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A REVIEW PAPER ON TWO-WHEELER CARBURETTOR

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ABSTRACT
Carburettor is a most important component in fuel feed system of spark ignition engines. A carburettor is a device used by a gasoline internal combustion engine to control and mix air and fuel entering the engine. The main structure and largest component of the carburetor is the molded body made from a lightweight alloy or aluminum. This carburettor model is made in a modelling software i.e., SolidWorks and this review examines the use of SolidWorks software for modelling two-wheeler carburettors, exploring its benefits for creating accurate 3D models, simulations, and design communication. It analyzes existing research on modelling various carburettor components and functionalities in SolidWorks, considering factors like detail, design intent, and manufacturability. This study is made for the best 3D model of the carburettor.

Keywords:
Carburettor, spark ignition engines, SolidWorks, 3D models, modelling.

LITERATURE SURVEY

A. Amardeep [1]: The document discusses the design and analysis of a two-wheeler carburettor. Carburettors play a crucial role in mixing air and fuel for internal combustion engines. The analysis covers various aspects, including fuel-air mixture ratios, performance optimization, and efficiency enhancement. The study aims to improve the carburettor's functionality, ensuring optimal engine operation.

B. Phanindra Kumar[2]: The article titled "Modelling and Analysis of Spark Ignition Carburettor" investigates the design and performance optimization of carburettors in modern passenger vehicles with gasoline engines. Fuel consumption in such vehicles is influenced by various factors, and the carburettor plays a crucial role. The study focuses on three critical parameters: pressure drop, fuel discharge nozzle angle, and throttle angle. To achieve better fuel economy and uniform air-fuel supply, the researchers employ computational fluid dynamics (CFD). They utilize two software tools: CATIA for designing the carburettor and ANSYS for analysing its performance. The results obtained from these simulations guide the optimum design of the carburettor, ensuring a homogenous air-fuel mixture at various throttle angles and choke valve positions12.

P. M. Deepthi[3]: The article discusses the design, development, and analysis of a two-wheeler eco-friendly plastic carburettor, emphasizing the use of plastic materials to prevent corrosion and enhance mass production through rapid prototyping12. The study highlights the advantages of replacing metal components with plastic, such as cost reduction, improved performance, and corrosion resistance, while also considering the challenges posed by environmental factors that may affect the suitability of plastics.

Abijit Guda[4]: The document titled "Design and Analysis of Two-Wheeler Carburettor" by Abijit Guda focuses on the comprehensive design and analysis of carburettors used in two-wheeler vehicles. It provides an in-depth look at the components, functionality, and improvements in carburettor design to enhance performance and efficiency.

S. Ramanathan[5]: The article presents a study on the design and analysis of a modified carburettor using Computational Fluid Dynamics (CFD). It explores the impact of various obstacles within the flow domain, such as the fuel-tube and throttle plate, on the mass flow rate and static pressure. The study proposes a modified carburettor with a double throttle body design, which shows improved volumetric efficiency and more organized flow downstream. The research indicates that this design could enhance engine performance by allowing more air to flow through the carburettor, especially at higher speeds.

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R. Elayaraja[6]: The article investigates the impact of venturi shape on the performance of carburettors in two-wheelers in India, where carburettors are prevalent due to their simplicity and cost-effectiveness. Through CFD analysis and actual vehicle trials, the study compares circular, oval, trapezoidal, and double D venturi shapes, concluding that while trapezoidal venturi improves acceleration, circular venturi enhances power output, and oval venturi offers a balanced performance compromise.

Z. Mody[7]: The article explains the transition from carburettors to fuel injection systems in vehicles due to the implementation of BS6 emission norms. Carburettors mix air and fuel using the Venturi effect, a simple and inexpensive method. However, fuel injection systems, consisting of a fuel pump, fuel injectors, and an ECU, offer greater precision and efficiency, reducing emissions and improving fuel economy1. Despite being costlier and more complex, fuel injection systems are less prone to issues compared to carburettors, especially in extreme conditions.

J. Sureshkumar[8]: The article presents a comprehensive study on the design of carburettors for two-wheelers, focusing on the venturi shape and its impact on engine performance. Through both numerical analysis and experimental methods, the authors investigate how different venturi designs can affect fuel consumption and air-fuel mixing, which are critical for the efficiency of spark ignition (SI) engines. The findings aim to optimize carburettor design for better performance and fuel efficiency.

P. Manasa Deepthi[9]: The article discusses the design, development, and analysis of a two-wheeler eco-friendly plastic carburettor using Rapid Prototyping (RP) to increase mass production and prevent corrosion1. The main aim is to replace metal components with plastic to reduce cost, weight, and improve corrosion resistance. The study covers various aspects of carburettors, air-fuel mixtures, compensating devices, and the advantages of using plastics, particularly Poly Butylene Terephthalate (PBT), in manufacturing. The article also details the use of Pro-Engineering software for design and the Finite Element Method (FEM) for analysis, concluding that plastic carburettors manufactured through RP have better life and efficiency.

