Organized by Odessa National Polytechnic University,
National Technical University «Kharkiv Polytechnic Institute»,
Sumy State University
and International Association for Technological Development and Innovations

InterPartner

Grabchenko's International Conference on Advanced Manufacturing Processes 2023

http://interpartner.odessa.ua

5th Grabchenko's International Conference on Advanced Manufacturing Processes

September 5-8, 2023 | Odessa, Ukraine

Book of Abstracts

Science unites people together.

International Association for Technological Development and Innovations

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Sumy
2023

Editors:
Volodymyr Tonkonogyi, Vitalii Ivanov, Ivan Pavlenko, Justyna Trojanowska

Advanced Manufacturing Processes: Book of Abstracts of the 5th Grabchenko's International Conference on Advanced Manufacturing Processes, Odessa, Ukraine, September 5-8, 2023 / Volodymyr Tonkonogyi, Vitalii Ivanov, Ivan Pavlenko, Justyna Trojanowska (Eds.). – Sumy: IATDI, 2023. – 94 p.

Recommended by Coordination Board of International Association for Technological Development and Innovations (Protocol No. 5, February 1, 2023)

This book offers a timely snapshot of innovative research and developments at the interface between design, manufacturing, materials, mechanical and process engineering, and quality assurance. It covers various manufacturing processes, such as grinding, milling, broaching, and gear machining, including additive manufacturing, vibrational-centrifugal strengthening, laser-ultrasonic surface hardening, and antifriction coatings. It focuses on computer and numerical simulation, mathematical and integrated process modeling, parametric synthesis, virtual prototyping, automatic control, design of manufacturing, mechanical and mechatronics systems. It describes innovative cutting and abrasive processes and combined technologies. It also covers the formation, strengthening, and thermomechanical rolling. It also investigates the temperature field behavior, thermal stability, wear resistance, and other processes of various materials. Gathering the best papers presented at the 5th Grabchenko's International Conference on Advanced Manufacturing Processes (InterPartner-2023), held in Odessa, Ukraine, on September 5–8, 2023, this book provides a comprehensive and up-to-date examination of design, manufacturing, mechanical, materials, and process engineering, as well as quality assurance trends and technologies. Yet, it also aims at fostering international and interdisciplinary communication and collaborations, offering a bridge between the academic and industrial sector.

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Welcome Message

5th Grabchenko's International Conference on Advanced Manufacturing Processes (InterPartner-2023), held in Odessa, Ukraine on September 5-8, 2023, was organized by the Odessa Polytechnic State University, National Technical University "Kharkiv Polytechnic Institute", Sumy State University, and International Association for Technological Development and Innovations in partnership with Poznan University of Technology (Poland), Springer Nature, and iThenticate.

InterPartner Conference Series promotes research and developmental activities, intensifying scientific information interchange between researchers, developers, and engineers.

InterPartner-2023 received 87 contributions. After a thorough peer-review process, the Program Committee accepted 53 papers written by authors from 13 countries. Thank you very much to the authors for their contribution. These papers are published in the present book, achieving an acceptance rate of 60%.

We thank members of the Program Committee and invited external reviewers for their efforts and expertise in contributing to reviewing, without which it would be impossible to maintain the high standards of peer-reviewed papers.

Thank you very much to keynote speakers Dr. Slawomir Luscinski (Kielce University of Technology, Poland) and Prof. Vasily Larshin (Odessa Polytechnic National University, Ukraine).

The editors appreciate the outstanding contribution of all the authors. We are deeply convinced that the research papers presented in the book will be helpful to scientists, industrial engineers, and highly qualified practitioners worldwide.

Thank you very much to InterPartner Team. Their involvement, devotion, and hard work were crucial to the success of the conference.

InterPartner's motto is **"Science unites people together"**.

