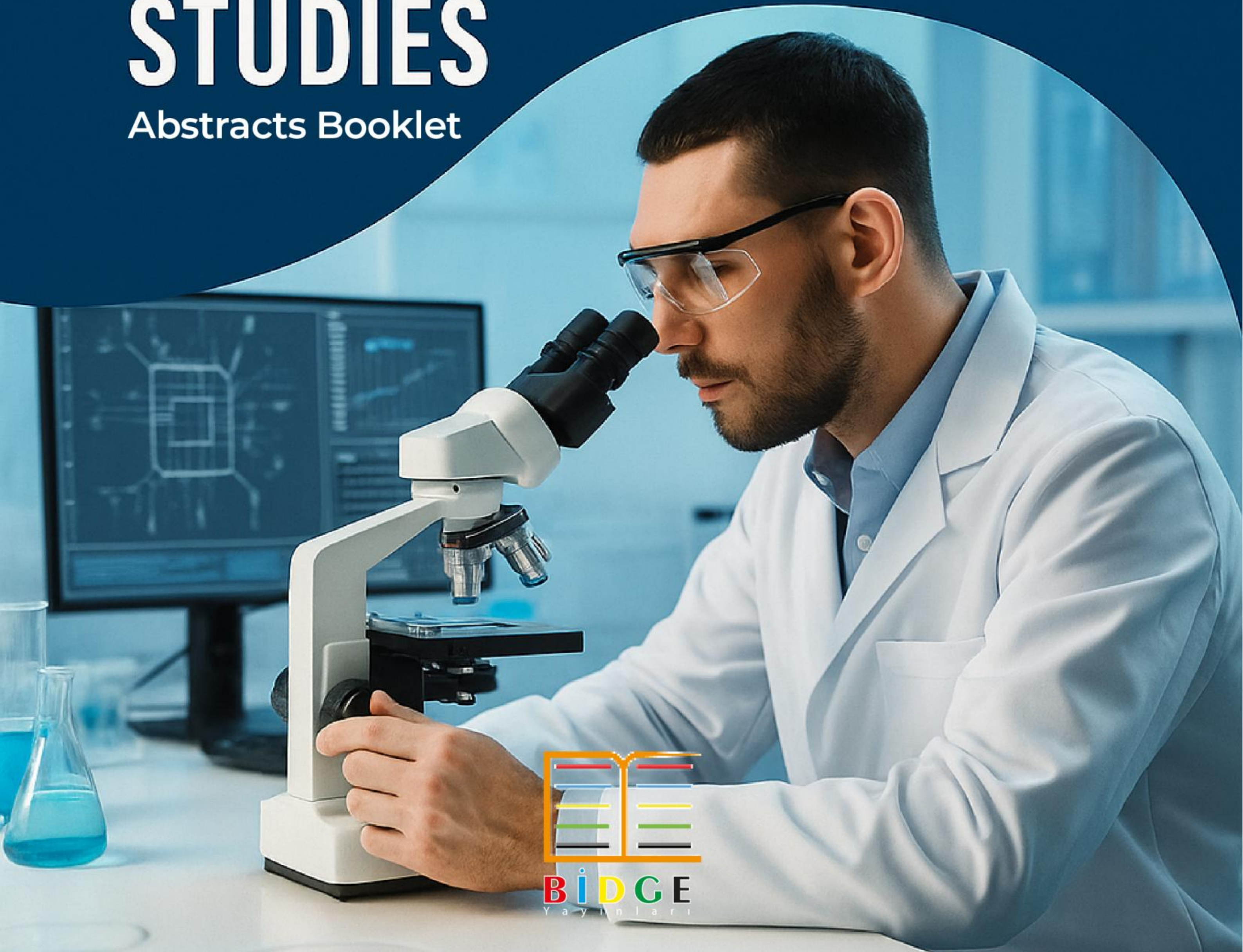
5TH INTERNATIONAL CONGRESS OF ENGINEERING AND NATURAL SCIENCES STUDIES

Abstracts Booklet



BİDGE Yayınları

5^{th}International

Congress of Engineering and Natural Sciences Studies

Abstracts Booklet

24-25 May 2025

Ankara/Turkey

BIDGE Publications

5th International Congress of Engineering and Natural Sciences Studies Abstracts Booklet

ISBN: 978-625-372-660-7

Editors

Hikmet Yeter Çoğun, Veli Keskin, Nursel Söylemez Milli

Page Layout: Gözde YÜCEL

1st Edition: BIDGE Publications, 2025

Certificate No: 71374

www.bidgeyayinlari.com.tr - bidgeyayin@gmail.com

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Investigation of Mechanical Effects of Different Lattice Structures on Composite Wing of UAV System

Onur YAVUZ[1]
Hüsnü DİRİKOLU[2]

Abstract

This study examines the mechanical properties of composite wing structures belonging to unmanned aerial vehicle (UAV) systems and investigates the effects of various lattice structures. The analyses were conducted using Ansys software on two fundamental models: a hollow wing structure and a lattice structure featuring upright-based cells. Support elements were utilized in the lattice design to enhance structural integration at the intersection points.

Static analyses were performed for both designs to evaluate the effects of different materials (steel, carbon fiber, and carbon polyester resin) on wing deformation and strength. The hollow structure demonstrated high strength when using steel, while carbon fiber stood out for its light weight and good flexibility. However, the strength of structures made from polyester resin significantly decreased compared to the other materials.

In the analyses conducted with the lattice structure, deformation improved by approximately 20% compared to the hollow structure, reducing to 0.35 mm under a load of 100 N. The lattice wing structure analyzed using carbon polyester resin yielded a deformation of 0.44 mm, while the structure made of polyester resin alone exhibited a deformation of 28.33 mm. This indicates that the lattice structure provides a significant strength increase over the hollow wing design and that wings produced from polyester resin without carbon fiber reinforcement are insufficient.

In conclusion, carbon fiber emerges as the most suitable material due to its lightness and durability. The use of lattice structures offers significant benefits in terms of strength improvement and structural support. When these two features are combined in UAV wing design, it is anticipated that a more effective and efficient flight performance can be achieved.

Keywords: Unmanned Aerial Vehicle (UAV), Lattice Structure, Wing Design, Composite, Carbon Fiber

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ISBN: 978-625-372-660-7

Investigatıon Of Honeycomb Structure In Commercıal Vehıcle Floor Boards

Vural KART[1]

Abstract

Keywords:

[1] Unvan, Üniversite, Bölüm, Orcıd:

ISBN: 978-625-372-660-7

EVALUATION OF T-BOARD STRUCTURE IN COMMERCIAL VEHICLE SEPARATION PANELS

Vural KART[1]

Abstract

Keywords:

[1] Unvan, Üniversite, Bölüm, Orcıd:

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ISBN: 978-625-372-660-7

EVALUATION OF HONEYCOMB STRUCTURE IN COMMERCIAL VEHICLE PARTITION PANELS

Vural KART[1]

Abstract

Keywords:

[1] Unvan, Üniversite, Bölüm, Orcıd:

ISBN: 978-625-372-660-7

INSPECTION OF CARRIER STRUCTURES IN BUS DRIVER AREAS

Vural KART[1]

Abstract

Keywords:

[1] Unvan, Üniversite, Bölüm, Orcıd:

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ISBN: 978-625-372-660-7

CFD-Based Design and Development of a High-Capacity Deaerator for Steam Boiler Applications

K. Furkan SOKMEN I[1]
Caner DOGRU [2]
Ali Husnu BADEMLIOGLU [3]

Abstract

In this study, a high-efficiency deaerator unit was developed for application in steam boiler systems. The system operates at a flow capacity of 115 tons per hour and is capable of removing more than 99.9% of dissolved oxygen, representing a significant improvement over existing technologies. Computational Fluid Dynamics (CFD) analyses were carried out using an incompressible ideal gas model, and a mesh independence study was conducted to ensure numerical accuracy. Flow and temperature distributions were optimized to enhance overall system performance. As a result of the design process, numerical simulations, and field testing, the dissolved oxygen concentration at the outlet was successfully reduced below 0.007 ppm. These results mark a notable advancement when compared to similar systems reported in the literature. According to ASTM standards, the maximum allowable dissolved oxygen concentration in the outlet of industrial deaerators is specified as 0.007 ppm. Studies by M.N. Ozisik (*Heat Transfer*, 1985) and the Electric Power Research Institute (EPRI, 2001) indicate that achieving this level typically requires thermal deaerators operating at 30–60 tons per hour, with oxygen removal efficiencies around 99.5%. In conclusion, the developed system offers a high-performance engineering solution for the removal of dissolved gases in high-capacity steam applications, outperforming existing approaches in terms of both capacity and efficiency. Its implementation holds significant potential for industrial use, particularly in improving energy efficiency and extending the operational lifespan of steam boilers.

Keywords: High-capacity deaerator, dissolved oxygen concentration, steam boiler systems, energy efficiency.

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Note: This work was conducted within the scope of the project titled "Development of a High-Capacity Deaerator," supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK) under the Industrial R&D Projects Support Program.

ISBN: 978-625-372-660-7

Thermal Cycle Test Of Automotive Industry While Component Development

Hami GÜLER[1]

Abstract

There are tests that all parts developed in the automotive sector, regardless of the department, must receive approval. These tests simulate situations where many parameters such as material tests and road tests are examined. The main focus in these tests is undoubtedly the examination of material strength. The most challenging of these tests is the Thermal Cycle test. Because this test simulates both the coldest and hottest conditions. In addition to temperature, another variable is relative humidity. Many different conditions are tested, from the driest to the most humid. During the test, these conditions are not completed in one go. Temperature and humidity are changed continuously for long hours with at lats of different cycles. The conditions of this test have been determined according to the relevant information in the each OEM. These test conditions vary depending on which part of the vehicle the part to be developed is. Another point where it varies is whether the part is aesthetic or non-aesthetic. The intention here is whether the customer can see this part or not. The most challenging conditions are when the part is visible to the customer. Especially in the interior of the vehicle, the parts that the customer sees and touches the most, such as the dashboard and console, are the most important places. Thermal Cycle tests performed here fall to maximum and minimum degrees. These temperatures are really challenging. Also, humidity values are constantly changing. This test continues until the defined cycles are completed. And separate times are defined for each cycle. Parts that successfully pass this challenging test receive an official approval report and their validation is completed.

Keywords: thermal, cycle, temperature, humudity, validation, evaluation

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

STRENGTH SUTUDY OF CORNER WELDING OF PVC WINDOW

Hayri YAMAN [1]
İlyas TACİR [2]
Ali KİBAR[3]

Abstract

The strength of corner welds is a critical factor in determining the durability of PVC window frames. The strength of the weld zone is primarily influenced by several key parameters, namely welding temperature, welding time, clamping force, and the maintenance of evenly distributed heat. In the context of the welding process, it is imperative that the heater plate is designed with minimal surface contact with other machine components. This is to prevent heat dissipation. Furthermore, it is imperative to ensure that the heating element (i.e. the heater plate) is protected from exposure to open air, as this can result in an uneven distribution of heat. It is imperative to ensure that temperature variations across the surface of the heating element remain within the range of ±5 degrees Celsius. The present article investigates the heat distribution characteristics during the welding process of a PVC window corner welding machine. The study utilised a range of heater plates with varying heat and wattage rates. The findings of the present study indicate a direct correlation between the wattage of the heater core and the consistency of heat distribution.

Keywords: PVC window, PVC welding machine, welding strength, heat distribution.

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ISBN: 978-625-372-660-7

Design and Optimization of Industrial Dampers for Enhanced Sealing in High-Temperature Gas Ducts

K. Furkan SOKMEN[1]
Caner DOGRU[2]

Abstract

Deformation and leakage issues observed in dampers used within energy generation systems significantly reduce overall process efficiency and lead to considerable energy losses. This study presents a comprehensive engineering approach aimed at improving the sealing performance of dampers used in gas ducts characterized by high particle concentration and elevated temperatures. In the initial phase of the study, alternative damper designs were developed using a range of materials, starting from carbon steel and extending to alloy steels resistant to high temperatures and abrasive conditions. The sealing surfaces were designed based on metal-to-metal contact principles, and were subsequently enhanced using flexible metallic sealing elements. Furthermore, in order to achieve complete sealing, a cushion air-assisted configuration was proposed and optimized accordingly. The performance of the developed designs was evaluated through Computational Fluid Dynamics (CFD) analyses based on the finite volume method, considering six different damper opening positions. These simulations enabled detailed assessments of flow and pressure distributions, from which torque requirements and mechanical integrity criteria were derived. While most studies in the literature remain limited to small-scale laboratory conditions (e.g., Blevins, 1984), the present work stands out with its direct applicability to full-scale industrial systems. The results indicate that the typical sealing efficiency of locally manufactured dampers, which is around 93%, was increased to the range of 99–100% through the proposed design. In doing so, both energy losses were minimized and the proportion of locally produced components was significantly increased. In this respect, the study offers a novel and high value-added engineering solution for the energy sector in Türkiye, representing a substantial advancement over existing technologies.

Keywords: Industrial dampers, sealing performance, high temperature gas ducts, Computational Fluid Dynamics (CFD)

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Investıgatıon Of The Effect Of Structural Parameters Of Attachments On The Plate On Energy Harvestıng

Serkan MANTAR[1]
Turgay ERAY[2]

Abstract

Vibration is often undesirable in mechanical systems due to its damaging effects and associated energy loss. The idea of recovering this lost energy has attracted significant research attention. In this study, a steel plate was used as the main structure to achieve the intended goal based on a similar idea. On this main structure, attachments consisting of varying numbers of mass and spring elements were placed symmetrically along both the x and y axes of the plate. The natural frequencies of the attachments were coupled with the frequency of the first mode of the plate. It was ensured that the total weight of the attachments remained less than 0.1 times the weight of the main structure. In order to create an ideal scenario for the maximum energy that can be obtained, analyses were performed without adding damping to the structure. Subsequently, the analyses were repeated by adding small amounts of damping to the structure. It was observed that as the damping ratio increased, the amount of energy that could be obtained decreased. Since the plate and attachments were coupled with the first mode of the plate, the highest amount of energy was obtained when the input was applied as the first mode. It was seen that as the number of attachments increased, the total energy increased, but the energy per unit attachment decreased. Since the edges of the plate were fixed, an increase in energy was observed when the attachments were placed toward the center of the plate. When the coupled frequencies of the plate and attachments altered, and the masses of the attachments were kept constant to observe the effect of spring stiffness, and when the stiffness was kept constant to observe the effect of mass, it was found that maximum energy occurred when the frequency ratio was 1.

Keywords: Plate Vibrations, Discrete Attachments, Energy Harvesting

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Investigation of the Effect of Belt Angle Change on Rolling Resistance and Static Properties in Passenger Car Tires

Tunç BİNGÖL[1]
Okan Gül[2]
Cansu Börüban Bingöl[3]

Abstract

Passenger car tires are complex structural components designed to meet a variety of performance criteria, including safety, comfort, durability, and fuel efficiency. Structurally, these tires typically consist of multiple layers, including the tread, carcass, and belt plies. Among these, the belt layers play a critical role in reinforcing the tread area and maintaining stability during operation. The belt angle—defined as the angle between the belt cords and the circumferential direction of the tire—is a significant design parameter that affects tire stiffness, rolling characteristics, and energy loss mechanisms.

This study investigates how variations in belt angle influence the rolling resistance and static behavior of passenger car tires. Rolling resistance is a key factor in determining vehicle fuel consumption, and is closely linked to internal hysteresis losses within the tire structure. A set of prototype tires was produced with identical constructions except for varying belt angles. Rolling resistance tests were performed in accordance with ISO 28580 procedures. In addition, static measurements, including outer diameter, section width, were analyzed under controlled laboratory conditions.

The results demonstrate that decreasing the belt angle generally reduces rolling resistance due to more efficient circumferential deformation. Conversely, larger belt angles tend to increase rolling resistance but may enhance cornering stiffness and stability. Static analysis further reveals that belt angle also affects contact patch geometry, influencing how load is distributed on the road surface. These findings contribute to tire design strategies aimed at optimizing the balance between fuel efficiency, handling performance, and ride comfort.

Keywords: Passenger Tire, RRC, Belt, Belt Angle, Fuel Efficiency

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5th International Congress of Engineering and Natural Sciences
ISBN: 978-625-372-660-7

Approximate Solution of Double Sine–Gordon Equation Using Multiple Scales Lindstedt Poincare Method

M.M. Fatih KARAHAN[1]

Abstract

The Multiple Scales Lindstedt–Poincaré (MSLP) method represents a sophisticated perturbation approach that combines the advantages of the Method of Multiple Scales and the Lindstedt–Poincaré technique. This hybrid analytical approach is particularly effective in yielding convergent approximate solutions, even in the presence of strong nonlinearities. In the present study, the MSLP method is employed to obtain approximate analytical solutions to the double Sine–Gordon equation. These solutions are then systematically compared against corresponding numerical results. The comparative analysis reveals that the MSLP approach provides high-fidelity approximations that are in good agreement with numerical solutions across both weakly and strongly nonlinear systems.
Keywords: Perturbation Methods, Numerical Solutions, Multiple Scales Lindstedt Poincare Method, Double Sine–Gordon Equation, Approximate Solutions

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ISBN: 978-625-372-660-7

Investigation of Containment Capability of an Air Turbine Starter Containment Ring: Analytically and Optimization

Muhammet Emirhan KARAHOCAGİL[1]
Ömer KELEŞ[2]

Abstract

This study presents a modeling and analysis framework to evaluate the structural resistance of engine accessory components, focusing on the containment ring of an air turbine starter (ATS), under high-velocity impact scenarios in aircraft. The simulation involves the radial ejection of three 120° disk fragments impacting a stationary ring at high velocity. The resulting plastic deformation, energy absorption, and structural damage were analyzed using both ANSYS Explicit Dynamics and LS-DYNA solvers. The Johnson-Cook material model and Johnson-Cook fracture mechanics model were employed to represent the material's behavior under extreme strain rates and to predict fracture initiation. For model validation, experimental tests reported in the literature were replicated numerically, and the correlation between experimental and simulation results was assessed. Once validated, the model was adapted to different geometrical configurations to examine how design changes affect impact performance and to evaluate the model's generalizability. Furthermore, the analysis results were assessed in light of certification criteria outlined in MIL-HDBK-516C and CS-APU to determine compliance with regulatory expectations. The findings indicate that the modeling strategy and tools used—particularly LS-DYNA—are effective in simulating high-speed impact conditions and can support structural integrity evaluations required in the certification process. This study contributes a systematic approach for integrating advanced simulation techniques into airworthiness certification procedures for engine accessory components.

Keywords: Containment, Air Turbine Starter, Structural Integrity, High-Velocity Impact, LS-Dyna

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ISBN: 978-625-372-660-7

Investigation of thermal comfort in the case of natural convection by means of a radiant cooled wall

Ömer AKÇEŞME[1]
Ahmet Selim DALKILIÇ[2]

Abstract

Thermal comfort is defined as a state in which individuals feel completely satisfied with the surrounding environmental conditions. It plays a crucial role not only in the health and productivity of occupants in enclosed spaces but also in the design of buildings, ventilation systems, and energy efficiency strategies. This study investigates the impact of natural convection on thermal comfort by cooling one of the four walls of a test room using a radiant cooling system. The experimental setup replicates the indoor conditions of a residential apartment under typical winter conditions in Türkiye. To simulate heat loss, one wall is maintained at a surface temperature between 14°C and 16°C. While the inlet air temperature remains constant, the temperature of the water supplied to the radiant panels is set at two distinct values: 13°C and 14°C. To simulate internal heat gain, a clothed, inanimate thermal manikin equipped with a heating element is positioned in a seated posture at the center of the room. For each test scenario, the temperature and air velocity distributions, natural convection heat transfer coefficients, and thermal comfort indices—including PMV (Predicted Mean Vote) and PPD (Predicted Percentage of Dissatisfied)—are analyzed. The results are evaluated in accordance with the thermal comfort criteria outlined in ASHRAE Standard 55, and the optimal level of comfort is recorded when the inlet temperature of the radiant panel is 14°C.

Keywords: Radiant cooling; Thermal comfort; Natural convection; PMV-PPD; Temperature distribution

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Optimization of Resistance Spot Welding Parameters for 2.5mm Thick MPH660Y760T Steel

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Uğur ÜZEL[2]

Abstract

This study investigates the suitability (weldability) of 2.5 mm thick MPH660Y760T steel sheet for resistance spot welding using medium-frequency direct current (MFDC) welding. During the experimental investigation, the welding current was gradually increased until spatter formation was observed, and the effects of this increase on the welding properties were investigated in detail. Key performance criteria such as weld penetration, weld diameter, and dimensional changes were analyzed.The results of the experiments compared the mechanical and physical properties of the welds formed at different current intensities. It was evaluated within which current range the material exhibited optimal welding properties for a given thickness. It was found that penetration increases with increasing current, but above a certain threshold, spatter and dimensional distortions occur. This highlights the need for careful control of welding parameters in industrial production processes.The results provide important guidance in determining suitable spot welding parameters, particularly for MPH660Y760T steel, which is widely used in the automotive industry. This makes it possible to increase productivity, ensure the continuity of weld quality, and guarantee the reliability of welded joints. The study contributes to the literature by contributing to the understanding of the weldability of this steel and defining the appropriate process window.

Keywords: Resistance spot welding, MPH660Y760T steel sheets, MFDC modes

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ISBN: 978-625-372-660-7

Performance Analysis and Optimization of a Heavy-Duty Vehicle Cooling System Using 1D Simulation

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Orkun ÖZENER [2]

Abstract

Vehicles require cooling systems to dissipate waste heat generated during the functional operation of their powertrains and to accommodate subsystems and components with different optimal operating temperature ranges. Cooling systems designed for vehicles powered by internal combustion engines using conventional fuels for over a century are now inadequate for next-generation electrification applications. For this reason, HVAC units with higher cooling performance and capable of operating at lower temperatures have been integrated into current systems. This study demonstrates that integrating battery cooling into the conventional cooling circuit of a series hybrid vehicle is not practically feasible. Through transient analyses conducted using a cooling cycle model built in the AMESIM 1D simulation software, it was shown that the target temperature values were achieved and excess heat was successfully removed from the system. In the developed model, an independent "refrigerant cooling" circuit was connected to the main loop via a single chiller unit, and R134A refrigerant was used to maintain battery operation through a battery cooling plate. The model includes not only the detailed battery cooling but also analyzes the performance of the "high-temperature circuit" used for the internal combustion engine and the "low-temperature circuit" used for other electrical components. The main point highlighted here is that components with different operating temperatures must be placed on separate circuits for effective cooling. When components with widely differing thermal requirements are cooled together, it becomes impossible to establish optimal thermodynamic balance, which can hinder the healthy operation of the powertrain. Unlike similar studies, this work utilizes the AMESIM software, which is based on the Bond Graph theory, for one-dimensional modeling of the cooling architecture. This approach enables the calculation of power and energy exchange, demonstrating that subsystems contributing to the cooling load can be effectively cooled under appropriate conditions by the selected cooling system.

Keywords: Hybrid vehicle cooling system, battery cooling, refrigerant cooling

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ISBN: 978-625-372-660-7

Corossıon On Vessel

Burak GÖKALP[1]

Abstract

Corrosion damages occur due to the chemical and electrochemical reactions by causing materials' properties to degrade. The annual economic loss from just only the corrosion around the world is estimated to be about $2.2 trillion to the report published by ICC. The major industries in which corrosion problems are most frequently encountered are marine and shipping. In these industries, the losses depending on corrosion are significant. In fact, although the problems encountered in this area are taken attention the required interest and research, corrosion protection applications on the ships are not still sufficient. The major corrosion damages occurring on the ships are generally seen on the ship installations, decks, covers, screws, shafts, valves, condensers and pipes. There are two main principles to protect metallic material from corrosion. Firstly, disconnection of the interaction between metal surface and sea water by organic insulator (painting), secondly, application of the methods to prevent decomposition of metals in the seawater, which means cathodic protection. This study concerning the metal surface processing and protection is focused on the latest studies carried out on the corrosion prevention methods and cathodic protection applications, corrosion problems in the shipping and marine industry.

Keywords: Corrosion, ship, anode, kotode

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Analysis of Bolted Beams under Vibration Excitation

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Abstract

This study investigates the dynamic behaviour of two different beam types under vibration excitation, with a particular focus on their modal characteristics and frequency responses. The primary aim of the study is to identify the differences between bolted (mechanically joined) and monolithic (single-piece) beams by considering several parameters such as varying bolt torque values and different bolt placement locations. In order to achieve this, both numerical and experimental approaches are employed. Modal and frequency response analyses are carried out using finite element methods while experimental modal analysis is conducted to validate the simulation results. Additionally, sine sweep tests are performed to measure the frequency response functions and transmissibility at corresponding points on the test specimens. Through a comparative evaluation, the mode shapes, natural frequencies, and vibrational transmissibility of both beam types are extracted and analysed. The results reveal significant insights into how mechanical joints influence dynamic properties, particularly in relation to stiffness, damping, and energy transmission characteristics. While monolithic beams generally provide consistent dynamic behaviour, bolted beams offer design flexibility and ease of assembly, which can be advantageous in modular structures. The findings underline the conditions under which bolted beams may serve as effective alternatives to monolithic structures in practical engineering applications.

Keywords: Modal, Frequency Response Function (FRF), Transmissibility, Vibration Test Fixtures, Bolted Structure

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Rancher and OpenShift: A Comparative Study of Performance in Container Orchestration Environments

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Feyzanur Sağlam TOPRAK[2]

Abstract

As the complexity of software applications continues to grow, container orchestration platforms have emerged as a crucial tool for managing, scaling, and deploying microservice-based applications. Among the available platforms, Rancher and OpenShift are two of the most widely adopted solutions. Despite their popularity, there has been a lack of comprehensive performance comparisons between these two systems. This study aims to fill this gap by performing an extensive performance comparison of Rancher and OpenShift. In this research, we deploy identical workloads on both platforms and measure their performance based on key parameters such as deployment time, scalability, and resource usage. Our findings indicate that while Rancher performed better in terms of 'scalability under high loads', OpenShift excelled in 'efficient resource usage and management'. These results provide valuable insights for developers and system administrators in making informed decisions on the choice of container orchestration platforms. It should be noted that this study's results are context-specific and may vary depending on the specific configuration and the nature of the workloads deployed.

