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DESIGN AND FABRICATION OF CROSS GEARS BY USING FDM 3D PRINTER

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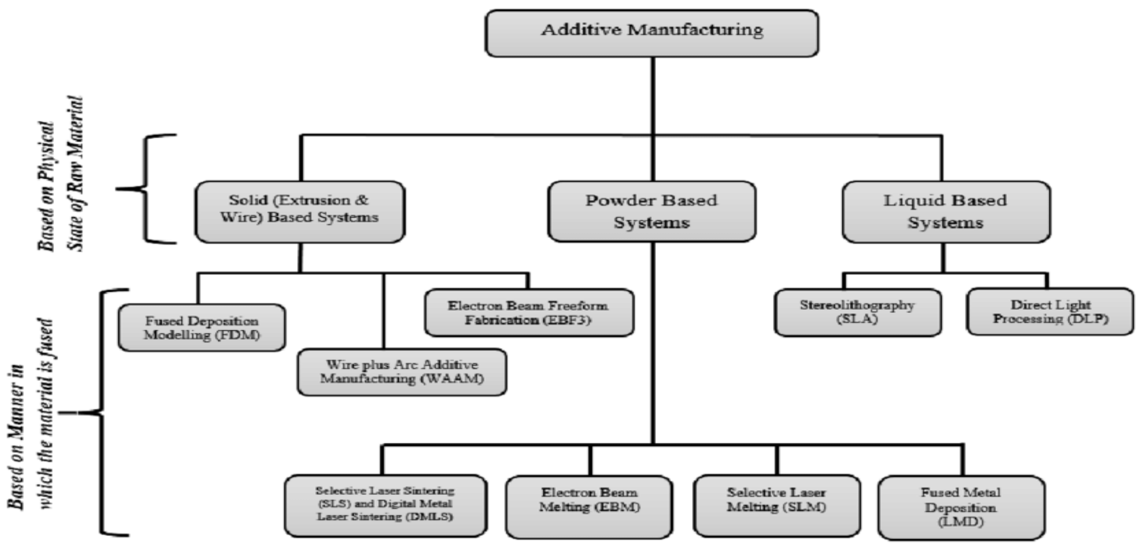
ABSTRACT
FDM (Fused Deposition Modelling) likely aims to provide users with a reliable and efficient 3D Printing product. The primary objective is to offer pre-size and high-quality printing using FDM technology allowing users to create a detailed and accurate prototype or finished products layer by layer. Kobra Neo is a paper shredder designed for efficient document preparation of G-codes, featuring automatic feeding and cross-cut securing capabilities. Kobra Neo product / object design is approximately accuracy of the original product with a minimum (0.09 %) of obstruction. Firstly, the required product/ Object can be designed in a CAD software with our required dimensions with the help of commands like (line, circle, curves, etc..). The completed design of a product can be imported to the STL format. The STL file is transferred to the FDM machine by connecting USD data card the PLA filament is fed into the heat extruder where it melts. The melted material is then extruded through a nozzle and to a built platform. The printer moves the nozzle in the X, Y, and Z axis depositing the material layer by layer according to the designed 3D model in the cad software. The Kobra Neo is a well-known for its fabrication of their products without any doubt of their quality printing products. Kobra Neo is essential for secure document presentation, ensuring confidentiality through its advanced cross-cut shredding technology and automatic feeding features, making it ideal for businesses and individuals seeking data protection. The applications of 3D printing are ever increasing and it's proving to be a very exciting technology like such as Bio-Medical industries, Medical Equipment's and Laboratory machines, etc.

Keywords:
Design, Fabrication, Properties, Applications.

INTRODUCTION

3D printing, also known as additive manufacturing, has a history dating back to the 1980s. The concept originated with Charles Hull, who invented stereolithography in 1983, the first 3D printing technology. This process involved using ultraviolet light to solidify thin layers of liquid resin, creating a three-dimensional object.
Over the years, various 3D printing technologies emerged, such as fused deposition modeling (FDM) developed by Scott Crump in the late 1980s. FDM involves layering melted plastic to build up a model layer by layer. This technology became instrumental in bringing 3D printing to a broader audience.



