



Multidisciplinary Aspects of Production Engineering

MAPE 2024



10-13. SEPTEMBER 2024
POLAŃCZYK, POLAND

2024

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ISBN: 978-83-968715-2-7

2024



**XXI Międzynarodowa Konferencja
Multidisciplinary Aspects
of Production Engineering
MAPE 2024**

Conference Programme

**Polskie Towarzystwo Mechaniki Teoretycznej
i Stosowanej Oddział w Gliwicach**

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CONFERENCE PROGRAMME



**10-13. SEPTEMBER
2024
POLAŃCZYK,
POLAND**

September 10, 2024

02:00 pm – 06:00 pm	Arrival, Registration
06:00 pm – 07:00 pm	Welcome
07:00 pm	Gala Dinner

September 11, 2024

08:00 am – 09:30 am	Breakfast
10:00 am – 11:30 am	Plenary Session I
11:30 am – 12:00 am	Coffee break
12:00 am – 01:30 pm	Scientific Session II
01:30 pm – 02:15 pm	Lunch
02:30 pm – 04:00 pm	Scientific Session III
04:00 pm – 04:30 pm	Coffee break
04:30 pm – 06:00 pm	Scientific Session IV
06:30 pm – 11:00 pm	Grill

September 12, 2024

08:00 am – 09:15 am	Breakfast
09:30 am – 06:00 pm	Field trip to Solina
07:00 pm	Dinner

September 13, 2024

08:00 am – 09:15 am	Breakfast
09:30 am – 11:00 am	Poster Session V, Summary
11:00 am	Departure from the hotel

PROGRAM SZCZEGÓŁOWY KONFERENCJI

10.09.2024

OTWARCIE KONFERENCJI 18.00-19.00

11.09.2024

SESJA I, 10.15-11.30

1. Aleksandra KUZIOR

Smart City Conceptual Framework in the Context of Achieving Sustainable Development Goals

2. Wiesław "Wes" GREBSKI

Gospodarka energią elektryczną – analiza i refleksje

3. Dorota KLIMECKA-TATAR

Designing and improvement of internal transport – energy and efficiency management of modern technologies in the mining industry

4. Julia JURASIK, Jan KAŻMIERCZAK, Łukasz JANKOWSKI, Wasyl DMYTRIV

Implementation of a CMMS class system for the support of maintenance services in accordance with the TPM paradigm in a selected manufacturing enterprise

5. Leszek KAŻMIERCZAK-PIWKO, Arkadiusz DĄBROWSKI, Przemysław OSIŃSKI

Changes in the structure of regional traditional products in the lubuskie voivodeship in 2020-2024

6. Józef JONAK, Andrzej WÓJCIK

Effect of undercutting anchor head geometry on the extent of detachment

SESJA II, 12.00-13.30

1. Wiesław "Wes" GREBSKI

Psychologiczne bezpieczeństwo jako metoda zwiększenia wydajności pracy w przedsiębiorstwie

2. Łukasz BOŁOZ

Efektywne projektowanie maszyn z wykorzystaniem funkcji "i" Autodesk Inventor

3. Tomasz MAŁYSA

Application of selected Lean tools to improve work safety during usage machines

4. Aleksandra SULIK-GÓRECKA, Witold BIAŁY, Marzena STROJEK-FILUS

The importance of EU taxonomy for sustainable development reporting. Case study of entities listed on the Warsaw Stock Exchange in Poland

5. Konrad TRZOP, Jan KURIC, Jarosław BRODNY, Magdalena TUTAK

Application of modern machine diagnostic systems to improve safety in the underground mining process

6. Małgorzata MALEC, Lilianna STAŃCZAK, Magdalena DRÓŹDŹ-SZEFLIŃSKA

The use of internet and social media as marketing tools in commercialization of research results

SESJA III, 14.30-16.00

1. Dariusz KRAWCZYK, Vitalina BABENKO, Liudmyla YEMCHUK, Serhii LIENKOV, Volodymyr DZHULII, Larysa DZHULII, Ihor MULIAR

Analysis of information security under the conditions of hybrid war in Ukraine: Social aspects

2. Joanna ZARĘBSKA, Andrzej ZARĘBSKI

New requirements for packaging waste management in Poland as a way to realizing the goals of a circular economy

3. Kinga STECUŁA

Advancing Education Through Virtual Reality in the Management and Production Engineering Field of Study

4. Marzena KUCZYŃSKA-CHAŁADA, Jakub JAWOREK, Tomasz FIGA

Implementation of the World Class Manufacturing system using selected Lean Manufacturing tools in a production enterprise

5. Katarzyna MLECZKO

Methodology for Selecting Research Tools in Work Ergonomics in the Context of Occupational Specificity

SESJA IV, 16.30-18.00

1. Szymon PAWLAK

Computer simulations in planning production processes as a tool of decision making

2. Jakub WIERCIOCH

Hybrid predictive maintenance model – study and implementation example

3. Kinga BIENIEK, Olena STRYHUNIVSKA

Management of goods flow in Hyperloop transportation system

4. Roksana POLOCZEK, Beata OLEKSIK

Optimization of production processes using computer simulation

13.09.2024

SESJA V POSTEROWA, 09.30-11.00

- 1. Aleksandra MIKOŁAJCZYK, Marlena MADEJ, Bogusław SPURGIASZ, Tomasz GWIZDA, Krzysztof NOWACKI, Jakub WIECZOREK**
Innowacyjne materiały opakowaniowe – tasiemka ściągająca HDPE produkowana z recyklatów
- 2. Pavlo PRYSYAZHNYUK, Michał BEMBENEK, Ilona DRACH, Andrii KORZHOV, Liubomyr ROMANYSHYN, Liubomyr ROPYAK**
Restoration of the impact crusher rotor by FCAW with high-manganese steel reinforced with complex carbides
- 3. Tibor KRENICKÝ, Jozef MAŠČENIK, Juraj RUŽBARSKÝ, Tomáš CORANIČ**
AWJ technological head vibration during the construction steel cutting
- 4. Jozef MAŠČENIK, Tibor KRENICKÝ, Juraj RUŽBARSKÝ, Tomáš CORANIČ**
Monitoring of selected parameters of the belt transmission on a specific design solution
- 5. Henryk BADURA, Witold BIAŁY**
Eksploatacja metanu z nieczynnej kopalni „MOSZCZENICA”
- 6. Jakub KOCJAN, Joanna FURMAN**
Possibilities of application of LM methods and tools in the construction industry – Lean Construction
- 7. Robert DYLEWSKI, Janusz ADAMCZYK**
Optymalizacja izolacji termicznej budynku pod względem ekonomicznym i ekologicznym
- 8. Jacek BOJARSKI, Dawid DRAPIŃSKI, Maciej NIEDZIELA, Gabriel ZABORNIAK, Piotr ZIEMBICKI**
System monitorowania i analizy jakości powietrza
- 9. Maciej NIEDZIELA, Michał SĄSIADK, Waldemar WOŹNIAK**
Analiza rzeczywistego procesu produkcji włóknin typu spunlace w nowoczesnych zgrzeblarkach dwubębnowych
- 10. Jacek BOJARSKI, Robert DYLEWSKI, Maciej NIEDZIELA, Magdalena WOJCIECH**
Metodyka analizy binarnych sygnałów mająca na celu wykrywanie anomalii w szeregowych procesach produkcyjnych
- 11. Magdalena TUTAK**
Assessing the quality of life of regional centres in Poland in the context of smart and sustainable cities
- 12. Elena PIVARČIOVÁ, Ivan KURIC, Maroš SOLDÁN**
Development, research and design of a diagnostic system for measuring the course of temperatures, vibrations and noise

13. Arkadiusz BOCZKOWSKI

Acoustic modeling of noise emission to the environment from the shooting range area during skeet and mop competitions

14. Beata OLEKSIAK

Using Lean Manufacturing tools to improve the production process

15. Łukasz BOŁOZ

Generating models for numerical strength tests of 3D printed elements

16. Bartosz KOPER, Agnieszka FORMALCZYK

A project to improve the production process using lean manufacturing tools

**17. Larysa MOSORA, Ivan LOPUSHYNSKYI,
Katarzyna MIDOR, Michał BEMBENEK**

Study of the migration attractiveness of the countries of the European continent: analysis of the factors of its formation

18. Andrzej WIECZOREK

CMMS class system in Industry 5.0 enterprises

19. Artur KUBOSZEK, Dawid MUNIZ

Use of computer simulation tools in the analysis and improvement of transport conveyor network performance

**20. Krzysztof KRAUZE, Tomasz WYDRO, Ryszard KLEMPKA,
Kamil MUCHA, Tomasz ROKITA**

Computer-Aided Selection of Belt Feeder Parameters for Assessing Structural Load and Stability

21. Andrzej Krzysztof MIRANOWICZ

Human resources management based on production – economic indicators

**22. Izabela ROJEK, Małgorzata JASIULEWICZ-KACZMAREK,
Mariusz PIECHOWSKI, Dariusz MIKOŁAJEWSKI**

Identification of the causes of production equipment failure using machine learning methods - a case study

23. Karolina ŁAKOMY

Structure of accidents related to transport and storage

24. Volodymyr KALINOVICH, Taras ROMANYSHYN

Auxiliary services in the field of oil and gas extraction

25. Magdalena MAZUR

Organization in the work environment as an introduction to Poka-Yoke tools – a case study of solving quality problems in production

