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Politehnica University Timisoara, Faculty of Engineering, Hunedoara, Romania
University of Szeged, Faculty of Engineering, Szeged, Hungary**



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Dear Ladies and Gentlemen, respectable Colleagues and Friends of KOD,

It is a real pleasure and great honor for us to greet You on behalf of the Organizing Committee of the Ninth International Symposium about machine and industrial design in mechanical engineering – KOD 2016. This year, symposium KOD, for the third time, takes place in Hotel Marina in Balatonfüred, Hungary on 9th and 12th June 2016, and I would like to thank You for participating in it.

As we all know, the basic goal of this event is to assemble experienced researchers and practitioners from universities, scientific institutes and different enterprises and organizations from this region. Also, it should initiate more intensive cooperation and exchanging of practical professional experiences in the field of shaping, forming and design in mechanical and graphical engineering, industrial design and shaping, product development and management. Having always present need for making more effective, simpler, smaller, easier, noiseless, cheaper and more beautiful and esthetic products that can easy be recycled and are not harmful for environment, the cooperation between specialists of these fields should certainly be intensive.

Fifty articles are published in the Proceedings. It is the same number of papers as in last symposium. This means our colleagues and friends of KOD are always active. Of course, we believe that time for organizing symposium has not passed and we want to prove it. However, published papers are very interesting, contribute to the understanding of design building relationships across multidisciplinary design domains including engineering and product development, innovation, manufacturing, management, complexity, human behaviour and system design, so that means these topics have potentials and have to be further researched.

Thank You for coming in Balatonfüred to take part in symposium KOD 2016 and for Your interesting articles. I wish You success in Your further researching and great fortune and happiness in personal life.

Prof. D.Sc. Siniša Kuzmanović, Eng.

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CONTENTS:

1. DESIGN OF AUTOMOTIVE GEARBOX WITH TOP PROPERTIES BASED AT HYBRID AND CVT APPROACH	
Milosav OGNJANOVIĆ, Dragan DŽODAN	1
2. FORMATION OF A VIRTUAL DESIGN DEPARTMENT FOR DEVELOPMENT OF HIGH-TECH PRODUCTS IN AN SME	
Gorazd HLEBANJA, Marjan JENKO	7
3. COST ESTIMATION IN THE EARLY STAGE OF PRODUCT DEVELOPMENT	
Dejan LUKIC, Mijodrag MILOŠEVIĆ, Jovan VUKMAN, Stevo BOROJEVIĆ, Mića ĐURĐEV, Aco ANTIĆ	13
4. IMPROVEMENT OF E-LEARNING PROCESS OF PACKAGING RAPID PROTOTYPING COMPUTER NUMERICAL CONTROL MACHINE SYSTEMS	
Dragoljub NOVAKOVIĆ, Ivan PINČJER, Stefan ĐURĐEVIĆ, Gojko VLADIĆ, Nemanja KAŠIKOVIĆ, Uroš NEDELJKOVIĆ	19
5. DEVELOPMENT OF IMPROVED WHEEL HUB PROTOTYPE THROUGH IDEALAB PLATFORM FOR STUDENTS'S CONTEST	
Zoran ANIŠIĆ, Igor FÜRSTNER, Atila NAĐ, Nemanja SREMČEV, László GOGOLÁK	23
6. TRANSFORMING PRODUCT-CONSUMER COMMUNICATION THROUGH AUGMENTED REALITY TECHNOLOGY	
Gojko VLADIĆ, Dragoljub NOVAKOVIĆ, Nemanja KAŠIKOVIĆ, Ivan PINČJER, Stefan ĐURĐEVIĆ	29
7. A NEW CONCEPT OF BICYCLE FRAME DESIGN	
Marija MATEJIC, Milos MATEJIC, Marijana MILICEVIC, Lozica IVANOVIC	33
8. 3D MODELLING OF CONSTRUCTION TOWER CRANE	
Stefan ILIC, Nenad MILORADOVIC, Rodoljub VUJANAC	37
9. STRUCTURAL SYNTHESIS OF THE MANIPULATOR OF THE THERMOFORMING MACHINE	
Maja ČAVIĆ, Marko PENČIĆ, Miodrag ZLOKOLICA	41
10. ANALYSIS OF THE CONCEPTUAL SOLUTIONS OF BIOMASS PELLET MILL	
Marko PENČIĆ, Maja ČAVIĆ, Miodrag ZLOKOLICA	45
11. DETERMINATION OF BASIC MECHANICAL PARAMETERS OF THE TRACTOR TYRE BY USING UNIVERSAL APPROACH	
Boris STOJIĆ, Aleksandar POZNIĆ	49
12. STRESS AND STRAIN STATE OF CYCLOID GEAR UNDER DYNAMIC LOADS	
Mirko BLAGOJEVIĆ, Miloš MATEJIĆ	55
13. USE OF SUN-AND-PLANET MECHANISM IN EDUCATIVE SYSTEM	
Dušan JEŠIĆ, Pavel KOVAČ, Borislav SAVKOVIĆ, Marin GOSTIMIROVIĆ, Ivan SOVILJ-NIKIĆ	59

