

*Scientific Research Centre  
"MachineStructure"*

*Amazon Kindle Direct Publishing*



**ISSN 2474-5901**

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

**Issue 35**

**Seattle, USA, 2023**

**Journal of Advanced Research in Technical Science. –**  
Seattle, USA: SRC MS, AmazonKDP. –  
2023. – Issue 35. – 118 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

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 © 2023 Authors, SRC MS

All rights reserved.

ISBN: 979-8395835390

## CONTENTS

### Mechanical engineering and engineering science

<b>Magomedov M.H.</b> The concept of using serial stepper motor in digital impact engraving systems .....	5
<b>Ryabicheva L.A., Belozir I.I.</b> Evolution of physical and mechanical properties during free burnishing of a powder billet.....	11
<b>Bokhonsky A.I., Golovin V.I., Ryzhkov A.I.</b> Analysis of bending-torsional vibrations of a drill .....	15
<b>Murlina P.V., Malyshev E.N.</b> Selecting a CNC milling machine.....	22
<b>Roshchin M.N.</b> Influence of temperature and load on the coefficient of friction of the Carbon fiber material .....	26
<b>Mukutadze M.A., Kirishchieva V.I., Badakhov G.A., Shvedova V.E., Zinoviev N.V.</b> Study of wear resistance in a bearing with a metal coating taking into account the dependence of viscosity on pressure.....	30
<b>Lagutova S.S., Vyatkin A.G.</b> Selection of a set of cutting tools for machining a group of parts on cnc milling machines.....	39
<b>Rakov D.L., Bardenhagen A., Pecheykina M.A., Todorov V.T.</b> Potential application of the morphological approach for the purposes of value engineering.....	43

### Mathematics and mechanics

<b>Alymbaev A.T., Soltonkulova Zh.M., Murzaev T.</b> Asymptotic expansion of periodic solution of differential equation with small second order parameter.....	46
--	----

### Mechatronics and robotics

<b>Tyulenev I.D., Filimonov N.B.</b> Automatic control for parking self-driving carbased on dubins and reeds-shepp models.....	52
--	----

### Power, metallurgical and chemical engineering

<b>Ametov I.E., Yagyaev A.K., Khokhlov A.V.</b> Quality control of resistance spot welding copper and aluminum by non-destructive method.....	60
---	----

Informatics, computer engineering and management

- Korotkov A.A., Bukunov S.V.** Cross-platform application for learning to develop graphical user interfaces using Qt library ..... 65

Materials science

- Bogdanov R.A.** The relationship between the impact strength of freight car castings and the chemical composition of steel 20GL ..... 74
- Bykov P.A., Kalashnikov I.E., Kobeleva L.I., Katin I.V., Mikheev R.S.** Influence of reinforcement of an antifriction alloy ao20-1 on the friction process stability of composite materials..... 79
- Roshchin M.N.** Temperature distribution in a coating with zirconium diboride particles during laser reflow ..... 84

Technology, machinery and equipment of Agroengineering systems

- Surin R.O., Sokolov M.S., Shields S.V., Kuznetsov E.E.** The use of a combined agricultural unit on slitting and rolling in the conditions of the Amur region ..... 88
- Alshynova A.M., Smailova A.T., Nasrullin G.Sh., Mukhamadieva K.K.** Methods of concentration and their effect on the technological properties of powdered milk..... 93
- Ershova I.G.** Feasibility study of the introduction of a microwave thawer of animal colostrum in a farm..... 100

Transport

- Sukhoverov A.A., Barkov K.V.** Analysis of the risk of oil and oil products spill during sea transportation ..... 107
- Matrosov S.V.** The concept of augmentation of reinforcement learning algorithms using cellular models of a traffic network in a traffic signal control problem ..... 113

Scientific periodical issue

ISSN 2474-5901

# Journal of Advanced Research in Technical Science

Issue 35

ISBN: 979-8395835390

---

*Founder:* Elena V. Zhukova.

*Editorial:* Scientific Research Centre «MachineStructure».

*Editor in chief:* Ivan A. Zhukov.

*Printed by* AmazonKDP, Seattle WA.

*Publication Date:* 23.05.2023.

*Title ID:* 23-10.

*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  
2023