

A REVIEW ON “DESIGN AND ANALYSIS OF STRIP AND MAGNET CLAMPING MACHINE”

Mr. Zaheer Shaikh¹ and Dr. Achal Shahare²

¹ MTECH Student (Industrial Engineering), Department of Mechanical Engineering
GHRAET, Nagpur, Maharashtra, India

² HOD Department of Mechanical Engineering
GHRAET, Nagpur, Maharashtra, India

ABSTRACT

Automation is the use of various control systems for operating equipment such as machinery, processes in factories, boilers, steering and stabilization of ships, aircraft and other applications and vehicles with reduced human intervention. Automation has been achieved by various means including mechanical, hydraulic, pneumatic, electrical, electronic devices and computers, usually in combination.

Automation is the conversion of a work process, a procedure, or equipment to automatic rather than human operation or control. Automation does not simply transfer human functions to machines, but involves a deep reorganization of the work process, during which both the human and the machine functions are redefined. Early automation relied on mechanical and electromechanical control devices; during the last 40 years, however, the computer gradually became the leading vehicle of automation. Modern automation is usually associated with computerization.

This paper deals with the design and development of strip and magnet clamping machine used to clamp the work piece. In this project we will be creating CAD model of the Strip and Magnet clamping machine and performing FEA on strip and magnet clamping machine will assist us to know the stresses and displacement on the machine while in operation for its enhancement and development.

Keyword: - Automation, Strip and Magnet clamping.

1. INTRODUCTION

Automation is a set of technologies that results in operation of machines and systems without significant human intervention and achieves performance superior to manual operation. Automation Systems are essential for most modern industries. It has been achieved by various means including mechanical, hydraulic, pneumatic, electrical, electronic devices and computers, usually in combination.

Earlier the purpose of automation was to increase productivity (since automated systems can work 24 hours a day), and to reduce the cost associated with human operators (i.e. wages & benefits). However, today, the focus of automation has shifted to increasing quality and flexibility in a manufacturing process. In the automobile industry, the installation of pistons into the engine used to be performed manually with an error rate of 1-1.5%. Presently, this task is performed using automated machinery with an error rate of 0.00001%.

Industrial automation eliminates healthcare costs and paid leave and holidays associated with a human operator. Further, industrial automation does not require other employee benefits such as bonuses, pension coverage etc. Above all, although it is associated with a high initial cost it saves the monthly wages of the workers which leads to substantial cost savings for the company. The maintenance cost associated with machinery used for industrial automation is less because it does not often fail. If it fails, only computer and maintenance engineers are required to repair it.

Although many companies hire hundreds of production workers for a up to three shifts to run the plant for the maximum number of hours, the plant still needs to be closed for maintenance and holidays. Industrial automation

fulfills the aim of the company by allowing the company to run a manufacturing plant for 24 hours in a day 7 days in a week and 365 days a year. This leads to a significant improvement in the productivity of the company.

Automation alleviates the error associated with a human being. Further, unlike human beings, robots do not involve any fatigue, which results in products with uniform quality manufactured at different times. Adding a new task in the assembly line requires training with a human operator, however, robots can be programmed to do any task. This makes the manufacturing process more flexible.

Adding automated data collection, can allow you to collect key production information, improve data accuracy, and reduce your data collection costs. This provides you with the facts to make the right decisions when it comes to reducing waste and improving your processes. Industrial automation can make the production line safe for the employees by deploying robots to handle hazardous conditions

2. AIMS AND OBJECTIVES

- To automate the strip and magnet clamping process.
- To generate the CAD model of metal strip and magnet clamping machine.
- To perform design and analysis of metal strip and magnet clamping machine.
- To enhance the production rate of company by using metal strip and magnet clamping machine.
- To improve quality, flexibility, accuracy and safety of the process.
- To minimize errors as well as time required for the process.
- To implement semi-skilled labors to the work and save manpower cost

3. LITERATURE REVIEW

[1] **Marko Krsulja, MijicSasa, BranimirBarisic, Zlatan** This paper is based on the design and planning of clamping work holder station for sheet metal part. Technology that supports a collaborative product manufacturing is proposed, developed and implemented in this study. A method of digital planning, based on setup planning and work-holding selection in three-dimension (3D) space was used for clamping of two sheet metal parts of a car body part. With accurate simulation and analysis, it is possible to influence and resolve spatial conflicts and other negative behaviors necessary for positioning and securing of complex shapes made from sheet metal plates. Complexity of given product is analyzed and a solution proposed for a work holding station for the selected manufacturing system. Modelling was performed with Catia software. Interaction design knowledge about the characteristics of the environment and operator has also been included in the design.

[2] **Tushar Jain and Meenu** This paper is based on the automation and integration of industries through computer vision system. In this application, the computer vision system scans manufactured items for defects and provides control signals to a robotic manipulator to remove defective parts automatically. Current examples of medical systems being developed include: systems to diagnose skin tumors automatically, systems to aid neurosurgeons during brain surgery, systems to perform clinical tests automatically etc. The aim of this paper is to show some of the most important vision-related topics which can have a more or less direct impact on the machine vision and industrial automation research fields. The paper covers a general-purpose computer or machine vision systems with its industrial applications.

