

THESIS

DESIGN AND VALIDATION OF A BRAKE CHAMBER TEST SYSTEM FOR ENSURING AUTOMOTIVE
SAFETY

Submitted by

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ABSTRACT

DESIGN AND VALIDATION OF A BRAKE CHAMBER TEST SYSTEM FOR ENSURING AUTOMOTIVE SAFETY

Accurate measurement of brake forces is critical for heavy vehicle accident reconstruction. To address this need, a Brake Chamber Force Tester was designed and developed. The tester is capable of measuring forces for different types of brake chambers used in heavy vehicles, mainly focusing on the Air brake chambers. The project involved the design and construction of a test bed that can simulate the conditions of heavy vehicle braking, by varying brake pressures. To measure the brake forces, a variety of sensors were integrated into the test bed. These include load cell, encoder and pressure transducers, which were selected based on their sensitivity, accuracy, and durability. Data acquisition and analysis software were also developed to collect and process the sensor data. The Brake Chamber Force Tester was subjected to validation and safety testing to ensure its performance and reliability. Validation testing involved testing the tester on various brake chambers and comparing the results against a reference instrument to validate its accuracy. The results showed that the tester was highly accurate and reliable, with errors within acceptable limits. Safety testing involved testing the tester under various conditions to ensure that it met safety standards and did not pose any safety hazards. As an additional feature of the Brake Chamber Force Tester, a graphical user interface (GUI) was designed using a Raspberry Pi to display real-time changes in brake force data. The GUI provides a user-friendly interface that allows operators to monitor and visualize the brake force data as it is being collected. The addition of the GUI makes the Brake Chamber Force Tester even more user-friendly and efficient, providing valuable feedback to operators and further enhancing the accuracy and reliability of the system. Overall, the Brake Chamber Force Tester is expected to be a valuable tool for heavy vehicle accident reconstruction. It provides accurate and reliable

measurement of brake forces, which can help improve the accuracy of accident reconstruction and ultimately contribute to safer roads for everyone.

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DEDICATION

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