

List of Conference Publications AY: 2025-26

S. N.	Name of Faculty / Authors	Title of Paper	Journal/Conference
1	Rone; Anshuman Aggarwal; Mohammad Asad	Gear-Related Stress Analysis and Comparison Between the FEM and AGMA Standards	Trends in Mechanical Engineering & Technology, 2025, 15(3), 13–18
2	Rone	Enhancing Surface Roughness in the Taguchi Method for Turning Alloy Steel in Wet and Dry Environments	International Journal of Robotics and Automation in Mechanics, 2025, 3(2), 1–6
3	Sindhu Kumar; Rone; Manish Kumar	The Analysis of the TEG Peltier Heat Collecting Device in the 1.5 HP Split Unit Air Conditioning System	Journal of Refrigeration, Air Conditioning, Heating and Ventilation, 2025, 12(3), 14–21
4	Kunal Kumar; Rone; Manish Kumar	Study of a Mist Enhanced Evaporative Cooler	Journal of Refrigeration, Air Conditioning, Heating and Ventilation, 2025, 12(3), 1–13
5	Sindhu Kumar; Rone; Manish Kumar	Fracture Analysis of FRP Composites under Thermo-Mechanical Loads for Different Geometry Cutouts	International Journal of Fracture Mechanics and Damage Science, 2025, 3(2), 1–10
6	Rone; Praveen Kumar Choudhary	Design and Development of Fiber Sandwiched Composite Materials for Improvement of Mechanical Properties	Journal of Experimental & Applied Mechanics, 2026, 17(1), 22–37
7	Sindhu Kumar; Rone; Manish Kumar	Evaluation of Critical MMAW Welding Defects Using Computer Simulation in Industrial Manufacturing Systems	International Journal of Industrial and Product Design Engineering, 2025, 3(2), 18–26
8	Rohit Kumar; Shallu Hassija	Beyond Static Decoys: A Position Paper on Reinforcement-Learning-Driven Honeygan Ecosystems with Blockchain-Anchored Audit Trails for Industry 5.0 Cyber Defense	International Journal of Science, Strategic Management and Technology, 2026, 2(5), May 2026. DOI: 10.55041/IJSMT.v2i5.247
9	Shallu Hassija	Smart Education and Sustainable Learning: Soft Computing Techniques for Efficient Duplicate Question Detection	IGI Global Scientific Publishing, 2025 (publication certificate provided)

Gear-Related Stress Analysis and Comparison Between the Fem and Agma Standards

Rone^{1*}, Anshuman Aggarwal², Mohammad Asad³

Abstract

In many different devices, gears enable the efficient transfer of motion and torque. They are an essential component of modern mechanical power transmission systems. It has been demonstrated that bending and surface contact stresses at the gear tooth are the primary causes of gear failure, despite their widespread use. Too much stress can lead to tooth wear, pitting, or breakage, which can ultimately reduce the operating life and reliability of the system. In order to improve gear performance, extend service life, and prevent early failure, accurate stress measurement has become a crucial area of research. The current study focuses on evaluating contact and bending stresses in an involute helical gear system. Both analytical methods and numerical simulations are employed to provide a comprehensive understanding of gear behavior under load. To establish a baseline for the stress distribution over the tooth profile, the analytical analysis makes use of the traditional Lewis bending equation. In addition to offering a platform for comparison in more intricate numerical investigations, this method offers an initial assessment of important stress sites. To achieve more precision, ANSYS, a powerful numerical simulation program that is perfect for structural and contact problems, is used to perform finite element analysis (FEA). To construct the three-dimensional gear models required for FEA, Pro/Engineer, a sophisticated solid modeling program, is utilized. Models with varying tooth counts are constructed in order to examine the effects of geometry on stress concentration and design parameters on gear performance. ANSYS and Pro/Engineer work together to enable precise stress field evaluation, providing insights that surpass the limitations of purely analytical methods. The comparison of analytical and FEA data illustrates the benefits and drawbacks of the Lewis formula in predicting actual gear stresses. Although analytical approaches are faster and easier to use, finite element modeling better captures the complex geometry and loading conditions, yielding results that are more consistent with real-world observations. The findings demonstrate the importance of numerical simulations in gear design and optimization, particularly in high-load situations where reliability is essential. All things considered, this work demonstrates the significance of integrating finite element analysis and analytical equations in the design and evaluation of helical gears. The findings guide the selection of appropriate design parameters, enhance gear reliability, and lower the likelihood of failure in mechanical power transmission systems.

