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5th International Conference on Design, Simulation, Manufacturing: The Innovation Exchange (DSMIE-2022)

June 7-10, 2022 | Poznan, Poland

Book of Abstracts

Sumy
2022

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The content of this book is based on the 5th International Conference on Design, Simulation, Manufacturing: The Innovation Exchange (DSMIE-2022), held on June 7-10, 2022, in Poznan, Poland. This book reports on topics at the interface between manufacturing, materials, mechanical, and chemical engineering. It gives a special emphasis on smart and sustainable manufacturing, describes innovative research in design engineering and manufacturing technology, covering the development and characterization of advanced materials alike. It also discusses key aspects related to ICT in engineering education. Furthermore, it covers recent findings concerning the mechanics of fluids, solids, and structures, and numerical and computational methods for solving coupled problems in manufacturing. It reports on recent developments in chemical process technology, heat and mass transfer research, and energy-efficient technologies, describing applications in the food and energy production sector. This book provides academics and professionals with extensive information on trends and technologies, and challenges and practice-oriented experience in all the above-mentioned areas.

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Conference Topics

Manufacturing Engineering

- CAx Technologies for Product Design and Advanced Manufacturing Processes
- Intelligent Manufacturing Systems, Automation, and Robotics
- Smart Manufacturing and Industry 4.0 Strategy
- Information Management Systems
- ICT for Engineering Education

Materials Engineering

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- Theoretical Fundamentals and Mathematical Modeling
- Numerical Simulation and Optimization Techniques
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Mechanical Engineering

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- Dynamics, Acoustics, and Vibrations
- Elasticity and Strength of Materials
- Hydro- and Aeromechanics
- Numerical Simulations of Coupled Problems

Chemical Engineering

- Chemical Process Technology and Plant Design
- Thermodynamics, Heat and Mass Transfer
- Energy-Efficient Technologies, Conversion, and Utilization
- Alternative and Renewable Energy Sources
- Industrial Ecology and Sustainable Engineering

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Publishing Opportunities

Full papers of selected contributions of DSMIE-2022 were published in two volumes in the book **"Advances in Design, Simulation and Manufacturing V"**. It belongs to the Lecture Notes in Mechanical Engineering series (ISSN 2195-4356). The books of this series are published by Springer Nature, indexed by Scopus, and submitted to the Web of Science Core Collection.

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Mathematical Model of Lifting Particles of Technological Material by Vertical Auger

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This research aims to investigate the transportation of a material particle by a vertically placed auger limited by a cylindrical casing. The surfaces are coaxial. When the auger rotates, the particle moves to the periphery and interacts with the cylindrical casing. The particle simultaneously slides on both surfaces and rises in absolute movement. Its relative motion is sliding along the periphery of the auger. Differential equations of particle movement in projections on a moving coordinate system that rotates with an auger were compiled. Numerical methods have solved the equations, and graphs of kinematic characteristics were built. The limit value of the rising angle for the helical line was found as the periphery of the auger. At such a position, the rise of the particle stops at a given angular velocity of the auger. It was found that the velocity of particle rising is influenced by constructive and technological parameters. In particular, for a given radius of the cylindrical casing, friction coefficients, and the edge angle of the auger, there is a minimum value of the angular velocity of its rotation. Then the particle "sticks" and rotates together with the auger, describing in absolute motion a circle on the inner surface of the cylindrical casing.

Keywords: Material Particle, Frene Trihedron, Cylindrical Casing, Sliding Trajectory, Transportation, Industrial Growth.

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The Effect of Manufacturing Tolerances on the Hydrodynamic Characteristics of Plain Bearings

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Plain bearing systems are widely used in rotor systems due to their efficiency, simplicity, long life, silent operation, low friction and wear, and in many cases, good heat dissipation. Despite the fact that a significant number of research have been published in the field of calculation and design of plain bearings, the proposed mathematical models and methods for calculating the characteristics do not consider the random changes of some geometric and operating parameters of these complex systems. The thickness of the lubricating film, which is one of the main operational parameters, is determined by the corresponding tolerances for the manufacturing of parts and assembly of the machine and a random variable. This work considers the effect of random changes in middle clearance and eccentricity values on pressure distribution based on the Reynolds equation. It is shown that the possible value of hydrodynamic force in such bearing can substantially differ from calculated under the deterministic models.

Keywords: Plain Bearing, Random Parameters, Mean Value, Film Thickness, Hydrodynamic Pressure, Industrial Growth, Process Innovation.

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