IJARSCT

ISSN (Online) 2581-9429

IJARSCT International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

Volume 2, Issue 8, June 2022

Impact Factor: 6.252

Automated Portable Hammering Machine

Prof. Govind Devke[1], Mr. Vinayak Sonawane[2], Mr. Arjun Patare[3], Mr. Akash Kolte[4], Mr. Shubham Kamble[5]

Assistant Professor, Mechanical Engineering, NBNSSOE, Pune, India[1]

UG Student, Mechanical Engineering, NBNSSOE, Pune, India[2,3,4,5]

Abstract: *This paper discusses cad modeling, design and analysis of automatic hammering machines. Our goal for this paper is to design and fabricate an automatic hammering machine. And for this, we have calculated the maximum torque, impact velocity for hammering, torque force and also shear failure in the bolt joint. In our project we are using torque force to perform various manufacturing operations in industries like riveting, upset forging, punching etc. Also, time required for operation is less so it is useful in mass production. In this project we have prepared a solid model of project assembly by using Solid works software. The snapshots of every component are attached in the file in the design section. The model consists of a motor, shaft, hammer, jigs and fixtures. From this we fabricate a conceptual model of an automatic hammering machine. Automatic portable hammering machine is one of the new techniques proposed in design in order to achieve instant Hammering accurate repetition and impacting, fast hammering process. It should be user friendly without any risk and worker manual Effort can be used easily automatically. In the past, labor used a hammer to drive nails, fit parts, break apart and more. It would be used manually with more effort and manpower used in the process. But nowadays it is possible to make the process easy by inventing automatic Hammering. There are very clear benefits that the industry sees while using automated systems. These advantages can be very beneficial in the long run. We assure that our products are one of the best and they are long lasting.*

Keywords: Instant Hammering, Connecting Rod, Shaft, 16V Battery, Disc, etc.

I. INTRODUCTION

This project is intended to design and manufacture a simple rotor test rig, where rotor faults can be inserted and tested. The test rig is to be fitted with vibration sensors to enable collecting data and use it to monitor the health of machines. The project is very important to the industry as through understanding the characteristics of failure, time and money will be saved. This is also very important from the safety perspective as this will lead to a safe operating environment for rotary machines.

II. LITERATURE SURVEY

"Design, Cad Modeling & Fabrication of Automatic Hammering Machine" by Abhijeet Dhulekar, Suyash Shirbhate, Rizwan Shaikh, M V Ingalkar International Research Journal of Engineering and Technology (IRJET) Volume: 05 Issue: 04 Apr-2018.In this paper we have studied about cad modeling, design and analysis of automatic hammering machine. The goal for this paper is to design and fabricate an automatic hammering machine. And for this, they have calculated the maximum torque, impact velocity for hammering, torque force and also shear failure in bolt joint. In their project they are using torque force to perform various manufacturing operation in industries like riveting, upset forging, punching etc. Also, time required for operation is less so it is useful in mass production. They have successfully calculated the torque force of the motor. For the design the impact velocity and torque force for riveting of 2 mm rivet is calculated accurately.

"Design & Fabrication Of Automated Portable Hammering Machine" by Rahul Kumar, I.Vijay kumar, G.Prudhvi Raj, N.Venkatesh, K.Reehnadhvi published by JETIR March 2019, Volume 6, Issue The aim of this research paper

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 8, June 2022
Impact Factor: 6.252

is Hammering is the most widely used industrial as well as construction activity.
Hammering or screws, metal sheets, parts etc. requires a lot of time and effort. So here we propose an automated hammering system that allows for fully automatic hammering process. This allows for accurate, fast and automated hammering wherever and whenever needed using a 24V&25W dc motor. We can use Photo electric sensor for metal detection purpose at workpiece bed. The person just needs to insert workpiece and start the hammering machine. We are using dimmer stat for voltage control which is connected to dc motor so that we can control speed of the hammer motion.

