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“A REVIEW ON SCISSOR LIFT DESIGN FAILURE CAUSE”

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ABSTRACT

This project is mainly focused on the design as well as analysis of hydraulic scissor lift when it is extended and contracted. Scissor lift design failures can occur due to various reasons, and they may result in accidents, injuries, or damage to equipment. To mitigate the risk of scissor lift design failures, it is essential to adhere to industry standards and regulations, conduct regular inspections and maintenance, provide proper operator training, and address any issues promptly. Additionally, manufacturers must ensure rigorous testing and quality control measures during the design and production phases to minimize the likelihood of failures in scissor lift systems.

Key Words: Scissor lift, failure, design, hydraulic.

I. INTRODUCTION

Scissor lifts are typical one of the vertical lifting equipment portable elevating work platforms . Scissors lift can be used indoor or outdoor with a considerable extensive space Their primary function is to elevate workers, tools, and materials to a desired working height, while allowing the operator to control the movement and position of the lift. Compared with conventional methods of lifting, scissor lift greatly reduces the psychological stress and physical demands on a worker at elevated height. Therefore, if a scissor lift is properly designed, manufactured, maintained, and appropriately used, it can increase not only the workers' productivity but also their safety. For these reasons, scissor lifts with different capacities and elevating heights are increasingly used at many workplaces. A scissor lift is a portable, easily extended and compressed, safe operating machine used for transportation of medium sized components to its expected position. A scissor lift is machine which moves in vertical direction using criss-cross 'X' pattern scissor arms. The required elevation of the lift is achieved based on the number of criss-cross 'X' pattern scissor arms attached. The scissor lift mechanism is based on linked arms in a criss-cross 'X' pattern which can be folded and extended in exact direction similar to a pantograph. The upward motion is achieved by the application of pressure to the outside of the lowest set of supports, elongating the crossing pattern, and propelling the work platform vertically upwards. The platform may also have an extending 'bridge' to allow closer access to the work area.

II. LITERATURE REVIEW

Monitors mission for development has never been fulfilled. The drive towards better and more noteworthy logical and mechanical result has made the world dynamic. Before now, a few researcher and designers have done a ton of work as respects the scissors lift overall. A survey of a portion of that work gives the plan and development of a pressure driven scissors lift a stage.

Gaffar G Momin, et al [2015] This Paper depicts the plan as well as investigation of a water powered scissor lift. Traditionally a scissor lift or jack is utilized for lifting a vehicle to change a tire, to get to go to the underside of the vehicle, to lift the body to calculable level, and numerous different applications Also such lifts can be utilized for different purposes like upkeep and numerous material taking care of tasks. It tends to be of mechanical, pneumatic or pressure driven type. The plan portrayed in the paper is created remembering that the lift can be worked by mechanical means by utilizing pantograph so the general expense of the scissor lift is diminished. For our situation our lift was required to have been planned a versatile and furthermore work without consuming any electric power so we chose to utilize a water driven hand siphon to control the chamber Also such plan can make the lift more smaller and much reasonable for medium scale work. At last the examination of the scissor lift was finished in ansys and all capable boundaries were broke down to check the similarity of the plan values.[1]

Divyesh Prafulla Ubale, et al.[2015] The regular strategy for utilizing rope, stepping stool lift getting individual to a level experience a ton of limit (significant investment utilization, ease, measure of burden that can be conveyed and so on) likewise there might be a gamble of tumbling down in the event of stepping stools thus water driven scissors lift is intended to conquer this large number of hardships. The primary point of this paper is plan and investigation and to build a multiutility home hardware for senior residents with the goal that they can convey their day to day exercises productively. Additionally the hardware ought to be reduced and practical. Lifting level accomplished by scissor component is of 1 m from base level. Clasping and twisting disappointment examination of scissor is additionally finished in this paper. With unending advancement of science and innovation, an ever increasing number of new advances are applied to lifting machine plan. This undertaking targets making hardware multifunctional, simple to utilize/work, financially savvy and compact with the goal that it will be utilized helpfully at home and might be utilized in emergency clinics, lodgings and other normal spots. Senior residents deal with numerous issues to do their everyday exercises, as this hardware is planned so that (for example it is remote worked with battery) they can undoubtedly move in house and perform everyday exercises. All security contemplations are considered while planning hardware. Scissor lifting instrument is intended to lift individual to wanted level. A scissor lift instrument is a gadget used to expand or withdraw a stage by water powered implies. The Extension or dislodging movement is accomplished by the utilization of power by pressure driven chamber to at least one upholds. This power brings about a lengthening of the cross example. Withdrawal through pressure driven chamber is likewise accomplished while bringing down of stage is wanted.[2]