Thomas[10]: In a groundbreaking collaboration, scientists from Florida Atlantic University (FAU) and the U.S. Office of Naval Research have unveiled a transformative advancement: the creation of 3D-printed robotic jellyfish, aptly named "jollyboats," designed to monitor and protect delicate coral reef environments worldwide. These innovative robots, inspired by the graceful movements of moon jellyfish, boast a sophisticated propulsion system driven by hydraulic tentacles powered by impeller pumps, eschewing conventional valves to enhance simplicity, efficiency, and cost-effectiveness. Through meticulous experimentation with varying levels of silicon hardness in their actuators, the researchers have refined propulsion mechanisms, showcasing the versatility and adaptability of these bio-inspired creations. Rigorous testing has demonstrated the jollyboats' unparalleled ability to navigate narrow openings, a crucial skill for surveying intricate reef structures. This groundbreaking endeavour represents a harmonious fusion of cutting-edge engineering and ecological stewardship, offering a potent tool for the preservation of our planet's most vulnerable marine ecosystems.

Tess[11]: The debut of Ishayu's 'Infinite Petals' 3D printed jewellery collection at their Summer Edit event in Mumbai signals a pioneering stride in merging traditional artistry with modern technology. Established in 2004 by Gauri and Radhika Tandon, Ishayu has garnered acclaim for its fusion of traditional and contemporary designs, admired by celebrities and fashion publications alike. The collection's intricate accessories are crafted through additive manufacturing, beginning with hand-drawn sketches translated into 3D models printed in nylon. This method enables the production of prototypes for modification and replication before casting in brass and final gold plating. Gauri Tandon extols the benefits of 3D printing, citing its capacity to realize shapes and sizes unattainable through conventional methods, while its scalability and speed facilitate rapid iteration and efficient production. Ishayu's embrace of 3D printing mirrors a broader trend in the jewellery industry, reflecting a commitment to innovation despite encountered challenges, and underscores the transformative potential of technology in jewellery design.

Richardt[12]: The integration of 3D printing in the fashion industry presents a wealth of opportunities, including streamlining production processes, enabling personalized designs, reducing costs through on-demand printing and material efficiency, and facilitating the creation of intricate shapes. Despite existing

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challenges such as material limitations and environmental concerns, 3D printing has shown promise in accessories, jewellery, watchmaking, and footwear. This technology, blending innovation with traditional techniques, has the potential to revolutionize both Haute Couture and Ready-to-wear fashion. Despite obstacles like costs and environmental impact, 3D printing is reshaping the future of fashion, with rapid advancements driving progress. Positioned at the initial phase of Gartner's Hype Cycle for Emerging Technologies, 3D printing in fashion prompts industry players to adapt and integrate the technology into their practices. As developments unfold swiftly, supporting professionals in seamlessly adopting this technology remains crucial, highlighting the need for ongoing observation as the fashion industry embraces additive manufacturing's potential.

Yayo Fiona[13]: As additive manufacturing (AM) evolves from rapid prototyping to producing end-use products, there's a significant expansion in design freedom, covering shape, material, hierarchical, and functional complexities. This shift challenges traditional Design Theory and Methodology (DTM) focused on manufacturing, assembly, and performance objectives. The analysis highlights that conventional DTM isn't adequate to fully exploit AM's opportunities. There's a clear need for new design principles tailored for AM, given its transformative impact on manufacturing constraints and possibilities. The paper categorizes design methods for AM into design guidelines, modified DTM for AM, and design for additive manufacturing (DFAM), evaluating their benefits and limitations. It explores novel design methods integrating function and structure optimization for improved performance and fewer parts. Additionally, the role of design tools in supporting the process is discussed. The review also identifies avenues for future research, underscoring the ongoing evolution and exploration in additive manufacturing design.

Mohamed[14]: The review discusses the integration of 3D printing (3DP) into rapid sandcasting applications, highlighting its widespread adoption by large-scale manufacturers but slower progress in smaller-scale foundries. While smaller foundries currently use 3DP through collaborations with larger enterprises, challenges such as high initial investment, ongoing operational costs, and production volume limitations hinder its widespread adoption. Despite its advantage in moulding complexity, 3DP's slower printing speed compared to traditional processes limits its suitability for large-scale production without deploying multiple printers. Additionally, constraints on job-box size require moulds to be produced in multiple parts, posing challenges for large castings. Although 3DP is not expected to replace traditional moulding entirely, ongoing research aims to enhance its advantages, leading to its universal acceptance and use as a complementary method alongside traditional moulding practices.