"Analysis of hammer movement based on a parametrically excited pendulum model" by Ken Ohtaa, Koji Umegaki, Koji Murofushic, Zhi Wei Luod and published by Procedia Engineering Volume 2, Issue 2, June 2010, Pages 3197-3203. In this research paper we have studied that the Motions of the hammer were analyzed to understand the mechanism of acceleration with a hula-hoop model using an energy pumping mechanism. The condition that makes the time derivative of the energy positive is derived as energy pumping for hammer. The condition is expressed in terms of the tugging force times velocity to pump the hammer energy. In this study, motions of the hammer were analyzed and numerical experiments were performed to examine the validity of the theory.

"The Pattern of Hammer Speed During a Hammer Throw and Influence of Gravity on Its Fluctuations" By Jescjs Dapena Published by Department of Exercise Science. University Of Massachusetts, Amherst, Ma 01003, U.S.A. Hammer speed at release is one of the most important factors contributing to the distance of a hammer throw. Hammer speed follows a generally increasing trend during the throw, with one fluctuation per turn. The purpose of the present paper was to quantify the influence of gravity on the speed fluctuations. Eight experienced hammer throwers were studied with three-dimensional filming methods. Instantaneous values of hammer velocity and speed were calculated from the film data.
The rate of change of hammer speed due to the tangential component of gravity was computed, and integrated to calculate the accumulated contribution of gravity to hammer speed at all instants of the throw. These values were subtracted from the corresponding values of hammer speed. The amplitude of the fluctuations was reduced in the corrected speed functions, indicating a contribution of gravity to the original fluctuations. However, the fluctuations were still clearly present in the corrected speed functions, indicating the existence of other causal factors.

"A vertical automated forging center for the plastic deformation of continuously-cast ingots" by S.P. Burkin, E.A. Korshunov, V.L. Kolmogorov, N.A. Babailov, V.M. Nalesnik and published by Journal of Materials Processing Technology 58 (1996) 170-173 Received 20 November 1994. This paper presents a new approach to designing forging machines and technological processes not realized by means of modern multi-purpose forging machines. In the present work, the authors have studied the radial swaging with shear of hollow ingots, and the transformation of a hollow ingot into a solid forging by a multi-die swaging unit. The results of these investigations have been used to design regimes of multi-die forging and new forging machines.

"Arduino Operated Portable Hammering Machine" by Dhruv Patil, Vedant Shah, Satyam Singh and Vedant Thakur and published by EasyChair Preprint No 7400 February 1, 2022. In this project we studied the different method project aims at designing and fabricating an automated hammering machine that can perform hammering operations without the involvement of any human operator. This project is selected because no such machines with speed control using Arduino are available in these industries. The introduction of an automated hammering machine in the industries will help the industries in prospering and it will make the operations safe and easy. Moreover, the project will have a greater impact on the metal industries.
The machine will be capable of performing fast and accurate hammering operations with the help of a 220-household supply. Mild steel is used for fabricating the machine. A large pulley and a shaft are connected with

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 8, June 2022
Impact Factor: 6.252

the help of a connecting rod. The spinning shaft will provide lateral motion to the rod. A mid-swinging arrangement is used for attaching the hammer and the connecting rod. A suitable bed will be developed for holding the work piece. Autodesk Inventor is used for designing the machine.

