A and over at 3000 and over rpm. So that 35% savings in fuel consumption was measured. This system will be employable water heater at the next tests. In this system 1 liter of pure water and 120 g KOH is consumed at 1000 km. KOH more quickly clogged and solidified than NAOH at high temperature in this system. So that NAOH was more useful than KOH.

1 liter water is used in the electrolysis process, 2400 l hydrogen gases are generated. 1 liter hydrogen gas is produced per min, 60 l hydrogen gas is produced per hour and these gases are burned per hour, this corresponds to only 32 g of water [9]. In this system 8 l hydrogen gases are produced per hour and this corresponds to 256 g of water.

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