Operating Mechanism And Concept of An Improved Scissor Lift

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ABSTRACT

Our Project relates to Mechanically actuated scissor lifts. These kind of lifts are widely used into the industries. In the prior research we briefed out the design procedure of the Improved Scissor Lift operated on the Lead Screw Mechanism. The present research relates to the Description of Working Mechanism of such Scissor Lift. Apart from that, the ANSYS Analysis of the model that we developed earlier is also explained here with, in the current research. The Proof of concept and the significance of such model is also explained.

Keyword: - *Scissor Lift, Lead Screw, ANSYS, Pro E, Ladle Lift.*

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1. INTRODUCTION

The harsh working conditions of the average steel mill require that equipment built for such an environment is durable and rugged. A powered lift must be designed to endure not only the jarring and bumping encountered while being moved in to stand out of ladies via overhead devices but also the impact that occurs when pallets of bricks are being loaded onto the lift. Such a lift must also be able to operate dependently in an environment where a wet and dry motor is routinely being dropped or chipped on to the equipment of primary importance is how the main platform on the lift is engineered. Platforms may come as a plate or as engineered platform.

The prior model mentioned in our earlier research **An Improved Scissor Lift Operating on the Lead Screw Mechanism** by **Anupam Chaturvedi et. Al[1]** is utilized. A plate is described as a plate disc of metal. An engineered platform is best described as a plate with tubular steel supports welded to the underside. This extra structural support can handle the impact a concentrated point loading of brick pallets better than a plate which may deform under the repetitive stress of such loading. The use of metal piping for mechanical are important for avoiding punctures, breaks and the resulting hydraulic fluid leaks which can lead to lifting failure, downtime and repairs.

2. DESCRIPTION OF MECHANISM

The mechanism of this Improved Scissor Lift can be achieved with the use of linked, folding supports in a criss-cross 'X' pattern, known as a pantograph. The motion in the upward direction is achieved by applying the pressure on the outside of the lowest set of supports. The cross pattern is elongated, propelling the work platform vertically.

Lead screw is the main component that bears the load and transfers the torque. It receives torque from the pulley arrangement. The larger pulley is connected to the lead screw and the smaller pulley is connected to the motor. The higher speed of the motor is reduced with help of pulley arrangement.

At the other end Lead screw turns in a nut. Nut has two studs on opposite sides attached to it to which one of the lower links is hinged. Studs slide in the slot provided for the same in the base plate. The other lower link is hinged by a bolt in the hole provided at the other end of the base plate. These two lower links are hinged at the centre with the help of pin. Similarly links are connected on the opposite side as well. Three such stages of scaffolding is used so that required height can be achieved. This mechanism is depicted by **Bert Sikli et. Al.[2]** in his patent.

At the top the upper plate is connected with the upper links with the help of pin and bolts.

The lateral movement of the lead screw is prevented by providing turning nut on the lead screw on both sides of hole in the base plate in which the lead screw rests. These nuts are dowelled so that they turn along with the lead screw and not come out.

3.1 Procedure

1. 3D Model Making

We have used Pro-E as modeling tool. First we made 3-D models of all the parts i.e. upper plate, base plate, links, pin, screw, same nuts as per the designed dimensions. After completing the part modeling we assembled all the parts together to transform them into an ASL 3-D model.

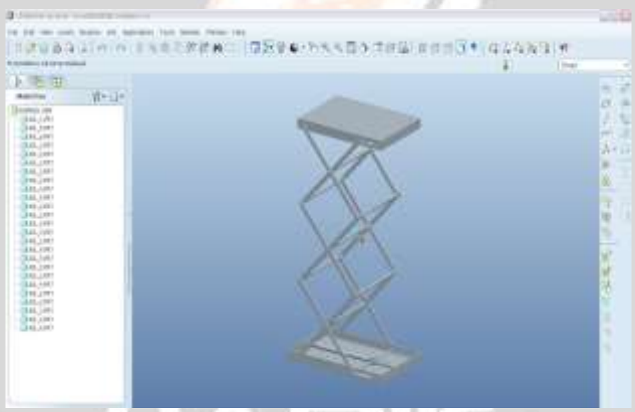

Fig -1: Geometric Modelling in Pro E

2. Analysis

We have used ANSYS as an analysis tool

Here, first we took ASL model on ANSYS then we applied some conditions like, [4]

a. Put weight at 10 kg on the upper plate
b. Kept base plate fixed
c. Curve motion constraints to pins which are connected to links only i.e. rotational motion w.r.t. Z-direction.
d. Curve motion constraints to the pin which are connected to link and adjusted in the slots at upper and base plate i.e. rotational motion w.r.t. z-direction and displacement along X-direction.