**26. Kornel MUNTHE, Peran SIMANIHURUK, Charli SITINJAK,
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Optimization of financial management for enhancing. The electric vehicle market in medan, Indonesia

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Hybrid predictive maintenance model – study and implementation example

Production Engineering Archives
Volume 29 (2023)

Jakub Wiercioch
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Abstract: In this paper, the concept of hybrid predictive maintenance for a single industrial machine is presented. A review of the solutions in the area of machine maintenance (especially predictive maintenance) which have been described in the literature is provided. The assumptions of the hybrid predictive maintenance model for modules, machines, or systems are presented. The methods used within the developed methodology are described. This includes the use of diagnostic data, experience, and a mathematical model. A case study of an industrial machine on which a system for collecting diagnostic data has been pilot-implemented, using, among others, vibration sensors and drive system parameters for damage detection is presented. The registered data can be used to precisely determine the time of upcoming failure after detection of the characteristic symptoms resulting from component wear. In addition, an analysis of the durations of correct operation and failure events was performed and indicators describing these values were determined. The values of the aforementioned indicators were determined based on empirical data and described using a gamma distribution. The objective of the research was to prepare, implement and draw conclusions on a hybrid predictive maintenance model. A real industrial machine was used in the research study. The hybrid predictive maintenance model presented in this paper enables the use of data of different types (diagnostic, historical and mathematical model-based) in scheduling machine downtime for maintenance actions. On the basis of the research conducted, it was determined which machine operating parameters are characterised by variability that enables the detection of upcoming failure. This allows for precise planning of maintenance activities and minimization of unplanned downtime.

Keywords: Predictive maintenance, maintenance models, hybrid predictive maintenance, condition monitoring, case study, gamma distribution

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Implementation of the World Class Manufacturing system using selected Lean Manufacturing tools in a production enterprise

Production Engineering Archives
Volume 29 (2023)

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Abstract: The World Class Manufacturing (WCM) system is based on the idea of continuous improvement and elimination of waste along with the involvement of all employees in improvement processes. It is an indispensable part of the strategy of many leading manufacturing companies around the world. The implementation of a WCM system requires a conscious approach and the use of effective tools consistent with the Lean Manufacturing philosophy. Lean Manufacturing, based on the philosophy of eliminating waste, offers a set of tools and techniques that can support the improvement process within WCM. Optimizing the flow of value, reducing cycle time, increasing flexibility, reducing waste and meeting customer needs are some of the main goals of companies implementing this concept. The article presents the World Class Manufacturing System (WCM), with particular emphasis on the two key pillars of this system: Cost Deployment and Focused Improvement in the aspect of creating financial matrices. The article presents how these pillars influence the process of improvement and efficiency of the examined enterprise. The proposed solutions can be used by other manufacturing companies to create financial matrices as a tool supporting the cost management process and identifying areas requiring improvement.

Keywords: Lean Manufacturing, World Class Manufacturing, cost deployment, focused improvement, Kaizen, production enterprise

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Optimization of production processes using computer simulation

Production Engineering Archives
Volume 29 (2023)

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Abstract: The article discusses the application of computer simulation in the optimization of production processes, particularly in the context of analyzing scenarios related to the addition of new production lines. The conducted research and simulations have shown that computer simulation is an essential tool for precise modeling and analysis of various options, allowing for better understanding and optimization of production activities. The article presents the theoretical foundations of simulation along with practical examples of its applications, focusing on assessing the impact of different production line configurations on the overall system's efficiency. The analysis of benefits includes the reduction of production cycle time, increased flexibility, and improved operational efficiency. The challenges associated with implementing computer simulation, such as the need for specialized knowledge and the necessity for continuous updates of simulation models, are also addressed. Based on the conducted research and analyses, the article demonstrates that computer simulation is an effective tool supporting strategic and operational decision-making in production management, especially in the context of expanding production infrastructure.

Keywords: Computer simulation, process optimization, production efficiency, process modeling, workflow

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Using Lean Manufacturing tools to improve the production process

Production Engineering Archives
Volume 29 (2023)

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Abstract: This article presents the process of implementing the SMED method in an enterprise from the automotive industry. Despite the implementation of many tools in the Manufacturing Company to improve the stages of the production process, the changeover times of measuring tools such as the DEA Global Silver Performance 7.7.5 measuring device and the Absolute Arm 8525 were still unsatisfactory. Therefore, the aim of the work was to minimize the changeover times of the above-mentioned coordinate measuring devices. In order to properly reduce changeover times for the analyzed coordinate measuring machines using the SMED method, data on the methods of performing individual activities and the times of individual activities were obtained. After analyzing all activities on the DEA machine and measuring arm, no substitutions were made in the internal and external activities because this was not possible. However, adjustments were made to the activities themselves, i.e. instead of paper documentation, electronic documentation was introduced, and dedicated mountings were implemented along with an epoxy resin mold. Such actions led to a reduction in the time needed to retool selected coordinate measuring machines. The changes introduced at the position of the operator of the discussed measuring devices improved the effectiveness of measurements by shortening the time of their performance and allowed to increase the number of measurements carried out, and thus provided financial benefits to the Production Company.

Keywords: Lean Manufacturing tools, SMED Improving the manufacturing process, coordinate measuring machine/ measuring arm

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Application of selected Lean tools to improve work safety during usage machines

Production Engineering Archives
Volume 29 (2023)

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Abstract: The issue of safety in the use of machines is an important for both producers and employers. The applicable legal regulations impose several obligations on producers (essential requirements) and employers (minimum requirements) to ensure safety at every stage, from design to operation. The study analyzes the possibility of using selected Lean Manufacturing tools to improve occupational safety when using machines (work equipment). The possible impact of the tools used on the operator's safety was determined, as well as the fulfillment of the legislator's requirements in terms of improving occupational safety. The LM tools used were also a solution to meet the requirements specified in legal regulations. The implemented LM solutions improve communication and work organization and above all, reduce the risk associated with the operation of technological machines.

Keywords: Work safety, Lean Manufacturing tools, operator

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Computer simulations in planning production processes as a tool of decision making

Production Engineering Archives
Volume 29 (2023)

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Abstract: Planning the production process is one of the most important stages determining the company's position in a highly competitive market. Production planning in terms of defining the number of resources necessary to execute the production plan in a precisely defined time is a complex task. The complexity of the planning process results from the large number of variables affecting the production process. The basic factors taken into account during the design process include: reduction of the duration of the production process, minimization of production costs, reduction of production resources necessary to be involved in the production process and ensuring the appropriate quality of products. The aim of the article is to present the validity of using simulation software as a tool supporting decision-making in the selection of the appropriate number of production resources necessary to implement the assumed production plan and their distribution in the production hall. For research purposes, a model was created in the FlexSim simulation software and a computer simulation of the manufacturing process was performed. The obtained results allowed to indicate the validity of using computer simulation in the planning of production processes as a decision support tool.

Keywords: Planning, production process, simulation software FlexSim

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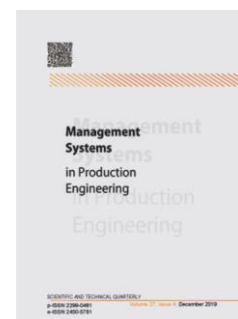
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Assessing the quality of life of regional centres in Poland in the context of smart and sustainable cities

Management Systems in Production Engineering
Volume 32 (2024)

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Abstract: The article addresses the issue of quality of life in cities based on developed methodology. A multidimensional approach was adopted, namely 28 subindices characterizing seven dimensions affecting the quality of life in 18 provincial cities in Poland. The developed methodology consisted of two stages. In the first stage, using the indicators, the values of quality-of-life indices for the studied dimensions were determined. In the second stage, using these results, the values of the total quality-of-life indices in the studied cities were measured. Then, rankings for the cities in question were created. In addition, based on the values of the dimension indices and total indices, the levels of quality of life were determined. Relationships between parameters characterizing the sizes of studied cities and their wealth and the determined quality of life were also measured. The Gray Rational Analysis method was used for ranking, and three objective analytical methods were used to determine index weights: Equal weight, Entropy and CRITIC, and the Laplace's criterion. The results indicate that living standards in the studied cities vary widely, both in terms of the value of the total index and the indices of individual dimensions. The best living conditions were found in Warsaw (the capital of Poland), Białystok and Olsztyn, and the worst in Kielce and Szczecin..

Keywords: Urban quality of life, urbanization, smart sustainable cities, ranking assessment

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Smart city conceptual framework in the context of achieving sustainable development goals

Management Systems in Production Engineering
Volume 32 (2024)

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Abstract: The article presents the conceptual assumptions of the Smart City in its different phases of development – Smart City 1.0, Smart City 2.0, Smart City 3.0, Smart City 4.0, Smart City 5.0 and Smart Sustainable City. With reference to „Transforming our world: the 2030 Agenda for Sustainable Development” containing 17 Sustainable Development Goals, the article specifically presents the assumptions and practical solutions for SDG Goal 11. A critical analysis of the literature on the subject and a content analysis of the SDG reports revealed a juxtaposition of the diverse capabilities of smart technologies and their insufficient implementation to meet the Sustainable Development Goals in Smart Cities. The reality is not encouraging. The population of people living in slums is growing rapidly, social inequalities are widening, and there is a lack of access to convenient urban transport. There is chaotic urban sprawl, air pollution and insufficient public open spaces. Solutions to urban problems are often interventionist rather than preventive. The rational and sustainable use of modern technology can change this.

