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Review on Designing and Development of Loading and Unloading Platform for Two Wheelers

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Abstract: ***Lift is a simple device use to raise the object from ground level to a certain height to perform a specific work with aiming of possible maximum load and minimum efforts. Lifts are generally operated either hydraulic, pneumatic or mechanical type. In many vehicle manufacturing industries, there are using lifting mechanism for loading and unloading operations which have to invest a huge capital for installing a exsisting bulkey and large platform which generally based on hydraulic means. This type of machine uses while export and import business. The main purpose of our study is to design and develop loading and unloading platform for two wheelers. Material selection plays important role in designing a machine and also influence on several factor such as strength, reliability, durability and resistance which leads to increase the life of lift. The aim of the project is to design and development of wire rope operated platform which lifts maximum 877.5 kg load including factor of safety with minimum time and labour for per cycle operation. Platform movement is achieved safely by using wire rope with the help of motor and drum assembly mechanism is of 2.8 m from the ground level. The design is performed by considering a mechanical lift as a portable, suitable for all type of load application and without any hydraulic or pneumatic means. The design is developed keeping in mind that consideration of all safety parameters. Lubrication required in few moving parts only. The aim of this paper is design, analysis and fabrication of a prototype mechanical lift which operate efficiently, consistently, sholud be easy to handle, multifunctional, cost effective, compact in size. Drafting and drawing of loading and unloading mechanical lift carried out in AUTOCAD with suitable modeling. The analysis of mechanical lift includes total deformation load, reaction forces, buckling and bending failures, equivalent stresses were done in ANSYS Software. Finally this analysis of strength, toughness, elasticity and temperature distribution is carried out in order to check the coherance of the design value.***

Keywords: Lifting Mechanism, Platform, Machine, Design and Development, Analysis, AUTOCAD, ANSYS Software.

I. INTRODUCTION

Lifts are generally used for loading and unloading of goods, two wheeler or person. Lifts are most commonly used mode of vertical transformation in day to day life with certain height depending upon requirement. Nowadays many lifting systems are designed to used for various purposes in industry. These system can be used in multi purpose application and wide range of services such as cleaning, maintenance activities. Lifts are In existing system of loading and unloading, there is used ramp system which is considered a very risky and time consuming for loading and unloading operation. At the time of loading and unloading operation of vehicles, more than two labour and sometimes four labour are required which is uneconomically and vehicle may be damage in unbalancing condition. There will be directly influences on productivity which is integral part of any industry.

Lifts have become popular for commercial purpose. Lifts are used in automobile industries, transportation system, agriculture and manufacturing industry, construction site, warehouse, complex building, airports, indoor stadium, etc. Lift concept become popular after Elisha Otis's safety mechanism that prevents the vehicle from falling. Generally the lift can be powered by hydraulic, pneumatic and mechanical way. It is seen that hydraulic type lifting machines are used for various types of application. Hydraulic Scissor lift is most famous example of Hydraulic lifting machine. The aim of the project is to design and fabricate the prototype in such a way that it should be compact, easily handle, portable, efficiently, cost effective, automated. As the project title name mentioned 'Designing and Development of loading and unloading platform for two wheeler' so designing and fabrication work is done on mechanical type lifting system. In this project, there are uses of essential components like Platform cum ramp, Platform Guardrail, Column, Base, Supporting Member, Slider, Pulley, Drum, Wire rope, Wheel, Electric motor cum gearbox, Motor shaft and Pedestal bearing. While designing and fabricating the prototype keeping in mind that it should be safe in all parameters of each components as the study of FMEA (Failure Mode Effective Analysis) was also done for this project. Analysis of each components are done in safety point of view and decided dimension accordingly. Welded and bolted joints are used in this project.

