

*Scientific Research Centre  
"MachineStructure"*

*Amazon Kindle Direct Publishing*



**ISSN 2474-5901**

# **Journal of Advanced Research in Technical Science**

**Issue 28**

**Seattle, USA, 2022**

**Journal of Advanced Research in Technical Science. –**  
Seattle, USA: SRC MS, AmazonKDP. –  
2022. – Issue 28. – 142 p.

ISSN 2474-5901

Themes of journal: 1) Mechanical engineering and engineering science; 2) Mathematics and mechanics; 3) Mechatronics and robotics; 4) Transport, mining and construction machinery; 5) Power, metallurgical and chemical engineering; 6) Instrument making, metrology and information-measuring devices and systems; 7) Electrical and Electronics; 8) Informatics, computer engineering and management; 9) Engineering geometry and computer graphics; 10) Materials science; 11) Technology, machinery and equipment of Agroengineering systems; 12) Transport; 13) Construction and architecture; 14) Problems of personnel training in mechanical engineering.

*Editor in Chief:*

Ivan A. Zhukov – Saint-Petersburg mining university. Department of mechanical engineering. Doctor of sciences

*Editorial Board:*

Elvira R. Zvereva – Kazan state power engineering university. Departments of technology in energy and oil and gas processing. Doctor of sciences

Daba N. Radnaev – Buryat state academy of agriculture. Department of mechanization of agricultural processes. Doctor of sciences

Vladimir I. Sarbaev – Moscow polytechnic university. Department of Land Vehicles. Doctor of sciences

Lev A. Saruev – Tomsk polytechnic university. Department of Oil and Gas Business. Doctor of sciences

Aleksandr B. Filimonov – MIREA – Russian technological university. Department of automatic systems. Doctor of sciences

Ildar S. Barmanov – Samara national research university. Department of machine design. Candidate of sciences

Elena S. Gebel – Omsk state technical university. Department of automation and robotics. Candidate of sciences

Azamat K. Djamankulov – Kyrgyz-Russian Slavic university. Department of mechanics. Candidate of sciences

Oleg S. Krol – Volodymyr Dahl East-Ukrainian National University. Department of engineering, machines and tools. Candidate of sciences

Nikita V. Martyushev – Tomsk polytechnic university. Department of Materials Science. Candidate of sciences

Copyright © 2022 Authors, SRC MS  
All rights reserved.  
ISBN: 979-8424192661

## CONTENTS

### Mechanical engineering and engineering science

- Nosov N.V., Yakubovich E.A.** Simulation of forging process based on the theory of adaptability ..... 6
- Evdokimov A.P.** Investigation of temperature fields of rubber cord shells of power drives of rolling stock..... 13
- Roshchin M.N., Krivosheev A.Yu.** Dependence of the coefficient of friction on the composition of carbon-containing material at high temperatures ..... 18
- Eliseev A.V., Mironov A.S.** Methodological approaches to the assessment of the totality of dynamic states and forms of interactions of elements of vibrating machines for transport and technological purposes ..... 22

### Mathematics and mechanics

- Kravchuk A.S., Kravchuk A.I.** To the issue of the correctness of modern studies of the equation of free oscillations of a mathematical pendulum ..... 26

### Mechatronics and robotics

- Bokhonsky A.I., Varminskaya N.I.** Minimum energy coercion to achieve the goal of controlled object motion ..... 30

### Transport, mining and construction machinery

- Zenkov S.A., Dryupin P.Yu., Bondalet I.S.** Determination of factors affecting the strength of soil freezing to machines ..... 37
- Lukienko L.V.** Substantiation of methods for manufacturing traction organs of large-module heavy-loaded rack and pinion gears ..... 41

### Power, metallurgical and chemical engineering

- Stolyarenko A.E.** Prospects for the processing of hydrocarbons in the Kaliningrad region..... 46

Electrical and Electronics

**Plotnikov S.M., Rubtsov K.D., Chinkov P.O.** Using the asynchronous motor's own stator capacity to compensate for reactive power..... 50

**Petukhov S.V., Balantseva N.B., Butakov S.V., Kalinicheva O.A., Krishyanis M.V., Khviyuzov M.A.** On the issue of developing an algorithm and clarifying the calculation of the characteristics of an asynchronous traction motor of the NTA-350 type..... 54

Informatics, computer engineering and management

**Matushkin V.P., Linkova Ya.A., Soboleva D.V.** Development of a laboratory stand "Drencher fire extinguishing system" ..... 63

Engineering geometry and computer graphics

**Sazonov S.E., Strelyanaya Yu.O., Tarakhovskiy A.Yu.** Interdisciplinarity in the geometric and graphic training of students of technical specialties, taking into account the WorldSkills competence standard "CAD Engineering Design" ..... 71

**Afanasieva I.B., Guseva T.A., Merkulova O.V.** Some aspects of engineering graphics training and control organization in the educational process..... 75

**Tarakhovskiy A.Yu., Sazonov S.E., But A.Yu.** Practice-oriented training in the geometric and graphic training of students of technical specialties..... 79

Materials science

**Tsaruk F.F., Pishchov M.N., Belsky S.E.** Kinetics of fatigue properties of metals and alloys under high frequency loading ..... 83

Technology, machinery and equipment of Agroengineering systems

**Belov M.I.** Evaluation of energy requirement of tillage with a rotary tiller ..... 87

**Koneva S.A., Matveev Yu.V., Tsaloev V.M.** Comparative assessment of the energy efficiency of seawater desalination methods..... 94

**Kassabekov M.I., Kassymov U.T., Dzhundibaev V.E., Akhmetov K.T.**  
New devices for the water recycling system of car washes ..... 98

**Makarov S.A., Danilin A.V., Azizov Ir.R., Alekseev V.S., Shishkin I.V.,  
Azizov Il.R.** The device and the principle of operation of the automated  
complex for the production of vermicompost ..... 103

*Transport*

**Tomleeva S.V., Moiseev G.D., Iudichev I.M., Drakunov I.I.** Reduction of  
road ruttes with improved vehicle drivability and stability..... 112

**Shishko E.A., Zhirnova A.S., Zhuravlev A.N.** Electromagnetic railways ..... 116

*Construction and architecture*

**AL-Jabri Mohanad Kadhem Ali, Ladik E.I.** Urban planning standards of  
Iraqi cities on the example of the city of Al-Amara, Maysan province ..... 121

**Skuratov N.V., Sobolev A.V., Usov D.V.** Determination of specific screw  
withdrawal resistance of thermally modified wood of birch, oak and ash..... 129

**Sobolev A.V., Skuratov N.V., Usov D.V.** Static bending strength of  
thermally modified birch, oak and ash wood ..... 134

*Problems of personnel training in mechanical engineering*

**Boyko L.A., Ksendzenko L.S.** Organizational and methodological aspects of  
preparing students of a technical university for olympiads in higher  
mathematics and theoretical mechanics ..... 138

Scientific periodical issue

ISSN 2474-5901

# Journal of Advanced Research in Technical Science

Issue 28

ISBN: 979-8424192661

---

*Founder:* Elena V. Zhukova.  
*Editorial:* Scientific Research Centre «MachineStructure».  
*Editor in chief:* Ivan A. Zhukov.  
*Printed by* AmazonKDP, Seattle WA.

*Publication Date:* 25.02.2022.  
*Title ID:* 22-03.  
*Trim Size:* 7" x 10" (17.78 x 25.4 cm).  
*Number of copies:* 50 min.

Seattle, USA:  
Scientific Research Centre «MachineStructure», Amazon Kindle Direct Publishing  
2022