

The Study of Seawater Electrolysis Combined with Fuel Cell Power Generation Technology

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Research Background :

The Taiwan government actively promotes 20% renewable energy power generation as the target by 2025. Hydrogen energy and fuel cell technology have the characteristics of power generation and energy storage, and it is a power generation technology that can achieve zero pollution. Datan Power Plant uses seawater electrolysis to produce sodium hypochlorite to prevent marine organisms from being attached to circulating cooling water tubes and equipment. So far, the hydrogen from seawater electrolysis is directly emitted into the atmosphere. If the hydrogen emission can be effectively used as a fuel source for fuel cell power generation system, it may be a potential energy utilization and clean power generation technology.

This research takes the seawater electrolysis equipment of the Datan Power Plant as the main research subject. It aims to establish the technology of seawater electrolysis combined with fuel cell power generation. The research was completed through power plant hydrogen potential investigation, fuel cell technology test verification, integration strategy proposal, etc. In order to verify the feasibility of the technology, we have established the equipment for testing. Finally, we propose the benefit assessment and implementation strategies based on the previous research results.

Research Results :

According to the research results in this study, the purity of hydrogen produced by seawater electrolysis is about 90%, and a small number of gas impurities must be purified to avoid long-term damage to the fuel cell system. Based on the field measurements, after treatment and purification, the hydrogen from seawater electrolysis can be used for fuel cell single-cell and short-cell stack for power generation, and the

performance curve in the short term has not shown a significant decline. The performance of the grid-type fuel cell power generation system has also been tested. Based on a conservative estimate, the entire Datan power plant's seawater electrolysis can be used for nearly 100 kW fuel cell power generation systems. Regarding the availability of long-term operation, continuous research and improvement are required before the application can be realized.



Figure 1. Appearance of seawater electrolysis gas treatment research and test equipment.



Figure 2. Remote status monitoring schematic