It is decided to used Mild Steel in the fabrication work which best suited metal for each components of the system after review of research paper. In Fabrication of prototype, two columns are welded in C section Base in eccentric position. Supporting member provides to column which is also act as a counter weight for balancing. Two pulleys mounted on top on each column and two pulleys on down. Two pulleys mounted in such a way that the axis of top and down pulleys are perpendicular to each other. Motor stand is required for motor-drum assembly and pedestal bearing plays main role for free rotation of drum. Motor is mounted at middle and drum with pedestal bearing is mounted on both side of gear motor. The gear motor, drum and pedestal bearing have same axis and mounted on same shaft. Gear motor mounted on the motor stand jointed with the help of bolt which can be remove the Motor – Drum assembly easily at the time of maintenance activity. Key way shaft is used to prevent relative motion between connecting parts. In simple words, key is used where the transmitting the power and rotation accurately without slipping. Reverse-Forward rotation motor required to achieve the up and down movement of platform. Platform can be stop at desired heights as per requirement by changer provided to motor connection. High torque need to loading and unloading operation is achieved only by the gearbox attached to the motor. Right – angle geared motor have the axis of motor shaft and gearbox shaft are perpendicular to each other. Worm, bevel or hypoid gearing system used in this gearbox. Ratio of Motor to Gear is 10:1. One end of wire rope fixed to drum and other end attached to platform with the help of clamp. When motor runs the wire rope wounds on drum with the help of pulleys and operation completed.

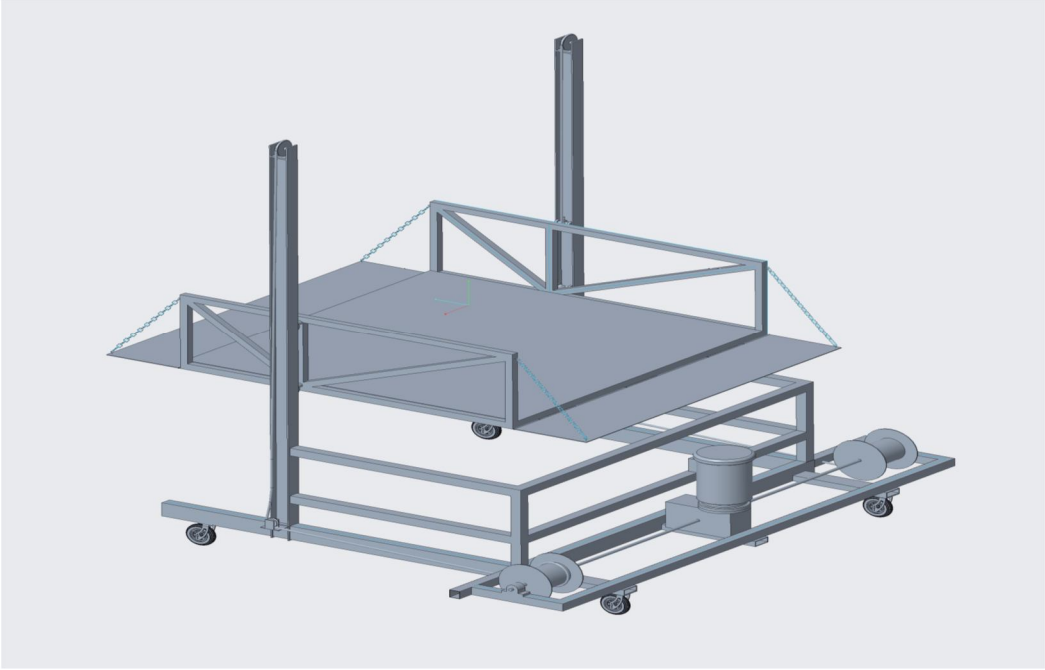

Figure : Design of Loading and Unloading Platform

II. LITERATURE REVIEW

Miss. Aishwarya B. Shinde, et.al [1] In this paper they have developed a concept of design and fabrication of mechanical lift for transportation. This project describes the design as well as analysis of a mechanical scissor lift which works on the principle of screw jack. The design will be developed keeping in mind that the lift can be operated by mechanical means so that the overall cost of the scissor lift is reduced. Also such design can make the lift more compact and much suitable for medium scale work. Conventionally a scissor lift or jack is used for lifting a vehicle to change a tire to gain access to go to the underside of the vehicle to lift the body to appreciable height, and many other applications.

