Optimal Design of Car Body Structure Based on Small Overlap Barrier Performance㊀

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Abstract: As the automobile market constantly matures and users' automobile literacy improves, safety performance of cars has been increasingly garnering people's attention. As safety performance is inextricably linked to the safety of occupants, it is the most noteworthy feature in car sales and ultimately affects the sales of cars. Collision accident can be classified into several types, including head-on collision, side collision, rear-end collision and roll-over collision and so on. Relevant data show that head-on collision is the most common type of collision, while in the fatal accidents of head-on collision, 25% small overlap barrier (SOB) accounts for about 1/4. This paper focuses on the real vehicle test and structural optimal design, in order to improve the safety performance of vehicles. China Insurance Automobile Safety Index, C-IASI is the first crash test guided by China Industry Insurance Association, and the test standards are in line with international first-class tests such as IIHS and E-NCAP. SOB is one of the key items of C-IASI. During SOB test, the vehicle hits the fixed rigid barrier at the speed of 64km/h and 25% overlap rate. the safety performance is analysed according to the damage of the vehicle and the injury of the dummy in the vehicle.

In the development process of this product, the Body in White (BIW) is faced with some problems, such as tight development time, high performance requirements, hard lightweight task and so on. Serious problems were exposed in the first round of SOB test. This paper studies the method of improving vehicle safety performance with small offset using finite element simulation technology and structure optimal designing. Through this research, the safety performance of small overlap collision of the vehicle can be significantly improved and the goal of lightweight can be achieved at the same time, indicating that this method has effective engineering application value.

Key words: C-IASI, small overlap barrier (SOB), optimal design of car body, finite element simulation technique

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