III. IMPLEMENTATION

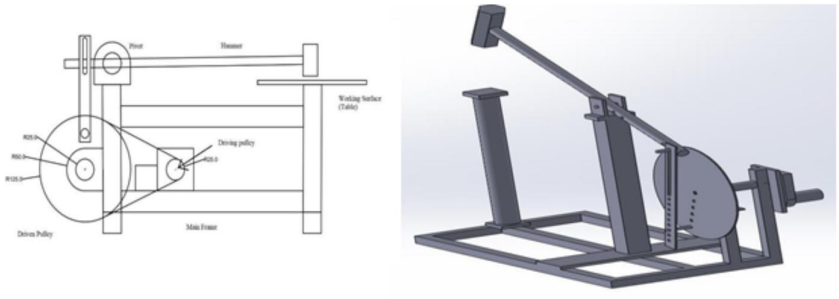


Figure 1: Block Diagram

In this above figure 1 we have proposed the design of Automated Portable Hammering Machine. In which we have the Design the model in the Solidworks CAD Software. The Components which we have using in the model are Frame, Shaft, Hammer, DC Motor 12V 15A 30rpm, Adapter 15A, Ball Bearing, Connecting Crank and Disk. This are the Components which we are using to Design and Manufacture the model.
The most reliable design of automatic hammering machine is described below along with their specification in order to show the different existing approaches to the small and portable automatic hammering concept. These data could be useful when performing the initial sizing in the design stage of the automatic hammering machine project. Following are 13 designs for initial data collection.

Hammering Machine

The advance cam operated hammer is a device which can be used for multi- purpose operations by either automatically or manually. It is mainly used for hammering of work piece. It can also be used for various purposes such as punching, forging, bending, etc. This advance cam operated hammer is very essential for doing number of such operations like crushing, riveting, hammering of larger work piece and cutting of metal. As in forging industry, the temperature of forging operation is very much higher and it is very difficult to do manual hammering over the forging metal by manually or hand and also there is always a risk while handling such type of high temperature base metals or wok piece. So advance cam operated hammer neglects this type of problems in industry.

IV. CALCULATIONS

- Hammer Length: 590 Mm
- Hammer Stroke Height: 350 Mm
- Hammer Weight: 1500 Gram
- Total Weight: 15 Kg
- Weight: 300 Mm
- Height: 460 Mm
- Length: 600 Mm
- Disc Thickness: 3mm
- Diameter Of Disc: 250mm
- Adaptor: 12v 15amp
- Motor: 13*40 Gear 12v 30rpm Dc Motor
- Length Of Linkage: 300mm

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 8, June 2022
Impact Factor: 6.252

To calculate maximum torque by a motor

Motor rating Given data N=30RPM I=15A V=12V

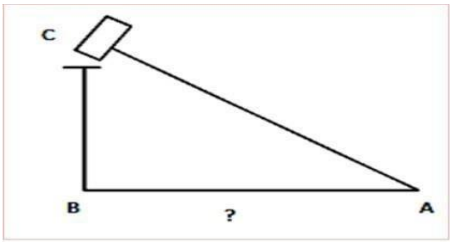
Power Transmitted by Motor

P=V×I P=12×15 □ P= 180W

Then, to find torque produce by motor P = 2ΠInt/60

□ 96= 2π30×T/60

□ T=57.30 N.m



By using Pythagoras theorem, we have,

Length of CA = 400MM Length of BC = 160MM (AB) 2 + (BC) 2 = (CA) 2

(AB) 2 + (160) 2 = (400)2 (AB) = 366.60 MM

To find torque force transmitted we have two cases Case 1: When Hammer Moves Downward.

Given:

(BC) = h = 160 mm = 0.160 mm

Maximum torque = 57.30 N-m =57.30×103 N-mm Length of hammer rod = 420 mm = 0.42 m Torque Force = Ƭmax × Length of hammer rod ×g

Tf = (57.30/0.160) × 0.42 × 9.81

Tf = 1430.422 N.m

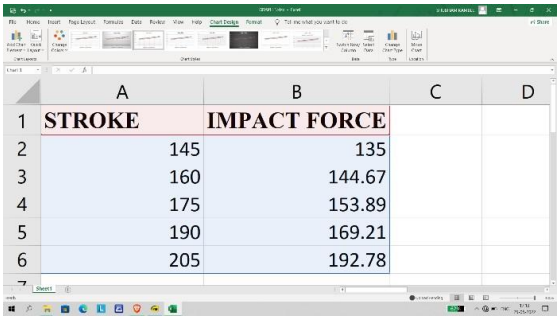
Case 2: When Hammer Goes Upward, Torque Force Will Be Decreased

TF = Ƭmax × Length of hammer rod – Weight of hammer h

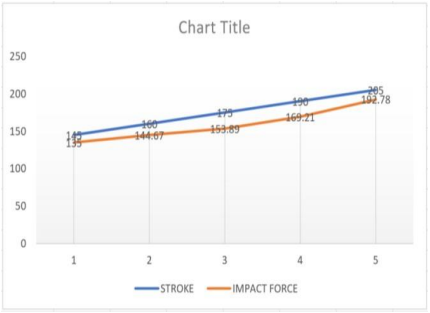
Tf = (57.30/0.160) × 0.42 – 14.71 = 135.70 N-m

V. RESULTS

CASE 1: IMPACT OF FORCE WITHOUT WORKPIECE.



