Multidisciplinary Aspects of Production Engineering

MAPE 2025

09-12. SEPTEMBER 2025

MASŁÓW near KIELCE, POLAND

2025

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2025

XXII Międzynarodowa Konferencja
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MAPE 2025

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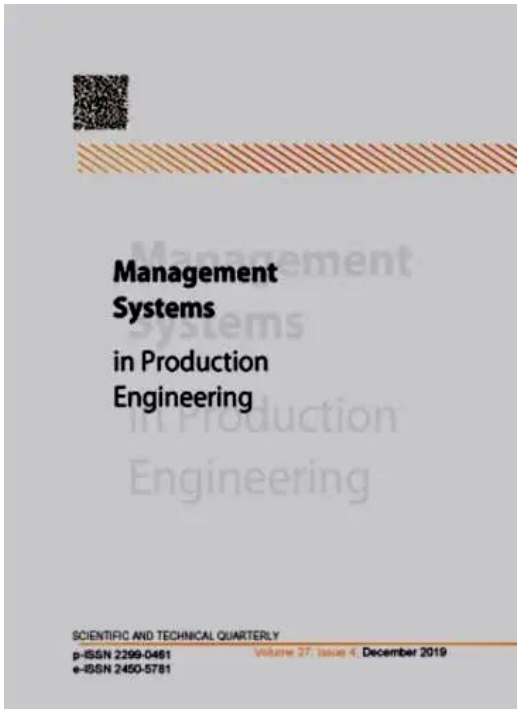

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XXII Międzynarodowa Konferencja
Multidisciplinary Aspects of Production Engineering
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CONFERENCE PROGRAMME

PRZEDWIOŚNIE HOTEL

09-12. SEPTEMBER 2025
MASŁÓW near KIELCE, POLAND

September 09, 2025

01:00 pm – 04:00 pm	Arrival, Registration
05:15 pm – 06:45 pm	Welcome, Scientific Session I
07:15 pm	Gala Dinner

September 10, 2025

08:00 am – 08:50 am	Breakfast
09:00 am – 02:30 pm	A trip to Łysa Góra, Holy Cross, Museum of Ancient Metallurgy Nowa Słupia
02:45 pm – 03:30 pm	Lunch
03:30 pm – 05:00 pm	Scientific Session II
05:00 pm – 05:15 pm	Coffee break
05:15 pm – 06:45 pm	Scientific Session III
07:00 pm – 11:00 pm	Grill

September 11, 2025

07:30 am – 08:30 am	Breakfast
08:45 am – 02:00 pm	Field trip to Chęciny, Cave Raj
02:15 pm – 03:00 pm	Lunch
03:15 pm – 04:45 pm	Scientific Session IV
04:45 pm – 05:00 pm	Coffee break
05:00 pm – 06:45 pm	Scientific Session V
07:00 pm	Dinner

September 12, 2025

08:00 am – 09:30 am	Breakfast
09:45 am – 10:00 am	Summary
10:00 am	Departure from the hotel

XXII Międzynarodowa Konferencja
Multidisciplinary Aspects of Production Engineering
MAPE 2025

PROGRAM SZCZEGÓŁOWY KONFERENCJI

09.09.2025

OTWARCIE KONFERENCJI 17.15-17.30

SESJA I, 17.30-18.45

1. Wiesław "Wes" GREBSKI
Wyższe Szkolnictwo Techniczne w Polsce i USA – analiza i refleksje

2. Tomasz SADŁOŃ, Jan KAŹMIERCZAK
Czy i jak zaangażować społeczność lokalną w techniczne i nietechniczne działania związane z systemem obrony cywilnej w jednostce samorządu terytorialnego w Polsce?

3. David H. LEHMAN
From Concept to Cosmos: A Journey through Project Management Principles and NASA's Best Practices

10.09.2025

SESJA II, 15.30-17.00

1. Małgorzata MALEC, Liliana STAŃCZAK
Role of employees' job satisfaction, competences and entrepreneurship in the management processes at the KOMAG Institute

2. Konrad TRZOP, Jarosław BRODNY
Opracowanie metody badania obudowy zmechanizowanej celem określenia wytycznych dla systemu monitorowania parametrów jej pracy

3. Grażyna PŁAZA, Patrycja KABIESZ, Andrew THATCHER, Tayyaba JAMIL
Ergonomics/human factors in the era of smart and sustainable industry: Industry 4.0/5.0

4. Piotr ŚLIWIŃSKI, Andrzej N. WIECZOREK
Electron beam surface hardening – possibilities and industrial applications

5. Martin KOMÁK, Elena PIVARČIOVÁ, Patrik HERČÚT
Machining of printed circuit boards using an industrial robot in a simulation environment

SESJA III, 17.15-18.45

1. Aleksandra KUZIOR, Alla LOBANOVA, Oleksii BONDAR
Sustainable consumption and production systems during wartime: needs, challenges, and adaptation strategies

2. Charli SITINJAK, Józef OBER
Examining the Impact of Service Quality and Product Innovation on Willingness to Buy Electric Vehicles: The Mediating Role of Customer Satisfaction

3. Łukasz BOŁOZ
Mass and volume wear rates of conical picks

4. Leszek KAŹMIERCZAK-PIWKO, Edyta WYSOCKA, Adrianna DYBIKOWSKA
Principal component analysis (PCA) in the assessment of regional development of the organic food market: A case study of the Lubusz voivodeship

5. Dorota KLIMECKA-TATAR
A model for improving production processes with AI-driven solutions in the context of Lean Management and Value Stream Mapping

6. Manuela INGALDI, Magdalena MAZUR, Robert ULEWICZ
Assessing the quality of e-learning services in higher education: A case study with empathy mapping and visual insights

7. Dagmar DLOUHÁ, Lukáš POSPÍŠIL, Viktor DUBOVSKÝ
Spatio-temporal kriging of air temperature for evaporation estimation

11.09.2025

SESJA IV, 15.15-16.45

1. Bogusława LISIECKA
Biżuteria obronna

2. Arkadiusz BOCZKOWSKI
Ograniczenie uciążliwości akustycznej strzelnic przez zastosowanie tłumików huku na broni palnej

3. Patrycja KABIESZ, Grażyna PŁAZA, Adam R. SZROMEK, Tayyaba JAMIL
The safety culture in textile industry companies in Poland

4. Tomasz WAŁEK
The prosumer-centered approach to energy microgrids in Poland

5. Weronika OSTOWSKA, Olena STRYHUNIVSKA
Development of a model supporting the analysis of costs related to equipment relocation in a manufacturing facility

6. Dariusz KRAWCZYK
Characteristics of the executive authorities of the largest urban centers in Poland after the local government elections in 2024

7. Erika SUJOVA, Daniela VYSLOUŽILOVÁ
Proposal for streamlining the CNC machine changeover process through the application of the SMED method

SESJA V, 17.00-18.45

1. Tomasz MAŁYSA, Szymon PAWLAK, Marek ŠOLC, Katarzyna MIDOR
Lockout – tagout system – as a solution aimed at reducing accidents at work

2. Marzena KUCZYŃSKA-CHAŁADA
Improvement of the Warehousing Process Using RFID Technology in a Manufacturing Enterprise – a Literature Review

3. Edward MICHLOWICZ
Possibilities of increasing the efficiency of production systems by using an additional capacitive element

4. Joanna FURMAN, Filip KEIPER, Sylwia KRUCZYŃSKA
The A3 report as a problem-solving tool based on the example of a manufacturing company

5. Anna KOCHMAŃSKA, Józef OBER, Charli SITINJAK
The concept of electromobility: The views of University students in Poland

6. Beata OLEKSIAK, Barbara CIECIŃSKA
Enhancing Warehouse Processes through the Application of the 5S Method

8. Ľubica MIKOVA, Erik PRADA, Michal KELEMEN
Integrated Multiphysics simulation and built in control design of a three link robotic manipulator

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Organizatorzy zastrzegają sobie możliwość zmiany w programie Konferencji
The organizers reserve the right to change the conference program

