



**Universitatea
Transilvania
din Braşov**

HABILITATION THESIS

SUMMARY

Title:

Research on the performance of motor vehicles, in relation to the specific requirements of active safety and the reduction of fuel consumption, respectively polluting emissions

Domain: Automotive Engineering

Autor: Assoc. Prof. dr. eng. Beleş Horia

University of Oradea

BRAŞOV, 2024

The habilitation thesis entitled "Research on the performance of motor vehicles, in relation to the specific requirements of active safety and the reduction of fuel consumption, respectively polluting emissions", presents the main scientific and professional results obtained since 2008, after obtaining the title of PhD, in the fundamental field of Engineering Sciences, Mechanical Engineering, until now.

The habilitation thesis is structured in three parts. The first part (B-i), entitled Scientific and professional achievements, contains the following chapters: *Introduction, Scientific and professional activity, Research on road safety, Research on active safety of motor vehicles, Research on determination of driver drowsiness, Research on constructive optimisation of body superstructures for motor vehicles, Research on road accident reconstruction, Research on reduction of fuel consumption and pollutant emissions*, presenting the main topics addressed within the fields of interest, as well as the results obtained. In the second part (B-ii), career development plans are presented, and in the third part, the bibliographical materials used for the habilitation thesis.

In Chapter 1, entitled Road Safety Research, the author presents a summary of road safety deficiencies as part of the "safe" system approach and the directions of the National Road Safety Strategy for the period 2022 - 2030.

The results of the research presented in Chapter 1 have been disseminated in a scientific article, published in ISI indexed proceedings, as well as in road safety audit reports, prepared for 7 consultancy contracts for the economic sector, as Project Manager. Detailed information on the dissemination of research results is given at the end of Chapter 1.

Chapter 2, Research on Active Vehicle Safety, presents a mathematical model, which was developed to simulate the operation of ABS (Anti-lock Braking System). Methods for experimental evaluation of the braking process and experimental tests carried out to determine the performance of the braking system are presented, and the chapter ends with a comparative analysis of the results and conclusions.

The results of the research presented in Chapter 2 were disseminated in a scientific article presented at an international conference and published in ISI-indexed proceedings, as well as in 6 scientific articles published in volumes of international scientific events indexed in BDI, and in the publication of 2 books, as sole author and main author. Detailed information on the dissemination of research results is presented at the end of Chapter 2.

In Chapter 3, Research on Driver Drowsiness Determination, the author presents various approaches to the development of a fuzzy decision algorithm designed for monitoring and issuing drowsiness warnings to drivers.

The results of the research presented in Chapter 3 have been disseminated in a scientific article published in an ISI (Q2) listed journal, as well as in 2 scientific articles published in volumes of international scientific events indexed in BDI. Detailed information on the dissemination of the research results is presented at the end of Chapter 3.

Chapter 4, entitled Research on the constructive optimisation of body superstructures for motor vehicles, presents an analysis of heat transfer in the walls of body superstructures of motor vehicles intended for the transport of perishable goods, as well as aspects of the conception and design of a body superstructure for a motor vehicle intended for the transport of meat carcasses.

The results of the research presented in Chapter 4 were disseminated in 2 scientific articles, published in volumes of international scientific events indexed in BDI, as well as in research reports, prepared for 2 research contracts with the economic sector, as Project Director. Detailed information on the dissemination of research results is presented at the end of Chapter 4.

In Chapter 5, Research on Road Accident Reconstruction, the author presents a summary of the determination of the geometric parameters of the frontal profile design of the vehicle, which influence the pedestrian's head acceleration in road accidents, and the assessment of the risk of injury to the pedestrian's head on impact with the windscreen or bonnet.

The results of the research presented in Chapter 5 were disseminated in a scientific article published in an ISI listed journal (Q4), in 2 scientific articles published in ISI indexed proceedings, as well as in 2 scientific articles published in volumes of international scientific events indexed in BDI, and also through the publication of a book, as co-author. Detailed information on the dissemination of research results is presented at the end of Chapter 5.

Chapter 6, Research on reducing fuel consumption and pollutant emissions, summarises the development of the combustion chamber of an opposed-piston, opposed-cylinder internal combustion engine and the specifics of the design adaptation of an opposed-piston, opposed-cylinder internal combustion engine for hydrogen operation in a two-stroke thermodynamic cycle. A summary of the water recovery from the exhaust gases of motor vehicle engines is also presented. The specifics of single-speed engines are also presented.

The results of the research presented in Chapter 6 were disseminated in 2 scientific articles published in ISI listed journals (1 in Q3 and 1 in Q4), in 2 scientific articles published in ISI indexed proceedings, in 2 scientific articles published in the volumes of international scientific events indexed in BDI, as well as in research reports prepared for 2 research grants won through competition (1 international and 1 national), as Project Manager, and 1 research contract with the economic sector, as Project Director. Detailed information on the dissemination of research results is given at the end of Chapter 6.

Part (B-ii) outlines career evolution and development plans.