Keywords: ANSYS, AGMA standard for computation, gear modeling, structural analysis, gear optimization

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Received Date: July 11, 2025

Accepted Date: September 08, 2025

Published Date: October 11, 2025

Citation: Rone, Anshuman Aggarwal, Mohammad Asad.
Gear-Related Stress Analysis and Comparison Between the
Fem and Agma Standards. Trends In Mechanical Engineering
& Technology. 2025; 15(3): 13–18p.

INTRODUCTION

Gearing is the occurrence that supplies the rotating motion with energy from one motor to the other. Gears are an advanced power transmission device for future machines. The development of the industry is concentrated on machinery terminology, which helps transmit energy from another device to another. A set of motors, motors and space layouts is supplied with a gearbox. The device transforms the decreased speed into a higher thrust. In this article, we investigated helical motors in a gearbox using a method called finite element evaluation.

Enhancing Surface Roughness in the Taguchi Method for Turning Alloy Steel in Wet and Dry Environments

Rone*

Abstract

The present investigation focuses on evaluating the performance of turning operations in alloy steel with particular emphasis on the effect of cutting parameters on surface roughness. In the machining of alloy steel, tool life and surface integrity are significantly influenced by parameters such as spindle speed, depth of cut, and feed rate [6]. Among these, feed rate has been observed to exert the most prominent effect on surface roughness [2]. To systematically analyze these influences, the Taguchi method employing an L9 orthogonal array design was selected as the most suitable approach for experimental planning [1]. This method not only reduces the number of experimental trials but also provides an efficient statistical framework to evaluate the contribution of individual parameters [11]. Three levels were chosen for each cutting factor to comprehensively study their interactions and effects [1]. The experiments were performed under both wet and dry turning conditions using a CNC lathe machine, with workpieces of 45 mm diameter and 145 mm length. For each condition, three sets of trials were conducted to ensure repeatability, and the average values were considered as the final outcomes [3]. The signal-to-noise (S/N) ratio analysis was used to determine the robustness of the parameters, while analysis of variance (ANOVA) was employed to quantify the percentage contribution of each factor [2]. Optimization of the experimental data was carried out using Minitab 17 software, which assisted in identifying the optimal combination of parameters for achieving minimum surface roughness [1].

The results revealed that feed rate was the most critical factor influencing surface finish, followed by spindle speed and depth of cut [2]. Furthermore, it was observed that wet turning yielded comparatively better results in terms of surface quality when compared to dry turning, thereby highlighting the importance of lubrication in improving machining performance [3]. The findings of this work provide useful insights for industry practitioners to optimize cutting conditions, enhance tool life, and improve productivity in alloy steel machining [7]. This study demonstrates the efficiency of the Taguchi method in machining optimization and emphasizes its applicability in both academic and industrial research contexts.

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Received Date: July 11, 2025
Accepted Date: November 14, 2025
Published Date: November 29, 2025

Citation: Rone. Enhancing Surface Roughness in the Taguchi Method for Turning Alloy Steel in Wet and Dry Environments. International Journal of Robotics and Automation in Mechanics. 2025; 3(2): 1–6p.

Keywords: Turning, Orthogonal array, roughness, spindle, Taguchi Method, Signal-to-noise.

INTRODUCTION

Manufacturing is the procedure of turning raw resources into completed products in order to satisfy consumer demands. This involves employing diverse manufacturing techniques to modify the physical characteristics of the raw materials, such as their shape and dimensions.

