

# Development of Calculation Software for Automotive Side Swing Door Closing Energy

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**Abstract:** The existing research of the automotive side swing door closing energy is mainly conducted by measuring the closing energy and the closing angle via tests and simulations. In these tests, the door closing velocity and initial door closing angle are usually not taken into consideration, so the accuracy of the test data cannot be ensured, and, meanwhile, simulations require a great deal of manpower and time. Moreover, frequent tests would give rise to the increasing research and development costs. In this paper, in response to the deficiencies of these current methods, the complicated door closing process is decomposed into the closing processes of different subsystems of door, which includes weather strip seal, air-binding effect, door weight, hinge, check-link and latch. Mathematical models of those subsystems are established according to their working principles during the door closing process. In addition to the theoretical research, an Excel-based software using Visual Basic Application programming language is developed to realize the mathematical models, which aims to calculate the energy consumption of the subsystems. The energy consumption of different subsystems of a production vehicle door is measured to verify the accuracy of the calculation software developed. The proposed research provides not only the theoretical basis for the future door closing energy research, but also an interactive method and system, effectively improving the quality and efficiency of vehicle door design.

**Key words:** side swing door, closing energy, mathematical model, software

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