After setting basic conditions, finally we simulated the movement of ASL i.e. upward and downward movement of upper plate.

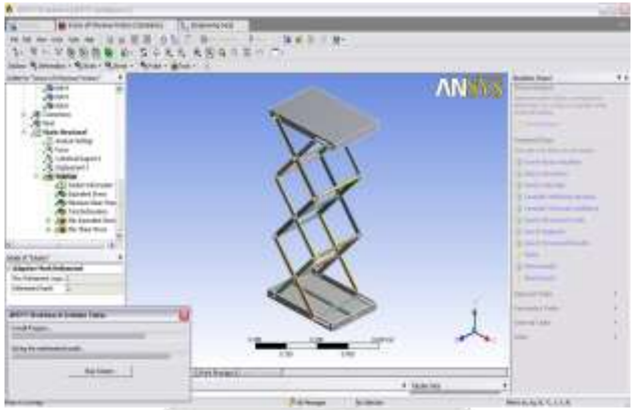

Fig -2: Analysis in ANSYS

During simulation, we were able to know the stresses, actual upon link-pin joint, pin-plate joints as well as the screw and thrust less than 10 kg load.

At the end of the simulation, we got the results that the stresses, acting upon joints are bearable, dimensions are optimum and hence whole model at ASL is feasible for the predefined load.[5]

Therefore, having been approved at design, we can move further to next phase.

3.1 Study Result

Name	Type	Min	Max
Stress	VON: von Mises Stress	1.67013e-010 N/mm^2 (MPa) Node: 3854	396.258 N/mm^2 (MPa) Node: 901

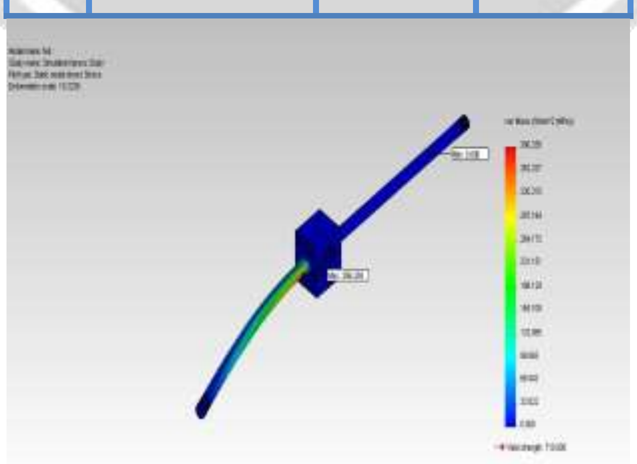

Fig -3: Stress Analysis of Nut

Name	Type	Min	Max
Stress	VON: von Mises Stress	0.501183 N/mm^2 (MPa)Node: 28024	119.853 N/mm^2 (MPa)Node: 34482

