



Faculty of Engineering



Ministry of Education,
Science and Technological Development

9th International Congress
Motor Vehicles & Motors 2022
ECOLOGY -
VEHICLE AND ROAD SAFETY
- EFFICIENCY
Book of abstracts



University of Kragujevac



Department for Motor Vehicles
and Motors



International Journal for Vehicle
Mechanics, Engines and
Transportation Systems

October 13th - 14th, 2022
Kragujevac, Serbia

**9th International Congress
Motor Vehicles & Motors 2022**

**ECOLOGY -
VEHICLE AND ROAD SAFETY
- EFFICIENCY**

BOOK OF ABSTRACTS

October 13th - 14th, 2022
Kragujevac, Serbia

Publisher: Faculty of Engineering, University of Kragujevac
Sestre Janjić 6, 34000 Kragujevac, Serbia

For Publisher: Prof. Slobodan Savić, Ph.D.
Dean of the Faculty of Engineering

Editors: Prof. Jovanka Lukić, Ph.D.
Prof. Jasna Glišović, Ph.D.

Technical preparation: Asist. prof. Nadica Stojanović, Ph.D.
Assist. prof. Ivan Grujić, Ph.D.
Assist. Slavica Mačuzić Saveljić, M.Sc.

Cover: Nemanja Lazarević

CD printing: Faculty of Engineering, University of Kragujevac, Kragujevac

ISBN: 978-86-6335-096-0

Year of publication: 2022.

Number of copies printed: 200

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

629.3(048)(0.034.2)
621.43(048)(0.034.2)

INTERNATIONAL Congress Motor Vehicles and Motors (9 ; 2022 ; Kragujevac)
Ecology - vehicle and road safety - efficiency [Elektronski izvor] : book of abstracts /
9th International Congress Motor Vehicles & Motors 2022, [MVM2022], October 13th-
14th , 2022 Kragujevac, Serbia ; [congress organizers University of Kragujevac [and]
Faculty of Engineering of the University of Kragujevac, Department for Motor Vehicles
and Motors, FE Kragujevac [and] International Journal "Mobility & Vehicle Mechanics"] ;
[editors Jovanka Lukić, Jasna Glišović]. - Kragujevac : University, Faculty of Engineering,
2022 (Kragujevac : University, Faculty of Engineering). - 1 elektronski optički disk (CD-
ROM) ; 12 cm

Sistemska zahtevi: Nisu navedeni. - Nasl. sa naslovne strane dokumenta. - Tiraž 200. -
Bibliografija uz svaki rad.

ISBN 978-86-6335-096-0

а) Моторна возила -- Апстракти б) Мотори са унутрашњим сагоревањем --
Апстракти в) Електрична возила -- Апстракти г) Хибридна електрична возила --
Апстракти
COBISS.SR-ID 76806921

Copyright © 2022 Faculty of Engineering, University of Kragujevac

*Publishing of this CD Book of proceedings was supported by
Ministry of Education, Science and Technological Development of the Republic of Serbia*

SCIENTIFIC BOARD

President

Prof. Jovanka Lukić, Ph.D., UniKg, FE, Serbia

Secretaries

Assist. prof. Nadica Stojanović, Ph.D., UniKg, FE, Serbia

Assist. prof. Ivan Grujić, Ph.D., UniKg, FE, Serbia

Assist. Slavica Mačužić Saveljić, M.Sc., UniKg, FE, Serbia

Members

Dr.-Ing. Oday Abdullah, TU Hamburg-Harburg, Laser- und Anlagensystemtechnik,
Germany

Prof. dr Giovanni Belingardi, Politecnico di Torino, Italy

Prof. dr Ivan Blagojević, University of Belgrade, FME, Serbia

Prof. dr Valentina Golubović Bugarski University of Banja Luka, FME, Republic of Srpska,
Bosnia and Herzegovina

