JMM: Journal of Mechanical and Manufactur
Vol. 3 No 2, April 2024, pp. 109-114
DOI:
e-ISSN: 2829-4424

BEAT MOTORCYCLE CONECTING ROD MOLD DESIGN USING MASTER CAM X5 AND INVENTOR

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ABSTRACT

In its development, every manufacturing industry increasingly makes people think more creatively and are faced with new problems, especially in making new innovations. The aim of these production problems is to achieve production targets more quickly and efficiently. The metal machining process is an important factor to support the final quality of the product, but there is one obstacle that must be faced, how to determine the appropriate manufacturing process to make a product with better accuracy.

The increasing development of technology in the casting manufacturing sector due to consumer demands for better quality encourages the industry to innovate, the process of making automotive components, especially connecting rods, currently uses metal molds with the aim of improving the quality of these components. The connecting rod functions to connect the piston to the shaft. This component can be a bridge for combustion power and can be channeled directly to the crankshaft. Please note that a car engine can go fast because the piston hits the crankshaft and the connecting rod which is the connecting rod. Without a connecting rod, the car will not be able to accelerate optimally

A design process has been carried out to make a connecting rod mold using Master Cam X5, to produce Code G which will be used to make a mold on a CNC machine. The material used is Alamunium 2024.

Keywords: Master Cam X5, Connecting rod, Aluminum, Cad Cam.

Submitted: 2024-03-01	Revised: 2024-03-01	Accepted: 2024-04-01

Introduction

The Manufacturing (Machinery) industry is currently developing very rapidly in line with the needs of service users or producers. Companies are required to innovate to develop technology to make it more effective and efficient. One of the manufacturing industries that is required to continue to innovate is the industry that operates in the machining sector. One of the machining products that is difficult to manufacture is gear components, so a technology is needed that is able to reduce the occurrence of human error.

Many factors influence the occurrence of an error in the process of making a machining product, especially since the manufacturing process uses automatic technology, that is, it is carried out based on program movements that have been made. To produce a program so that the results of the component manufacturing process are accurate, you need to design the correct drawings. Currently, the Machining Industry is already using a lot of industrial application-based software such as Mastercam software. Mastercam can produce G-Code from images created during the simulation process.

Connecting rods play an important role in the transmission system because they produce more efficient transmission power than other transmission methods such as belts and so on. Connecting rod design requires accuracy, especially in terms of surface smoothness because it will rub against the shaft [1].

Connecting Rod

Connecting rod is one of the important components in the engine combustion system. This component functions to support the performance of the piston in the vehicle.

Connecting rod (piston rod) is one of the component parts of a car engine, namely the piston. As the name suggests, the piston rod is shaped like a rod with a size that adjusts to the engine capacity. The performance of the connecting rod is assisted by several components. These include rod eye, shank, crankshaft journal bore, cap, bolt, big-end bearing, and piston pin.

Apart from that, the connecting rod material is also different because it is adapted to the purpose of the vehicle. For example, cars produced for racing have titanium piston rods. Meanwhile, cars used for daily mobility usually have piston rods made of metal and aluminum.

Connecting rod parts

Connecting rod has two main parts, namely the small end and the big end. The following is a complete explanation.

1. Small End

The small end is located at the top with a small diameter, precisely at the end of the piston rod. The small end plays an important role in connecting the piston with the connecting rod. To carry out this function, there is a piston pen that is inserted into the piston hole and small end hole.

2. Big End

The big end has a larger diameter than the small end. The big end is not directly connected to the piston because it is at the opposite end.

Apart from that, the big end will also connect the connecting rod to the crankshaft. The big end is directly connected to the crank pin (crank pin) which can make high rotations, causing the potential for overheating. To prevent overheating, the connecting rod and crankshaft joints are provided with a sliding bearing equipped with lubricant. So, the two touching parts can be cooled.

2.10.2 Connecting Rod Material

The materials used for connecting rods vary widely, including carbon steel, iron base sintered metal, micro alloy steel, spherical graphite cast iron. In mass-produced automotive engines, connecting rods are usually made of steel. In high performance applications, "billet" connecting rods may be used, which are made from solid metal billets, rather than cast or forged.

Other materials include T6-2024 aluminum alloy or T651-7075 aluminum alloy, which are used for their lightness and ability to absorb high impact at the expense of durability. Titanium is a more expensive option that reduces weight. Cast iron can be used for cheaper, lower performance applications such as scooter motors.