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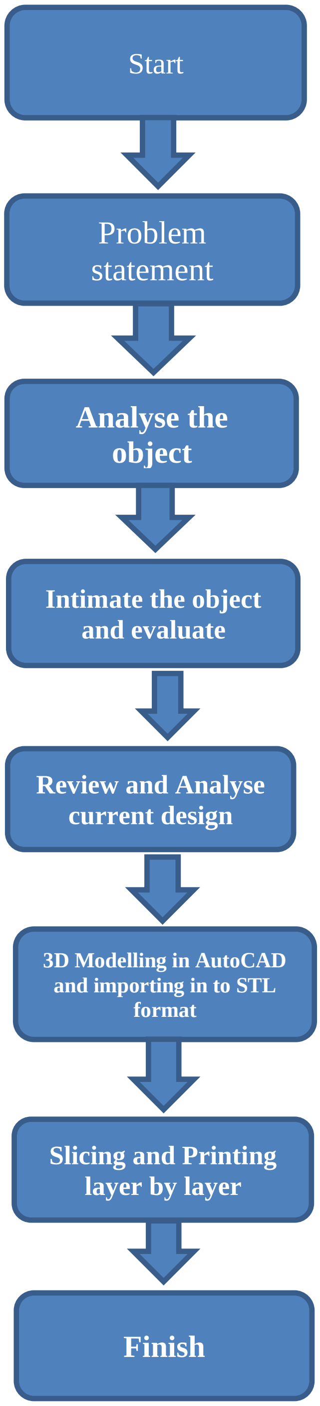
3D printing is changing the way industrial production lines work, which is why some analysts are calling the advent of 3D printers the second industrial revolution. 3D printing is also very popular in the medical field. From bionics to prosthetics and digital dentistry. This is sure to positively impact and transform all aspects of healthcare. Although most of the research is still in the exploratory phase, experts believe that incorporating 3D printing as a tool will revolutionize tomorrow's healthcare.

METHODOLOGY



Design of a Cross Helical Gear:

Crossed helical gears, also known as helical gears with non-parallel, non-intersecting axes, are used when motion needs to be transmitted between non-parallel, non-intersecting axes. Cross-helical gear design requires several parameters, and the calculations depend on factors such as pitch, helix angle, and coefficients. The important parameters and calculations for cross-helical gear design are:

1. Pitch diameter (D): • Pitch diameter is the diameter of the imaginary cylinder in which the gear teeth are placed. • The calculation is performed according to the following formula: D = m/cos(β), where (m) is the elastic modulus and (β) is the torsion angle.

2. Module (m): • Module represents the tooth size of a gear and is defined as the ratio of the pitch diameter to the number of teeth. 38 • m =D / N, where (D) is the pitch diameter and (N) is the number of teeth.

3. Helix angle (β): • The helix angle is the angle between the teeth of a gear and an element parallel to the gear axis. • It is usually given in degrees and can be calculated using trigonometric functions: β= Tan-1(P/3.14D), where P is the axial inclination.

4. Axial pitch (P): Axial pitch is the distance between corresponding points of adjacent teeth along the axis. Calculated as P = m *3.14.

5. Center distance (C): ▪ Center distance is the distance between the axes of two gears.

- C = D1 + D2 / 2, where D1 and D2 are the pitch diameters of the two gears

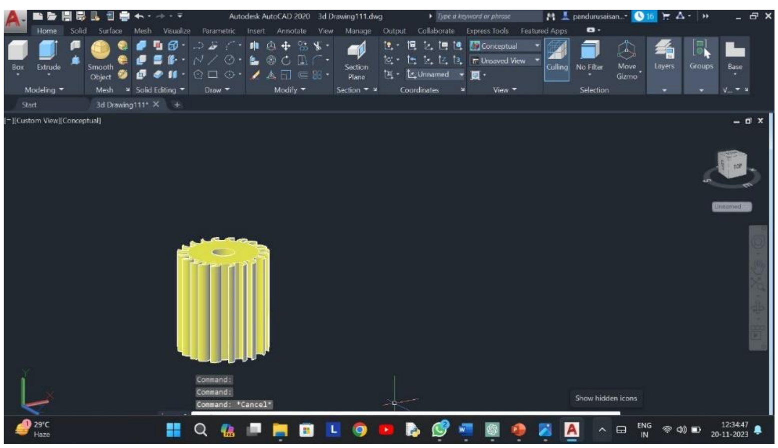


Figure 1.1: Designing a Cross Gear

Design of a C clamp:

