DSM:IE 2022

5th International Conference on

Design, Simulation, Manufacturing: The Innovation Exchange

June 7-10, 2022 | Poznan, Poland

Book of Abstracts

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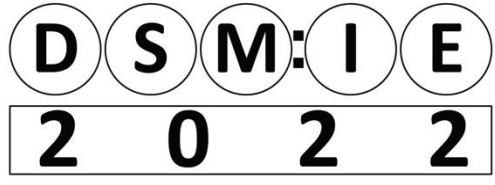

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The content of this book is based on the 5th International Conference on Design, Simulation, Manufacturing: The Innovation Exchange (DSMIE-2022), held on June 7-10, 2022, in Poznan, Poland. This book reports on topics at the interface between manufacturing, 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.

Rotor Dynamics and Stability of the Centrifugal Pump CPN 600-35 for Nuclear Power Plants

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The paper ensures the vibration reliability of the centrifugal pump CPN 600-35 for the water supply of an industrial circuit at nuclear power plants by improving its technical designs. The main aim of the research is to develop an approach for parameter identification of rotor dynamics and analyze the dynamic stability of the rotor movement. For this purpose, the modified design of the centrifugal pump CPN 600-35 was developed. Also, the main parameters of the rotor dynamics model (e.g., equivalent stiffness and discrete mass) were evaluated based on the parametric identification approach. Moreover, the eigenfrequencies and the corresponding mode shapes of free oscillations were obtained based on the finite element method. Finally, the dynamic stability of the rotor movement was studied based on the developed mathematical model of its oscillations considering the circulating and internal friction forces. Finally, based on the Routh-Hurwitz criterion, the stability region of rotor movement in terms of the dimensionless frequency and friction coefficient was analytically obtained.

Keywords: Energy Efficiency, Oscillations, Critical Frequency, Discrete-Mass Model, Parameter Identification, Circulating Force, Internal Friction, Routh-Hurwitz Criterion, Industrial Growth.

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