Keywords: Container Orchestration, Rancher, OpenShift, Performance Comparison, Scalability, Resource Management, Microservice-Based Applications, Deployment Time, High Loads, Workloads.

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ISBN: 978-625-372-660-7

Automotıve Kıck Sensors Applıcatıons

Melih CEBE[1]

Abstract

The automotive industry is undergoing a rapid transformation, primarily fueled by continuous technological innovations aimed at enhancing user experience, safety, and convenience. One prominent outcome of this evolution is the emergence of hands-free access systems, such as kick sensors, which allow users to open vehicle trunks or liftgates through a simple foot gesture—eliminating the need for physical contact. This paper presents an in-depth investigation into kick sensor technology by analyzing the two prevailing types: radar-based and capacitive sensors. The fundamental working principles of each sensor type are examined, with particular emphasis on their response behavior, accuracy, environmental adaptability, and integration complexity. In addition to the technical aspects, the study highlights the broader value kick sensors bring, including improved hygiene by reducing surface contact and enhanced safety, particularly in situations where users' hands are occupied. Real-world applicability is further explored through a review of validation procedures and performance tests that simulate diverse environmental and usage conditions, ensuring the robustness and reliability of the system. Finally, the paper offers a future outlook on the integration of kick sensors with emerging vehicle technologies, such as AI-based gesture recognition and V2X communication, positioning them as a critical component in the evolution of intelligent vehicle access systems.

Keywords: Kick sensors, radar, capacitive, trunks, liftgates.

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Investigation of the Effect of Injector Geometry on Hydrogen Spray Characteristics by Numerical Simulation Method

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Orkun ÖZENER[2]

Abstract

In the ongoing global effort to find viable alternatives to fossil fuels, hydrogen stands out as a promising option due to its potential for zero carbon emissions. Nevertheless, hydrogen's unique physical characteristics result in notable deviations in in-cylinder injection dynamics and mixture formation compared to traditional fuels. This study explores how variations in injector tip geometry affect the spray behavior of hydrogen injected into a cylindrical chamber, operating under constant injection pressure and a time-dependent mass flow rate. The research is conducted without accounting for combustion processes and focuses on key spray metrics such as jet penetration length, spray cone angle, and the spatial distribution of hydrogen within the domain. Numerical simulations were carried out using CONVERGE CFD software, and the resulting flow fields and scalar distributions were post-processed with Tecplot 360 EX. The results demonstrate that injector tip design has a substantial influence on spray development. Specific geometric features, including tip caps, poppet valves, pintle protrusion, and tip curvature, significantly affect spray patterns and mixture uniformity under varying pressure conditions. These insights offer valuable guidance for the design and optimization of hydrogen injectors and spray strategies in hydrogen-fueled internal combustion engines.
This work has been supported by Yıldız Technical University Scientific Research Projects Coordination Unit under project number FYL-2024-6336.
Keywords: Hydrogen, injector geometry, spray characteristics, simulation

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Simulation-Assisted Production and Structural Analysis of a Special Part With Spot Weld Form

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Sezer ASLAN [2]
Cafer EKİN [3]

Abstract

Cold forging process is one of the most preferred methods in the production of fasteners, which are designed based on the formability of the material. This method is often used because of its ability to work within tight tolerances and its suitability for mass production. In this study was carried out using simulation-aided cold forging designs, simulation, production and structural analysis studies for a special rivet section with a weld spot form under the head. Spot welding rivets, which are one of the types of fasteners, are an intermediate element that serves to assemble more than one part together and integrates with the surface on which it is applied. The special spot welded rivet examined has critical dimensional properties. Having six spot weld, which is one of the critical features of the part under study, the spot weld diameter and height (Ø1.5 ±0.5 mm, 0.5 +0.3 mm), concentricity between spots weld centres (Ø14.5 mm) and spot weld design dimensions must be obtained within the scope of the requirements. While obtaining the desired properties of the part, the material flow must also be homogeneous. The optimum design, which was predicted in accordance with the part geometry and determined as two stations, was analysed using Simufact.Forming software. When the simulation outputs obtained were evaluated, the equivalent stress value occurring in the under-head weld spots formation area was determined as 696 MPa. When the dimensions of the design, simulation and prototype product were compared, it was determined that there was 98% similarity. As a result of the microstructure analyses, no folding, tearing or rupture was observed in the material flowlines and the technical requirements were met with simulation-supported production studies and a reduction of approximately 20% in the mould cost was achieved.

Keywords: Cold Forging, Plastic Forging, Simulation, Fasteners

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ISBN: 978-625-372-660-7

Design and Prototype Manufacturing of a Brake Caliper for Pneumatic Disc Brake Systems That Mechanically Collects Brake Pad Dust and Cools Elastomer Components

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Naci KURGAN[2]

Abstract

In today's automotive industry, the emission of harmful particles released from internal combustion engine vehicles, known to negatively affect both environmental and human health, has been significantly reduced through current technologies and emission regulations. However, the harmful particles emitted from vehicles in motion are not solely produced by the engine components of the vehicles. A substantial portion of particulate emissions from vehicles manufactured under current regulations originates from tire and brake wear. With the implementation of the Euro 7 emission regulations, planned to take effect in 2028, the automotive industry is expected to undertake new initiatives addressing this issue.

In the present study, a system design and prototype manufacturing have been conducted to collect brake pad dust released from pneumatic disc brake systems in heavy duty commercial vehicles. This system performs both passive and active filtration functions without any assistance from the vehicle's engine or electronic systems. The system is designed to be fully integrated into the brake caliper and caliper carrier, and it can be adapted to various models of heavy duty commercial land vehicles through different geometric configurations.

Additionally, the system utilizes the excess air, filtered during the active filtration process and resulting from the suction power generated, to cool the dust boots located on the brake caliper, which are typically made of silicone or similar elastomeric materials. Although materials such as silicone possess high thermal resistance, the heat energy generated through friction during prolonged braking can damage these dust boots over time. Furthermore, the entry of unwanted external factors (such as moisture, dust, etc.) into the caliper's internal mechanism can lead to premature wear of the braking systems.

Keywords: Disc Brake systems, Brake Pad Dust, At-Source Particle Collection, Active Filtration, Passice Filtration

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5th International
Congress of Engineering and Natural
Sciences

ISBN: 978-625-372-660-7

Design of a Steering System Driven by a Rack and Pinion Mechanism Based on the Ackermann Principle for AGV and AMR Autonomous Vehicles

Anıl ŞEKER [1]
Furkan DEĞİRMENCİOĞLU [2]
Şule ÖZKAN TERZİ [3]

Abstract

Advancements in digitalization and automation technologies in the industry have led to a growing use of autonomous mobile robots (AMR) and automated guided vehicles (AGV). These vehicles require high-performance steering systems to maneuver effectively in narrow spaces and to execute transport tasks with precision and safety. The steering mechanisms used in autonomous vehicles must be designed to be both structurally compact and provide high control accuracy. In this context, the Ackermann steering principle is a critical design approach that ensures the front wheels align with the ground during turns by steering at different angles, minimizing tire friction and energy loss.

This study presents an innovative steering system developed for AGV and AMR platforms, featuring a four-bar mechanism and rack-and-pinion drive that complies with the Ackermann principle. The system design employs a four-bar linkage to achieve optimal steering angles, which is then actuated via a rack-and-pinion gear pair converting rotary motion into linear motion. The geometric and kinematic analysis of the system was conducted, and the turning radius along with the front wheel angles were calculated mathematically. The results confirmed that the ideal turning radius is 1271 mm, with the inner wheel angle being 45° and the outer wheel angle 34°, meeting the Ackermann steering conditions. The design, supported by CAD-based modeling and simulations, was prototyped and successfully tested.

The findings indicate that the proposed system offers an effective solution for autonomous vehicles such as AGVs and AMRs. With its low-cost and easily manufacturable structure, the design is particularly suitable for warehouse transport, production line integration, and logistics applications.

Keywords: Steering system, Ackermann principle, autonomous vehicles

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ISBN: 978-625-372-660-7

Effect of Pre-Heat Treatments on Mechanical Properties of Boron Steel After Quenching

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Abstract

In this study, it was investigated that how the mechanical properties of 22MnB5 boron steel can be controlled by different pre-heat treatments applied before conventional quenching and tempering. Four different pre-treatments were applied to hot-rolled samples with initial microstructure: (1) coarse-grained structure by annealing at 950°C, (2) fine-grained structure by double quenching at 920°C, (3) spheroidized cementite structure by annealing at 700°C for 8 hours, (4) 5% cold deformation structure after spheroidization annealing. Subsequently, all samples were austenitized at 920°C, oil quenched and then tempered at 580°C for 5 minutes. Mechanical properties (yield/tensile strength, elongation, hardness) and microstructures were comparatively investigated. Although 950°C annealing provided high tensile strength (~1813 MPa), it decreased ductility (9%). Double quenching increased strength by grain refinement. While tensile strength decreased in the spheroidized cementite structure, yield strength slightly increased. This situation was explained by the incomplete dissolution of carbides and the formation of large carbides. As a result, the tempering process provided significant gains in ductility (12.5%) compared to the hot pressing process that only included quenching. This study shows that microstructure optimization in boron steels is critical in terms of both strength and ductility and can contribute to production efficiency in areas such as the automotive sector.

Keywords: 22MnB5, Boron steel, Quenching-tempering, Spheroidizing annealing, Mechanical properties

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ISBN: 978-625-372-660-7

Advancing Geopolymer Mortars with Recycled Concrete Aggregates Through Electrical Curing

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Mücteba UYSA[2]

Abstract

This paper discusses the usage of recycling concrete aggregate (RCA) as an environmental-friendly substitute for natural river sand in geopolymer mortars (GMs), considering the increasingly growing demand for such greener construction materials. In this study, GMs were designed with 50% ground granulated blast furnace slag (GGBFS) and 50% Ceramic Powder as binder compositions and replacing 100% of the natural river sand with ≤2 mm-sized RCAs. The influence of variations in the activator-to-binder ratio between 0.7 and 1.2, coupled with variations in NaOH molarity to 2M, 4M, 6M, and 8M, on geopolymerization and mechanical properties are analyzed. In order to increase the flexural and compressive strength, fiber reinforcements of different types and ratios were used in geopolymer mortar production. Carbon fiber, micro steel and waste erosion wire were preferred in the ratios of 0.4%, 0.8% and 1.2% by volume. Ambient curing was carried out at 23±2°C with a relative humidity of 95%, thermal curing at 80°C for 24 hours, and electrical curing with an application of 20V to study the effects of all these curing methods on the compressive and flexural strengths at 7 and 28 days to provide details on short- and medium-term performances. The study also brings into focus how curing methods interact with a/b ratios and NaOH molarity in determining hydration and matrix behavior, while providing a practical and sustainable solution to construction waste management and contributing to the development of high-performance, eco-friendly materials. This study also revealed that electrical curing at low molarity was more effective than curing under ambient conditions.

Keywords: Geopolymer; Low Molarity; Recyling Concrete Aggregate; Curing Methods; Mechanical Properties

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ISBN: 978-625-372-660-7

Evaluation of Kocaeli Gulf Marine Solid Wastes as Binding Material in Geopolymer Composite Production

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Abstract

Concrete; is the most widely used building material in the construction sector with its many known advantages. Cement is used as a binding material in concrete production, but it is seen that the majority of carbon dioxide emissions in the world are caused by cement production. Due to this disadvantage of cement, the usability of more environmentally friendly and sustainable materials as alternative binding materials has come to the fore. As a result of these studies, the concept of geopolymer composite has emerged.

This project aims to investigate the usability of bottom mud extracted from Kocaeli Bay as a binder material in geopolymer composite production and its effect on mechanical performance. The muds used in the production of geopolymer mortar were first subjected to a drying process at 105±5 degrees in the laboratory for approximately 72 hours, then to grinding in a grinding device and sieving on a 90 micron sieve. 75% granulated blast furnace slag and 25% bottom mud were used as binder materials. 100% river sand was used as aggregate. Sodium hydroxide (NaOH) and sodium silicate (Na_2SiO_3) were used as alkali activators in the study. NaOH concentration was determined as 12M, and the ratio between sodium hydroxide and sodium silicate was determined as 1/2. In order to increase the flexural and compressive strength, different types and ratios of fiber reinforcements were used in geopolymer mortar production. Polyvinyl alcohol (PVA), basalt fiber and micro steel fibers were used at 0.4%, 0.8% and 1.2% by volume. Thermal curing process was applied to the produced samples and the curing process continued until the date of the experiments.

Keywords: Geopolymer; Sustainability; Blast furnace Slag; Bottom Sludge; Mechanical Properties

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Modal Analysis of Sulfur-Based Concrete: Experimental Investigation of Modal Properties

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Ömer GÜMÜŞ[2]
Bekir AKTAŞ[3]

Abstract

This study investigates the dynamic properties of sulfur-based concrete through Experimental Modal Analysis (EMA). Sulfur-based concrete, an alternative to traditional Portland cement-based concrete, offers unique mechanical and chemical advantages, including rapid strength gain, superior chemical resistance, and recyclability. Despite these benefits, limited research has focused on its vibrational characteristics and structural response under dynamic loads. This study aims to address this gap by experimentally determining the natural frequencies, damping ratios, and mode shapes of sulfur concrete. The specimens were supported on polyurethane foam to simulate free-free boundary conditions. A Dytran 5800B2 modal hammer with a metal tip was used for excitation, while MMF KS76C.100 accelerometers recorded vibrational responses. Data acquisition was performed using a Dewe-43A USB system, and results were analyzed through Dewesoft software. Frequency Response Functions (FRFs), Mode Indication Functions (MIFs), and coherence plots were evaluated to extract key modal parameters. The first-mode frequency varied between 1324 and 1452 Hz, depending on sulfur content and basalt fiber reinforcement. Damping ratios ranged from 0.001588 to 0.003253, indicating that basalt fiber inclusion enhances energy dissipation, whereas increased sulfur content reduces damping capacity. These findings contribute to optimizing sulfur-based concrete for structural applications where vibrational performance is a key concern, offering valuable insights into its behavior under dynamic conditions.

Keywords: Sulfur Concrete, Modal Analysis, Frequency Response Function, Damping Ratio, Modal Behavior.

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5thInternational Congress of Engineering and Natural Sciences
ISBN: 978-625-372-660-7

Developments In Hot Mıx Asphalt (Hma) Desıgn Methods And Evaluatıon Of Theır Integratıon In Turkey

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Altan ÇETİN[2]

Abstract

Over time, knowledge of the physical and chemical properties of asphalt pavement systems has increased significantly. Accordingly, modern methods used in pavement design are constantly evolving in line with new data and technological developments. Failure to meet the expected performance of pavements produced by empirical methods used in asphalt pavement design and permanent deformations caused by high traffic loads have brought performance-based mix design methods to the agenda. The Superpave method has been developed, which takes into account regional and climatic conditions in terms of permanent deformations and low temperature cracks. However, the complexity and cost of performance-based tests in Level 2 and Level 3 of this method limited this method to Level 1, which is based on volumetric mix design. Consequently, this leads to the need for design that incorporates easily applicable performance tests. In this context, Balanced Mix Design (BMD) has emerged as one of the most recent and promising approaches to the design of asphalt mixtures. This method replaces certain elements of traditional volumetric design with performance test criteria, taking into account common asphalt deterioration phenomena such as rutting and cracking. In Turkey, efforts to keep pace with developments are being made by the relevant authorities. Although some experiments on the Superpave binder system have been integrated, the Marshall Method is still widely used in BSK design. Superpave and BMD methods should be evaluated in terms of our country's conditions. It is important to develop a BSK design method by integrating basic performance tests suitable for the conditions of our country. Turkey's transition to performance-based methodologies while developing its highway infrastructure is of critical importance. The integration of BMD, including rutting and cracking tests, and the adoption of BMD by the relevant sector will improve the quality and service life of asphalt pavements..

Keywords: Asphalt Mix Design Methods, Performance Based Design methods, Superpave Method, Balanced Mix Design, Simple Performance Tests

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5th International Congress of Engineering and Natural Sciences
ISBN: 978-625-372-660-7

Investıgatıon Of Local Governments' Dısaster Management Approaches For The Possıble Istanbul Earthquake Usıng Ahp And Topsıs Methods

Umut SOY[1]
Aslı Pelin GÜRGÜN[2]

Abstract

Disasters are events that negatively affect human health, the economy, and social structure, causing widespread destruction and loss. To prevent the negative effects of future disasters and take precautions, it is important to implement an effective disaster management plan. Local governments, which know the local population well and understand their needs, have a critical role in contributing to disaster risk reduction, intervention, and recovery processes. Istanbul, one of Turkey's most important cities, faces the risk of an earthquake, requiring effective disaster management. This study aims to assist researchers and local government units working in the field of disaster management by analyzing the current situation, taking into account institutional capacities and resources, and evaluating and prioritizing preparedness for potential disasters. In the first phase of the study, five key criteria highlighted in the literature for effective disaster management against earthquakes were examined. The criteria identified from this review were weighted using the Analytical Hierarchy Process (AHP) method, in consultation with the opinions of 15 experts working in different district municipalities of Istanbul, and the importance rankings of these criteria were determined. In the second phase of the study, a comprehensive mathematical analysis was conducted using inventory data from five district municipalities located in different parts of Istanbul, the criteria identified in the first phase, and the variables affecting these criteria. The analysis data obtained were integrated with the TOPSIS method, along with the weight values derived in the first phase, to determine the most disaster-sensitive option among the five district municipalities based on their existing local resources and capacity factors. As a result of the analysis, it was concluded that disaster management awareness should be increased, and local resources should be strengthened and used more effectively.

Keywords: Disaster Management, Earthquake, AHP, TOPSIS, Local Government

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ISBN: 978-625-372-660-7

Jet Grout Applıcatıons In Kırşehir Example

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Mehmet Mustafa ÖNAL[2]

Abstract:

Jet grout; It is made by injecting the water and cement mixture into the ground under constant pressure, with constant pulling speed and constant rotation speed, through multi-purpose drilling machines; It is a ground improvement method that has become very prominent recently due to the fact that the soils on which it is applied can vary greatly such as clay, silt, sand, gravel, alluvial soil, the variety of areas of use, production speed and economy. This method is widely used in our country and around the world. The first stage in projects where the application of the method is on the agenda is design. In the design, defining the soil properties realistically, knowing the soil-jet interaction of different jet injection manufacturing methods in the existing ground conditions and choosing the most appropriate manufacturing technique emerge as an important stage.

After determining the design and manufacturing methods, the most important issue in jet injection applications is the control and supervision of whether the productions comply with the project criteria. It is known that jet grout (jet injection) applications, which can be performed differently as jet 1, jet 2 and jet 3, have been carried out in residential buildings built in the Central District of Kırşehir Province in recent years, on sand and alluvium type soils where the ground safety stress (safe bearing capacity) is low.

In this paper, it is aimed to examine the jet grout applications carried out on the residential buildings to be built in Kırşehir Province; The difficulties encountered on the ground and ground improvement works were evaluated based on existing documents and construction site experiences. It has been observed that the jet grout method is a fast and practical ground improvement method. It is thought that the study will shed light on similar studies since it deals with the first applications made in the region.

Keywords: Kırşehir, jet grout, soil improvement, soil safety tension, design

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ISBN: 978-625-372-660-7

Comparative Analysis of Seismic Performance of Buildings Constructed Under Different Code Periods in Kocaeli Province

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Hakan ERDOĞAN [2]

Abstract

Turkey is a country with a high seismic risk due to its location on active fault lines. This situation brings potential disaster scenarios to the forefront, especially in densely populated urban areas, where significant loss of life and property may occur. A large portion of the existing building stock was not constructed in accordance with current seismic codes, making the assessment of their earthquake performance critically important. Evaluating the seismic resilience of buildings is a vital step in minimizing casualties in possible earthquakes and in planning effective disaster management strategies. In this study, the seismic performance of three five-story reinforced concrete buildings, constructed in accordance with the 1975, 1998, and 2007 Earthquake Codes and located in Kocaeli Province approximately 5 km from the North Anatolian Fault Line, was evaluated using the Nonlinear Time History Analysis method defined in the 2018 Turkish Building Earthquake Code. According to the analysis results, none of the buildings with similar typologies were able to meet the target performance level of "Controlled Damage" as prescribed by the 2018 code. Furthermore, the damage levels of buildings constructed under different code periods were comparatively analyzed and the potential damage states of structural elements were assessed. The study reveals deficiencies in the seismic performance of reinforced concrete structures in Kocaeli, underscoring the urgent need for retrofitting the existing building stock. Furthermore, it provides a significant scientific foundation for evaluating the impact of different periods' earthquake regulations on structural safety.

Keywords: Seismic performance, earthquake codes, nonlinear time history analysis, reinforced concrete buildings, structural damage assessment

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5th International
Congress of Engineering and Natural
Sciences
ISBN: 978-625-372-660-7

Earthquake Performance Analysis and Strengthening Applications of Existing Reinforced Concrete Buildings Affiliated to Kırşehir Provincial Directorate of National Education

Vahit SEYFİ[1]
Mehmet Mustafa ÖNAL[2]

Abstract

Earthquakes are the most common natural disasters in Türkiye. Due to our geographical location, being located in a region with intense fault lines makes earthquakes an inevitable reality of our daily lives. Turkey is located on one of the most active earthquake zones in the world. According to the Earthquake Zones Map, it is known that 92% of our country is in earthquake zones, 95% of our population lives under earthquake risk, and 98% of our large industrial centers and 93% of our dams are in earthquake zones. When the earthquake safety of reinforced concrete buildings in our country is examined, it is seen that the resistance of many structures is insufficient. As a result of the examinations, since the strengthening of structures found to be insufficient or the demolition of buildings that can meet the current regulation conditions and the reconstruction according to the new regulations will cause damage to the country's economy, it is inevitable to prefer reinforcement if the cost is reasonable.

In this study, the compliance of two reinforced concrete school buildings located within the borders of Kırşehir province with the provisions of the Turkish Building Earthquake Code 2018 (TBDY-2018) was examined. Considering the current physical conditions of the structures, numerical models were created using the STA4CAD package program; performance analyzes were performed under the design earthquake levels predicted by today's regulations. In line with these analyses, the current status of the structures and their post-reinforcement status were comparatively evaluated.

The analysis process and results of the sample school buildings selected within the scope of the study were discussed in detail, and the effects of the reinforced load-bearing elements on the structural performance were evaluated. In the first part of the study, the preliminary evaluation and test stages, which are of critical importance for school buildings, were explained. In the second part, structural analyzes and technical approaches performed using the STA4CAD program were presented. In the third part, in line with the findings obtained, the evaluation of the existing structures was made within the framework of the performance concept defined in the earthquake code; results were reached in line with the principles, rules and objectives of performance analysis according to TBDY-2018, and reinforcement works were carried out by adding shear walls in both school buildings. Thus, it was observed that the performance level of the existing structure increased and the damage levels decreased as a result of the addition of shear walls. Based on the results obtained, it was concluded that adding sufficient shear walls to the structures and strengthening them would be both a practical and effective solution technique.

Keywords: Reinforced Concrete, Retrofit, Strengthening, Performance level, 2018 Tsc, reinforced concrete frame, stiffness

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Dynamic Interaction and Seismic Mitigation of Adjacent Buildings with Tuned Mass Dampers

Ibrahim OZ[1]

Abstract

Seismic pounding between adjacent buildings is a serious issue in urban environments, especially when separation distances are inadequate or based on outdated design standards. This study evaluates the effectiveness of tuned mass dampers (TMDs) in mitigating pounding effects between two mid-rise reinforced concrete buildings with four and six stories. The buildings were modeled in SAP2000 using nonlinear elements and soil-structure interaction effects representative of ZD soil type. The separation gap was defined according to the simplified provisions of the Turkish Building Earthquake Code (TBEC-2018), which proved insufficient due to a period ratio greater than 1.25.

The pounding mechanism was simulated using the Kelvin impact model, which includes gap elements, springs, and dampers to realistically represent contact behavior. TMDs were tuned to the fundamental modes of the structures, with a mass ratio of 7% and damping ratio of 15%. Nonlinear time history analyses were conducted under seven bidirectional ground motions to compare structural performance with and without TMDs.

This study concludes that TMDs are effective in mitigating seismic pounding effects and enhancing the seismic performance of adjacent structures. Their success depends on proper tuning and dynamic compatibility with the building's primary vibration mode. The findings suggest that TMDs are a practical and efficient strategy for retrofitting closely spaced buildings in earthquake-prone areas.

Keywords: Tuned Mass Dampers, Seismic Pounding, Reinforced Concrete Structures

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5th International
Congress of Engineering and Natural
Sciences

ISBN: 978-625-372-660-7

Hibrit Frekans ve Faz Kaydırmalı Modülasyon Stratejisi ile 10 kW LLC Rezonanslı Dönüştürücünün Kontrolü ve Simülasyonu

Abdullah ÖZSAN[1]
Hulusi KARACA[2]
İbrahim SEFA[3]

Abstract

Nowaday, there is a significant need for high efficient, hig power dense isolated DC-DC converters for different applications. LLC resonant converter is one of the important canditaes to fulfill this need. They are very popular in electric vehicle charging applications, uninterruptable power supplies, renewable energy systems, consumer electric etc. due to their high efficiency, providing soft switching, low electromagnetic interference (EMI) level, and bidirectional operation features. However, the typical oprerating range of LLC resonant converters is narrow. The pulse frequency modulation (PSM) is most common method to control the LLC resonant converters. However, the voltage control capacity of PSM method depends on teh LLC resonnat converter parameters and load value. Therefore, a control method to control the LLC resonnat converter output voltage and current in wide input voltage and load range is a challange. Different control methods are suggested to maintain constant output voltage across a wide input voltage range and under variable load conditions. To address the limitation mentioned above, this study proposes a hybrid modulation strategy hybrid modulation strategy that combines PFM and phase-shift modulation (PSM). The proposed approach extends the operational range of the converter while minimizing switching losses and maintaining high efficiency. To valiadte the proposed control approach, a 10 kW LLC resonant converter is desinged and simulated with MATLAB/Simulink. Simulation results demonstrate that the hybrid-modulated LLC resonant converter effectively tracks the reference output under different load conditions and within a specified input voltage range. Additionally, the hybrid control strategy enhances the transient response and overall stability, further improving the system's performance and efficiency.