Keywords: Smart City, Smart Sustainable City, Sustainable Development Goals, Sustainable Development Goal 11

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Optimization of financial management for enhancing the electric vehicle market in medan, Indonesia

Management Systems in Production Engineering
Volume 32 (2024)

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Abstract: The global shift towards sustainable transportation, exemplified by the increasing adoption of Electric Vehicles (EVs), represents a vital response to contemporary environmental and energy challenges. This study investigates the determinants of consumers' Desire to Purchase EVs within the unique context of the Medan market, where consumer preferences and market dynamics differ from more globally examined settings. Additionally, it explores the mediating roles of Consumer Awareness Campaigns and Local Industry Partnerships in shaping purchase intent. Through a comprehensive survey of 832 respondents in Medan, Indonesia, the study reveals crucial insights. Government incentives, including tax breaks and rebates, emerge as influential factors, significantly increasing consumers' inclination to adopt EVs. Equally vital is the accessibility and availability of charging infrastructure, which is pivotal in bolstering consumer confidence in EVs. Consumer perceptions and attitudes have a significant bearing on purchase intent, with positive perceptions regarding environmental benefits, cost savings, and driving experiences contributing to the heightened desire for EV ownership. Effective financial management strategies also play a positive role, emphasizing the significance of sound financial planning and resource allocation. Furthermore, this research emphasizes the instrumental role of Consumer Awareness Campaigns in shaping purchase intent. These campaigns are a powerful tool for elucidating the multifaceted advantages of EV ownership, encompassing environmental consciousness, economic feasibility, and enhanced driving experiences. Local Industry Partnerships within the Medan EV market equally contribute to heightened purchase intent, reflecting the synergistic effects of collaborative initiatives.

Keywords: Electric Vehicles (EVs), Consumer Adoption; Mediating Factors, Government Initiative, Consumer Awareness

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Analysis of information security under the conditions of hybrid war in Ukraine: social aspects

Management Systems in Production Engineering
Volume 32 (2024)

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Abstract: The development of the post-industrial society requires the acceleration of the integration of the national economy into the globalized economic space. This stage is characterized by active informatization of all spheres of life in society, which requires information security and cyber protection for high-quality information provision of the country's population, intellectualization of economic processes and prevention of destructive informational influence on the social status of the individual. It is also necessary to consider that for Ukraine the specified stage is complicated by the hybrid war with Russia, which requires strengthening the protection of information from cyber-attacks and the formation of new approaches in preserving the quality of information on social networks. Therefore, the purpose of this article is the development of scientific and methodological approaches in information security management, strengthening its social significance. This requires solving a certain range of tasks of identifying and preventing socially dangerous information based on the use of economic and mathematical methods and models. The article highlights the main directions of socialization of modern technological development and theoretically substantiates its significant impact on human consciousness and behavior, puts a person in front of serious challenges and, under conditions of hybrid warfare, requires strengthening of information security in social networks. In the work, the components of information security are supplemented, its impact on social aspects of society's life is highlighted. As a result of the research, the authors proposed a scientific and methodical approach to the construction of a system for countering the spread of socially dangerous information in social networks. Besides, its functional elements are highlighted. A method of combating the spread of harmful information in social networks has been developed, which solves the problem of information support of the decision-making process and includes providing the chosen and alternative options to the person making the decision, with the justification of the choice. This creates prerequisites for information support for making a well-founded management decision.

Keywords: Cyber security, social networks, harmful information, hybrid warfare, countermeasures

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Restoration of the impact crusher rotor by FCAW with high-manganese steel reinforced with complex carbides

Management Systems in Production Engineering
Volume 32 (2024)

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Abstract: A new hardfacing alloy within the Fe–Ti–Nb–Mo–V–C alloying system was utilized to restore the working surfaces of cone crusher rotors using Flux-Cored Arc Welding (FCAW). TiC, NbC, Mo₂C, VC, Mn, and ferromanganese powders were selected as the base materials for manufacturing the welding wire. The resulting hardfaced layer exhibits a composite structure, with manganese austenite as the matrix and complex solid solution reinforcements with a NaCl structure, closely resembling the formula (Ti_{0.3}Nb_{0.3}Mo_{0.3})C. The primary advantages of this hardfacing alloy include its capacity for intensive deformation hardening along with high abrasion resistance. The hardness of the hardfaced layer is approximately 47 HRC in the as-deposited state and increases to around 57 HRC after work hardening, surpassing typical hardfacing alloys derived from high manganese steel by about 10 HRC. The efficacy of the alloy was tested in restoring rotors made of Hadfield steel in a PULVOMATIC crusher model 1145, during the milling of sand-gravel mixtures ranging from 25 to 150 mm into spalls measuring 5 to 20 mm. With an average productivity of approximately 60 tons per hour and a production volume of 300 tons, the utilization of this hardfacing alloy enabled multiple restorations of the rotor while maintaining productivity at a level of 15 thousand tons of spalls.

Keywords: Abrasion wear, hardfacing, high-manganese steel, impact crusher, refractory compounds

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The importance of eu taxonomy for sustainable development reporting. case study of entities listed on the Warsaw stock exchange in Poland

Management Systems in Production Engineering
Volume 32 (2024)

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Abstract: The introduction of the obligation to prepare ESG reports taking into account EU Taxonomy is a challenge for enterprises, but at the same time opens up the possibility of using disclosures in this area to assess entities in the context of environmentally sustainable activities. Legal changes in the field of the Green Deal have been introduced in the last three years, and in the area of EU taxonomy this process is still ongoing, resulting in a deficit of research on the effects of implementing the new legal regulations. The main goal of our study is to assess the importance of the newly applicable ESG reporting and environmental disclosure requirements under EU Taxonomy in improving the quality and comparability of sustainability reporting and the creation of ESG ratings. A qualitative research method was applied based on multiple case studies using content analysis on the basis of ESG reports for 2021-2022 for entities listed on the Warsaw Stock Exchange. The research results indicate a very low level of activities classified as environmentally sustainable and taxonomy-aligned. Additionally, the results may also indicate problems with implementing the new solutions in reporting practice. At the same time, a positive impact is noted of the implementation of taxonomic reports on improving the comparability and detail of disclosures.

Keywords: CSR, CSRD, sustainable development, environmental investments, financial statement, IFRS

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Generating models for numerical strength tests of 3D printed elements

Management Systems in Production Engineering
Volume 32 (2024)

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Abstract: Additive manufacturing, or 3D printing, has become very common in professional applications in many industries. The 3D printing technology is especially suitable for making prototypes, demonstrators and small-batch production. The stiffness and strength of 3D prints depend on many factors, including among others infills, which are specific to this technology, as well as the orientation of the object during 3D printing. Where the stiffness or strength of an element is crucial, the only way is to empirically assess its properties. The advantage of 3D printing, i.e. incomplete infill of the interior of an object with the use of different types of infills (patterns) and different amounts of material, means that its mechanical properties differ from those of a solid element. The application of numerical tests, i.e. the finite element method (FEM), requires the creation of a 3D model while taking this infill into account. The modelling of elements for performing numerical strength calculations is time-consuming and labour-intensive. The article presents a proprietary original analytical method for generating various types of infills with varying infill density. The method was developed for typical infills (Grid, Triangular, Honeycomb). It was next implemented in the CAD environment using the iLogic tool of Autodesk Inventor. As a result, a tool for creating 3D models of objects consistent with those obtained from 3D printing was obtained. The method and tool were verified. Next, the influence of selected parameters of the 3D print on its mechanical properties was presented on three real objects. The results of numerical analyses revealed measurable benefits of such tests. The research conclusions also constitute recommendations for selecting the type and infill density of an object and its orientation in the printer with regard to the strength and stiffness obtained.

Keywords: 3D printing, rapid prototyping, FEM tests, strength of 3D prints, numerical strength tests

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Study of the migration attractiveness of the countries of the European continent: analysis of the factors of its formation

Management Systems in Production Engineering
Volume 32 (2024)

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Abstract: The article presents the author's approach to the classification of types of attractiveness that may be characteristic of certain European countries. The migration attractiveness of countries is highlighted and a list of factors that can affect it is given. Factors were ranked according to the level of their impact on population migration, among which the following were highlighted: the economic development of countries, production processes, the use of more modern technologies, ensuring one's financial well-being, and the culture of the production environment. The dynamics of the number of immigrants who moved to the studied European countries since 2020 are given. The main programs under which European countries accept migrants for permanent residence are considered the issues of providing housing, employment in the industrial infrastructure, and increasing the level of professional competence in various fields. To conduct a comparative assessment of the attractiveness of European countries for potential migrants, a set of available statistical indicators was selected, which fully reflects the main parameters of the countries' attractiveness. Individual results obtained in the process of assessing the migratory attractiveness of the countries of the European Continent are presented, and proposals for its improvement are presented. It is proved that increasing migration attractiveness is possible by improving the social and economic attractiveness of countries. To do this, countries should create conditions for the development of various industries, create additional jobs, provide high wages, social services, protection, etc. to attract as many highly skilled labor resources from other countries as possible. As a result, the growth in the number of professional labor migrants in countries will contribute to the development of those industries that are common in the respective countries.