Nukul G. Tambe, et.al [2] In this paper Mr. Tambe and his team have developed a system of loading and unloading platform for two wheelers. This deals with the design as well as analysis of a vehicle ramp. Conventionally a scissor ramp or jack is used for lifting a vehicle for various purposes, to lift the body to appreciable height, and many other applications also such ramps can be used for various purposes like maintenance and many material handling operations. It can be of mechanical, pneumatic or hydraulic type. The design described in this is developed keeping in mind that the ramp can be operated by mechanical means by using wire ropes with the help of electric motor.

Muzaffar Othman Abdulla, [3] In this research paper Mr. Muzaffar has dealt with concept of Design and development a multi-portable lift platform trolleys for the warehouses and markets. The knowledge application obtained from Master's University study and practical experience in various companies has been the main and most important objective of this study and is also the fundamental task solution for the creation and design of hydraulic multi-portable lift trolleys which has double platform lift scissors. For a glowing forward in the project, a research was conducted in literature and articles containing missing information for the theoretical part of the problem. The data were extracted from the Internet, particularly from articles and digital versions of books and scientific works in a related field. The results of this research are presented in the first theoretical part of the Thesis.

Er. G.S. Ramteke, et.al [4] This paper is about analysis of wire rope. The paper presents a study carried out on simple 7 wire single strand rope using the analytical as well as FE approach. The results obtained are compared. It is concluded that the behaviour is significantly altered when rotation of the wire rope is allowed and when the rotation is prevented. Each case has been analyzed and presented.

S.D. Wankhede, et.al [5] In this is paper, they have developed a mechanism of hydraulic scissor lift. This paper deals with analysis and optimization of hydraulic scissor lift. CATIA is used for modelling purpose, MSC Apex for meshing and Sim Xpert for analysis work i.e. to check stress, strain, displacement and deformation induced in the system. The main aim is to reduce lift weight by modifying parameters like the cylinder position and replacing supporting link of cylinder ultimately reducing the cost.

Suraj B. Dhanawade, et.al [6] In this paper resolves problem of material handling for cold storage industry. Goods were in cartoons which are likely to be perished if not loaded to cold room in stipulated time. The aim of this paper is design, analysis and to fabricate a hydraulic scissor lift which lifts maximum 2000 kg load with minimum time. Lifting height achieved by scissor mechanism is of 2 m from bottom level. The aim of this paper is design, analysis and to fabricate a hydraulic scissor lift which operates efficiently and consistently and it should be compact and cost effective. Deformation analysis, beam 188 reaction forces, equivalent stress analysis of scissor were done by ANSYS design software and buckling and bending failure analysis were also done in this paper.

Mr. Dayal Singh Rathore, et.al [7] The following paper describes the design as well as analysis of a hydraulic scissor lift. Conventionally a scissor lift or jack is used for lifting a vehicle to change a tire, to gain access to go to the underside of the vehicle, to lift the body to appreciable height, and many other applications also such lifts can be used for various purposes like maintenance and many material handling operations. It can be of mechanical, pneumatic or hydraulic type. The design described in the paper is developed keeping in mind that the lift can be operated by mechanical means by using pantograph so that the overall cost of the scissor lift is reduced. The upward motion is achieved by the application of pressure to outside of the lowest set of support elongating the crossing pattern and propelling the work platform vertically. In our case our lift was needed to be designed a portable and also work without consuming any electric power so we decided to use a hydraulic hand pump to power the cylinder also such design can make the lift more compact and much suitable for medium scale work. This paper describes the complete study of components (hydraulic cylinder, scissor arms, spacing shaft and platform), selection of materials and analyzes the dimensions of components. Further fabrication of all the parts and assembly is carried out.

