

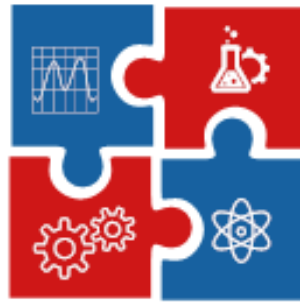
**Innovation Center of
Faculty of Mechanical
Engineering**



**Faculty of Mechanical
Engineering, University
of Belgrade**



**Center for Business
Trainings**



CNN TECH

**„International Conference of Experimental and
Numerical Investigations and New Technologies“**

Sponsored by:

MINISTRY OF EDUCATION OF THE REPUBLIC OF SERBIA

Programme and The Book of Abstracts

04 – 07 July 2023

Zlatibor, Serbia

**„International Conference of Experimental and Numerical
Investigations and New Technologies“**

CNN TECH 2023

04 – 07 July 2023

Hotel Mona, Miladina Pecinara 26, Zlatibor, Serbia

<http://cnntechno.com>

Programme and The Book of Abstracts

Organised by:

Innovation Center of Faculty of Mechanical Engineering
Faculty of Mechanical Engineering, University of Belgrade
Center for Business Trainings

Sponsored by:

Ministry of Education of the Republic of Serbia

<i>J. Dinkic, S. M. Levic, V. Nedovic, N. Obradovic, A. DJordjevic</i> RADIO-FREQUENCY ELECTRICAL CHARACTERIZATION OF VIABLE-CELL SUSPENSIONS	38
<i>Nada V. Ratkovic Kovacevic, Goran Z. Vojnovic, Djordje N. Dihovicni, Dragan D. Kreculj</i> AUTOMATED LIBRARY INVENTORY USING STEPPER MOTOR AND ARDUINO BOARD .	39
<i>Milos Milosevic, Nenad Korolij, Isaak Trajkovic, Ivan Zlatanovic</i> A METHOD DEVELOPMENT FOR ANALYSING FOOD TEXTURE AND EXAMINING CRISPINESS	40
<i>Milos Milosevic, Nenad Korolij, Isaak Trajkovic, Ivan Zlatanovic</i> COMPRESSION DETERMINATION OF DIFFERENT TYPES OF DRIED VEGETABLES	41
<i>Ivica Camagic, Milivoje Jovanovic, Simon Sedmak, Predrag Zivkovic, Mladen Radojkovic</i> INFLUENCE OF TEMPERATURE ON CRACK INITIATION AND CRACK GROWTH RESISTANCE OF WELDED JOINT CONSTITUENTS FOR STEEL SA-387 GR. B WELDS SUBJECTED TO CYCLIC LOADS	42
<i>Dragan D. Milkovic, Goran Z. Simic, Sasa Z. Radulovic, Vojkan J. Lucanin, Aleksandra S. Kostic Milicic</i> THE ROLE OF RELAY VALVE WITH KINKED CHARACTERISTICS IN BRAKING WAGONS WITH DIFFERENT BRAKES IN A FREIGHT TRAIN.....	43
<i>M. Maksimovic, I. Vasovic Maksimovic, S. Manasijevic, M. Djuric, S. Maksimovic</i> NUMERICAL AND EXPERIMENTAL STUDY OF FATIGUE STRENGTH OF HELICOPTER COMPOSITE TAIL ROTOR BLADES.....	44
Numerical Methods.....	45
<i>Adriana Peles Tadic, George Vukovic, Aleksandar Kojovic, Dusica Stojanovic, Branislav Vlahovic, Natasa Milosavljevic, Nina Obradovic, Vladimir Pavlovic</i> FRACTAL ANALYSIS AND MICROSTRUCTURE DEVELOPMENT OF BATIO3 AND PVDF BASED MULTIFUNCTIONAL MATERIALS	46
<i>Mirko Maksimovic, Ivana Vasovic Maksimovic, Katarina Maksimovic</i> STRESS AND STRENGTH ANALYSIS OF SANDWICH CONSTRUCTION: NUMERICAL AND EXPERIMENTAL STUDY	47
<i>DJordje D. DJurdjevic, Andrijana A. DJurdjevic, Nina M. Andjelic, Ana S. Petrovic, Vesna Milosevic-Mitic</i> COMPARATIVE ANALYSIS OF THIN-WALLED Ω PROFILE EXPOSED TO THE ACTION OF CONSTRAINED AND UNCONSTRAINED TORSION	48
<i>Rafa, K., Petkovic, J.</i> VARIATIONS OF THE AHP METHOD, AND APPLICATION OF THE AHP EXPRESS METHOD IN THE MULTICRITERIA EVALUATION OF COMPANIES	49

THE ROLE OF RELAY VALVE WITH KINKED CHARACTERISTICS IN BRAKING WAGONS WITH DIFFERENT BRAKES IN A FREIGHT TRAIN

Dragan D. Milkovic^{1*}, Goran Z. Simic¹, Sasa Z. Radulovic¹, Vojkan J. Lucanin¹, Aleksandra S. Kostic Milicic¹

¹University of Belgrade, Faculty of Mechanical Engineering, Department of Rail Vehicles, 11120 Belgrade, Serbia

*Corresponding author e-mail: dmilkovic@mas.bg.ac.rs

Abstract

This paper explains the problem of more pronounced heating of the wheels and wear of the brake shoes of equally loaded railway vehicles with SS or S2 tread brakes compared to wagons with S0 or S1 brakes when they are in the same train composition. As the mass of the railway vehicle increases and the square of the speed increases, the energy that is converted into heat during braking increases. In the case of tread brakes, this heat is dissipated to a lesser extent through the shoes, and to a greater extent through the wheel. Due to the uneven temperature field, parts of the wheel expand differently, and thermal stresses arise in the wheel. During extreme braking, the thermal stresses in the circumferential part of the wheel can exceed the yield point of the material, and as a result, permanent deformations occur due to circumferential compression. After cooling, residual tensile stresses are created in the direction of the wheel circumference. In extreme cases, this can cause the wheels to crack. For this reason, it is necessary to limit the intensity of braking, especially during long-term partial braking due to speed regulation on railway down slopes. However, the maximum braking force must not be limited. This is achieved by introducing a variable load relay valve with kinked characteristics. The Kink valve is a relay valve of a special design, which, based on the level of loading of the wagon, maps the pressure in the brake cylinder, so that when braking from 80 to 100% of the maximum pressure at all loads, the braking force is proportional to the load, and during partial braking, in the case of a load over 14.5 t/axle, the braking force is reduced, so that the wheels do not overheat during frequent partial braking.

Keywords

Freight wagons, braking, relay valve, kinked characteristics, wheel overheating.

Acknowledgement

Authors express gratitude to Ministry of Education, Science and Technological Development of Republic of Serbia, Project Contract 451-03-9/2023-14/200105.