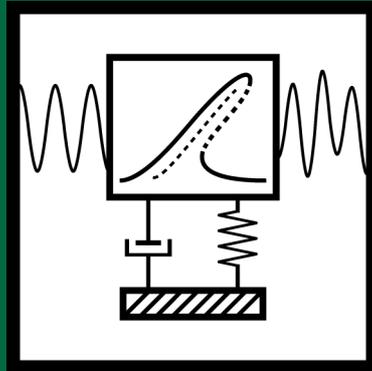


May 2017, Volume 11  
ISSN 2345-0533

# Vibroengineering PROCEDIA



## Editor in chief

K. Ragulskis Lithuanian Academy of Sciences, (Lithuania) k.ragulskis@jve.lt, ragulskis.jve@gmail.com

## Managing Editor

M. Ragulskis Kaunas University of Technology, JVE International, (Lithuania) minvydas.ragulskis@ktu.lt m.ragulskis@jvejournals.com

## Editorial Board

H. Adeli The Ohio State University, (USA) adeli.1@osu.edu  
V. Babitsky Loughborough University, (UK) v.i.babitsky@lboro.ac.uk  
R. Bansevicius Kaunas University of Technology, (Lithuania) ramutis.bansevicus@ktu.lt  
M. Bayat Roudehen Branch, Islamic Azad University, (Iran) mbayat14@yahoo.com  
I. Blekhman Mekhanobr – Tekhnika Corporation, (Russia) iliya.i.blekhman@gmail.com  
K. Bousson University of Beira Interior, (Portugal) bousson@ubi.pt  
A. Bubulis Kaunas University of Technology, (Lithuania) algimantas.bubulis@ktu.lt  
R. Burdzik Silesian University of Technology, (Poland) rafal.burdzik@polsl.pl  
M. S. Cao Hohai University, (China) cmszhy@hhu.edu.cn  
Lu Chen Beihang University, (China) luchen@buaa.edu.cn  
F. Chernousko Institute for Problems in Mechanics, (Russia) chern@ipmnet.ru  
Z. Dabrowski Warsaw University of Technology, (Poland) zdabrow@simr.pw.edu.pl  
Y. Duhovnik Institute of Machine Building Mechanics, (Russia) l institut@bk.ru  
J. Duhovnik University of Ljubljana, (Slovenia) joze.duhovnik@lecad.uni-lj.si  
S. Ersoy Marmara University, (Turkey) sersoy@marmara.edu.tr  
A. Fedaravičius Kaunas University of Technology, (Lithuania) algimantas.fedaravicius@ktu.lt  
R. Ganiev Blagonravov Mechanical Engineering Research Institute, (Russia) rganiev@nwmtc.ac.ru  
W. H. Hsieh National Formosa University, (Taiwan) allen@nfu.edu.tw  
V. Kaminskas Vytautas Magnus University, (Lithuania) v.kaminskas@if.vdu.lt  
V. Klyuev Association Spektr – Group, (Russia) v.klyuev@spektr.ru  
G. Kulvietis Vilnius Gediminas Technical University, (Lithuania) genadijus.kulvietis@vgtu.lt  
V. Lyalin Izhevsk State Technical University, (Russia) velyalin@mail.ru  
R. Martonka Technical University of Liberec, (Czech Republic) rudolf.martonka@tul.cz  
R. Maskeliūnas Vilnius Gediminas Technical University, (Lithuania) rimas.maskeliunas@vgtu.lt  
L. E. Muñoz Universidad de los Andes, (Colombia) lui-muno@uniandes.edu.co  
V. Ostaševičius Kaunas University of Technology, (Lithuania) vytautas.ostasevicus@ktu.lt  
A. Palevičius Kaunas University of Technology, (Lithuania) arvydas.palevicius@ktu.lt  
G. Panovko Blagonravov Mechanical Engineering Research Institute, (Russia) gpanovko@yandex.ru  
L. Qiu Nanjing University of Aeronautics and Astronautics, (China) lei.qiu@nuaa.edu.cn  
S. Rakheja Concordia University, (Canada) subhash.rakheja@concordia.ca  
V. Royzman Khmelniyskiy National University, (Ukraine) iftommm@ukr.net  
M. A. F. Sanjuan University Rey Juan Carlos, (Spain) miguel.sanjuan@urjc.es  
P. M. Singru BITS Pilani, (India) pmsingru@goa.bits-pilani.ac.in  
A. El Sinawi The Petroleum Institute, (United Arab Emirates) aelsinawi@pi.ac.ae  
E. Shahmatov Samara State Aerospace University, (Russia) shakhm@ssau.ru  
G. Song University of Houston, (USA) gsong@uh.edu  
S. Toyama Tokyo A&T University, (Japan) toyama@cc.tuat.ac.jp  
K. Uchino The Pennsylvania State University, (USA) kenjiuchino@psu.edu  
A. Vakhguel't Nazarbayev University, (Kazakhstan) anatoli.vakhguel't@nu.edu.kz  
A. Valiulis Vilnius Gediminas Technical University, (Lithuania) algirdas.valiulis@vgtu.lt  
P. Vasiljev Lithuanian University of Educational Sciences, (Lithuania) vasiljev@vpu.lt  
V. Veikutis Lithuanian University of Health Sciences, (Lithuania) vincentas.veikutis@ismuni.lt  
J. Viba Riga Technical University, (Latvia) janis.viba@rtu.lv  
V. Volkovas Kaunas University of Technology, (Lithuania) vitalijus.volkovas@ktu.lt  
J. Wallaschek Leibniz University Hannover, (Germany) wallaschek@ids.uni-hannover.de  
Xiao-Jun Yang China University of Mining and Technology, (China) dyangxiaojun@163.com  
Mao Yuxin Zhejiang Gongshang University, (China) maoyuxin@zjgsu.edu.cn  
M. Zakrzhevsky Riga Technical University, (Latvia) mzakr@latnet.lv

