



Design & Modelling of Hydraulic Scissor Lifting Mechanism

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Abstract: - Scissors lift stage with a wide reach, the fundamental stage, lift instrument and the base are made out of three parts. Lifting from low to high lifting, the scissors posts, and the water driven chamber format numerous, versatile way has foothold, self-impelled, promoter, and so forth, Scissors lift system of scissors post number and chamber format by lifting level. This paper is about a plan-based 3D programming Ace/E with 8m high scissors lift stage, which gives a whole stage aspect with 1800 x 900mm². An evaluated heap of highlights so the entire stage can be set up by two sets of scissors alludes to like items. The stage is intended to be collapsed away entryways, to save more space for helpful capacity. Lift stage utilizes a water powered driver, which chugs along as expected, steadily, and precision factors relative to high.

Index Terms: - Hydraulic scissor lift, hydraulic circuit, solidworks etc.

I. INTRODUCTION

The Scissor lift stage is one of the vertical lifting gear, which can be utilized indoors or open air with an impressive broad space. It is very well may be utilized in mechanical businesses, programmed creation lines, cellars, actual dispersion lines, etc. To satisfy the increasingly utilizing regions, the scissors lift stage should give increasingly high stacking capacity, and increasingly fast-moving speed and That's only the tip of the iceberg and all the more consistent beginning and halting of the stage.

The scissors lift system is the essential constituent piece of the scissors lift stage, whose power trademark will impact the presentation of the entire hardware straightforwardly. In this manner, the main issue for planning the stage is to determine the construction aspect of the primary divisions, for example, the scissors posts, the base vehicle and the upper stage, the water-driven parts also, and the driving water- powered chamber.

III. METHODOLOGY

Redirection in scissor lifts can be characterized as the change in elevating height, everything being equal to the first size of whole gathering i.e., from the bottom platform base to the highest point of stage deck at whatever points loads are applied or taken from the lift. Each part inside the scissor lift can be possibly stored or

There are numerous sorts of developments for the scissors lift stage, however, the principal divisions of the ordinary lift stage, as a rule, are the upper stage, the scissors arms, and the base vehicle. The quantities of the scissor's posts and the place of the water-driven chambers even have different grouping, which decides the lifting level of the stage. In this paper, we give a level of 8m for the stage to lift. An around 1800*900mm² regions will be given for the upper stage to lift an adequate number of issues and a greater evaluated stacking ability can be acquired. There are three habits for the base vehicle to move hauling, programmed running, and power supporting. The entire stage is intended to have some scissors components, which are placed on the base vehicle for two sections evenly. Each scissors system has four post matches to satisfy the level of necessity.

Utilizing the three aspects of reenactment programming Star/E, the component plan and recreation of the gear of the scissors lift stage should be possible very much like the designs portrayed upwards. The entirety parts' 3D demonstration, the reproduced collecting, collecting, and component reenacting are expelled however the programming. During these reenactments, the check of impedance between the parts can be given impeccably, also as the issues probably can be kept away from, which can further develop that the component plan we have done is dependable.

II. CLASSIFICATION OF SCISSOR LIFT

The scissor lift can be classified as follows based on the energy required to lift the load

- 1) Hydraulic Lifts using hydraulic Energy.
- 2) Pneumatic Lifts using pneumatic energy.
- 3) Mechanical Lifts using mechanical energy.

Hydraulic scissor lifts distribute its load equally among different parts of the body i.e., the platform and the arms.

deliver energy when stacked and dumped. Redirection happens in every component of scissor lifts i.e., scissor legs, stage structure, base edge, stuck joints. To lessen the stress on the scissor, lift the heap ought to move similarly between the two-scissor arm pair.

Base casings are to be connected to the surface on which they are mounted.

A. Single Acting Hydraulic Cylinder

Single acting cylinders utilize hydraulic oil for a power generation in one course as it were. Some outside force acting on the cylinder pole causes its return. Most industrial uses require a acting cylinder with the spring pushing the cylinder and bar to the stroke position.

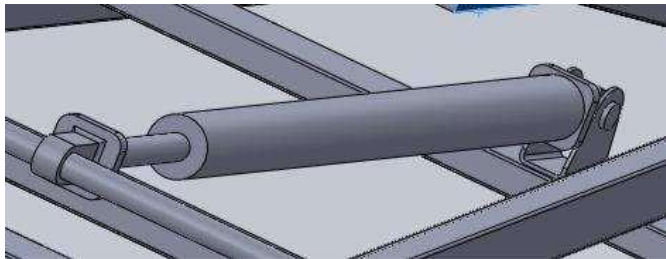


Fig -1: Hydraulic cylinder

B. Material Selection

Material choice assumes a vital part in the machine plan. Two metals considered for the examination of the scissor lifts are mild steel and aluminium.