Cengiz Görkem Dengiz, et.al [8] In These systems are mainly preferred to do maintenance, repair, and clean. In this study, the design and analysis of a scissor lift system were performed with having a load carrying capacity of 500kg and a working height of 2m. The solid model and assembly of the system have been developed by the Solid Works program. The structural analysis of the system was also investigated with the help of the same program i.e. stress, deflection, and safety factor values of system elements were obtained. As a result of the analyses, it was concluded that the system designed could safely be used during load/unload operations.

Bekir Cirak, [9] In this study, model of lifting platform consisting of scissors and hydraulic cylinder is formed. Static state equations have been used for the mathematical model of the mechanism. The weights and mass inertia moments of the platform members and the upper table have been neglected. Vehicle load as a point force, the top of the table is closed at the moment when the mechanism is effective. The sliding in the joints have been neglected.The mechanism is modeled and simulated in order to evaluate several application-specific requirements such as dynamics, position accuracy etc. The system has a 5 degree of freedom. The simulation gives different link lengths of the mechanism over a linear displacement.

Sabde Abhijit Manoharrao, et.al [10] The following paper describes about a hydraulic pallet lift is a mechanical device used for various applications for lifting of the loads to a height or level. A lift table is defined as a scissor lift used to stack, raise or lower, convey and/or transfer material between two or more elevations. The main objective of the devices used for lifting purposes is to make the table adjustable to a desired height. A scissor lift provides most economic dependable & versatile methods of lifting loads; it has few moving parts which may only require lubrication. This lift table raises load smoothly to any desired height.

Panwar1, et.al [11] The main aim of this research paper is study, design and fabrication of hydraulic scissor lift. In our case lift has to be movable and portable so rollers are provided for motion of lift and also we can't use electric power in this lift so we use hydraulic pump. Hydraulic generate more and accurate pressure. By use of this mechanism and design hydraulic lift became efficient and can operate at industries. The purpose of this research paper is to use all components effectively so that it produce good results with good efficiency.

Gaffar G Momin, et.al [12] In the following paper describes the design as well as analysis of a hydraulic scissor lift. Conventionally a scissor lift or jack is used for lifting a vehicle to change a tire, to gain access to go to the underside of the vehicle, to lift the body to appreciable height, and many other applications, also such lifts can be used for various purposes like maintenance and many material handling operations. It can be of mechanical, pneumatic or hydraulic type. The design described in the paper is developed keeping in mind that the lift can be operated by mechanical means by using pantograph so that the overall cost of the scissor lift is reduced. In our case our lift was needed to be designed a portable and also work without consuming any electric power so we decided to to use a hydraulic hand pump to power the cylinder.

III. PROBLEM IDENTIFICATION

Problem Identification was done on the basis of that visited at respective showrooms. It was seen that somewhere used the ramp system and used the hydraulic scissor lift with extra ramp at some places. We observed and identified problems found in existing mechanism at the time of visiting at showroom places, we noted down the problem identification in existing model accordingly.

It is found that to use ramp system for loading and unloading operation. There are high chances of occurring accidents while loading and unloading and due to this damages to the vehicle may occur. It is very risky and time consuming and it takes more than three labours depending on operations. It is observed that the existing system of ramp requires large space which is not possible for congested space.

It is found that safety is matter of concerned of existing system for loading and unloading operations with ramp due to unbalance of vehicles.

IV. AIM AND OBJECTIVE

A. Aim

Our aim is to design and develop loading and unloading platform for two wheelers.

B. Objectives

1) Study of existing system.
2) Collect the relevant data from research paper.
3) Time, Labour and Cost analysis in existing system.
4) Design and analysis of various components of the system.
5) FEM analysis for the structure by ANSYS Software.
6) Fabrication of the system.

V. METHODOLOGY

A. Literature Search
B. Personal Visit
C. Material Selection
D. Analytical Analysis
E. Optimization of design
F. Design of various components
G. FEM study within software like ANSYS
H. FEM analysis of the structure
I. Fabrication of prototype for the system
J. Experiment and Testing

VI. CONCLUSION

In this project, we seen the lack of safety and more time consuming while loading-unloading operations in existing ramp system at the time of visiting. It was observed that the more time consuming for loading and unloading operations per cycle and it occupied large space. It is not efficient system to loading-unloading of two wheelers in safety, space and time parameters. Hence we decided to develop a cost effective and safely working loading-unloading platform.