Keywords: Attractiveness of the countries, migration attractiveness, migrants, factors influencing migration attractiveness

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Designing and improvement of internal transport - energy and efficiency management of modern technologies in the mining industry

Management Systems in Production Engineering
Volume 32 (2024)

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Abstract: Energy is the foundation of functioning in the modern world. It is also the basis of contemporary industry and national economies. Economical and efficient use of energy is promoted worldwide as a model of conscious care for the environment in which we live. In the era of an energy crisis related to the current geopolitical situation, much is said about the need to reduce production costs. One of the significant components of these costs, besides the obvious material costs, is the cost associated with logistics at both the production and distribution stages. Therefore, it is necessary to optimize the entire process, which will consequently allow for the regulation (or reduction) of costs related to the production and distribution of energy and the materials necessary for its generation. Companies benefit by improving their energy efficiency, experiencing a tangible improvement in reducing production and overall costs, which in turn positively affects the overall economics of the business. However, this is often associated with considerable expenses that must be incurred to achieve the desired level of energy efficiency, especially in the mining industry. The aim of this work is to analyse the management of the energy efficiency of belt conveyors in mining plants. Basic legal energy regulations are also discussed. The analysis focuses on the possibilities of improving the operation of belt conveyors in mining plants. The information collected in this work indicates the need to invest in installations, data monitoring, and other activities including financial investments in new projects and modernization works related to energy savings in the operation of belt conveyors, which will result in real benefits positively affecting the economics of mining enterprises.

Keywords: Production processes, production efficiency, process improvement, logistic

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Computer-Aided Selection of Belt Feeder Parameters for Assessing Structural Load and Stability

Management Systems in Production Engineering
Volume 32 (2024)

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Abstract: The primary means of transporting bulk and granular materials in rock mining are short belt conveyors, with lengths of up to 40 meters and belt widths of up to 1 meter, often called belt feeders. Their widespread use in industry is attributed to their simple construction, high reliability, and relatively low energy consumption. In addition to mining, belt feeders are widely used in the energy sector, metallurgy, and other industries such as chemical plants, transshipment ports, and storage yards. Simulations and multi-variant calculations are necessary for belt feeders, where each unit—despite standard components and modules—requires an individualized approach. Only such an approach allows for identifying optimal solutions early in design. Consequently, in this article, an analytical model of a belt feeder was developed, followed by an analysis of its stability and calculations of the forces in its supports. As a result, utilizing computer techniques, an application was created to study belt feeder stability during the design phase or when making structural changes.

Keywords: Rock mining, bulk materials transport, belt feeder, stability, computer application

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Application of modern machine diagnostic systems to improve safety in the underground mining process

Management Systems in Production Engineering
Volume 32 (2024)

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Abstract: Currently used machine diagnostic systems are based on very modern solutions based on the acquisition and recording of their operating parameters in real time. Increasingly available and high-tech sensor systems mean that the number of recorded parameters is increasing and their quality is improving. These data are mainly used to assess the technical condition of machines and the processes they perform. In mining, these data can also be used to assess and, at a later stage, improve the safety of the underground mining process. Referring to this issue, the paper presents examples of the use of diagnostic systems for powered roof supports and longwall shearers to assess the safety status of the underground hard coal mining process. In the case of the wall support, the focus was on measuring the pressures in the stands of its individual sections. Temporary changes in the values of these pressures constitute a valuable source of information regarding the interaction of the support with the rock mass. In particular, this concerns the identification of the effects of the informational impact of the rock mass on the longwall excavation protected by the support. The research results presented in the paper, especially in the case of very dangerous dynamic impacts, indicate the possibility of both diagnosing the operating condition of the section and identifying symptoms of exposure to such events. This undoubtedly significantly expands the possibilities of using the measured pressures. Diagnostic signals from a longwall shearer are also widely used. The current intensities drawn by its motors while cutting the rock mass, as well as the advance speed and its position in the wall make it possible to analyze these parameters and their changes before, during and after the occurrence of various types of events. These data enable the assessment of the effects of the rock mass on its operational efficiency and safety status. It also enables the identification of symptoms that precede the occurrence of such events. The presented examples indicate the need for a broader and more holistic approach to the use of diagnostic parameters of mining machines. In particular, this concerns the study of the cooperation between the support and the rock mass and its influence on the efficiency and safety of the rock mass mining process. The subject matter addressed relates to very important and current issues, and the developed methodology and obtained results should be applied in practice as soon as possible.

Keywords: Machine diagnostics, underground mining, process safety, production engineering, mining machines

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Human resources management based on production - economic indicators

Management Systems in Production Engineering
Volume 32 (2024)

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Abstract: Increasing competitiveness in the market both locally and globally, as well as increasing globalization forces companies to optimize costs in all areas of the company's operation, such actions are determined by the need to survive and constantly improve production profitability.

The presented author's method allows the use of production-economic indicators based on selected key parameters specific to the production profile of the analyzed enterprise. Targeted analysis of indicators leads to optimized management of human resources in the company's structures. The analyzed company uses the presented method to increase profitability by specifying employees permanently employed in the company, as well as external temporary workers. Further subdivision makes it possible to analyze in detailing production employees: indirect and direct, sales and administrative employees. Data from six quarters covering the entire year 2023 and two quarters of 2024 were used for the analysis. The case study depicts a company operating on the Polish market in the food industry.

Keywords: Strategic management, creative strategy, cost optimization, indicators

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The use of internet and social media as marketing tools in commercialization of research results

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Purpose: The article presents the survey results, concerning commercialization processes conducted in scientific and research organizations in the scope of research and development projects' results of innovative character, with the use of Internet and social media as marketing tools.

Design/methodology/approach: The questionnaires were distributed among universities, research institutes and institutes of the Polish Academy of Sciences. Special attention was paid to the most commonly used commercialization methods such as sales of the R&D results, granting a license for R&D results and making a contribution in a form of R&D results. The Authors were particularly interested in the type of collaboration oriented onto a commercialization of research results such as a development of a new product, a modification of an existing product, an elaboration of a new process, a modification of an existing process, entering a new market, a participation in a creation of economic programmes as well as opinions, expert opinions and reports.

Findings: The research results, presented in the article, also reflect different forms of disseminating the R&D offer with use of the Internet and the social media such as the website of the institute, branch website portals, social media e.g. Facebook, X portal (former Twitter), multi-media website pages e.g. YouTube, Flickr, Picasa, SlideShare.

Originality/value: The article assesses the factors that play a decisive role in the processes of successful commercialization of R&D research results in a research institute.

Keywords: Research results, commercialization, Internet, social media, marketing tool

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New requirements for packaging waste management in Poland as a way to realizing the goals of a circular economy

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Purpose: The aim of the article is to present the legal changes in the field of packaging and packaging waste in Poland over several years. These changes also concern various institutions adapting to the amendment to the law by, for example, introducing a deposit system or purchasing bottle dispensers. The authors want to show what the deposit system in Poland will look like in principle. It is intended to reduce the waste of secondary raw materials and accelerate the implementation of circular economy (CE) and sustainable development goals. Design/methodology/approach: The aim of the article will be achieved by analyzing the proposed changes to the Act on packaging and packaging waste management and comparing them to economic realities. A review of scientific articles, the authors' participation in online debates on changes in the deposit system and a review of websites will allow for a comparison of the work/changes made so far by various institutions (cities, shops) in this area. This will also allow you to formulate the benefits and difficulties that may arise when implementing the system.

Findings: Based on the analysis of documents and implemented investments, ecological, economic and social benefits for the country were identified in the implementation of the deposit system (affecting the implementation of CE objectives).

Research limitations/implications: The research conducted by the authors is based on the previous initiatives of the organizations described. The real benefits of implementing the deposit system will be visible at least after a year or two of its operation. Currently, these are guesses based on other countries. In their research, the authors intend to monitor the results and benefits of the deposit system in Poland in the coming years.

Practical implications: The article has a synthetic application for retail chains that can observe the activities of competitors. Moreover, it constitutes source material for future comparisons and research in this area.

Social implications: The implementation of the deposit system from January 1, 2025 in Poland will have a positive impact on increasing the recovery of packaging waste. This has a direct impact on environmental protection, saving raw materials and energy, increasing the responsibility of packaging producers and society for the implementation of packaging waste management and CE.

Originality/value: The article presents current achievements in the implementation of the deposit system in Poland as a result of new legal regulations.

Keywords: Deposit system, bottle dispensers, waste packaging management, circular economy

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Identification of the causes of production equipment failure using machine learning methods - a case study

Scientific Papers of Silesian University of Technology
- Organization & Management (2024)

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Purpose: This paper aims to present the possibility of using DT to increase the efficiency and effectiveness of maintenance activities by identifying the probable cause of failure based on historical data.

Design/methodology/approach: This study used classifiers based on General Chi-square Automatic Interaction Detector (CHAID) and random forests. Using this group of classifiers brings with it faster u performance, the possibility to process symbolic data directly, and the possibility to add a tree as part of interactive tree building. A separate tree was built for each input parameter to aggregate the results from both trees by considering them together. The proposed solution also analyzes the importance of features (input data).