CONTENTS

The impact of formal and legal conditions on environmental disclosures in the ESG framework by capital groups in the hard coal mining sector: evidence from Poland

Acta Montanasicta Slovaca
Volume 30 (2025)

Aleksandra Sulik-Górecka,
Marzena Strojek-Filus
University of Economics in Katowice, **Poland**

Abstract: The extraction of hard coal has significant adverse effects on the natural environment, which mining entities disclose in their non-financial reports in compliance with increasingly stringent legal regulations. Regular stakeholder communication, encompassing comprehensive information on a company's economic, social, and environmental activities, enhances corporate transparency, facilitates the assessment of strategic implementation, and supports the identification of future risks. The objective of this article is to assess the impact of formal and legal conditions on ESG reporting within the environmental disclosure domain by the largest capital groups in Poland's hard coal mining sector over the period 2017-2024, with a particular focus on the role of taxonomy reports. The study employs an in-depth qualitative comparative analysis of data contained in the Management Board's activity reports and the consolidated financial statements of the three largest capital groups in the hard coal mining sector: the Jastrzębska Spółka Węglowa (JSW) Group, the Lubelski Węgiel Bogdanka S.A. (LWB) Group, and the Polska Grupa Górnicza S.A. (PGG). The comparative findings of these three capital groups – two of which are publicly listed on the Warsaw Stock Exchange (GPW) and one that remains privately held and subject to the Polish Accounting Act – revealed significant differences in the scope of environmental disclosures within the ESG framework. The primary reason for these differences lies in the varying ESG reporting regulations applicable to publicly traded groups. The study's results indicate that due to the classification of their operations as non-sustainable under the EU Taxonomy, the ESG indicators reported by the publicly listed companies are notably low, as coal extraction and sales are not considered sustainable activities. However, a detailed analysis of the companies' activity reports highlights substantial engagement in pro-environmental initiatives, reflected in expenditures, costs, and investments related to environmental protection. The study's findings contribute to a deeper understanding of the specific characteristics of the hard coal mining sector in the context of ESG reporting, offering insights into the implications of regulatory frameworks on corporate disclosure practices.

Keywords: EU taxonomy, sustainable development, coal mining, non-financial reporting, financial report

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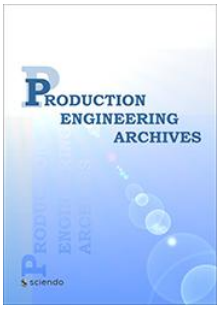
Examining the Impact of Service Quality and Product Innovation on Willingness to Buy Electric Vehicles: The Mediating Role of Customer Satisfaction

Production Engineering Archives
Volume 29 (2025)



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Abstract: Adopting electric vehicles (EVs) is a critical step towards achieving sustainable and environmentally friendly transportation systems in urban areas. This study delves into the factors that influence consumers' willingness to buy electric vehicles in Jakarta, Indonesia, focussing on the mediating role of customer satisfaction. The research framework integrates service quality, product innovation, and customer satisfaction as key determinants of the adoption of electric vehicles. Data from 420 respondents were analysed using regression and mediation analyses. The findings underscore the importance of service quality and product innovation in shaping consumers' willingness to embrace EVs. Efficient after-sales services, responsive customer support, and innovative product features positively impact consumers' perceptions and willingness to adopt electric vehicles. Furthermore, customer satisfaction emerged as a crucial mediator in this pro-cess, highlighting the importance of ensuring ongoing satisfaction throughout the EV ownership experience. These insights offer valuable guidance to EV manufacturers and policymakers in Jakarta and beyond as they seek to promote the adoption of cleaner and more sustainable transportation options. Furthermore, this research contributes to a broader understanding of the dynamics of EV adoption in urban settings and calls for continued efforts to improve service quality, innovation and customer satisfaction in the EV industry.

Keywords: electric vehicles, EV adoption, service quality, product innovation, customer satisfaction

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Mathematical model of differentiation of tractor reliability indicators and its application for given conditions of an agricultural enterprise

Production Engineering Archives
Volume 29 (2025)

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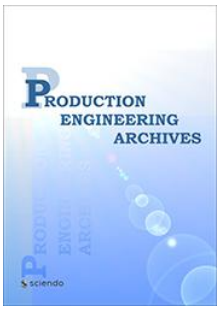

Abstract: The article presents the results of a theoretical study of optimization of life cycle costs of com-plex technical objects using agricultural tractors as an example. A mathematical model for differentiating tractor reliability indicators for given conditions of use has been developed. The developed model supports the cost optimization of tractors and similar high-complexity mechanical systems. An example of using the mathematical model is demonstrated, and recommendations are given to an agricultural enterprise on increasing the profitability of tractor operations. Calcu-lations have shown that the optimal indicator of mean time between failures of complexity group 3 for tractors of traction class 5-7 is the optimum value of the objective function in the 480-740 engine hours range. At the same time, the monitoring data of operational indicators indicate that the actual operating time for K744P2 tractors is 215 engine hours, and for Buhler Versatile 2375 tractors, it is 865 engine hours. Thus, the use of Buhler Versatile 2375 tractors from the point of view of cost optimization is 12.7% more economically advantageous than the use of K744P2 tractors in these conditions. However, the use of Buhler Versatile 2375 tractors also does not correspond to the optimum of the objective function, and further optimization by another 13.8% is possible here.

Keywords: differentiation, reliability, monitoring, optimization, tractor

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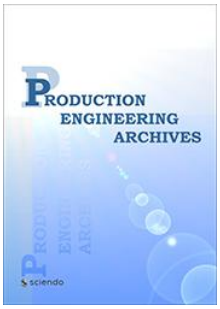
Sustainable consumption and production systems during wartime: needs, challenges, and adaptation strategies

Production Engineering Archives
Volume 29 (2025)



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Alla Lobanova, Oleksii Bondar
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Abstract: The article explores the impact of the Russo-Ukrainian war on sustainable consumption and production systems, with a focus on adaptive strategies of industrial enterprises and consumer behaviour. The study analyses how wartime conditions have caused significant changes in resource management, supply chain reconfiguration, and industrial efficiency. The research highlights a shift in consumption patterns towards essential goods, a reduction in energy consumption, and a prioritization of resource conservation. The war has led to increased industrial relocation, transformation of production processes, and a reassessment of sustainable development principles, including the traditional 3R model of 'Reuse-Reduce-Recycle,' supplemented by 'Rethink.' The findings of the study contribute to a better understanding of sustainable production and consumption strategies in crisis conditions, emphasizing innovative solutions for maintaining industrial operations and achieving sustainable development goals in extreme environments.

Keywords: Sustainable development, Sustainable consumption, Resource efficiency, Wartime, Adaptation strategies

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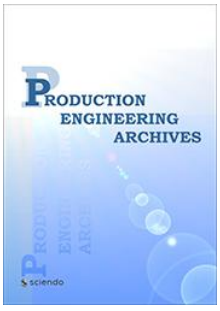
Role of employees' job satisfaction, competences and entrepreneurship in the management processes at the KOMAG Institute

Production Engineering Archives
Volume 29 (2025)



Małgorzta Malec, Liliana Stańczak
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Abstract: The authors take advantage of their scientific and professional experience in the scope of project management and management policy at a research organization, presenting the results of KOMAG employees' job satisfaction survey and of two projects conducted in 2022 and 2023 within the framework of the European Fund for Just Transformation. The survey results concerning the KOMAG employees' job satisfaction revealed an urgent need of improving competences and qualifications. It was particularly interesting to investigate the employees' level of engagement in trainings and courses and their impact on improving competences and developing professional careers. It lacks an analysis of the role of employees' job satisfaction, competences and entrepreneurship in the management processes at research organizations. The results of two projects, carried out as components of continuing education and job crafting, can be treated as a sort of guidelines and recommendations for not only representatives of research organizations but also for industrial companies as they are of interdisciplinary, general character. The article's objective is oriented onto getting knowledge about specific requirements and expectations of researchers employed at institutes. So far this aspect has not been investigated and presented in available literature. The results of two projects, described in the article, are in line with job crafting policy at the KOMAG Institute and they show explicitly that a development of entrepreneurship, competences and job satisfaction is an important component of managerial strategy.