Keywords: LLC resonant converter, soft switching, hybrid modulation, frequency modulation, pulse-shift modulation

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Development of a Digital Linearity and Flatness Measurement Control Algorithm for Machine Tools

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Abstract

This study emphasizes the importance of linear motion and surface flatness in the context of rapidly evolving Computer Numerical Control (CNC) machine technologies, aiming to enhance the precision and accuracy of machining operations. In this regard, the procedures necessary to achieve geometric accuracy are outlined, and the benefits and conveniences offered by a newly developed probe system are presented. Fundamental concepts related to various categories of CNC machines—including lathes, milling, and laser cutting machines—are explained, and the application methods, tools, and techniques used in flatness measurements are examined in detail. Additionally, the extent to which operator and equipment errors impact machine flatness has been analyzed. With the rapid advancement of information technologies, mobile communication and wireless data transmission have become critical components in industrial systems. The newly developed probe integrates Bluetooth-based wireless communication to address existing deficiencies in this field, offering a cost-effective and device-compatible solution that facilitates efficient transmission of data and audio signals. Ensuring surface flatness in CNC machines plays a vital role in improving product quality and overall efficiency. The selection of appropriate measurement tools enables consistent and precise measurements, contributing not only to time savings but also to enhanced reliability and productivity. The proposed probe systems and measurement algorithms aim to eliminate operator- and device-induced errors by executing measurement processes through computer-aided automation, thereby minimizing both time losses and measurement inaccuracies.

Keywords: CNC Machines, Flatness, Dial Clock, Data Transfer, Geometric Accuracy

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Modelling and Analysis of a Permanent Magnet Synchronos Motor Using Field-Oriented Control at Different Speeds

Furkan SONERI[1]
Volkan Başay[2]
Güneş YILMAZ[3]

Abstract

This research examines the performance of Permanent Magnet Synchronous Motor (PMSM) technology for hydrogen fuel cell vehicle applications is evaluated at different speeds (60,000; 90,000; and 120,000 rpm). Based on data from commercial applications and experimental trials, a PMSM model was developed. The motor was simulated in the MATLAB/Simulink program using a field-oriented vector control strategy.As a result of the simulations, significant performance parameters (i.e rotor speed, output torque, torque losses, stator winding temperatures for each phase, and phase currents) were obtained at 60,000, 90,000, and 120,000 rpm, and the motor's behavior was analyzed accordingly. Results of the simulation performed shows that as speed increases, the motor's output torque decreases. This fact indicates increasing rotor friction losses at higher speeds. Additionally, both stator phase temperatures and inverter-supplied phase currents increase with speed. It indicates that as the speed increases, the motor has more current to meet required electromangnetic torque. It highlights that thermal management at high-speed operating conditions is a significance measure.PMSMs provide significant advantages in hydrogen fuel cell vehicles due to their high efficiency and compact size. They deliver high torque at low speeds, torque decreasing and increased thermal load at high speeds causes limitations during long term operation conditions. In order to optimize high-speed performance, this study recommends implementing advanced cooling solutions, adopting optimized control strategies to reduce torque losses, designing rotors with less pole pairs, and using materials capable of enduring high-temperature conditions.

Keywords: Permanent Magnet Synchronous Motor, Motor Modeling, Field-Oriented Control, Thermal Management, Hydrogen Fuel Cell Vehicle

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Utilization of Second Life Battery Energy Storage Systems in Energy Arbitrage

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Ali Rıfat BOYNUEĞRİ[2]
Feyza TURAN[3]

Abstract

Traditional energy production methods based on fossil fuels are gradually being phased out in favor of renewable energy sources, driven by rising environmental concerns, urgent need to combat climate change, and global sustainability targets. As part of this transition, energy storage technologies have gained importance for overcoming key challenges associated with renewables, particularly their intermittent nature. Among these solutions, battery energy storage systems are expected to play a central role in both present and future energy infrastructures, not only by supporting the technical stability of interconnected grids but also by enhancing the financial viability of renewable energy investments.
This study introduces a MATLAB-based simulation model incorporating Second Life Battery solutions, designed to optimize energy storage performance and economic returns in wind energy systems, with a particular emphasis on arbitrage strategies under dynamic electricity pricing. To ensure the validity of the model real production data from a 2 MW wind power plant located in the Aegean region and operated by a globally brand were incorporated into the analysis, reinforcing theoretical findings with practical.
The analysis integrates wind energy generation data, electricity market price, and battery storage dynamics, including Second Life Battery (SLB) solutions to maximize economic returns while ensuring long term battery efficiency. The primary objective of this study is to evaluate and compare three financial scenarios for wind energy systems: a system without battery storage, one using second life batteries, and another with new batteries.
Moreover, the simulations conducted in this study incorporate dynamic aging characteristics, including State of Health (SoH) and Depth of Discharge (DoD) parameters for different battery options. The findings suggest that second-life battery systems may offer a more feasible solution for storage-integrated power plants.
Keywords: Second Life Battery, Wind, Energy Storage, Energy Management, Battery Degradation

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ISBN: 978-625-372-660-7

Implementation of Data-Driven LQR for Cruise Control

Mehmet Can HALİS[1]
Uğur YILDIRAN[2]

Abstract

This paper presents a study on the design of a data-driven linear quadratic regulator (LQR) controller for a nonlinear cruise control system.
In the data-driven approach, by applying input data with certain characteristics to the system without modeling, data can be collected from the output of the system and the controller can be calculated only from this obtained data. Thus, time-consuming, costly and human-efficient steps such as mathematical modeling and model parameter estimation methods found in traditional controller design are not required. In this way, LQR state feedback gain K is calculated automatically.
An extended observability matrix and Toeplitz matrices of Markov parameters must be obtained for the calculation of LQR state feedback gain. An algorithm is developed to find these matrices. This developed algorithm was implemented in the MATLAB-Simulink environment by applying it to a complex cruise control system that includes the battery that powers the electrically mapped engine, the engine that produces torque, the powertrain responsible for transmitting this torque to the wheels, the wheels that provide the longitudinal motion of the vehicle in dynamic interaction with the road surface, and the vehicle body parts responsible for aerodynamic drag and mass-related inertial effects, which are the basic parts of longitudinal vehicle dynamics.
As a result, the simulations performed on the longitudinal vehicle model show that the vehicle speed is controlled by the data-driven LQR approach. In this way, the data-driven method becomes more important both theoretically and practically.

Keywords: Data-driven LQR control, Markov parameters, Observability matrix, Longitudinal vehicle dynamic, MATLAB-SIMULINK.

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Model Predictive Control of an Advanced SEPIC Converter

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Abstract

This study presents the application of Model Predictive Control (MPC) to an Advanced SEPIC (Single-Ended Primary Inductor Converter) topology. The advanced SEPIC structure provides improved efficiency and reduced output ripple compared to the traditional SEPIC converter by introducing an additional filtering stage and optimized passive components. In addition, the advanced topology extends the voltage conversion range, allowing the converter to operate efficiently under wider input and output voltage conditions. The advanced SEPIC converter is widely used in systems that require stable operation over a wide input voltage range due to its capability to perform both step-up and step-down voltage conversion. However, the nonlinear dynamics of this topology make it challenging for traditional controllers to achieve the desired performance, particularly during transient states. MPC is a control method that predicts how the system will behave and adjusts the control input by choosing the best option at each moment. In this study, a discrete-time model of the Advanced SEPIC converter is derived, and the MPC algorithm is implemented in MATLAB/Simulink. The simulation results indicate that the MPC approach improves voltage regulation, dynamic behavior, and steady-state performance of the converter. The overall results reveal the advantages of controlling an advanced SEPIC converter with MPC in energy conversion systems operating across a wide voltage range.

Keywords: Advanced SEPIC Converter, Model Predictive Control, Power Electronics, Nonlinear Systems, MATLAB/Simulink

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

JWT, SAML, OAuth 2.0, and OpenID Connect: A Comparative Study on Authentication and Authorization Technologies

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Feyzanur Sağlam TOPRAK[2]

Abstract

In this era of digital connectivity, securing user information and ensuring valid access to web resources are key considerations in web application development. Various technologies have been developed for this purpose, notably JSON Web Tokens (JWT), Security Assertion Markup Language (SAML), OAuth 2.0, and OpenID Connect. This paper aims to present a comprehensive comparison of these four major technologies in terms of their structure, functionality, implementation ease, security features, and suitability for various use cases. Starting with an in-depth introduction to each technology, the paper provides an overview of their design principles and how they operate in a web environment. It then focuses on their use in different scenarios, emphasizing the strengths and weaknesses of each. This includes an examination of JWT's stateless, self-contained nature, ideal for scalable applications; SAML's XML-based assertions used widely for enterprise Single Sign-On (SSO); OAuth 2.0's delegation protocol that enables applications to perform actions on behalf of the user without sharing their credentials; and OpenID Connect's simple identity layer built on top of OAuth 2.0, providing user authentication and ID information. Moreover, the paper analyzes the security aspects of these technologies, addressing common threats and how each technology mitigates them. It discusses their roles in mitigating issues such as Cross-Site Request Forgery (CSRF), token hijacking, and other potential vulnerabilities. By providing a comparative study, the paper intends to offer developers and system architects a deeper understanding of these technologies, enabling them to make informed decisions when incorporating authentication and authorization mechanisms into their web applications. Furthermore, it paves the way for future research and advancements in secure and efficient web technologies.

Keywords: JWT, SAML, OAuth 2.0, OpenID Connect, Authentication, Authorization, Security, Web Development, Single Sign-On, Identity Verification.

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Development of a Digital Linearity and Flatness Measurement Control Algorithm for Machine Tools

Mustafa ALKAN [1,2]
Erdem ASLAN [3]

Abstract

This study emphasizes the importance of linear motion and surface flatness in the context of rapidly evolving Computer Numerical Control (CNC) machine technologies, aiming to enhance the precision and accuracy of machining operations. In this regard, the procedures necessary to achieve geometric accuracy are outlined, and the benefits and conveniences offered by a newly developed probe system are presented. Fundamental concepts related to various categories of CNC machines—including lathes, milling, and laser cutting machines—are explained, and the application methods, tools, and techniques used in flatness measurements are examined in detail. Additionally, the extent to which operator and equipment errors impact machine flatness has been analyzed. With the rapid advancement of information technologies, mobile communication and wireless data transmission have become critical components in industrial systems. The newly developed probe integrates Bluetooth-based wireless communication to address existing deficiencies in this field, offering a cost-effective and device-compatible solution that facilitates efficient transmission of data and audio signals. Ensuring surface flatness in CNC machines plays a vital role in improving product quality and overall efficiency. The selection of appropriate measurement tools enables consistent and precise measurements, contributing not only to time savings but also to enhanced reliability and productivity. The proposed probe systems and measurement algorithms aim to eliminate operator- and device-induced errors by executing measurement processes through computer-aided automation, thereby minimizing both time losses and measurement inaccuracies.

Keywords: CNC Machines, Flatness, Dial Clock, Data Transfer, Geometric Accuracy

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Renewable Energy Integration in Smart Grids

Ayşenur SEKİN[1]

Abstract

The transformation in energy systems has gained great importance with the widespread use of generation models based on renewable resources. This transformation is an important step towards solving global problems such as environmental concerns, the need for energy security and climate change. However, the intermittent and unpredictable nature of renewable energy sources (solar, wind, etc.) causes various technical problems in existing electricity grids. At this point, smart grid technologies come into play if renewable energy can be integrated reliably and effectively.

Thanks to smart meters, sensors, automatic control systems and artificial intelligence-supported applications based on real-time data analysis, energy supply can be flexibly regulated according to demand. This facilitates the integration of solar and wind energy into the system, which fluctuates especially due to sudden weather changes.

The study also details the stabilising role played by energy storage systems (e.g. lithium-ion batteries) in the integration. By means of storage units, energy can be stored without putting pressure on the grid during high generation hours, and can be switched on when consumption increases, ensuring energy supply and continuity. This method both maintains frequency stability and improves energy quality.

The paper also discusses microgrid systems. These structures, which can be applied especially in rural and isolated areas, reduce the dependence on the central grid by balancing local production and consumption and increase the security of energy supply. With the development of microgrids, users are becoming an active part of the energy system by becoming both producers and prosumers.

Keyword: Smart grids , renewable energy sources , production-consumption balance

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Evaluation of biological wastes in energy production: Obtaining energy from urban waste

Ayşenur SEKİN[1]

Abstract

Today, rapid urbanisation and population growth cause a large amount of biological waste in cities. Biological materials such as food residues, organic wastes from vegetable and fruit markets, green wastes collected from parks and gardens and domestic kitchen wastes are generally disposed of by methods such as storage or incineration. However, this approach causes both environmental pollution and wastage of an economically potential energy source. In this context, the utilisation of biological wastes in energy production is of great importance in terms of sustainable urban management and environmental protection.

In this study, the process of converting biological wastes generated in cities into energy production is examined. In particular, obtaining biogas by anaerobic digestion (fermentation) is one of the most common and efficient techniques in this field. The biogas obtained can be converted into electricity and heat energy, and the remaining organic waste can be used as agricultural fertiliser. In this way, waste is prevented from harming the environment and the concept of circular economy is supported.

Successful waste-to-energy projects implemented in different countries of the world demonstrate the applicability and economic value of this method. In Turkey, interest in this field has been increasing in recent years and local governments have started to reshape their waste management strategies to include energy production. In order for this transformation to become permanent, it is of great importance to strengthen the technical infrastructure, to make the legislation supportive and to raise awareness in the society

Keywords :Circular economy , sustainable waste management , organic waste , local governments, renewable energy, energy production from waste.

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ISBN: 978-625-372-660-7

Energy environmental impacts of production

Ayşenur SEKİN[1]

Abstract

Energy production, even though it is a vital necessity for the functioning of modern societies also , the type of resources that are used in the realization of this process, our health , and gives rise to several important results. For centuries, which is the main energy source of fossil fuels (coal, oil, natural gas), offer high energy efficiency, although they brought with them the environmental damage is increasing. Of these fuels, burning through together emitted into the atmosphere as carbon dioxide, sulfur dioxide, harmful gases such as nitrogen oxides and particulate matter, only the quality of air not only reduce, but also has a negative impact on the global climate system. Increasing greenhouse gas emissions, global warming, sea level rise and an increase in the frequency and severity of extreme weather events to global issues such as background provides.

These problems are overcome to build a sustainable energy future and more the basic approach is to increase the efficiency in energy use more environmentally friendly energy technologies and make constantly. This is both the development and implementation of cleaner technologies in energy production means the reorganization of both consumption habits. Energy in the production of environmentally sound and sustainable solutions to be preferred, for today only and will not protect environmental health, but also to live a cleaner, healthier planet for future generations will form the basis for. At this critical point in this study the work energy used in the production of various complex effects on the environment and examine in detail the different sources ofyerek aims to find a solution to these problems.

Keywords: Sustainable solution, fuel , energy production , environmental impacts.

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Analog approximation of fractance elements using MATLAB 'tfest' function

Burak ARICIOĞLU [1]

Abstract

Fractional-order circuit elements, known as fractance elements, have been widely utilized in various scientific and engineering applications, including biomedical engineering, control systems, and signal processing. These elements provide more accurate representations of complex dynamic systems compared to conventional integer-order components. However, their practical realization remains challenging due to the difficulty in constructing physical fractional-order inductors and capacitors. This study proposes an effective method to approximate fractional-order impedance and admittance functions using MATLAB's "tfest" function, which is part of the System Identification Toolbox. The methodology involves generating time-domain input-output data based on fractional-order differential equations, particularly using the Grünwald-Letnikov approach. The "tfest" function is then employed to estimate transfer functions that approximate the impedance and admittance characteristics of fractional-order capacitors and inductors. The accuracy of the approximations is analysed by comparing the simulated and theoretical frequency responses for different pole-zero configurations. The results demonstrate that increasing the number of pole-zero pairs enhances the precision of the approximations, with higher-order models closely matching the theoretical fractional-order behaviour. Furthermore, all derived impedance/admittance functions exhibit stable pole-zero distributions, allowing their realization with passive electrical components. Simulations further validate the effectiveness of the proposed approach, showing that the approximated fractional-order elements exhibit dynamic responses similar to their ideal counterparts. The extracted impedance and admittance functions are also realized using passive electrical components, providing a practical means of constructing fractional-order circuits.

Keywords: Fractional order-elements, fractional order differential equation, Grünwald-Letnikov method, MATLAB tfest, Fractional-order circuit

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Photochemical Laser Etching of Randomly Distributed Inverted Nanoholes on Crystalline Silicon

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Abstract

While crystalline silicon solar cells currently dominate the photovoltaic market, improving their efficiency through advanced surface texturing remains a significant research challenge. This study introduces an innovative single-step inverted nanohole (SS-INH) surface texturing approach using in-situ photochemical etching (PCE) on n-type silicon solar cells, employing a continuous-wave laser (532 nm) in an HF/H_2O_2 aqueous solution. The nanostructures produced via PCE have been shown to be deeper, denser and more effective across a broad spectral range compared to conventional texturing techniques. Scanning electron microscopy (SEM) confirmed the uniformity of the inverted nanoholes. Photon trapping was significantly enhanced, as evidenced by reduced average reflectance—down to 17.5% for SD and 22.5% for SDR—across the 300–1200 nm wavelength range, along with increased haze resulting from enhanced light scattering. Comparative analyses between saw damaged (SD) and saw damage removed (SDR) wafers highlighted the superior electrical characteristics of SDR surfaces, notably reduced defect-induced recombination. Furthermore, simultaneous photochemical etching demonstrated distinct advantages over conventional sequential methods, including continuous oxide removal, deeper structures, and improved profile anisotropy suitable for micro-electromechanical systems (MEMS) fabrication. Notably, the proposed method (SS-INH-PCE) inherently eliminates the need for a separate saw damage removal (SDR) step, simplifying the process and reducing overall chemical and thermal loads. The simplicity, reproducibility, and optical efficiency of the SS-INH-PCE process highlight its potential for scalable industrial integration, positioning inverted nanohole texturing as a promising pathway for next-generation high-efficiency solar cells and MEMS technologies.

Keywords: Photochemical etching, inverted nanohole, crystalline silicon, saw damage removal, laser assisted etch, surface texturing.

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ISBN: 978-625-372-660-7

Improving and Optimizing React Web Applications: Strategies and Techniques

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Abstract

React, its flexibility and efficiency has become one of the most widely used libraries for building user interfaces, particularly for single-page applications. As these applications grow in complexity, developers are increasingly faced with the challenge of ensuring that their React applications remain fast and responsive. This article explores various strategies and techniques for improving and optimizing React web applications. It discusses key topics such as component optimization, state management, the use of React's built-in tools, and the implementation of lazy loading, code splitting, and server-side rendering. By employing these techniques, developers can enhance the performance of their React applications, leading to better user experiences and more efficient resource utilization. This paper aims to serve as a comprehensive guide for developers seeking to improve the performance of their React web applications.

Keywords: React, Web Applications, Optimization, Performance Improvement, Component Optimization, State Management, Lazy Loading, Code Splitting, Server-side Rendering, User Experience, Resource Utilization.

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Keyword Extraction from Turkish Stories Using Natural Language Processing Techniques

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Abstract

Texts, which are written sources, are among the primary tools people use to transfer information. Extracting information from texts is of great importance in terms of accessing information. Checking thousands or millions of text data one by one by people to extract the necessary information leads to a lot of time and cost. Natural language processing techniques are used to eliminate these problems. Keyword extraction, widely used in natural language processing, is one of the basic methods that help summarize the content by determining a text's most essential and representative words. Keyword extraction from the text is possible in semantic context-based and frequency-based. Semantic context allows an inference based on the meanings of the words in the sentence. Frequency-based occurrence is obtained based on the frequency of repetition of the words in the text. Understanding the Turkish language's structural characteristics is essential to compute word frequency. Root words that do not take any suffixes and stems that gain a new meaning by taking derivational suffixes have a meaning on their own. However, words with inflectional affixes do not acquire a new meaning and cannot convey meaning independently. In this study, pre-processing and stemming operations were applied to Turkish short stories using a dictionary, and the frequencies of words were calculated to extract keywords. The results demonstrate that the proposed method provides a simple and effective approach for extracting keywords from narrative texts and applies to such text types. In addition, a new method was developed that includes previous studies in the stemming process. This method also provided more accurate results than other studies.

Keywords: Natural Language Processing, Information Extraction From Text, Keyword Extraction, Word Frequency, Stemming.

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5thInternational
Congress of Engineering and Natural
Sciences

ISBN: 978-625-372-660-7

Performance Analysis of Artificial Intelligence Frameworks

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Abstract

With the rapid advancement of technology, artificial intelligence (AI) has emerged as a pivotal component across various domains. Today, AI technologies are extensively applied in fields such as education, defense, mining, healthcare, finance, and many others, owing to their high computational power and advanced data analysis capabilities. This study presents a comprehensive performance analysis conducted using three distinct AI frameworks, applied to three different datasets with three neural network architectures. The frameworks examined are TensorFlow, PyTorch, and MindSpore, while the datasets include CIFAR-10, CIFAR-100, and MNIST. The models evaluated in this study are ResNet, DenseNet, and EfficientNet. For each combination, key performance metrics—including training time, confusion matrix, accuracy, F1 score, and inference speed—were systematically analyzed. Based on the findings, recommendations are provided to assist users in selecting the most appropriate AI framework according to their specific needs and priorities. Among the first ten experiments, the configuration using TensorFlow with the ResNet architecture and the CIFAR-10 dataset yielded the highest performance, achieving an F1 score of 0.6926, a training time of 529.66 seconds, an inference speed of 0.000307 seconds per image, and an accuracy rate of 70%. These results suggest that this combination offers a robust and efficient solution, particularly for users prioritizing fast training, balanced accuracy, and low inference latency. Additionally, TensorFlow's flexible architecture and extensive community support make it a sustainable choice for long-term projects.
Keywords:AI, Performance Analysis,TensorFlow,PyTorch,MindSpore

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Majority-Based Automatic Multi-Document Summarization

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Abstract

With the advancement of technology, the number of textual data kept in electronic form is increasing day by day. It is now great importance of obtaining useful information from textual data by developing low-cost and high-performance methods in this process. Automatic multi-document summarization is responsible for filtering text in order to drop size and bring compact information. Multi-document summarization is actually an optimization problem that requires simultaneous optimization of more than one objective function. In this study, a majority-based general extractive multi-document summarization method is proposed using well-known algorithms on summarization. Document Understanding Conference (DUC)-2004 and CNN Daily/Mail data set was used for experiments. The summaries generated by the majority algorithm were compared with the original summaries produced by human summarizers in the DUC-2004 and CNN Daily/Mail data sets. The Simhash text similarity algorithm is used to evaluate the experiments. In the majority-based approach, the summary first was filled from the preponderance of similar sentences in the extracted summaries by LexRank, TextRank, and KL Divergence algorithms. The rest of the sentences, which are differ, then further processed to obtain the summary size. At the end of this process, when the length ratio of the summary obtained with the proposed majority-based summarization approach is less than the specified summary length, the summary size is completed by choosing among the sentences most similar to the original document in the summaries obtained by the third-party algorithms. In the experiments conducted on the DUC-2004 and CNN Daily/Mail data sets, the highest average Simhash similarity rate of the summaries generated by individual summarization algorithms with the original summaries in the DUC-2004 data set was 41.3% and 43.4% in CNN Daily/Mail data set, while it reached to 52.8\% for the proposed majority approach. If it would be considered even human summarizer's summaries differ in 50%, the majority-based approach seems valuable in the case of no human summarizers exist to create reference summaries.

Keywords: KL Divergence, Latent Semantic Analysis, LexRank, Multi-document Summarization, TextRank.

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ISBN: 978-625-372-660-7

Anomaly-Based Visual Quality Inspection of Laser-Marked Smartphone Back Covers

Merve Temur

Abstract

Regulatory engravings such as CE and WEEE symbols on electronic products serve as visual indicators of compliance with safety and environmental standards defined by European Union directives. Their clarity and defect-free appearance are essential for ensuring product quality, regulatory adherence, and consumer trust. In practice, the inspection of such markings is often performed manually. However, traditional inspection methods used on production lines are largely manual; this makes the process time-consuming, labor-dependent, and inconsistent. This work aims to propose an unsupervised anomaly detection approach that focuses specifically on the laser-marked region and is trained using only defect-free samples. Under controlled conditions, a dedicated dataset was created, and since no real defective images were available, synthetic anomalies were generated in order to used as test data. These anomalies simulate production-related defects such as texture distortions. The proposed method was evaluated using modern deep learning-based models, namely PatchCore and PaDiM, and was trained solely on normal examples.Model performance was analyzed using industry-standard metrics such as AUROC and F1 Score, without the need for labeled defective data. The results show that the method can detect anomalies with high accuracy. The proposed approach offers a low-cost, automated, and easily integrable solution for production environments where real defective data is limited.

Keywords: Industrial anomaly detection, Unsupervised machine learning, Quality control, Computer vision

5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Recommending New Products with High Sales Potential in Fashion Retail: A Machine Learning Approach

Enes Tezcan[1]
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Abstract

The fashion retail sector faces major challenges in anticipating demand for products that have not yet been produced and lack historical sales data. This study presents a machine learning-driven recommendation framework that assists fashion retailers in designing new items by analyzing structured product attributes—such as fabric type, fit, sleeve style, and collar design—and identifying combinations with high sales potential.

Sales performance is represented as a normalized sales-per-store ratio, and products are categorized into demand levels using a histogram-based method that detects natural density gaps in the distribution. Categorical features are transformed using encoding techniques, and a predictive model—based on the XGBoost algorithm—is used to evaluate the sales likelihood of various attribute combinations. A custom distance-aware loss function is introduced to reflect the closeness of sales classes and improve the model's sensitivity to misclassification.

Instead of prioritizing general classification accuracy, the framework emphasizes high-confidence recommendations by applying a probability-based threshold to predictions. Feature importance analysis is also conducted to understand which attributes most strongly impact predicted sales performance.

Finally, the trained model is applied to synthetically constructed product combinations, enabling the system to suggest new, logically coherent product designs that are likely to succeed in the market. This approach provides fashion brands with a practical tool for informed decision-making in product planning, well before production begins.

