RE: HHO Tuesday, June 21, 2011 1:37 AM

From: "Ali Can YILMAZ" <acyilmaz@cu.edu.tr>
To: "'Mark Dahlman'" <mkdahlman@yahoo.com>

Dear Dahlman,
Thanks for your concern and kind thoughts. I always try to reply as fast as I can but you know we are generally busy. As I mentioned, we firstly observed the effect of chemicals addition to the water and determined the most effective one. Our reactor has 16 plates and although your calculations seem to be true for your assumptions, the main thing is HECU here. I sent you general working principle of HECU but we made some additions to that electronic unit and did some trials and still working on it. We did not finish the electronic system at all, therefore, I could not send you the last state of HECU. Anyway, our aim was more HHO production with less energy consumption and we observed that when reactor was on, first of all, bubles began to appear which prevented HHO output from reactor although energy consumption kept going. This of course reduced efficiency of system. We thought that if we modify the HECU that arranges the current on/off with changing High Time, Low Time and duty cycle of the system within constant frequency, we might get more HHO flow rate with less energy consumption. In fact, this is what Stan Meyer did. He managed to connect alternator of the car to an electric motor and drive the HHO system. In our experiments, our HECU did some kind of same thing, also a kind of triggering below 1750 rpm which yields more production with less energy. We can say, 12V and 10.6 A are average values. We're working on a comprehensive HECU whose high time, low time and duty cycle can be set. I think this describes the high HHO production with low energy. We measured the HHO flow rates by a hydrogen flowmeter maybe with little experimental errors. Especially at low speeds HHO causes reductions in volumetric efficiency (handicap for correct air to be taken into the cylinders) due to the long opening time of intake manifolds. In your test engine, maybe you can use an electronic circuit which "cheats" on lambda sensor of vehicle. Because HHO also consists of oxygen and lambda sensor will order the ECU to bid injectors spray more fuel into combustion chambers to compansate lean mixture which will cause higher SFC values (Maybe there exists a correlation with the Critical Point for HHO reduction but we did not research on it at all). Another way is maybe to inject HHO after MAF sensor. In the end, as you know, our research was academic, not commercial or we did not manage to observe the feasibility of system but you may try these options that I mentioned above.

Thank you
Kind Regards
Ali Can

From: Mark Dahlman [mailto:mkdahlman@yahoo.com]
Sent: Tuesday, June 21, 2011 4:49 AM
To: Ali Can YILMAZ
Subject: Re: HHO

Good afternoon Ali Can YILMAZ
Thanks for the fast reply:
I appreciate your time in answering my questions. I realize you must be very occupied with your studies and research endeavors.
I have read through your answers to my questions. I see many correlations in your work to the finding I have come across in my experiments. Just let me say, it is nice to be able to share thoughts on this subject with like minded individuals.
I do have a couple more questions:

Your data states that your Hydroxy Gas generator is producing between 4.1 - 5 liters/ min at 127.2watts power. (12v x 10.6amp)
Can you disclose to me your design. This to me seems like a large quantity of gas for just 127watts.
How did you measure the flow rate of the HHO gas? According to Faraday: At room temperature the Faraday efficiency would be 0.684 LPH/A per cell. The 100% efficient electrolyzer (gas volume measured at room temperature) would be about 1.48v/0.684LPH/A = 2.16W/LPH .
5 liters/min at 127.2watts = 300LPH at 127.2watt/hr.s
12volts/(number of plates/cells 7?) = 1.71v/plate/cell. (I have used 7 for the number of plates/cells in your hydroxy generator. I am just guessing, you would have to substitute the actual number of plates/cells as this will make much difference in generator efficiency.)
LPH/A per cell = 300LPH/ 10.6amps / 7plates = 4.043 LPH/A per cell
1.71v / 4.043LPH/A = .423Watt/LPH
2.16W/LPH / .423W/LPH = 5.106 times more gas production (less energy expense) over Faraday.

