

# Stamping Process using Industrial Robotics with Pneumatic Sequential Method

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## Abstract

Industrial robotics is a key factor in the field of growing industrial sector with Automation. The implementation of Industrial Robotics over worldwide have increased; owing to the fact of its production, accuracy and time management. Automation has reshaped the manufacturing industry with fastest production. The Automation of stamping process using Industrial Robotics will function effectively without vulnerability. The Pneumatic sequential circuit is designed upon its application, herewith the Pneumatics sequential control circuit was designed in the process of stamping with the help of pneumatic devices. The model of the Industrial Robot on Stamping process Application is designed in the sequence of A+ B+ A- B- . The pneumatic supply is used to control the whole robotic process. Ergo the stamping process is automated without interfacing microcontroller and programming languages.

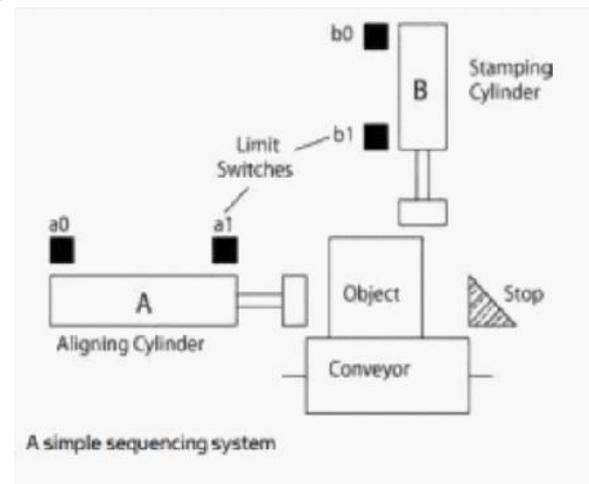
## Keywords

**Industrial Automation, Pneumatic control, Pneumatic sequential controls, Sequential and Cascading methods, Stamping process.**

## I.INTRODUCTION

Stamping application is used in many industrial sectors on the area of packaging, designing etc. Since the role of industrial robotics reduces the time of the production and process without the help of man power with more accuracy. This automation process is carried out with the help of Robots which are in programmed with some coding and with the usage of micro-controllers for the sequential process. In the case of Pneumatic Sequential control circuit, the process executes and results sequentially with the main power of Pneumatic supply unless the intervention of external circumstances. It controls the whole process of stamping which executes in the Sequential method

of A+ B+ A- B-. This automation of stamping process was held out with the Pneumatic devices. The role of Micro-controller and programming languages were replaced by the Pneumatic limit switches which determines the extraction and retraction position (A+ B+ A- B-) of the pneumatic cylinders which acts as an arm of the stamping process automated robot.



**Figure 1: SIMPLE SEQUENTIAL SYSTEM**

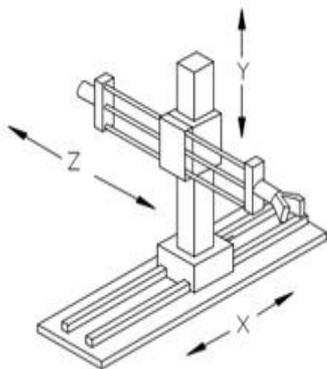
## II.INDUSTRIAL ROBOT

An Industrial Robot is a manipulator which is designed or programmed to perform specific task that can and cannot be performed by the human workers. Industrial Robots were reshaping the whole Industrial sector with its precision, production time and constant production work. Industrial Robots are automated, programmable and capable of working on two or more axis. Industrial Robots are also entitled as Arm in industries. Arm is categorized variously on the basis of number of

axis. The classification on the configuration of Arm is based on:

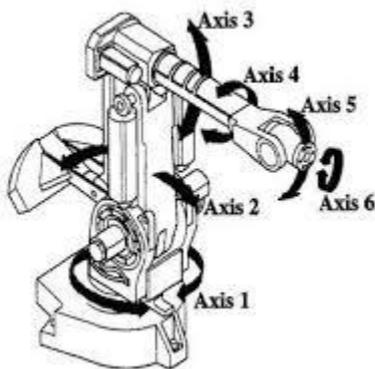
- ) Degree of Freedom (DOF)
- ) Kinematic Structure
- ) Drive Technology
- ) Workspace Geometry
- ) Motion characteristics

The Degrees of Freedom is equal to the total number of independent displacements or aspects of motion. In which minimum of three axes can able to touch a point in the space.



**Figure 2: THREE AXIS ARM**

The axis of the Arm varies according to the applications. An Articulated armed robot has six axis.



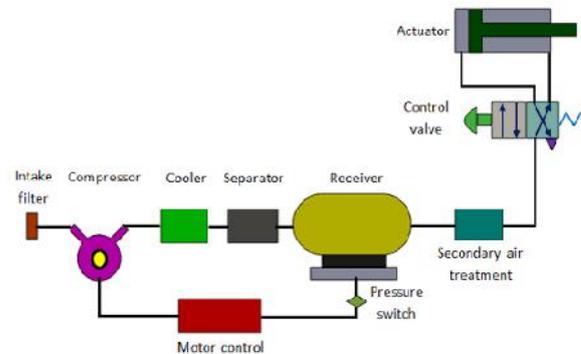
**Figure 3: SIX AXIS ARM**

The geometry to the study of moment of multi degree of freedom is Robot Kinematics that forms the structure of robotic system. The space of interaction of the arm is finalized by the number of axis on the robotic structure. The compact size and the powerful motion control structures the industrial robots. The Pneumatic drive technology plays a main role in the movement of the Arm.