The Analysis of the TEG Peltier Heat Collecting Device in the 1.5 HP Split Unit Air Conditioning System

Sindhu Kumar¹, Rone², Manish Kumar^{3,*}**Abstract**

Energy recycling is a different approach to creating a green environment in the modern world. Global energy usage is highest for air conditioning. Commonly air conditioning used to maintain indoor temperature. Split unit air conditioning systems are well-known for their small-area applications in Malaysia. Nevertheless, the condensing unit's heat discharge results in environmental waste. As a result, in this experiment, one peltier device employing a thermoelectric generator (TEG) module was developed. This paper's goal is to describe the creation of a peltier device that collects heat from a condensing unit and turns it into electricity. The Peltier gadget was positioned between copper plates measuring 120 mm by 60 mm by 2 mm. The copper plate was brazed at the compressor's output pipe, and its other side was attached to the heat sink, which allowed condensed water from the evaporator to pass through. Six peltiers were arranged in different configurations between copper plates. Three cases were monitored based on the condenser temperature and the cooling coil's ΔT . Case 1's maximum ΔT was noted, and each peltier's voltage output was concurrently examined. After operating the split unit air conditioner for 30 minutes at a temperature of around 9–10°C, the maximum 1.61V was recorded. The potential alternative for heat recovery is demonstrated by the use of TEG to capture heat and convert it into power. The produced current could be helpful for small-scale home electrical use.

Keywords: TEG, energy conservation, heat transformation, split air conditioner, seebeck effect

INTRODUCTION

Because of our dependence on energy resources, there has been a rise in energy consumption. Due to the limited supply of oil, the quantity of energy derived from current sources will decline. The price of power has risen to historically high levels throughout time due to a mix of political and monetary factors as well as the limited availability of oil. Since renewable energy will also leave a better environment for future generations, it is a more enticing alternative than producing power.

There are many different ways to produce renewable energy, including nuclear energy, solar energy, wind energy, and hydro energy. In the modern world, producing electricity would require significant energy and resource expenditures as well as increased disruption of natural resources [1]. Recycling energy would be an additional way to attain green environment technology of renewable energy in order to minimise energy consumption. In order to maintain human comfort, air conditioning has recently consumed 50% of all energy consumed [2]. Heat recovery thus presents a viable avenue for the use of renewable energy. Using a thermoelectric generator, waste heat from the split unit air conditioning system's condenser was converted to electrical power (TEG). Nevertheless, not much

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Received Date: December 04, 2025

Accepted Date: December 07, 2025

Published Date: December 23, 2025

Citation: Sindhu Kumar, Rone, Manish Kumar. The Analysis of the TEG Peltier Heat Collecting Device in the 1.5 HP Split Unit Air Conditioning System. Journal of Refrigeration, Air Conditioning, Heating and Ventilation. 2025; 12(3): 14–21p.

Study of a Mist Enhanced Evaporative Cooler

Kunal Kumar¹, Rone^{2*}, Manish Kumar³

Abstract

Comfort air conditioning through vapour-compression refrigeration is commonly used and is the energy-intensive system. That to split air conditioning system is being employed to create cooling in closed spaces which lag in fresh air supply leading to an increase in carbon dioxide concentration in the cooled space. This is of very much concern towards to maintain indoor air quality. Evaporative Cooling (or Desert Cooling) concept is also a known phenomenon to generate cold by the evaporation of water; however, Flash Evaporation is the new concept which helps to evaporate the water particle generated through mist nozzle. To achieve the flash evaporation process, water is forced through a very small but specially designed nozzle and spinning disc leading to a very fine water mist i.e. Water droplets less than 50 microns. A mist nozzle and a spinning disc are the two innovative components lead to generate the fine mist at minimum cost and zero energy consumption. Which extend the benefits like less energy consumption, no maintenance, and no storage of water which actually promotes the fungus and mosquito breeding, no use of honeycomb structure, jute fiber or any cooling media as used in conventional desert coolers. As a result, it has no greenhouse gas impact and works as a green air cooler. Flash evaporative cooling systems consume @30 % less energy compared to the conventional evaporative cooling system. Subsequently, the use of such systems definitely leads to saving the building energy consumption. Also, the water consumption is just @ 1 liter per hour, and for mist generation no need of any high-pressure pump.

Keywords: Comfort cooling system, air conditioning system, mist chamber, mist spray direct evaporative cooler, axial fan

INTRODUCTION

In earlier days before the development of heating ventilation and air conditioning systems natural available resources were used for getting relief from heat stress such as-natural ventilation, shading. For example, the people an ancient conditioned their residences by using the evaporative cooling. Ancient people would sling wet clothes or grass mats on the wind-area side of their residence to get relief from the heat stress. Since 1900's people moved towards newly invented mechanical cooling systems [1–3].