Findings: Based on the research conducted, we have shown that using ML techniques can improve the accuracy of decisions regarding the type of maintenance work that should be carried out to efficiently and effectively remove failures and reduce losses caused by machine downtime.

Research limitations/implications: The research is worth extending to use other novel artificial intelligence methods to compare the developed models. A limitation was the amount of data. As new data becomes available, the developed models should be trained to respond to the new data and better adapt to it.

Practical implications: Relatively simple AI-based solutions such as CHAID and random forests have yielded fairly high accuracy with very short execution times. Within edge processing, this fulfills the complex trade-off between accuracy and speed in predictive maintenance applications. The presented families of simple algorithms should be developed as a transparent source of opinion for industrial decision-making processes.

Originality/value: What is new is the automation of maintenance activities by identifying the probable cause of failure using AI methods. The solution is aimed at company employees who diagnose the causes of failure, ultimately improving the accuracy and speed of diagnostics and service response.

Keywords: Data-driven maintenance, decision-making, machine learning, CHAID decision tree, random forests

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Structure of accidents related to transport and storage

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Purpose: The aim of the topic is to analyze available statistical data on accidents at work in the transport and warehousing sector. The analysis included data for the years 2017-2022, i.e. three years before the COVID-19 pandemic and three years of the pandemic in Poland and the related restrictions on work organization.

Design/methodology/approach : The article is an overview of applicable legal acts in the field of accidents at work and the related obligations of employers. The work presents current data on working conditions and threats in the above-mentioned areas. industry, compared to those employed in all other sectors of the economy. The work also presents the latest statistics on accidents at work, their severity and the most common causes. The study also paid attention to the issues of costs related to employees' inability to work, the amount of benefits paid and the financial burden on employers.

Findings: The article presents trends in accidents in particular years and predictions for future years. The structure of costs related to accidents at work was presented and discussed.

Research limitations/implications: Transport and warehousing are industries that employ over 700 000 people in Poland. employees. Every day they are exposed to a number of unfavorable and health-hazardous factors that may cause poor health, reversible health disorders, occupational diseases or accidents at work. The employer is responsible for protecting the health of employees, eliminating factors or minimizing their effects, although he is not always aware of his obligation. The article indicates the problems that employers have to struggle with.

Originality/value: The article is an overview of legal requirements in the field of accidents at work, so it may be useful to employers looking for information on this topic.

Keywords: Accidents at work, transport and storage, occupational safety

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A project to improve the production process using Lean Manufacturing tools

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Purpose: This study investigates the production process of the selected product, aiming to identify and implement improvements. The objective is to analyze various stages of the production process to pinpoint areas that can be optimized for enhanced efficiency and quality. By focusing on the selected product, the study will evaluate current methodologies, employ advanced techniques, and propose actionable solutions to improve overall production outcomes.

Design/methodology/approach : The core methodologies employed in this project were Value Stream Mapping (VSM) and the 5S framework. VSM was utilized to visualize the current state of the production process, identify inefficiencies, and design an optimized future state. Concurrently, the 5S methodology was applied to organize the workspace, enhance efficiency, and maintain discipline in operations. These methodologies were chosen for their proven effectiveness in Lean Manufacturing and continuous improvement initiatives

Findings: The study meticulously documented the state of the production process before the implementation of these improvements, providing a baseline for comparison. After the application of VSM and 5S, the production process was re-evaluated to measure the impact of the improvements. The results demonstrated significant enhancements in efficiency, organization, and overall productivity.

Practical implications: The findings of this research underscore the importance of structured project management and the strategic application of lean methodologies in manufacturing. The improvements observed in the production process of selected product serve as a testament to the effectiveness of VSM and 5S in driving process optimization. This study provides valuable insights for manufacturing professionals seeking to implement similar improvements in their own production processes.

Originality/value: The originality and value of this research lie in its practical application and comprehensive analysis of Value Stream Mapping (VSM) and the 5S framework, demonstrating their combined effectiveness in significantly enhancing efficiency, organization, and productivity in the production process of the selected product.

Keywords: Lean Manufacturing, Visual Management, Standardization, Value Stream Mapping.

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Possibilities of application of LM methods and tools in the construction industry - Lean construction

Scientific Papers of Silesian University of Technology
- Organization & Management (2024)

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Purpose: The study aims to present the possibilities of using the methods and tools of the LM concept in the construction industry. The potential impact of the LM solutions used on the implementation of the construction process was determined in terms of improving the organization and safety of work, workflow (employees, materials, information), timeliness of work performed, and employee involvement. Attention was paid to the possibility of eliminating or limiting activities that do not add value to the construction process, which is the main goal of both Lean Manufacturing and the Lean Construction approach.

Design/methodology/approach: Based on the analysis of literature related to the researched topic, LM methods and tools were identified, the implementation and use of which in construction may translate into improved implementation of the construction process in its various aspects.

Findings: Based on the analysis, it was found that the methods and tools of the LM concept can be used in the construction industry. The eight LM solutions most frequently mentioned in the literature, which can improve the functioning of the construction process and eliminate losses, were analyzed. The selection and use of a given tool will depend on the problems occurring in the construction project, as well as on the awareness of the work organizers/managers about the possible benefits that these solutions can bring to construction workers and all project stakeholders. Attention should also be paid to barriers that may hinder the use of lean practices in construction processes, including resistance to change, non-compliance with applicable standards, lack of awareness, lack of commitment of employees and people supervising the process, and lack of communication.

Originality/value: The article attempts to determine the potential impact of LM methods and tools on improving the construction process. The use of LM solutions in construction may indicate the direction of improvement activities for supervisors and organizers of work on the construction site.

Keywords: Lean Manufacturing tools, Lean Construction, construction industry.

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Acoustic modeling of noise emission to the environment from the shooting range area during skeet and mop competitions

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Purpose: The intensive development of outdoor shooting sports is causing the generation of disruptive noise and escalating conflict situations with residents living near shooting ranges in built-up areas. Therefore, it is necessary to develop a methodology for determining the actual nuisance and range of the noise emitted from the shooting range, which can be effectively achieved through computational methods using computer simulations. The issue of noise emission assessment also applies to new shooting ranges, for which one of the conditions for permitting the range for use is to conduct an acoustic analysis to confirm the absence of noise nuisance from the facility.

Design/methodology/approach: This article presents a method for modeling noise emissions into the environment from a shooting range using the example of two popular shotgun shooting disciplines: Skeet and Mop, and describes in detail the parameters of the developed acoustic models such as acoustic power and directionality. These parameters were determined based on field measurements of the noise levels emitted during actual shooting sessions. Then, an example of applying the obtained results to analyze noise propagation into the environment during typical shotgun shooting sessions on the Skeet and Mop ranges is presented. This article is the second in a series of four articles presenting a method of modeling hunting shooting ranges during shooting competitions.

Findings: The developed methodology and the presented example of its application clearly indicate the possibility of its practical use for modeling noise emissions from shooting ranges. The presented methodology allows for analyzing the emitted noise and determining the extent of a shooting range's excessive acoustic impact.

Originality/value: The research results presented in this article fill a gap in the field of evaluation of acoustic influence of outdoor shooting ranges on the environment. Included in the article is an example of determining the level of acoustic power and directionality of the noise source which is a shooter at a shooting position, and the way in which this information can be used to model the acoustic emissions during selected shotgun shooting competitions (Skeet and Mop). The presented method is original and can be practically applied when conducting evaluations of the acoustic influence that newly designed investments will have on the environment.

Keywords: Noise, Shooting range, Noise emissions of shooting ranges, Assessment of acoustic impact on the environment.

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Advancing Education Through Virtual Reality in the Management and Production Engineering Field of Study

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Purpose: The purpose of this paper is to explore the application of virtual reality (VR) as an innovative tool for education in the field of Management and Production Engineering. It aims to demonstrate how VR can be effectively integrated into laboratory classes to enhance students' learning experiences and practical skills. Additionally, the paper highlights the role of the teacher in guiding and supporting students in using VR technology for educational purposes.

Design/methodology/approach: The paper utilizes a case study approach to examine the use of a specific virtual reality application in the field of Management and Production Engineering. The study involves the implementation of VR-based laboratory classes, where students engage in various training modules of the given selected VR application, including both theoretical and practical tasks in a simulated production environment. The methodology includes a presentation of the VR application's modules, the tasks for students, the organization of VR-supported laboratories, and the role of the instructor in facilitating the learning process.

Findings: The study showed that it is possible to use virtual reality in higher education, especially in the context of classes in the field of management and production engineering. The possibility of creating and implementing VR applications that realistically reproduce the production environment and enable conducting training and classes for students of technical studies has been confirmed. The research results confirmed that VR is a practical tool for teaching about production lines, technological processes, machine parameters, equipment operation, quality control, and safety rules in the production hall. All these elements can be effectively implemented under controlled conditions in the university, without the need for physical presence in the industrial plant.

Originality/value: This paper offers a perspective on integrating virtual reality into laboratory classes within the field of Management and Production Engineering, highlighting its transformative potential for traditional teaching methods. The study emphasizes VR's value as a modern educational tool that enhances applied learning by providing hands-on practice in addition to theoretical knowledge, allowing students to engage actively and perform tasks independently.