Prof. dr Bruno Dalla Chiara, Politecnico di Torino, Italy

Prof. dr Murat Ciniviz, Selcuk University, Turkey

Prof. dr Adrian Clenci, University of Pitesti, Romania

Assoc. Prof. dr Aleksandar Davinić, University of Kragujevac, FE, Serbia

Prof. dr Miroslav Demić, University of Kragujevac, FE, Serbia

Assoc. Prof. dr Jovan Dorić University of Novi Sad, FTS, Serbia

Prof. dr Jasna Glišović, University of Kragujevac, FE, Serbia

Asst. Prof. dr Aleksandar Jovanović, University of Kragujevac, FE, Serbia

Prof. dr Breda Kegl, University in Maribor, Slovenia

Prof. dr Božidar Krstić, University of Kragujevac, FE, Serbia

Prof. dr Zoran Lulić, University of Zagreb, Croatia

Prof. dr Danijela Miloradović, University of Kragujevac, FE, Serbia

Prof. dr Patrizio Nuccio, Politecnico di Torino, Italy

Prof. dr Radivoje Pešić, University of Kragujevac, FE, Serbia

Prof. dr Snežana Petković, University of Banja Luka, FME, Republic of Srpska, Bosnia
and Herzegovina

Prof. dr Ralph Puetz, Landshut University of Applied Sciences, Germany

Assoc. Prof. dr Dragan Ružić, University of Novi Sad, FTS, Serbia

Assoc. Prof. dr Boris Stojić, University of Novi Sad, FTS, Serbia

Assoc. Prof. dr Dragan Taranović, University of Kragujevac, FE, Serbia

Assist. Prof. dr Predrag Živanović, University of Belgrade, FTTE, Serbia

ORGANIZATIONAL BOARD

President

Prof. Jasna Glišović, Ph.D., UniKg, FE, Serbia

Secretaries

Assist. prof. Nadica Stojanović, Ph.D., UniKg, FE, Serbia

Assist. prof. Ivan Grujić, Ph.D., UniKg, FE, Serbia

Assist. Slavica Mačužić Saveljić, M.Sc., UniKg, FE, Serbia

CONGRESS ORGANIZERS

University of Kragujevac
Faculty of Engineering of the University of Kragujevac
Department for Motor Vehicles and Motors, FE Kragujevac
International Journal "Mobility & Vehicle Mechanics"

CONGRESS PATRONS

Ministry of Education, Science and Technological Development of the Republic of Serbia
City Council of Kragujevac

CONTENT

INTRODUCTORY LECTURES

MVM2022-IL1	Giovanni Belingardi Alessandro Scattina	INTEGRATED UNDERBODY AND BATTERY PACK FOR BATTERY ELECTRIC VEHICLES: CHALLENGES AND SOLUTIONS IN THE DESIGN	3
MVM2022-IL2	Ralph Pütz	EUROPEAN POLICY ON FUTURE ROAD MOBILITY - TECHNOLOGY NEUTRALITY RIGHT OF WAY OR HEADED IN THE WRONG DIRECTION?	5

SECTION A Power Train Technology

MVM2022_002	Vasile Blaga Mihai Blaga	THE STUDY OF THE PROCESSES THAT TAKE PLACE IN GASOLINE INJECTION ENGINES	9
MVM2022_003	Vasile Blaga Mihai Blaga	THE INDICATED DIAGRAMS IN P-V COORDINATES CALCULATED AND MEASURED ON THE ENGINE STAND	11
MVM2022_005	Miroslav Demić Aleksandar Đurić Aleksandar Grkić Momir Drakulić <u>Slavko Muždeka</u>	A CONTRIBUTION TO INVESTIGATION OF OSCILLATORY LOADS OF DRIVING AXLES IN ORDER TO CREATE CONDITIONS FOR LABORATORY TESTS OF TRUCKS	13
MVM2022_014	Vanja Šušteršič Vladimir Vukašinović Dušan Gordić Mladen Josijević	3D PRINTING OF HYDRODINAMIC COUPLING FOR SCHOOL EDUCATION	15
MVM2022_016	Luka Ponorac Ivan Blagojević Aleksandar Grkić	ANALYSIS OF POWERTRAIN'S WORKLOAD DURING THE TURNING PROCESS OF A HIGH- SPEED TRACKED VEHICLE	17
MVM2022_019	Ivan Grujić Aleksandar Davinić Nadica Stojanović Jovan Dorić Sunny Narayan	THE INFLUENCE OF THE FUEL STRATIFICATION ON THE IC ENGINE WORKING CYCLE WITH THE COMPRESSED NATURAL GAS	19
MVM2022_021	Predrag Mrđa Marko Kitanović Nenad Miljić Slobodan Popović	INTERNAL COMBUSTION ENGINE TEST PLAN EXECUTION ORDER OPTIMIZATION USING TRAVELLING SALESMAN PROBLEM HEURISTICS APPROACH	21
MVM2022_022	Nebojša Nikolić Nikola Crnogorac Jovan Dorić Dalibor Feher Stjepan Galamboš	A COMPARISON OF MAIN BEARINGS LOAD OF TWO-CYLINDER "V" AND BOXER MOTORCYCLE ENGINES	23