### III. SEQUENTIAL CIRCUITS

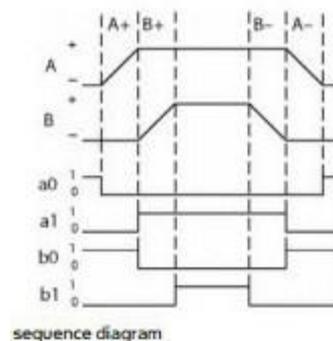
The logic circuit in which the output does not depends on input but on past input and repeat sequentially is sequential circuit. The circuit in which the output depends on past input is sequential circuit. The output depends on the sequence of events occurring at circuit input. A system powered with compressed gas or air to transmit power is well known as pneumatic system.

As Pneumatic system use compressed gas as a source, the system has infinite availability of source and it does not have hazardous effects.



**Figure 4: FLOW CHART OF PNEUMATIC CIRCUIT**

In pneumatic system, the Actuators can be operated automatically through sequential circuit in a preprogrammed sequence based on the application. Sequence is a series of steps that is performed in an order. Industrial automation process can be initialized by sequential setup.



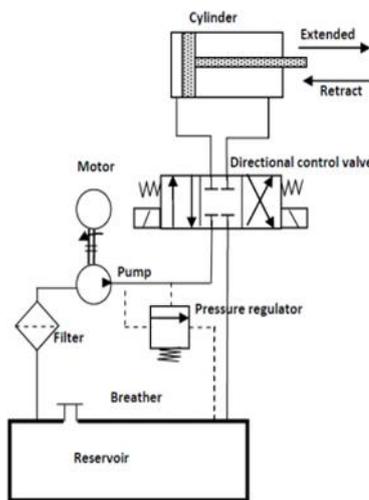
**Figure 5: SEQUENCE DIAGRAM OF A+ B+ B- A-**

Limit switch used to terminate the case of applying the signal to opposing side of the valve simultaneously. In pneumatic, one most important device to achieve the sequential logic is directional

control valve. Directional control valve directs the source flow.

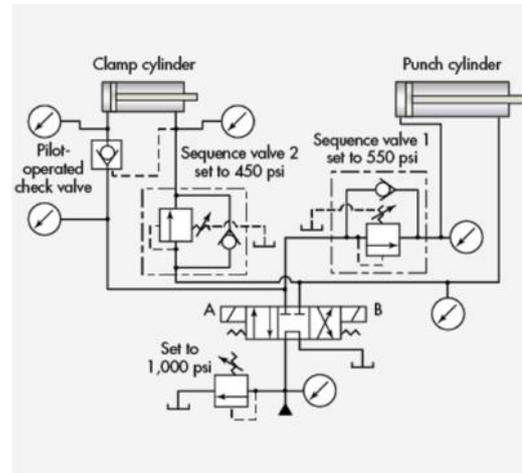
#### IV. STAMPING PROCESS

Therefore the principle of the sequential logic is applied in the pneumatic system with actuators, limit switches and pneumatic devices. The limit switch of the pneumatic device determines the role of piston which results in extraction and retraction of the piston which is the arm.



**Figure 6: SIMPLE MOTION WITH PNEUMATIC DEVICES**

The forward motion of the piston 1 stops the object which is to be stamped, and then the piston 2 extends forward to stamp the object, these forward motions of two piston cylinders are ensured with the limit switches and even the sequential time gap is also ensured by the limit switches. The Piston 1 will retract back so that the object moves forward for the next uniformed placed object to be stamped through conveyors, as the source results from the limit switches which ensured the retraction of the piston 1, the piston 2 will retract back. Thus this sequential process will be executed sequentially in the sequential process of A+ B+ A- B-. Where A+ denotes the extension of the piston forward of piston 1, A- denotes the retraction position of the piston 1. B+ denotes the extension of the piston forward of piston 2, B- denotes the retraction position of the piston 2.



**Figure 7: STAMPING PROCESS WITH PNEUMATIC SYSTEMS**

#### V. CONCLUSION

Ergo the stamping process with the pneumatic devices which works on the principle of sequential logic can be used for any application. Thus this process has no involvement of microcontrollers and preprogramming area. Thus with the principle of pneumatics, the stamping process is executed sequential with the power source of compressed air. The automation is accompanied when the process takes place sequentially without any external interventions. The whole pneumatic setup will be replaced with Arm with the principle followed in sequential systems.

#### VI. REFERENCE BOOKS

- [1] Robot Dynamics and Control by Mark W.Spong, M.Vidyasagar.
- [2] Kusiak, A, "computational Intelligence in Design and Systems", Third Edition, Addison-Wesley, 1992.
- [3] Rosheim, M, "Robot Evolution: The Development of Anthrobots", New York: John Wiley & Sons, 1994.
- [4] S R MAJUMDAR, "PNEUMATIC SYSTEMS", 2006.
- [5] Blaine Wright Andersen, "The Analysis and Design of Pneumatic System".
- [6] "Pneumatics and Hydraulics" by Andrew Parr.
- [7] "Fundamentals of Pneumatic control Engineering" by J.P. Hasebrink and R.Kobbler.
- [8] "A Method of Analyzing the Logic Design of Pneumatic Sequential Circuits" by R.M.H. Cheng.