Keywords: job satisfaction, competences, entrepreneurship, continuing education, job crafting, management policy, trainings

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Characteristics of the executive authorities of the largest urban centres in Poland after the local government elections in 2024

Management Systems in Production Engineering
Volume 33 (2025)

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Abstract: By decision of voters, the local government of the new term was elected in 2024. The study conducted in the largest Polish urban centres allowed to characterize single-person executive bodies of municipalities, taking into account both political and demographic criteria. The tendency to mask signs was confirmed. The level of social support for the winning candidates responsible for managing local administration for the next five years was also determined. The analysis covered all cities with district rights , whose total revenues reached 18% of the state budget revenues in the analysed period. 66 mayors who managed municipal employees and performed corporate supervision over municipal institutions, units and companies had the actual impact on the spending of these funds. Describing the single-person executive bodies of all Polish cities with district rights, elected in the elections in April 2024, was the purpose of the paper. The conducted research study allowed to characterize (taking into account both political and sociological criteria) a group of 66 mayors managing the largest centres of local government in Poland. The paper was based on the analysis of source materials from the National Electoral Commission, data provided by the Central Statistical Office, budget resolutions adopted by collegial decision-making bodies of cities with district rights, as well as media verification of texts published in the mass media and social media.

Keywords: local government unit, city mayor, city with district rights, municipal district, municipality

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Possibilities of increasing the efficiency of production systems by using an additional capacitive element

Management Systems in Production Engineering
Volume 33 (2025)

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Abstract: The continuity of the flow of materials needed for correct operation of manufacturing systems can be achieved using different means and control methods. These objectives can be achieved through the use of Total Productive Maintenance (TPM). Specific effects can also be achieved by using additional capacitive elements in device systems (manufacturing lines). In this paper to be considered is a system with a serial structure and an additional capacitive element (the position within the system and the capacity of the element are determined). The capacitive element divides the system into two subsystems: the part delivering the material to the buffer (DP) and the part receiving the material (RP). The time lost due to unplanned interruptions in the operation of the production system equipment is described by the MTTR (Mean Time to Repair) indicator. The analysis of the system's operation used the failure index, which is directly related to the MTTR index. To study the system, a method involving the analysis of states and a digital simulation are used. To assess the system with an additional capacitive, a production performance indicator is used. The obtained results allow for conclusions on the possibilities for improving the effectiveness of manufacturing systems using the proposed method.

Keywords: manufacturing effectiveness, serial structure with buffer, system state analysis, system with a capacitive element, simulation research

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Ergonomics/human factors in the era of smart and sustainable industry: Industry 4.0/5.0

Management Systems in Production Engineering
Volume 33 (2025)

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Abstract: The three primary branches of ergonomics/human factors (E/HF), concentrate on the physical, cognitive, and organizational dimensions, have developed over time. Generally, E/HF is the scientific discipline concerned with the design and arrangement of work environments, systems, and products to fit the physical, cognitive, and emotional needs of the people who use them. The goal of E/HF is to optimize human well-being and overall system performance by improving comfort, safety, efficiency, and productivity while reducing the risk of injury and strain. E/HF is increasingly relevant in the context of Industry 4.0 characterized by automation, cyber-physical systems, and interconnected technologies. The integration of advanced technologies such as the Internet of Things (IoT), artificial intelligence (AI), robotics, and augmented reality (AR) within manufacturing environments presents both opportunities and challenges for worker well-being. Development of industrial technologies requires also a rethinking of traditional E/HF principles to address new human-machine interactions, cognitive demands, and the physical layout of workplaces. E/HF benefits and the threats of Industry 4.0/5.0 technologies must be considered in an integrated manner. The importance of designing systems that promote user-friendly interfaces, reduce mental and physical strain, and support sustainable work environments now becomes critical. In this context, this review paper explores the connection between E/HF and Industry 4.0/5.0, emphasizing the need for a holistic approach to designing work systems that enhance both human performance and technological innovation.

Keywords: safety work, ergonomics (E/HF), cognitive ergonomics, Industry 4.0/5.0

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Shaping a safe working environment in the coal methane production process: utilizing model studies to assess hazard formation

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Abstract: The establishment of a safe working environment is one of the key challenges in the implementation of various production processes. This is particularly relevant to underground coal production, where the primary operations (exploitation) take place in an underground environment. In this context, the paper presents the results of a study on methane hazard formation during the coal production process. The analysis was conducted through model studies that included driven dog headings, longwall workings with and without auxiliary ventilation equipment, and collapsing goafs. The research methodology, mining region models, and validation of the obtained results were further supported by tests conducted under real conditions. The findings highlight the significant potential of model studies based on structural models for assessing ventilation hazards in the examined regions and the phenomena occurring within them. Based on these results, the identification and assessment of methane hazard levels in the studied regions were carried out. This, in turn, opens avenues for their practical application in enhancing both safety and efficiency in the mining production process. The developed methodology and models are universal in nature, offering a broad range of applications for studying various ventilation states, both in steady and unsteady conditions. Additionally, they allow for comprehensive predictions of methane concentration distributions, forming a critical basis for preventive measures and improvements in underground mining safety.

Keywords: production process, safe working environment, modeling studies, underground coal mining, structural modeling, forecasting

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Improving ballistic resistance of armor steel by FCAW with hard facing alloys of Fe–Mo–Mn–B–C system

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Abstract: Armor steels can be strengthened against modern ballistic threats through surface hard facing with advanced Fe-based alloys. This study develops a series of flux-cored arc welded (FCAW) hard facing alloys in the Fe–Mo–Mn–B–C system to enhance the ballistic resistance of Armox® 440T steel. Single-layer (~3 mm) hard facings were deposited on 6 mm armor plates using an automated hard facing device, and subsequently characterized with respect to their microstructure, phase composition, and ballistic performance. Thermodynamic calculations and microscopy revealed an austenitic matrix reinforced by hard boride inclusions. By increasing the Mo and B concentrations, the alloy solidification shifted from a primary austenite + austenite boride mixture to a primary boride + austenite boride mixture structure. The compositions with high Mo:B ratio yielded a ~25% volume fraction of Mo2(Fe,Mn)B2 borides. Ballistic tests using 7.62 mm steel-core bullets (~830 m/s) showed that uncoated Armox 440T was completely perforated, whereas all hard faced plates prevented penetration. Notably, coatings with higher boride content eliminated rear-side spalling, indicating superior energy absorption and projectile fragmentation. These findings demonstrate that FCAW-applied hypereutectic Fe–Mo–Mn–B–C hard facing alloys can significantly improve the ballistic performance of armor plates.

Keywords: hard facing, flux-cored arc welding, boride reinforcement, Armox 440T, ballistic resistance, austenitic manganese steel

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Machining of printed circuit boards using an industrial robot in a simulation environment

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Abstract: This paper is devoted to the design, simulation and optimization of a robotic cell designed for machining printed circuit boards (PCBs) using a stationary milling machine mounted on an industrial robot. The main goal was to create a digital model of the production workplace in the RobotStudio environment, which allows testing robot movements, program logic, and functional arrangement of the entire system before physical implementation. The use of off-line programming reduces costs and risks, enables rapid tuning of robot paths, and minimization of collision states. An important part of the design was the creation of a custom gripper made by 3D printing. This gripper combines vacuum suction cups with pneumatic clamping, which allows gentle manipulation of PCBs without damaging electronic components. The created cell model includes a conveyor system, milling machine, a protective Plexiglas cover, and a camera for recognizing PCB types. The simulation confirmed the functionality of the entire cycle, the optimized length of which reaches 56.58 s. The results show the potential of digital design for automated manufacturing cells and open the space for future research in the field of effectors, advanced control, and artificial intelligence in industrial automation.