MVM2022_023	Zoran Masoničić Ivan Grujić Aleksandar Davinić Slobodan Savić Radivoje Pešić	NUMERICAL ANALYSIS OF INTAKE PORT MODIFICATION ONTO FLUID FLOW PATTERN AND FLAME PROPAGATION IN PARTICULAR COMBUSTION CHAMBER	25
MVM2022_045	Saša Milojević Slobodan Savić Radoje Jovanović Blaža Stojanović Dušan Arsić Božidar Krstić	APPLICATION OF LIQUEFIED NATURAL GAS IN MOBILE SYSTEMS	27
MVM2022_047	Marko N. Kitanović Predrag D. Mrđa Slobodan J. Popović Nenad L. Miljić	THE INFLUENCE OF NARX CONTROL PARAMETERS ON THE FUEL EFFICIENCY IMPROVEMENT OF A HYDRAULIC HYBRID POWERTRAIN SYSTEM	29
MVM2022_055	Boris Stojić Aleksandar Poznić	NOVEL MODULAR POWERTRAIN PROPOSAL FOR E-BICYCLE	31

SECTION B

Vehicle Design and Manufacturing

MVM2022_006	Ana Pavlovic Cristiano Fragassa	IMPACT DAMAGE ANALYSIS OF COMPOSITE AUTOMOTIVE COMPONENT	35
MVM2022_011	Saša Jovanović Zorica Đorđević Sonja Kostić Danijela Nikolić Milan Đorđević	SELECTION OF SHAFT MATERIALS USING A MULTICRITERIA APPROACH	37
MVM2022_017	Momir Drakulić Lazar Stojnić Ivan Blagojević Aleksandar Đurić Sreten Perić	DEVELOPMENT OF MATHEMATICAL MODEL FOR DESIGN OF VEHICLE STEERING SYSTEM	39
MVM2022_020	Nina Busarac Dragan Adamović Nenad Grujović Fatima Živić	LIGHTWEIGHT MATERIALS FOR AUTOMOBILES	41
MVM2022_026	Sonja Kostić Bogdan Živković Aleksandra Ivanović Dragan Džunić Suzana Petrović Vladimir Kočović	DEVELOPMENT OF DEVICES FOR TESTING DYNAMIC DURABILITY OF MATERIALS	43
MVM2022_032	Stjepan Galamboš Dalibor Feher Nenad Poznanović Nebojša Nikolić Dragan Ružić Jovan Dorić	EXPERIMENTAL AND NUMERICAL STUDIES OF REDUCING OF DRAG FORCE A SEMI-TRAILER TRUCK MODEL USING THE CABIN SPOILER	45
MVM2022_033	Elena Angeleska Vasko Changoski Tashko Rizov Sofija Sidorenko	MBSE APPROACH FOR FACILITATING THE APPLICATION OF STANDARDS IN THE VEHICLE DEVELOPMENT PROCESS	47

MVM2022_034	Slavica Miladinović Blaža Stojanović Sandra Gajević Lozica Ivanović Aleksandar Skulić	A REVIEW OF HYPEREUTECTIC ALUMINUM PISTON MATERIALS	49
MVM2022_038	Sandra Gajević Jovana Krstić Slavica Miladinović Blaža Stojanović Jasmina Blagojević	POLYMER MATRIX NANOCOMPOSITES FROM THE ECOLOGICAL ASPECT IN THE AUTOMOTIVE INDUSTRY	51
MVM2022_040	Clio Vossou Andreas Nakos Dimitrios Koulocheris	TOPOLOGY OPTIMIZATION OF A MACPHERSON CONTROL ARM	53
MVM2022_043	Gordana Tošić Gordana Bogdanović Dragan Čukanović Aleksandar Radaković	FUNCTIONALLY GRADED MATERIALS IN TRANSPORT VEHICLES - OVERVIEW, FABRICATION, APPLICATION, MODELING	55
MVM2022_044	Marko Delić Vesna Mandić Filip Pavlović	ANALYSIS OF THE IMPACT OF THE MACHINE ON THE FORGING PROCESS OF A CONNECTING ROD USING NUMERICAL SIMULATION	57
MVM2022_050	Miloš Pešić Nikola Jović Vladimir Milovanović Mladen Pantić Miroslav Živković	FE MESH DENSITY INFLUENCE ON BLAST LOADING ANALYSIS	59
MVM2022_053	Isak Karabegović Edina Karabegović Mehmed Mahmić Ermin Husak	HOW THE CORE TECHNOLOGIES OF INDUSTRY 4.0 ARE CHANGING THE AUTOMOTIVE INDUSTRY IN THE WORLD, WITH A FOCUS ON CHINA	61
MVM2022_056	Lyubov Šladkova Aleksandr Siuzev	ANTI-WHEEL SLIP DEVICES	63

