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A SUSTAINABLE APPROACH WITH 3D PRINTING AND SOLIDWORKS

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Abstract *– This article explores the use of 3D printing and SolidWorks software for the restoration and modification of tools. The project focuses on the repair of a broken DEWALT DCF610S2 screwdriver. The article details the process of converting the screwdriver into a car window mechanism tester, including the design and fabrication of a special connector holder using SolidWorks. The ANYCUBIC KOBRA 2 Max 3D printer and corresponding slicing software were used to print the complex parts with support material.*

Keywords *3D printing, SolidWorks, DEWALT DCF610S2, tool restoration, car window mechanism tester, ANYCUBIC KOBRA 2 Max, connector holder design, rapid prototyping, product lifecycle extension, additive manufacturing.*

Problem statement. The traditional manufacturing and repair processes for tools often result in discarded components and inefficient use of resources when specific parts fail. In the case of the DEWALT DCF610S2 screwdriver, continuous use led to the failure of the motor and speed control, rendering the tool inoperative despite the battery and case being in good condition. This situation presents an opportunity to explore the use of 3D printing and advanced CAD software to repurpose and extend the life cycle of such tools. The challenge lies in designing and fabricating a functional connector holder that can be integrated into a new application, specifically a car window mechanism tester, using 3D printing technology and ensuring the durability and performance of the repurposed tool.

The main part. Today, 3D printing is playing an increasingly significant role in production, design, and conception. It allows for rapid prototyping, customization, and the creation of complex geometries that would be difficult or impossible to achieve with traditional manufacturing methods [1, 2]. One of the most important programs in this field is SolidWorks [3]. This software is

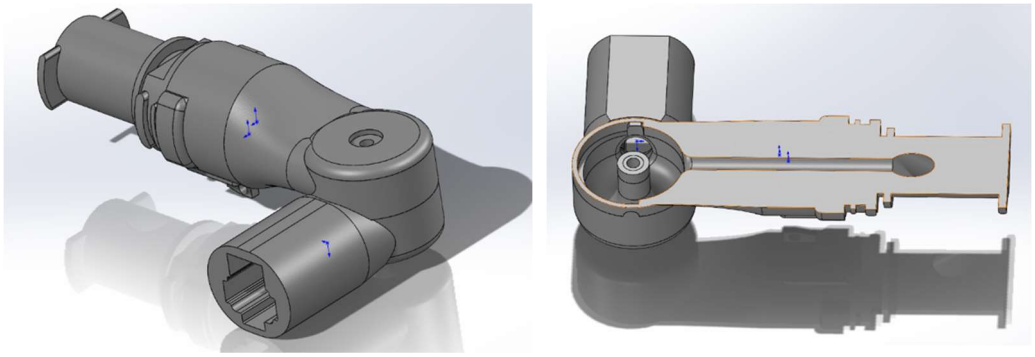
renowned for its user-friendly interface and intuitive features, making it accessible compared to other CAD programs.

As an example, a project involving a broken DEWALT DCF610S2 screwdriver was undertaken (Fig. 1, a). After five years of continuous use, the motor and speed control ceased functioning, although the case and battery remained in good condition. Rather than discarding the screwdriver, it was decided to repurpose it into a car window mechanism tester. This project involved several stages, beginning with the removal of the faulty motor and speed control components. A special connector holder was then designed to fit the new application (Fig. 1, b).