Keywords: industrial robot, robotic cell, gripper, RobotStudio, simulation, milling

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Possibilities of increasing the efficiency of production systems by using an additional capacitive element

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Abstract: The continuity of the flow of materials needed for correct operation of manufacturing systems can be achieved using different means and control methods. These objectives can be achieved through the use of Total Productive Maintenance (TPM). Specific effects can also be achieved by using additional capacitive elements in device systems (manufacturing lines). In this paper to be considered is a system with a serial structure and an additional capacitive element (the position within the system and the capacity of the element are determined). The capacitive element divides the system into two subsystems: the part delivering the material to the buffer (DP) and the part receiving the material (RP). The time lost due to unplanned interruptions in the operation of the production system equipment is described by the MTTR (Mean Time to Repair) indicator. The analysis of the system's operation used the failure index, which is directly related to the MTTR index. To study the system, a method involving the analysis of states and a digital simulation are used. To assess the system with an additional capacitive, a production performance indicator is used. The obtained results allow for conclusions on the possibilities for improving the effectiveness of manufacturing systems using the proposed method.

Keywords: manufacturing effectiveness, serial structure with buffer, system state analysis, system with a capacitive element, simulation research

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Spatio-temporal kriging of air temperature for evaporation estimation

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Abstract: This study focuses on the reconstruction of incomplete and spatially sparse air temperature data for the purpose of estimating evaporation from Lake Most – a large artificial reservoir in the Czech Republic with no natural inflow. The primary objective is to generate daily spatial temperature fields using spatio-temporal kriging and subsequently compute evaporation using a calibrated Hargreaves–Samani (HS) model. We utilize daily data from the years 2020-2022, collected from six low-cost micro stations installed around the lake and from a nearby professional meteorological station (Kopisty, operated by the Czech Hydrometeorological Institute). Due to frequent outages, data coverage from the micro stations ranges from 5% to 38%. To fill in missing values and estimate temperature over the lake surface, we apply a Gneiting covariance model. All computations are carried out in MATLAB using a in-house implementation. The reconstructed temperature fields exhibit realistic spatial structure and seasonal variability. Based on the interpolated daily mean, maximum, and minimum air temperatures, we compute daily and cumulative evaporation from the lake surface. The results show that even a sparse and unreliable sensor network can yield physically consistent inputs for evaporation estimation when combined with statistical interpolation. The proposed method is readily applicable to other reservoirs under limited measurement conditions and may support hydrological modelling and water balance analysis.

Keywords: Evaporation, Kriging, Lake Most, Temperature, Time series

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Proposal for streamlining the CNC machine changeover process through the application of the SMED method

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Abstract: In today's highly competitive business environment, enhancing the efficiency of manufacturing processes is of critical importance. This research focuses on the application of the SMED methodology to increase the efficiency of the changeover process of a CNC machining center. The core of the study is a detailed analysis of the current state of production and changeover procedures on a selected machine. The process was monitored using video analysis of work operations. Based on this analysis, internal and external changeover activities were identified, and by eliminating inefficient steps, a set of improvement measures was proposed. As a result, a standardized changeover procedure was developed to optimize the overall process duration and improving maintenance systems. The final part of the study presents the outcomes of the improvement, expressed through reduced changeover time, along with a proposed economic evaluation of the implemented optimization measures.

Keywords: Optimalization, SMED (Single-Minute Exchange of Die), OEE (Overall Equipment Effectiveness), maintenance

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

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Abstract: This study examines how integrating digital technologies into government operations can enhance urban governance in smart cities. It specifically looks at how these advancements can contribute to the development of sustainable smart cities in alignment with the Sustainable Development Goals (SDGs). The research employs two analytical frameworks to assess how advanced technologies impact and integrate with government functions. The first framework examines the effects of digitalization on sustainable smart cities, while the second offers a holistic approach to optimizing government processes through digital transformation. The research demonstrates the various advantages of digitalization, such as enhanced public services, advanced infrastructure, and greater transparency and accountability. Nevertheless, obstacles like data security, privacy issues, and disparities in digital access are recognized, requiring cautious handling. The research affirms that while integrating digital technologies in government operations can significantly support urban sustainability, the strategy is crucial to manage potential threats and foster inclusivity and environmental responsibility. These models provide practical recommendations for governments to responsibly and effectively utilize digital tools, ultimately fostering the development of resilient, efficient, and inclusive smart cities.

Keywords: digitalization; sustainable development; smart cities; government management; Sustainable Development Goals (SDGs); policy framework; technology implementation; e-government

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Integrated multiphysics simulation and built in control design of a three link robotic manipulator

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Abstract: The aim of this paper is to create a complex model of a robotic manipulator in a multiphysics simulation environment and design its control exclusively using the built-in resources of this environment, without the application of external analytical or numerical methods for calculating controller parameters. The introductory chapter sets the goal and emphasizes the importance of control systems in technical practice. At the same time, the basic parameters of the modeled mechanism and the characteristics of the operation that the simulated system is to perform are specified. In the following chapters, a simulation model of the mechanism is derived. The kinematic structure of the robotic arm, the number of degrees of freedom, as well as key dynamic characteristics that significantly affect the behavior of the system during movement are described. This model forms the basis for subsequent virtual implementation in the simulation environment. The next part is devoted to the implementation of the simulation model, where the mechanism structure consists of a stationary base, three rotating links and an end effector. The chapter describes in detail the specified motion profiles and boundary conditions of the simulation, which reflect realistic loading and operating modes of the system.

Keywords: Robotic manipulator, simulation model, controller, MSC Adams

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Development of a model supporting the analysis of costs related to equipment relocation in a manufacturing facility

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Abstract: This paper introduces a cost estimation model for facilitating the relocation of internal machinery within manufacturing sites. There is existing literature on full-site relocations, but the task of repositioning machinery internally – while having some level of operational and financial relevance – has had minimal academic study. The main intent of this research was to decrease total relocation costs through better planning and costs estimation. The model provides a specific breakdown of relocation costs in three main areas – equipment cost, labor cost, and transport rental cost. The model utilizes the ABC classification method to categorize the costs into groups based on potential financial impact. This model was developed in Microsoft Excel and used the OLESTR – a combined spatial and technological – methodology which can improve layout optimization and reinforce practical application. The model was validated using a case study carried out in a printing facility. The analysis considered two layout variants, each involving specific machine relocation scenarios. Slight cost variations between model iterations were observed, reflecting built-in parameter variability in the figures, mainly time and price ranges – which is in keeping with real-world uncertain environments. Overall, the model allows for practical, transparent and flexible planning for machinery relocation, and assists industrial managers in considering their options, prioritizing activities and reducing costs of relocation.

Keywords: relocation, machinery relocation, cost estimation model, factory layout, manufacturing facility, spatial planning, ABC classification, equipment repositioning

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Ergonomic analysis of working conditions at production stations using computer simulations

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Abstract: This article presents an analysis of the ergonomics of working conditions at production workstations using computer simulations. The aim of the study was to assess factors affecting the comfort and safety of workers performing repetitive manual tasks in a production environment. The study used methods of virtual mapping of human work, which allowed for a detailed analysis of the adopted body positions, range of movement and musculoskeletal loads. The simulations made it possible to identify potential ergonomic risks, such as forced body positions, overreaching or frequent trunk rotation. Based on the results, specific organisational and technical improvements were proposed to reduce the risk of injury and increase work efficiency and comfort. The article confirms that the use of computer simulations is an effective tool to support the design of ergonomic workstations.

Keywords: ergonomics, ergonomic diagnosis, computer simulations, ergonomic workstations

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Impact of ergonomics and workflow on the optimization of selected indicators in production processes

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Abstract: This study examines the impact of ergonomics and workflow organization on optimizing selected indicators of production processes in an industrial enterprise. Selected workstations were assessed for current ergonomic conditions and work organization. Based on the findings, targeted improvements were proposed to enhance ergonomics and workflow efficiency. Post-implementation results were compared with baseline data, revealing significant gains: reduced physical workload, shorter operation times, and smoother task execution. The results demonstrate that intentional ergonomic design combined with workflow optimization is an effective approach to improving performance in industrial settings.