14. EFFICIENCY AS AN EXPRESSION OF PLANETARY GEAR TRAIN ENERGY LOSSES	
Jelena STEFANOVIĆ-MARINOVIĆ, Sanjin TROHA, Miloš MILOVANČEVIĆ	63
15. LOAD CAPACITY OF CYLINDRICAL WORM GEARS ACCORDING TO DIN 3996-2012	
Aleksandar MILTENOVIĆ, Milan BANIĆ, Đorđe MILTENOVIĆ	67
16. ANALYSIS OF SELECTION PROCEDURES OF UNIVERSAL WORM GEAR UNITS	
Siniša KUZMANOVIĆ, Milan RACKOV, Ivan KNEŽEVIĆ, Miroslav VEREŠ	73
17. NUMERICAL ANALYSIS OF MOTORCYCLE SUSPENSION SYSTEM	
Slavica MAČUŽIĆ, Jovanka LUKIĆ	79
18. INFLUENCE OF VANES SHAPE ON FLOW VELOCITY OF VENTILATED DISC IN HEAVY TRUCK BRAKING	
Nadica STOJANOVIC, Jasna GLISOVIC, Ivan GRUJIC	83
19. A COMPUTER PROGRAM FOR THE VISUALIZATION OF IC ENGINE CRANKSHAFT MAIN BEARINGS LOAD	
Nebojša NIKOLIĆ, Jovan DORIĆ, Mitar JOCANOVIĆ	89
20. NONLINEAR KINEMATICS OF ENGINE CRANK-PISTON MECHANISM	
Ivan GRUJIC, Danijela MILORADOVIC, Nadica STOJANOVIC	93
21. DYNAMIC ANALYSIS AND PARAMETRIC OPTIMISATION OF THE CONNECTING ROD USING AUTODESK INVENTOR	
Vasile George CIOATĂ, Imre KISS	99
22. NEW INTERNAL COMBUSTION ENGINE	
Jovan DORIĆ, Nebojša NIKOLIĆ	105
23. STUDY ON BEHAVIOUR IN SERVICE OF DIESEL ENGINES AND ASPECTS CONCERNING THEIR MAINTENANCE	
Olimpia COROIAN	109
24. GASODYNAMIC STUDY OF THE INTAKE ROUTE AT A SPARK-IGNITION ENGINE	
Sorin RAȚIU, Vasile ALEXA	113
25. ON MAGNETORHEOLOGICAL BRAKE FEM MODELING	
Aleksandar POZNIC, Danijela MILORADOVIC, Boris STOJIC	117
26. THE INFLUENCE OF THE ECCENTRICITY ON SAFETY COEFFICIENT ON A BUTTERFLY VALVE BIPLANE DISC	
Tiberiu Ștefan MĂNESCU, Cristian Marius MIMIȘ, Zeno-Iosif PRAISACH	123
27. DIRECTIONAL DEFORMATION OF THE BIPLANE DISC BY MOVING THE ECCENTRICITY	
Cristian Marius MIMIȘ	127
28. GEOMETRY CHARACTERISTICS OF HUMAN BODY MODEL SUITABLE FOR SIMULATION OF THERMAL COMFORT IN AN AGRICULTURAL VEHICLE	
Dragan RUŽIĆ, Mirko SIMIKIĆ	131