Volodymyr Tonkonogyi,
General Chair of the Conference

Vitalii Ivanov,
Co-Chair of the Conference

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Conference Topics

Manufacturing Engineering

- Advanced Manufacturing Processes
- CAD/CAE/CAPP/CAM Systems for Design, Manufacturing, and Assembling Technologies
- Information Management Systems for Manufacturing Enterprises
- Intelligent Manufacturing Systems and Industry 4.0 Strategy
- Automation and Robotics
- Engineering Education

Mechanical Engineering

- Engineering Design and Optimization
- Computer Modeling of Fracture, Failure, and Fatigue
- Computational Techniques in Machine Mechanics and Dynamics
- Numerical Methods for Dynamics, Acoustics, and Vibration
- Computational Methods for Control Theory
- Numerical Simulation of Nonlinear Dynamic Systems

Materials Science

- Theoretical Fundamentals and Mathematical Modeling
- Numerical Simulation and Optimization
- Methods and Technologies for Additive Manufacturing
- Resource-Saving and Energy Efficient Technologies in Materials Science

Quality Assurance

- Theoretical Fundamentals
- Mathematical Modeling
- Standardization and Certification

Publishing Opportunities

Full papers of selected contributions of InterPartner-2023 will be published in Lecture Notes in Mechanical Engineering series (ISSN 2195-4356), Springer Nature under the title "**Advanced Manufacturing Processes V**". The books of this series are indexed by Scopus, EI Compendex, and submitted to the Web of Science Core Collection (Conference Proceedings Citation Index).

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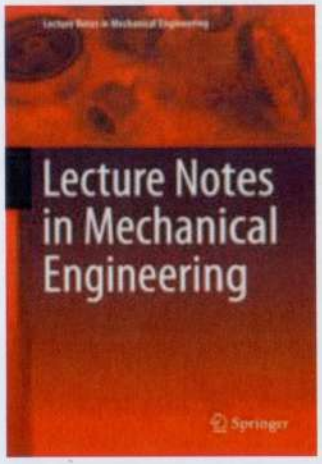

Springer Scopus

Extended versions of the best papers, presented at InterPartner-2023, will be recommended for publication in cooperating journals, subject to further review:

Management and Production Engineering Review, Poland (ISSN 2080-8208, e-ISSN 2082-1344), http://mper.org;

Journal of Engineering Sciences, Ukraine (ISSN 2312-2498, e-ISSN 2414-9381), http://jes.sumdu.edu.ua;

Assembly Techniques and Technologies, Poland (e-ISSN 2450-8217), https://journals.prz.edu.pl/tiam.

Agenda

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13^{00}–14^{00}	Time for Lunch
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13^{00}–14^{00}	Time for Lunch
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Day 1: September 5, 2023, Tuesday

0^{00}–23^{59} Day of Arrival

Odessa is the third most populous city of Ukraine and a major tourism center, seaport, and transport hub located on the northwestern shore of the Black Sea. It is also a multiethnic cultural center. Odessa is sometimes called the "Pearl of the Black Sea", the "South Capital", and "Southern Palmyra".

In 1794, the city of Odessa was founded by a decree of the Russian empress Catherine the Great. From 1819 to 1858, Odessa was a free port. During the Soviet period, it was the most important port of trade in the Soviet Union and a Soviet naval base. On 1 January 2000, the Quarantine Pier at Odessa Commercial Sea Port has been declared a free port and free economic zone for 25 years.

Odessa's historical architecture is more Mediterranean than Russian, having been heavily influenced by French and Italian styles. Some buildings are built in a mixture of different styles, including Art Nouveau, Renaissance, and Classicist.

Odessa is a warm-water port. The city of Odessa hosts both the Port of Odessa and Port Yuzhne, a significant oil terminal situated in the city's suburbs. Another notable port, Chornomorsk, is located in the same region, to the southwest of Odessa. Together they represent a major transport hub integrating with railways. Odessa's oil and chemical processing facilities are connected to European networks by strategic pipelines.