SECTION C

Driver/Vehicle Interface, Information and Assistance Systems

MVM2022_004	Slobodan Mišanović Dragan Taranović Miloš Maljković Branko Miličić	MEASUREMENT NOISE LEVEL OF E-BUS HIGER KLQ6125GEV3 ON THE POLYGON	67
MVM2022_010	Dragan Ružić	THE ERGONOMIC ASPECTS OF A PASSENGER CAR CLIMATE CONTROL PANEL	69
MVM2022_027	Snezana Petković Valentina Golubović- Bugarski Gordana Globočki-Lakić Željko Đurić	INVESTIGATION OF THE PERMITTED LEVEL OF DAMAGE OF VEHICLES SAFETY GLASS	71
MVM2022_028	Slavica Macužić Saveljić Danijela Miloradović	SIMULATION OF PEDESTRIAN THROW DISTANCE IN THE SOFTWARE PACKAGE PC- CRASH - COMPARISON WITH EXPERIMENT AND THEORY	73
MVM2022_0030	Slavica Macužić Saveljić Branko Arsić Igor Saveljić Jovanka Lukić	IN-VEHICLE COMFORT ASSESSMENT DURING FORE-AND-AFT RANDOM VIBRATIONS BASED ON ARTIFICIAL NEURAL NETWORKS (ANN)	75

MVM2022_0035	Dalibor Feher Dragan Ružić Stjepan Galamboš Nebojša Nikolić Jovan Dorić	OPTIMIZATION OF THE AIR DISTRIBUTION SYSTEM IN MOTOR VEHICLE CABIN USING COMPUTATIONAL FLUID DYNAMICS	77
MVM2022_0039	Franci Pušavec Janez Kopač Krsto Mijanović	THE INFLUENCE OF STEP SHAPED ROAD SURFACE ON SAFETY WHEN DRIVING IN A BEND ON THE ROAD	79
MVM2022_0042	Ioana-Alexandra Rosu Ioana Diana Buzdugan Laurentiu Carabulea Csaba Antonya	SIMULATION OF A PEDESTRIAN COLLISION AVOIDANCE USING THE PEDESTRIAN PROTECTION SYSTEM	81

SECTION D

Vehicle Dynamics and Intelligent Control Systems

MVM2022_008	Vase Jordanoska Vasko Changoski Darko Danev	COORDINATED CONTROL OF ESC WITH ACTIVE FRONT STEERING AND ACTIVE SUSPENSION NORMAL FORCE CONTROL FOR BETTER VEHICLE'S DYNAMIC RESPONSE	85
MVM2022_009	Nadica Stojanović Ivan Grujić Oday I. Abdullah Ali Belhocine Jasna Glišović	THE DETERMINATION OF THE DISC BRAKE THERMAL STRESSES FOR DIFFERENT VEHICLE SPEEDS	87
MVM2022_013	Ketan Kotecha Aleksandar Jovanović Katarina Kukić Vaishali Dinesh Khairnar Ana Uzelac Rahee Walambe Likhesh Kolhe	THE ECOLOGY-BASED OPTIMIZATION OF TRAFFIC SIGNAL TIMING ON SUPER STREET	89
MVM2022_024	Saša Vasiljević Branislav Aleksandrović Jasna Glišović Marko Maslač	REGENERATIVE BRAKING ON ELECTRIC VEHICLES: WORKING PRINCIPLES AND BENEFITS OF APPLICATION	91
MVM2022_031	Vasko Changoski Igor Gjurkov Vase Jordanoska	IMPROVING VEHICLE DYNAMICS EMPLOYING INDIVIDUAL AND COORDINATED SLIDING MODE CONTROL IN VEHICLE STABILITY, ACTIVE FRONT WHEEL STEERING AND ACTIVE REAR WHEEL STEERING SYSTEMS IN CO-SIMULATION ENVIRONMENT	93
MVM2022_037	Aleksandar Poznić Boris Stojić	NUMERICAL SIMULATION OF AN ELECTROMECHANICAL BRAKE CONCERNING ASSOCIATED DIFFICULTIES	95
MVM2022_041	Clio Vossou Ioannis Katsas Dimitrios Koulocheris	EVALUATION OF THE ROLLOVER THRESHOLD OF TANK VEHICLES	97
MVM2022_046	Boris Stojić Aleksandar Poznić	COMPUTATIONAL ASSESSMENT OF LIGHT EXPERIMENTAL HYBRID VEHICLE BRAKING EFFICIENCY	99
MVM2022_048	Vasko Changoski Ile Mircheski Darko Danev	IMPROVING RIDE COMFORT BY OPTIMISING SUSPENSION SYSTEM OF AN ELECTRIC STREET SWEEPER	101