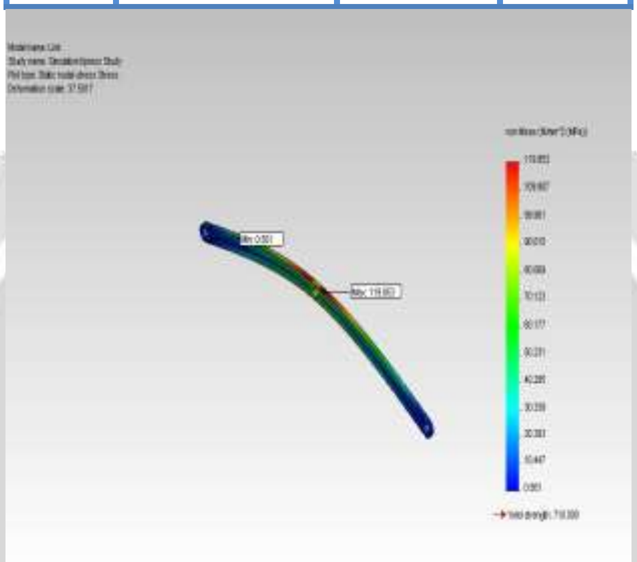

Fig -4: Stress Analysis of Link

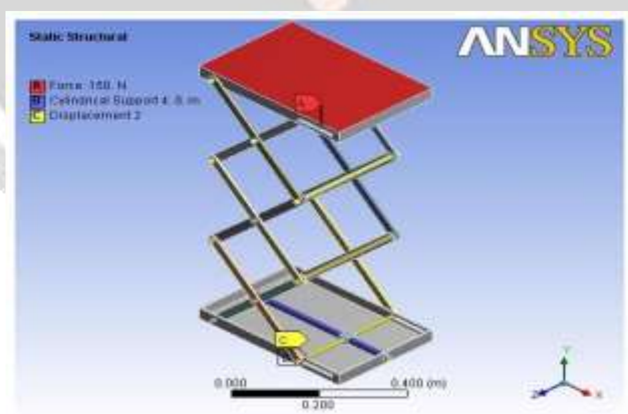

Fig -5: Force, Support and Displacement

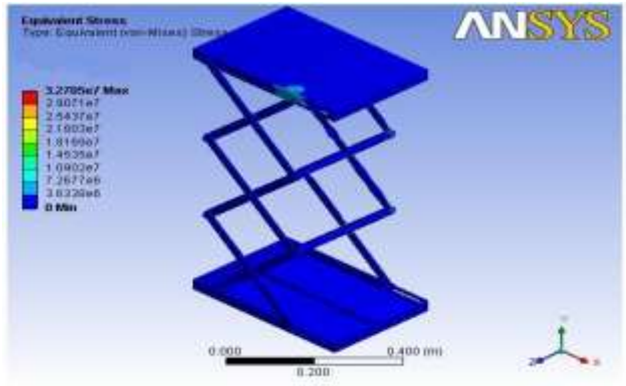

Fig -6: Stress Analysis of Assembly

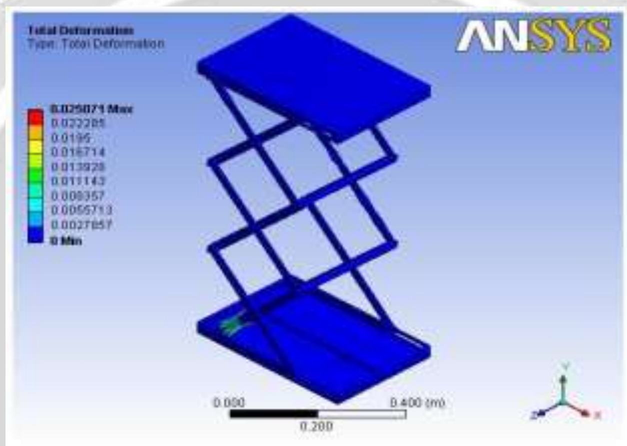

Fig -7: Deformation Analysis on Assembly

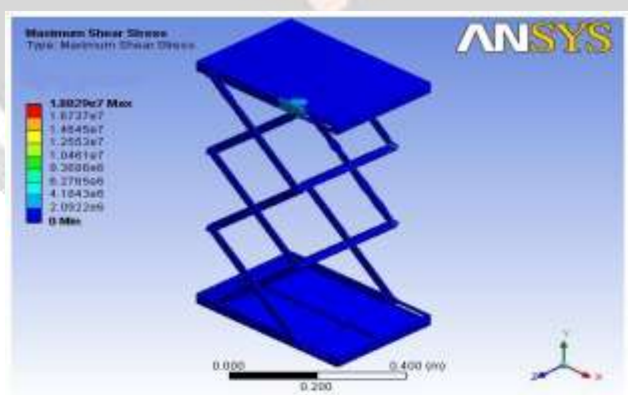

Fig -8: Shear Stress Analysis on Assembly.

4. CONCLUSIONS

With the help of the present research we described the working of the Improved Scissor Lift with the required accessories. We also did the analysis of the Model that we made in our earlier research as a part of validation of our design.

6. REFERENCES

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