29. DEVELOPMENT AND MANUFACTURING OF SENSOR CASES FOR MEMS INERTIAL MEASUREMENT UNITS	
Florin CORCIOVA, Gheorghe-Daniel VOINEA, Andrei MARCU, Ivan KNEŽEVIĆ, Milan RACKOV	137
30. AUTOMATIC TECHNOLOGY FOR GLUING CERAMIC HOBS	
Gábor PINTYE, Gheorghe ACHIMAȘ, Csaba GYENGE	143
31. COMPARISON OF DIFFERENT FLUIDIC MUSCLES	
József SÁROSI	147
32. LUBRICATION REGIME INFLUENCE ON COLD STAMPING PARTS	
Silviu Dan AVRAM, Silviu Răzvan AVRAM, Tiberiu Ștefan MĂNESCU	151
33. APPLICATION OF RAPID PROTOTYPING IN MAXILLOFACIAL SURGERY	
Aleksandar DIMIC, Zarko MISKOVIC, Drago JELOVAC, Radivoje MITROVIC, Mileta RISTIVOJEVIC, Marija MAJSTOROVIC	157
34. CAVITATION EROSION BEHAVIOR OF THE STEEL 17CrNiMo6	
Ilare BORDEASU, Mircea Octavian POPOVICIU, Cristian GHERA, Laura Cornelia SALCIANU, Lavinia Madalina MICU, Corneliu Eusebiu PODOLEANU	163
35. LINEAR ELECTRIC MOTORS – NEW POSSIBILITIES FOR SMART LINEAR MOTION	
László GOGOLÁK, Igor FÜRSTNER	169
36. ANALYSIS OF NEW TECHNICAL SOLUTION IN PROCESS OF DETOXIFICATION ELV FROM ENVIRONMENTAL ASPECT	
Miroslav VULIĆ, Eleonora DESNICA, Aleksandar TOMOVIĆ	173
37. ESTIMATION BY FUZZY LOGIC OF ABRASIVE WEAR PROPERTIES OF COATED VALVES SURFACES BY TIG WELDING	
Hakan GÜRÜN, Uğur ARABACI	177
38. END-MILLING FORCE CONTROL SYSTEM WITH SURFACE ROUGHNESS MONITORING	
Uros ZUPERL, Franc CUS	181
39. CLAMPING AND SUSPEND SYSTEMS TO MANIPULATIONS DOCKING RAMPS	
Vasile ALEXA, Sorin RAȚIU	185
40. EXTERNAL FACTORS INFLUENCE ON THE METAL COFFERDAM WALLS PROTECTING RIVERS IN CASE OF NATURAL DISASTERS	
Silviu Răzvan AVRAM	189
41. INNOVATIVE, SAFE AND COST-EFFICIENT LIGHT-WEIGHTING SOLUTIONS IN THE AUTOMOTIVE WHEEL MANUFACTURING	
Imre KISS, Vasile George CIOATA	193
42. COMPUTER-AIDED STRIP LAYOUT FOR PIERCING AND CUTTING DIES	
Onur ÇAVUŞOĞLU, Gökhan KÜÇÜKTÜRK	199
43. OPTIMIZATION OF PROCESS PARAMETERS OF SURFACE ROUGHNESS INAL-7075 DRILLING PROCESS	
Ramazan ÇAKIROĞLU, Adem ACIR	203

44. DETERMINATION OF OPTIMUM PARAMETERS OF CUTTING FORCE IN DRILLING OF B₄C ALUMINUM COMPOSITE WITH TAGUCHI METHOD	
Adem ACIR, Ramazan ÇAKIROĞLU, Yakup YURGUT, Selçuk YAĞMUR	207
45. EFFECTS OF CUTTING PARAMETERS ON THE CUTTING FORCE AND TORQUE IN DRILLING OF AISI D2 STEEL	
İsmail TEKAÜT, Halil DEMİR, Hacı Bekir ÖZERKAN, Ulvi ŞEKER	211
46. AN EXPERIMENTAL STUDY OF THE EFFECT OF ABRASIVE WATER JET AND LASER BEAM ON THE SURFACE INTEGRITY	
Duran KAYA, Gökhan KÜÇÜKTÜRK, H. Bekir ÖZERKAN	217
47. TIP-JET HELICOPTER PROPULSION SYSTEM TESTING	
Nenad KOLAREVIĆ, Nebojša KOSANOVIĆ, Marko MILOŠ	221
48. MODULAR CONSTRUCTION OF CIRCULAR MANIPULATOR AS A TEST BED FOR TESTING PNEUMATIC CONTROL	
Vule RELJIC, Dragan SESLIJA, Jovan SULC, Brajan BAJCI, Slobodan DUDIC, Ivana MILENKOVIC	225
49. INVESTIGATION OF MACHINING CARBON FIBER REINFORCED COMPOSITE MATERIALS WITH SOLID CEMENTITE CARBIDE TOOLS	
Selçuk YAĞMUR, Yafes ÇAVUŞ, Abdullah KURT, Hasan Basri ULAŞ, Ulvi ŞEKER	229
50. RISK ASSESSMENT EMISSION OF POLLUTION FROM ROAD TRANSPORT IN THE URBAN AREA CITY OF ZRENJANIN IN THE AIM OF ENVIRONMENT PROTECTION – USING THE SOFTWARE ADMS-ROADS	
Aleksandar ĐURIĆ, Miroslav VULIĆ, Una MARČETA, Bogdana VUJIĆ, Milan PAVLOVIĆ	235
INDEX	241



