



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

June 7-10, 2022 | Poznan, Poland

Book of Abstracts

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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

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

Mechanical Engineering

- Mechanics of Solids and Structures
- 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

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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To read the full papers, please visit the official webpage of the Publisher via the following link <https://link.springer.com/conference/dsmie> or DSMIE's website <https://dsmie.sumdu.edu.ua/schedule/proceedings.html>.

Organization of Transportation of a Particle by an Inclined Cylinder Rotating Around the Axis

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The movement of a material particle on the inner surface of an inclined cylinder rotating around its axis with a constant angular velocity is investigated in the article. When a particle hits the surface of a horizontal cylinder, it begins to oscillate in the cross-sectional plane of the cylinder with a certain amplitude in the angular dimension. Its value depends on the incidence point, friction coefficient, and initial absolute velocity. Differential equations of movement in projections on the axis of a fixed coordinate system are compiled. They are solved numerically. Under the appropriate initial conditions, which are determined analytically, the particle in absolute movement can be stationary, being at a point on the cylinder at a certain distance from the lower point in the angular dimension in the direction of the rotation of the cylinder. Some movement cases are described when the angle of inclination of the cylinder's axis to the horizontal plane is greater, equal, or less than the friction angle on the cylinder's surface. An analytical solution for the last case that describes the particle's movement after stabilization is found. Visualization of the obtained results is made.

Keywords: Angular Velocity, Horizontal Cylinder, Differential Equations, Axial Direction, Friction Force, Industrial Growth.

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Supersonic Flow in the Blade Channel of the Nozzle with a Rotary Diaphragm at Small Degrees of Opening

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The article presents a study of the flow of supersonic flow in the interscapular duct of a nozzle with a rotating aperture at low degrees of opening. Modeling and calculation of the working fluid flow were carried out using the Fluent software package. The construction of computational domains, limited by one interscapular channel, for different degrees of opening of the nozzle diaphragm has been carried out. Grids for computational domains have been built. A numerical study of the flow in the interscapular channel of the C-9013R airfoil lattice at $\pi = 0.3$ $\delta = 0.3$ was carried out using the Reynolds Stress turbulence model. A numerical study of the spatial flow in the interscapular channel has been carried out. As a result of the calculations performed, the flow patterns in the interscapular channel and behind it were obtained. The distribution of the kinetic energy loss coefficients along the grating front at various degrees of opening of the diaphragm at the inlet to the nozzle apparatus. The results obtained in this work will develop a method for multi-parameter optimization of cogeneration steam turbines with controlled steam extraction.

Keywords: Supersonic Flow, Rotary Diaphragm, Blade Channel, Energy Efficiency.

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