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Received Date: December 04, 2025

Accepted Date: December 05, 2025

Published Date: December 22, 2025

Citation: Kunal Kumar, Rone, Manish Kumar. Study of a Mist Enhanced Evaporative Cooler. Journal of Refrigeration, Air Conditioning, Heating and Ventilation. 2025; 12(3): 01–13p.

Thermal Comfort

The ambient factors are as shown in Figure 1. It is made up of the radiant temperature, or the ambient air temperature, and relative humidity, which is the ratio of the quantity of moisture in the air. to the maximum amount that the air might hold at the same temperature.

The personal factors consist of metabolic rate of the human body to generate the heat and the clothing insulation wearied by the human being as represented in Figure 2.



Fracture Analysis of FRP Composites under Thermo-Mechanical Loads for Different Geometry Cutouts

Sindhu Kumar¹, Rone^{2,*}, Manish Kumar²

Abstract

Fiber-reinforced composites (FRPs) are used extensively in structural and non-structural components of the aerospace and automotive industries. To utilize these materials for structural applications, it is necessary to understand the fracture behavior of the material. In the present investigation of carbon fiber laminates, studies were carried out to understand the fracture toughness characteristics of the carbon fiber laminates with mechanical, thermal, and thermo-mechanical loadings of modes I, II, and III. The carbon composite laminate with four layers and different stacking sequences of angle-ply and cross-ply cases was investigated by considering three kinds of loadings: mechanical, thermal, and coupled thermo-mechanical loading. The finite element method was used to model the carbon composite laminate and to estimate the strain energy release rate (SERR) subjected to simply supported boundary conditions. The FE model predicted results are validated with analytical results and experimental predictions. Finite element models of laminated composite rectangular plates were modeled to determine the fracture behavior under mechanical, thermal, and combined thermo-mechanical loading. The strain energy release rate was estimated to characterize whether the crack is open or closed. Experimental results were produced by creating a composite with chopped carbon fibers and an epoxy matrix using the hand lay-up technique. The composite material with a pre-existing crack was tested for fracture toughness, and the same was simulated using ANSYS for validation. A close agreement was observed between the experimental and analytical results.

Keywords: Carbon fiber reinforced polymer (CFRP), fracture toughness, finite element analysis (FEA), strain energy release rate (SERR), thermo-mechanical loading

INTRODUCTION

A composite is a multiphase material that contains two or more distinct phase materials. The properties of these materials are superior to those of the individual materials. The main objective of the composite material is to replace conventional materials with high specific strength and high specific stiffness materials. Among the different categories of composite materials, the continuous fiber-reinforced composite material shows better mechanical properties. To meet the required properties of composite materials, the designer must arrange the continuous fibers in the required direction.

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Received Date: December 16, 2025

Accepted Date: December 18, 2025

Published Date: December 29, 2025

Citation: Sindhu Kumar, Rone, Manish Kumar. Fracture Analysis of FRP Composites under Thermo-Mechanical Loads for Different Geometry Cutouts. International Journal of Fracture Mechanics and Damage Science. 2025; 3(2): 1–10p.

Composites are frequently used in two forms: the lamina and the laminate. The lamina is a flat or curved arrangement of unidirectional or woven fibers inserted in a matrix material. These laminas are stacked together to form a laminate with the desired fiber angle.

Lamina and Laminate

A layer of a thin sheet of material is called a lamina and is generally treated as a plate. When two or more sheets are adhered or glued together, the newly formed material is known as a laminate. A laminate consists of a number of layers or sheets of

Design and Development of Fiber Sandwiched Composite Materials for Improvement of Mechanical Properties