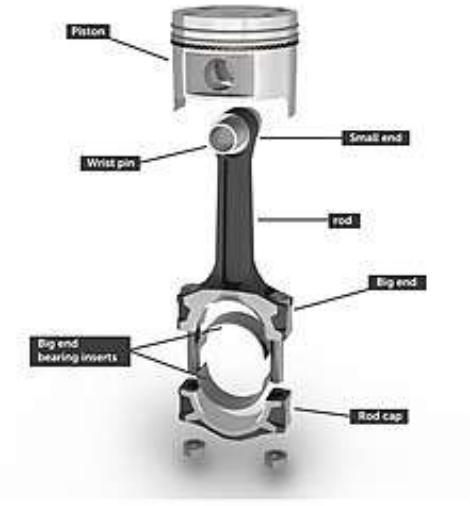

Figure Connecting Rod Parts

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CAM (COMPUTER AIDED MANUFACTUR)

Currently there are many computer workstations such as windows which are PC-based; some CAD systems can also run on UNIX or LINUX operating systems. For somewhat complex production plans, high-speed (and possibly multiple) CPU machines with large amounts of RAM are recommended. Human and computer interface via a computer mouse but also via a pen and digitizing graphics tablet. Manipulation of the model image on the screen can also be done using the spacemouse/spaceball. Some systems also support stereoscopic glasses for 3D model images.
There are 2 types of CAD (computer aided design) software. 2D design software allows the designer to design shapes with very limited 3D properties.
1. Draw a 2D model using TechSoft 2D design software.
2. After the design is completed, the image will be processed. Converts the drawing to more detail on a series of X, Y, and Z coordinates. Processing must be done before the CNC machine cuts the design from the material. When the CNC machine forms the cutting material based on coordinates, sequentially until the desired shape.
3. CAD/CAM software allows designers to manufacture designs on a single computer instead of making actual ones. Design testing using the 'Simulation' software ('CAD/CAM Design Tools' software).

When the design is run through the simulation software, the computer displays the manufacturing process on the screen. Also check whether the design can be manufactured successfully or not. Many designs are changed before they can be made by a CNC machine.
4. After all the testing and repairs for the design have been carried out, the last one is manufacturing.

Master Cam

Mastercam is software used to describe or plan machining processes virtually through a computer screen. The results of the machining process planning are then used as a guide in programming CNC (computer numerical controlled) machines. Mastercam was developed in Massachusetts in 1983. The company that developed Mastercam was CNC Software, Inc. which is one of the oldest computer-aided design/computer-aided manufacturing-based PC software developers. CNC Software, Inc. currently located in Tolland, Connecticut. Currently Mastercam is growing widely and is often used both in industry and education.

Basic elements of the machinery process

Based on technical drawings, where the geometric specifications of a machine component product are asked, one or several types of machining processes must be selected as a process or sequence of processes used to make them. For this reason, it is necessary to understand the five basic machining processes, namely:

Cutting speed	V (m/min)
Feeding speed	V_f(mm/min)
Depth of cut	a (mm)
Cutting time	tc (min)
Furious earning speed (Rate of metal removal)	Z (cm^3/min)

The basic elements of the machining process are calculated based on the dimensions of the workpiece and tool and the size of the machine tool.
The basic elements of the lathe process can be known or calculated using the formula.

Basic elements can be calculated with the following formulas:

Cutting speed	: v=(π.d.n)/1000;m/min where d=diameter
the average, namely	: d=(do+dm)/2;mm..
Feeding speed	: v_f=f.n ;mm/min.
Cutting time	: tc=l_t/v_f ; min.
Feeding speed	: Z =A.v.

Where, the cross section was furious before it was cut
A=f.a ;mm^2. Then Z=f.a.v ;cm^3/min.

Research Method

To facilitate the research process and flow, it is necessary to determine the methods used so that the expected results are maximized.

Tools and Materials

Tool

The equipment used in this study are as follows:

a. Laptops

b. Software Master Cam X5

Materials

The materials to be used in this study are as follows

a. aluminum

The method used in this study is the analytical method, which is a method used to predict a component or design by analyzing the design with the required analytical methods. In this case the simulation uses MasterCam X5

Research Procedures

The research procedure to be carried out in this study is as follows:

a. Making technical drawings

Technical drawings are needed to visualize the product to be made.