Please understand I am not trying to be critical of your work. I have to find these answers to finish my work and complete programming my 'automatic current controller'. I find it indeed tantalizing the prospect that you have found a way to produce Hydroxy gas at less than Faraday. I am sure you have heard of Stanley Meyers, of the Water car fame. He ran (allegedly) a Volkswagen car for 4 years on nothing but water gas (HHO). Of course he used an extravagant system supposedly utilizing acoustically tuned electrode tubes and high frequency resonance technology. They say his gas production was something like 1300 times Faraday.
I am using 'Brute Force' hydrolysis, with a 'automatic' current limiting PWM. I sent you some of the prototype photos in last letter. This system runs at about 2.3watts/LPH = Approx. less than 93% Faraday. I can tell you that I have experienced quite by mistake, that when a certain frequency is attained and maintained under certain conditions, an exponential production of Hydroxy gas is possible. Unfortunately, the conditions seemed to be dictated by internal Resistance and Capacitance of the water cell, along with the concentration of electrolyte, temperature and the frequency of PWM. As you know as the temp changes in the cell, you have changes in all other properties, R and C. This being said, the process becomes more involved.
On the Nissan 2.5 liter turbo diesel engine that I am working on at the moment, I am injecting the HHO gas before the MAF sensor. I am beginning to think that this is a mistake because the MAF will 'meter' the volume of HHO gas as 'normal' air for use in calculations in the combustion process. This could logically give a 'richer' mix due to having less than apparent combustion-able O2 for the calculated injector pulse width. Unfortunately these newer turbo diesels meter the air intake for turbo charge rate metering which I believe affects the injector pulse width, hence the amount of Diesel entering the cylinder on each charge cycle. I have noted the poor burn, and loss of power at low rpms, when injecting constant rate (quantity x) HHO gas pre-MAF sensor.
Quantity (x) HHO at off idle rpms (higher RPMs) runs the truck with noticiably more power and torque, you can actually feel the difference just driving the vehicle. It will drive at cruising speed 400 rpms lower with quantity (x) HHO than without it. Usually the truck will require 2200 rpms to cruise (no HHO), and with HHO, that is reduce to 1800 rpms. This translates to 18% reduction in required torque to move the vehicle at cruise. This number is just about what you found on the reduction of SFC on your motor. I am not sure how increased torque converts to reduced SFC. I am sure there is some relation at relative rpms.
The ONLY problem we are confronting is the low RPM, off idle hesitation, explained earlier.
I will probably change the location of supplementing the HHO gas to after the MAF sensor, and install the new 'automatic current controller'. Please tell which

parameter was the most pronounced / evident in locating the critical point for HHO gas reduction in relation to RPM.
I noticed that the Peak in the Torque curve for your motor was approx. 1750 rpms. Does this always correlate with the Critical Point for HHO reduction?
Please let me know your thoughts on these matters.

Thank you for your attention in this matter.
Have a great day!
mjd

--- On **Mon, 6/20/11, Ali Can YILMAZ <*acyilmaz@cu.edu.tr*>** wrote:

From: Ali Can YILMAZ <acyilmaz@cu.edu.tr>
Subject: HHO
To: mkdahlman@yahoo.com
Date: Monday, June 20, 2011, 1:17 AM

Dear Dahlman,

Prof.Dr.Kadir AYDIN directed you to me to answer your questions about our HHO system study. You may contact me too. First of all, I would like to thank for your concern about our study and congratulate for your research on this topic. Our test engine is an old fashion Mitsubishi Canter DI Diesel with mechanical distributor pump. I mean, it does not work with a Common Rail system. If you check the SFC values in our article, you see that they're too high for an internal combustion engine. Our aim was to investigate the effects of HHO addition to diesel fuel on performance and exhaust emissions of the engine and we attained positive results above our critical engine speed of experiments (about 1750 rpm). However, below this speed, the positive results transformed to negative due to the reason that you indicated in your mail (volumetric efficiency reduction). In consequence of our experimental trials, we concluded that if we decrease the flow rate of HHO below this critical speed, we could obtain positive results both for performance and emission parameters too. Therefore, we decided to construct a 555 timer PWM circuit which is connected to data logger of experiment rig and yielding reduction in HHO flow rate at low engine speeds by decreasing the electrolysis current and voltage (arranging duty cycle) to appropriate values that we concluded. Our test engine has no lambda sensor and does not utilize a MAF sensor. As I mentioned, we did several experiments without and with HECU and compare the performance and emission data and obtained positive results. It was simple-deemed but effective. The answers for your squent questions are given below:

1) The maximum voltage and current drawn by the HHO generator without HECU was about 12V (car battery) and 10.6 A (127 W). HECU was programmed to decrease current and voltage to about 7.1V and 5.4 A (61% duty cycle, values obtained as the result of trials) which corresponds to about 40 W below 1750 rpm. This 1750 rpm value is not a standard for CI engines, this is the critical value that we observed for our experiments. HHO flow rate was about 4.1-5 L/min above 1750 rpm (HECU off time) with 1% NaOH addition to the electrolyzed water. Detailed description about HECU is attached.
2) In consequence of our trials, we observed that flow rate of about 1.6 L/min was appropriate for the engine speeds below 1750 rpm. When we decreased it below this flow rate value, HHO effect was too little which could be neglected. However, when we increased it HHO caused negative effects. About 1.6 L/min can be deemed optimum for our experiments.
3) First of all, we observed the effects of a number of chemicals (NaOH, NaCl, KOH, all by 1%) addition to the water to see the flow rates of HHO gas. When 1% value was exceeded, an abrupt current increment was achieved due to the dramatic reduction of resistance. Eventually, NaOH was the most appropriate one with regard to flow rate results. Flow rate-mass fraction graphs with different types of electrodes are attached.
4) HHO gas was supplemented between air filter and intake manifolds of the engine (just before intake valves).

I hope these will be enlightining for you.

Thank you
Best Regards

Rsc. Asst. Ali Can YILMAZ
Cukurova University
Department of Mechanical Engineering
Automotive Engineering Laboratories