전남 개조전기차 규제자유특구
홍보 세미나

중형승용 전기차개조 개발연구

송재문*

Research on Modification and Development of Mid-Size Passenger Electric Vehicles

Jae moon Song*

Key Words : Internal combustion engine(내연기관), Electric vehicle modification(전기차개조), Automobile tuning (자동차튜닝), Automobile safety standards(자동차안전기준), Test and evaluation(시험평가)

ABSTRACT

This study is to develop technologies for converting and manufacturing internal combustion engine vehicles into electric vehicles. This study involves removing unusable parts such as engines, exhaust, and fuel systems from existing internal combustion engine vehicles and installing electric-based drive systems such as motors and batteries to transform them into electric vehicles. It is a research on remodeling. Through research, we will demonstrate the driving/durability safety of overweight modified electric vehicles and, when converting to electric vehicles, develop performance and safety evaluation methods for vehicles with increased weight beyond the current system (tuning is prohibited for vehicles exceeding 120 kg for small vehicles and 200 kg for medium vehicles).

* ㈜마일레오토모빌/대표이사
E-mail : jiho4009@naver.com

개조전기차의 구조안전성 사전 검증을 위한 유한요소해석

김강민* · 이태희**

Finite Element Analysis for Preliminary Verification of Structural Safety of Modified Electric Vehicles

Kang-Min Kim*, Tae Hee Lee**

Key Words : Modified electric vehicles(개조전기차), Electric vehicle(전기차), Structural analysis(구조해석), CAE (컴퓨터 이용 공학), Finite element analysis(유한요소해석)

ABSTRACT

Modified electric vehicles refer to the modification of aging internal combustion engine vehicles into electric vehicles. This process involves the removal of the engine, transmission, and related components from the internal combustion engine vehicle and the installation of essential electric vehicle components such as batteries and motors. This technology aims to transform the existing fossil fuel-based propulsion system into an electric-based propulsion system. These converted electric vehicles offer the added value of recycling old vehicles and achieving carbon neutrality. However, during the modified process to electric vehicles, the total vehicle weight increases due to the installation of heavy electric vehicle components, leading to a change in the vehicle's overall weight and center of gravity. Therefore, it is essential to conduct production and pre-driving safety verification. In this study, finite element analysis was used to perform preliminary structural safety verification of the vehicle body due to weight changes resulting from the production of modified electric vehicles

Finite element analysis boundary conditions involved assigning the curb weight to each wheelhouse of the monocoque body vehicle and applying additional loads according to the weight and location of the components added during the production of modified electric vehicles. The analysis results showed that the installation of the battery in the vehicle trunk resulted in significant loads and deformations in components such as the B-pillar, lower frame, and rear frame compared to the original internal combustion engine vehicle configuration. However, from a safety margin perspective, the loads on various vehicle components due to the production of modified electric vehicles did not pose a threat to structural integrity. Therefore, it is expected that there will be no structural issues when designing and manufacturing modified electric vehicles with the same battery position and weight as those in this study. In future research, a pre-driving safety verification will be conducted through vehicle dynamic evaluations to assess driving safety.

* 한국자동차연구원/선임연구원
** 한국자동차연구원/센터장
E-mail : gmkim@katech.re.kr