

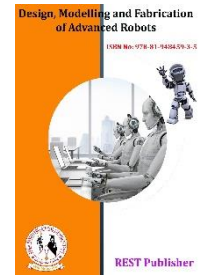
## Design, Modelling and Fabrication of Advanced Robots

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# Design and Development of Wireless Control of Pneumatic Actuated Robotic Arm

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**Abstract:** A Pneumatic robotic arm is a type of pick and place robot what is usually used for transferring goods/products from one place to another constantly. There are many types of pick and place robots based on their applications. In this robot we have used pneumatic cylinders for the movement of robot. In Pneumatic application the pressurized air plays a vital role. The main motive of the robot is to reduce the consumption of electricity, increase productivity in Industries that requires repetitive and precise movements, reduce human errors. The successful implementation of the pneumatic pick and place robot system will potentially lead to cost saving, increased production capacity, and enhanced overall performance in manufacturing processes. The robot utilizes pneumatic actuators and solenoid valves to perform various tasks. The system will be controlled by microcontroller and programmed to execute specific commands. Grippers are attached at the end of an industrial arm robot for material handling purpose.

## 1. INTRODUCTION

We have been aiming at developing a flexible and lightweight actuator and applying it into the flexible robot arm, the rehabilitation device and so on. So far, we have proposed and tested the new types of flexible pneumatic actuator that can be used even if the actuator is deformed by external forces such as flexible pneumatic rotary actuator. We have also proposed and tested a flexible robot arm with simple structure by using of the rod-less type flexible pneumatic cylinders. This arm has a potential to be used as a rehabilitation device for human wrist. A wide diversity of arm support systems is developed to support the upper limb function. Within these developments several fields of application can be distinguished. Firstly, devices assisting someone with a limited arm function that provide support during activities of daily living (ADL).

## 2. METHODOLOGY



FIGURE 1. Methodology

### 3. CAD DIAGRAM

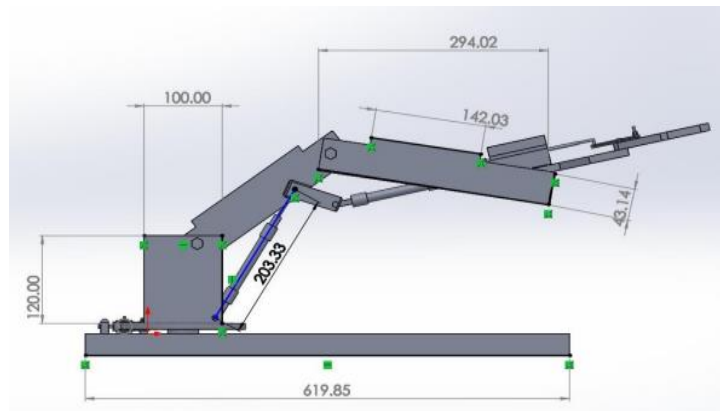


FIGURE 2. Cad Diagram

### 4. MATERIALS USED



FIGURE 3. Materials Used

The pneumatic cylinder converts the pressure energy of a compressed air medium into mechanical energy in the form of linear or rotary motion. Pneumatic cylinders are Mechanical Device which use the power of compressed gas to produce a foreign a reciprocating linear motion. The piston is a disc or cylinder, and the piston rod transfers the force it develops to the object to be moved. We prefer to use pneumatics because they are quieter, cleaner, and do not require large amounts of space for fluid storage. They have two ports to allow air in, one for outstroke and one for instroke. Stroke length for this design is not limited, however, the piston rod is more vulnerable to buckling and bending. Additional calculations should beper formed as well. It is Calculated By,

$$F = A\sigma$$



FIGURE 4. Gripper Claw

Grippers are devices that enable robots to pick up and hold objects. When combined with a collaborative robot arm, grippers enable manufacturers to automate key processes, such as inspection, assembly, pick & place, and machine tending. We are using 2 finger grippers to pick and place the rectangular and square shaped objects. In This one end is fixed and another end is moved by the pneumatic cylinders



**FIGURE 5.** Pneumatic Valves

A pneumatic valve, also known as a directional control valve, controls the flow of compressed air or other gasses inside a system by blocking or diverting it. These valves are used to pilot other valves and to drive other component such as an actuator, gripper, hand tool, or other devices. We used 4 pneumatic valves for 4 pneumatic cylinders. Each Pneumatic Cylinder Posses each different motions for pick and place an Object.



**FIGURE 6.** Solenoid Valves

A solenoid valve is an electrically controlled valve. The valve features a solenoid, which is an electric coil with a movable ferromagnetic core. It works by producing an electromagnetic field around a movable core, called an armature. When compelled to move by the electromagnetic field, the motion of that armature opens and closes valves or switches and turns electrical energy into mechanical motion and force. While solenoid valves are powered by DC, that current passing through the coil creates an electromagnet which produces an attractive force on the armature. When current is applied through the coil, the armature will always be pulled towards the coil, regardless of the contact and current polarity



**Push-in Fittings**



**Barbed Fittings**



**Threaded Fittings**



**Click Fittings**

**FIGURE 7.** Pneumatic fittings

**Push-in Fittings:** Straight to the Right Fittings-a Reliable Solution for every solution.

**Barbed Fittings:** Push-in Connection with additional Mechanical Locking.

**Threaded Fittings:** Line connection components with additional functions, such as Rotational, Self-Sealing etc ,

**Click Fittings:** Quick and Simple tube installation using one hand taken.

## 5. WORKING PRINCIPLE

It starts Working when the compressor generates the compressed air and then moves to a servo, which stores the air. Valves then control the airflow, and circuits control the valves moving the air between the pneumatic cylinders which makes forward and backward motion. By this way when all the 4 Pneumatic Cylinders moves, the structure makes pick and Place operation.

## 6. CONCLUSION

The design and fabrication of pneumatic arm for pick and place is completed with economic and effective considerations. It is controlled by mobile app flow control and direction control valves. Pneumatic arm movement and rotation is done by pneumatic cylinder using a helical slot mechanism. The gripper is also a pneumatic actuator which holds objects which are rectangular in shape. The maximum payload is yet to be calculated and total weight of arm is 25kgs. The model is expected to lift objects of at least 10 kgs weights. The controlling of pneumatic arm for automation is studied with economic and effective considerations. It is controlled by manually flow control and direction control valves. Robotic arm can reduce the human efforts by automatic handling of material, an automatic, servo controlled, freely programmable, multipurpose manipulator, with several areas for the handling of work pieces, tools, or special devices.

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