수동안전 II

재료 및 점용접 파단 물성 개발

김영완* · 남병군* · 예병우* · 박현정* · 김용민*

Development of Material and Spot Weld Failure Properties

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Key Words : Property(재료물성), Spot weld(점용접), Fracture(파단), Crashworthiness(충돌), Heat afected zone(열영향부), GISSMO(기쓰모)

ABSTRACT

Material and spot weld fracture, which occurs frequently in high-speed vehicle collisions, can lead to poor crash performance and damage to vehicle safety components such as high-voltage batteries. Predicting material and spot weld fracture and the resulting vehicle body behavior through CAE is one of the most challenging analysis techniques and an essential technique for improving test-CAE analysis consistency.

This study aims to develop material and spot weld fracture properties for vehicles to improve physical test-CAE analysis consistency. Through systematic testing and analysis of specimen, component, and full vehicle units, fracture properties for vehicle crash analysis were developed. In addition, a material fracture prediction tool based on machine learning was developed and the spot weld modeling technique was automated.

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2W급 비경화형 컴파운드 타입 원가절감 TIM 개발

김지은*

Development of 2W-Class Non-Curing Compound Type Cost-Saving TIM

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Key Words : Thermal interface material(열전달계면소재), Theramal conductivity(열전도도), Oil bleeding(유분리)

ABSTRACT

Heat dissipation efficiency is important to solve the increase in the amount of heat generated by electronic devices due to miniaturization and high-functionality of electronic components. In particular, the application and development of Thermal Interface Material (TIM) materials are being actively studied.

In this study, a 2W-class non-curing compound type TIM was developed to improve heat dissipation efficiency and cost competitiveness.

To reduce cost, heat dissipation was improved by unifying the heat dissipation filler into a low-cost alumina filler, and by adjusting the size of the filler to improve packing properties. In addition, the accuracy of oil separation evaluation has been improved by newly developing a non-curing compound type TIM oil separation evaluation method. Finally, by using a silane coupling agent and silicone containing an alkoxy group, the bonding strength between the silicone resin and the heat dissipation filler was increased to improve the oil separation.

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볼트의 잔류 토크와 축력의 상관관계 분석

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Investigation of the Correlation Between Residual Torque and Bolt Preload

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Key Words : Bolt(볼트), Preload(축력), Residual torque(잔류 토크), Tightening scenario(체결 절차), Frictional coefficient(마찰 계수)

ABSTRACT

This study aims to investigate the correlation between preload of bolts and residual torque under various tightening conditions and to precisely control the bolt preload. The residual torque is measured to verify that the bolts are fastened properly. However, due to the unclear relationship between residual torque and bolt under various industrial tightening conditions, the application of residual torque has limitations. Therefore, this study conducted residual torque and preload measurement experiments on a total of 520 M8 bolts under various tightening conditions. The experiments were conducted controlling the tightening speed and tightening torque. The residual torque, preload, tightening angle, and friction coefficient of the bolt were measured under different tightening conditions, lubrications, plating, tightening scenarios, and tightening torque. The results showed that there was almost no correlation between the residual torque and preload in the tightening direction, on-torque. In contrast, for the loosening direction, off-torque, a linear inverse relationship was observed between the residual torque and preload. This inverse relationship was more pronounced when the bolt and bearing surface damage was low during the tightening. Consequently, the observed linearly inverse relationship and measured residual torque indirectly allowed for the measurement of preload. By using this relationship, we proposed a tightening method for lower preload dispersion. The standard deviation of preload for bolts tightened to an average of 23.5 kN was corrected from 1.21 to 0.69 using a hand-torque wrench with a resolution of 0.1 N·m via the proposed tightening method.

