DESIGN AND FABRICATION OF PNEUMATIC OPERATED CRANE

Dr. V.M. Sonde[1], Akshay Suryawanshi[2], Shubham Shelke[3], Kashmira Somkuwar[4], Sushilkumar Pillewan[5]

[1]Assistant Professor, Mechanical Engineering Department, Priyadarshini College of Engineering, Hingana, Nagpur, Maharashtra, India

[*2,3,4,5]Studnet, Mechanical Engineering Department, Priyadarshini College of Engineering, Hingana, Nagpur, Maharashtra, India

---

Abstract Pneumatics is one of the most accustomed systems in these days. moment outfit and system use this type of actuating because it's truly safe, profitable, and easy to apply. Another advantage that recommends this type of actuating is the reduced loss of heat during the actuating process. Material handling systems are characterized by repetitive movements, speed and deportation control, and perfection, conditions that recommend pneumatics driving. Certain characteristics of compressed air have made this medium fairly suitable to be used in modern manufacturing and product industriousness. It's therefore important that technicians and engineers should have a good knowledge of pneumatic system, air operated gates and accessories.

Keywords: Crane, Low-cost applications, mechanical advantage, pneumatics, prolusion.

1. INTRODUCTION

Material handling is a necessary and significant element of any productive exertion. It's a commodity that goes on in every plant all the time. Material running means furnishing the right amount of the right material, in the right condition, at the right place, at the right time, in the right position, and for the right cost, by using the right system. It's simply picking up, moving, and lying down paraphernalia through manufacture. It applies to the movement of raw paraphernalia, corridor in process, finished goods, packing paraphernalia, and disposal of scraps. In general, hundreds and thousands of tons of paraphernalia are handled quotidian taking the use of large amounts of force while the movement of paraphernalia takes place from one processing area to another or from one department to another department of the plant. The cost of material handling contributes significantly to the total cost of manufacturing. Handling and storing paraphernalia involve different operations analogous to hoisting tons of brand with a crane; driving a truck loaded with concrete blocks; carrying bags or paraphernalia manually; and mounding palletized bricks or other paraphernalia analogous as barrels, barrels, pipes, and timber. The effective handling and storing of paraphernalia are vital to sedulity.

2. LITERATURE REVIEW

It's to be noted that the pneumatic system; which uses pressurized feasts to transmit and control power for demanded mechanical conduct; forms a comparatively simple, provident, and attractive medium for automation in paraphernalia handling. An effective paraphernalia handling system must have three primary attributes; videlicet the capability to perform its intended function, respectable service life, and the capability of being produced at reasonable cost. The review summarizes the study of paraphernalia handling systems with pneumatic systems and the former trouble on the design and fabrication of pneumatic system predicated paraphernalia handling outfits. There were a lot of factors being carried out in the development of pneumatic paraphernalia handling systems. also, numerous books and papers appertained in this

design and listed below are described in the preceding sections. Esposito

[1] This book (Fluid Power with Applications) presents the details of pneumatics analogous to parcels of air, compressors, air control gates, pneumatic selectors, etc., and multitudinous further. It describes the drug of compressed air with compressors. Different corridors of the compressors along with their functions have also been mooted. The book also describes the pneumatic circuit design considerations and their operations. The named portions of the book were studied and understood. The introductory ideas for the system were developed after studying the book. The review of the book formed the base for the pneumatic predicated paraphernalia handling system. Thrner

[2] This book (Engineering Applications of Pneumatics and Hydraulics) presents the detailed generalities of control gates, their types and principles of operation; pneumatic pickers, pneumatic circuits, and arrangement of factors. The important portions of the book were reviewed. An understanding of the generalities of pneumatics was developed. The review of the book also helped in concluding suitable control gates analogous to directional control gates demanded in the pneumatic system. It also handed information about the pneumatic circuits and arrangement of the factors Ray

[3] This book is concentrated on the paraphernalia running. It describes the paraphernalia running, its type, and automation in paraphernalia handling. The book also describes the robotic handling of paraphernalia. The automation in paraphernalia handling with a pneumatic system is also mooted. The named portions of the book were studied and hence the understanding of the generality of the paraphernalia handling with pneumatics along with its advantages over other systems was developed. Premkumar