a b

Fig. 1. a. DEWALT DCF610S2 screwdriver; b. Connector holder

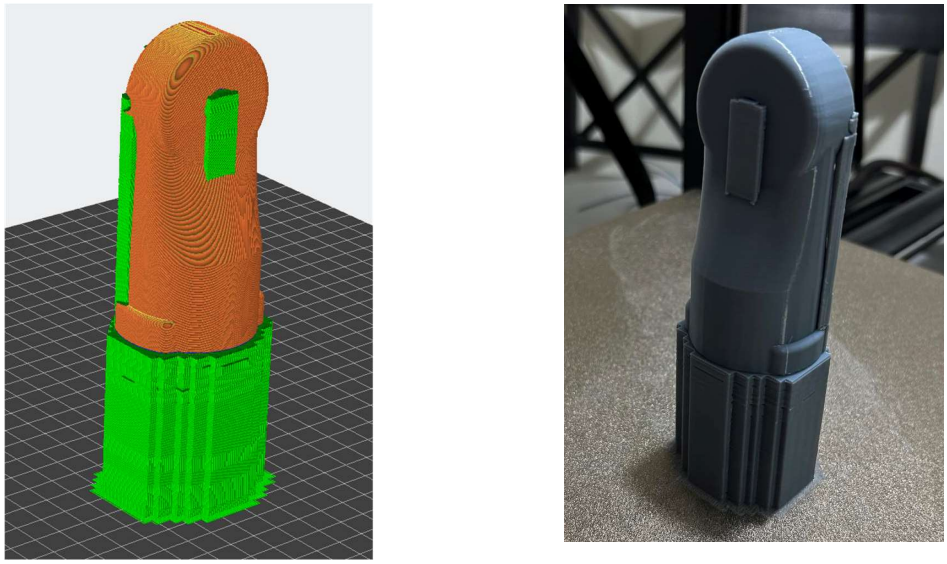
Using SolidWorks, multiple design iterations were created, refining the concept with each version. After several testing phases, the optimal design was identified (Fig. 2, a, b). This version allows the user to operate the tool on the left side or rotate it to the right side, providing flexibility in use. Furthermore, the internal dimensions of the connector holder are designed to accommodate cables of various diameters, enhancing the tool's versatility.



a b

Fig. 2. a. SolidWorks 3D model of the connector holder; b. Cross section of the connector holder

For printing the parts, the ANYCUBIC KOBRA 2 Max printer [4] was used, offering a large build volume suitable for the needs of the project. The AnycubicSlicer [5] software was employed to prepare the print files (Fig. 3, a). Due to the complexity of the part surfaces, support material was necessary to ensure accurate and clean printing (Fig. 3, b).



a b

Fig. 3. a. AnycubicSlicer 3D model of the connector holder; b. Printed connector holder

The final product was tested using a Mercedes Sprinter (Fig. 4). The tests demonstrated that the redesigned tool exhibits high durability and impact strength, indicating that it can withstand the rigors of practical use.

This project serves as a compelling demonstration of the transformative power of 3D printing technology and SolidWorks software in revitalizing and repurposing existing tools. By breathing new life into the broken DEWALT DCF610S2 screwdriver and converting it into a functional car window mechanism tester, the immense potential of innovative thinking in prolonging the lifespan of products and reducing waste was showcased.

Moreover, through meticulous design iterations and rigorous testing, the effectiveness of advanced 3D printing techniques and sophisticated design software in producing reliable and robust solutions for practical use was proven.

As the future is considered, the continued evolution of 3D printing technology promises to unlock even greater possibilities in engineering and manufacturing. From rapid prototyping and custom fabrication to sustainable production practices, 3D printing holds the key to revolutionizing various industries and driving innovation on a global scale. By embracing these advancements and harnessing the creative potential of innovative thinkers, new opportunities will undoubtedly emerge across diverse fields of endeavor.

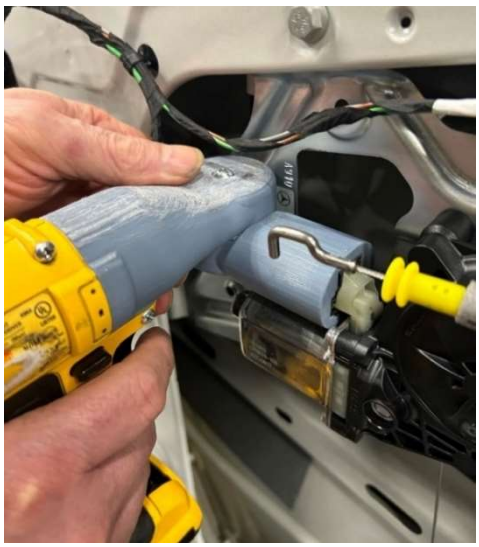


Fig. 4. Connector holder is use

Conclusions. This study demonstrates the efficacy of 3D printing and SolidWorks in repurposing tools, as evidenced by the successful conversion of a broken DEWALT DCF610S2 screwdriver into a functional car window mechanism tester. Through iterative design and testing, the project showcased the adaptability of 3D printing technology, resulting in a versatile and durable tool capable of real-world applications. These findings underscore the potential of advanced manufacturing techniques to enhance sustainability and functionality across industries, paving the way for further innovation in engineering and manufacturing practices.

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