Keywords: Virtual reality, production engineering, education, management, technology, production line, machines

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Management of goods flow in Hyperloop transportation system

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Purpose: The aim of this study is to model, simulate and analyze the process of goods flow in the Hyperloop transportation system, with a focus on assessing transportation infrastructure, transport regulations and the potential benefits of implementing Hyperloop technology. By examining these factors, the study seeks to determine how Hyperloop could revolutionize freight transportation, offering faster, more efficient and potentially sustainable options compared to traditional methods. Additionally, the research aims to identify potential challenges and opportunities associated with integrating Hyperloop into existing logistics networks, providing a comprehensive understanding of its viability.

Design/methodology/approach: the research involves evaluating the feasibility of goods transportation using the Hyperloop system through FlexSim analysis, which includes modeling the flow of goods between selected points and identifying bottlenecks. The model was built using key input data, such as demand and network data, while considering various indicators, including availability, efficiency, and demand.

Findings: the results of the analysis will enable a critical evaluation of the Hyperloop system's implementation in the context of freight transportation. The study identified specific areas where the Hyperloop could significantly improve the efficiency of goods transport, such as reducing transit times and lowering operational costs. Conclusions were drawn regarding the efficiency of the transport system, along with proposals for managing the flow of goods to enhance the overall efficiency of this transportation method. Moreover, the findings suggest that while the Hyperloop has great potential, certain infrastructural and regulatory adjustments would be necessary to fully realize its benefits.

Originality/value: this study provides a novel evaluation of the feasibility and efficiency of implementing the Hyperloop system for freight transportation, contributing valuable insights for future applications and infrastructure planning. This study highlights the innovative approach of Hyperloop to freight transportation and the value of conducting this research.

Keywords: Hyperloop, cargo transport, cargo flow management, transport efficiency, logistics

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Use of computer simulation tools in the analysis and improvement of transport conveyor network performance

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Purpose: This article presents the results of a study conducted to determine the feasibility of using simulation methods and tools as an enabler in improving conveyor networks

Design/methodology/approach: The article covers, among other topics, the use of FlexSim computer software to analyse the performance and improvement of conveyor networks. The research presented consisted of creating two simulation models of conveyor networks. The base model was based on non-accumulation conveyor technology at the workstations, while the improved simulation model included accumulation conveyors to increase the buffer potential of the plant at the entrance and exit to the workstations

Findings: The result of the study was to determine the change in the efficiency of the conveyor system. The simulation studies carried out showed that the improvements had a positive effect, yielding an improvement of around 67% in the number of order totes filled, with no significant increase in the amount of storage space occupied.

Originality/value: This paper presents the possibility of using simulation tools in the process of improving conveyor systems. The possibility to carry out this type of research already at the stage of designing new conveyor systems makes it possible to determine the appropriate structure of such a system, taking into account the specific parameters required, e.g. capacity, occupied storage area, etc

Keywords: FlexSim, Simulation, Conveyors, Improvement, Modelling

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CMMS class system in Industry 5.0 enterprise

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Purpose: The purpose of the article is presenting the conception of using CMMS class systems in supporting maintenance in Industry 5.0 concept.

Design/methodology/approach The above-mentioned purpose was achieved as research was executed focusing on Industry 5.0 and Society 5.0 ideas and opportunities of their applications in maintenance activities in enterprise.

Findings. During the conducted research, it was found that there is a necessity to integrate CMMS class system with another co-operating computer systems in which it is required to implement model solutions guaranteeing existence of humanocentric character of computer tool, sustainable development in maintenance of technical means and also resilience in this area.

Originality/value:

The methodology presented in the article is original and is addressed to employees of maintenance departments interested in implementing new solutions - methods and tools, as well as creators of CMMS systems and people who implement them.

Keywords: Exploitation, maintenance, management, CMMS, Industry 5.0, Society 5.0

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Methodology for Selecting Research Tools in Work Ergonomics in the Context of Occupational Specificity

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Purpose: The purpose of this article is to develop a structured methodology for selecting appropriate research tools in the field of work ergonomics, tailored to the specific characteristics of various occupational tasks. The study aims to improve the accuracy and relevance of ergonomic assessments by aligning methods with the particular demands and conditions of different job types.

Design/methodology/approach The research employs a mixed-methods approach, combining a literature review with case studies across diverse industries. The methodology involves the analysis of various ergonomic tools and techniques, followed by the development of a selection framework based on the specific requirements and challenges associated with different occupations. This framework is then validated through practical application.

Findings. The study identifies key criteria and frameworks essential for matching research tools to occupational specifics. It presents a flexible methodology that can be adapted across various professions, enhancing the accuracy and effectiveness of ergonomic assessments.

Originality/value: This study fills a gap in ergonomic research by providing a structured approach to tool selection based on their limitations and occupational specificity. It offers valuable insights for ergonomists, health and safety services, and organizational management seeking to optimize workplace assessments and interventions.

Keywords: Work Ergonomics, Ergonomic Assessment, Research Tool Selection

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Changes in the structure of regional traditional products in the lubuskie voivodeship in 2020-2024

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Purpose: Analysis of changes in the structure of regional traditional products in Lubuskie Voivodship in 2020-2024.

Design/methodology/approach: Statistical analysis of data contained in the register of traditional products, kept by the Ministry of Agriculture and Rural Development. The analysis included data on traditional products registered in the Lubuskie Voivodeship in 2020-2024. The background for the analysis was a study previously conducted for this group of products covering the years 2006 to the beginning of June 2020.

Findings: The research showed a slowdown in the dynamics of products introduced to the market, and in the last 3 years a complete halt in the process.

Practical implications: Intensifying the promotion of the regional market of traditional products and encouraging local producers to register these products on the list maintained by the Ministry of Agriculture and Rural Development.

Social implications: The research showed a slowdown in the dynamics of products introduced to the market, and in the last 3 years a complete halt in the process.

Originality/value: The article shows the current situation in the structure of traditional products and the changes that have taken place in it in the last 4 years. The recipients of the article may be local food producers, organizers of fairs and events related to the promotion of regional culture and consumers interested in buying traditional products.

Category of the paper: Research paper/Case study

Keywords: Agri-food processing, food production, traditional products, regional culture, sustainable consumption

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Implementation of a CMMS class system for the support of maintenance services in accordance with the TPM paradigm in a selected manufacturing enterprise

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Purpose: The paper presents the basic assumptions and the plan of the research work, which is directed at implementing a CMMS class system in a selected manufacturing enterprise to support selected maintenance tasks.

Design/methodology/approach The research conducted at the company was based on participant observation, using social research techniques and a tool from the Root Cause Analysis group.

Findings. were used to develop proposals for implementing a system to support maintenance and repair tasks in selected segments of the production system. These proposals included tool and organizational solutions to increase the efficiency and effectiveness of maintenance activities.

Research limitations/implications: While the issue of maintenance is a key component of manufacturing engineering, the article does not address other equally important areas, such as process design, optimization or quality control, which, with an integrated approach to manufacturing engineering, could lead to synergistic results.

Practical implications: The introduction of solutions based on the TPM paradigm will make it possible to systematically increase the stability of the production process by improving maintenance processes and reducing the risk and severity of the consequences of downtime and failures.

Originality/value: The paper's novelty is its systematic approach, which provides a practical framework for implementing a CMMS in a manufacturing environment. The diagnostic process and the resulting proposals for using the system to support maintenance and repair tasks in selected segments of the production system represent a form of process innovation. The paper is aimed at manufacturing companies seeking to improve maintenance operations and increase productivity by implementing modern management systems.

Keywords: TPM, CMMS, RCA, Lean Maintenance

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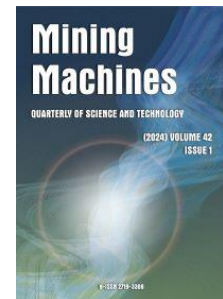
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AWJ technological head vibration during the construction steel cutting

Mining Machines
Volume 42 (2024)

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Abstract: Vibration measurement is a fundamental aspect of ensuring the optimal and reliable operation of machinery, with implications for production quality, economic efficiency, and safety. The monitoring of machine condition provides essential data for the early detection of damage to machine parts, thereby preventing unanticipated failure modes and disruptions in production. Accordingly, this paper focuses on the measurement and assessment of fundamental vibration parameters, with a particular emphasis on frequency and vibration acceleration amplitude. Experimental measurements were conducted while cutting construction steel (12 050 and 11 523) on a production system using abrasive water jet technology (AWJ) with a varied feed rate. Based on the results of these measurements, recommendations were formulated regarding suitable and inappropriate combinations of operating parameters, thereby enhancing current knowledge regarding the influence of technological parameters on the amplitudes of vibration acceleration in the operation of production systems with AWJ technology.

