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MODELLING AND 3D PRINTING OF BEARING SEPARATOR

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ABSTRACT
This paper presents a novel approach to the design and fabrication of a bearing separator using computer-aided design (CAD) modelling and additive manufacturing (3D printing) techniques. Bearing separators are essential tools in various mechanical applications for removing bearings efficiently and without damage. Traditional manufacturing methods for such tools often involve complex machining processes, resulting in time-consuming production and high costs. In contrast, the proposed method leverages the capabilities of CAD software and 3D printing technology to streamline the design-to-production workflow, enabling rapid prototyping and customization. Once the CAD model is finalized, it is exported for additive manufacturing using a suitable 3D printing technique and material. Selective laser sintering (SLS) or fused deposition modeling (FDM) are commonly preferred methods due to their ability to produce durable and high-quality parts with complex geometries. The 3D printing process offers flexibility in material selection, allowing for the use of engineering-gradeplastics or metal composites depending on the application requirements.

INTRODUCTION
A bearing is a machine element that constrains relative motion to only the desired motion and reduces friction between moving parts. They are mostly associated with the rotating members. The wide user of bearings is the Automobile industry where the bearings are used in the engines, transmission system, and steering system and in other areas where rotation involves. The mounting and unmounting of a bearing from an engine or from a shaft is a tedious job as the conventional method is hammering which involves lot of human effort and there are many chances for bearings to get damaged. So to reduce these ambiguities the solution is brought with the help of pneumatic systems where air pressure is utilised to mount and unmount the bearings. This is achieved by using a pneumatic cylinder which is operated using a compressor and the plunger of the pneumatic cylinder is fitted with the corresponding pusher or puller depending upon the needs. The pneumatic cylinders are available in different ranges of operating pressures, so depending upon the load requirements the pneumatic cylinder can be chosen. The setup requires only less operating space and it is also portable, so that it can be connected with compressors which may be at different spots in an industry. This also consumes less time thereby increasing the productivity. The control of the Pneumatic cylinder is a hand lever valve which is used to determine forward or return stroke of the plunger fitted with the pusher or puller. The frame is so designed to house an engine casing and provisions for fixing vice to hold shafts. The pneumatic cylinder is fitted vertically by providing two columns in the either sides and a horizontal plate at the top.

LITERATURE SURVEY
Nikolai A. Markov, Ila A. Shipping, Tara V. Brushstroke, "Synthesis of the Position Controller for the Pneumatic Actuator," Siberian Conference on Control and Communications SIBCON, 2009: This paper discusses the advantages of pneumatic actuators over electromagnetically and hydraulic ones for positioning applications.[1]

Rakish Y. Showmanship, Prana y S. Ramekin, "Design and Fabrication of Hydraulic Bearing Puller and Pusher," IJIRST – International Journal for Innovative Research in Science & Technology, Volume 1, Issue 11, April 2015: This journal presents a method for the installation and removal of bearings using hydraulic cylinders and control valves to ensure effective mounting and unmoving.[2]

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A.V. Varanasi: Describes the complexity of press fit operations in machine assembly and the need for heavy force in bearing assembly and disassembly. It emphasizes the importance of maintaining bearing integrity and proposes a hydraulic bearing puller and pusher for safe operations.[3]

Moran Krishna S. A: Discusses the use of hydraulics for bending pipes, rods, and bars. It introduces a hydraulic pipe bending machine as a replacement for conventional bending machines in industries.[4]

Prof R.V. Charybdis: Introduces a full-automatic pipe bending machine supported by a base with four legs and driven by DC motors and chain mechanisms for efficient bending operations.[5]

Prof. Nile Iranian and Prof. A.K. Malleable: Presents a portable rolling pipe bending machine for reliability and easy conveyance, although it is not suitable for mass production due to its slow hand-operated process.[6]

Prof. A. Pandit: Describes a zigzag pipe bending machine operated by a hydraulic bottle jack, specifically designed for making zigzag profile pipes.[7]

Saccharin's Throat: Introduces a hydraulic operated bearing puller for easy bearing removal from shafts, highlighting its effectiveness and ease of use compared to traditional methods.[8]

M. Hume: Develops an analytical model to study the mechanics of continuous plate edge bending in the four roll bending process, focusing on thermoplastic thin plates with arbitrary strain hardening.[9]

Mohammedan G. T: Proposes a hydraulic operated bearing puller based on Pascal's law to provide easy bearing removal from shafts with minimal human effort, highlighting the drawbacks of traditional hammering methods.[10]

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CONCLUSION

In conclusion, the bearing separator major project successfully achieved its objectives of designing and developing a tool to efficiently separate bearings from shafts or housings. Through comprehensive research, analysis, and engineering principles, the project team created a reliable and effective solution that addresses industry needs. The bearing separator demonstrates innovation, functionality, and usability, positioning it as a valuable tool in various mechanical applications. Overall, the project represents a significant contribution to the field of mechanical engineering, offering a practical solution to a common challenge in bearing maintenance and replacement processes. Through careful planning, design iteration, and testing, the project successfully resulted in a functional and reliable tool that meets the desired specifications. The project's conclusion highlights the significance of collaboration, attention to detail, and adaptability in engineering projects, ultimately leading to the successful development of innovative solutions.

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