Setu Dabhi, et al,[2015] This paper depicts the plan and examination of water driven bed framework in a chain transport utilized in car ventures for stacking and dumping of materials .The framework, comprising of a water driven power pack, a chain transport, a bed framework is consequently controlled with the assistance of PLC. Our point is to plan a practical and a financially savvy instrument to lift the given burden utilizing pressure driven incitation and posting benefits of water powered incitations over pneumatic and servo activation. The plan module bed alongside system utilized for adjusting is plan in CAD programming SOLIDWORK and examined for variable stacking in ANSYS .The plan proposed is exceptionally adaptable with the fabricates prerequisite and its dependability is dissected under factor load. The consequence of the practicality study showed a prominent shortening of working hours, and a mitigation of physical work The producer required a bed framework which is to be water powered incited, as opposed to pneumatically or servo impelled. Looking at the three frameworks, we track down pneumatic framework fairly beneficial over the other two. Benefits of pneumatic framework are recorded underneath: Simplicity in plan, Cost compelling, Safety and dependability disregarding the above benefits, it was found that water powered framework could deal with more burden when contrasted with the past, and the back pressure so created in water driven activation could effectively be taken care of when contrasted with pneumatic during development of the bed ,so as keeping up with strength and decreasing how much vibrations. Taking into account the inclusion of the third framework , where incitation of the bed is by means of servo engines is out of inquiry ,as its exceptionally exorbitant, requires regular upkeep, and its heap bearing limit is likewise low when contrasted with others. The primary benefit of involving pressure driven framework in our application over pneumatic other than the heap bearing limit is the liquid in water powered framework is fundamentally incompressible, consequently it prompts least springing activity. So regardless of whether the heap on the bed is non uniform, the actuators will adjust the bed in such a manner in order to limit the possibilities of over tossing the heap. This kind of wellbeing measure is challenging to accomplish utilizing pneumatic activation, and, surprisingly, in the event of uniform stacking the vibration experienced is considerably more.[3]

S. B. Naik, et al [2015] An extraordinary kind of bar lifting gadget is intended for material businesses. The machine is using pressurized water worked and is having two casings one flat and another vertical. Even edge is mounted with two adjustable chambers utilized for shaft lifting to required level. The portability for the design is given by utilizing castor wheels. Limited component examination of the edges is finished by ANSYS programming considering the need of the material businesses, a specific reason machine has been intended to lift the pillars in material ventures. The limited component examination of the edge of this machine is finished to find out about the anxieties and distortion of the construction to change something similar if necessary.[4]

M. Abhinay, P.Sampath Rao et al [2014] Airborne scissor lifts are for the most part utilized for impermanent, adaptable access purposes, for example, support and development work or by firemen for crisis access, and so on which separates them from extremely durable access gear like lifts. They are intended to lift restricted loads typically under a ton, albeit some have a higher safe working burden (SWL). The rising interest of Aerial Scissor Lifts in organizations to further develop their assembling adaptability and result by giving.[5]

Kiran Kumar, M., et al. (2016) The force monitoring of the water-driven scissor lift during its expansion and contraction is the main focus of this work. Large load parts are typically lifted and held in place using a water-driven scissor lift. The choice of material plays a crucial role in machine planning and has an impact on several variables, including strength, durability, and blockage, all of which increase the need for scissor lifts. The design is carried out by taking into account water-powered scissor lifts as a flexible, cost-effective, and very reasonable option for medium-sized burden applications. Using powerful works and suitable demonstration, the drafting and drawing of the water-driven framework scissor lift is completed, and it is imported into Ansys Work Seat for examination and cross section. Following that, the scissor lift analysis includes In Ansys, the total deformity load and equivalent pressure were completed, and all feasible boundaries were broken down to verify how comparable the design was to the actual one. For optimal results, the computational advantages of two different materials, such as aluminum and mild steel, are considered.[6]