Rone^{1,*}, Praveen Kumar Choudhary²

Abstract

This research paper presents the development and mechanical characterization of fiber sandwiched composite materials (FSCM) to address the increasing demand for high-strength, lightweight, and corrosion-resistant materials in advanced engineering sectors such as automotive, aerospace, and transportation industries. Traditional homogeneous materials such as metals, ceramics, and polymers often fail to provide a balanced combination of properties like high tensile strength, low density, toughness, abrasion resistance, and impact resistance needed for modern structural applications. In contrast, composite materials, which consist of a reinforcement phase (fibers/particles/flakes) and a continuous matrix phase, offer superior performance through enhanced strength-to-weight ratio and customizable properties. In this study, laminated sandwich composite specimens are fabricated using teakwood as the core material, reinforced with different fiber laminae including carbon fiber, aramid fiber, jute fiber, and banana fiber. All fiber orientations are maintained at 0° to achieve uniform structural behavior and to simplify comparative evaluation. The FSCM samples are manufactured by adopting the hand lay-up technique, which is cost-effective and suitable for experimental as well as small-scale industrial production. The fabricated composites are experimentally evaluated for key mechanical properties such as tensile strength, bending strength, and impact strength, following standard ASTM testing procedures. Additionally, the experimental results are supported and validated through Finite Element Analysis (FEA) to improve the reliability of the findings. The main objective of this research paper is to compare the performance of different fiber-reinforced sandwich combinations and to identify the optimum material configuration that provides improved mechanical strength with reduced weight, making it suitable for practical structural applications.

Keywords: Composite materials, fiber reinforce polymer, Fiber composites, Finite Element Analysis, glass fiber reinforced polymer

INTRODUCTION

The modern trends in engineering applications require materials with unusual physical and mechanical properties that may not be met by the individual conventional homogeneous metals,

ceramics, and even polymers too. For example, the materials required for underwater, transportation, and aerospace. The research and development team working in large scale industries like aerospace always researching and developing for structural materials that have high strength, low density, good toughness, corrosion resistant, impact resistant and abrasion resistant. Generally, strong materials always have more density and if the process has done to increase the strength of a particular material, it generally leads to decrease of impact strength. So, the composites are wholly greater than the sum of the parts of materials [1].

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Received Date: January 15, 2026

Accepted Date: January 29, 2026

Published Date: February 07, 2026

Citation: Rone, Praveen Kumar Choudhary. Design and Development of Fiber Sandwiched Composite Materials for Improvement of Mechanical Properties. Journal of Experimental & Applied Mechanics. 2026; 17(1): 22–37p.



Evaluation of Critical MMAW Welding Defects Using Computer Simulation in Industrial Manufacturing Systems

Sindhu Kumar^{1,*}, Rone², Manish Kumar³

Abstract

Manufacturing is one of the key sectors of any countries GDP and welding is one of the prime manufacturing processes of the manufacturing sector. Welding has several notable advantages over mechanical joining techniques, including higher structural integrity, design flexibility, and cost and weight lowers. Welded products/structures are subjected to serious issues of residual stresses and distortions. The performance and sturdiness of the welded structures are severely impacted by weld remaining strain and deformation. Welding distortions introduce sever problems in assembling of the welded structures and reduce its quality. In some cases the higher values of the distortions make the products useless in shape. Whereas, the residual stresses cause the premature failures of the structures during the service life. Hence there is a need for suitable a methodology to control/minimize the residual stresses and distortions. Accordingly, this study has proposed three distinct methods, namely pre-setting, restraining and auxiliary side heating to control distortion in butt welds of MMAW process. Similarly auxiliary side heating is also proposed to control the residual stresses. For pre-setting the workpieces with known magnitudes of angular distortion in the opposite direction, a linear regression model based on five independent process parameters/factors (current, welding speed, electrode diameter, number of passes and plate thickness) is developed to predict the magnitude of angular distortion. The efficiency of linear regression model is tested through confirmation tests and it is found that a variation of the predicted angular distortion is within 10%. Similar to the regression model, use of Finite Element Analysis (FEA) is made for predicting angular distortion and residual stresses.

Keywords: Finite element analysis, MMAW process, submerged Arc welding, shielded metal Arc welding, WRSD

INTRODUCTION

Manufacturing is one of the key sectors of any country's GDP and welding is one of the prime manufacturing processes of the manufacturing sector. Welding has several noteworthy advantages over mechanical joining procedures, including increased quality of construction, cost and weight reductions, and flexibility for design. Industries like automotive, ship manufacturing, aeroplane, heavy structures used in chemical industries and nuclear energy use welding very extensively. Varieties of materials are welded by different welding processes. The welding can be performed in manual, semi-automatic and automatic manner. The defects in welding like slag inclusions, undercutting, porosity, toe cracks, incomplete

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Received Date: December 13, 2025
Accepted Date: December 14, 2025
Published Date: December 27, 2025

Citation: Sindhu Kumar, Rone, Manish Kumar. Evaluation of Critical MMAW Welding Defects Using Computer Simulation in Industrial Manufacturing Systems. International Journal of Industrial and Product Design Engineering. 2025; 3(2): 18-26p.



