

Design and Fabrication of Hydraulic Crane

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ABSTRACT

Now days in this fast growing industrial age every company needs speed in manufacturing to scope up with the customer's requirements. Every industrialist cannot afford to transform his unit from manual to semi-automatic or fully automatic as automation is not that cheap in India. The basic objective of our project is to develop a versatile and low cost robotic arm which can be utilized in any industry to eliminate this problem. Our robotic arm can be used in number of application by changing the program of controller and the structure is designed in such a way that it is capable to lift light loads but can also lift medium loads. Our robotic manipulator would be used mainly in the packaging department and automatic assembly lines.

paramount importance

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I. INTRODUCTION

The crane for lifting heavy loads was invented by the ancient Greek in late sixth century. The introduction of the winch and pulley hoist soon lead to a widespread replacement of ramps as the main means of vertical motion. A crane is a type of machine generally equipped with hoist rope, wire rope or chain, and sheaves, that can be used both to lift and lower material to move them to other place. It uses one or simple machine to create mechanical advantages and thus move loads beyond the normal capability of human. Cranes are commonly employed in the transport industry for the loading and unloading of freight, in construction industry for the movement of material and in the manufacturing industry for the assembling of heavy equipment.

II. OBJECTIVE

The broad objective of the work is to ease material handling in Small and Medium Scale Industrial workshops by the

development and manufacture of various capacity pneumatic shop cranes in "Om Sai Enterprises". This will be value addition, as it would drastically reduce the drudgery and musculoskeletal injuries currently experienced in the operations of such industries.

The specific objectives are:

- To design various pneumatic shop cranes within the range of 200 kg to 1 tonne.
- To manufacture their prototypes.
- To test-run the prototypes equipment and evaluate its performance and cost in comparison with imported ones.
- To disseminate the technology to SMEs for mass production.

III. METHODOLOGY

The research methodology is as follows:

- Review of existing work on Pneumatic Workshop Cranes and Cranes in general.
- Design of the equipment for various capacities.

- Selection of materials for the construction of the crane mainly from the local market.
- Fabrication of the prototype.
- Parametric studies of the prototype equipment in other to ascertain its performance andStandardize it.
- Performance evaluation as economically in comparison with imported ones.

IV. LITERATURE SURVEY

Material Handling is the movement, storage, control and protection of materials, goods and products throughout the process of manufacturing, distribution, consumption and disposal. The focus is on the methods, mechanical equipment, systems and related controls used to achieve these functions. Pneumatic cranes are an important part of the material handling equipment's. The pneumatic cranes that are being used work on electrical supply or manual power.

V. MATERIAL SELECTION

The proper selection of material for the different part of a machine is the main objective. In the fabrication of machine,for a design engineer it is must that he be familiar with the effect, which the manufacturing process and heat treatment have on the properties of materials. The Choice of material for engineering purposes depends upon the following factors:

1. Availability of the materials.
2. Suitability of materials for the working condition in service.
3. The cost of materials.
4. Physical and chemical properties of material.
5. Mechanical properties of material.

VI. EXPERIMENTAL SETUP

The above drawing shows the complete overview of our project.

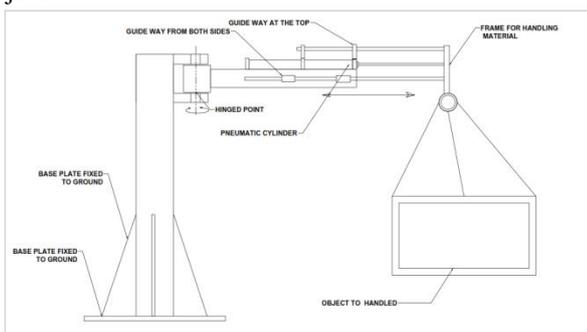


Fig.1 Experimental Setup

Important points regarding to our system:

1. 3 Degrees of freedom
2. High load carrying capacity.
3. Rotation angle about 270°.
4. Upper cylinder max stroke length: 2000mm.
5. Lower cylinder 2 stroke length: 600mm.

VII. COMPONENT OF PROJECT

The hydraulic crane which was manufactured has 12 parts: They are

1. Base plate/ Truck/Pallet,
2. Pneumatic tank,
3. Pneumatic hoses,

4. Direction control valve,
5. Vertical column,
6. Ball bearings,
7. Horizontal arm,
8. Secondary horizontal arm,
9. Pneumatic cylinder,
10. Roller, Hook,
11. Nuts and
12. Bolts,
13. Wheels.