Anani Kev. V.P[15]: The study demonstrates the suitability of 3D printing, particularly fused deposition modelling (FDM), for producing completed and functionally consistent products with good sealing properties using a variety of polymers, even with inexpensive personal 3D printers. However, optimal printing parameters may vary depending on factors such as the printer model and filament material. Product properties can be influenced by factors like feeder construction, the presence of a closed case, heating mode of the working platform, and extruder cooling system. Nevertheless, with proper optimization of printing conditions, commercial desktop 3D printers can produce sealed containers for various applications. The proposed quality assessment procedure enables gradual improvement of 3D printed object quality by addressing structural defects, offering a pathway for enhancing overall product quality.

RAMAKRISHNA[16]: The review emphasizes the significant role of additive manufacturing (AM) techniques in various industries, particularly in biomedicine where they have revolutionized the production of customized implants, surpassing traditional methods. AM has become a cornerstone of contemporary manufacturing, offering innovative solutions and transforming manufacturing approaches across diverse fields. The versatility of AM applications has led to its widespread adoption and highlighted its transformative impact on the manufacturing landscape. The maturity of AM technologies enables rapid and precise solutions to critical health issues, particularly in tailoring implants and medical devices to individual patient needs, thus showcasing the potential for personalized healthcare solutions. However, the review also acknowledges the inherent limitations of technological advancements, underscoring the need for continuous improvement and innovation in additive manufacturing for biomedical applications.

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Remus 's .M[17]: This study introduces a procedural framework for dental educational institutions with access to both a CBCT unit and a stereolithographic printer, offering a practical solution for producing tooth replicas tailored for endodontic training. These replicas, leveraging the precision of 3D printing, serve as valuable educational tools by faithfully replicating dental structures and enhancing the overall training experience. The workflow's universal applicability allows for seamless integration into various dental educational settings, requiring only basic infrastructure. Emphasizing accuracy in the printing process, the replicas are suitable for undergraduate students to develop skills in endodontics. Feedback from students highlights the efficacy of standardized tooth replicas, ensuring fairness and uniformity in training, and aligning with contemporary educational practices focused on consistency and precision. This amalgamation of technology and educational needs contributes to the advancement of endodontic training within dental institutions.

VAN HOUTUM[18]: This paper introduces a comprehensive model for evaluating two production methods for system components with different designs but identical functionality, focusing on additive manufacturing's potential advantages over traditional methods. Emphasizing increased design flexibility and reduced production lead times, the model serves as a valuable tool for assessing trade-offs and benefits between these approaches. Additive manufacturing offers amplified design freedom and potential performance benefits, along with promising implications for after-sales service efficiency due to reduced production lead times. Overall, the model provides critical insights into practical considerations and advantages of incorporating additive manufacturing into system component production.

Christer W[19]: This study focuses on understanding the effects of voids on the structural properties of components manufactured through fused deposition modelling (FDM). The presence of voids significantly impacts structural behaviour, particularly contributing to anisotropy, yet the exact magnitude of this effect remains unquantified. To address this gap, the study introduces a novel statistical method to evaluate the minimum residual cross-section as a baseline model for quantifying the strength reduction caused by process-induced voids. This method is crucial for predicting the decrease in ultimate tensile strength in transversely printed specimens compared to solid or longitudinally printed ones.

Hitesh[20]: This paper presents a method for manufacturing high-performance ceramic (HPC) parts using solvent-based slurry stereolithography (3S) and subsequent sintering. Zirconia, the structural material, is combined with methyl alcohol solvent, waterborne inorganic pigment dispersant, and visible-light-curing resin organic binder to create the slurry. The photocuring process, facilitated by a visible-light projector, enables layer-by-layer deposition, forming a three-dimensional object. After high-temperature sintering reaching up to 1600 °C, densification occurs, resulting in a robust HPC part with elevated material strength. This system allows for the production of intricate zirconia ceramic parts with remarkable precision, eliminating the need for support structures for overhang features. The method achieves fine-detailed shapes with a resolution as fine as 30 μm. Mechanical properties, including flexural strength, density, and average roughness, were thoroughly examined, demonstrating the potential of this methodology for fabricating HPC parts with precision and enhanced material strength.

CONCLUSION

The literature reviewed provides a comprehensive understanding of the design, analysis, and optimization of carburettors, particularly in the context of two-wheeler vehicles. The studies cover various aspects, including traditional and modern carburettor designs, material choices, manufacturing techniques, and performance evaluations. The findings reveal a continuous effort towards improving carburettor functionality, efficiency, and environmental sustainability. While traditional carburettors remain prevalent due to their simplicity and cost-effectiveness, modern advancements such as computational fluid dynamics (CFD) simulations, rapid prototyping, and additive manufacturing techniques offer opportunities for enhancing performance and addressing environmental concerns. Additionally, studies exploring alternative

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materials like eco-friendly plastics and ceramic composites highlight the importance of material innovation in carburettor design. Overall, the literature underscores the significance of ongoing research and innovation in optimizing carburettor performance to meet the evolving demands of the automotive industry, balancing efficiency, cost-effectiveness, and environmental considerations.

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