Beyond Static Decoys: A Position Paper on Reinforcement-Learning- Driven Honeygan Ecosystems with Blockchain-Anchored Audit Trails for Industry 5.0 Cyber Defense

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<https://doi.org/10.55041/ijst.v2i5.247>

Cite this Article: Kumar, R. & Hassija, S. (2026). Beyond Static Decoys: A Position Paper on Reinforcement-Learning- Driven Honeygan Ecosystems with Blockchain-Anchored Audit Trails for Industry 5.0 Cyber Defense. International Journal of Science, Strategic Management and Technology, 02(05).
<https://doi.org/10.55041/ijst.v2i5.247>

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Abstract—Recent work on Generative Adversarial Networks for honeypot generation, most notably the HoneyGAN Pots framework, has shown that decoys produced by a learned generator can evade existing honeypot detectors more reliably than hand-crafted ones. That result is encouraging, but it is only a first step. A trained generator still produces decoys that are static after training: it does not learn from how attackers actually behave once the decoys are deployed, it provides no tamper-proof record of what it generated, and it assumes a class of compute resources that does not exist on industrial edge nodes. This paper is a position paper that takes the future-work agenda outlined by Gabrys et al. and develops it into a concrete research design. We propose an integrated framework, HoneyGAN+, that couples a conditional GAN to a reinforcement-learning policy trained on observed attacker engagement, anchors every generated decoy on a permissioned blockchain to give responders a verifiable audit trail, and uses knowledge distillation together with federated learning to push inference onto resource-constrained Industry 5.0 endpoints. We further argue that individual decoys should be replaced by coordinated multi-agent ecosystems whose internal references are mutually consistent, and we propose a standardized evaluation pipeline (detection resistance, engagement, longevity, and intelligence value) to make claims comparable across studies. The paper also discusses dual-use risks and a governance model that, in our view, ought to be developed before broad deployment rather than after. We are explicit throughout: the contribution is a research design with enough technical detail to support implementation, not a fully built and benchmarked system.

Index Terms—Generative adversarial networks, honeypots, reinforcement learning, blockchain, federated learning, multi-agent deception, Industry 5.0, adversarial machine learning, position paper.

I. INTRODUCTION

Cyber deception has had something of a quiet renaissance in the last few years. Honeypots, once mostly the province of researchers studying botnets [15], are reappearing in production environments as defenders look for ways to slow down attackers who themselves rely heavily on automation. The most interesting recent development on the defensive side is the use of Generative Adversarial Networks (GANs) to produce decoy configurations that statistically resemble real systems and therefore resist fingerprinting better than hand-crafted decoys. Gabrys, Silva, and Bilinski demonstrated this

concretely in their HoneyGAN Pots framework [1], and subsequent work — for example MMHP-GAN [2] and the systematic review by Ndayipfukamiye et al. [3] — has reinforced that the basic idea generalizes.

Even so, the GAN-only formulation has limits that the original work itself flagged. Once trained, a generator does not improve from experience in the field: an attacker may engage a decoy, give up after twenty seconds, and the generator never learns. The training data is sensitive and hard to share across organizations, which slows the field as a whole. There is no built-in record of which decoys were generated, when they were instantiated, or how they evolved —

ISSN: 3108-1762 || Impact Factor: 3.8



CERTIFICATE OF PUBLICATION

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**BEYOND STATIC DECOYS: A POSITION PAPER ON REINFORCEMENT-LEARNING- DRIVEN
HONEYCANE COSYSTEMS WITH BLOCKCHAIN-ANCHORED AUDIT TRAILS FOR INDUSTRY 5.0 CYBER DEFENSE**

authored by

SHALLU HASSIJA

has been accepted through peer review and published in the
International Journal of Science, Strategic Management and Technology (IJSMT).

The article has been processed in accordance with the journal's editorial policies and accepted standards of academic integrity and publication ethics. This certificate is issued as an official publication record.

Bibliographic Record:

Volume/Issue: Volume 02, Issue 05
Month/Year of Publication: May/2026
Certificate No.: IJSMT-CERT-26-05-247
DOI: 10.55041/ijgmt.v2i5.247

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