Keywords: Ergonomics, Workflow, Optimization, Work efficiency, Production processes

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Lockout – tagout system – as a solution aimed at reducing accidents at work

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Abstract: In the context of manufacturing companies, incidents related to the unintentional activation of sources of hazardous energy, or the failure to adequately secure them, are systematically documented on a daily basis. The implementation of a lockout/tagout system has been identified as a viable solution to effectively mitigate the occurrence of accidents during the process of installing, repairing, and maintaining machinery and equipment. The system is predicated on the distribution of competencies across diverse employee categories and the execution of procedures as delineated. The developed procedures have been demonstrated to facilitate the appropriate implementation of the lockout/tagout system, thereby reducing the probability of accidents in the workplace. The study presents the essence of the problem of accidents at work and the possibility of forecasting quantitative data. The prediction of quantitative data facilitates the assessment of the trend of recorded incidents over an extended period. The presented trend of the phenomenon will allow a preliminary analysis in terms of the effectiveness of implemented solutions aimed at improving occupational safety.

Keywords: Lockout-Tagout system (LOTO), work safety, legal regulations, improvement of working conditions, forecasting accident at work

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A model for improving production processes with AI-driven solutions in the context of Lean Management and Value Stream Mapping

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Abstract: In the face of dynamic technological evolution and increasing operational complexity in contemporary manufacturing enterprises, the integration of artificial intelligence (AI) tools with traditional methods of operational management is emerging as a key strategic direction. The shift toward Industry 4.0 necessitates not only automation but also intelligent support for decision-making, process optimization, and value creation. In response to these needs, this article introduces a conceptual model aimed at improving production processes through the integration of AI assistants with Lean Management principles, particularly focusing on the application of Value Stream Mapping (VSM). In the proposed model, AI assistants act as active analytical and decision-support entities. Their role extends beyond passive data collection to include real-time monitoring of key performance indicators (KPIs), identification of inefficiencies and waste (MUDA), and proactive facilitation of continuous improvement activities, in line with the kaizen philosophy. AI tools enable the automation of VSM processes by dynamically generating and updating process maps based on live data from integrated production systems, such as MES (Manufacturing Execution Systems), ERP (Enterprise Resource Planning), and other digital platforms. Moreover, the model leverages AI's predictive capabilities to support strategic and operational decisions in areas such as production scheduling, material flow optimization, predictive maintenance, and workforce allocation. By detecting patterns of deviations and operational disturbances, AI can recommend data-driven corrective actions and simulate their potential outcomes, enabling organizations to respond more effectively to dynamic manufacturing environments. The article outlines the conceptual architecture of the proposed model, explores its practical applications, and discusses its expected benefits, including increased process transparency, responsiveness, and value orientation. In addition, it addresses key challenges related to the implementation of AI in Lean environments, such as data quality and consistency, employee acceptance and upskilling, and the interpretability of algorithmic decisions. The model constitutes a foundational step toward the development of intelligent, adaptive, and sustainable production management systems, and offers valuable directions for both future research and industrial practice.

Keywords: Artificial Intelligence (AI), Lean Management, Value Stream Mapping (VSM), Industry 4.0, Production Process Optimization

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Assessing the quality of e-learning services in higher education: A case study with empathy mapping and visual insights

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Abstract: The rapid development of digital technologies has significantly reshaped the way higher education institutions deliver their services. E-learning, as a form of digital service (e-service), has become an essential component of academic teaching, especially following the global shift toward remote learning. However, the effectiveness and quality of these services remain a subject of increasing interest and scrutiny. This paper aims to assess the perceived quality of selected university-level online courses by analyzing their delivery through the lens of student experience. The study proposes a mixed-methods approach that combines a quantitative online survey with qualitative techniques, such as empathy mapping and platform analysis. By applying user-centered tools, the research seeks to explore how students perceive various aspects of online learning, including accessibility of content, clarity of communication, technical usability, interaction with instructors, and emotional engagement. The empathy map, in particular, will help capture students' thoughts, feelings, concerns, and expectations regarding digital education. Infographics and visual methods will be used to enhance the presentation of insights and make findings more accessible to both academic and administrative stakeholders. Although the study is based on selected case courses from a Polish university, its methodological framework can be adapted for broader applications. The anticipated outcomes include the identification of critical success factors and potential gaps in the quality of e-learning services. Ultimately, the paper aims to provide practical recommendations for improving the design, delivery, and evaluation of online academic courses in order to support better student satisfaction and learning outcomes.

Keywords: e-learning quality, e-services, student satisfaction, empathy map, e-service assessment

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The concept of electromobility: The views of University students in Poland

Management Systems in Production Engineering
Volume 34 (2026)

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Abstract: The phenomenon of electromobility is the subject of discussion among many diverse groups. Although its implementation in individual countries poses many challenges that must be addressed, among others, by electric car manufacturers and sellers (for example, in the form of developing technological solutions to increase the safety of electric cars or adapting recycling processes to specific technological solutions), the benefits it brings are measurable. Therefore, the main objective of the research undertaken in this manuscript is to analyse the advantages and disadvantages of the concept of electromobility based on the opinions of university students in Poland. A total of 859 respondents were selected to participate in the study, including 488 men (56.81%), 353 women (41.09%) and 18 people who identified their gender as other (2.10%). The statistical calculations used included the Mann–Whitney U test, Spearman's rank correlation, multidimensional cluster analysis and Profit analysis. University students are sceptical about the concept of electromobility; they attach greater importance to the disadvantages of this concept (mainly related to the high purchase cost of electric cars and their repairs). Among the advantages of electromobility, the most important (in the students' opinion) are technological progress, no need to purchase increasingly expensive fuel and the low failure rate of electric cars.

Keywords: Electromobility, advantages of electromobility, disadvantages of electromobility, ELV

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Electron beam surface hardening – possibilities and industrial applications

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Abstract: This paper presents an overview of work on the possibilities and applications of electron beam surface hardening as a method of increasing mechanical properties. Electron beam surface hardening can be used to manufacture a wide range of components that require high wear resistance under friction conditions. This applies to components such as cutting tools, working surfaces of gear transmissions, shaft components, bearings and many other components exposed to increased abrasive wear. The electron hardening process is mainly used in the production of components with complex geometries, components that require high heating rates or very high precision for surface heating. The electron hardening method allows hardened layers with thicknesses ranging from a few micrometres to several millimetres to be obtained using continuous and pulsed equipment. The hardness increases achieved can exceed 100%, producing remelted layers as well as those without a liquid phase.

Keywords: surface hardening, electron beam, the hardness, increased abrasive wear

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Mass and volume wear rates of conical picks

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Abstract: Mechanical mining is extensively employed in the mining and construction industries. Conical picks are essential cutting tools that experience wear during operation, necessitating their timely replacement. Prolonging the service life of these picks can significantly enhance mining efficiency and provide economic benefits. This article examines the wear of conical picks used in mining machines and explores quantitative methods for assessing their wear rates. We have compared two different types of assessment: the mass and volume methods. Laboratory tests were conducted under controlled conditions to measure the wear of the picks, utilising a laboratory scale, 3D scanning, and Archimedes' principle. The accuracy of these methods was evaluated by calculating both the wear indicators' maximum and mean squared errors. The findings reveal that both methods produce similar results under standard conditions although there are differences in accuracy. 3D scanning, while slightly less precise than the Archimedes method, offers the significant advantage of generating a 3D file depicting the tool's wear profile. In contrast, the Archimedes method is characterised by a higher repeatability and accuracy. The decision to employ mass or volume-based indicators should depend on the objectives of the test: volume measurements are recommended to compare structurally different picks, while mass measurements are adequate for picks of the same type. In summary, both methods demonstrate high accuracy and can be effectively applied in engineering practices.

