Department of Mechanical and Materials Engineering

SENIOR DESIGN PROJECT SYNOPSIS – SPRING 2013

HYDRO-GEN (HYDROGEN GENERATOR)

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Nowadays, engineers have ethical responsibilities to look for ways to improve people's day-to-day problems, as well as to look out for environmental wellness. This senior thesis is aimed to improve the fuel consumption of internal combustion engines by turning it into a hydrogen hybrid engine. The performance of the combustion engines is improved by using hydrogen as an additional fuel source. The main component of this research is to produce a compact hydrogen generator system that is easy to install on most vehicles. It will improve gas mileage and its main associated problems for the environment, such as air pollution and gas emissions. The electrolysis process is the method used in order to generate hydrogen. This process uses electric current to split water into its two main components, hydrogen and oxygen. The generator's main components include, the reactor cell and the control system. Some challenges in the design of the system include, material and size selection of the cell in order to yield an ideal amount of hydrogen. After testing, the finished product will then be connected to intake manifold of the combustion engine with fixed constant pressure. After the generator is designed, manufactured, and installed, testings will be done in order to provide proof of the engine's efficiency.

The original intention of this thesis was to create two types of system, one as a hybrid system capable of running on gasoline mixed with hydrogen, and the other as a full hydrogen system that completely replaces the need for gasoline. Ideally, both systems will maintain constant pressure within the vessel while monitoring with the control units. However, due to some complications dealing with air/fuel ratios as well as lack of power, the generator was not able to supply enough hydrogen without the use gasoline. Therefore, the final generator prototype uses hydrogen as an additive in the air and fuel mixture. The hydrogen in the generator system is sent to the air intake and burned almost simultaneously. No hydrogen storage is involved for safety reasons. Adding hydrogen resulted in an improvement of gas mileage.

The outcome shows proof of one way vehicles can be improved, which in turn could benefit the environment and lower the consumer's gas expenditure. The performance of the combustion engine has improved in the form of average gas mileage. This result has been satisfying. Adding hydrogen to the air-fuel mixture in the combustion chamber has resulted in an increase of miles per gallon of about 25%.

Hydrogen hybrid cars have positive impacts on the environment. Hydrogen, after the combustion

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process, produces particles of water that help run the engine cooler. Moreover, carbon dioxide emissions are also reduced. We have to take advantage of Hydrogen as a fuel alternative. Its abundance and environmental benefits, make an ideal power source.