# VP Vibroengineering PROCEEDIA

Vibroengineering PROCEEDIA Volume 11 contains papers presented at the 25-th International Conference on VIBROENGINEERING held in Liberec, Czech Republic, 30 May-1 June, 2017. The main theme of this Conference is “Vibration and acoustics in automotive industries – problems and applications”.

## Aims and Scope

Original papers containing developments in vibroengineering of dynamical systems (macro-, micro-, nano- mechanical, mechatronic, biomechanics and etc. systems).

The following subjects are principal topics: vibration and wave processes; vibration and wave technologies; nonlinear vibrations; vibroshock systems; generation of vibrations and waves; vibrostabilization; transformation of motion by vibrations and waves; dynamics of intelligent mechanical systems; vibration control, identification, diagnostics and monitoring.

**All published papers are peer reviewed and crosschecked by plagiarism detection tools.**

More information is available online <http://www.jvejournals.com>

## Vibroengineering PROCEEDIA is referred in:

**SCOPUS:** ELSEVIER Bibliographic Database.

**COMPENDEX:** ELSEVIER Bibliographic Database.

**EBSCO:** Academic Search Complete;  
Computers & Applied Sciences Complete;  
Central & Eastern European Academic Source;  
Current Abstracts;  
TOC Premier.

**GALE Cengage Learning:** Academic OneFile Custom Periodical.

**INSPEC:** OCLC. The Database for Physics, Electronics and Computing.

**GOOGLE SCHOLAR:** <http://scholar.google.com>

**CROSSREF:** <http://www.crossref.org>

**Internet:** <http://www.jveconferences.com>; <http://www.jvejournals.com>

**E-mail:** [m.ragulskis@jvejournals.com](mailto:m.ragulskis@jvejournals.com); [conferences@jve.lt](mailto:conferences@jve.lt)

