

# HYDROGEN FROM SEWAGE

Introduction - Hydrogen is Future Fuel. Hydrogen can be extracted from water or organic compounds using external energy sources. In developed nations, considerable interest are being shown in using hydrogen – in both as combustion engines as a fuel and in conjunction with fuel cell technology. The main reason behind it is hydrogen represents a renewable energy source with lower or nil emissions than current fossil fuels.



It has been known to us that, hydrogen can be produced fermentatively from a range of bio-solids (bio-solids from sugar factory or from municipal wastewater) by certain anaerobic micro-organisms. Available methods of hydrogen production from bio-solids are quite smarter and greener because these are carbon neutral. These methods can be used with a wide range of substrates and involves a relatively low cost, simple reactor design. Sewage bio-solids are an abundant waste product, which is already successfully, treated using anaerobic digestion in many countries. Use of sewage bio-solids as a substrate for the production of hydrogen via continuous anaerobic fermentation, prior to treatment via methanogenic anaerobic digestion in an existing system would be great idea of production of hydrogen.

Biological generation of hydrogen using fermentation – Food industry co-products and crops rich in carbohydrates can be fermented in the dark to produce hydrogen. There is world-wide interest in this process since it uses well-known reactor technology, but the biological aspects must first be studied. Mixed microbial communities obtained from natural sources convert the range of carbohydrates present in organic materials to hydrogen and fermentation end products. These end products are good

substrates for anaerobic digestion to methane. Conditions which allow stable operation of the hydrogen reactor and maximise hydrogen yield are only now becoming known.

Anaerobic digestion of municipal waste – Scientists in the US and other developed nations have improved the efficiency of bacteria-powered fuel cells that convert biodegradable organic matter into hydrogen gas. It is hoped that their discovery would make it possible to generate hydrogen from sewage, sustainable and on a larger scale.

Although hydrogen is considered to be an important fuel of the future, current production methods require non-renewable fossil fuels. The alternative – extracting it from the electrolysis of water – is too energy intensive to be practical. But there is an abundant source of hydrogen running directly under our streets – locked up in the form of sewage. This biomass contains huge amounts of organic compounds, such as cellulose, that can be converted into fuel.

As per report, the improved method is feasible to make hydrogen from variety of products containing cellulose. Therefore, in this range anything, like banana peel to apple cores included; but the best prospect may be waste cellulose – which our sewage has.

Modified Microbial Fuel cells for generation of Hydrogen- As per some of the experts, hydrogen can be produced from fermentation of sugars in wastewaters, but much of the organic matter remains in solution. Hydrogen production from a food processing wastewater high in sugar can be linked to electricity generation using a microbial fuel cell (MFC) to achieve more effective wastewater treatment.

Microbial fuel cells were originally designed to generate electricity. These cells contain “exoelectrogenic” bacteria that can chew up organic compounds, converting them into electrons and hydrogen ions (protons). The protons combine with oxygen to produce water at the cathode of the system, causing a net flow of electrons and generating electricity.

In the modified system for generation of hydrogen, electricity is passed into the system to catalyse hydrogen gas formation. The scientists have changed from using a proton exchange membrane in the system to an anion exchange membrane. This allows negatively charged species to carry protons to the cathode forming Hydrogen. It has been demonstrated that the fuel cell can convert glucose, cellulose

and several acidic by-products into hydrogen. The conversion is quite energy efficient – the cell generated almost three times more available hydrogen energy than the electrical energy boost added to make the process work

Although these demonstrated fuel cells do not have implications for smaller applications, it is hoped that larger fuel cells could be set up next to existing sewage treatment plants, which would produce a constant supply of cheap hydrogen.

In addition to producing hydrogen, this process also cleans the water, so, ideally, treatment plants could be developed to take in sewage and send out hydrogen fuel and clean water.

Conclusion – Sewage could be a new way for future green energy generation in the way of production of cheap hydrogen. However, more studies are needed to improve hydrogen yields.

Source : <http://saferenvironment.wordpress.com/2009/05/04/565/>