Keywords: pick, laboratory tests, wear rate, tool life, volume determination, 3D scanning

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Improvement of the Warehousing Process Using RFID Technology in a Manufacturing Enterprise – a Literature Review

Scientific Papers of Silesian University of Technology – Organization & Management (2025)

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Purpose: The purpose of this publication is to present a review of the existing literature regarding the use of RFID technology in warehouse processes in manufacturing enterprises. The publication aims to identify the benefits and challenges associated with RFID implementation, as well as to highlight areas where this technology can improve warehouse processes and inventory management.
Design/methodology/approach: A literature analysis was conducted on the applications of RFID in logistics and warehousing, focusing on research related to the automation of inventory processes, improving inventory accuracy, and reducing waste. The paper also compares results from different industries to identify universal benefits and challenges associated with RFID implementation.
Findings: The literature points to several benefits of implementing RFID technology, such as improved inventory accuracy, reduction of human errors, acceleration of warehouse processes, and better warehouse space management. RFID implementation also allows real-time tracking of goods, leading to better inventory control and faster decision-making. However, the literature also highlights challenges related to initial implementation costs, integration with existing systems, and the need for staff training.
Research limitations/implications: Further research should focus on investigating the long-term impact of RFID on operational costs in warehouses and analyzing the effectiveness of RFID technology across different industries. There is a need for research on integrating RFID with other technologies, such as IoT (Internet of Things) and artificial intelligence, to further improve warehouse processes.
Originality/value: The article provides a comprehensive review of the existing literature on RFID technology in warehouse processes, highlighting its potential for automation and optimization. The publication adds value by analyzing various aspects of RFID technology, its implementation, and the long-term benefits resulting from its use in manufacturing enterprises.

Keywords: RFID, warehouse automation, inventory management, logistics, technology in logistics

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The A3 report as a problem-solving tool based on the example of a manufacturing company

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Purpose: This article aimed to analyze a problem occurring in the pipe production process and then solve it using the A3 report. The analysis was conducted using the example of a production plant in Poland, where a problem with gel lumps on the inner surface of pipes was identified, affecting the quality, durability, and safety of finished products. Solving the problem by the A3 report methodology enabled understanding of the problem, analyzing its causes, and developing an action plan, engaging the team in the improvement process.
Design/methodology/approach: The A3 report was used for the analysis as a tool to support problem-solving in the production environment. According to the A3 report methodology, the problem-solving process included: defining the problem, analyzing current conditions, defining the action objective, identifying the root cause, defining countermeasures, developing an implementation plan, and defining further actions (monitoring results and drawing conclusions).
Findings: Using the A3 report allowed to identify the root cause of the problem being analyzed. Furthermore, taking preventative measures and standardizing the process allowed to effectively resolve the problem and prevent its recurrence.
Research limitations/implications: The analysis focused on a single issue in the pipe production process at a specific company, which limits the ability to compare the results regarding the effectiveness of the A3 report at that plant as a problem-solving tool. The results are also, to some extent, dependent on the competence and commitment of the team conducting the analysis. Furthermore, the effectiveness of the implemented actions was observed over a limited time horizon.
Originality/value: This article is a case study and presents the practical application of the A3 report in the process of solving a specific problem at a manufacturing company in Poland. The work serves as source material for the company where the analysis was conducted and can also be a source of knowledge for other companies undertaking similar activities. Furthermore, the conducted research can serve as a reference point for further research and comparative analyses in industrial practice.

Keywords: the A3 report, Problem-Solving, Ishikawa diagram

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The safety culture in textile industry companies in Poland

Scientific Papers of Silesian University of Technology – Organization & Management (2025)

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Purpose: The aim of this article is to analyse the safety culture in selected Polish textile enterprises and to understand employees' perception of occupational safety.
Methodology: The study was conducted in two Polish textile companies using three data collection methods: (1) employee surveys, (2) interviews with management and safety specialists, and (3) observations of working conditions on the production floor. The survey consisted of 50 questions, including a demographic section and questions on safety culture, assessed on a five-point Likert scale.
Findings: Data analysis revealed significant correlations between demographic variables and perceptions of safety. It was found that length of service affects awareness of hazards and compliance with safety rules. Employees' involvement in safety-related activities was strongly related to their perception of the level of safety in the workplace. Surprisingly, the level of education did not show a significant correlation with the perception of safety culture. Additionally, a relatively low sense of safety was noted among employees, which may be due to insufficient actions on the part of management or lack of access to appropriate personal protective equipment.
Originality/value: The article contributes to the development of safety culture theory by analyzing its aspects in the context of the Polish textile industry. It provides practical guidelines for companies striving to improve their safety performance, which in the long term can contribute to building a safer and more responsible work environment in this industry.

Keywords: safety culture, textile industry, work safety

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The prosumer-centered approach to energy microgrids in Poland

Scientific Papers of Silesian University of Technology – Organization & Management (2025)

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Purpose: This paper presents the application potential of an innovative, prosumer-centered concept of energy microgrids, aimed at increasing benefits for prosumers under the technical and legal conditions of the Polish energy system.
Design/methodology/approach: The concept is implemented through a novel metering and billing system tailored for prosumer microgrids in Poland. It uses a new type of multi-source energy meter, which allowed for maximizing the benefits for prosumers.
Findings: This paper proposes a more prosumer-centered interpretation of the "smart" concept in the context of microgrids operating within the Polish smart grid systems. Traditional smart grid solutions in Poland have focused mainly on balancing and stabilizing energy generation and transmission infrastructure. Existing grid management systems can partially control the prosumer energy use level to enhance balance and stability of utility-scale energy sources and distribution networks – while treating prosumers as secondary, controllable actors. In contrast, the proposed approach directly integrates smart functionalities on the prosumer side, enabling them to gain direct benefits from participating in energy clusters that include renewable energy sources, energy storage systems, and other energy-efficient sources – allowing for lower-cost electricity use. The introduction of multi-source energy meters, which enable the real-time distinction of what portion of the electricity measured comes from specific sources present in the microgrid (e.g., grid, solar, wind, hydro, battery), forms the basis for a new billing method aligned with Polish regulations and technical standards. This enhances the financial viability of microgrids for prosumers and shifts the operational benefits of microgrid participation toward them.
Social implications: The proposed solution supports the development and broader adoption of energy microgrids, especially in prosumer clusters, contributing to energy transition and local sustainability.
Originality/value: The study introduces an original approach using multi-source energy meters as a component of a billing framework designed specifically for Polish prosumer microgrids. This enables a shift in value creation from the utility side to the prosumer side. The concept is relevant to energy cluster and microgrid designers and operators, as well as prosumers engaged in local energy systems.

Keywords: Polish smart microgrids, energy clusters, multi-source energy metering, smart billing system, energy management

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Principal component analysis (PCA) in the assessment of regional development of the organic food market: A case study of the Lubusz voivodeship

Scientific Papers of Silesian University of Technology – Organization & Management (2025)

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Purpose: The aim of the article is to indicate the possibilities of using Principal Component Analysis (PCA) in assessing regional conditions of development of the organic food market. The article attempts to identify the relationships between selected indicators of public statistics.
Design/methodology/approach: The applied methodology may constitute the basis for developing a synthetic indicator of the development of the regional organic food market and a support tool for those shaping development policy in the area of agriculture, rural areas and promoting sustainable consumption patterns.
Findings: The use of Principal Component Analysis (PCA) allowed us to identify the development trajectories of selected, significant regional indicators of the organic food market.
Practical implications: The constructed synthetic indicator may be a useful tool for assessing the development of the regional organic food market and, therefore, for better implementation of development policies in the areas of agricultural production and the promotion of sustainable consumption.
Social implications: Promoting knowledge about the regional organic food market and thus shaping sustainable consumption patterns among the community living in the analyzed region.
Originality/value: The application of PCA analysis to assess the development of the regional organic food market, using selected regional public statistics data. The added value of this work is the attempt to integrate quantitative methods with a regional perspective on the development of the organic food market by using a synthetic indicator to assess the processes taking place within it.