MVM2022_049	Nikola Nešić Julijana Simonović Milan Blagojević Saša Milojević Srđan Jović	VEHICLE SUSPENSION SYSTEM WITH INTEGRATED INERTER – EXTENDED ANALYSIS	103
-------------	---	--	-----

SECTION E
Transport Challenges in Emerging Economies

MVM2022_015	Alin Drosu Corneliu Cofaru Mihaela Virginia Popescu	THE INVESTIGATION OF THE SINGLE VEHICLE ACCIDENTS SEVERITY BY USING A PROBABILISTIC APPROACH	107
-------------	---	--	-----

MVM2022_018	Bojana Bošković Saša Babić Branimir Milosavljević	USE OF ALTERNATIVE INTERSECTIONS IN ORDER TO IMPROVE TRAFFIC SAFETY	109
-------------	---	--	-----



Zoran Masoničić¹
Ivan Grujić²
Aleksandar Davinić³
Slobodan Savić⁴
Radivoje Pešić⁵

NUMERICAL ANALYSIS OF INTAKE PORT MODIFICATION ONTO FLUID FLOW PATTERN AND FLAME PROPAGATION IN PARTICULAR COMBUSTION CHAMBER

KEYWORDS: computational fluid dynamics, turbulence modelling, flame propagation

It is known for a long time that inlet port geometry has a great influence onto fluid flow pattern and flame propagation in spark ignition IC engines. In this paper only the initial results of the very complex study on the effects that proposed inlet port modification has onto the in-cylinder flow processes including the combustion stage, in particular. The study mentioned below incorporates state of the art multidimensional numerical modelling of reactive flow in the inlet port and combustion chamber geometry layout with moving boundaries of spark ignition IC engine with two valves. The main objective of this study is to investigate the possibilities for improvement the IC engine output characteristics through the inlet port modifications. Bearing in mind that flame propagation through unburnt mixture of spark ignition IC engine is primarily controlled by dint of turbulence diffusion, it is of prime importance for engine optimization to correctly identify the influence of certain types of organized flows onto the fluid flow pattern and flame propagation. The efforts for improvement have to be aimed on the type of organized flow or eventually their combination that is of prime importance for further development of the in-cylinder processes and combustion stage.

¹ Zoran Masoničić, Institute of Nuclear Sciences "Vinča", University of Belgrade, M. Petrovića Alasa 12-14, 11351 Belgrade, Serbia, masonicz@vinca.rs, -

² Ivan Grujić, University of Kragujevac, Faculty of Engineering, 6 Sestre Janjić Str., 34000 Kragujevac, Serbia, ivan.grujic@kg.ac.rs, <https://orcid.org/0000-0003-0572-1205>

³ Aleksandar Davinić, University of Kragujevac, Faculty of Engineering, 6 Sestre Janjić Str., 34000 Kragujevac, Serbia, davinic@kg.ac.rs, -

⁴ Slobodan Savić, University of Kragujevac, Faculty of Engineering, 6 Sestre Janjić Str., 34000 Kragujevac, Serbia, ssavic@kg.ac.rs, -

⁵ Radivoje Pešić, University of Kragujevac, Faculty of Engineering, 6 Sestre Janjić Str., 34000 Kragujevac, Serbia, pesicr@kg.ac.rs, <https://orcid.org/0000-0002-9669-1744>

ISBN 978-86-6335-096-0



9 788663 350960