Anh-Tuan Dang et al [2021] Scissor lifts are applied for moving or lifting different items. Water driven chambers are utilized to raise or lower stages which have numerous ways of organizing. This study means to decide proper aspects in plan 1X water powered scissor lifts. Utilizing representative factors to control the aspects, places of the chamber are determined to guarantee the viability of working space and powers in the chambers. Results got from the estimations demonstrate the act of mathematical techniques and can be utilized to decide ideal aspects for plan 1X scissor lifts. Scissor lifts are applied for moving or lifting different articles.[7]

Solmaziyigit, İ.; et al [2022] In this review, a creative 25-ton-limit scissor lift was intended interestingly, and a model was delivered in Onder Gathering Inc. Inside the extent of the review, a moving bearing framework was planned rather than the traditional welded scissor-pivot association framework. For purposes of comparison, static and strength calculations were made using finite element analysis. Because of the investigation, it was resolved that the pressure dissemination on the roller bearing framework was more homogeneous and at lower values (≈ 60 MPa) than the welded pivot framework. What's more, a separable (catapulted) joint was gotten rather than a fixed (welded) joint with the planned moving bearing framework. A particular joint-clamp system was developed to increase the surface areas of the welded joints as a result of the design analyses carried out within the scope of the study. [8]

Anh-Tuan Dang et al [2023] Scissor lifts are broadly utilized in industry. The choice of a design of lift table framework assumes a significant part since this relies upon the functioning necessities of the frameworks and furthermore the kind of lift object. In order to improve the operation of scissor lift systems (such as lifting height, loading, and stability), the mathematical model of the configuration and the load calculation for the double-stage scissor lifts, which are dependent on the design parameters, were investigated in this paper using the parametric dimension technique. The Working Model software was used to construct and simulate a two-dimensional model of the system in order to confirm the proposed method's accuracy. The outcomes got from the reenactment demonstrate that by changing the mounting places of chambers, the height of the stage and responses on joints of the parts can be determined, which helps with working on the exhibition of the framework. In addition, the findings demonstrate the

practical significance of the calculations and dimensional design of scissor lifts, particularly for structures with double stages.[9]

III. CAUSES OF FAILURE

Scissor lift design failures can occur due to various reasons, and they may result in accidents, injuries, or damage to equipment. Some common causes of scissor lift design failures include:

Structural Integrity Issues:

Material Defects: The use of substandard materials or manufacturing defects in the construction of the scissor lift can lead to structural weaknesses, reducing its overall load-bearing capacity and stability.

Welding Failures: Inadequate welding or welding defects in critical joints can compromise the structural integrity of the scissor lift, leading to failure under load.

Hydraulic System Failures:

Leakage: Hydraulic systems are crucial for the proper functioning of scissor lifts. Hydraulic fluid leaks can lead to a loss of pressure, resulting in a sudden collapse or uncontrolled descent of the lift platform.

Faulty Valves or Seals: Malfunctions in hydraulic valves or seals can affect the lift's ability to maintain position or control the descent.

Electrical System Failures:

Control System Malfunctions: Electrical components, including the control system, are essential for the safe operation of scissor lifts. Malfunctions in control systems can lead to unintended movements or failures to respond to operator commands.

Wiring Issues: Faulty wiring, connections, or electrical components can lead to operational failures, compromising the overall safety of the lift.

Overloading:

Exceeding Load Capacity: Loading the scissor lift beyond its specified weight capacity can result in structural failures, causing the lift platform to collapse or the scissor arms to bend.

Poor Maintenance:

Lack of Regular Inspections: Inadequate maintenance and infrequent inspections may lead to undetected wear and tear, corrosion, or other

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