Keywords: organic farming, sustainable agriculture, regional organic food production market, market development assessment, sustainable consumption, food production

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The use of Value Stream Mapping for process optimization – a case study

Scientific Papers of Silesian University of Technology – Organization & Management (2025)

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Purpose: This article aims to apply the Value Stream Mapping method to optimize the container cleaning process in an automotive company.
Design/methodology/approach: The article uses observation to analyze the process flow and assess the workload of employees in the small container cleaning department. The observation was structured, overt, and uncontrolled, and was conducted in a natural work environment. A management tool such as the Ishikawa diagram was used to analyze disruptions in the process, and the process was visualized using a Value Stream Map
Findings: After the analysis, it was found that the problems that occurred were: the arrangement of pallets in a line, transport trolleys stopping on the road, and the inappropriate placement of containers near the workstation. Based on the analysis, a process optimization was proposed, consisting, among other things, of reorganizing the container cleaning station.
Originality/value: This article is of an implementation nature and is based on a case study of the organization on which the analysis was based. The results have added value in identifying areas causing waste.

Keywords: Continuous improvement, Kaizen, optimization, quality management instruments, Total Quality Management

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System control´s mechanics of a reliable mobile robot operation with regards to obstacles

Scientific Papers of Silesian University of Technology – Organization & Management (2025)

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Purpose: The paper is devoted to the development of an algorithm for automatic path planning of a mobile robot (MR) to a given target point, taking into account the occurrence of obstacles on its way. The advantages of using MR in manufacturing, such as increased productivity, reduced costs, improved safety and flexibility, are discussed. State-of-the-art path planning methods including graph search, random sampling and intelligent bionic algorithms are discussed.
Design/methodology/approach: Special attention is given to the problem of planning safe paths in the presence of information scarcity and obstacles. The results of MP path planning modelling are presented, confirming the effectiveness of the proposed solutions. Laser range finders have been proposed to improve the safety of MR traffic. The main criteria for selecting a laser rangefinder – distance, weight, reliability, cost - are defined.
Findings: Path planning for MR and collision avoidance remains a topical issue and requires further research, especially in the context of integrating MR with other automated process systems and improving their reliability and safety.
Research limitations/implications: The research focused on modern technological processes that require a high degree of automation to increase efficiency, reduce costs and improve product quality. One of the key areas of development was the use of mobile robots (MRs) capable of performing a wide range of tasks, from transporting materials to performing complex manufacturing operations. This article deals with research on route planning for MRs, taking into account the presence of obstacles, such as people in the path.
Practical implications: For obstacle detection the VL53L1X laser rangefinder based on the principle of time-of-flight (ToF) measurement from the ST FlightSense product family with the parameters; distance measurement range up to 4 m, measurement frequency up to 50 Hz, independence from the obstacle color and surface reflection properties was selected. It is recommended to install 3 laser rangefinders to realize the collision detection and automatic evasion system.
Social implications: For reliable operation in a social environment, 3 laser rangefinders were chosen to implement the collision detection system and automatic evasive maneuver.
Originality/value: An original mechanics of control system for reliable operation of a mobile robot with regard to obstacles is proposed.

Keywords: Path planning, automation, mobile robot, obstacles, modelling

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Application of Smart Control and Scheduling in HVAC Systems for Industrial Facilities

Scientific Papers of Silesian University of Technology – Organization & Management (2025)

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Purpose: This paper aims to examine how smart control and scheduling of HVAC systems in industrial facilities can improve energy efficiency.
Design/methodology/approach: The research was conducted as a case study focused on improving the energy efficiency of HVAC systems in an industrial building. Areas with the greatest potential for energy savings were identified based on an analysis of building parameters and system performance. Special attention was given to the operation of ventilation, heating, and cooling units. As a key improvement, scheduling of HVAC operation was developed and applied to better match system capacity with the actual demand at different times of the day, week, and season. The results were assessed in terms of both energy efficiency and operational effectiveness.
Findings: (mandatory) The study confirmed that applying smart control and scheduling in HVAC systems can significantly reduce energy use and operational costs, while at the same time improving indoor comfort conditions for employees. The approach also contributes to lowering the carbon footprint of industrial facilities and, when combined with renewable energy sources such as photovoltaic systems, creates a pathway towards zero-emission operations.
Research limitations/implications: The findings are based on the implementation of smart scheduling in a specific industrial facility, which may limit the generalizability of results. Further research in different industrial contexts and under varying climatic conditions would strengthen the conclusions and provide broader applicability.
Originality/value: The study highlights the potential of smart scheduling in HVAC systems not only as a cost-saving tool but also as a contributor to sustainable industrial practices and improved working conditions. The originality lies in linking technical optimization with both environmental impact and employee comfort, offering insights relevant to energy management strategies in modern industry.

Keywords: air preparation, HVAC systems, industrial buildings, energy efficiency, automation

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From Concept to Cosmos: A Journey through Project Management Principles and NASA's Best Practices

Conference, Multidisciplinary Aspects of Production Engineering *MAPE 2025*

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Abstract: In this presentation Mr. Lehman will summarize the basic principles of project management. This will be followed by a summary of NASA's process for managing space projects throughout the life cycle, including formulation which consists of Phase A (concept & technology development) and Phase B (preliminary design and technology completion phase), approval for implementation, and implementation which includes Phase C (final design & fabrication), Phase D (system assembly, integration & test, launch & checkout), and Phase E (operations and sustainment). He will address how NASA forms teams including the importance of key roles such as Project Manager, Project Systems Engineer (PSE), Safety & Mission Assurance Manager, and System Managers. He will then address the role of systems engineering in project management and the process of how PSEs mature their systems-level preliminary designs and then address the expected maturity state of projects as they progress through the life cycle. Finally, Mr. Lehman will present three case studies in project management: the Deep Space 1 mission, the Mars Climate Orbiter failure lessons learned, and the last mission of the Space Shuttle Challenger.

Keywords: process for managing space projects, life cycle, mission of the Space Shuttle Challenger

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Opracowanie metody badania obudowy zmechanizowanej celem określenia wytycznych dla systemu monitorowania parametrów jej pracy

Conference, Multidisciplinary Aspects of Production Engineering *MAPE 2025*

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Streszczenie: Spośród maszyn wchodzących w skład zmechanizowanego kompleksu ścianowego szczególne istotne znaczenie ma zmechanizowana obudowa ścianowa. Jej zadaniem jest, z jednej strony zabezpieczenie przestrzeni roboczej, w której odbywa się proces urabiania górotworu, a z drugie umożliwienie przemieszczania się maszyny urabiającej (kombajn lub strug) oraz przenośnika ścianowe i innych urządzeń współpracujących. Pogarszające się warunki podziemnej eksploatacji powodują, że wymagania co do bezpieczeństwa oraz niezawodności pracy obudowy rosną. W szczególności dotyczy to zapewnienia odpowiedniej stabilności i stateczności oraz bezpieczeństwa w trakcie procesu jej eksploatacji. Ten stan powoduje, że w pełni zasadne stało się podjęcie prac obejmujących badania obudowy zmechanizowanej pod kątem opracowania skutecznego systemu monitorującego jej parametry pracy. Opracowana metoda i przeprowadzone badania stanowiskowe i warunkach rzeczywistych oraz będące ich wynikiem rozwiązania praktyczne stanowią nowe podejście do problemu badania obudów zmechanizowanych oraz monitorowania parametrów ich pracy. Stwarzają bardzo dogodne warunki do ich praktycznego wykorzystania, co powinno wpłynąć na poprawę bezpieczeństwa i efektywności procesu produkcji górniczej.