[3] **J.KrügeR , T.K.Lien , A.Verl** This paper deals with cooperation of human and machines in assembly line . Flexibility and changeability of assembly processes require a close cooperation between the worker and the automated assembly system. The interaction between human and robots improves the efficiency of individual complex assembly processes, particularly when a robot serves as an intelligent assistant. The paper gives a survey about forms of human–machine cooperation in assembly and available technologies that support the cooperation. Organizational and economic aspects of cooperative assembly including efficient component supply and logistics are also discussed.

[4] **Manish Shrivastava, Prof. Jaikaran Singh and Prof.Mukesh Tiwari** In this research article, a comprehensive approach toward industrial automation has been taken. Several methods were evaluated on the basis of cost and performance. In addition to that a new system based on Control Area Network has also been discussed. The proposed system is under development and GUI (graphical user interface) for the same has to be developed. Also, all the technological solutions have been discussed keeping in view Indian scenario and development state in our

country. Despite years of activity, truly open and intelligent control systems seem still to be a promise of the future. Agreement on common architectures and application objects is needed to raise open control systems from exchanging raw data to the level of real interoperability of off-the-shelf components. Future control platforms and programming languages should have new built-in mechanisms that support implementation of intelligent functions, such as flexible resource management and exception handling. This article argues that many of these challenges can be met by taking full advantage of emerging software engineering technologies. This also means that the modeling techniques and design practices of software engineering should be combined with the traditional ways of thinking in automation.

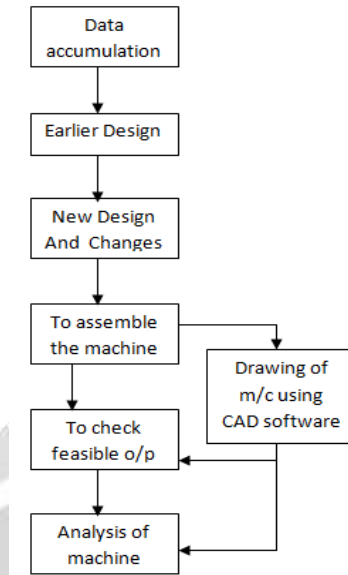
[5] Patrick Curry Automation of difficult and often menial manual tasks is something that all companies in the Ireland will need to consider. The rising cost of labor and increasing global competition will exert pressure on companies that cannot bring their manufacturing costs down. This project required a lot of experimental work that the company could not have had the time or the resources to do and in the respect the university environment was more suitable. Problems in finishing the project were mostly due to the relatively high level of machining and assembling required to make the machine work. There was far more assistance required from the technical I personnel in the college than in other more traditional areas of research. The project brought in a variety of different types of technology to accomplish the task. This may have been stimulating from an educational point of view but caused a lot of difficulty for the company in terms of finding people in -house that had any experience of some of these areas. For instance, there is still no person employed in the firm that knows enough about PLC programming to debug the machine at that level. Also, the use of adhesive equipment is new to them too. This places more pressure on the reliability of the machine as breakdowns may not be easily solved by the maintenance crew in the plant.

4. Identified Gaps in the Literature

Many researchers have presented their work on design and development of special purpose assembly machine considering limited parameters, calculations on mechanism, was also observed during our study. Very limited and small amount of work for design and analysis for strip and magnet clamping has been observed and there is still a need for further work. Understanding the problems this work is mainly focused on design and analysis of strip and magnet clamping machine.

4.1 Plan of work

- 1) Data accumulation.
- 2) Literature survey.
- 3) CAD modeling of Strip and Magnet clamping machine.
- 4) Analysis of Strip and Magnet clamping machine in FEA.
- 5) Result discussion.
- 6) Finalization of the design.



5. Research Methodology

All design data related to the dimensions, material and forces acting on strip and magnet clamping machine, etc. will be fetched from the company. With the help of measuring devices, all the essential measurements will be taken to generate CAD design of the strip and magnet clamping machine. As per design data obtained, a CAD model of machine will be generated by using CAD software SOLIDWORKS. A finite element model of machine will be generated using CAD model in hyper mesh. As per geometry dimensions suitable element configurations will be used for meshing. A modified CAD model of clamping machine will be generated if required by using CAD software SOLIDWORKS. A finite element model of modified design will be performed and comparative study of the result will be carried out. To draw out the conclusion.

6. CONCLUSIONS

Our project involves the design and analysis of the strip and magnet clamping machine. The detailed study of special purpose machine from the sources available has help us to gain deeper knowledge of affecting parameters, mechanism and its working principle etc. By performing design and analysis company will be directly benefited with improved design of clamping machine.

7. REFERENCES

- [1] Parametric Design and Planning of Clamping Work-holder Station for Sheet Metal Part by Marko Krsulja, MijicSasa, BranimirBarisic , Zlatan Car
- [2] Automation and Integration of Industries through Computer Vision Systems by Tushar Jain and Meenu
- [3] Cooperation of human and machines in assembly lines by J.KrügeR ,T.K.Lien , A.Verl.
- [4] A Review on Design and Analysis of Work Holding Fixture by ShivajiMengawade , VaibhavBankar , Pratik P Chaphale.
- [5] Industrial automation – A Review by Prof. Jaikaran Singh, Prof.Mukesh Tiwari, Mr. Manish Shrivastava
- [6] Attila Rétfalvi, MihályStampfer " The Key Steps toward Automation of the Fixture Planning and Design " Subotica Tech, MarkaOreškovića 16, 24000 Subotica, Serbia