**Address:** Geliu ratas 15A, LT-50282, Kaunas, Lithuania

**Publisher:** JVE International Ltd.

# VP Vibroengineering PROCEDIA

---

MAY 2017. VOLUME 11, PAGES (1-204). ISSN 2345-0533

## Contents

### MECHANICAL VIBRATIONS AND APPLICATIONS

<b>LATERAL DISTRIBUTION CALCULATION OF MULTI-I BEAM COMPOSITE CURVED BRIDGE WITH SLIP EFFECT</b>	<b>1</b>
XUXI QIN, CHUNLI WU, HANBING LIU, CHENGXIU XIANG	
<b>INVESTIGATION OF VIBRATIONS DURING DEEPHOLES MACHINING</b>	<b>7</b>
LEONID KONDRATENKO, LYUBOV MIRONOVA, VIKTOR TEREKHOV	
<b>FAULT DIAGNOSIS BASED ON VIBRATION SIGNAL ANALYSIS</b>	
<b>VIBRATION BASED DIAGNOSIS OF WHEEL DEFECTS OF METRO TRAIN SETS USING ONE PERIOD ANALYSIS ON THE WAYSIDE</b>	<b>13</b>
ONUR KILINÇ, JAKUB VÁGNER	
<b>A HEALTH STATE ASSESSMENT METHOD FOR SHIP PROPULSION SYSTEM BASED ON FUZZY THEORY AND VARIABLE WEIGHT THEORY</b>	<b>19</b>
PIAN HU, TAOTAO ZHOU	
<b>VIBRATION DIAGNOSTICS OF SMALL HYDROELECTRIC POWER STATION MACHINERY</b>	<b>25</b>
MARTIN MAZAC, ELIAS TOMEH	
<b>FATIGUE LIFE ESTIMATION ALGORITHM OF STRUCTURES WITH HIGH FREQUENCY RANDOM VIBRATION BASED ON HYBRID ENERGY FINITE ELEMENT METHOD</b>	<b>29</b>
J. ZENG, H. B. CHEN, Y. Y. WANG	
<b>EXPERIMENTAL HALTS WITH SINE-ON-RANDOM SYNTHESIZED PROFILES</b>	<b>34</b>
MARCO TRONCOSSI, ALESSANDRO RIVOLA	
<b>AN APPROACH TO FAULT DIAGNOSIS FOR ROTATING MACHINERY BASED ON FEATURE RECONSTRUCTION WITH LCD AND T-SNE</b>	<b>40</b>
JIAYU CHEN, DONG ZHOU, CHUAN LYU, CHEN LU	
<b>A FAULT DIAGNOSIS METHOD FOR A PRACTICAL ENGINEERING APPLICATION BASED ON CEEMD AND ELM</b>	<b>46</b>
JIAYU CHEN, HONGYONG FU, YANG WANG, DONG ZHOU	

## VIBRATION GENERATION AND CONTROL

<b>WATERPROOF ULTRASONIC MOTOR</b>	<b>52</b>
S. TOYAMA, U. NISHIZAWA	
<b>A NEW TYPE FLEXIBLE TRANSMISSION MECHANISM USED IN OCEAN ENERGY CONVERTERS</b>	<b>56</b>
JIAN ZHANG, YANJUN LIU, TONGTONG HE, JINGWEN LIU, YUDONG XIE	

## SEISMIC ENGINEERING AND APPLICATIONS

<b>SEISMIC RESPONSE ANALYSIS ON SHEAR LAG EFFECT OF CONTINUOUS CURVED BOX GIRDER WITH THREE SPANS</b>	<b>62</b>
HAILIN LU, HENG CAI, HONGYIN YANG, KAIYI XUE	
<b>COMBINATION RULES FOR STEEL BUILDINGS UNDER SEISMIC LOADING: MDOF VS SDOF SYSTEMS</b>	<b>67</b>
ALFREDO REYES-SALAZAR, MARIO LLANES TIZOC, EDEN BOJORQUEZ, JUAN BOJORQUEZ, FEDERICO VALENZUELA-BELTRAN, JOSE GAXIOLA-CAMACHO	
<b>MAXIMUM INTER-STORY DRIFT DEMANDS OF STEEL FRAMES IN TERMS OF THE INTENSITY MEASURE <math>I_{Np}</math></b>	<b>73</b>
EDÉN BOJÓRQUEZ, VICTOR BACA, JUAN BOJÓRQUEZ, ALFREDO REYES-SALAZAR, ROBESPIERRE CHÁVEZ, MARÍA HERNÁNDEZ	
<b>ANALYSIS AND OPTIMIZATION OF MUTUAL INFLUENCE OF SINGLE CHANNEL TUNNEL CONSTRUCTION BLASTING</b>	<b>79</b>
JUNFENG ZHANG, MING LI, XIAOLIN YANG	
<b>STUDY ON THE WEIGHT COEFFICIENT INFLUENCE OF SURFACE WATER ON THE STABILITY OF OPEN-PIT DUMP. COMPARATIVE ANALYSIS OF 6 DEGREE SEISMIC SIMULATION</b>	<b>85</b>
ZHEN-GUO XING, WENFENG DU	

## MODAL ANALYSIS AND APPLICATIONS

<b>COMPARISON OF MODAL CHARACTERISTIC OF WRAPPED AND WINDED COMPOSITE TUBES FROM CARBON PREPREG</b>	<b>91</b>
PETR KULHAVY, PETR LEPSIK	