Keywords: Fashion Retail, Sales Forecasting, Cold-Start, Synthetic Data Generation, Feature Importance

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5th INTERNATIONAL CONGRESS OF ENGINEERING AND NATURAL SCIENCES

ISBN: 978-625-372-660-7

An Algorithm with Dna Encryption Using Discrete Wavelet Transform and Subblockıng Methods

Gülay ÇAĞLI[1]
Hüseyin ÇAKIR[2]

Abstract

Image encryption is a method developed to ensure the security of digital image data. In this method, pixel values are encrypted and only authorized persons are allowed to access them. Security is provided by rendering the image meaningless with encryption algorithms. In this study, a stronger encryption system that applies both spatial and frequency-based operations on the image is presented by using discrete wavelet transform (DWT), subblock separation and DNA encryption methods together to ensure the security of color images. Thus, encryption is strengthened both locally and statistically. Discrete wavelet transform (DWT) is a method that allows analyzing the image by separating it into different frequency components. Subblocking provides easier encryption by dividing the image into smaller pieces. Each block is encrypted separately. In DNA encryption, image data is converted to binary form as 00-01-10-11. This two-bit group is converted to a DNA base. The obtained DNA sequence is encrypted with the XOR encryption algorithm. The RGB image is decomposed with a single-level DWT for each channel to obtain the LL component, and these components are divided into fixed-size subblocks. Each block is encrypted according to the DNA coding rules and combined to form the encrypted image. Visual and histogram analyses of the system developed using Matlab App Designer have shown that the method provides effective hiding. Thanks to the user-friendly application applied, the image selected with three different methods can be displayed in its encrypted form. The decryption result is also seen. In this way, image storage and transfer has become more secure.

Keywords: Encryption, decryption, subblocking, wavelet, DNA

ISBN: 978-625-372-660-7

Using Erodium cicutarium extract in a 1 M HCl solution to prevent mild steel corrosion

Buşra ERGEL[1]
Reşit YILDIZ[2]

Abstract

Mild steel (MS) is a material that is employed extensively in industrial applications, including oil pipelines and agricultural irrigation systems. However, the use of sulphuric and hydrochloric acid solutions in pickling, rust and scale removal processes can lead to severe corrosion of mild steel. Conventional inhibitors are generally effective, but the majority of these are toxic, harmful to the environment and expensive. Consequently, there has been a surge of interest in environmentally friendly and economical alternatives, namely green corrosion inhibitors. The present study investigates the corrosion inhibitory effect of Erodium cicutarium plant extract on MS in a 1 M HCl solution. The inhibitory action was assessed by linear polarization resistance, potentiodynamic polarization and electrochemical impedance spectroscopy. Scanning electron microscopy and atomic force microscopy were used for surface investigation. The results demonstrated that both polarisation resistance (R_p) and inhibition efficiency (η%) increased with increasing concentration. At the highest concentration of 1000 ppm, these values reached 338 Ω cm^2 and 95.6%, respectively. The adsorption isotherm was found to fit the Langmuir model. The surface analysis results indicated that the addition of plant extract in an acidic medium provided a significant level of protection for the mild steel surface, while the MS surface exhibited substantial damage. Consequently, these findings indicate that needlewort can be employed as an environmentally friendly, safe and effective corrosion inhibitor in industrial applications.

Keywords: Erodium cicutarium, Mild steel, Green Corrosion inhibitor

Acknowledge

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The Mardin Artuklu University Scientific Research Projects Coordination Unit provided financial support for this work under the grant number MAÜ.BAP.24.LEE.044.

ISBN: 978-625-372-660-7

Investigation of Catalytic Degradation Activity of Palladium Dopped Activated Carbon Obtained from Sunflower Stalk

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Zehra ÖZÇİFÇİ[2]
Dilan TEKTAŞ[3]

Abstract

Industrial waste is one of the main sources of environmental pollution that threaten many species with extinction and pose significant health risks to humans and other living things. The accumulation of these pollutants, most of which are chemically stable, poses an increasing ecological threat. Pd(0) doped catalysts offer effective solutions for environmental remediation by showing a strong potential in degrading organic pollutants. In this study, activated carbon was produced by first applying hydrothermal carbonization to the spongy part of sunflower stalk, an agricultural waste material, and then by applying chemical activation with phosphoric acid under 100 mL/min nitrogen flow at 800°C. Then, a catalyst was prepared by adding Pd(0) to this carbon support solid. The catalytic activity of the prepared catalyst was investigated on Rhodamine B, which was selected as a model compound, together with $NaBH_4$. The porosity properties of the produced activated carbon were investigated by BET, BJH and QSDFT methods. BET analysis showed a surface area of 570 m^2/g, a pore volume of 0.756 cm^3/g, and an average pore diameter of 5.31 nm. The material contained mostly meso- and macropores. Structural and morphological properties were analyzed using XRD and SEM. The Pd(0) doped catalyst provided 98.5% color removal of Rhodamine B in 9 min with a calculated decomposition rate constant of 0.401 min^{-1}.

Keywords: Activated carbon, Rhodamine B, catalytic degradation, Palladium

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This research was supported by the TÜBİTAK 2209-A University Students Research Projects Support Program.

ISBN: 978-625-372-660-7

Hydrogen Production from Ammonia Borane Using The Activated Carbon Supported Pd(0) Catalyst Obtained from Waste Wheat Straw

Hakkı Türker AKÇAY[1]
Zehra ÖZÇİFÇİ[2]
Emir ÖZDOĞAN[3]

Abstract

Hydrogen maintains its importance among alternative energy sources because it does not produce harmful combustion products such as CO_x and SO_x, has relatively high fuel efficiency, and is not a local resource. The most effective solution to the storage problem regarding the use of hydrogen as fuel is to transport hydrogen via solid sources such as hydride compounds. In this study, demineralized wheat straw was activated with phosphoric acid at 800°C under a nitrogen atmosphere to produce activated carbon. As evidenced by the SEM images and N2 adsorption/desorption isotherms, our study successfully preserved the macro and meso porous structure, which plays a crucial role in facilitating the access of guest molecules to micropores. The QSDFT, BJH, and BET methods were used to determine the porosity characteristic. Pore size distribution analysis showed that the activated carbon was composed of meso and macro porosity dominantly. According to QSDFT method, the surface area and pore volume of the produced activated carbon were calculated by 689.61 m^2/g and 0.824 cm^3/g, respectively. In the XRD spectrum of the prepared catalyst, the characteristic bands belonging to Pd(0) were observed. The activated carbon-supported catalyst demonstrated a high efficiency, with dehydrogenation of ammonium borane achieved at approximately 95% in 38 min at 303 K. In addition, the experiments conducted at 313 K and 323 K showed that increasing temperature increases the dehydrogenation yield of ammonia borane. TUBITAK 2209-A University Students Research Projects Support supported this study

Keywords: Wheat Straw, Catalyst, Palladium, Ammonium Borane, Hydrogen Energy

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ISBN: 978-625-372-660-7

Determination of Photodynamic Therapy Potential of A Peripherally Tetra Acetylpiperazin Substituted Zinc(II) Phthalocyanine

Ümit DEMİRBAŞ[1]

Abstract

Cancer has become a global health problem due to the high rate of cancer-related deaths. Surgery, radiotherapy and chemotherapy are widely used methods for the treatment of cancer. When these methods are applied, common and long-lasting side effects occur. This situation negatively affects the success of the treatment. For this reason, scientists have been working on developing novel cancer treatment methods for many years.

Photodynamic therapy (PDT) is an alternative method for cancer treatment. PDT is based on the selective accumulation of a photosensitizer in the cancerous tissues and then its activation by light irradiation. The activated photosensitizer releases singlet oxygen as a result of photochemical reactions. Treatment is achieved by the breakdown of cancerous tissues by singlet oxygen. The most important advantages of PDT are that the photosensitizer selectively accumulates in cancerous tissues, does not show toxicity in the dark, and does not activate without light irradiation.

Phthalocyanines consist of a planar aromatic macroring with 18 π electrons formed by the connection of four isoindole units. Phthalocyanines are suitable photosensitizers for PDT because they have strong absorbance in the visible region between 600-800 nm, have singlet oxygen produce potential, can selectively accumulate in cancerous cells, and are not toxic in the absence of light.

In this work, a peripherally tetra acetylpiperazin substituted zinc(II) phthalocyanine was prepared as a photosensitizer that has the potential to be used in PDT. To determine the PDT performance of this compound; aggregation, singlet oxygen production, photodegradation and fluorescence properties of it were examined. The results showed that zinc(II) phthalocyanine has the potential to be used in PDT applications.

Keywords: Phthalocyanine, Photochemistry, Photophysic, Singlet Oxygen, Photodynamic Therapy.

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Synthesis and Application of Titanium-Based Metal-Organic Framework in Photocatalytic Degradation of Some Organic Dyes

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Kader ÖKTEM[2]

Abstract

Recently, water pollution has emerged as a serious global problem. Organic dyes used in various industries harm humans and aquatic ecosystems. Among the many materials available for dye removal, using metal-organic frameworks as photocatalysts is remarkable due to their versatility in various research. Metal–organic frameworks (MOFs), representing an innovative category of porous crystalline materials, have garnered significant attention as a highly promising candidate for environmental remediation.

In this study, titanium-based MOF structures have been synthesized by two different methods (solvothermal and reflux) using trimesic acid as organic linker and titanium isopropoxide used as metal source. The synthesized MOF structures have been characterized by XRD (X-ray diffraction), TGA (Thermogravimetric analysis), FTIR (Fourier Transform Infrared Spectroscopy), BET (Brunauer–Emmett–Teller), and SEM (Scanning Electron Microscopy) analysis. Additionally, the photocatalytic activities of Ti-MOFs for removing methylene blue (MB) and methyl orange (MO) dyes were investigated. The results revealed that Ti-MOFs exhibited efficient photocatalytic activity for MB degradation under UV light. In the photocatalytic experiment conducted using the Ti-MOF catalyst synthesized by the solvothermal method, when UV spectra were examined at certain time intervals, it was determined that 82% of methylene blue (10 ppm, 100 mL) was removed from the water after 330 minutes and 30% of methyl orange (10 ppm, 100 mL) was removed from the water after 120 minutes.

Keywords: titanium, metal-organic framework, solvothermal, photocatalyst, methylene blue

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

New heterocyclic azo dye polymers: Synthesis, characterization and thermal stability studies

Dilek ÇANAKÇI[1]

Abstract

This study reveals the polymerization of monomers with very small structural differences under the same reaction conditions. The azo dye monomers used in the polymerization were obtained by coupling the diazonium salt of Ethyl 4-amino-1-piperidinecarboxylate to 2,7-Naphthalenediol and 1,6-Naphthalenediol in a basic medium. Various analytical techniques, including ^{1}H-NMR, LC-MS, GPC, FT-IR spectra, UV-Vis, TGA and SEM spectra support azo monomers and polymers structures. Structural analyzes prove that the targeted monomer and polymer syntheses have been achieved. Thermodynamic parameters obtained using the Horowitz and Metzger, Coats-Redfern and Broido methods show that the thermal decomposition processes of monomers and polymers are different from each other. The thermal decomposition process of monomers occurred in two steps, while that of polymers occurred in one step. At the end of the thermal decomposition processes, the remaining amount of material of both monomers and polymers is quite high. The enthalpies of the decomposition steps of the synthesized compounds are different from each other. The highest enthalpy value belongs to the first thermal decomposition step of Na2. The entropy values calculated by the Horowitz and Metzger, Coats-Redfern and Broido methods are negative. The increase in temperature has promoted the thermal decomposition of the compounds. The ΔG of the synthesized compounds is positive. In cases where $\Delta G > 0$, energy must be given from the outside to the environment for thermal degradation to continue.

Keywords: Polymer, polycondensation, SEM, Coats-Redfern, Broido

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ISBN: 978-625-372-660-7

Biberde Bakteriyel Leke (*Xanthomonas campestris pv. vesicatoria*) ve Belirtileri

Buse ORTA[1]
Zehra Nur ARDA [2]
Nur ÜLGER [3]
Büşra ÜLGER [4]

Abstract

Pepper (*Capsicum annuum L.*), a species of the Solanaceae family, is a widely produced agricultural product in our country and worldwide. Today, it is offered for consumption in different ways and is also valued asfunctional food products. Pepper can be grown in tropical and subtropical climatic conditions under cover, open field and low tunnels. However, there are several plant diseases and pests that negatively affect pepper cultivation. Bacterial spot (*Xanthomonas campestris pv. vesicatoria*),is one of the most widespread and destructive bacterial crop diseases, leading to economic losses by negatively affecting yield and fruit quality in pepper production. The disease is a major problem, especially in production areas where high temperatures and relative humidity occur at the same time. Infection symptoms are small amorphous and oily spots appear on the young leaves of the plant. In the later stages of infection, all leaves dry out as the spots fuse together. On the fruit, small, slightly pitted spots appear at the beginning, which grow in size over time, eventually resulting inloss of the crop. Molecular methods such as RT-PCR and ELISA tests are used in diagnostic studies to identify the pathogen. Various studies have been and are being carried out to control *Xanthomonas*. In the chemical control approach, as soon as the disease is detected, copper-containing green parts are sprayed as a protective measure. The most effective methods of control are careful cultural practices and the use of resistant cultivars. In this review, the damages caused by *Xanthomonas campestris pv. vesicatoria* in pepper, the symptoms of the disease and control methods were investigated.

Keywords: Solanaceae, Pepper, *Xanthomonas campestris pv. vesicatoria*

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5thInternational Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Some Important Pests That Cause Galls on Forest Trees

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Abstract

Galls, which constitute aberrant proliferations in plant tissues, arise due to the influence of various biotic agents, including viruses, bacteria, fungi, bee, mite, nematodes, insects, and even parasitic plants. These aberrant growths are triggered by the secretion of specific biochemical compounds, eliciting anomalous cellular proliferation and differentiation within the host plant. The intricate interplay between the host's defense mechanisms and the gall-inducing agents underscores the multifaceted nature of these formations, rendering them significant subjects of study within the fields of entomology, plant pathology, and ecological interactions. Plants possess the capacity to withstand moderate gall formation; however, severe infestations can significantly compromise their physiological integrity. Excessive galling adversely affects plant vigor, disrupts photosynthetic efficiency, and precipitates premature foliar abscission, ultimately culminating in plant mortality. Gall-inducing mite and insects rank among the most detrimental pests in global agricultural systems, exerting substantial economic and ecological consequences due to their pervasive and destructive impact on host plants.
In this study, information is given about the important pests that cause galls.

Keywords: Gall, mite, bee, aphid, pest

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ISBN: 978-625-372-660-7

From Cows to Cloud: Smart Tech Powers the Dairy Industry

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Abstract

Farm management and operations will drastically change due to a digital transformation from traditional observation-based methods to data driven strategies. With recent advances in sensor technologies, it is now possible to continuously monitor and predict key physiological states like energy balance, estrus, and subclinical diseases. Sensor-based tools, including smart sensors such as wearable activity trackers, rumen bolus systems, and automated milking systems enable the collection of real-time data from individual cows. One of the key advantages of these technologies is the ability to track animals individually, facilitating the early detection of changes in health, behavior, or productivity. Many tasks that once required human labor and supervision, such as heat detection or health monitoring, can now be carried out more efficiently and consistently by automated systems. The data collected by these devices are transmitted to cloud-based platforms, where they are processed and translated into actionable insights. These insights support timely and informed decision-making in reproduction, nutrition, animal health, and milk yield. The shift toward data-driven herd management improves early disease detection, optimizes breeding strategies, reduces antibiotic use, and enhances both productivity and animal welfare. While initial investment and technological adaptation pose some challenges, the long-term benefits—greater efficiency, transparency, and sustainability—are becoming increasingly clear. Successful adoption also depends on farmer training and robust data privacy protocols, as the integration of digital systems requires not only infrastructure but also trust and informed engagement from end-users. Ultimately, sensor-based systems are transforming production workflows and fundamentally changing decision-making in the contemporary dairy industry.

Keywords: Cloud-based systems, dairy cattle, real-time monitoring, smart sensors

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5th INTERNATIONAL CONGRESS OF ENGINEERING AND NATURAL SCIENCES

ISBN: 978-625-372-660-7

Determination of the Effects of Different Nitrogen Doses on Yield and Quality Characteristics of Mint (Mentha spicata L.) under the Ecological Conditions of Eskişehir

Nimet KATAR[1]
İrem YAZICI[2]
Duran KATAR[3]

Abstract

The experiment was conducted in 2023 to determine the effects of different nitrogen doses on the yield and quality characteristics of mint (Mentha spicata L.) under the ecological conditions of Eskişehir. The field experiment was carried out in a randomized complete block design with three replications, using five different nitrogen doses (0, 5, 10, 15, and 20 kg N/da). The parameters evaluated in the study included plant height (cm), fresh herba yield (kg/da), dry herba yield (kg/da), dry leaf yield (kg/da), essential oil content (%), and essential oil yield (l/da).According to the findings, increasing nitrogen doses significantly enhanced plant height, fresh herba yield, dry herba yield, and dry leaf yield. However, a decrease was observed in essential oil content. The highest plant height (61.3 cm) and fresh herba yield (3955.9 kg/da) were obtained with the application of 20 kg N/da. In contrast, the highest dry herba yield (1110.8 kg/da), dry leaf yield (633.7 kg/da), and essential oil yield (10.7 l/da) were observed at the 15 kg N/da dose. The highest essential oil content (2.23%) was recorded in the control plot.In conclusion, based on the results obtained from this study, it can be recommended that 15 kg N/da nitrogen application is optimal for achieving the highest dry leaf and essential oil yield of mint (Mentha spicata L.) under the ecological conditions of Eskişehir.

Keywords: Mentha spicata, nitrogen, essential oil content, yield, quality characteristics

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5thInternational Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Repellent Effects of Rosemary and Lavender Essential Oils on *Tribolium castaneum* (Herbst) (Coleoptera: Tenebrionidae)

Şerife BÜTÜN[1]
Ayşe YEŞİLAYER[2]

Abstract

Pests have seen in stored products can cause both economic loss and human health, especially with the damage they cause. *Tribolium castaneum* (Coleoptera:Tenenrionidae) (Herbst) is a significant pest seen in cereal products and is widespread worldwide. This species feeds intensively on cereal grains, causing a loss of quality in the crop. The crops are unsuitable for sowing due to the loss of seed characteristics. Generally, it has been used pesticides and fumigantsthe control of *T. castaneum*. However, alternative control methods are developing in importance due to the negative effects of these chemicals on the environment and human health in the long term, as well as problems such as pest resistance to chemicals. Among these alternative methods, the efficacy of essential oils against pests is of particular interest. In this study, the repellent effects of commercial essential oils obtained from rosemary [*Rosmarinus officinalis*, (Lamiaceae)] and lavender [*Lavandula angustifolia*, (Lamiaceae)] plants produced by TOGÜ MTAL (Tokat Gaziosmanpaşa University-Tokat-Turkey) Research Laboratory on *T. castaneum* were evaluated. Within the scope of the study, essential oils were applied at doses of 0.31 µL/cm² and 0.47 µL/cm² from a 10% stock solution and the percent repellent rates were calculated by determining the areas where the pests were located with controls made after 1/2, 1 hour, 4 hours, 12 hours and 24 hours. As a result of the repellent effect study of lavender and rosemary, 80% and 68% effects were observed at the end of 1 hour at the lowest concentration, respectively. In the essential oil trial, it was observed that lavender plant showed higher effect than rosemary.

Keywords: Storage pests, essential oil, repellent, Lamiaceae, *Tribolium castaneum*

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ISBN: 978-625-372-660-7

Reconstruction of Spatial Memory Through Absence

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Abstract

Spatial memory is often studied through tangible architectural elements, historical narratives, and preserved urban fabrics. However, memory is not solely a construct of permanence—it is also affected by voids, absences, and disruptions. This study explores a non-traditional approach to spatial memory, shifting the focus from continuity to rupture, from presence to erasure. In this way, it reveals the effects of lost, forgotten, or deliberately erased architectural objects on memory.
Traditional spatial memory studies depend on material artifacts, monuments, and urban continuity to reconstruct past experiences. However, in cases of forced displacement, war, or radical urban transformation, memory is not carried through built forms but rather through voids and absences. This raises a critical question: How can spatial memory persist without its physical referent?
The work creates a new approach to architecture that rejects traditional documentation techniques such as mapping or historical reconstruction. This methodology proposes to trace the spatial meaning of the architectural object in its transition from presence to absence. Phenomenological interpretations of the space that emerges with the embodied cognition approach are examined. These interpretations carry spatial memory to a different point and form the structure of "layered memory".
This paper puts forward an alternative architectural discourse that values absence and loss, as well as the reconstruction of memory. This reconstruction occurs not through material permanence but precisely through its transience. As a result, it provides a new perspective on the role and function of memory in architectural design. In essence, it becomes evident that memory, like architecture itself, is subject to fracture and transformation.

Keywords: Merleau-Ponty, Phenomenology, Embodied Cognition, Spatial Memory, Architectural Space.

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This article is based on Tugba Cestel's doctoral thesis, which she is continuing at Yıldız Technical University, Faculty of Architecture, Department Of Architecture.

ISBN: 978-625-372-660-7

Accessıbılıty In Archıtectural Desıgn: Faculty Of Law Sample

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Can GÜNGÖR [2]

Abstract

In the 21st century, technological and social developments have increased individuals' mobility opportunities. However, the risk of disability remains constant, and many people already live with disabilities. According to the 2011 Population and Housing Survey, 6.9% of Turkey's population (approximately 4.88 million people) has at least one disability (Engelli ve Yaşlı Genel Müdürlüğü, 2023). Therefore, accessibility has become a fundamental requirement.

Accessibility refers to the ability of individuals with disabilities to enter, move within, and benefit from all the services in a building independently or with minimal assistance (Enginöz, 2015). In Turkey, the TS 9111 standard titled *Accessibility Requirements in Buildings for Persons with Disabilities and Mobility Restrictions* published by the Turkish Standards Institution (TSE) outlines the principles to be followed in this regard.

This study aims to emphasize the importance of accessibility arrangements in educational buildings. In this context, the Faculty of Law building at Atılım University was evaluated for compliance with national accessibility regulations. The analysis covers entrances and exits, horizontal and vertical circulation, common use areas, wet spaces, signage and information systems, as well as seating and working areas.

Findings reveal that while some parts of the building comply with the relevant standards, others show deficiencies or inappropriate architectural applications. Accordingly, various suggestions are proposed to enhance accessibility and improve the quality of life for individuals with disabilities.

By focusing on an educational institution and evaluating it in accordance with current legal frameworks, this study contributes to the broader discourse on inclusive architecture. Moreover, it highlights the ongoing need for accessibility improvements and provides a reference point for future research and similar assessments in other educational settings.

Keywords: Accessibility, Educational Buildings, Accessibility Standards, Built Environment, Universal Design

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ISBN: 978-625-372-660-7

A Contemporary Architectural Intervention in a Historic Context by the 'Warrior Against Boring Buildings': Thomas Heatherwick's Bombay Sapphire Distillery

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Gonca BÜYÜKMIHÇI[2]

Abstract

Historic environments, as representatives of cultural heritage, allow us to understand past ways of life through social, cultural, economic, and technological dimensions. However, due to changing conditions, these environments often lose their original functions and require new uses in order to remain relevant and preserved. To guide such transformations, international frameworks such as the *Valletta Principles for the Safeguarding and Management of Historic Cities, Towns and Urban Areas* (ICOMOS, 2011) have been established. These principles emphasize that contemporary architecture can revitalize historic urban continuity and contribute to the city's aesthetic quality—provided that it respects the character, values, and context of the historic setting. The charter warns against overly contrasting or disruptive interventions that may fragment the urban fabric. Instead, it advocates for designs that embrace the "spirit of place" and reflect a creative but context-sensitive approach. Despite these guidelines, there is on going debate in architectural discourse regarding the appropriate forms of intervention in historic settings. Influenced by postmodernism and deconstructivism, contemporary additions today are often bold, experimental, and technologically advanced. Such interventions are not only visually striking but also serve as expressions of innovation and transformation (Jencks, 2002; Lardinois, 2017; Sklair, 2017, as cited in Kurnaz & Anıktar, 2024). This paper examines Thomas Heatherwick's Bombay Sapphire Distillery as a case study of an unconventional contemporary addition within a historic context. The project is analyzed in terms of its architectural features, intervention strategy, and its alignment with international conservation principles. Ultimately, the study explores how a visually distinctive form can coexist with historical continuity and contribute meaningfully to contemporary architectural debates.

Keywords: contemporary additions, historic environments, cultural heritage, unconventional contemporary addition

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ISBN: 978-625-372-660-7

Development of Section Options to Provide Noise Control in Buildings

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Abstract

Increasing noise levels in urban environments is a significant issue, adversely impacting human health. Particular legal regulations are carried out to remove the undesired effects of noise. In Turkey, the Regulation on the Acoustic Protection of Buildings (RPBN) specifies limit values for sufficient sound transmission loss against airborne and solid-borne sounds, varying based on the functions of buildings, the types of spaces, and whether rooms serve as sources or receivers. According to the regulations, buildings are classified into six categories, from A to F regarding acoustic comfort, and the target for new buildings should be at least Class C. During the design phase, appropriate selections of the building envelope for external noise and the sections of dividing walls and floors for internal noise are significant to provide auditory comfort. After the building is completed, measures taken to control noise are much more costly, difficult and generally inadequate. While choosing sections, it is important to consider the structure as a whole, since there can be effects on sound transmission in the walls and floors. The aim of this study is to determine the appropriate section options depending on variables such as the noise zone affected by the structure, the function of the affecting volume, the noise sensitivity of the affected volume, and the size of the volume. For this purpose, three fictional volumes of different sizes were considered. Different sections are tried for each three volumes according to external noise level, noise sensitivity of the volumes, transparency ratio of the building envelope. According to these variables and the TS EN ISO 12354 standard, section recommendations are developed with an acoustic simulation program for further buildings. Hence, the thesis is going to be thought of as a guide for architects and other relevant sectors to refer to noise control.

