

HYDROGEN USAGE AND STORAGE

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ABSTRACT

It is thought that it will be useful to inform society and people who are interested in hydrogen energy. The study below has been prepared due to this aim can be accepted as an article to exchange of information between people working on this subject. This study has been presented to reader to be utilized as a "technical note". Main Energy sources coal, petroleum and natural gas are the fossil fuels we use today. They are going to be exhausted since careless usage in last decades through out the world, and human being is going to face the lack of energy sources in the near future. On the other hand as the fossil fuels pollute the environment makes the hydrogen important for an alternative energy source against to the fossil fuels. Due to the slow progress in hydrogen's production, storage and converting into electrical energy experience, extensive usage of Hydrogen can not find chance for applications in wide technological practices. Hydrogen storage stands on an important point in the development of Hydrogen energy Technologies. Hydrogen is volumetrically low energy concentration fuel. Hydrogen energy, to meet the energy quantity necessary for the nowadays technologies and to be accepted economically and physically against fossil fuels, Hydrogen storage technologies have to be developed in this manner. Today the most common method in hydrogen storage may be accepted as the high pressurized composite tanks. Hydrogen is stored as liquid or gaseous phases. Liquid hydrogen phase can be stored by using composite tanks under very high pressure conditions. High technology composite material products which are durable to high pressures, which should not be affected by hydrogen embrittlement and chemical conditions.[1]

Keywords: Hydrogen Storage, Hydrogen Energy, Hydrogen Utilization

1. INTRODUCTION

The clearest feature of the systems of the hydrogen energy is to constitute "sustainable energy system". In other words; hydrogen and electrical energies may be transformed into many types of energies by forming a compatible and supplementary cycle not consuming limited natural resources and wasting the environment. While by being used hydrogen and oxygen in the nature, electric energy can be produced by means of fuel cells, it is possible to obtain hydrogen from water using electric energy by the method of electrolyze. The oxygen coming out during this time is given back to nature.

The main features of the hydrogen element and gas can be summarized as the following. Hydrogen being the most sample and common element, it is a gas without colour, smelling, poison and it is lighter than air 14.4 times. The fuel of the heat which has given with the sun and the other thermonuclear reaction of stars is hydrogen, and it is the main energy source of the universe. It is thought that hydrogen exist on %90 of the solar system. Hydrogen does not

exist on the nature freely, exist in form of composites. The most famous composite of it is water. In every area requiring heat and explosion energy, hydrogen which is easy and clean to use in the energy system used as fuel, the product omitted to the atmosphere is just water or water vapor. Also, it is not produced gas and harmful chemical product which pollute the environment such as carbon monoxide or carbon dioxide. [2,5]

These are the practice areas that are tried hydrogen energy as the battery of fuel: Automobiles, buses, motorbikes, gulf cars, space technology, planes, locomotives, ships, submarines, energy production technologies, degeneration, auxiliary power sources , portable power sources.

Fuel cells have been used on the space technology for decades. Fuel cells are used for submarines. It has been on the level of the demonstration on the area of automotives and settled power. It has been used on the portable power sources on the military area and it is about to be marketing commonly as a battery. [3]

2. HYDROGEN USING FIELDS

Hydrogen is not only used for energy utilization purposes, but also produced for industrial applications. Hydrogen is used for many fields in industry such as; at the synthesis of ammoniac, in the oil refineries , on the manufacture of methanol, at the sector of vegetable oil and animal fat, for the cooling of heated generator coils in the electric stations, at the meteorology in the place where helium is absent as lifter gas, for welding technologies, for the glass industry during melting and being cut the quartz, in chemical industry, for steel industry to prevent oxidation of materials, for cooling areas, and manufacture of cooling systems, in the field of metallurgy for heat treatment, bright plating, brass plating, for the electronic industry to prevent material from oxidation, as conductor gas, as ambient gas, semi conductor applications. It is filled in balloons and zeppelins since it is lighter than air.

It is possible to create energy systems which don't pollute the environment with hydrogen energy. Although there is a lot of hydrogen on the nature, it doesn't exist alone. Hydrogen is obtained with two ways. The first of both is to fire hydrocarbons, the second is the electrolysis method. The method of obtaining hydrogen should be used by decomposing the water with electrolysis method to be located in an ideal alternative energy system of hydrogen and to solve the environmental pollution. The additional productions will increase and vary on burning hydrocarbons.[5]

The damage that fossil fuels give the environment can be arranged like that briefly global warming, becoming thin ozone layer, acid raining, pollution, decreasing of the biological kinds of nature, being consumed the sources etc. In 2000, the cost of the damages that fossil fuels give the environment is predicted as 2876 billion dollars. All of these are important to show that hydrogen is better alternative for environment.