A C-clamp, also known as a G-clamp or clamp, is a type of clamping device that is typically used to hold two components together. It consists of a frame with a mechanism with a threaded spindle 41 that can be tightened and loosened to secure or release the object to be clamped. The frame is often shaped like the letter "C", so it is also called a C-clamp.

Frame: The frame is the body of the clamp and is usually a C-shaped design. One end of the C-clamp is fixed and the other end has a threaded hole to accommodate the spindle.

Spindle: The spindle is a long threaded rod that passes through the frame. The spindle typically has a rotating handle or handle on one end and a flat surface or pad on the other end that makes contact with the object being clamped.

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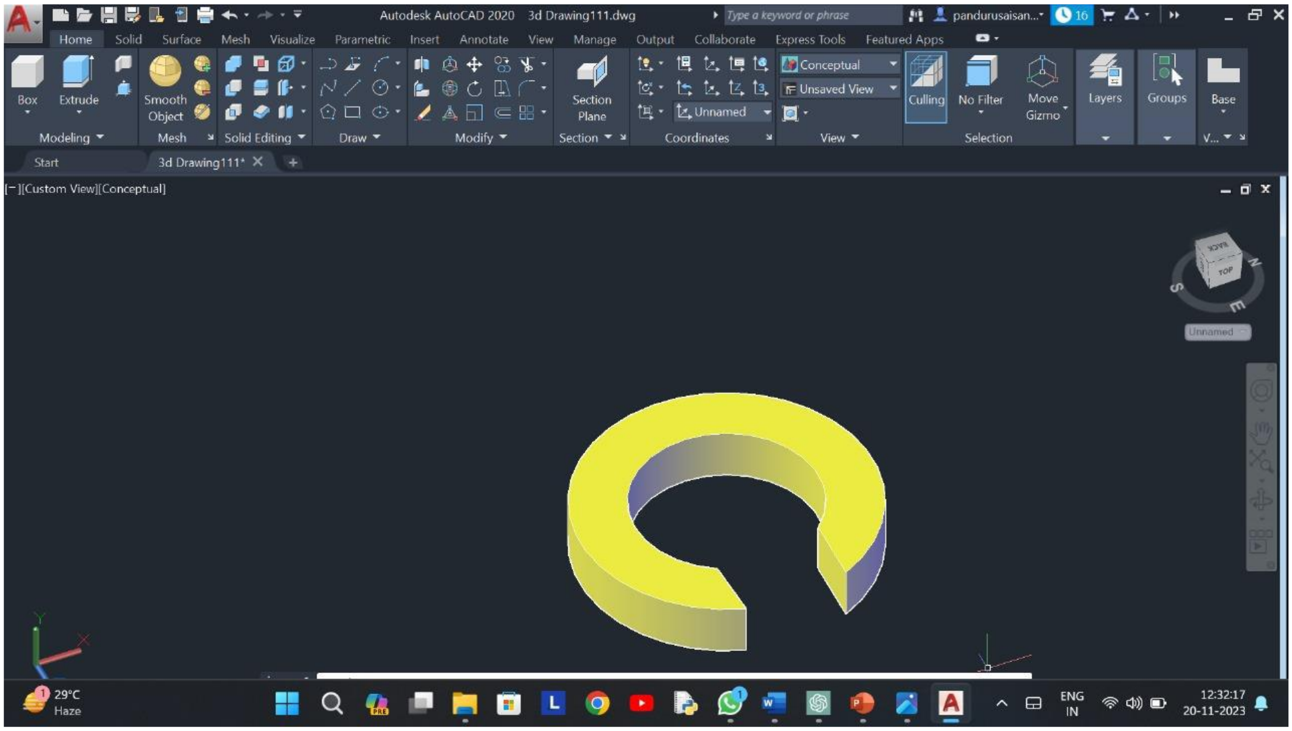

Figure 1.2: Design of a C-Clamp

All components can be drawn in AutoCAD. You can specifically choose which parts can be drawn and exported individually. Convert it to STL format and save it on your PC or computer.