Day 4: September 8, 2023, Friday

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Chair: Oleg Zabolotnyi
Lutsk National Technical University, Ukraine

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Chair: Volodymyr Gurey
Lviv Polytechnic National University, Ukraine

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Olena Mikulich

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Yevhen Nemanezhyn, Gennadiy Lvov and Yuriy Torba

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Anatolii Panchenko, Angela Voloshina, Roman Antoshchenkov, Ivan Halych and Szymon Głowacki

The Form of a Spiral Spring in a Free State
Serhii Pylypaka, Vyacheslav Hropost, Tetiana Kresan, Tatiana Volina and Volodymyr Vasyliuk

Computer Modeling of Casting Processes for Centrifugal Pump Parts
Khrystyna Berladir, Tetiana Hovorun and Jozef Zajac

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Chair: Ivan Pavlenko
Sumy State University, Ukraine

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Dmytro Konovalov, Halina Kobalava, Mykola Radchenko, Maxim Karpoff and Yuriy Shapovalov

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Igor Palamarchuk, Vladislav Palamarchuk, Mikhailo Mushtruk, Evgenii Shtefan and Ievgenii Petrychenko

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Andrii Rogovyi, Serhiy Lukianets, Sergey Krasnikov, Iryna Hrechka and Oleksandr Shudryk

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Oleksandr Shorinov, Andrii Volkov, Anatolii Dolmatov and Kostyantyn Balushok

15^{15}–15^{45} Closing Ceremony

Chair: Volodymyr Tonkonogyi
General Chair of the Conference

The Form of a Spiral Spring in a Free State

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This article deals with a spiral spring made of tape material with a rectilinear cross-section. A classic example of the use of this type of spring is mechanical type clockwork and starter mechanisms of internal combustion engines with manual start. If one end of a metal ruler is pinched, and a specific force is applied to the other end, it will bend under the action of the generated moment. The magnitude of the moment depends on the applied force and the ruler's length. Therefore, the amount of deflection will increase with the increase of these parameters, and the shape of the ruler may take the form of a spiral. After the external load influence is terminated, the ruler will take its initial shape. That is, it will become straight. However, such spiral springs do not exist in practice. In its free state, the spring also has a spiral shape for compact sizes. This article uses the theory of elastic bending of rods for large deflections to determine this form. In addition, the initial curvature of its elastic axis in the free state must be considered for the spring. Simplifying linear bending formulas cannot be used to calculate the shape of the spring. The calculation of the shape of a spiral spring in a free state based on a given final shape with an applied moment is conducted in the article. The nonlinear bending theory is applied using the corresponding differential equations.

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Improved Methods for Diagnosing an Autotransformer with a Defect in a High-Voltage Bushing

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Aleksandr Volkov[0000-0002-9697-9406]

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The article is devoted to the improvement of methods for diagnosing an oil-filled power autotransformer of the ATDCTN-200000/330/110/10 type with an internal defect in an oil-filled high-voltage bushing of the GMTPA-45-330/1000U1 type. Purpose: improving the reliability of the results of diagnosing an oil-filled power autotransformer with an internal defect in its oil-filled high-voltage bushing by improving the methods of diagnosing, taking into account the results of electrical tests of this equipment and analyzing samples of mineral oil from them. Studies of the electrical characteristics of an oil-filled power autotransformer and an oil-filled high-voltage bushing and mineral oils' physicochemical, thermophysical, and electrical properties have been conducted. Numerical values of indicators of electrical characteristics for an oil-filled power autotransformer and its high-voltage input are determined, and for mineral transformer oils, numerical values of indicators are determined - breakdown voltage; flash point of oil vapor in an open crucible; acid number; water-soluble acids; dielectric loss tangent; density; moisture contents; the content of dissolved diagnostic gases, additives "Ionol", furan compounds. The analysis of the studies makes it possible to increase the reliability of the results of technical diagnostics of a power electric oil autotransformer with an internal defect in a high-voltage oil-filled bushing.

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