[4] This paper mainly focuses on the design and performance of multi-pick and place robotic arms. The robotic arm consists of revolute joints that allow angular movement between the conterminous joint. Three double-acting cylinders were used to actuate the arm of the robot. Robot manipulators are designed to execute demanded movements. By using this barred medium the success rate of pick and place robots are increased. The rack and pinion are welded with the piston of the double cylinder, by actuating the handle very alive the vertical arm will attain its 360-degree rotary moment. While the angular moment of the perpendicular arm is actuated by the double recreation cylinder and 3/2 hand switch cock. The material handling paraphernalia analogous as gripper and vacuum suction mug are mounted over the arm. The and down movement of the gripper is actuated by a separate double recreation cylinder and the gripper is operated by using a BO motor. The robots contain two vacuum suction mugs which induce vacuum with the help of a vacuum creator. The compressor continuously delivers the air to the cylinder with the help of the cylinders all the corridors of the robot were operated. By using a gripper and vacuum suction mug both the flat and irregularly structured paraphernalia were handled. Bodkhe

[5] This paper presents the designs of curvaceous transfer systems (whether drive or pull) that require careful consideration of several important considerations. Material considerations include flyspeck attributes similar as flyspeck size, size distribution, flyspeck shape, viscosity, hardness, and frangibility. Physical parcels similar as viscosity, compressibility, permeability, and cohesion, and other parcels similar as toxin, reactivity, and electrostatic effectiveness System attributes include the resistance of pipe and fittings to chemical reactivity and bruise, the effective design or routing of the system to transfer accouterments from and to multiple points, and the conservation of acceptable tailwind over the range of conditions anticipated. These considerations can be complex and it's the design And Fabrication of a curvaceous-operated Operated Crane Horizontal, perpendicular, rotary cylinders & arm lifting cylinders are of the same design and named from the curvaceous product roster. Cylinders are of double amusement type. According to the operations, the forward and return recommended that you consult with a qualified and experienced engineer to assure that your system is duly designed.

In these motifs, different parameters like air haste, pressure, flyspeck size, and shape, distance to be conveyed, which govern the design of the system, are described.

3. NEED OF PROJECT

Robotization plays an important part in mass production. It accomplishes what can't be done manually. It reduces the labor costs and hence increases the labor productivity. In addition, it improves the worker safety and product quality. robotization can be achieved through computers, hydraulic systems, curvaceous systems & robotics, etc. Out of these sources, pneumatics forms a seductive medium for low-cost robotization.

4. MATERIALS REQUIRED

To fabricate this project model following materials are essential –

Table 1 : List of materials required with quantity

Sr. No.	Parts	Materials	Quantity
1	Horizontal Cylinder	M.S.	1
2	Vertical Cylinder	M.S.	1
3	Rotary Cylinder	M.S.	1
4	Arm Lifting Cylinder	M.S.	1
5	Rack	C.I.	1
6	Pinion	C.I	1
7	Block	M.S.	2
8	Frame	M.S.	1
9	Gripper Arm	M.S.	1
10	Tie Rod	M.S. Pipe	1
11	Nuts and Washers	M.S.	-
12	D.C. Valves	Aluminum	4
13	Tubes	Polyurethane	10 Meters
14	Hoss Coller and Hoss Connector	Brass	20

5. EXPERIMENTATION

There are four double-acting pneumatic cylinders in the experimental setup. One of these cylinders is used to operate the rack and pinion assembly, connecting the cylinder's piston rod to the rack that is meshing with the pinion. The rack and pinion assembly is turned through roughly 260° by operating the cylinder. The rack's length can be changed to change the assembly's turning angle. The height of the setup can be increased by using a second cylinder, or a vertical cylinder; the cylinder's piston rod length determines the maximum height. The arm's working area is constrained by the length of the piston rod and can be extended using a horizontal cylinder. The gripper that holds is activated by a gripper cylinder.

Figure 1: Fabricated assembly model of the equipment

The base block, cylinders, rack and pinion, baseplate, tie rods, solenoid valves, and gripper make up the assembly unit. Mounted on the base block, Cylinder 1 has a rack and pinion assembly attached to it via tie rods. A block and endplate are given at the end of the vertical cylinder, which is installed vertically over the base plate to enhance height. In order to lengthen the arm, the horizontal cylinder is mounted horizontally on the block of the vertical cylinder, with an end plate and block provided at the end position. To activate the gripper, the gripper cylinder is positioned at an angle of 30 on the horizontal cylinder block. One side of the gripper is attached to the gripper's piston rod, which is part of the gripper. The working of model can easily be understood by the following process chart.