## VIBRATION IN TRANSPORTATION ENGINEERING

<b>BEAM ELEMENTS AS APPROXIMATE MODELS OF VIBRATING MECHANICAL SUBSYSTEMS OF FREIGHT WAGONS</b>	<b>97</b>
ANDRZEJ BUCHACZ	
<b>ANALYSES OF TRUCK POWERTRAIN TORQUE AND VIBRATION</b>	<b>101</b>
PAVEL KUČERA, VÁCLAV PÍŠTĚK	
<b>NUMERICAL SIMULATION AND MEASUREMENT OF CAR STRUT UNDER SHOCK VIBRATION</b>	<b>107</b>
ONDŘEJ NOVÁK, MICHAL PETRŮ, ALEŠ LUFINKA	
<b>ANALYSIS OF VIBRATION TRAITS OF UNDERWATER VEHICLE PROPULSION SHAFTING AND OPTIMIZATION DESIGN OF SUPPORT PARAMETERS</b>	<b>112</b>
ZHONGCHAO YANG, JIONG SUN, JINGJUN LOU, QINGCHAO YANG	
<b>FIBER COMPOSITES FOR CAR SEATS</b>	<b>119</b>
MARTIN DVORAK, RUDOLF MARTONKA, MARTINA SYROVATKOVA	

## FLOW INDUCED STRUCTURAL VIBRATIONS

- NUMERICAL MODELLING OF SCOUR AROUND CIRCULAR CYLINDER CAUSED BY JET FLOW AND BED SHEAR STRESS** 123  
HYOSEOB KIM, SEUNGHOO LEE, JUNGKIL LEE, HAK SOO LIM, HEE-SUK RYOO

## OSCILLATIONS IN BIOMEDICAL ENGINEERING

- PHYSIOLOGICAL EFFECT OF GRAPHENE OXIDE ON TOBACCO BY-2 SUSPENSION CELLS AND ITS IMMIGRATION** 129  
NANNAN CHEN, PENG FENG, XIANYAN LIAO, PING LI, ZHANMIN LIU, JUNYI HUANG

## OSCILLATIONS IN ELECTRICAL ENGINEERING

- A SHIP'S MAGNETIC FIELD CAMOUFLAGE METHOD BASED ON MULTI-OBJECTIVE GENETIC ALGORITHM** 135  
DONG TIAN, SHENG-DAO LIU, ZHI-XIN LI
- NANOMETRIC DISPLACEMENT MEASUREMENT BASED ON INTERFERENCE FRINGES DEFLECTION** 140  
HELY GONZÁLEZ-RIVERA, G. E. SANDOVAL-ROMERO
- EFFECTS OF BOLT SLIPPAGE ON THE WIND INDUCED RESPONSES OF TRANSMISSION TOWER LINE SYSTEM** 145  
XIUZHEN ZHAO, HAIBO CHEN, MIN YE, YINGQING HUANG

## ACOUSTICS, NOISE CONTROL AND ENGINEERING APPLICATIONS

- LOW-INTENSITY ACOUSTIC WAVES DETECTION USING AN INTERFEROMETER** 151  
F. J. ÁLVAREZ-RAMÍREZ, G. E. SANDOVAL ROMERO
- ANALYSIS OF HYDRODYNAMIC NOISE CHARACTERISTICS OF RUDDER-WING** 155  
DUO QU, ZHENHAI ZHANG, JINGJUN LOU
- OPTIMIZATION FOR HEAT AND SOUND INSULATION OF HONEYCOMB SANDWICH PANEL IN THERMAL ENVIRONMENTS** 161  
JINLONG YUAN, HAIBO CHEN, QIANG ZHONG, KONGJUAN LI
- INFLUENCE OF GEAR GRIP QUALITY ON NOISE LEVELS OF GEARBOX** 167  
ELIAS TOMEH, TOMÁŠ OUDRNICKÝ
- NOISE LEVEL OF REVERSE MOTION GEARING OF GEARBOX** 173  
TOMÁŠ OUDRNICKÝ, ELIAS TOMEH
- STUDY OF THE ACOUSTIC ATTENUATION IN PLASTER COMPOSITES IN DEPENDENCY ON ADDED FIBER REINFORCEMENT** 179  
ALZBETA SAMKOVA, PETR KULHAVY

## MEASUREMENTS IN ENGINEERING

- MEASUREMENT OF SPEED IRREGULARITIES** 186  
JAN NOVÁK

## MATHEMATICAL MODELS IN ENGINEERING

- NUMERICAL SIMULATION OF HIGH-SPEED WATER-ENTRY FOR HEMISPHERICAL-NOSED PROJECTILE** 190  
YU-SONG SUN, SUI-HUA ZHOU, XIAO-BING ZHANG

<b>ROLE OF SLANTED REINFORCEMENT ON BENDING CAPACITY SS BEAMS</b> MOHAMMAD REZA GHASEMI, AYDIN SHISHEGARAN	<b>195</b>
<b>INTRODUCING BOX-PLATE BEAM-TO-COLUMN MOMENT CONNECTIONS</b> A. SHISHEGARAN, S. RAHIMI, H. DARABI	<b>200</b>