Keywords: Noise control**,** acoustic performance, building sections, auditory comfort, noise

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ISBN: 978-625-372-660-7

Examination and Evaluation of LED Conversion in Lighting of Educational Buildings in Terms of Visual Comfort and Energy Efficiency

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Abstract

Education is important in the development of societies all over the world. The appropriateness of physical environment conditions has a great effect on the continuation of education as required. In the relationship between humans and their environment, the largest proportion is formed by visual perception. In the educational process, the contribution of visual perception to learning is greater than the contributions of other sense organs. Therefore, the ability to learn completely, correctly, without tiring and without much effort depends largely on the provision of good vision conditions, that is, visual comfort. In addition to providing the necessary conditions in terms of quantity and quality of lighting, the appropriate use of energy in lighting is also an important factor. Generally, the electrical energy used in artificial lighting covers a large proportion of all electrical energy consumed. It is clear that a large amount of energy savings will be achieved with efficient energy use without compromising visual comfort, especially in structures such as educational buildings that are used for long periods and throughout the day.

Today, lighting luminaires with traditional light sources continue to be widely used in educational buildings from primary school to university. However, due to the development of LED technology, it is important for sustainability that long-lasting and energy-efficient LED lighting luminaires replace traditional systems. In this context, it is recommended to carry out LED conversion, especially in educational buildings used for long periods throughout the day.

In this study, lighting design will be created with traditional lighting luminaires in a typical classroom, which is the main space of educational buildings. After replacing traditional lamps and luminaires with LED lamps and luminaire systems, Visual comfort and energy use data obtained will be compared and evaluated in terms of visual comfort and efficient energy use.

Keywords: LED Lighting, Visual Comfort, Energy Efficiency, Educational Buildings, Sustainability

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

The Ontological and Spatial Implications of Architecture in the Age of the Anthropocene

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Abstract

In today's environmentally burdened and increasingly fragmented world, the Anthropocene emerges not merely as a geological or scientific term, but as a mode of thought that compels a reconsideration of humanity's relationship with the Earth.

The Anthropocene has profoundly reshaped the nature-human relationship. In this epoch, the human being occupies a dual position: as a force contributing to ecological degradation and as an agent striving to remediate it. Architecture, within this transformation, holds a critical position both as an instrument and a medium of expression.

This study interrogates the ontological dimension of architecture in the context of the Anthropocene, reinterpreting architectural practice through Martin Heidegger's reflections on being, space, and dwelling. The aim is to explore the evolving relationship between architecture and the Anthropocene a period whose boundaries remain fluid by drawing upon philosophical references from the past. Rather than adding to the conceptual ambiguity surrounding the term, the research seeks to clarify and systematize it through an architectural lens.

The theoretical framework is grounded in Heidegger's seminal texts such as *Building, Dwelling, Thinking* and *The Question Concerning Technology*. Here, spatial practices in architecture are seen as existential responses to the planetary transformations of the Anthropocene epoch. At the core lies Heidegger's notion of "dwelling," which emphasizes that architecture is not merely a technical or aesthetic endeavor, but a manifestation of being-in-the-world.

This approach allows for a reconsideration of architecture not only as the act of constructing physical space but also as a means of rethinking the human-nature relationship ontologically.

The Anthropocene necessitates integrative modes of thought that transcend disciplinary boundaries.

As a result, this study repositions architecture as a critical framework for interpreting our contemporary planetary condition and reevaluating the role of humanity within it.

Keywords: Anthropocene, Architecture, Ontology, Heidegger, Dwelling

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ISBN: 978-625-372-660-7

Comparative Analysis of Acoustic Comfort in Indoor Swimming Pools: The Case of YTU and Mehmet Öcalan Sports Complex

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Abstract

Noise control in indoor swimming pools is often neglected, which adversely affects both user comfort and safety. Various sources, ranging from mechanical systems such as ventilation and water installations to the sounds generated by users' speech and movement, cause both physical and psychological discomfort. Prolonged exposure to noise may lead to numerous negative effects, including distraction, communication difficulties, hearing loss, and various bodily pains. Swimming pools are used not only for sporting activities but also as spaces for learning and instructional purposes. In this context, speech intelligibility is of great importance for effective communication among instructors, lifeguards, and users. However, the widespread use of hard and reflective interior surface materials in pools, combined with the reflective nature of water, leads to prolonged reverberation time and increased levels of reflected sound within the space. This situation not only increases the overall noise level but also reduces speech intelligibility, thereby hindering communication. This study aims to comparatively evaluate the acoustic comfort of the indoor swimming pool at Yıldız Technical University and the public swimming pool at Mehmet Öcalan Sports Complex. Through noise level measurements and survey studies conducted in both facilities, the auditory comfort conditions of the spaces were analyzed. The findings reveal that noise levels in both pools exceed acceptable limits, and male users reported being more disturbed by these conditions. Furthermore, even measurements taken when the pools were unoccupied indicated high levels of ambient noise. In this regard, material suggestions were developed to reduce the reverberation time in the pool volumes. The study aims to enhance communication quality and improve user comfort through these proposed acoustic interventions.

Keywords: Acoustic comfort, Noise control, Indoor swimming pool, Acoustic material, Room acoustics.

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Time Series-Based Forecasting of Temperature Data in Hatay Province Using LSTM and XGBoost Models and Comparison of Model Performances

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Erdem ÇOBAN [2]

Abstract

Temperature is one of the fundamental indicators of climate systems and represents a critical parameter that directly affects various sectors such as agriculture, energy production, public health, and water resource management. In recent years, with the increasing impacts of climate change, abrupt and irregular fluctuations in temperature values have made reliable temporal forecasting of this variable increasingly important. In this study, a time series forecasting approach was implemented using daily average temperature data for the province of Hatay over the period 2015–2025. For this purpose, a comparative analysis was conducted between the Long Short-Term Memory (LSTM) model, a deep learning-based method, and the Extreme Gradient Boosting (XGBoost) algorithm, which is based on gradient-boosted decision trees. The predictive performance of both models was evaluated using statistical metrics including Mean Absolute Error (MAE), Mean Squared Error (MSE), and the Coefficient of Determination (R^2). The results obtained from the test data indicate that the LSTM model achieved high accuracy with approximately 1.99 °C MAE, 7.01 MSE, and 0.947 R^2, while the XGBoost model followed with approximately 2.06 °C MAE, 7.44 MSE, and 0.931 R^2. These findings demonstrate that artificial intelligence–based methods can be effectively employed in regional temperature forecasting applications.

Keywords: LSTM Model, XGBoost Model, Time Series

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Hazelnut Shell Flour Filled Epoxy Composites: Characterization and Mechanical Properties

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Abstract

In this study, the influence of hazelnut shell flour addition on the mechanical, water absorption, and surface properties of epoxy resin composites was comprehensively investigated. Hazelnut shell flour was incorporated into the epoxy matrix at varying concentrations (5%, 10%, 20%, 30%, and 35%) and the composites were characterized through particle size analysis, water absorption tests, contact angle measurements, scanning electron microscopy (SEM), and mechanical testing. Results demonstrated that low filler contents (up to 10%) improved the hydrophobicity and stiffness of the composites, as indicated by higher contact angles and increased tensile modulus. However, higher filler contents led to increased water absorption, filler agglomeration, and reduced tensile strength, primarily due to poor interfacial adhesion between the filler and the epoxy matrix. SEM analyses confirmed that while small filler amounts resulted in better dispersion and surface integrity, excessive filler caused significant agglomeration and defects in the composites. Water absorption tests revealed that composites with higher hazelnut shell flour content exhibited significantly increased moisture uptake, compromising the material's durability. Mechanical tests showed a notable decrease in tensile strength and elongation at break with increasing filler content. These findings suggest that hazelnut shell flour is a promising eco-friendly filler for epoxy composites, provided the filler content is carefully optimized. This research highlights the potential of utilizing agricultural waste in sustainable composite development, emphasizing the importance of balancing mechanical performance and environmental resistance for practical applications.

Keywords: Hazelnut shell flour, Epoxy composites, Water absorption, Mechanical properties, Scanning electron microscopy.

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Recent Development and Industrial Applications of Friction Welding Techniques

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Abstract

Friction welding is a solid-state joining method in which heat is generated through relative motion under a certain axial pressure between the materials to be joined. This heat causes the materials to undergo plastic deformation and bond without reaching the melting point. As a non-fusion welding technique, friction welding offers significant advantages in applications that demand high-quality and homogeneous joints. The method is primarily categorized into rotary friction welding (RFW), linear friction welding (LFW), and friction stir welding (FSW), each differing based on the type of motion and equipment utilized, thereby addressing distinct application needs. Friction welding is particularly preferred for joining materials that are traditionally considered difficult to weld, such as aluminum, magnesium, titanium, and various steels. Its low heat input, minimal welding defects, reduced residual stresses, and limited distortion make it a viable alternative to conventional fusion welding methods. The process has found widespread use in sectors such as automotive, aerospace, space, railway, and defense industries, especially where weight reduction and high joint strength are critical. Furthermore, its compatibility with automation, high energy efficiency, and reduced post-weld processing requirements contribute to its alignment with sustainable manufacturing principles. In this review, the historical development, fundamental principles, process parameters, advantages, and current limitations of friction welding are discussed in light of recent literature, with a particular focus on its significance and potential in advanced engineering applications.
Keywords: Friction welding, solid state joining, process parameters, dissimilar materials, advanced manufacturing

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

The Role of Reactive Liquid Phase Sintering in the Production of High-Performance Materials

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Büşra TUNÇ[2]

Abstract

Powder metallurgy is an effective technique for the production of high-performance engineering materials, offering precise control over microstructure and composition. In this method, the sintering stage plays a critical role in enhancing densification and optimizing the microstructure. Reactive Liquid Phase Sintering (RLPS), unlike conventional liquid phase sintering, is an advanced technique in which the liquid phase is formed as a result of chemical reactions between constituents during sintering. This reactive liquid not only facilitates densification but also restructures the microstructure by promoting the formation of new phases. In RLPS, the liquid phase is generated not solely by thermal activation but also through diffusion-controlled reactions between solid reactants. These reactions result in the formation of a transient or permanent liquid phase, which enhances particle bonding through mechanisms such as wetting, dissolution-precipitation, and reactive sintering. Additionally, the process supports the formation of carbide, boride, silicide, or intermetallic compounds in the final microstructure. RLPS is particularly preferred in the development of ceramic matrix composites, hard metals, and specialized alloys for high-temperature applications. This review presents an in-depth examination of the fundamental principles of RLPS, sintering kinetics, formation of reactive phases, and the effects of thermal processing, along with recent application examples from the literature. Moreover, the advantages and limitations of RLPS are discussed in terms of microstructural control, phase stability, porosity reduction, and mechanical performance. As a result, RLPS offers an innovative approach to the design and development of functional and structural materials through controlled phase transformations.

Keywords: Reactive liquid phase sintering, powder metallurgy, microstructure evolution, intermetallic compounds, densification mechanisms

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5th INTERNATIONAL CONGRESS OF ENGINEERING AND NATURAL SCIENCES

ISBN: 978-625-372-660-7

Investigation Of the Effect Of Welding Speed And Wire Feed Speed on Penetration In Lap Joint Welding of FB590 Hot Rolled Ferrite-Bainite Steel By PULSED-GMAW Method

Naime BABİR [1]
Uğur ÜZEL [2]

Abstract

Industrial developments present significant challenges for manufacturers in optimizing welding parameters, especially for advanced materials such as hot-rolled ferritic-bainitic steels. A promising solution to overcome these challenges is robotic gas metal arc welding (PULSED-GMAW), which offers great advantages in terms of high precision and compatibility. In this study, robotic gas metal arc welding (PULSED-GMAW) was performed on hot-rolled ferritic-bainitic FB590 material of the same thickness and composition. The main objective was to determine the ideal welding wire speed that would produce a stable arc with dimensional characteristics. In this study, two experimental trials were conducted within the travel speed and wire speed ranges to ensure the production of a stable arc with dimensional characteristics. Other welding parameters were kept constant: Electrode and Shielding Gas were ISO 14341 G42 3 M21 3Si1 and 82% Argon, 18% CO2 mixture, respectively. Electrode diameter was kept constant as 1.0 mm, shielding gas flow rate was set as 12 L/min, distance between electrode tip and workpiece was determined as 15°, 1.0 mm and 14 mm, respectively. After welding, the penetration depths were measured for each sample. In addition, tensile tests were performed to evaluate the mechanical properties of the welded joints, and the cross-sectional tensile strength was measured. Hardness measurements were also taken to determine the hardness distribution in the weld zone.

Keywords: : FB590 steel, PULSED-GMAW , Lap Joint, Penetration, Wire feed speed

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5th INTERNATIONAL CONGRESS of ENGINEERING AND NATURAL SCIENCES

ISBN: 978-625-372-660-7

Strontium Adsorption Performance of Bio-Composites Based on Chitosan and Turkish Coffee Waste

Şevval BAYSAL[1]
Süleyman İNAN[2]
Bekir ÖZKAN[3]

Abstract

In this study, a novel bio-composite material was developed using chitosan and Turkish coffee waste for the adsorption of strontium ions from aqueous solutions. Chitosan was first dissolved in acetic acid solution and then mixed with air-dried spent coffee grounds. The resulting homogeneous mixture was carefully dropped into a sodium hydroxide solution to form spherical hydrogel beads. After washing and drying, the composite beads were characterized using various analytical techniques to determine their morphological and chemical properties. The impact of various parameters, such as contact time, pH, initial concentration, and temperature, on Sr(II) sorption was examined using Response Surface Methododlogy (RSM). Adsorption kinetics were investigated using pseudo-first-order, pseudo-second-order, and intraparticle diffusion models to understand the adsorption mechanism. Furthermore, equilibrium adsorption data were analyzed using Langmuir, Freundlich, and Dubinin-Radushkevich isotherm models to determine the adsorption capacity and the nature of the adsorption process. The results showed good agreement with the Langmuir isotherm model, indicating monolayer adsorption on a homogeneous surface. The kinetic data were best described by the pseudo-second-order model, suggesting that chemical adsorption was the rate-limiting step. Overall, the prepared bio-composite demonstrates promising potential as a low-cost and environmentally friendly adsorbent for the removal of strontium from contaminated water sources.

Keywords: Chitosan, Coffee waste, Strontium, Adsorption, Bio-composite

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ISBN: 978-625-372-660-7

Effect of Glass Fiber Content on the UV Resistance of Non-Homogeneous Multi-layered Structures

Şazimet Sinem AYCAN[1]
Keziban Kotanak Pişkin[2]

Abstract

In this study, a novel bio-composite material was developed using chitosan and Turkish coffee waste for the adsorption of strontium ions from aqueous solutions. Chitosan was first dissolved in acetic acid solution and then mixed with air-dried spent coffee grounds. The resulting homogeneous mixture was carefully dropped into a sodium hydroxide solution to form spherical hydrogel beads. After washing and drying, the composite beads were characterized using various analytical techniques to determine their morphological and chemical properties. The impact of various parameters, such as contact time, pH, initial concentration, and temperature, on Sr(II) sorption was examined using Response Surface Methododlogy (RSM). Adsorption kinetics were investigated using pseudo-first-order, pseudo-second-order, and intraparticle diffusion models to understand the adsorption mechanism. Furthermore, equilibrium adsorption data were analyzed using Langmuir, Freundlich, and Dubinin-Radushkevich isotherm models to determine the adsorption capacity and the nature of the adsorption process. The results showed good agreement with the Langmuir isotherm model, indicating monolayer adsorption on a homogeneous surface. The kinetic data were best described by the pseudo-second-order model, suggesting that chemical adsorption was the rate-limiting step. Overall, the prepared bio-composite demonstrates promising potential as a low-cost and environmentally friendly adsorbent for the removal of strontium from contaminated water sources.

Keywords: Chitosan, Coffee waste, Strontium, Adsorption, Bio-composite

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Analysis of the Effect of Fin Structure on Thermal Performance in Aluminum Radiators Using CFD Method

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Haluk EKİCİ[2]

Abstract

Aluminum radiators are the heating systems that have been widely preferred in recent years because they provide thermal comfort and rapid heating. Unlike other heating systems, aluminum radiators can be manufactured in the desired form and structure with the extrusion method as slice based. This situation allows the formation of structures called fins on the slice, which play an active role in thermal conduction. The fin forms on the radiator and their shapes are the structures that directly affect the thermal performance of the product.
This paper is about demonstrating the effect of a change made in one of the fins of the aluminum slices on the thermal performance of the radiator by simulating it with computer-aided computational fluid dynamics (CFD) analysis and examining the resulting change.
Keywords: Aluminum Radiator, Extrusion, Aluminum Fin, Thermal Performance, CFD Analysis

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5[th] International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Analysis of the Effect of Different Vent Designs on Thermal Performance in Convection Heaters Using CFD Method

Hafizittin Hakan YUDAR[1]
Hatice Elif BARBAROS[2]

Abstract

Convector heaters are used to meet the heating needs in residences because they provide both rapid heating and a natural heating process. In convector heaters, heating is based on the heating of the air in the environment with the help of resistances and its rise, replacing the cold air and ensuring this cycle is continuous. The design of the air inlet and outlet area of the building is a very important factor for the healthy air cycle.

In this paper, the structure and form of the upper vents of convector heaters are examined by simulating the interaction of possible design changes on the air flow and their effects on the thermal performance of the convectors with computer-aided computational fluid dynamics (CFD) analysis.

Keywords: Convector, Vent Structure, Thermal Performance, Air Flow, HAD Analysis

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ISBN: 978-625-372-660-7

Design of an elastomer composite for self-sealing fuel tank lining

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Abstract

In order to minimize fuel leakage in the fuel tank of a vehicle used in compelling conditions, the fuel tank can be coated with specially selected self-sealing elastomers. In the event of a penetration, the first intervention against fuel leakage is provided by an elastomer layer coating that can quickly cover the hole, while the sealing of the hole can be provided by another auxiliary polymer that swells to stop fuel leakage. To provide these two effects, a polymer that swells when it encounters fuel, can be added in the elastomer matrix as a dispersion. In the event of a piercing object such as a bullet penetrating the fuel tank, this auxiliary polymer can complete the task of sealing the whole hole by exhibiting swelling behavior when it encounters the leaking fuel.
Hansen Solubility Parameters (HSPs) can be used in the selection of these polymers that are specially dispersed in the elastomer and exhibit swelling properties when they encounter fuel leakage. To use Hansen Solubility Theory, firstly the Hansen Solubility Dispersion, Polar and Hydrogen Bond parameters of the fuel are determined and then the obtained parameters can be used to select the most suitable polymer.The use of HSPs calculations is very simple and convenient, however, obtaining the parameters can be time consuming. For easy use in determining a suitable polymer candidate, the Hansen Solubility Parameters can be calculated approximately by values obtained from the refractive index, static dielectric constant, surface tension and surface energy measurements of the liquids and the polymer.
Keywords: Hansen solubility parameters, self sealing, refractive ındex, static dielectric constant, surface tension

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Green Transformation In Mobile Device Packaging

Emel Peker [1]

Abstract

The environmental impacts of plastic –based materials commonly used in the in-box packaging of mobile devices encourage the develepmont of sustainable alternative materials. In this context, starch-based and biodegradable eco-friendly materials come to the fore. In products that require short-term packaging such as phones, tablets and wearable technology products, biodegradable materials provide both physical protection and minimize environmental impacts. On an industrial scale, this transformation can provide significant environmental benefits, especially in large volume production quantities. In this way, both nature is protected and sustainable production targets are contributed.

Keywords: Sustainable Packaging, Biodegradable Materials, Mobile Device Packaging, Temporary Packaging Solutions

5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

The Place of Athermic Glass and Solar PVB Glass in the Automotive Industry

Hilal ZEYTİNCİ[1]
Mehmet Akif Çevik[2]
Onur KOZBAY[3]

Abstract

Today with the developing technologies in the automotive industry is also increasingly focusing on increasing passenger comfort, energy efficiency and safety. In this context there are new technologies related to vehicle glass, which is the first to be seen in terms of contact with the external conditions used in vehicles in order to improve driver driving area and in-car experiences. Some of these are: Athermic Glass and Solar PVB glass. Athermic glass, also known as heat reflecting, consists of a layer with infrared (IR) and ultraviolet (UV) filtering properties as a result of the addition of some metal oxide coatings to the glass composition during production, while Solar PVB glass is laminated glass with a special PVB application. This article will mention the production methods, features, application areas and differences between these glasses.

Keywords: Laminated Glass, Tempered Glass, Athermic Glass, Solar PVB, Heat Reduction, Heat Reflective

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Gifted Students and Floragenda: Let's Get to Know the Plants in Our Local Environment

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Melisa BİRSEN[2]
Deniz DEĞER[3]

Abstract:

The purpose of this study is to evaluate an educational application named Floragenda, designed to help 5th grade students recognize the plants in their local environment. The application includes three core components: observation of herbarium samples, educational games, and a nature education perspective that moves from local to global.
The study was conducted with 23 gifted 5th grade students (11 girls and 12 boys) from Etimesgut Science and Art Center during the 2024–2025 academic year. A qualitative research method was employed. After participating in the educational program, students completed an interview form. Their responses were analyzed through descriptive analysis, with conceptual categories created and their frequencies and percentages calculated.
Results showed that 52.2% of students commented on the educational process, while 47.8% discussed the plant names they learned. Those who shared their thoughts on the process mainly focused on the educational game, expressing feelings such as joy (30.4%), happiness (24.4%), academic satisfaction (24.4%), feeling good (9.09%), and curiosity and excitement (6.06%).
Students' environmental awareness increased, with their feedback categorized under biodiversity protection (52.2%) and awareness of diversity (47.8%). A majority (91.3%) also reported greater interest in nearby plants after observing herbarium samples.
In addition to flower observations, the application included seed samples and their storytelling. Most students focused on seed structure and shape (56.5%), while others mentioned germination (17.4%) and emotional reactions to seed stories (17.4%).
Regarding the plant and bee story, students primarily focused on the plant theme (82.6%), with smaller percentages noting pollen and nectar themes (8.7% each).
Floragenda is considered a valuable tool for nature education and is recommended for adaptation and broader use across different age groups. The study is expected to contribute to the related literature.
Keywords: Nature education, Herbarium, Educational game, Local environment, Gifted student

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ISBN: 978-625-372-660-7

Gifted Students and Eutrophication: The ETAV Protocol

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Abstract

The aim of this project is to evaluate the "Eutrophication Think-Aloud Visualization Protocols" (ETAV), an educational program designed for gifted fifth-grade students at Etimesgut Science and Art Center. The program not only aims to inform students about the effects of phosphorus increase in water, one of the human-induced factors that accelerate the process of eutrophication, but also incorporates emotional skills and uses visual arts to help students express their perceptions, emotions, and sensitivities toward nature in an artistic way. Additionally, the program seeks to enable students to suggest solutions to the problem, take responsibility, and feel that they have contributed through action-oriented activities. The ETAV protocol consists of two phases (verbalization and visualization) and two dimensions (actionability and emotional skills), synchronized with Think-Aloud.

The research methodology is a mixed-methods approach, utilizing both quantitative and qualitative data collection and analysis techniques. When examining the quantitative data, the correlation result of the environmental attitude scale applied to 31 participants (14 girls, 17 boys) was found to be greater than 0.05 ($p>0.05$), indicating that there was no significant difference between the pre-test and post-test. However, it can be concluded that the experimental group demonstrated high environmental sensitivity, and their opinions showed positive development after the application.

According to the qualitative analysis, the information the students gained about eutrophication was verbalized in association with "lake," and visualized using "cleaning products." The most common solution suggestions for eutrophication were related to reducing the use of cleaning products in both verbalization and visualization phases. This study is expected to contribute to the literature by providing a model application, which can be implemented in different schools and adapted to address various environmental issues.

Keywords: Eutrophication, ETAV, Phosphate, Visualization, Verbalization

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Visual Metaphors Created by Gifted Students Concerning Genetically Modified Organisms (GMOs)

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Zeynep Dila DEMİR [2]
Deniz DEĞER[3]

Abstract

The aim of this study is to determine the perceptions of gifted high school students regarding Genetically Modified Organisms (GMOs) through visual metaphor analysis. The study sample consists of 38 gifted students enrolled at Etimesgut Science and Art Center during the 2024–2025 academic year. Among the participants, 25 are female and 13 are male; 26 are in 9th grade, and 12 are in 10th grade. Data were collected using an interview form that instructed students to "Draw an image that represents GMOs for you.". The data were analyzed using descriptive analysis and categorized under six conceptual themes: process/application (f:10, 26.31%), change (f:10, 26.31%), harmful (f:6, 15.78%), seemingly good but actually bad (f:6, 15.78%), beneficial (f:4, 10.52%), and both beneficial and harmful (f:2, 5.26%). The students' drawings commonly included visuals such as needles, DNA, fruit, and representations of before-and-after transformation. These findings suggest that students generally hold negative perceptions of GMOs. When analyzing the metaphors in terms of the areas of GMO usage, the drawings predominantly focused on the food sector (89.7%). There were no representations related to the industrial or health sectors. This indicates that students associate GMOs primarily with food and lack awareness of their applications in other fields. It is expected that, with broader education on the various uses of GMOs, students would develop a more comprehensive and balanced perspective.

Keywords: GMO, visual images, metaphor, gifted student, education

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Analyzing Gifted Students' Perceptions of Genetically Modified Organisms (GMOs) Through Metaphorical Representations

Zeynep Dila DEMİR[1]
Ecem TOK[2]
Deniz DEĞER[3]

Abstract

The aim of this study is to determine the perceptions of gifted high school students regarding Genetically Modified Organisms (GMOs) through conceptual metaphor analysis. The target group consists of gifted students studying at Etimesgut Science and Art Center during the 2024-2025 academic year. Among the 43 participants, 13 are male and 30 are female; 31 are in the 9th grade and 12 are in the 10th grade. Data were collected using a metaphor form in which students completed the prompt "GMO is like …… because ……". The data were analyzed using descriptive analysis, and conceptual categories were identified. According to the analysis, the group produced a total of 37 different metaphors. The most frequently produced metaphor was "poison" (f: 4). These metaphors were grouped into seven conceptual categories: harmful (f: 12, 27.9%), both beneficial and harmful (f: 10, 23.2%), altered in structure or appearance (f: 7, 16.2%), seemingly good but actually harmful (f: 5, 11.6%), seen as a scientific development (f: 4, 9.3%), beneficial/solution-oriented (f: 3, 6.9%), and effects revealed over time (f: 2, 4.6%). In the "harmful" category, students perceived GMOs as a major threat to the world and a factor that negatively affects health. In the "both beneficial and harmful" category, students focused on side effects, usage amount, and type. Overall, students viewed GMOs as having negative effects, although many also acknowledged potential benefits. In terms of application areas, most conceptual metaphors referenced the food sector (30.2%), while fewer referred to health (4.6%). No references were made to industrial use. This suggests that students are primarily focused on GMOs in the context of food, with limited awareness of other application areas.