Table 1: Process Chart

Sr. No.	**Components Name**	**Materials**	**Tools Used**	**Machines Used**	**Process**	**Instruments Used**
1	Piston Rod	M.S.	Turning Tool	Lathe	Turning Grinding Hard chroming	Vernier Caliper
2	Bracket	M.S.	Turning Tool	Lathe	Turning	Vernier Caliper
3	Tie rod	M.S.	Turning Tool, Threading Tool	Lathe	Turning, Threading	Vernier Caliper, Micrometer
4	Piston Rod	M.S.	Turning Tool, Grinding Tool	Lathe, Grinding	Turning, Grinding, Hard Chroming	Vernier Caliper, Micrometer
5	Rack	C.I.	Turning Tool, Disc Cutter	Lathe, Milling	Turning, Teeth Cutting	Vernier Caliper, Micrometer
6	Inion	C.I.	Turning Tool, Teeth Cutter	Lathe, Milling	Turning, Teeth Cutting	Vernier Caliper, Micrometer
7	Square Block	C.I.	Turning Tool, Boring Bar	Lathe	Turning Boring	Vernier Caliper

6. CONCLUSIONS

The four-axis pneumatic material handling apparatus was created. To guarantee satisfactory outcomes as anticipated, the apparatus underwent testing. The equipment's output result was obtained through equipment experimentation. It was determined that the equipment was operating satisfactorily. Nevertheless, the equipment's material handling capacity was lower than its intended load-carrying capacity. The equipment's outputs or outcomes can be summed up as follows:

- Although it was intended to support a maximum weight of 40 N, the equipment could manage loads as high as 20–25 N.
- The apparatus's output torque was rather modest.

- There were moments when the arm's movement was overly sensitive. This was caused by variations in both the supply and operating pressure of the same

7. REFERENCES

[1] 1 A. Esposito, Fluid Power with Applications, 4th ed. New Delhi: Prentice-Hall of India Private Limited, 1980, pp. 423-452, 460-481.

[2] I. C. Thrner, Engineering Applications of Pneumatics and Hydraulics. Jordan Hill, Oxford: Butterworth-Heinemann, pp. 57-63, 72-76, 87-93.

[3] S. Ray, "Preface to Accoutrements Handling," New Age International (P) Limited, Publishers, pp. 1-8, 185-190.

[4] S. Premkumar, K. Surya Varman, and R. Balamurugan, "Design and perpetration of multi-handling Pick and Place Robotic Arm," International Journal of Engineering Trends and Technology (IJETT), vol. 33, no. 3, Mar. 2016.

[5] N. Bodkhe, S. L. Kanekar, and T. G. Bhore, "Design, Analysis & Fabrication of Curvaceous Accoutrements Handling Systems," International Journal of Engineering Trends and Technology (IJETT), vol. 6, no. 8, pp. 12-23, Aug. 2015.

[6] C. Chivu, "Curvaceous Driving in Accoutrements Handling Systems," Transilvania University of Brasov, Romania, vol. 15, no. 3 (43), pp. 155-159, Nov. 2014.

[7] S. C, M. C. S, A. Peddarajula, and A. R. Shetty, "Design and Fabrication of Curvaceous Arm for Pick and Place of Spherical Objects," International Journal of Rearmost Technology in Engineering, Management & Applied Science (IJLTEMAS), vol. 5, no. 6, Jun. 2016, ISSN 2278-2540.

8. BIOGRAPHIES

Name:	Dr. V. M. Sonde	
Designation:	Assistant Professor	
Email Id:	mailtovivekms@gmail.com	
Alternate Email Id:		
Facebook/twitter Id:	Vivek Sonde	
Mobile No:	9850495947	

PROJECTEES DETAIL

Name:	Akshay Suryawanshi	
Enrolment no	20211027820674	
Email Id:	akshay28032003@gmail.com	
Facebook/twitter Id:	Akshay Suryawanshi	
Mobile No:	9145456927	
Permanent Address:	At. Godhani, Post. Mowad, Tah. Narkhed Dist. Nagpur, Maharashtra 441303\	
Name:	Kashmira Somkuwar	
Enrolment no	20221027801262	
Email Id:	k.c.somkuwar@gmail.com	
Facebook/twitter Id:	Kashmira Somkuwar	
Mobile No:	9518937405	

Permanent Address:	Plot no 59, lokmanva Gruha nirman sanstha behind Balaji Mandir 3rd Road besa, Nagpur 440037	
Name:	Shushilkumar Pillewan	
Enrolment no	20221027801411	
Email Id:	skpillewan0@gmail.com	
Facebook/twitter Id:	Shushil Pillewan	
Mobile No:	9834611069	
Permanent Address:	S/0 Ramakrishnaji Pillewan House No 1028/116 Jaytala road near kaka Kirana Store, Ekatmata Nagar Nagpur 440036	
Name:	Shubham Shelke	
Enrolment no	20221027801404	
Email Id:	shelkes907@gmail.com	
Facebook/twitter Id:	Shubham Shelke	
Mobile No:	9665863857	
Permanent Address:	At Post. Thadipwani,Tah.Narkhed Dist.Nagpur	