Słowa kluczowe: zmechanizowana obudowa ścianowa, monitoring, warunki pracy, badania stanowiskowe

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Wyższe Szkolnictwo Techniczne w Polsce i USA – analiza i refleksje

Conference, Multidisciplinary Aspects of Production Engineering *MAPE 2025*

Wiesław "Wes" Grebski
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Streszczenie: Artykul zawiera analizy i refleksje na temat istniejacego systemy Wyższego Szkolnictwa Technicznego w USA i Polsce.
System szkolnictwa technicznego w USA jest opisany bardziej szczegółowo ze względu na długoletnie doświadczene autora i lepszą znajomosc tego systemu. System szkolnictwa technicznego w Polsce jest dobrze znany sluchaczom/czytelnikom. Porównanie obydwu systemów ma na celu wybranie najlepszych i najbardziej efektywnych praktyk. Celem artykulu jest dyskusja nad „ciaglą poprawą jakości" Wyzszego Szkolnictwa Technicznego.

Słowa kluczowe: szkolnictwo techniczne, systemy szkolnictwa, analiza porównawcza szkolnictwa, szkolnictwo w Polsce i USA

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Czy i jak zaangażować społeczność lokalną w techniczne i nietechniczne działania związane z systemem obrony cywilnej w jednostce samorządu terytorialnego w Polsce?

Conference, Multidisciplinary Aspects of Production Engineering *MAPE 2025*

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Streszczenie: Nie da się zbudować sprawnego systemu Ochrony Ludności czy Ochrony Cywilnej bez zaangażowania społeczności lokalnej. Cały system odporności państwa opiera się w pierwszej kolejności na samodzielności i zaradności jednostki oraz rodziny, a także wzajemnej pomocy między mieszkańcami danego kraju. Konieczne staje się znalezienie skutecznych sposobów zaangażowania członków społeczności we współtworzenie systemu obrony cywilnej to absolutnie kluczowy warunek powodzenia całego przedsięwzięcia. Osiągnięcie tego celi wymaga przede wszystkim podniesienia poziomu samodzielności jednostki i rodziny poprzez wyposażenie ich w wiedzę i umiejętności radzenia sobie w sytuacjach kryzysowych (pierwsza pomoc, zapasy pożywienia i wody, sprzęt do łączności i zapewniający określoną samodzielność energetyczną, etc.). Można to osiągnąć poprzez różne działania edukacyjne i szkolenia (w programie szkoły i poprzez ośrodki szkoleniowe, instrukcje postępowania, etc.). Kolejny warunek osiągniecia wskazanego celu to skuteczne zachęcanie mieszkańców do zrzeszania się w stowarzyszeniach mających za cel pomoc członkom wspólnoty w sytuacjach kryzysowych (harcerstwo, ochotnicze straże pożarne, koła łowieckie) a także wspieranie ze środków publicznych działalności tych organizacji. W ramach proponowanych przedsięwzięć powinno pojawić się:

- Zaprojektowanie zdecentralizowanego systemu opartego na przeszkolonych i przygotowanych osobach pełniących rolę lokalnych liderów (sołtysi, radni, pracownicy urzędów gmin i jednostek gminnych, szefowie stowarzyszeń i firm), którzy w razie potrzeby kierują i koordynują działania.
- Zachęcenie do wstępowania do Korpusu Obrony Cywilnej poprzez system zachęt i ulg (podatkowych, reklamacja od służby wojskowej, etc.).
- Zachęcanie mieszkańców do podjęcia osobistych inwestycji w zakresie miejsc bezpiecznego schronienia (adaptacja piwnic, subsydiowanie zakupu wyposażenia, etc.).
- Zmiana przepisów prawa budowlanego obligujących inwestorów do przewidywania w nowych obiektach lub adaptacji istniejących na cele OL i OC poprzez system ulg, zachęt i dotacji.
- Wygaszenie sporów ideologicznych czy światopoglądowych dzielących wspólnotę naszego kraju i wspieranie projektów i przedsięwzięć nakierowanych na budowanie jedności, współpracę, empatię, szacunek i wzajemną pomoc.

W referacie autorzy przedstawiają projekt konkretnego przedsięwzięcia, realizującego w zamierzeniu wszystkie wymienione powyżej cele.

Słowa kluczowe: obrona cywilna, samorząd lokalny, kształtowanie postaw przywódczych

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Biżuteria obronna

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Streszczenie: W prezentacji omówione zostaną podstawowe zasady oceny przydatności biżuterii (dla kobiet i mężczyzn) do celów obronnych, w szczególności:

- czy posiadanie biżuterii obronnej to kaprys czy konieczność (nawet w naszych czasach);
- metale z których najczęściej na przestrzeni wieków była wykonana biżuteria obronna;
- minerały używane do biżuterii według skali Mosha;
- przykłady biżuterii obronnej z całego świata (rodzaj, sposób zdobienia, wykonanie, itp.)

Słowa kluczowe: Historia sztuki, mineralogia, materiałoznawstwo, stosunki międzynarodowe, komunikacja społeczna

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Ograniczenie uciążliwości akustycznej strzelnic przez zastosowanie tłumików huku na broni palnej

Systemy Wspomagania w Inżynierii Produkcji
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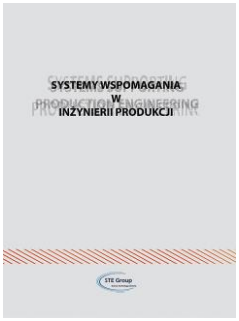

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Streszczenie: Wysoki hałas powstający w czasie wystrzału z broni palnej jest znanym zagrożeniem wpływającym bardzo destrukcyjnie zarówno na samego strzelca, ale również na środowisko zewnętrzne. Jest on szczególnie uciążliwy dla osób zamieszkujących tereny w pobliżu strzelnic, co skutkuje licznymi skargami mieszkańców oraz wywołuje lokalne konflikty. W artykule przedstawiono wyniki przeprowadzonych przez autora badań związanych z redukcją hałasu wystrzału z broni palnej po zastosowaniu tłumika huku. Określono zmniejszenie poziomu dźwięku, jak również zmianę jego charakterystyki częstotliwościowej oraz kierunkowości źródła. Następnie opracowano model geometryczny i akustyczny osi strzeleckiej kulowej oraz wykonano obliczenia propagacji hałasu do środowiska dla strzelań o różnej intensywności, wykonywanych bez i z użyciem tłumików huku. Eksperyment ten pozwolił zobrazować jak duży potencjał mają tłumiki huku w ochronie przed hałasem terenów wokół strzelnic.

Słowa kluczowe: hałas, tłumik huku, strzelnica, hałas strzelnic, broń palna, ochrona przed hałasem

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Enhancing Warehouse Processes through the Application of the 5S Method

Management Systems in Production Engineering
Volume 34 (2026)

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Abstract: The article addresses the application of the 5S method in warehouse management within a manufacturing enterprise. This method, based on the principles of sort, set in order, shine, standardize, and sustain, forms a foundation for shaping organizational culture and continuous process improvement. Implementing 5S in the warehouse contributes to better organization of workstations, elimination of unnecessary activities, and reduction of time spent searching for tools and materials. Additionally, it enhances operational efficiency, minimizes losses, improves ergonomics, and ensures a higher level of employee safety. The analysis presented in the article confirms that implementing 5S in the warehouse is a key element in building a competitive advantage by optimizing processes and making better use of available resources

Keywords: 5S, warehouse management, work organization, operational efficiency, ergonomics

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Laser marking – analysis and assessment of the possibility of applying qualitative and quantitative quality criteria

Management Systems in Production Engineering
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Abstract: This paper presents the results of an analysis of the effects of laser marking on selected structural materials. Issues related to the selection of processing parameters are analyzed, considering the diversity of the materials used in terms of chemical composition and thermal properties. Qualitative and quantitative criteria are proposed for assessing the quality of the processing performed, taking into account its potential for industrial application. Based on the conducted experiment, it was concluded that in a given case, the qualitative criterion used can lead to decision-making dilemmas in the context of laser technology, particularly when considering the expected effects described by quantitative criteria, as expressed in measurement results. The paper includes a discussion of the obtained results and proposes practical solutions to facilitate the use of laser marking technology and the assessment of the quality of marked products in actual manufacturing processes.

Keywords: laser, marking, surface, legibility of characters, roughness

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