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HYDROGEN FUEL ENERGY

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Abstract

Nowadays there are many environmental problems in the world. Atmospheric pollution is one of the major issues. Much pollution comes from different engines and vehicles. The solution lies in discovering of either a new energy resource or form of energy and this will lead to a new technological stage. This paper deals with issues facing hydrogen fuel as an alternative source of energy, its advantages and disadvantages.

Key words: hydrogen fuel, energy, vehicle, hydrogen fuel cells, environment.

Introduction

Hydrogen fuel is zero-emission fuel, which uses electrochemical cells or combustion in internal engines, to power vehicles and electric devices. It is also used in the propulsion of spacecraft and might potentially be mass-produced and commercialized for passenger vehicles and aircraft.

In 2009, about 25% of carbon dioxide emissions into the atmosphere of the Earth were made as a result of various kinds of transport [1]. The IEA estimates that by 2050 this number will have been doubled and will continue to grow as the developing countries will increase the number of private vehicles. In addition to carbon dioxide into the atmosphere of nitrogen oxides are responsible for the increased incidence of asthma; sulfur oxides are responsible for acid rain, etc.

In maritime transport cheap low-quality grades of fuel are often used. Maritime transport emits sulfur oxide is 700 times more than road transport. According to the International Maritime Organization CO2 merchant fleet reached 1.12 billion tons per year [2].

Main discussion

Use of hydrogen fuel and its advantages

Hydrogen can be used as fuel in a conventional internal combustion engine. In this case, the engine power is reduced to 82% - 65%, compared with a gasoline embodiment. But if to make small changes in the ignition system, the engine power is increased to 117% in comparison with a gasoline embodiment, but then the output of nitrogen oxides will increase due to the higher temperature in the combustion chamber, and increases the likelihood of overcooking the valves and pistons in continuous operation on high power. In addition, hydrogen at temperatures and pressures, which are created in the engine, is capable of reacting with materials of construction of the engine and lubrication, leading to rapid deterioration of. Also, hydrogen is very volatile, because of using of conventional carburetor supply system can penetrate into the exhaust manifold, which also ignites due to heat [2]. Conventional reciprocating internal combustion engines are ill-suited to work on hydrogen. Typically, for the hydrogen rotary internal combustion engine is used, since it dramatically exhausts manifold away from the inlet.

Currently in limited quantities the following items are available:

- BMW Hydrogen 7 and the Mazda RX-8 hydrogen - dual-fuel (petrol / hydrogen) cars. Use liquid hydrogen.
- Ford E-450. Bus.
- City buses are low-floor MAN Lion City Bus.

The widespread adoption of hydrogen fuel is hindered by higher cost of hydrogen compared with usual liquid and gaseous fuels, the lack of necessary infrastructure. An interim solution could be a mixture of traditional fuels with hydrogen. Hydrogen can be used to improve the ignitability of lean mixtures in combustion engines running on conventional fuels [3].

Hydrogen fuel cells can produce electricity for the electric motor in a vehicle, thus replacing the internal combustion engine or using is becoming a reality for the time being.

Disadvantages hydrogen fuel

The danger of using hydrogen as a fuel is related to two factors. On the one hand the high volatility of hydrogen, because of which it gets through very small gaps, and ease of ignition. On the other hand in the breakdown of the fuel tank gasoline spills puddle on the surface, whereas hydrogen evaporates as directed jet. However, there is a danger of filling the enclosed space of vehicle interior hydrogen [4].

A mixture of hydrogen with air explosive is more dangerous than gasoline, as it burns in the mixture with air in a wide range of concentrations. Gasoline is not lit when the lambda less than 0.5 and more than 2, hydrogen burns with such great proportions. However, the hydrogen stored in tanks at high pressure, in case of breakdown of the tank quickly evaporates [4]. For transport special safe hydrogen storage systems are developed

- tanks with multilayer walls, special materials, etc., for example, the tank of nanotubes filled with hydrogen. But still it generally increases the cost of the entire cycle of the vehicle, lying down costs on the shoulders of consumers.

Hydrogen power plant on the basis of the traditional internal combustion engine is much harder and more expensive to maintain than a conventional internal combustion engines (especially diesel). According to MIT, the exploitation of hydrogen car at this stage of development of hydrogen technology costs a hundred times more expensive than gasoline.

As long as there is not enough operating experience of hydrogen transport. There is no possibility of a quick refuel en route from the canister or from another car.

To fill the need to build a network of hydrogen filling stations. For gas stations to refuel vehicles with liquid hydrogen equipment costs are higher than for petrol stations to refuel vehicles with liquid fuels (gasoline, ethanol and diesel fuel). Price is 8 Euros per liter (600 rubles).

Volatility is the major minus of the highest hydrogen gas. Thus, the hydrogen is difficult to maintain as a liquid, it is difficult to store hydrogen, transportation and use in the tank. Since the fuel evaporates from the tank is completely in a short time. For nine days half bank vaporized fuel BMW Hydrogen. At the moment there is hydrogen produced by electricity consumption of a significant amount.

Conclusion

Hydrogen fuel energy will help to address the issue of environment protection. The preferences to use hydrogen energy to fossil fuels would be world's salvation. To realize this, much investment should be made in this field of economy. Pros of hydrogen fuel energy prevail over its cons. Hydrogen is very competitive type of fuel and it is safe for environment.

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DIAGNOSTICS OF INDUCTION MOTOR SHORT-DAMAGED ROTOR WINDING

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Introduction

A squirrel-cage rotor damage is common and difficult to control during induction motors operation. This amounts up to 10% of the damage depending on the capacity and type of machine [1]. It is very difficult to identify squirrel-cage rotor mechanical damage because of the lack of information sources about the rotor winding electrical parameters. The main line of research in such damage diagnostics is stator currents and voltages frequency estimation [2], because any damage in rotor circuits distort a motor magnetic field, and therefore, distortion should be visualized in the stator currents and voltages depending on the type of a damage.

The induction motor feature is a variable rotor speed depending on the shaft load, and, consequently, damaged defect of rotor winding creates a distortion in the shape of the stator current with changeable frequency [3]. Using spectral analysis is justified for stationary signals, which are periodic. The presence of the Fourier spectrum instability in the stator current decomposition does not give an unambiguous interpretation of the "squirrel cage" technical state. A stator currents decomposition based on wavelet transform is a promising direction [4].

Problem statement

On the basis of experimental data to investigate the possibility of applying the wavelet transform to identify the diagnostic feature of short-circuited winding mechanical damage.

Experimental data and their processing

Figure 1 shows the waveform of the induction motor phase currents in the presence of cracks in the rotor winding bar.

The phase current signals were received via galvanically isolated current sensors and through the signals input card were fed from the AD