

"Hybrid Gas Station" System with a Micro Gas Turbine Generator for the Spread of Electric Vehicles

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1. Introduction

In order to promote the popularization of electric vehicle (EV)s, we propose a new type of gas station (GS) system, namely "Hybrid Gas Station (HGS)". It can be considered as a new energy provider infrastructure system for gasoline engine vehicle (GV)s as well as for EVs.

2. Background of proposal of HGS

2.1 Potential and problem of EV

As far as fuel consumption, Hybrid Electric Vehicle (HEV)s are significantly superior to conventional GVs. They are even better than improved GVs equipped with new technologies such as lean burn, direct injection and variable valve timing. Yet, when fuel consumption is taken into consideration, EVs are better than the HEVs in terms of lower calorific value of gasoline. Given better availabilities of batteries charge infrastructure⁽¹⁾, EVs will have a good chance of becoming a popular transportation means.

2.2 Proposed HGS equipped with MGT

As shown in Fig.1 the HGS is a straightforward extension of conventional gasoline station with a compositional addition of a micro gas turbine (MGT) generator and battery chargers. The MGT system can operate on conventional fuels such as kerosene all of which are available through existing gas syndicate networks. The system shows the advantage of MGT's high energy efficiency, low emission, fuel flexibility, long up-time and life-time, and easy to develop the cogeneration system.

3. Results and conclusions

For the purpose of analytical calculation of our experimental data, we have postulated, based on our case

survey, a gas station to be of typical, which can supply 12.1kL/day gasoline and use 924MJ/day electric power.

The results obtained from our energy and emission evaluation analyses show that the HGS with a 75kW MGT can achieve significant fuel savings, that is CO₂ emission can reduce by 24% (see in Fig.2) and NO₂ emission by 28% in comparison to the conventional GS, respectively. Furthermore, by becoming one of the distributed generator systems, the HGS can have positive influence on the securities of electric energy in the future.

In our view, therefore, the proposed system can be a viable migration path for the next generation transport system in where EVs can coexist with gasoline-powered vehicles.

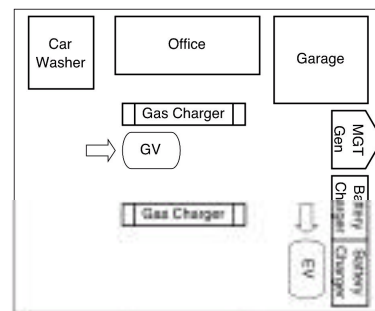


Fig.1 HGS system model

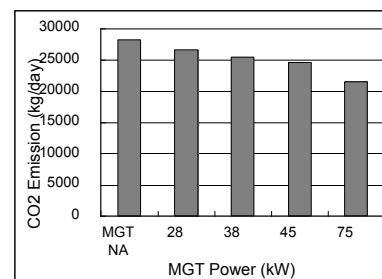


Fig.2 CO₂ emission

References

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