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ECOLOGY -
VEHICLE AND ROAD SAFETY
- EFFICIENCY
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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 HYDRODYNAMIC 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 Gjurov 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
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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

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APPLICATION OF LIQUEFIED NATURAL GAS IN MOBILE SYSTEMS

KEYWORDS: exhaust emission, liquefied natural gas, mobile systems, transportation


In the paper, it systematized the possibilities for the application of liquefied natural gas in mobile systems for transportation on longer distances. For calculation of energy consumption and greenhouse gas production, when applied different fuels it is proposed the use of the European Standard EN 16258:2012.


In countries like the Republic of Serbia in particular (with a large river port, a big international airport, many tourist centers and the transportation of goods by trucks due to the connection with international companies, etc.), the demand for alternative fuels which are suitable for long distance applications is expected to remain high. Natural gas is a high-quality fuel for propulsion systems. Available reserves equal the known oil reserves; negative influence upon environment is less than with fuels derived from oil, as well as the price. Due to that, natural gas as a fuel has been having a growing application in motor vehicles.

The growing number of vehicles powered by natural gas has required in parallel new regulations and rulebooks regulating this field to be adopted. The requirements related to the aspect of safety and functionality of installation of gas devices and equipment have been defined under regulations UN ECE 110R and UN ECE 115R. Laws and bylaws applicable in the Republic of Serbia are: Road traffic safety law, Rulebook on the Classification of Motor Vehicles and Trailers and Technical Conditions for Vehicles in Road Traffic and vehicle testing rulebook.


Cryogenic fuels such as LNG (liquefied natural gas) and liquid hydrogen are attractive alternatives due to their high specific energy density, but they are at a disadvantage compared to other fuels in terms of their volumetric energy density, meaning that they require greater storage volume, a critical aspect for aviation as example. Another way to increase the energy of stored natural gas on vehicles is under higher pressure of 20 MPa onboard in cylinders as CNG (compressed natural gas). In the Republic of Serbia, natural gas was used for the first time in serially produced MAZ-BIK buses for the needs of city traffic in Kragujevac.


Figure 1 shows the parts of the installation for supplying the engine with natural gas, in the case when the gas is stored under high pressure in a gaseous state CNG or in a liquid state in a cryogenic tank LNG.


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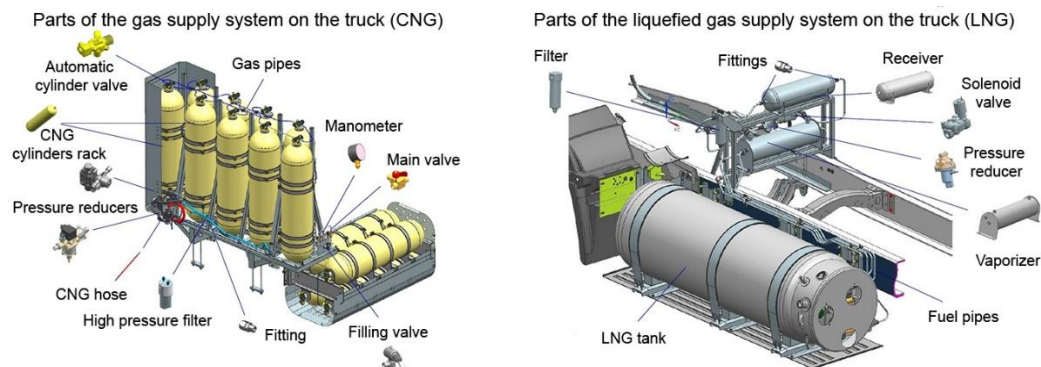


Figure 1. Gas engine power supply system - dedicated (CNG and LNG).

Liquefied natural gas is predominantly methane (92-98%), that has been liquefied by condensation at cryogenic temperatures. At atmospheric pressure, the condensation temperature of natural gas is about ($-162\text{ }^{\circ}\text{C}$). In the process of liquefying natural gas, its volume decreases by approx. 600 times.

When using different types of fuel, it is necessary to systematize the methods for calculating fuel consumption and emissions for comparison. The EN 16258 European Standard establishes a common methodology for the calculation and declaration of energy consumption and greenhouse gas (GHG) emissions related to any transport service.

Periodical Technical Inspection of gas powered vehicles means a periodical administrative uniform procedure by which the authorized technical Inspection Centers responsible for conducting the inspection tests declare, after carrying out the required verifications, that the wheeled vehicle submitted conforms to the requirements.

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