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군집 지능 알고리즘을 통한 구속 장치 최적화 및 성능 예측에 관한 연구

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A Study on the Optimum Design of Restraint System and Prediction Performance Using Particle Swarm Optimization Algorithm

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Key Words : Restraint System(구속장치), Optimization(최적화), Particle swarm optimization(개체 군집 최적화), PCHIP

ABSTRACT

In order to achieve NCAP performance, it is necessary to develop not only the robust body design but also the optimized restraint system. In this study, based on Particle Swam Optimization algorithms and Piecewise Cubic Hermite Interpolating Polynomial were used to predict passenger injury according to restraint system specification and finding optimal design factor. PSO is population-based, stochastic algorithms that have been developed from the underlying concept of swarm intelligence and search heuristic. It is numerically shown that PSO algorithm successfully completed the optimization process of restraint design spec in order to reduce passenger injury for NCAP

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스몰오버랩 충돌 데이터 분석을 통한 프론트 바디 강건화 구조 연구

안도환* · 정현수** · 이상일** · 배기순** · 김병진**

A Study on the Structural Design Method of the Front Body by Analyzing the Small Overlap Collision Data

Do Hwan Ahn*, Hyun Soo Jung**, Sang il Lee**, Ki Soon Bae**, Byung Jin Kim**

Key Words : IIHS Small Overlap(IIHS 스몰오버랩), Front body(프론트 바디), Body structural optimization design (차체 분석), Internal energy(내부 에너지), Crash energy(충돌 에너지)

ABSTRACT

Since 2012, manufacturers' efforts to satisfy the IIHS Small Overlap test have continued. Our company has also concentrated our engineers' capabilities on various projects so far.

As a result, we were able to respond successfully to testing. However, as the paradigm of automobiles changes, such as EV vehicles, and various vehicle platforms and non-control elements increase, responding to tests for each project can cause many inefficiencies in vehicle development.

For this reason, in terms of the energy distribution and absorption of the body, through many projects so far, the purpose was to analyze the data transmitted to the A-pillar during the crash test to identify the tendency. A primary study focusing on the A-pillar to establish a guide to design a robust car body within a given platform by classifying our developed models by platform, classifying non-control factors and influencing factors for each platform has been going since 2021.

Accordingly, this study intends to propose a comprehensive robustness design plan for the car body by adding additional models for analysis to secure the reliability of the primary study and expanding the analysis area to the front body part.

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시스템 단위 충돌 성능 목표설정 연구 및 검증

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A Study and Verification of System-Unit Crash Performance Target Setting

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Key Words : Body structure(차체구조),Body system unit(단위시스템),IIHS Side crash test(IIHS 측면충돌평가), B pillar(B필라), Crash performance target(충돌 성능 목표)

ABSTRACT

The Solutions for various structures according to the type, specifications and the concept of the vehicle have been developed. Unlike the floors that are platforms, the upper body affected by the design has more diverse structures. In this paper, regardless of the limited regular vehicle unit analysis event, the designer can predict the crash performance of various concepts and specifications with only the upper body pillar part 3D model in the preceding development stage including the vehicle design stage. Further, based on the data of the existing developed vehicles, a method for determining efficient and optimized specifications by setting a target of a vehicle body system unit for collision performance is proposed. At the same time, it is possible to increase work efficiency by providing a verification tool that can be used by structure engineering designers.

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수소연료전지 자동차 통합성능 평가에 관한 연구

류도정*

A Study on the Integrated Power of Fuel Cell Electric Vehicle

Ryu Do Jeung*

Key Words : Hydrogen fuel cell(수소 연료전지), System power(시스템 출력), Global technical regulation(세계 통합 기술규정), KMVSS(국내자동차안전기준),

ABSTRACT

To reduce greenhouse gas emissions and respond to climate change, development of hydrogen fuel cells and electric vehicles is being actively developed. This paper derives improvements through a study on the hydrogen fuel cell power test method according to the Korea Moter Vehicle Safety Standard (KMVSS), and to consider the application of the integrated performance test method of eco-friendly vehicles with multiple power sources through the study of the system unit integrated performance test method (GTR 21) established by the UN

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