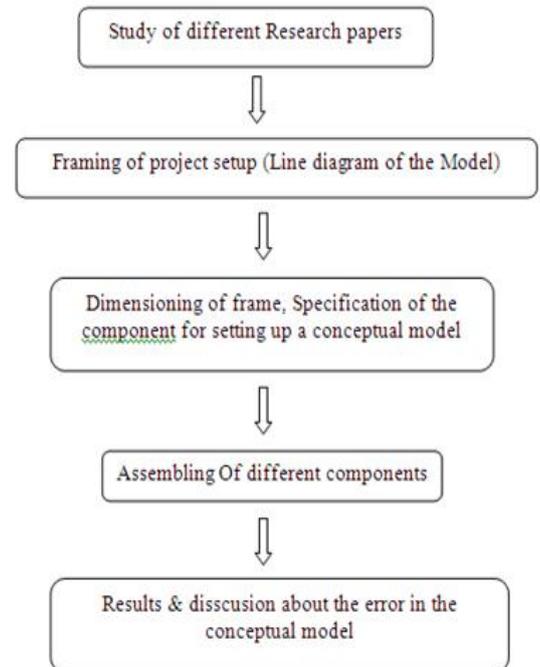


Fig. 2. Flow chart for working process.

VIII. COMPONENT COSTING

Sr. No	Component	Quantity	Price/piece	Total cost
1.	Pneumatic cylinder 200x40	01	1850	1850
2.	5/2 Solenoid valve	01	750	750
3.	Pneumatic Pipe	15 metre	40	600
4.	connector	10 piece	35	350
5.	Flow Control Valve	02	250	500
6.	Round bar 60 mm	3ft	850	850
Total				4900

Table. 1 Cost of component

IX. ADVANTAGES

1. Most powerful means of lifting objects:-

It is one of the most powerful means of lifting objects is with the strength of a pneumatic crane. By harnessing the

strength that liquid under pressure gives, and the ease with which it can be used, it is possible to transfer a relatively small amount of effort from one place to another, and pneumatic cranes are amongst the most efficient lifting systems available in the modern workplace.

2. Extremely stable in use:-

Because the pneumatic cranes use a fixed system of pipes, constant pressure can be maintained once a part of the system has been moved into place, and this makes them extremely stable in use, and able to support relatively large weights.

3. Very easy to maintain:-

Pneumatic cranes are amongst the simplest systems that you can use within any industrial process, and are very easy to maintain. Provided that all the pumps and pistons are regularly checked for any leaks, and potential stress points where the levers are supported are inspected for damage, the crane will continue to operate completely reliably for long periods of time.

4. A very versatile tool:-

Most pneumatic cranes are comparatively light weight, and the ease with which they can be moved from one area to another within the factory or distribution centre, makes them a very versatile tool with lots of uses on a day to day basis. From simple loading jobs in your loading bay area where the portable pneumatic cranes can be used to lift objects into a waiting truck to more complex jobs within the main factory, the lifts will come in very useful.

5. Quite simple Design:-

A pneumatic system works with a system of pumps and pistons that are filled with a liquid, usually a light oil or water. By moving the liquid under pressure from the pumps, pistons can be extended or reduced, and when these pistons are connected to a system of levers, the pistons can be used to lift surprisingly heavy weights.

X. FIGURE

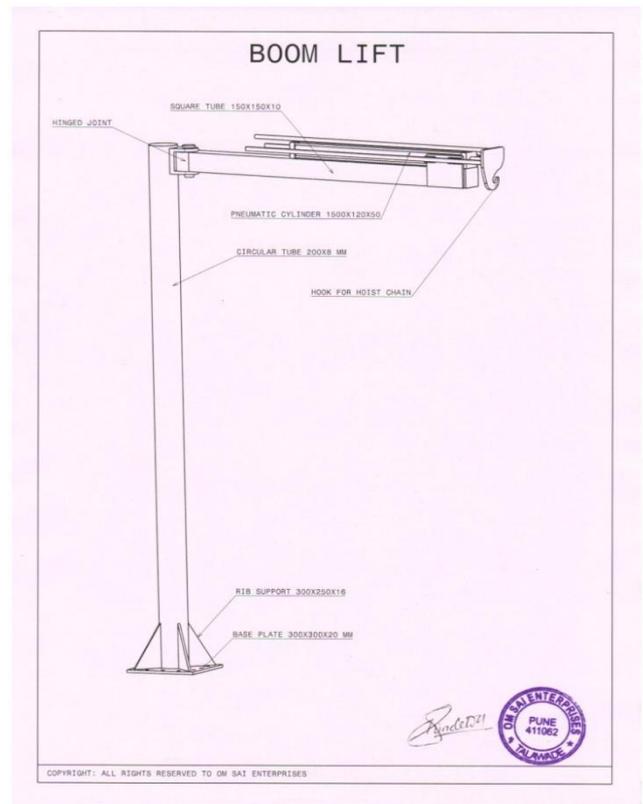


Fig. 3. Diagram of boom lift

XI. CONCLUSION

The aim of our project was to build a fully functional mechanism which is capable of lifting load up to 10 kg. We accurately achieved our first goal of lifting the load and 270° rotary motion of the vertical column. We feel that our design and fabrication was a great success both in terms of strength and stiffness. Our project weighed 20kg which is capable of lifting load up to 10kg using pneumatic power.

ACKNOWLEDGEMENT

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