Keywords: GMO, metaphor, gifted student, perception, education

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Experimental Determination of Burnup Distribution Across the Full Core of the ITU TRIGA Mark II Research Reactor

Zeynep BODUROGLU[1]
Tayfun AKYUREK[2]

Abstract

In this study, a comprehensive experimental burnup assessment was conducted for the full core of the TRIGA Mark II research reactor, which has been in continuous operation at Istanbul Technical University since 1979. The primary objective was to calculate the burnup rates of the fuel elements and propose possible core reconfiguration options based on the obtained data. A normalization factor was employed in the burnup calculations, differing from conventional methods. This factor was determined by averaging the ratios of Cs-137 activities of four fuel elements (B5, D18, E14, and F30) measured in 2024 to their respective values measured in 2018. Subsequently, the burnup values of 67 fuel elements were calculated as percentages. The results indicate that fuel elements in the innermost core region, specifically in the B ring, exhibit the highest burnup values, followed sequentially by elements in the D, E, and F rings. These variations in burnup rates reflect neutron flux distribution and emphasize the importance of core optimization for long-term operation. The findings suggest significant advancements in burnup analysis techniques and highlight the necessity of fuel reconfiguration to maintain reactor efficiency. Rearranging fuel elements with varying burnup levels within the core is considered a potential strategy to extend operational lifetime and enhance safety. Based on the obtained burnup data, the next phase of this study involved a detailed reassessment of the reactor's current fuel arrangement, leading to proposed new core configurations aimed at optimizing reactor performance. This evaluation makes significant contributions to reactor safety and operational performance.

Keywords: Burnup assessment, fuel reconfiguration, TRIGA Mark II reactor, core optimization, Cs-137 activity

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Radiation Analysis of ITU Triga Mark II Research Reactor Fuel Inspection System

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Abstract

The aim of this study is to comprehensively evaluate the presence, levels, and safety significance of radiation in working environments. Radiation measurement methods were examined in detail, and their appropriateness for safety was assessed. Additionally, this study investigated whether the radiation levels encountered during burn-up studies remain within safe limits. The experimental study utilized an HPGe detector with a relative efficiency of 14.4% and an energy resolution of 2.0 keV. A specially designed fuel analysis cask was used to analyze reactor fuel via gamma spectroscopy. Fuel elements were extracted from the reactor core, placed in a fuel investigation system, and then analyzed using gamma spectroscopy at three- and ten-minute intervals. The radioactive content of the fuel was determined, and its gamma spectrum was analyzed. Environmental radiation dose levels were also measured at the surface and one meter away from the fuel investigation system. The obtained data enabled a detailed analysis of the fuel's radioisotope content, identifying 15 different nuclides. Cumulative attenuation and shielding calculations were performed for these nuclides, considering multiphoton energies. Additionally, uncertainty and error analyses were conducted for dose measurements at the contact point and one meter away. For Cs-137, Co-60, K-40, and Pr-144 peaks, square distance calculations were performed from three different positions: the detector, helmet surface, and helmet center. Based on these calculations, activity and fuel element graphs were generated.
Keywords: Radiation, radioisotopes, shielding, gamma spectroscopy, efficiency

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ISBN: 978-625-372-660-7

Nondestructive Burnup Analysis and Gamma-Ray Spectroscopic Evaluation of Spent Fuel Elements in the ITU TRIGA Mark II Reactor

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Abstract

In nuclear reactors, the burnup values of fuel elements are crucial parameters that indicate both the safety of the reactor system and its energy generation capacity. Additionally, these values are utilized in reactor reconfiguration processes, which aim to optimize fuel utilization and extend the operational lifetime of the reactor. In this study, a correlation was established using a non-destructive method to compare the burnup values of the fuel elements in the ITU TRIGA Mark-II Research Reactor with data obtained from a previous study conducted on four fuel elements in the same reactor in 2018. Based on this correlation, a new methodology was developed to calculate the burnup values of all fuel elements. As a result of these burnup calculations, a reconfiguration example was proposed, considering that no reconfiguration has been performed in the reactor for many years. Additionally, gamma spectroscopy was employed to analyze the four fuel elements examined in 2018, and these results were compared with the gamma spectroscopy analysis of four fuel elements used in this study. Each spectral peak was individually analyzed to identify the detected radioisotopes. Through this study, the current burnup values of the ITU TRIGA Mark-II Research Reactor fuel elements were obtained, providing valuable insights for reactor operation and fuel management. Furthermore, a comparative analysis with the most recent study in the same reactor enabled a more comprehensive understanding of the burnup characteristics and their evolution over time.

Keywords: Burnup analysis, TRIGA Mark-II reactor, non-destructive method, reactor reconfiguration, gamma spectroscopy.

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5th International Congress of Engineering and Natural Sciences
ISBN: 978-625-372-660-7

Testing Casual Relationships Between Energy Consumption and Income With DoWhy Algorithms

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Abstract

The aim of this study is to examine the causal relationship between energy consumption and GDP per capita in developed, developing, and underdeveloped countries from 1974 to 2014. Understanding this relationship is crucial not only for shaping effective energy policies but also for revealing the mutual interactions between economic growth and energy usage. In particular, in developing countries, the impact of energy consumption on economic growth is one of the key components of economic development strategies. In this context, the analysis conducted on a sample of countries worldwide contributes to the creation of strategic orientations for countries in different income groups by deeply examining the interaction between energy consumption and economic growth. To determine the causal relationship between these two variables, a modern machine learning method called DoWhy is employed. DoWhy is a powerful tool for analyzing causal effects, and unlike traditional correlation methods, it aims not only to identify the existence of relationships but also to explore their causal directions and strengths. Additionally, a more classical method, the Granger causality test, is used in the study. This test plays a supportive role in analyzing causal relationships over time series data while reinforcing the findings of DoWhy.
The results reveal bidirectional positive causal relationships between energy consumption and economic growth in developing and underdeveloped countries. In developed countries, this relationship is found to be weak and statistically insignificant. This study emphasizes the importance of the relationship between energy consumption and economic growth, particularly for developing countries, and suggests that energy policies and economic growth strategies should be designed with these dynamics in mind. Furthermore, increasing energy efficiency and alternative energy sources plays a critical role in the sustainability of economic development.
Keywords: Causal Analysis, Machine Learning, DoWhy, Granger, Electricity Consumption and GDP

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

A Neutrosophic QFD Model for Strategic Evaluation of Business Class Seat Investments in Airlines

Gürkan Hasan GÖKTÜRK[1]
Şükran ŞEKER[2]

Abstract

Quality Function Deployment (QFD) approach is widely used to design of the products, services or the processes considering customer requirements. This study aims to facilitate investment decision-making processes regarding business class seats—a major cost item for network-type airline companies—through a neutrosophic QFD approach. Neutrosophic Fuzzy Sets (NFS) is used to handle uncertainty derived from judgments of expert in real life applications. Thus, to optimize investment of business class seating products the research focuses on aligning customer expectations and corresponding technical requirements to meet these expectations. To determine customer expectations, the initial phase involved in-depth interviews with frequent flyers who have flown at least 10 times in business class over the past five years. From these interviews, to determine technical requirements with respect customer expectations, five airline professionals with a minimum of eight years of experience and direct involvement in seat investment decisions were invited. While the assessments of customer expectations were processed using the Analytic Hierarchy Process (AHP) employed by NFS to determine the relative importance weights of each customer requirement, the experts were then asked to identify relevant technical requirements that correspond to the previously defined customer needs. The findings indicate that the most critical customer expectations include: fully flat bed capability, wide seat and legroom, personal space and privacy, and direct aisle access. Expert assessments showed that corresponding technical features—such as bed mechanism quality, seat dimensions, privacy-enhancing partitions, and aisle accessibility—should be prioritized in investment planning. At the end of the study future research directions related to limitations are introduced.

Keywords: neutrosophic, QFD, INVS, aviation, seat

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ISBN: 978-625-372-660-7

Mathematical Modeling Of Disaster and Emergency Response Teams in Earthquake Coordination and Optiimization with Social Policy – The Case Of Istanbul

Halil İbrahim YAVUZ[1]
Hayri BARAÇLI[2]

Abstract

When disasters strike, it's not only concrete and steel that collapse. Systems crack, coordination slows, and sometimes, fairness disappears in the noise. This study didn't begin with formulas or simulations—it began with a question: can disaster response be more just?

To explore this, we built a decision model to help allocate emergency teams across Istanbul's 39 districts after a potential 7.5 Mw earthquake. But the model isn't just about numbers or geography.

Many existing approaches center on physical destruction alone. But in a sprawling city like Istanbul, risk has more than one face. Our framework includes factors like social vulnerability, response delays, infrastructure strain, uneven team capacity, occupational risks, and potential secondary hazards—elements that often go unseen in technical plans.

We used data from TÜİK, AFAD, and İBB, normalized the variables, and applied AHP for weighting. A Markov chain helped simulate how resources might move over time. The technical side was built in GAMS (General Algebraic Modeling System) and analyzed further in Python.

Still, what mattered more than the code was the insight behind it: sometimes, the places that "look fine" struggle the most when it counts. This model aims to make those invisible weaknesses visible—before choices get locked in.

While the design echoes international tools like FEMA's Social Vulnerability Index or UNDRR's resilience maps, our aim was to stay grounded in local realities. Though it was created for an earthquake scenario, the framework adapts to other crises—floods, fires, or anything that hits unevenly.

In the end, this isn't just a system. It's a reminder: resilience isn't only about bouncing back—it's about who gets left behind.

Keywords: Disaster Management, Resource Optimization, Social Vulnerability, Response Teams, AHP, Markov Chain, OHS, Secondary Hazard, GAMS, Istanbul Earthquake Scenario

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ISBN: 978-625-372-660-7

Brief Evaluation of Manually Operated Emergency Door Opening Handle on Cars In Aspects of Avaliability and Ergonomics

Serkan Burak Can ÇANGIR[1]

Abstract

Nowadays, trends are affecting many more aspects of automotive design than they used to. Some examples even conflict with some other features. For instance, opening doors, which may sound like a simple operation, can be complicated in some cases. Manufacturers are obliged to add components for specific conditions. However, when it comes to aesthetic concerns, some manufacturers may ignore adding these obligatory components. Additionally, in many cases it may take a long time for these applications to become a standard. In this study we will be examining and take a photo of current applications on door handles. Also, we look back previous applications and approaches from history of automobile manufacturing. Eventually we will gain information about manufacturer's perspective around the globe when defining needs of the user that has different anthropometric features. In specific regions these features can be definitive on the other side of the could be irrelevant. As a conclusion trends can be understand at different population in a aspect of market-driven and technology-driven but need of safety features can not be decisive choose of marketing operation and must applied on every car that produced for every region.

Keywords: Electric Cars, Trend, Emergency Door Handle, Electrically Operated, Manually Operated Handle, Safety, Accident

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

A Human-Centered Overhead Bin Design Enhancing In-Cabin Accessibility

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Ramazan Ensar İLSAY[4]

Abstract

In this study, a human-centered and innovative cabin baggage system was designed to facilitate the placement of hand luggage by passengers in civil aviation aircraft cabins. The design thinking methodology, which is one of the human-centered approach methodologies, has been considered in the design process. In this direction, the main goal in the design process was to increase accessibility and ease of use while maintaining the lightness and durability of the structure. To achieve this, Glass fibre reinforced plastic (GFRP) was preferred as the main material for both the fixed outer shell and the movable inner partition due to its advantages in terms of light weight, cost effectiveness and tensile strength.. Stainless steel A-286 was used to ensure that the bolts and nuts at the connection sites could withstand the required loads. A functional solution was developed by considering user ergonomics and cabin movement area. Static structural analyses were performed using ANSYS software in order to evaluate the structural strength and performance of the product. The analysis results show that the design meets both high strength and low weight criteria. This developed system has the potential to increase passenger satisfaction and is a solution that supports efficiency for airline companies. This study draws attention to the importance of user-centered design in the aviation sector and emphasizes the role of engineering analyses in design decisions.

Keywords: Design thinking, overhead bin design, structural analysis, human-centered, aviation.

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5th International Congress of Engineering and Natural Sciences
ISBN: 978-625-372-660-7

Macro-Scale Finite Element Simulations of Woven Fabric-Reinforced Polymer Matrix Composite Laminates with Drilled and Molded-in Holes

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Sedat SÜSLER[2]

Abstract

Conventional drilling methods cause stress concentration around a hole in composite structures, leading to a certain reduction in load-bearing capacity compared to non-perforated structures. Therefore, minimizing the damage that occurs during the drilling process directly affects the service life, strength, and performance of laminated composite structures. In this context, the hole molding method emerges as a significant technique that promises to enhance the performance of structures by minimizing the defects caused by conventional drilling methods. Moreover, developing accurate and rapid numerical modeling techniques to simulate the beneficial impact of the molded-in hole on the mechanical behavior of structures offers advanced approaches for improving design and optimization process. In this study, macro-scale finite element modeling and analysis are carried out for 6-ply 0°/90° woven carbon fabric-reinforced polymer matrix composite laminates (150 mm x 25.4 mm x 1.32 mm in length, width and thickness) with the molded-in holes with the diameters of 3 mm and 6 mm under tensile loading. The 3D continuum shell finite element model based on Hashin's damage initiation criteria and a damage evolution focuses on local derived material properties for created partitioned cells around the hole, which are fiber rich regions, and the stack directions which encircle the hole smoothly unlike conventional drilling model in Abaqus/CAE 2024. The results are compared with the numerical modeling for the laminates with drilled holes and experimental results obtained for both drilling and molding methods in the literature. The compared open-hole tensile strengths, stress-strain curves on certain locations and damage criteria for both longitudinal and transverse directions as a result of fiber breakage and matrix cracking or the combination of them show that the macro-scale model presented for composite laminates with molded-in holes works effectively on their virtual testing.

Keywords: Laminated composites, molded-in hole, drilled hole, woven fabric, tensile strength

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ISBN: 978-625-372-660-7

Development of Cylindrical De-Icing Device for Aircraft Icing: Design and Function Introduction

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Elif Hazan EFE[3]
Burhan Şahin[4]

Abstract

Ice accumulation on aircraft wings endangers aerodynamic performance and flight safety. Therefore, de-icing is of vital importance. Traditional de-icing systems operate with high energy consumption, have limited effective areas, and involve mechanically complex systems. This study presents two innovative mechanical de-icing systems designed to overcome these limitations. The first system uses rotating cylinders that move along a gear rail mechanism to stretch an elastic surface and break the ice layer. The second system creates localized stress points with electromagnetically controlled iron spheres to fracture the ice. Both systems were modeled in SolidWORKS 2024 and analyzed for aerodynamic performance using ANSYS Fluent 2024 R2. Simulation results showed that the cylinder configuration placed on the leading edge provided the most efficient performance at 0° angle of attack, with a drag coefficient (CD) of 0.01467 and a lift-to-drag ratio (L/D) of 21.49. In comparison, this system was found to provide 40% energy savings compared to conventional electrothermal systems. The modular design allows the system to be adapted to various wing profiles. Integrated ultrasonic sensors enable real-time monitoring of ice thickness, allowing for precise control of the system. The proposed systems combine mechanical efficiency with intelligent control features to address the fundamental limitations of existing technologies. Due to their low energy consumption, these systems are particularly suitable for unmanned aerial vehicles (UAVs) and commercial aircraft. This study provides an energy-efficient and reliable solution for aviation safety by effectively preventing ice accumulation on critical wing surfaces while preserving aerodynamic integrity.

Keywords: Aircraft wing icing, mechanical de-icing, aerodynamic efficiency, energy conservation, electromagnetic control.

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ISBN: 978-625-372-660-7

Design of a Modular and Scalable Autonomous Underwater Vehicle for Multi-Misson Application

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Abstract

This study presents the design of a multi-purpose and scalable Autonomous Underwater Vehicle (AUV) capable of executing various mission types while adapting to diverse operational requirements. Traditional AUVs are often tailored for specific tasks, which limits their flexibility and raises operational costs. In contrast, the proposed AUV introduces a modular architecture that enables reconfiguration of both hardware and software components according to mission-specific needs. The vehicle is composed of modular units, including a sensor package for environmental data collection, a power management system for efficient energy distribution, a propulsion unit for underwater maneuverability, and communication modules for real-time or post-mission data transfer. This architecture allows the AUV to be used in applications such as environmental monitoring, underwater inspection, payload delivery, and scientific data acquisition. During the design phase, special emphasis was placed on sensor integration, ensuring the system's adaptability to varying mission profiles. The hull of the AUV was also designed to be scalable, allowing modifications in length and internal volume to accommodate different payloads or endurance requirements. Simulation-based analyses were conducted to evaluate the effects of these modular adjustments on the vehicle's hydrodynamic performance. The results demonstrate that the proposed modular and scalable design enhances the vehicle’s operational flexibility without compromising performance. The AUV can maintain mission compatibility across different configurations, making it a viable solution for institutions seeking versatile and cost-effective underwater platforms. This approach promotes a new standard in modular underwater robotics design tailored for multi-mission adaptability.

Keywords: Moduler AUV Design, Scalable Underwater Systems, Multi-Mission AUV, Hydrodynamic Simulation, Sensor Integration

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Mathematical Modeling and Hydrodynamic Optimization of Hull Geometry for Modular and Scalable Autonomous Underwater Vehicles

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Abstract

This study presents a mathematical framework for the geometric and hydrodynamic modeling of modular and scalable Autonomous Underwater Vehicle (AUV) hulls. As underwater missions become increasingly diverse and complex, AUVs must be designed with greater adaptability and performance efficiency. To address this need, a novel empirical model was developed that establishes quantitative relationships between key performance parameters—such as hull length, wetted surface area, internal volume, hydrodynamic resistance, and energy requirements. This integrated approach enables the efficient optimization of hull geometry according to specific mission profiles.The methodology combines established Reynolds number-based friction drag calculations with empirically derived form drag coefficients. Additionally, structural constraints related to the pressure resistance of modular hull sections are incorporated, ensuring the model reflects realistic engineering limitations. A weighted optimization function is introduced, balancing hydrodynamic resistance against internal volume to allow flexible prioritization based on operational goals.To demonstrate practical use, the model is implemented via a Python-based optimization script. Engineers can input mission parameters and obtain the optimal hull length through numerical methods. This tool supports early-stage design decisions and accelerates performance analysis. Overall, the study enhances the modular AUV design process by integrating hydrodynamic efficiency with mission adaptability in a unified mathematical framework.

Keywords: Moduler AUV Design, Scalable Underwater Systems, Multi-Mission AUV, Hydrodynamic Simulation, Sensor Integration

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

A Study on Increasing Plastic Pollution in Türkiye and the World after the COVID-19 Pandemic

Kasım ATMACA[1]

Abstract

During the COVID-19 outbreak, the use of personal protective equipment (face masks, face shields, gloves, goggles, aprons) produced from polymeric materials such as polypropylene (PP), polystyrene (PS), polyurethane (PU), polycarbonate (PC) and polyethylene (PE) has increased significantly. This situation has caused the already existing microplastic (MP) and nanoplastic (NP) pollution to increase even more. Uncontrolled disposal of plastic waste in open areas further increases the size of the danger. In addition, the continuous degradation of MPs causes the formation of NPs, which are much more toxic than MPs. If the necessary precautions are not taken, it is inevitable that these plastic wastes will have a negative impact on the environment. In this study, especially during and after the pandemic period, plastic waste production due to COVID-19 in Türkiye and the world countries, mask usage percentages according to the population and the number of masks used per day were investigated and compared. Additionally, in this study, existing sustainable plastic waste management systems such as incineration and landfill and new technologies such as pyrolysis-based systems (graphene and carbon nanotube, coal-based adsorbent, fuel production) were analyzed in detail from a different perspective.

Keywords: COVID-19, pollution, mask, plastic waste, plastic waste management

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Technıcal Capacıtıes Of Communıcatıon Systems To Be Included In Marıne Vessels After The New Gmdss Regulatıons

Tayfun ACARER[1]

Abstract

The most commonly used form of transportation in international trade is undoubtedly maritime transportation. Because today, large-volume materials and some special products can only be transported by sea. This necessity makes it necessary for world trade to be carried out largely by sea.

Meanwhile, the increasing love of the sea in recent years has also increased the time people spend at sea for different purposes. Today, with the increase in purchasing power, many people buy boats of different sizes. Again, the opportunities and conveniences provided by developing technologies are also making the use of boats of different sizes widespread.

These developments make the safe navigation of marine vessels even more important. Especially the broadband data and automatic communication opportunities provided by new communication systems provide great convenience to marine vessel users.

As a result, these regulations called GMDSS Rules have been made within the IMO in recent years. With these regulations, new communication systems that must be mandatory or can be used preferably in sea vessels of different tonnages have been determined in detail. In addition, those who will use these systems are required to know the basic technical information and operating procedures regarding their use.

The most important reason for the differentiation in ship communication systems in recent years is new communication opportunities. Especially satellite systems such as Starlink, which can also be used in marine communication, and new systems such as AIS and LRIT are causing very important changes in current ship communication. With these systems, which can also provide broadband data communication, it is possible to easily send large data, maps and images.

These systems greatly facilitate life on sea vessels, and the necessary technical infrastructure is being prepared for remote monitoring of ships and the transition to autonomous ships.

In order to benefit from these developments to the maximum extent, the technical features of these new communication systems must be well known by Maritime Businesses and ship personnel and ships must be equipped accordingly.

Keywords: GMDSS Rules, Ship Management, Ship Communication Systems, Marine Operations, Autonomous Ships

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Investigation of Aflatoxin Formation and Detection Methods in Dried Figs

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Cavit BİRCAN[3]

Abstract

Mycotoxins are toxic compounds produced by certain types of molds and can cause diseases and even death in humans and animals when consumed. Aflatoxins and ochratoxins are among the most common naturally occurring mycotoxins found in food. The factors influencing mycotoxin formation can be categorized into three groups: physical, chemical, and biological. Physical factors are related to environmental temperature, relative humidity, and water activity of the food. Chemical factors include the composition of the substrate, pH, acidity, and moisture content. Among the biological factors, the most critical is whether the mold strain is toxigenic. Various studies have shown that the most frequently detected mycotoxins in dried figs are Ochratoxin A, Fumonisin, and Aflatoxins B_1, B_2, G_1, and G_2. Aflatoxins are classified based on their fluorescence characteristics under ultraviolet (UV) light: Aflatoxins B_1 and B_2 exhibit blue fluorescence, whereas G_1 and G_2 exhibit green fluorescence. Dried figs are obtained by drying harvested figs using natural or artificial methods and can be consumed directly or after further processing. One of the major challenges in dried products such as figs is mold contamination. Mold contamination poses significant concerns for food safety, public health, and economic losses. The primary aflatoxin-producing mold species in dried figs are *Aspergillus flavus* and *Aspergillus parasiticus*, which can infect the fruit either before harvest or during improper storage conditions.

Traditional methods used for the analysis of mycotoxins include Thin Layer Chromatography (TLC), High-Performance Liquid Chromatography (HPLC), Gas Chromatography/Mass Spectrometry (GC/MS), Enzyme-Linked Immunosorbent Assay (ELISA), and Capillary Electrophoresis. In addition to these, recent years have seen increased focus on innovative analytical techniques that offer faster and more efficient results. The aim of this study is to highlight the factors influencing aflatoxin formation in dried figs and to evaluate current detection methods.

Keywords: Mycotoxins, Aflatoxins, Dried fig, Mold contamination, Detection methods

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5th International
Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Changes in MUFA, PUFA and Trans Fatty Acids Composition of Produced Different Table Olives Methods Preserved with Irradiation Technologies

Şahnur IRMAK[1]

Abstract

In this study, the effects of the methods used in the production and preservation of black olives of Gemlik type produced as low salt (2%) by using different methods have been determined the effects on the shelf life and quality. As a result of the study, the production of table black olives as less salty (2%) and less salty table black natural olives were kept on shelf-life for at least 6 months without using any preservatives.

During fermentation, pH and acidity values of black table olives produced by natural fermentation have changed in normal course. Trans fatty acids (TYA), during the fermentation and storage, in the olive oil obtained from traditional table olive from 0.10% to 0.44%, while in the olive oil obtained from the table olive produced using culture increased from 0.12% to 0.40%. It was determined that the oleic acid content, which is important in terms of nutritional value, showed a very low decrease (from 74,42% to 72,31%) compared to the raw olive.

Oleic acid quantity wasn't decreased much during processing and storage. In this context, it is determined that the best preservation was performed by modified atmosphered packaging technology.

In this study, gamma irradiation has been applied first time in extending the shelf-life of table olives produced using starter culture in the marketting.

Keywords: table olive, starter culture, processing, oleic acid, modified atmosphere, irradiation

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Investigating Sustainability Using Lean Manufacturing Tool in Woodworking Industry

Önder TOSUN[1]

Abstract

The lean manufacturing system is a set of concepts, systems and techniques that are presented by purifying and simplifying the product and service production process from excesses, aiming to perfect value and thus increase company profitability. The lean manufacturing system was developed for the automotive sector in Japan and has been widely applied in different sectors over time. In studies on lean manufacturing conducted in the woodworking industry, it is reported that it provides significant competitive advantages such as reducing manufacturing costs, shortening product delivery time, reducing in-process stocks and increasing customer satisfaction.

Manufacturers and engineers need a practical and operational way to understand sustainable production and apply it in the production process. In order to increase sustainability performance in the woodworking industry, decisions must be made by considering continuous improvement. The aim of this article is to try to reveal environmental, economic production techniques for the woodworking industry through a production based on lean and sustainable concepts. In this context; the transition process of businesses to the lean production system, the change of performance criteria, and sustainability targets were questioned comprehensively. While it was determined that the most applied lean production techniques were 5S, kaizen, TPM techniques, it can be said as a result of the study that sustainability applications using lean production tools in the Turkish woodworking industry are not yet fully known.