TABLE 1: - Chemical Composition of Mild Steel

Carbon	Silicon	Manganese	Sulphur	Phosphorous
0.16-0.18%	0.41%	0.71-0.91%	0.041%	0.041%

TABLE 2: - Mechanical Composition of Mild Steel

Sl. No.	Mechanical composition of mild steel BS970
1	Maximum stress is 401-561 N/mm
2	Yield stress is 301-441 N/mm
3	0.2% proof stress is 281-421 N/mm
4	Elongation is 11-15% Min

TABLE 3: - Mechanical Properties of Aluminium AL (6061)

Sl. No.	Mechanical Properties
1	Ultimate tensile stress is 310Mpa
2	Modulus of elasticity is 68.9Mpa
3	Ultimate strength is 607Mpa
4	Poisons ratio is 0.33
5	Fatigue strength is 96.5Mpa
6	Machinability is 50%

7	Shear strength is 207Mpa
8	Tensile yield strength is 276Mpa

IV. MODELING

Given below are the parts of the scissor lift which must be designed and assembled.

1. Scissor Lift Platform:

A platform should be designed in such a way which should be capable of resisting high load and withstand heavy stresses.



Fig -2: Scissor lift platform

2. Scissor Arm:

Scissor arms are used in the vertical motion of the load on the platform. It is the most vital and key part of their design of scissor lift.



Fig -3: Scissor Arm

3. Coupler:

The couplers are fixed joints which supports the hydraulic lifting cylinder to lift the platform.

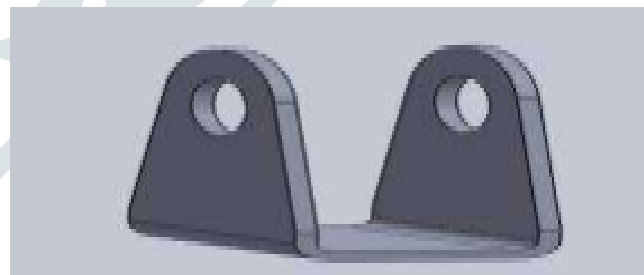


Fig -3: Coupler

4. Cylinder:

The heavy loads on the platform are lifted by the function of scissor lift cylinder in modelling.

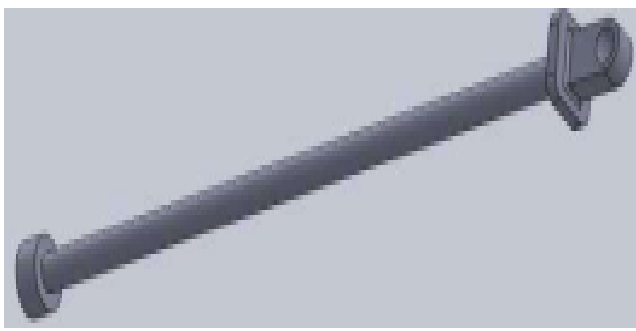


Fig -4: Cylinder of Scissor Lift

The finished structure of hydraulic scissor lift is assembled using the parts written above which is represented in the below figure.



Fig -6: Various Parts of Scissor lift

based on the application and the requirement of the customer, the length of the scissor arms area of the platform and the maximum load capacity can be altered. There are 2 types of arm length which are important which are extended arm and closing arm.



Fig -7: Open Scissor lift

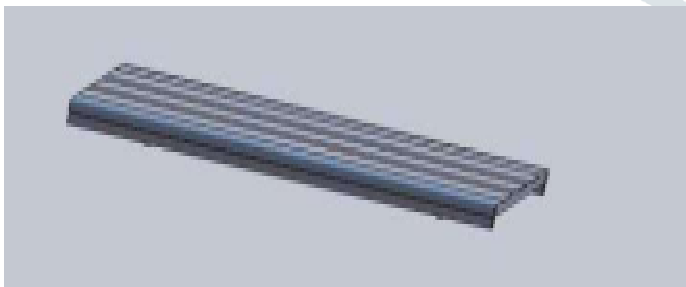


Fig -8: Closed Scissor lift

For example, a technical specification list is created based on a application to lift a certain load.

Sl. No.	Type	Hydraulic Scissor type
1	Capacity	750Kgs

2	Length	72 inches = 1828 mm
3	Lifting height	36 inches = 914 mm
4	Closing height	150 mm

Here, a load of 750 Kgs is to be lifted to an estimated length of 72 inches.

V. WORKING PRINCIPLE

A pantograph is a type of structure that can cram or expand like an accordion, forming a distinctive rhomboidal pattern. This is due to the shape of original device. Temporary fencing, scissor lifts, and other scissor mechanisms like the pantograph used in trans are examples of objects that use this mechanism.

