講演番号	270

Functional Extension of the Integrated FC System Simulator “FC-DynaMo”

- Incorporation of Vehicle, HV Battery, and Control System Models -

Tomoaki Takagi[1)], Toshikazu Ota[1)], Yuji Yajima[1)] , Shigeki Hasegawa[2)]

1) MCOR Co., Ltd., 124-1 Nibanwake Kitano-cho Okazaki, Aichi 444-0951 Japan

2) Kyoto University Katsura Campus, Nishikyo-ku, Kyoto City, Kyoto 615-8510, Japan

KEY WORDS: EV and HV systems, Power control unit, FCEV, Fuel Economy

In recent years, diverse applications of fuel cell (FC) systems have been expected across a wide range of sectors to promote the utilization of hydrogen and expand the FC market, including passenger and commercial vehicles, stationary power generators, construction machinery, railways, ships, and aircraft. As part of these efforts, Kyoto University has developed an integrated FC simulator, “FC-DynaMo,” under a NEDO project. This simulator enables detailed modeling of whole FC systems and aims to establish a high-accuracy FC system model by incorporating experimental data acquired from actual systems under a wide range of operating conditions.

In FC vehicle development, system-level optimization is required not only at the technical level of the FC system itself, but also from the perspective of overall vehicle system design, where vehicle performance, safety, and cost which are treated as higher-level requirements. To realize these higher-level requirements, detailed studies must be conducted with a clear separation between hardware mechanical design and control system design. Therefore, an integrated vehicle model that can consistently coordinate and evaluate individual functional models is indispensable.

In this study, FC-DynaMo was extended by incorporating models that represent the dynamic characteristics of the vehicle and HV battery, as well as control models for vehicle speed tracking and power distribution control. As a result, the simulation scope was expanded to include a complete fuel cell vehicle model.

Specifically, a vehicle model targeting the Toyota MIRAI was constructed, and its validity was verified through comparison with the certified fuel economy under the Japanese WLTC driving mode. This paper presents the modeling methodology and the verification results.

Figure 1: Concept of the vehicle model based on FC-DynaMo

Figure 2: Overview of simulation results

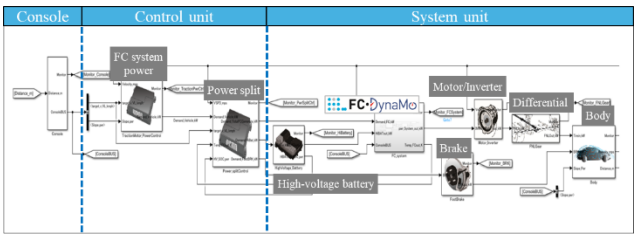

Fig.1 Integrated vehicle model based on FC-DynaMo

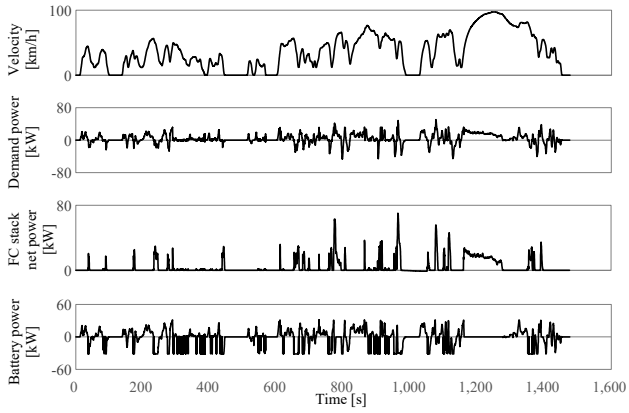

Fig.2 Overview of simulation results