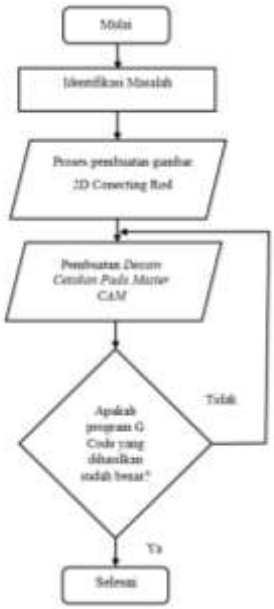
b. Gear Manufacturing Village

c. Analysis and simulation

The analysis is carried out to see the machining process used in the component manufacturing process, while the simulation is carried out to see how the component is produced so as to produce a product that is in accordance with the technical drawings.

Research Flowchart

To simplify the design process of the gear manufacturing process and the simulation process using MasterCam, a flow chart is made as follows



Mold Design Steps

The design and simulation of making this Connecting rod mold using Mastercam X5 to produce G-Code is explained in several stages:

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Figure Connecting Rod Honda Beat Motorcycle

2D Drawing Process using AutoCAD

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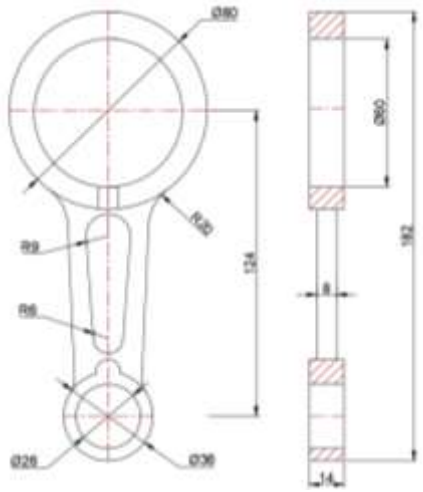
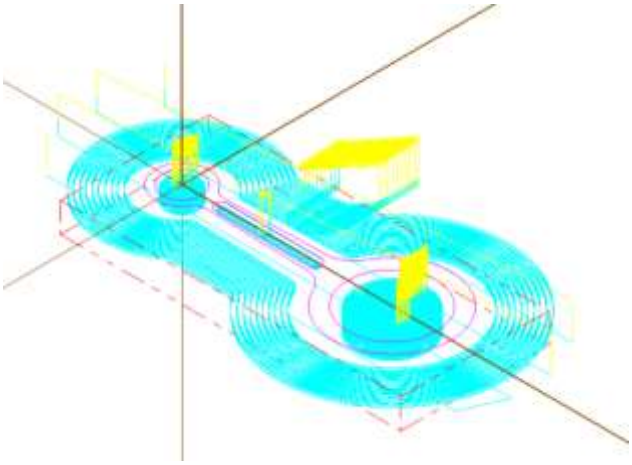


Figure Connecting rod mold design using Inventor

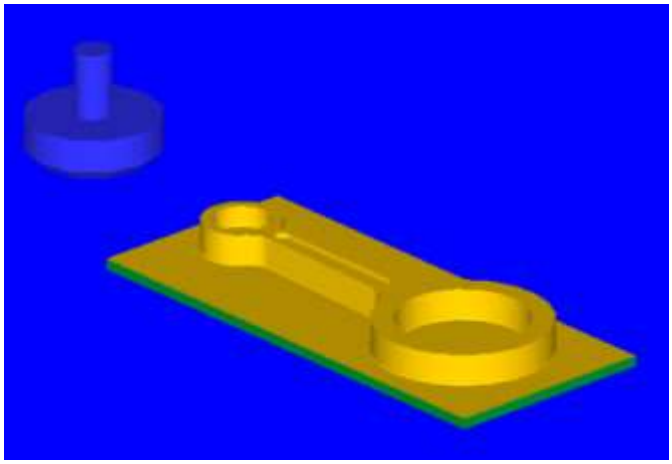
Results and Discussion

The steps for drawing prints are as follows:
1. Connecting rod design
Drawing process
Simulation Results



The parameters used to carry out the facing process include:
1. Chisel diameter 50 mm
2. Feed rate 305 mm/put
3. Spindle speed 760 rpm

Simulation results of the facing process



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