Keywords: Lean manufacturing, Furniture industry, Efficiency, Sustainability, Waste reduction

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Examining the Effect of Production Parameters on Fiberboard Milling Value

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Abstract

Fiberboard panel group constitutes a very useful raw material group in the furniture industry with its homogeneous structure and suitability for surface treatment. Fiberboard is a product produced by drying or pressing the sheet draft created by taking advantage of the natural adhesion and felting properties of vegetable fibers and fiber bundles or by using additional glue. Although fiberboard has a homogeneous appearance and structure among other wood panel groups, its milling value decreases towards the middle regions in terms of its thickness. Milling is the process of removing chips from the work piece moving forward with a tool rotating around its own axis. Milling value is the measurement of the plate surface roughness value as a result of the movement of the needle-tipped device over the determined region of the plate. The test materials consist of the plate group that undergoes surface treatment (surface painting, pvc coating, etc.) after the top surface milling process, which is sold to the customer as raw. In the evaluations, a positive result was observed in the milling value when the chip firing pressure was gradually increased and the density of the milling measured area increased. As the fiber moisture increased, the upper surface milling value increased and a decrease in the middle zone density was detected. Deciduous and coniferous tree species were used, and a decrease in the milling value was observed as the proportion of deciduous trees in the matrix increased. End users gave positive feedback on milling values between 6 and 8 Ra. This study provides originality in terms of improving the milling value with the production parameters during fiberboard production and reaching the closest milling value of the middle and upper surface.

Keywords: Fiberboard, Production parameters, Milling, Milling value, Surface roughness

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Holding Cost Minimization in Flowshops with Interval setup times

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Abstract

Holding cost is a significant factor in many manufacturing environments as a result of lean manufacturing. In particular, in today's manufacturing market, the holding cost is becoming more and more important, and hence, it needs to be minimized in order for manufacturing companies to stay competitive. This implies that while scheduling related decisions are made holding cost has to be considered. Moreover, research indicates that flowshop manufacturing environments are more common when all the manufacturing environments are considered. For some manufacturing environments, an operation should instantly follow an earlier operation due to characteristics of the material. These environments are called no-wait flowshop environments. The research shows that no-wait flowshop scheduling has applications in different industries including semiconductor, printed circuit board, chemical, plastic, and metal industries. We consider a no-wait flowshop scheduling problem where setup times are random but within some lower and upper bounds, called interval setup times, with the objective of minimize holding cost. For such a scheduling environment there may not exist a single sequence which remains optimal for all possible realizations of setup times within the lower and upper bounds. Hence, the objective in such a scheduling environment is to reduce the size of dominating sets. We present some dominance relations which help reduce the size of dominating sets.

Keywords: Flowshop, holding cost, setup times

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Effect of Injection Molding Parameters on Scratch Resistance of Automotive-Grade Polypropylene

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Çağrı ÇALIŞKAN[2]

Abstract

This study investigates how injection molding parameters affect the scratch resistance of mold-in-color (MIC) grained plastic components. Scratch resistance is a critical property for polymers used in visible automotive parts, as it determines their ability to retain surface quality under mechanical stress. Maintaining aesthetic durability is especially important in the automotive industry, where surface appearance directly influences perceived quality. Scratch performance is governed by multiple factors, including the polymer's chemical composition, mechanical properties such as hardness, type and depth of surface grain, processing conditions, and the presence of functional additives. Since injection molding parameters can alter polymer chain orientation and influence additive migration or distribution, this study focuses on isolating the role of processing conditions in scratch behavior. To minimize material-related variables, the research is conducted on components produced using the same polypropylene grade and identical surface grain design. The primary goal is to understand the effect of key molding parameters—such as mold temperature, injection speed, cooling time, and packing pressure—on the scratch resistance of automotive-grade polypropylene.

Results show that even with consistent material and design, variations in molding conditions lead to differences in scratch performance, emphasizing the importance of process optimization for achieving high-quality, durable automotive plastic components.

Keywords: scratch resistance, injection molding parameters, MIC polymers, automotive polypropylene, surface aesthetics

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ISBN: 978-625-372-660-7

Water Element in Landscape Design: A Way to Reduce Urban Heat

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Nurhan KOÇAN[2]

Abstract

As cities grow to meet social demands, structural density in urban areas increases day by day. The growth of cities brings with it many serious challenges such as increasing impermeable surfaces, shrinking green areas and the resulting rising temperatures. Therefore, improvements and measures are required in terms of environmental sustainability and public health, especially in urban public spaces. In this context, urban parks are important public spaces that stand out with their environmental and social functions. The main objective of the study is to demonstrate the multifaceted effects of the water element in urban parks and to evaluate the potential contributions of water on urban microclimate through sample applications in Türkiye. Because water elements, in addition to their aesthetic advantages, also serve as a balancing element for microclimate, psychological healing and recreational activities. The research was developed within a theoretical framework using a literature review approach. In the study, issues such as spatial use of water, formal variables, the effect of water on the user and examples of water designs at different scales were discussed. In this context, the study aims to demonstrate the role of water elements in landscape design in reducing the impact on the urban heat island (UHI). As a result of the study, the multifaceted role of water in landscape design, how it changes spatial qualities and its effects on microclimatic conditions in urban open spaces are presented.

Keywords: Water element, urban heat islands, water design, cooling effect

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ISBN: 978-625-372-660-7

Title Raising Awareness of Climate Change Adaptation Strategies by Implementing Green Roof and Rainwater Harvesting System in Bartın

Mustafa ARTAR[1]
Aylin ALİŞAN YETKİN[2]

Abstract

Climate change has become an increasingly urgent issue, particularly for cities already experiencing its negative impacts. Although communities in these areas are generally aware of climate change, many lack familiarity with effective adaptation strategies. In addition to national and local government initiatives, individuals also play a critical role in mitigating the adverse effects of climate change. Bartın, a province in the Black Sea region of Türkiye, has been affected by both flooding and water scarcity linked to climate change. According to the European Commission's "Gap Analysis of the Water Scarcity and Droughts Policy in the EU," the Black Sea basin is projected to experience year-round water stress by 2030, with more severe impacts expected during the summer months. As part of a project funded by the European Union Climate Change Adaptation Grant Programme, we conducted a construction activity that involved the implementation of rainwater harvesting systems and green roof solutions. This study explores how pilot demonstrations can enhance public awareness of climate change adaptation strategies in Bartın. We present our experience from the project, which included: i) preparing survey questionnaires, ii) recruiting participants, iii) conducting surveys, and iv) executing the construction work. Our findings suggest that pilot demonstrations are effective tools for improving public understanding of adaptation strategies and encouraging individuals to adopt similar solutions. Overall, this study underscores the importance of sustainable water management practices and public engagement in addressing water scarcity intensified by climate change.

Keywords: Climate Change Adaptation Strategies, Green Roof, Rainwater Harvesting, Survey

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

A PROACTIVE APPROACH TO CYBERSECURITY VULNERABILITIES IN MEDICAL DEVICES

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Selden Çepni [2]

Abstract

Implantable Medical Devices (IMDs) are sophisticated medical devices implanted during surgery into the human body for managing chronic disease and improving patients' health states. Modern IMDs have crossed the limits of basic stand-alone devices; these now often include wireless communication mechanisms, connecting them to external monitors or even to the Internet from the larger Internet of Medical Things (IoMT). Even as this innovation elevates healthcare provision, it carries grave cybersecurity dangers. Cybersecurity vulnerabilities in networked medical devices have the potential to compromise patient safety, expose confidential health information, and cause regulatory violations. The objective of this study was to establish a proactive model for IMD cybersecurity to detect vulnerabilities in advance, conduct Root Cause Analysis (RCA), and have a methodical security evaluation process. It began with a thorough literature review of cybersecurity recalls and breaches involving medical devices. Then, a step-by-step security evaluation flowchart was established based on that information, including the application of RCA to detect the root causes of vulnerabilities rather than mere superficial problems. The research was able to determine common threats affecting healthcare devices, loopholes in existing cybersecurity measures, and proposed a systematic, proactive mitigation approach. Emphasis was placed on continuous threat monitoring and incorporating cybersecurity into pre-market reviews in order to satisfy regulatory needs. The resulting model offers a practical and realistic path to manufacturers, health care providers, and regulators that will enhance IMD security, reduce the risk of cyberattacks and costly post-market recalls, and ultimately save patient well-being.

Keywords: Cybersecurity Vulnerabilities, Implantable Medical Devices, Internet of Medical Things (IoMT), Patient well-being, Proactive mitigation approach, Root Cause Analysis

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5th International
Congress of Engineering and Natural
Sciences

ISBN: 978-625-372-660-7

The Evaluation of Natural Gas Explosion Risk in Residential Area – Our Motto is "The Safety starts in Your Home!"

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Abstract

Although natural gas is a safe energy source commonly used for domestic requirements such as cooking and heating, accidental natural gas explosions in residential areas cause severe losses.
The analysis of domestic natural gas explosion risk in the study is based on a true explosion accident that happened on 1 April 2023. In the accident analysis scenario, it was assumed that natural gas spread from the cooking stove into the house with a volume of 85 m^3, and when it reached the stoichiometric concentration (95000 ppm, %9,5 v/v) it exploded due to an ignition source (such as static electricity, lighter, open flame etc.) in the room. The concentration of methane gas at which explosive conditions are achieved for a house with a volume of 85 m^3 is equivalent to 5,3 kg of methane gas.
According to the results of the study, the explosion of 5,3 kg of methane gas in a closed volume of 85 m^3 is equivalent to an explosion caused by 3,4 kg of TNT. The amount of TNT equivalent mass, theoretically calculated by the TNT equivalent mass method and, was analyzed for overpressure values that will occur at different distances on the CFD. After the CFD explosion simulation, the overpressure on the concrete wall 4 m away from the explosion center was around 422 kPa. The overpressure value can have fatal consequences. It also means severe destruction of the building.
Keywords: Gas Explosion, Natural Gas Risk, Explosion Damage

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5th INTERNATIONAL CONGRESS OF ENGINEERING AND NATURAL SCIENCES
ISBN: 978-625-372-660-7

Thermal Analysis of Solar Panel Deployment Configurations for 3U CubeSats in Low Earth Orbit

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Abstract

The thermal management of CubeSats in Low Earth Orbit (LEO) is critical to ensuring mission success, as temperature fluctuations caused by varying solar irradiance, albedo, and planetary infrared radiation can directly impact component reliability and performance. This study investigates the thermal behavior of three distinct solar panel deployment configurations: normal deployed, lateral deployed, and side deployed arrays on a 3U CubeSat operating in sun synchronous LEO, with the kinematic setup that the solar panels are facing towards the sun. A combination of numerical simulations and thermal modeling was employed to evaluate temperature distributions, heat dissipation, and thermal gradients across each configuration under orbital conditions by means of the Systema Thermica, a commercial thermal analysis software. The analysis included LEO-specific environmental parameters, including orbital thermal cycling, eclipse transitions, and orientation-dependent solar exposure. Results indicate significant variations in the thermal performance of the satellite for the analyzed cases. The side deployed solar panel configuration exhibits the highest total heat input compared to other two configurations and presents significant thermal challenges due to its higher heat loads and greater temperature gradients. This analysis highlights the thermal outcomes and challenges associated with each solar panel configuration, providing a basis for preliminary design decisions. These findings contribute to advancing thermal design strategies for small satellites, providing valuable information for thermal control applications and optimizing the energy budgets of the satellites.

Keywords: CubeSat, Low Earth orbit, Thermal analysis, Thermal modeling, Solar panel deployment

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Effects of Some Phytohormone Applications on Germination Parameters of Anatolian Black Pine Seeds Under Drought Stress

Esra Nurten YER ÇELİK[1]
Seda Nur ATAK[2]

Abstract

Black pine (*Pinus nigra* Arnold. subsp. *pallasiana* Lamb. (Holmboe)) is one of the most preferred species for afforestation in degraded areas due to its drought tolerance. In the afforestation of arid or semi-arid areas, the selection of stress-tolerant origins directs the success of afforestation. In this respect, pretreatments applied to the seed (priming) positively support seed germination parameters under stress conditions and affect the seedling survival percentage. In this study, it was aimed to determine the effect of plant growth hormones applied with priming techniques to black pine seeds exposed to drought stress (PEG 6000 / -6 bar water stress) on germination parameters. For this purpose, 3 different doses of seaweed and vermicompost were applied. No treatment was applied to control seeds. Germination percentage (GP), germination rate (GR) and germination value (GV) formulas were used to determine germination parameters. As a result of the research, it was determined that low dose groups of vermicompost increased the germination percentage parameter compared to the control seed groups. When drought stress was applied, it was determined that the germination percentage of the low dose groups approached the control. In black pine origin with low germination, it was observed that vermicompost increased the germination rate parameter in all treatment groups. Seaweed application increased the germination percentage in all dose groups in seed with low germination value. The positive effects of seaweed and vermicompost on both germination parameters and drought stress were determined in this study and it is recommended to use these phytohormones in seeds with low germination percentage.

Keywords: Black pine, Drought stress, Seaweed, Vermicompost, Germination parameters, Pretreatment

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Comprehensive Investigation of Dynamic, Thermodynamic, Piezoelectric and Elastic Properties of Ferroelectric SrHfO3 Using First-Principles Calculations

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Abstract

In this study, the elastic, piezoelectric, dynamic and thermodynamic properties of the ferroelectric $SrHfO_3$ crystal were investigated using density functional theory (DFT). The calculations were performed using the ABINIT package program within the framework of the generalized gradient approximation (GGA). First, the components of the elastic stiffness tensor (C_{ij}) for the ferroelectric $SrHfO_3$ crystal were calculated. Many mechanical parameters such as bulk modulus, shear modulus, Young modulus and Poisson's ratio were obtained using the components of the calculated elastic stiffness tensor. In addition, the Pugh ratio and Cauchy pressure were evaluated, and the brittleness or ductility character of the material was determined. The ferroelectric SrHfO3 crystal also exhibits piezoelectric properties. The components of the piezoelectric tensor (d_{ij}) were calculated for the $SrHfO_3$ crystal. As a dynamic property, the phonon distribution of $SrHfO_3$ and the phonon density of states (PDOS) were calculated accordingly. Finally, in thermodynamic properties, thermodynamic parameters such as temperature dependent heat capacity, entropy, enthalpy and free energy were calculated. Also, parameters such as thermal expansion coefficient and Debye temperature were obtained. This study provides a comprehensive understanding of the elastic, dynamic and thermodynamic properties of ferroelectric $SrHfO_3$ crystal and may be of interest to evaluate the potential of the material in structural, mechanical and thermal applications due to its ferroelectric and piezoelectric properties.

Keywords: Elastic properties, DFT, Dynamic-Thermodynamic properties, Piezoelectric properties, $SrHfO_3$

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ISBN: 978-625-372-660-7

The Future of Microalgae for Animal Feeding Operations and Waste Treatment

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Abstract

Microalgae have gained increasing attention as a sustainable and multifunctional resource in modern agriculture, addressing key challenges in animal nutrition and waste management. With rising concerns over environmental degradation and the limitations of conventional feed sources, alternative solutions are essential for long-term agricultural sustainability. The ability of microalgae to thrive in diverse environments without competing for arable land or freshwater resources makes them a promising candidate for integration into animal feeding operations and environmental remediation systems. Additionally, microalgae-based waste treatment systems offer a novel solution to agricultural and animal production waste challenges by effectively assimilating nitrogen and phosphorus, reducing pollution, and generating valuable biomass for bioenergy and animal feed.

This study explores the dual role of microalgae in enhancing animal nutrition and improving waste treatment processes. The aim is to assess the potential of microalgae as a sustainable alternative in animal feeding operations while simultaneously addressing environmental concerns. By reviewing recent advancements in microalgae cultivation, bioprocessing, and economic feasibility, this research highlights emerging innovations, including photobioreactor technology and microalgae-based waste treatment systems, that could enhance their large-scale adoption to animal production facilities.

Keywords: photobioreactor, mitigation, sustainable, treatment, feed

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ISBN: 978-625-372-660-7

Magnetic Properties of Mn Coated Ge Nanowires Synthesized by Vapor–Liquid–Solid Growth

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Leyla ÇOLAKEROL ARSLAN[2]

Abstract

We present the preparation of GeMn coated Ge nanowires (NWs) using molecular beam epitaxy. The Ge NW arrays were epitaxially grown on Si (111) substrate in an ultra-high vacuum (UHV) with VLS method. Gold was used as a metal catalyst to realise the growth by VLS method. Ge/GeMn core/shell NW arrays were fabricated by thin Mn deposition followed by solid phase epitaxial growth of GeMn layer. Magnetic properties and morphology of the Ge/MnGe core/shell NWs were investigated. XRD measurement was performed to determine the crystal structure of th NWs. The magnetic properties of the Ge/GeMn and core/shell NWs were characterized by FMR. Analysis of the FMR signals shows that there is magnetic anisotropy perpendicular to the growth axis of the nanowires. When the variation of the resonance field at different temperatures was analysed, it was observed that the magnetic anisotropy of the structure increased with decreasing temperature. Due to the low NW density, the magnetic anisotropy was observed to change from out of plane to in plane as in thin films. Scanning electron microscopy results revealed that the some of the nanowires were found to grow on Si at an angle rather than perpendicular to the surface due to the mismatch between Ge and Si lattice parameters.

Keywords: Magnetic heterostructures; Ferromagnetic Mn_5Ge_3 clusters; Nanowires; Vapor-Liquid-Solid Growth; Solid Phase Epitaxial

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ISBN: 978-625-372-660-7

Why the Sr/Y Ratio Cannot Reliably Predict Crustal Thickness: Evidence from Adakitic Melts in the Menderes Massif (western Türkiye)

Ömer KAMACI[1]

Abstract

The Sr/Y ratio has been used as a geochemical proxy for crustal thickness, under the assumption that high Sr/Y values reflect partial melting of overthickened lower crust, where garnet is stable and plagioclase is absent. However, this interpretation does not hold in all tectonomagmatic contexts. This study presents new thermodynamic modelling results from the Early Miocene Güneşli Granite in the northern Menderes Massif (western Türkiye), a pluton showing adakitic geochemical features and Sr/Y values reaching 108. Although such high Sr/Y values are typically attributed to melting at high pressures in thickened crust, the regional geodynamic setting at the time contradicts this. During the Early Miocene, the Menderes Massif underwent core complex exhumation, suggesting a thinned or normal crustal profile rather than an overthickened one. Thermodynamic models indicate that the Güneşli adakitic melts were generated through water-fluxed melting at mid-to-lower crustal depths. Under such hydrous conditions, plagioclase becomes unstable and breaks down at lower pressures than expected, producing melts with elevated Sr/Y ratios even in the absence of thick crust. This challenges the assumption that Sr/Y can be used as a straightforward crustal thickness proxy in all settings. These findings emphasize that the role of water must be critically considered when interpreting high Sr/Y signatures. Hydrous melting can generate adakitic signatures unrelated to crustal thickening, particularly in extensional tectonic regimes. Therefore, Sr/Y ratios alone should not be used to infer crustal thickness without constraints on pressure, source depth, and water content.
Keywords: adakitic melts, crustal thickness estimation, thermodynamic modeling, Menderes Massif

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

SYNTHESIS OF POLYCARBOXYLATE AND INVESTIGATION OF ITS PERFORMANCE ON CONCRETE

Zeynep Özserçe Haste[1]

Abstract

Concrete admixtures consist of three generations. The first generation is commonly produced from lignosulfonates and the second generation from sulfonated naphthalene formaldehyde or sulfonated melamine formaldehyde. Polycarboxylate superplasticizers (PCEs) were introduced and developed as third generation concrete admixtures. With the developing technology, the demand for high performance concrete in the construction industry is increasing. PCEs in concrete admixtures have become extremely popular due to their different chemical structures, much lower water-cement ratio, easy workability, consistency retention, high segregation resistance, high strength, ability to produce concrete with high fluidity, environmental friendliness, and easy modification of chemical and performance properties.

This study aims to synthesize PCE via copolymerization of IPEG (isoprenyl oxy poly(ethylene glycol) with methyl methacrylate (MMA). The effects of reaction time, different reaction temperatures and changes in IPEG/MMA ratio in PCE synthesis on slump, water/cement ratio reduction and compressive strength in concrete will be comprehensively investigated. The aim of this research is to determine the most suitable conditions for PCE synthesis and to analyze the chemical structure of synthesized PCE by performing characterization analyses.

Keywords: Polycarboxylate, concrete, copolymerization, IPEG, MMA

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Smart Auctions: AI-Powered Vehicle Classification and Damage Detection

Berke Yağmur
Merve ŞEN

Abstract

Automating vehicle image classification and damage detection in auction processes is a critical need, as traditional manual ranking methods are time-consuming and costly. In this study, we present an innovative artificial intelligence solution based on the YOLOv8 architecture to address this challenge.During data preparation, vehicle images retrieved from the auction system were carefully labeled and enriched using an active learning approach. Additional data were systematically generated for the classes where the model performed poorly, enhancing both data quality and diversity. Images were categorized into interior, exterior, and damage types, and various camera angles (front, rear, left, right, etc.) were converted into model inputs.
Three dedicated AI models were developed for distinct tasks: (1) a classification model for distinguishing interior vs. exterior shots, (2) a ranking model for determining the camera angle of exterior shots, and (3) an object detection model for identifying vehicle damage. The models achieved 97.4% accuracy for interior/exterior classification, 98.7% accuracy for angle prediction, and 99.8% precision for damage detection. YOLOv8 was chosen for its real-time inference capability, mobile compatibility, and high performance. The training process incorporated data augmentation, hyperparameter optimization, and transfer learning, resulting in robust generalization.As a result, the integrated model and API enable a fast, automated, and highly accurate system. This work makes a significant contribution to the field through its use of active learning, real-time prediction, and multi-stage modeling strategy.

Keywords: Artificial Intelligence, Deep Learning, Active Learning, Real-Time Image Processing, Data Augmentation

5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Evaluating the Sensitivity of Vehicle Front-End Parameters on Pedestrian Lower Leg Performance

Müzeyyen Nur KAPLAN[1]

Abstract

Lower leg injuries are among the most frequently observed and potentially debilitating outcomes of pedestrian-vehicle collisions. These types of injuries are particularly critical due to their long-term impact on mobility and recovery. With the rise of electric vehicles, which are generally quieter and less detectable in urban environments, the likelihood of pedestrian accidents has increased, thereby emphasizing the need for optimized vehicle front-end design. This study focuses on assessing the influence of front-end geometric parameters on pedestrian lower leginjury metrics through detailed finite element analysis. A series of simulations were conducted using the explicit crash solver in combination with the validated TRL legform model. TRL legform was chosen for its consistent kinematic response and widespread use in pedestrian safety research. Key injury criteria such as tibia acceleration, knee shearing displacement, and knee bending angle were examined under varying vehicle configurations. Design modifications included changes in the ground clearence, absorber and crashbox arrangement, hood leading edge positioning, and the inclusion of a lower stiffener beneath the bumper. The results reveal how subtle geometric changes can significantly influence pedestrian injury outcomes. Moreover, the study highlights the importance of component interaction particularly how the synchronization between hood, crashbox, and substructures can enhance or deteriorate performance. The findings offer valuable guidance for future vehicle design strategies aiming to reduce lower leg trauma in pedestrian impacts.

Keywords: Euro NCAP, FEA, Lower Leg Injury, Pedestrian Safety, Vehicle Front-End Design

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Instalaltion & Comparison of Driver Monitoring System on Vehicles

Erhan YAMAN[1]
Eren BABAYİĞİT[2]

Abstract

Advanced Driver Assistance System (ADAS) has become so important for transportation and together with a lot of features, this system includes a lot of sub systems. Driver Monitoring Systems (DMS) is the part of ADAS feature on the modern vehicle to improve driver safety by identifying fatigue, distraction, or drowsiness. Besides, European Union's General Safety Regulations mandate DMS installation on vehicles. According to the different layout of interior design with different vehicles, DMS camera geometric integration solutions may vary. Ergonomics is also so important for different position points of camera because of head motion volume. This system has also additional electronic control unit inside vehicles and the position of control unit and camera can affect performance of camera and cost of layout solutions. In addition, interfaces between DMS and other systems should be taken into consideration by designers and feasibility studies should be conducted by integration designers.
Driver Monitoring System integration study carried out by R&D department of TOFAŞ Turkish Automobile Factory, various lay-out solutions were studied. In this paper, Different DMS camera integration solutions were comparatively examined according to geometric integration, ergonomic, manufacturability, safety, homologation, serviceability and performance requirements. As a result of assessments, the optimum integration layout and interfaces was determined for DMS Camera installation on vehicle.

Keywords: Active Safety, Autonomous Vehicles, Driver Monitoring

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Evaluating Trunk Volume for Interior Trim Integration in Concept Phase

Ahmet KAHRAMAN[1]

Abstract

In today's automotive industry, companies face numerous challenges while they strive to align with customer expectations and strengthen their positions in the market. Trunk volume, as one of the critical factors affecting customer decisions, is a key element among ergonomics. Although it may appear initially to be a straightforward consideration, trunk volume plays a significant role in the vehicle development stages and requires complex methods for accurate calculation.

This study highlights the importance of considering ergonomic, stylistic, and functional factors in the early phases of trunk volume development. It also emphasizes the importance of cross-functional collaboration to ensure alignment between design intent and practical storage efficiency. This paper introduces the general definition of trunk volume, its variation across different vehicle segments, and standard measurement methods most commonly adopted in the industry. It also outlines how trunk volume evolves throughout vehicle development process, from early phases to series production.

Furthermore, the relationship between interior trim design and trunk volume is discussed within the scope of concept phase. Example cases are presented to illustrate the evaluation and resolution used for the alignment of trim components with trunk volume requirements. The study concludes by offering a general framework for understanding the role of trunk volume in the integration of interior trim design.

Keywords: Ergonomics, Trunk Volume, Packing, Interior Trim, Concept

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5th International
Congress of Engineering and Natural
Sciences

ISBN: 978-625-372-660-7

Heat Energy Recovery for BEV Cabin Air Conditioning System

Kürşat ÇOBAN[1]

Abstract

Nowadays, technology is developing and evolving very rapidly. The most visible example of this development is the automotive sector. With new technologies, battery-powered electric vehicles have been made available to end users in the last decade. One of hottest topic of automotive industry is increasing of driving range of battery electric vehicles. Many approaches and try outs are done for increase drive range like pre-conditioning cabin and conditioning of battery while changing of vehicle, using new generation heat pumps and various thermal management systems, new generation electric traction motors etc. Studies have shown that additional loads on thermal systems can decrease driving range by up to %50 when outside is colder than 0° Celsius [1]. Generally automotive makers use positive temperature coefficient heaters for vehicle cabin heating which is causes range loses. The aim is reducing energy consumption for vehicle cabin air conditioning while maintaining comfort and air quality with using air to air heat exchanger for cabin fresh air inlet and new outlet. In this paper the impact of using counter flow type air to air heat exchanger for cabin air conditioning for battery electric vehicles will be investigated. Results clearly show that the range gain can be as high as %21 for average battery electric vehicle in colder climates and %14 kilometers for hotter climates.