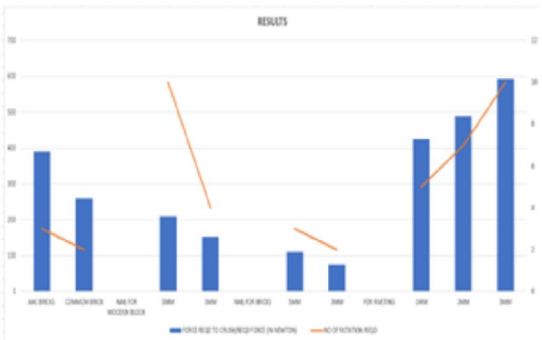
	A	B	C	D
1	STROKE	IMPACT FORCE		
2	145	135		
3	160	144.67		
4	175	153.89		
5	190	169.21		
6	205	192.78		



IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 8, June 2022
Impact Factor: 6.252

CASE 2: IMPACT OF FORCE WHILE HAVING WORKPIECE

	A	B	C
1	COMPONENTS	FORCE REQD TO CRUSH/REQD FORCE (IN NEWTON)	NO OF ROTATION REQD
2	AAC BRICKS	390	3
3	COMMOM BRICK	260	2
4	NAIL FOR WOODEN BLOCK		
5	5MM	210	10
6	3MM	153	4
7	NAIL FOR BRICKS		
8	5MM	110	3
9	3MM	75	2
10	FOR RIVETING		
11	1MM	425	5
12	2MM	490	7
13	3MM	592	10



VI. CONCLUSION AND DISCUSSION

We have successfully calculated the torque force of the motor. The entire modelling of the project is done with the help of SolidWorks. In this addition to this, the project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding. Planning, purchasing, assembling and machining while doing this feel that the project work is good. We are proud that we have completed the work with limited time successfully Automatic hammering machine is working with satisfactory condition. We have done to knowledge and research on the papers with our ability.

REFERENCES

[1] "Design, Cad Modeling & Fabrication of Automatic Hammering Machine" by Abhijeet Dhulekar, Suyash Shirbhate, Rizwan Shaikh, M V Ingalkar International Research Journal of Engineering and Technology (IRJET) Volume: 05 Issue: 04 Apr-2018.

[2] "Design & Fabrication Of Automated Portable Hammering Machine" by Rahul Kumar, I.Vijay kumar, G. Prudhvi Raj, N. Venkatesh, K. Reehnadhvi published by JETIR March 2019, Volume 6, Issue 3

[3] "Design of Machine Elements Third Edition" by V B Bhandari published by Tata McGraw Hill Education Private Limited.

[4] "Analysis of hammer movement based on a parametrically excited pendulum model" by Ken Ohtaa, Koji Umegaki, Koji Murofushic, Zhi Wei Luod and published by Procedia Engineering Volume 2, Issue 2, June 2010, Pages 3197-3203. 5) Machine design book RS khurmi& JK gupta for calculation.

[5] "A vertical automated forging center for the plastic deformation of continuously-cast ingots" by S. P. Burkin, E. A. Korshunov, V. L. Kolmogorov, N.A. Babailov, V.M. Nalesnik and published by Journal of Materials Processing Technology 58 (1996) 170-173 Received 20 November 1994.

[6] "The Pattern of Hammer Speed During a Hammer Throw and Influence of Gravity on Its Fluctuations" By Jescjs Dapena Published by Department of Exercise Science. University Of Massachusetts, Amherst, Ma 01003, U.S.A.