

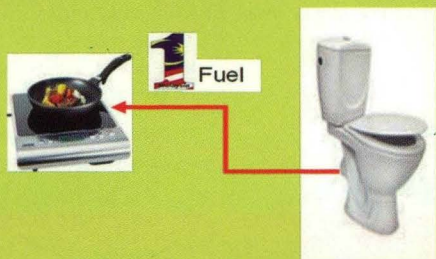
Development Of Clean Renewable Fuel From Wastewater Towards A Sustainable Energy Source Using Green Technology Approach: HEC²

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Project summary

Fossil fuel such as diesel and petrol that are drawn from finite resources are non renewable and is becoming more expensive and unaffordable besides polluting the environment. There has been a constant increase in oil price due to depletion of fossil fuel resources and increase in energy demand (due to intensive industrialization, population and automotive activities). Furthermore fossil fuel burns incompletely thus contributes to emission of greenhouse gasses, global warming and other detrimental environmental problems. Therefore a cheaper, cleaner, sustainable and environmental friendly fuel source is urgently needed and subsequently an innovative system has been designed and developed in order to overcome the above mentioned problems.

The present invention relates to a system to produce a synthetic gas fuel using a green technology. In particular, hydrogen is the ideal alternative for future fuel as it burns completely, contains high flammability and produces no greenhouse gas but water. Conventionally hydrogen is electrolyzed by high energy input that is derived from hydrocarbon fuel therefore it becomes inefficient and uneconomic. To overcome this issue, the present invention produces synthetic hydrogen using higher technological efficiency powered by renewable energy resources such as solar, therefore will significantly reduce our dependability on fossil fuel, preserve the environmental quality and as well as able to push forward the green technology to greater height. Essentially, the present invention



generates synthetic hydrogen gas fuel from wastewater sources such as sewage, leachate and industrialized waste using solar energy as energy providers. This invention primarily employed photovoltaic collectors which generates electricity and stores the obtained electrical power in batteries. The batteries which act as the energy storing devices supplies relatively inexpensive electrical energy for the system to generate hydrogen gas fuel through enhanced electrolysis process. In general there are numerous processes that can be employed to electrolyze and separate a water molecule into its elemental hydrogen and oxygen elements such as the electrolysis process. However the hydrogen and oxygen generated through this conventional electrolysis are generally produced in inefficient manner and involved with problems such as requirement of high electrical power, costly electrolytic cells, electrode cell tends to heat-up, the produced gas need to be immediately transferred to a pressurized storage, low hydrogen/oxygen gas production, boiling water and electrode cell forms gas bubbles that acts

as electrical insulators that subsequently reduce the cell functionality.

Thus, this newly innovative system has been designed and developed in order to overcome the above mentioned problems. The most inventive step in this invention is its ability to generate hydrogen gas fuel at lower voltage source (12 V), at ambient pressure (14.2 psi) and at a controllable amount of fuel gas in order to provide an optimal source of fuel. The generated hydrogen gas could be used as potential fuel for fuelling cooking stoves, incinerator, welding works, thermal electric power generation, furnaces, heaters and cooking stoves. In particular water vapour is the exhaust products from hydrogen fuel combustion. Furthermore this invention is not only capable of producing hydrogen gas from wastewater sources but also concurrently able to treat the wastewater such as sewage and leachate by increasing the wastewater's quality such as carbon oxygen demand (COD), suspended solids and biochemical oxygen demand (BOD₅). It is noted that the quality of the electrolyzed wastewater particularly sewage can be improved during at least 3 hours of electrolysis process wherein it is observed that there is COD reduction up to 88%, suspended solids removal up to 91% and BOD₅ removal up to 87%. Subsequently potential innovative technology which supports our National Green Technology Policy would certainly materialize our Prime Minister vision's for the economy that is based on innovation and indirectly transforming Malaysia into a high-income economy.