RESULTS AND DISCUSSION:

The FDM machine used PLA material to study the effectiveness of FDM-based 3D printing technology. The filament used in FDM is PLA filament, which has several properties and characteristics. The properties of PLA mean that its solid form can easily transform into a semi-liquid form within the print head. FDM 3D printing machines can provide a limited range of temperatures from a minimum of 160 °C to a maximum of 260 °C. Shear rate range for FDM processing to ensure stability of the 3D printing process. PLA is generally a relatively hard material, and its hardness contributes to its wear resistance. The glass transmission temperature of PLA is relatively low. FDM machines are equipped with even more advanced work technology. These printing machines allow you to design and manufacture various types of 3D objects in environments that are not economical in today's world.

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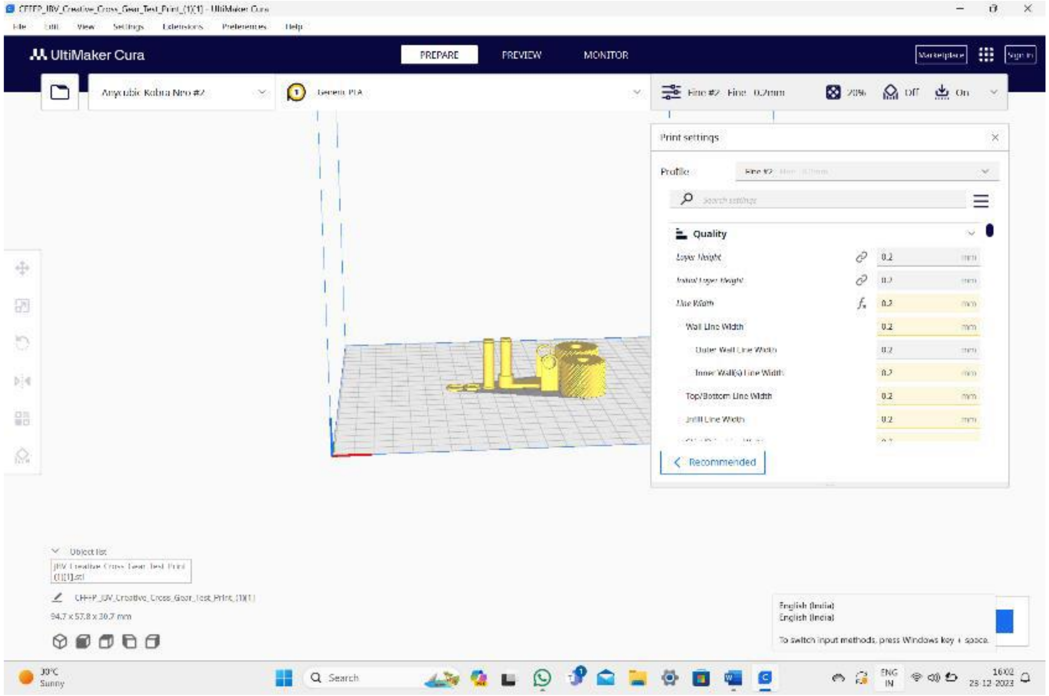

Figure 1.3: Input of a Components


Figure 1.4: Output of a components

CONCLUSION

Currently, 3D printing processes belong to the mechanical engineering industry. It brings many benefits to the industry. In this sense, further data are anticipated to advance this method and improve the acceptance of 3D printing methods. Further data on 3D printing methods will help companies modernize and improve their 3D printing innovation framework. Therefore, this article provides an overview of his 3D printing manufacturing methods, materials, and types of applications in different industries. This article will help academics, researchers, and scientists conduct extensive research on 3D printing manufacturing techniques and materials suitable for specific applications. Regarding the composition of filament material, extrusion processing parameters, e.g.: B. extrusion speed and temperature, FDM machine specifications, extrusion machine specifications, filament polymer type, and his FDM working parameters

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when printing filament.

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