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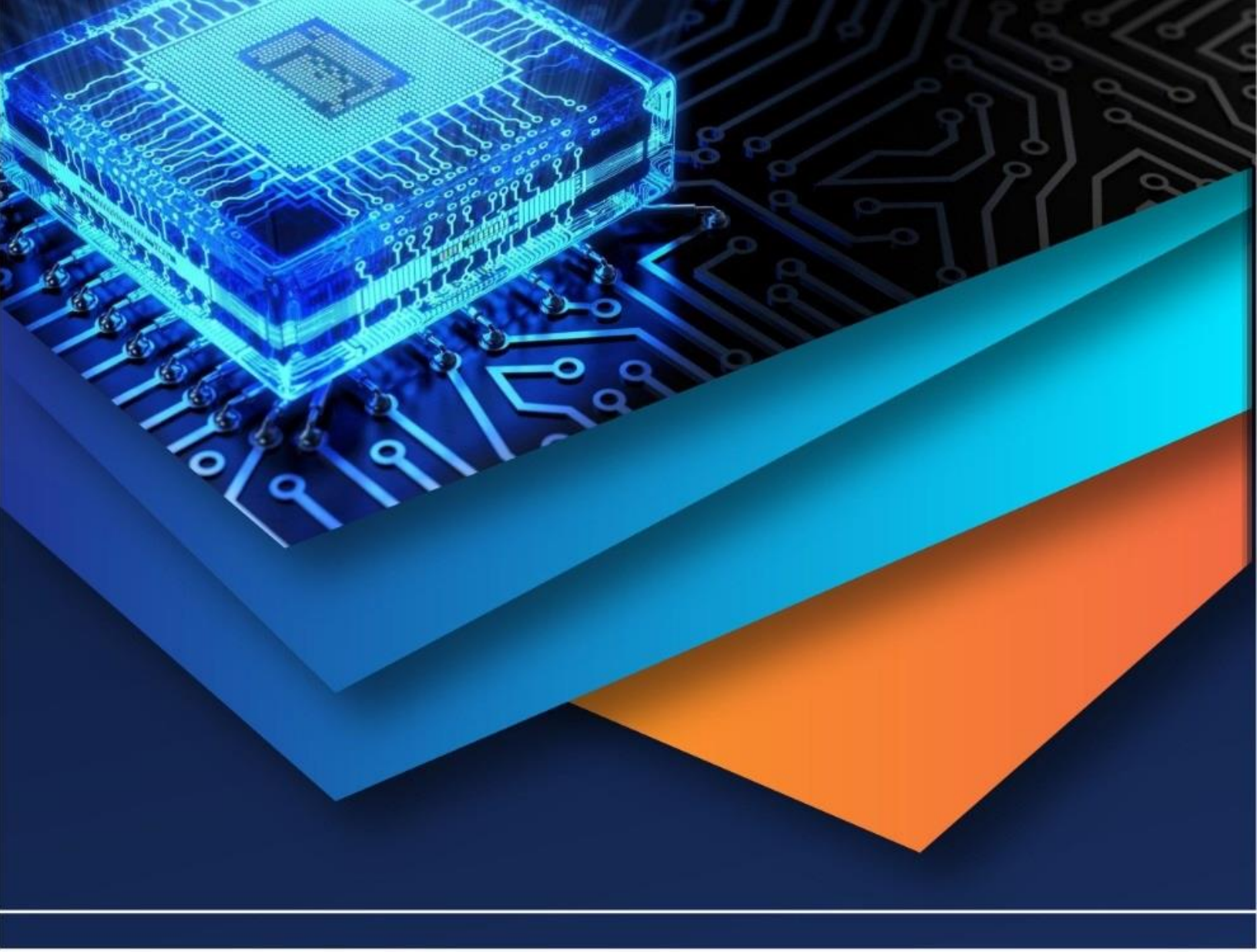

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