Keywords: Abrasive water jet, feed rate, abrasive mass flow, vibration amplitude, frequency spectrum

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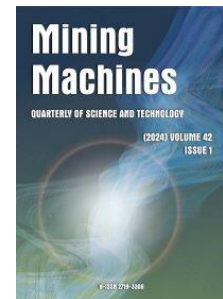
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Monitoring of selected parameters of the belt transmission on a specific design solution

Mining Machines
Volume 42 (2024)

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Abstract: Belt drives have been used for decades to transmit power from a drive unit to an end device in a variety of applications. There is constant scientific, technical and technological progress in the production and use of belts, which has led to a variety of types and types of belts. Belt drives have several advantages over other methods of power transmission, including light weight, affordability, and the ability to be used as a slip clutch. As the requirements for V-belts increase, so does the required quality of the offered belts. When analyzing belt transmissions, it is also possible to examine their influence on other components of the machine or equipment on which they are installed. If the belt drive transmits large forces, this can have consequences on the bearings and other parts of the transmission. It is therefore essential to ensure that belt drives are optimally designed and installed to minimize potential damage to other components. On the designed specific design solution for testing belt transmissions, the actual revolutions of the input and output pulleys were monitored, the belt float was measured using high-precision distance measurement sensors, and the vibrations were measured using a magnetically fixed sensor. During the experimental measurements, parameters such as belt tension, input speed and output load were changed. The experimental measurements themselves were carried out on three A1450Lw 13x1420Li belts of the same dimensions, but manufactured by other manufacturers (Optibelt, Rubena and Gufero).

Keywords: Construction, monitoring, belt transmission, load, belt tension, vibration, belt slip

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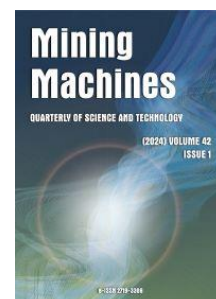
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Eksploracja metanu z nieczynnej kopalni „Moszczenica”

Mining Machines
Volume 42 (2024)

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Streszczenie: Zamknięte metanowe kopalnie węgla kamiennego mogą się stać źródłem metanu wykorzystywanego w energetyce. Pozostało w nich wiele niezlikwidowanych wyrobisk korytarzowych, zawierają duże ilości zrobów zawałowych charakteryzujących się dużą pojemnością przestrzeni wolnych, w górotworze powstała siatka spękań. Wydzielanie metanu do atmosfery jest praktycznie ograniczone do zera. Zamknięte kopalnie mogą być źródłem metanu wykorzystywanego do produkcji energii. W niniejszym artykule przedstawiono przykład kopalni „Moszczenica” jako źródło metanu, który jest ujmowany i przetwarzany na prąd elektryczny i ciepło.

Słowa kluczowe: Kopalnia metanowa, stacja odmetanowania, ujęcie metanu, wytwarzanie prądu elektrycznego

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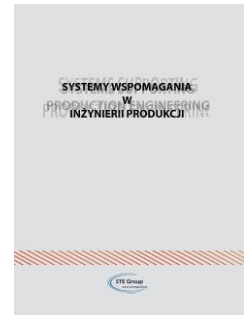
Development, research and design of a diagnostic system for measuring the course of temperatures, vibrations and noise

Systemy Wspomagania w Inżynierii Produkcji
Volume 13 (2024)

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Abstract: The development of scientific and technical progress in measuring and microprocessor technology, advances in artificial intelligence methods give impetus to the development of technical diagnostics of mechatronic systems. In mechatronic systems, electrical drives are based on asynchronous motors, DC motors, synchronous and stepper motors, and mechanical drives are based on gearboxes.

Failure of motors and gearboxes leads to equipment shutdown, continuous production and financial losses of the company. Therefore, tools are needed to monitor the current status of devices.

Keywords: Diagnostic system, DC motors, actuators, robot

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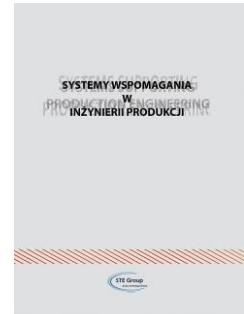
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Effect of undercutting anchor head geometry on the extent of detachment

Systemy Wspomagania w Inżynierii Produkcji
Volume 13 (2024)

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Abstract: The paper presents the results of FEM analysis of the formation of the range of detachment depending on the value of the angle of the conical anchor head. The issue is important for determining the influence of influential factors on the process of rock lump detachment and the selection of optimal technological parameters of detachment and the most favorable for the realized process, geometric parameters of the anchor

Keywords FEM analysis, conical head of the anchor, rock block

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Efektywne projektowanie maszyn z wykorzystaniem funkcji "i" Autodesk Inventor

Systemy Wspomagania w Inżynierii Produkcji
Volume 13 (2024)

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Streszczenie: Programy typu CAD (Computer Aided Design) są podstawowym narzędziem pracy konstruktora wszelkiego rodzaju maszyn i urządzeń. Programy te przede wszystkim pozwalają na projektowanie w 3D oraz tworzenie związanej z modelem dokumentacji technicznej. Projektowanie w 3D pozwala na tworzenie elementów i złożeń przy jednoczesnej weryfikacji wielu cech fizycznych i użytkowych projektu oraz eliminowaniu błędów typu kolizje geometryczne. W trakcie projektowania nierzadko występują powtarzające się elementy. Mogą to być fragmenty pojedynczej części, całe części lub też złożenia. Wychodząc naprzeciw konstruktorom, programy typu CAD posiadają funkcje ułatwiające automatyzację projektowania, w tym tworzenie rodzin części i złożeń oraz typoszeregów. W programie Autodesk Inventor Professional dostępne są funkcje iFeature, iPart, iMate, iAssembly, iLogic oraz iCopy, które znacząco ułatwiają oraz przyspieszają projektowanie. W artykule przedstawiono, na wybranych przykładach, praktyczne zastosowanie funkcji „i” programu Autodesk Inventor Professional w projektowaniu maszyn i urządzeń.

Słowa kluczowe: CAD, CAE, modelowanie parametryczne, iLogic, Autodesk Inventor, modelowanie automatyczne

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Innowacyjne materiały opakowaniowe- tasiemka ściągająca HDPE produkowana z recyklatów

Conference, Multidisciplinary Aspects
of Production Engineering *MAPE 2024*

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Streszczenie: W artykule przedstawiono wyniki prac B+R, których wynikiem było opracowanie innowacyjnych receptur, pozwalających na wdrożenie do działalności gospodarczej materiałów opakowaniowych o innowacyjnych cechach, przy jednoczesnym zachowaniu ich parametrów wytrzymałościowych. Diagnoza, z której wynikała potrzeba opracowania składu tasiemki ściągającej opartego na udziale surowców wtórnych wynika wprost ze strategii firmy oraz szerokiej analizy stanu istniejącego - po licznych konsultacjach przeprowadzonych z klientami na rynku regionalnym i zagranicznym zaistniała konieczność opracowania produktu dostosowanego do zmieniających się uwarunkowań i prawodawstwa poprzez zastąpienie dotychczas stosowanych surowców pochodzenia ropopochodnego innymi surowcami a także recyklingu odpadów poprodukcyjnych realizując aspekty ochrony środowiska. Założeniem było otrzymanie następujących parametrów i funkcjonalności tasiemki ściągającej w celu zmniejszenia objętości odpadów, zmniejszenia materiałochłonności:

- zastąpienie surowców pierwotnych surowcami pochodzącymi z recyklingu w ilości nie mniejszej niż 55%,
- dodatkowe obniżenie grubości o 10% dla opracowanej mieszanki.

Omówiono sposób otrzymywania jak również wpływ recyklatów, polietylenów liniowych i polietylenów średniej gęstości na właściwości mechaniczne, termiczne i optyczne. Z przedstawionych informacji wynika, że odpowiednie przygotowanie regranulatu jak również właściwy dobór mieszanki surowcowej pozwala na otrzymanie tasiemki ściągającej HDPE o zawartości min 55% recyklatów z jednoczesnym zachowaniem parametrów wytrzymałościowych.

Słowa kluczowe: Tasiemka ściągająca, polietylen wysokiej gęstości, opakowania, recyklat

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Optimalizacja izolacji termicznej budynku pod względem ekonomicznym i ekologicznym

Conference, Multidisciplinary Aspects
of Production Engineering *MAPE 2024*

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Streszczenie: W artykule przedstawiono matematyczny model termoizolacji przegród zewnętrznych budynku. Zaproponowano wartość bieżącą netto (NPV) do oceny inwestycji w termoizolację budynku. Wzięto pod uwagę aspekty ekonomiczne i ekologiczne, aby określić optymalną grubość izolacji termicznej. W analizie ekologicznej zastosowano ocenę cyklu życia (LCA). Wzięto pod uwagę różne źródła ciepła w budynku. Rozważono również różne rodzaje materiałów termoizolacyjnych. Opracowane wskaźniki zależą również od zadanej temperatury w mieszkaniu. Przeanalizowano zakres zadanych wartości temperatury powietrza w pomieszczeniach od 17°C do 26°C. Należy podkreślić, że temperatura utrzymywana w mieszkaniu ma bardzo duży wpływ zarówno na ekonomiczną NPV, jak i ekologiczną NPV. Głównym wnioskiem jest to, że dzięki racjonalnemu projektowaniu budynków, dostosowanemu do potrzeb użytkownika, możliwe jest znaczne obniżenie zapotrzebowania na energię, kosztów użytkowania budynku, a jednocześnie zmniejszenie negatywnego wpływu budynku na środowisko.

Słowa kluczowe: Izolacja termiczna; optymalna grubość; ocena cyklu życia; temperatura bazowa

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System monitorowania i analizy jakości powietrza

Conference, Multidisciplinary Aspects
of Production Engineering *MAPE 2024*

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Streszczenie: Zaprezentowany zostanie kompleksowy system monitorowania i analizy jakości powietrza wdrożony w mieście Żary.