The most practical, reliable, and adaptable way to lift heavy objects are done with scissor lifts. Scissor lifts operate without incidents for many years because they have few moving parts and are well lubricated. These lifts rise the loads easily to any desired height and are easily configurable to meet the precise speed, capacity requirement of any hydraulic lift's application can be manufactured. It is most widely used and effective style of scissor tables used in material handling applications and is designed and produced to meet the industry safety requirements set forth in ANSI MH2 9.1.

VI. WORKING OF EACH COMPONENT

1. Scissor arms:

leg deflection caused by bending which is determined by the total weight carried by the legs, the length of the scissor and the available leg cross section. The longer the scissor legs, the harder it is to regulate bending under pressure. Greater leg strength is achieved by increasing the leg material height which improves resistance to deflection, however it might result in an unwanted rise in lift collapsed height.

2. Platform:

Stage twisting will increment as the heap's focal point of gravity moves from the middle to any edge of the stage. Additionally, as the scissors open during upward movement of the lift, the rollers roll back towards the stage pivots, what's more, making an undeniably unsupported, overhung piece of the stage get-together. Capricious burdens applied to this unsupported end of the stage can enormously affect the bowing of the stage. Expanded stage strength through expanded help structure a material level further develops protection from redirection, yet additionally adds to an expanded fell level of the lift.

3. Base Platform:

Ordinarily, the lift's base platform is mounted to the floor and ought to not indulge in any diversion. For those applications where the scissors lift is mounted to a elevated or small casing the edge of the base must be inflexibly upheld from the bottom part to help the point stacking made by the scissors leg rollers and the scissors arms pivots.

4. Coupler:

Hydraulic Scissors lifts are stuck at all pivot hub focuses, and each pin has a running leeway. between the outer diameter of the pin and the inner diameter of Its leeway opening or closing. The more scissors match, or pantographs, that are overlapped on each other on top of one another, the more stuck associations there are to aggregate development, or redirection.

5. Cylinder:

Chambers lay almost level inside the scissor's legs when the lift is completely brought down and should create starting even powers up to multiple times how much the heap on the scissors lifts due to the mechanical disservice of their lifting calculation. Therefore, there are gigantic anxieties (and coming about redirection) set on the scissor's internal leg member(s) that are intended to stand up to these chamber powers. Also, as currently referenced above with any change in section length of the lifting actuator/chamber, coming about vertical lift development is multiple times that measure of progress.

6. Load:

Load situation likewise has a huge impact on scissors lift diversion. Unbalanced loads on the grounds that the scissors lift to divert in an unexpected way than with focused, or equally conveyed, loads, End loads (in-line with the scissors) are typically divided well among the two scissors' leg matches. Side burdens (opposite to the scissors), be that as it may, are not divided well among the scissors leg matches and should be kept inside adequate plan cutoff points to forestall leg curve (inconsistent scissors leg pair avoidance) which frequently results in unfortunate roller following, inconsistent pivot pin wear, and misalignment of chamber mounts.

7. Mechanism of Vertical Lifting:

As referenced over, the level of avoidance is straightforwardly connected with a change in framework tension and a change in partial pressure as an aftereffect of stacking and dumping Scissors lift normally insight their most elevated framework pressure and most noteworthy anxieties (and consequently the most elevated potential for diversion) inside the first 20% of aggregate accessible vertical travel (from the completely brought down position).

VII. PROTOTYPE OF HYDRAULIC SCISSOR LIFT

From the above segment we know the major components involved in the mechanism of a hydraulic scissor lift. A prototype is a cheaper and efficient way to Us understand the mechanism involved in the help working of a scissor lift.

The following prototype is mainly focused on the mechanism involved rather than the amount of load it can elevate. The material science in the scissor lift plays a very important role in the amount of load it can hold or withstand. The major components used in the prototype are:

1. Scissor arms and platforms:

Two wooden platforms and four wooden scissor arms on each side of two-level scissor lift is modelled.

2. Hydraulic piston:

Two medical syringes are used to generate the hydraulic energy required to elevate the load vertically by the action of piston and cylinder.



Fig -9: Prototype of hydraulic scissor lift

VIII. CONCLUSION

Scissor lifting mechanism has wide range of applications in various fields of engineering so a low cost highly efficient scissor lift can be used to bring a change in the industry. Some of the major applications: of the scissor lift are as follows:

- The scissor lift platform can raise a forklift so that maintenance to the lowermost of the floridity can be: performed.
- By using scissor lifting mechanism in warehouses, all heavy items can be lifted with ease.
- Sheet metals are often stacked and these are nearly impossible for us to lift, here a scissor lifting mechanism can come in handy.
- Lifting of merchandise in many distributaries and manufacturing plants.
- you will often see scissor lifting tables used as platforms for maintenance and construction industry.
- Some scissor lifts are used as weighing machines to weight heavy machinery and other heavy goods.
- The design and modeling of a high purpose hydraulic scissor lift was carried out flourishingly meeting the required machine designing standards.

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