Keywords: Battery Electric Vehicle, Vehicle Cabin HVAC Systems, Heat Recovery, Heat Exchanger, Exreme Ambiant Temperatures

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

The Effect of Fiber Winding Angle on the Structural Strength of a Type IV Composite Pressure Vessel

Ceyhun ŞAHİN[1]
Ahmet Hanifi ERTAŞ[2]

Abstract

One of the prominent storage methods in today's hydrogen-powered vehicles is the high-pressure storage of hydrogen in its gaseous phase. In this context, among the various tank types, Type IV composite pressure vessels have become a widely preferred solution due to their advantages such as light weight, high mechanical strength, and long service life. These metal-free tanks are manufactured by winding carbon fiber reinforced epoxy resin over a high-density polyethylene (HDPE) liner, providing both weight reduction and resistance to corrosion from a structural perspective. In this study, the effect of fiber winding angle on the structural performance of Type IV hydrogen tanks was investigated parametrically. Various configurations were created by applying different helical (±θ) and hoop (90°) winding angles to the composite structure formed through the filament winding process. The mechanical behavior of the tank under internal pressure was evaluated using finite element analysis (FEA). In addition, the analysis results were compared with widely used theoretical approaches found in the literature. The results revealed that helical winding within specific angular ranges helps to balance axial and hoop stresses, thereby enhancing the overall structural integrity. These findings contribute to the identification of critical design parameters in terms of both safety and mechanical efficiency. The outcomes of this study offer valuable guidance for the design process of future hydrogen storage systems.

Keywords: Composite tanks, Netting analysis, Type IV tank, Finite element methods, Structural Analysis

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5th International Congress of Engineering and Natural Sciences
ISBN: 978-625-372-660-7

Seat Side Airbag Performance Factors

Kemal Can YARPUZOĞLU [1]

Abstract

Seat airbag systems are critical safety components designed to protect occupants, especially in side impact and rollover accidents. In cases such as side impact and passenger sliding, they prevent serious injuries by reducing the impact to the chest, head and hip area. In modern automobiles, airbags are an integral part of the overall safety concept and minimize the risk of injury in the event of a collision. Thanks to developing automotive safety technologies, seat airbags have evolved into faster-reacting, smarter and more effective systems, maximizing passenger safety.

The first airbag concepts were developed in the 1950s, and front airbags began to be included in vehicles in the 1970s. Seat airbags began to be used in luxury and safety-oriented vehicles towards the end of the 1990s. With developing sensor and software technologies, these systems have gained a structure that responds faster and provides wider protection.

In the application and protection of airbags to a vehicle, not only their presence and classical parameters, but also factors such as the passenger's posture or the use of seat belts are effective.

This report will discuss the critical characteristics and parameters that affect the performance of seat airbags, such as deployment time, shape, cushion folding method & style, cushion volume, internal pressure, protection area, and flying objects.

Keywords: Vehicle Crash, Airbag, Occupant Safety, Airbag Performance, Automotive Safety Systems, Seats, Seat Side Airbag

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ISBN: 978-625-372-660-7

Thermo-Mechanical Creep Behavior of Automotive Polypropylene Components

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Mustafa NAZLI[2]
Uğurcan SERBEST[3]
Yunus TÜRK[4]

Abstract

In this study, the viscoelastic behavior of polypropylene (PP) material used in the automotive industry under long-term loads and thermal cycles has been investigated. The creep phenomenon, which is critical in terms of material stiffness, impact resistance, and geometric stability, has been the focus of the analysis. The reason for choosing creep analysis is that thermal analyses focus only on temperature-induced dimensional changes, whereas bumper materials are subjected to both mechanical loads and thermal stress in real-world operating conditions. In this study, multi-stage temperature cycles were applied, and the samples were stabilized at each temperature.

Material behaviors were analyzed through physical testing and Finite Element Method (FEM). Using a viscoelastic model, time-dependent deformation characteristics were calculated, and the bumper structure was modeled to match the actual vehicle geometry. When comparing FEM results with physical tests, a correlation of over 90% was found for the gaps between the bumper and the headlight-bumper and fender-bumper connections, as well as the areas where the bumper is attached. This high correlation confirms the accuracy of the FEM model. As a result, it has been shown that considering creep behavior in numerical modeling plays a significant role in long-term performance prediction and design optimization of automotive components.

Keywords: Creep, Viscoelasticity, Polypropylene (PP), Finite Element Method (FEM)

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

A Design Approach to Prevent the Risk of Leakage on the Fuel Line During a Collision

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Abstract

The rapid increase in the number of vehicles on the road significantly raises the risk of accidents, particularly frontal collisions. These collisions can cause severe damage to the fuel lines of internal combustion vehicles, posing risks of explosions and fires. To mitigate these risks, several protective measures are employed. One approach to improve safety is to reinforce fuel pipes using high-strength materials. This allows the pipes to withstand impact forces during a crash and prevent rupture. In addition, protective components such as shields can be added to protect the fuel lines from direct impact. These components act as energy absorbers, reducing the force transmitted to the pipes. Repositioning the fuel lines can also be considered as an alternative solution. In this study, a design modification that forces structures which may contact the fuel pipes during a crash to change direction has been investigated. By altering the direction of force, this modification significantly reduces the likelihood of fuel line damage. The modification involves changing the design of the engine body to ensure that any structures that could potentially encounter the fuel lines are redirected away from them during a collision. All these comprehensive measures aim to improve the safety of internal combustion engine vehicles by reducing fuel line damage and associated hazards. Through these strategies, vehicle safety can be enhanced, and the risk of fire and explosion can be minimized.

Keywords: Finite Element Analysis (FEA), Frontal Crash, Fuel Line Protection, Fuel Leakage, Collision

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5th International
Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Front Seat Structural Solutions for Electric Vehicles

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Abstract

The evolution of electric vehicles (EVs) has introduced new challenges and opportunities in front seat design. Unlike internal combustion engine (ICE) vehicles, EVs often feature a flat floor due to the absence of a central transmission tunnel. This allows for greater flexibility in seat positioning but also demands innovative structural solutions to ensure safety, comfort, and weight efficiency.

One critical factor is low block height, which optimizes cabin space and enhances passenger ergonomics. A lower seat profile maximizes headroom while maintaining a comfortable seating position, especially in EVs with unique floor layouts.

Another key aspect is the integration of seatbelt systems within the seat structure. Many EVs lack traditional B-pillars, so integrated seat belts enhance safety while maintaining structural integrity. These designs improve crash protection and offer more flexibility in vehicle interior layouts.

Long seat travel is essential, as the absence of traditional drivetrain components allows for extended seat adjustment. This is particularly beneficial in autonomous or premium EVs where adjustable and reclining seats enhance the passenger experience.

Swivelling seats are also gaining popularity, particularly in autonomous and high-end models. These rotating seats facilitate easier entry and exit, improve accessibility and contribute to a interactive cabin experience.

To further enhance comfort for rear passengers, the front seat structure is being designed more narrowly. This reduces the physical space taken up by front seats, providing more legroom for passengers in the rear cabin without compromising front seat comfort.

Lightweight construction remains crucial. EV battery packs add significant weight, so advanced materials like high-strength steel, aluminium alloys, and carbon fiber-reinforced plastics (CFRP) are used to reduce seat weight while maintaining strength.

In conclusion, low block height, integrated seat belts, long seat travel, swivelling seats, and narrow front seat skeletons are shaping the future of EV seating, improving both comfort and performance.

Keywords: Electrical Vehicle, Vehicle Seats, Front Seat Design Integrated Seatbelt Systems

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ISBN: 978-625-372-660-7

Child Occupant Safety Validation Against Airbag System Impacts

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Abstract

The proceeding outlines the findings and recommendations of the Side Airbag Out-of-Position (OOP) Injury Technical Working Group, formed to address risks associated with side airbag deployments in vehicles. The working group, sponsored by various automotive and safety organizations, aimed to develop a shared understanding of these risks and ways to minimize them. The proceeding emphasizes the importance of following the recommended procedures to assess and reduce the risks of injury from side airbags, which, despite their effectiveness in protecting occupants in side-impact crashes, can cause injuries in certain out-of-position scenarios.

The group acknowledges that while the risk of injury from airbag inflation cannot be entirely eliminated, efforts can significantly reduce it. The group highlights three key limitations: the inherent risk of injury from any inflatable restraint system, the varying levels of scientific understanding regarding side airbag risks, and the ongoing nature of research in this area. The working group emphasizes the need for continuous review and updates of the recommendations as new data emerges.

The proceeding also provides a historical background, noting the concerns that led to the formation of the working group, including the risks posed by side airbags in certain conditions and the need for comprehensive industry guidelines to ensure safety. The group's deliberations involved collaboration between automakers, airbag suppliers, and safety experts, with input from government agencies like NHTSA and Transport Canada. The overall goal is to reduce side airbag-related injuries while promoting their benefits in preventing severe side-impact crash injuries.

Keywords: Child Occupant Safety, Vehicle Crash, Vehicle Side Impact, Airbag Systems,

[1] Unvan, Üniversite, Bölüm, Orcıd:

5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Application of Talk Filler in Plastic Materials and Its Effect on the Material

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Abstract

This paper investigates the role of talc filler in plastic materials utilized in the automotive industry and evaluates its impact on the mechanical and thermal properties of polymer-based components. Automotive applications require materials that fulfill various criteria, including structural integrity, thermal stability, ease of processing, and reduced weight for improved fuel efficiency. Talc, a widely used mineral filler, is incorporated into polymer matrices to enhance stiffness, dimensional stability, and heat resistance. These enhancements make talc-filled plastics suitable for under-the-hood components, interior trim parts, and other structural applications. However, while increasing the talc content can improve strength and rigidity, it often leads to reduced impact resistance and elasticity, posing limitations in applications where flexibility or toughness is essential. This paper presents a comprehensive overview of the advantages and drawbacks of talc fillers in automotive plastics, with a focus on balancing performance requirements through optimized filler content and potential hybrid filler strategies. It also discusses the influence of talc particle size, shape, and dispersion on final part performance. By understanding the trade-offs and engineering considerations, this work contributes to the development of more efficient and application-specific polymer formulations for the evolving needs of the automotive sector.

Keywords: Plastic Stiffness, Durability, Talk, Thermal Resistance

[1] Unvan, Üniversite, Bölüm, Orcıd:
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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Steering Gear Sizing Calculation on Passenger Vehicles

Murat GÜNEY[1]

Abstract

The steering gear provides directional control of the vehicle via a mechanism that interfaces between the steering column intermediate shaft and the steering knuckle of the front suspension. It converts the rotational motion of the steering wheel into the angular motion of the tires of the vehicle. Mainly there are two different kind of steering gear which are mechanical steering gear and powered steering gear (hydraulic or electrical). Steering gear is one of the safety parts for the vehicle, the design and sizing of the steering gear are so important that it must be taken into account various inputs regarding vehicle mass, suspension geometry, vehicle tire pressures, and orientations.

In this paper, mechanical steering gear sizing calculation is done by using analytical methods. Steering gear sizing result is also key characteristic for steering torque & effort. The study focuses on a Mac Pherson-type of suspension, considering key variables such as rack travel, tire pressures, and front axle weight. Those variables are the main characteristics for the calculations and correlation of those variables directly effects the sizing of the steering gear. In the same manner, torque required to maneuver the vehicle in a safe manner. As a result, steering gear sizing calculation helps to choose the correct sizing for the steering system.

Keywords: steering gear, sizing, Mac Pherson, suspension, tire pressure

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ISBN: 978-625-372-660-7

Digital Human Models on Vehicle Ergonomics

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Abstract

Vehicle Ergonomics can be defined as evaluating the user's comfort and relationship with other components in the vehicle, according to the positions of the driver or passengers. The basis of ergonomic analysis with the human model dates back to the 1950s. Initially, 2D human models were created and began to be used for ergonomic studies of vehicles. 3D human models were later created. As technology improved, software applications were created, and digital human models were used to ergonomic evaluations of vehicles.
Vehicle ergonomics has been the subject of several research. Numerous research have been conducted on vehicle architecture, ergonomics of vehicles, vehicle occupant packaging and digital human models. This study is about the development of digital human models.
With the development of technology, software programs which digital human models are integrated, have been developed. These software applications allow for the creation of digital human models with different dimensions and various degrees of movement. This makes it possible to represent the intended population in society. Ergonomic issues can be identified in the early stages of vehicle design through the use of digital human models. This implies that the cost needed to correct the issues decreases. This paper includes an extensive examination of the development of digital human models in addition to the models that are frequently used in the literature.

Keywords: Vehicle, Ergonomics, Physical Manikins, Digital Human Models, Development

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Effect of the Number and Placement of Microphones on the Acoustic Package Performance Evaluation of a Vehicle

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Abstract

Vehicle transparency tests are essential for assessing the effectiveness of acoustic packages in reducing airborne noise propagation, particularly from the engine sides. Precise noise measurement is critical for the refinement of Noise, Vibration, and Harshness (NVH) characteristics and the development of acoustic insulation package. However, the impact of microphone numbers and placement around the sound source on measurement accuracy remains a topic that needs to be investigated in NVH research. This study investigates how accurately measuring on microphone numbers influence for vehicle stationary tests in semi-anechoic room. By comparing different configurations, the study quantifies the effects of microphone spatial distribution on recorded noise levels and its implications for acoustic package performance assessment. The research begins with a baseline configuration, placing one microphone on each engine surface to represent a minimal measurement setup. Subsequently, the number of microphones is increased systematically to understand how the number of microphones affects the consistency, accuracy, and spatial resolution of the noise data. The findings provide valuable insights into NVH measurement, ensuring more reliable data acquisition for vehicle acoustic development process. The results also contribute to refining microphone placement strategies and sensitive measurements for vehicle-level acoustic tests in future, facilitating enhanced noise control solutions for automotive applications.

Keywords: Vehicle transparency test, acoustic package performance evaluation, air borne engine noise, NVH, Correlation

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

The Influence of ECE R26 on Bumper Design

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Abstract

The automotive industry has proceeded significant advancements in bumper design, by the two objectives that are enhancing vehicle aesthetics and ensuring occupant and pedestrian safety. This paper explores the evolution of bumper design, diving into the interaction between design languages, functional features and materials in modern applications. From early bumper structures to today's advanced systems, bumpers have evolved to balance style with utility, representing the brand face and effecting many other performances such as Aerodynamics. A key focus of this study is how Regulation No. 26 of the United Nations Economic Commission for Europe (UNECE), commonly referred to as ECE R26, which establishes uniform provisions for approving vehicles with regarding to their external projections, influenced, especially the amount of bending of curvatures that are measured as radius of the curvature, bumper designs. This regulation has influenced bumper design by requesting specific safety criteria, such as minimizing injury risk by controlled protrusions and edge configurations. This paper shows the historical progression of bumper design, examines the technical and aesthetic features that are shaped by Regulation No. 26, and evaluates vehicle safety performance from the perspective of the pedestrian and highlights how regulatory compliance has reshaped design innovation and enhancing overall safety outcomes.

Keywords: ECE R26, bumper design, homologation, regulatory compliance, pedestrian safety

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Modeling of Chassis Lifter Moving at Constant Speed on Vehicle Dynamics Software

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Abstract

In this study, a chassis lifter system was investigated by Vehicle Dynamics Software with a parametric function. While conventional suspension models utilize a constant preload value, this approach enables greater flexibility in managing suspension height and ride mode transitions purely at the software level. In the proposed model, the preload force is directly linked to driving modes, allowing it to function as a dynamic variable. This eliminates the need for an additional subsystem and implements the height adjustment solely through the preload function.

A time-domain full vehicle analysis was performed to verify the model's accuracy. The results demonstrated that the preload function facilitated a seamless and stable shift between driving modes, allowing ride height changes to occur without disrupting the vehicle's overall dynamic behavior. This study demonstrates a software modeling approach by incorporating preload adjustments through a functional structure rather than a separate subsystem. The methodology does not aim to influence vehicle performance but instead focuses on verifying the correct operation of the function as a modeling technique within the software environment.

The simulation results confirmed that the vehicle maintained consistent dynamic behavior throughout the preload transition, with no abrupt changes in suspension displacement or vehicle attitude, verifying that the preload function successfully achieved its goal of simulating ride height variation purely within the software layer and providing a reliable, streamlined modeling approach for integrating height-adjustable systems into virtual concepts without added complexity.

Keywords: Vehicle Dynamics, Chassis Lifter System, Function Builder, Ride Height

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ISBN: 978-625-372-660-7

Mechanics of HVAC Airflow Noise and Its Spectral Characteristics in Vehicle Cabins

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Abstract

HVAC airflow noise refers to the noise content disturbances generated by the heating, ventilation, and air conditioning system within a vehicle cabin. Unlike external aerodynamic noise, this miracle originates internally, stemming from the movement of air through the HVAC elements and its relationship with the cabin environment. As HVAC systems are essential for climate control and human comfort, their noise contribution can significantly affect the perceived quality of a vehicle's noise performance. This paper delves into the mechanisms of HVAC airflow noise generation, its transmission within the cabin, impacting factors, and occupant perception, delivering a comprehensive overview for engineering analysis.

The primary mechanisms of noise generation include turbulence in tubes, blower fan operation, flow through components and vent outlet effects. Once generated, the noise propagates through air-borne transmission, structure-born transmission, resonance in the cabin volume, reflection and interference. Factors impacting the noise characteristics and intensity include blower speed, duct design, vent outlet configuration/design, airflow rate and cabin acoustics.

Understanding these mechanisms and factors is crucial for developing effective mitigation strategies. These strategies include optimizing fan design, duct configuration, vent improvements, vibration insulation, and active noise cancellation. By addressing these aspects, engineers can enhance the acoustic environment within vehicle cabins, aligning with modern expectations for quiet and comfortable interiors. This paper aims to give detailed analysis and practical insights for perfecting HVAC system design and reducing noise situations in vehicle cabins.

Keywords: Airflow noise, Ventilation, Vehicle Air conditioning systems (HVAC), Ducts, Blower Fan

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5th INTERNATIONAL CONGRESS OF ENGINEERING AND NATURAL SCIENCES

ISBN: 978-625-372-660-7

Investigation of Acoustic Performance of a Vehicle for High-Speed Driving

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Ayhan YAĞCI[2]
Halil ATEŞ[3]

Abstract

Acoustic comfort has become a key concern in modern vehicle design, particularly as long-distance travel and high-speed driving become more common. With increasing awareness among users, interior noise caused by road texture, aerodynamic turbulence, and powertrain operation is now a critical factor influencing overall driving experience and perceived vehicle quality. This study examines the effectiveness of selected acoustic interventions aimed at reducing cabin noise and improving speech intelligibility under real-world highway conditions.

The methodology involved in-vehicle testing across a range of speeds and environmental scenarios to evaluate practical performance. Two core metrics were used to assess acoustic outcomes: the Articulation Index (AI), which quantifies how clearly speech can be understood inside the vehicle, and the Sound Pressure Level (SPL), which measures overall noise intensity. Comparative measurements were taken before and after the application of each acoustic treatment to determine its impact.

Findings reveal that specific interventions—such as improved sealing, sound-absorbing materials, and optimized aerodynamic features—can lead to notable reductions in SPL and measurable gains in AI scores. These results not only demonstrate the practical benefits of targeted acoustic design but also offer guidance for integrating such solutions into future vehicle platforms.

By focusing on real-life driving conditions and measurable improvements, this research contributes valuable insights to the development of quieter, more comfortable vehicles, aligning with industry trends toward enhanced user experience and refinement

Keywords: Acoustic Comfort, NVH, Highway Driving, Articulation Index, Sound Pressure Level

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Welding Methods and Advantages of Plastic Materials Used in the Automotive Industry

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Abstract

Plastic welding is used to join thermoplastics by heating plastic pieces until they are malleable and then joined into a unified structure. It is used in a wide range of sectors from infrastructure building, plumbing, manufacturing of water tanks and heat exchangers and automotive repairs. The increasing demands for lightness, durability, cost-effectiveness and innovative aesthetic styles in the automotive industry are increasing day by day. These demands are increasing the use of plastic materials even more. The connection methods used due to the visual and functional use of plastic materials are constantly being developed. In this context, plastic welding methods play an important role as a connection technique. In general, the most common welding methods can be classified as ultrasonic welding, vibration welding, laser welding and hot gas welding. The welding connection solution will also bring some welding machine investments according to the method. In order to connect the materials to each other with this method and to meet the requirements, the selection of raw materials suitable for these methods is also of great importance. The use of these methods varies depending on the material properties, part geometry, application area on the vehicle and assembly method. This paper will discuss the different types of welding used for plastic materials in the automotive sector, the differences between them and the advantages, disadvantages and limitations of each method.

Keywords: Plastic Fixation, Welding, Ultrasonic Welding, Vibration Welding

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Surface Coatings for Solar Resistance in Plastic Materials in the Automotive Industry

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Abstract

In the automotive sector, plastic materials are commonly utilized due to their lightweight nature, aesthetic appeal, and safety advantages. Nevertheless, the exterior components of a vehicle, which are subjected to outdoor elements, particularly sunlight, encounter challenges in durability. Extended exposure to ultraviolet (UV) rays from the sun can inflict substantial damage on plastic parts, resulting in color fading, surface cracks, and diminished mechanical properties. This kind of deterioration can reduce the lifespan of the plastic components, impacting both their visual attractiveness and structural strength.

To overcome these challenges, UV resistance technologies have been created to improve the UV resistance of plastic materials used in the automotive industry. These operations function by protecting plastic surfaces from UV radiation, thus increasing their resistance to sunlight and extending their durability over time.Besides offering functional advantages, UV resistance processes also aid in preserving the visual appeal of the vehicle by preventing discoloration and deterioration of the material. This paper will examine the different application of UV resistance techniques utilized in the automotive sector, assessing their application ease, cost -effectiveness, and environmental effects. The contribution of these technologies to enhancing both the mechanical and visual longevity of plastic components will be thoroughly discussed.

Keywords: UV Rays, Thermal Resistance, Surface Coatings, Sunlight

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Semiconductor Technologies for Automotive Integration: Standards, Manufacturing, Challenges, and Future Directions

Özge AŞKAN[1]

Abstract

The automotive industry has undergone significant transformations in semiconductor technology in recent years. These transformations are driven by the growing adoption of electric and autonomous vehicles, the increasing use of artificial intelligence (AI)-enabled applications, and the rising demand for advanced driver assistance systems (ADAS). In this transformation, the complex sensor fusion algorithms and real-time data processing requirements of ADAS, in particular have increased the need for high-performance semiconductors. Meanwhile, the growing complexity of in-vehicle infotainment systems (IVI) necessitates advanced graphics processing and AI integration to enhance user experience. Consequently, these developments have led to substantial evolution of semiconductor technology, with the development of more efficient, durable, and miniaturized solutions that are essential for the automotive industry.

While extant literature addresses each of semiconductor manufacturing processes and automotive technologies separately, there is a lack of comprehensive studies examining the integration of these two areas. This paper aims to provide a holistic approach by examining the stages of semiconductor production, from wafer-to-chip manufacturing processes, and presenting the significance and development processes of these components in automotive systems.

Significant progress in semiconductor technology, particularly through the adoption of smaller node sizes such as 5nm and 7nm, has enabled higher efficiency, faster processing speeds, and improved overall performance in automotive systems. The paper aims to provide a comprehensive overview of the role of semiconductors in the automotive industry, their production processes, standards, and future trends, while discussing the challenges faced by the sector and its future directions.

Keywords: Semiconductor technology, Automotive standards, Wafer-to-chip manufacturing, Advanced driver assistance systems (ADAS), In-vehicle infotainment systems (IVI), Node size(nm)

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

AUTOMOTIVE GLASS AND PRODUCTION METHODS

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Mehmet Akif Çevik[2]
Onur KOZBAY[3]

Abstract

Developing technologies in the automotive industry are become more and more important every day with the competitive culture provide. Today, passenger comfort, energy efficiency and security, which are becoming increasingly important, are being focused on in these areas. Instead of usinge the vehicles as only transportation-oriented, users see them as an area of experience, and these changing consumer preferences have increased the need to provide more comfortable, safe and efficient interior design in the automotive industry. Initially automotive glass was used as a safety element to protect drivers and passengers from the effects of the external conditions, it has become the subject of many studies. Among modern needs, acoustic glass can be preferred to provide sound insulation, Athermic and Dimmable glass to adjust the ambient temperature, Solar PVB for protection against harmful radiation coming from the sun and Dimmable glass for privacy purposes. This paper will mention laminated and tempered glass with these features and areas of use, along with developing production methods and techniques.
Keywords: Laminated Glass, Tempered Glass, Athermic Glass, Dimmable Glass, Solar PVB

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5th International Congress of Engineering and Natural Sciences

ISBN: 978-625-372-660-7

Electricity Consumption in Developing Countries

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Abstract

Electrical energy is of critical importance, especially for developing countries. Energy, which is one of the most important inputs of sustainable economic growth today, has many economic, social and environmental impacts. The increase in the world population, technological innovations, accelerated industrialization, rising living standards and increasing consumption expenditures lead to a rapid increase in energy demand. This increase has led to a shift towards exhaustible fossil resources such as oil, coal and natural gas to meet energy demand.

In recent years, the need to turn to renewable energy sources has been on the agenda of countries seeking sustainable solutions. Meeting the increasing energy demands of countries with clean and domestic energy resources is of great importance in terms of minimizing the damage caused to the environment by greenhouse gas emissions that lead to global warming, as well as reducing foreign dependency. This has led governments to develop various incentive and support policies for energy generation from renewable energy sources. Many countries are reducing their reliance on electricity, and the relationship between electricity consumption and economic growth has become a current topic of discussion for policymakers and researchers alike. A number of country-wide and individual country studies have examined different variables between electricity consumption and economic growth. The common finding of these studies is that countries that use electrical energy continuously, effectively and efficiently are positively affected by economic growth. In this study, electricity consumption in developing countries will be investigated.

Keywords: Electric energy consumption, population growth, energy demand, technological innovations , clean and domestic energy

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