Do stworzenia przestrzennego modelu rozkładu zanieczyszczeń wykorzystano metodę kriging wraz modyfikacjami, która wykorzystuje znane wartości zanieczyszczeń z punktów pomiarowych do oszacowania wartości w nieznanymi punktach. Do graficznej prezentacji rozkładu zanieczyszczeń wykorzystano tzw. heatmap.

Słowa kluczowe: System monitorowania, model rozkładu zanieczyszczeń, jakość powietrza, kriging

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Analiza rzeczywistego procesu produkcji włókien typu spunlace w nowoczesnych zgrzeblarkach dwubębnowych

Conference, Multidisciplinary Aspects
of Production Engineering *MAPE 2024*

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Streszczenie: Włókniny wiskozowo-poliestrowe znajdują obecnie bardzo szerokie zastosowanie. Pożądane właściwości użytkowe tych włókien, tj. jakość i wytrzymałość w dużym stopniu zależą od procesu zgrzeblenia, w którym formowane są ujednorodnione pokłady odpowiednio wymieszanych włókien. Na podstawie badań i testów wykonanych w rzeczywistym przedsiębiorstwie, dokonano analizy porównawczej dwóch różnych konstrukcji nowoczesnych zgrzeblarek dwubębnowych i ich wpływu na jakość wymieszania włókien oraz na wytrzymałość finalnie powstałej włókniny. W tym celu opracowano modele matematyczne istotnych wskaźników (czas opóźnienia włókien i średnia długość drogi obiegu włókien w zgrzeblarce) charakteryzujących proces zgrzeblenia. Na podstawie obliczeń numerycznych wyznaczono te wskaźniki dla rzeczywistej geometrii zgrzeblarek oraz testowych parametrów procesowych (nastaw zgrzeblarek w badaniach). Przeprowadzono dyskusję w celu interpretacji wartości tych wskaźników i ich korelacji z wytrzymałością wytworzonej włókniny, z uwzględnieniem różnej konstrukcji wykorzystanych w testach zgrzeblarek.

Słowa kluczowe: Modelowanie matematyczne; proces zgrzeblenia; wytrzymałość włókniny; produkcja włókniny

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Metodyka analizy binarnych sygnałów mająca na celu wykrywanie anomalii w szeregowych procesach produkcyjnych

Conference, Multidisciplinary Aspects
of Production Engineering *MAPE 2024*

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Streszczenie: Przedstawiona zostanie propozycja analizy binarnych sygnałów odczytywanych ze sterowników PLC maszyny produkcyjnej wykonującej operacje w szeregowym, cyklicznym procesie produkcji detalu. Funkcją celu jest wykrycie nietypowej pracy takiej maszyny mogącej w konsekwencji prowadzić do opóźnień w czasie produkcji lub do awarii. Wykrycie takich nieprawidłowości, czy też zakłócenia w procesie produkcyjnym oraz wskazanie ich przyczyn, momentów i miejsc rozregulowań pozwala na dalszą szczegółową obserwację tylko wybranych części maszyny produkcyjnej i może zapobiec dalszej degradacji jej elementów.

Metodyka analiz binarnych sygnałów celem wykrywania zdarzeń odbiegających od zmapowanych wcześniej wzorców przebiegu szeregowego procesu została oparta głównie o metody statystyczne i zdefiniowanie w obrębie cyklu wzorce relacji pomiędzy binarnymi sygnałami. Anomalie wykrywane są poprzez porównanie sekwencji zdarzeń bieżącego przebiegu sygnałów z sekwencjami referencyjnymi oraz weryfikację zgodności czasu trwania określonych stanów sygnałów (czuwania, roboczego i odpoczynku) z tymi oczekiwanymi, wynikającymi z zapisu w tablicy relacji.

Przedstawione zostanie również studium przypadku maszyny przemysłowej, dla której dedykowane jest to rozwiązanie. Przedstawione tu pomysły i rozwiązania są zgłoszone do opatentowania w Polsce i za granicą.

Słowa kluczowe: Wykrywanie anomalii, szeregi czasowe, przetwarzanie sygnałów binarnych

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Gospodarka energia elektryczna - analiza i refleksje

Conference, Multidisciplinary Aspects
of Production Engineering *MAPE 2024*

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Streszczenie: Prezentacja zawiera analizę przyczyn kryzysu energetycznego jak również refleksje na temat alternatywnych metod które mogą być użyte w celu jego złagodzenia i rozwiązania. Prezentacja analizuje również współczynnik energochłonności gospodarki wybranych krajów oraz metody jego obniżania. Rola państwa w promowaniu przyszłościowych rozwiązań energetycznych jest również dyskutowana. Prezentacja zawiera również refleksje na temat szans i zagrożeń używania różnych paliw do generacji prądu elektrycznego. Energia nuklearna jest również dyskutowana i poddana analizie. Prezentacja koncentruje się również na decentralizacji rynku energii jako metodzie efektywniejszej gospodarki energia.

Metoda decentralizacji rynku energii jest lokalny rynek energii wykorzystujący istniejącą sieć energetyczna. Podsumowanie zawiera praktyczne zalecenia i rekomendacje odnośnie decentralizacji rynku energii.

Słowa kluczowe: Gospodarka energetyczna, rynek energii, sprawność energetyczna, energochłonność , energia odnawialna , energia nuklearna

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Psychologiczne bezpieczeństwo jako metoda zwiększenia wydajności pracy w przedsiębiorstwie

Conference, Multidisciplinary Aspects
of Production Engineering *MAPE 2024*

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Streszczenie: Prezentacja koncentruje się na promowaniu kultury bezpieczeństwa psychologicznego w przedsiębiorstwie jako metody zwiększenia wydajności pracy. Kultura bezpieczeństwa psychologicznego pozytywnie wpływa na morale pracowników, poprzez włączanie ich w proces podejmowania decyzji w przedsiębiorstwie. Większość nowoczesnych firm, szczególnie w przemyśle 4.0 przywiązuje dużą wagę do tworzenia psychologicznie bezpiecznego środowiska pracy. Kultura bezpieczeństwa psychologicznego w wyższym szkolnictwie technicznym jest również niezbędna by lepiej przygotować absolwentów do pracy w ekonomii opartej na wiedzy. Ułatwia to dzielenie się wiedzą i pozwala na efektywniejsze osiągnięcie celów kształcenia.

Słowa kluczowe: Psychologiczne bezpieczeństwo, wydajność pracy, zarządzanie przedsiębiorstwem, efektywne zarządzanie

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Auxiliary services in the field of oil and gas extraction

Conference, Multidisciplinary Aspects
of Production Engineering *MAPE 2024*

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Streszczenie: During the drilling of wells for oil and gas, drilling waste of various composition is generated. The optimal amount of waste should consist of moistened drilled rock and a small amount of spent drilling mud. However, in practice, the actual amount of waste is 1.5-2.5 times higher than the required amount. The activities of our enterprises are aimed at reducing drilling waste and reducing the ecological burden on the environment by implementing the technology of storage-free drilling of wells. The main purpose of the technology of pitless drilling of wells: high-quality well construction, maintenance of drilling fluid parameters within the project requirements. Complete or partial removal of the solid phase depending on the technological tasks, reduction of clean water consumption, reduction of drilling waste by dehydration, preparation of sludge for safe transportation to a landfill or sludge storage facility. Means for implementing the technology of pitless drilling of wells: For these tasks, we use the following equipment: Vertical centrifuge OVSH-950, Horizontal centrifuges of the OGS type, Coagulation-flocculation unit (CFU), Pumping equipment. A brief description of the technology The drilled rock, after cleaning by the drilling machine equipment, is fed to a vertical centrifuge, where the solid phase larger than 0.3 mm is separated. The purified fugat is fed by the pump to the Coagulation-Flocculation Unit (CFU) , where reagents are added in the appropriate proportions for feeding to the horizontal centrifuge. The prepared fugat is separated into a dehydrated solid phase (sludge) and technical water in a horizontal centrifuge. Water is reused and sludge is disposed of.

Słowa kluczowe: Drilling, waste, mud, drilling mud, drilled rock, fugat

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Organization in the work environment as an introduction to Poka-Yoke tools – a case study of solving quality problems in production

Scientific Papers of Silesian University of Technology
– Organization & Management (2024)

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Abstract: This thesis deals with the use of 5S in an organization. It focuses on the implementation of 5S in an organization oriented to the production and processing of metal components for the automotive industry. 5S is a Japanese methodology that was first used in the automotive industry to improve productivity. The thesis is devoted to the basic principles of lean manufacturing. The practical part analyses the state of the workplaces before the introduction of 5S and the actual implementation of this methodology. The implementation of 5S brings a number of benefits to the organization, including reducing time wasted searching for tools, improving safety, boosting employee morale, and building the culture of the organization. Keeping the workspace organized with visual aids helps to increase productivity and reduce waste. The ultimate goal of 5S is continuous improvement in the workplace. The final section evaluates the benefits to the organization after the implementation of 5S. By implementing this strategy, the workplace becomes clean and standardized, allowing employees to work as efficiently as possible. The 5S method creates a more efficient work environment by improving the organization and optimizing the system of operation.

Keywords: 5S, Lean Manufacturing, Visualization, Standardization

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