3.STORAGE OF THE HYDROGEN

The aim of being stored of the hydrogen is to develop storage supplies and the safest, most productive and most economic hydrogen storing method. Alternatives: Storing solid, liquid and gas condition. While that storing liquid condition compared to gas condition storing from the point of view having higher energy density is appeared advantageous, the compulsion of absorbing requiring -253 C for liquefying procedure pave the way for losing energy. Storing solid condition has appeared more inspiring compared to the other two methods. Metal hydride, high storing capacities, high bulky energy density, high securities in storing solid condition have appeared preferable in sense of requiring low pressure procedures. However, their costs should be reduced at least %50, and the back leaving warmth of the hydrogen should be decreased at least under 100 °C. [1,4,6]

Alternative of the storage systems is transport with pipelines or tools. Transport with pipelines is suitable for the middle distance such as 10 km or much longer distance up to 100 km. or 200 km. Few material with steel should be used because of slack of the hydrogen. [7]

4. FUTURE OF HYDROGEN

Technology is getting developing, the necessary of the energy is increasing and growing between energy sources and requiring energy day by day. The present energy system is not sustainable. According to Canada National Energy Committee's reports, while the demand being fossil fuel since 2020 is continuing to increase speed of today, the production is predicted to start decreasing suddenly with decreasing world reserved. Alternative solutions to meet the deficit is felt the need. Hydrogen energy has appeared in these solutions as an ideal selection in terms of environmentalist, productivity and sustainability, economical in the future. Although energy does not finish suddenly, in the world the danger of the consuming energy can be explained like that cheap petrol, environment, tolerance for injustice, money for better alternatives, time for easy passing, leadership abilities to do necessary consumed fast. Petrol is continuing to be the biggest energy sources except for Russia and Pasific countries ruling natural gas. Hydrogen energy will be a productive and sustainable source in opposition to fossil fuels. Thus, a sustainable economy will be able to set up. It will be harmonious with environment. Both health insurance premiums and health expenses will decrease. The expenses of the production of the environment will decrease. Natural disasters which are due to global warming will decrease. The quality of the life will increase.

That the yield is taken into consideration on using and producing energy in industry will open new working areas that will cause to bore new sectors, productions and processes, which will be solution to unemployment. Increasing of the new sources and production method will stiffen the politic stability of the countries and industry on sustainable obtaining and delivering energy.[4,8]

5.HYDROGEN ENERGY STUDIES IN TURKEY

Some researches about production, storage, and usage of hydrogen are done at many universities in Turkey. International Centre of Hydrogen Energy Technologies (ICHET), and United Nations Industrial Development Organization (UNIDO) have been founded in Istanbul. Prof. Nejat Veziroğlu's valuable contribution to the Hydrogen studies in scientific fields and for applicable projects became hydrogen research subjects more popular in TURKEY. National, and International Hydrogen Energy Congress (UHK-2006 and IHEC-2007) were carried out in Istanbul. Hydrogen energy was discussed with many aspects. Subject has still been searched in many scientific platforms. Some of the researches continuing at TUBİTAK are like these; Using of PEM fuel power production source with battery on the universal application by being developed, Being developed the technology of the production, transformation and storing of the electric tool. The subjects of hydrogen energy and fuel cells are located in the universities' programs dealing with energy subjects in every passing year in the country. In the high schools, in order to start education on the subject about hydrogen energy some programs were prepared, and the laboratories of the fuel cells opened. Education seminars were organized to teachers and high school directors to encourage them on this phenomenon.

6. CONCLUSION

Using hydrogen has been started slowly on industry, house applications and portable energy consumption possessions. For instance, laptop working with hydrogen energy, flashlights, mobile phones and automobiles are on the position of being tested on markets, even some of them commercializing in many countries.

World started to consider the damage caused by the redundant fossil fuels. The steps such as Rio World Peak, Kyoto Protocol are the most important indication of this. Detailed and large researches are being done nearly in every country to constitute the substructure of the clean developing mechanism as a parallel to these steps.

A hydrogen superhighway, on it a hydrogen stations built, is being planned to do in California. British California Superhighway Project has been continuing in Canada. Hydrogen filling stations, hydrogen automobiles, fuel battery buses, hydrogen fishing boat fleet have been started to use. A clean mass transport net has been set up for Europe called CUTE (Clean Urban Transport for Europe) Natural project that is coordinated in Europe is an integrated project which is financed mutually for researching, technological development and demonstration by the Europe Commission. ICHET has encouraged and slowed production, distribution and using of the hydrogen energy with seven different demonstration project in seven different countries with Turkey.

Hydrogen energy, if it compares its alternatives, has an advantage like continuing a determined energy rotation from the point of view of being stable and storable.

Alternative energy sources are nuclear, sun, wind ocean (thermal), ocean currents, the tides, geothermal energy sources.

The disadvantages of the alternative energy sources can be count as being discontinuous, being far away from the consumption places, not being carried, not being stored except nuclear, not being clean of the nuclear and geothermal energy.

According to all these, a helper energy system has been seen to need to obtain connection between energy sources and consumer.

The preconditions of this energy system may have these specific, but convenient features such as being portable, storable, producible as transport fuel. At the same time it should be produced safe, and economically. Hydrogen or any other energy system could be renewable, clean, independent from primary energy sources. Besides, productive, safe and harmonies with environmental conditions. Hydrogen energy is found important as an alternative energy system by the science association, because having these criterions.

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