NUMERICAL ANALYSIS OF MOTORCYCLE SUSPENSION SYSTEM

Slavica MAČUŽIĆ
Jovanka LUKIĆ

Abstract: A shock absorber is the main part of a vehicle suspension system. This mechanical device has a role to reduce the bumpy road shocks and enable a more comfortable ride. In this study we investigated the behavior of a shock absorber, that is installed on the motorcycle, with three different material of helical springs. 3D model was created using Catia v5 r18. Numerical simulation was done by Ansys workbench 12.0. The results of von Mises stress, deformation and shear stress, in the case of three different materials of coil spring, are analyzed and presented.

Key words: shock absorber, suspension system, helical spring, finite element method

1. INTRODUCTION

A shock absorber presents a mechanical or hydraulic device that is designed to absorb the holes and bumps on the road. Kinetic energy of the shock is transformed into another form of energy, for example, in the heat, and then performs dissipation. A coil spring, as the main part of the shock absorber, is defined as an elastic body. Spring has a role to compress when loaded, and to return to the initial state, when the load disappears. In this study, we used three different materials of helical coil spring: structural steel, spring steel and chromium-vanadium steel. The last two materials are increasingly used in the suspension system. It is very important to determine which steel gives better results in real conditions.

2. LITERATURE REVIEW

A large number of researchers studying the suspension system of the vehicle. The goal is to design an optimal shock absorbers and using quality materials of helical coil, get better vehicle performance.

The authors [2] have presented an analysis of the shock absorber before and after optimization design. They executed the change in diameter of the coil and the use of

two materials showed how different loads affect the operation of the damper.

The author [3] observed the behavior of spring steel as the main material coils. It is a new material, invented by Japanese researchers, that has application in the suspension system. They concluded that spring steel having very high ultimate tensile strength.

Another author [4] has studied the behavior of the shock absorber when using two different materials coils. These materials are structural steel and aluminum alloy. A comparison was made for the same boundary conditions, and the result of research shows that best material for shock absorber is the steel.

As it is known, a composite material made from two or more constituent materials with significantly different physical or chemical properties. The resulting material has a better structure than the individual components. Recent research [5] studying composite materials. It was concluded that composite materials may find use in suspension systems because they have high strength, high stiffness and low weight.

3. MATERIALS AND METHODS

3.1. Model definition

A 3D computer model of a shock absorber was developed using the CATIA v5 r18. The total height is 336 mm. Helical coil spring has the following physical characteristics:

- height 220 mm,
- diameter of wire 10 mm,
- total number of coils 10,
- outer diameter of spring coil 70 mm.

Figure 1 show 3D geometry of a shock absorber.

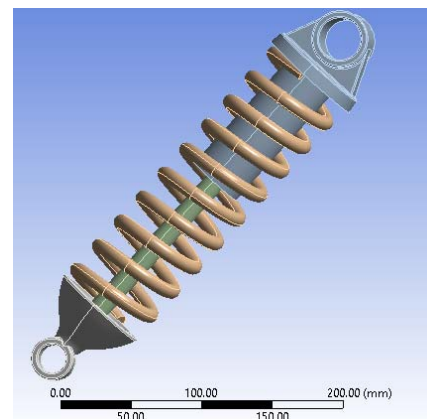


Fig.1. Geometry of shock absorber

Weight of motorcycle is 125 kg. In this study, it is assumed that a vehicle has two passenger of 75 kg. Rear suspension absorbs 60% of the total weight, and the force that acting on the shock absorber has a value of 1618 N. One end of the model is fixed, while at the other end acts mentioned value of the force.

3.2. Material definition

Numerical simulations were conducted with three different materials of helical spring. The following

