

MATERIAL HANDLING BY VACUUM USING COMPRESSED AIR

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Abstract

Pneumatic Handling is an effective method of conveying dry bulk material through pipes by means of air as a conveying medium. But instead of using air as conveying medium vacuum can do the same job. Compressed gas or air is compressed in a compressor and it is passed through a controlled space or holes which are very small in size 2 to 3 mm, this high pressure air produces a vacuum behind where it flows and hence sucks the material.

Air flow in the pipe carries the material in a homogeneous mixture and thus a minimum velocity is required to be maintained to ensure that the material does not settle down. No standard procedure is available for the design of pneumatic conveying system. As the configuration of the system changes, variable involved also changes, and one has to change the design considerations based on the applications. So there is wide scope for experimentation in the field of pneumatic conveying system.

Keywords: pneumatics, pressure control valve, drilling, connector.

1. INTRODUCTION

In all the pneumatic material handling systems, the material is conveyed through the pipes with the assistance of air flow, to a closed conduit. In order to ensure continuous carrying of material specific pressure of air should be maintained that is controlled by using controlled valve. Pneumatic systems used in industry are commonly powered by compressed air or compressed inert gases. A centrally located and powered compressor powers cylinders, air motors, and other pneumatic devices. A pneumatic system controlled through manual or automatic solenoid valves is selected when it provides a lower cost, more flexible, or safer alternative to electric motors and actuators.

Pneumatic conveying started in 1866 with the application of a fan and ducts to remove the dust and fine particles from woodworking operations. Both pneumatics and hydraulics are applications of fluid power. Pneumatics uses an easily compressible gas such as air or a suitable pure gas—while hydraulics uses relatively incompressible liquid media such as oil. Most industrial pneumatic applications use pressures of about 80 to 100 pounds per square inch (550 to 690 kPa). Hydraulics applications commonly use from 000 to 5,000 psi (6.9 to 34.5 MPa), but specialized applications may exceed 10,000 psi (69 MPa).

Vacuum is space devoid of matter. Vacuum is a region with a gaseous pressure much less than atmospheric pressure. In engineering and applied physics on the other hand, vacuum refers to any space in which the

pressure is lower than atmospheric pressure. The quality of a vacuum is indicated by the amount of matter remaining in the system, so that a high quality vacuum is one with very little matter left in it.

2. PLACING THE FIGURES

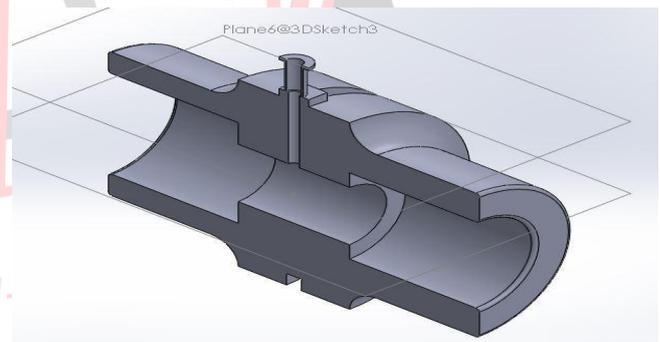


Fig.1. Model of material handling device

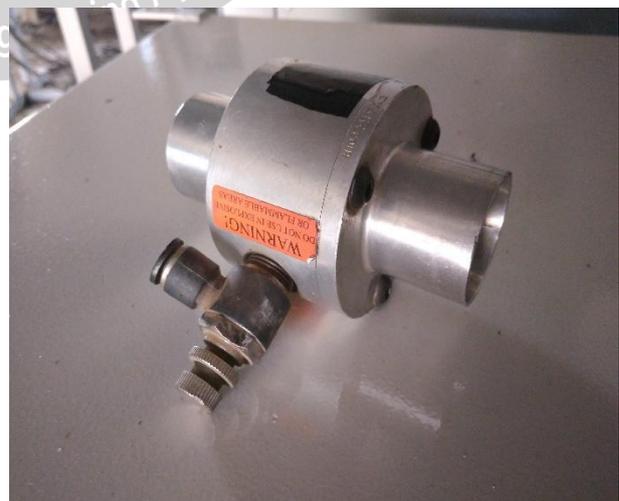


Fig.2 Actual model

3. WORKING PRINCIPLE:

As train with high speed passes by, it drives away all the air from that area and creates a low pressure region. As a result air from our back with high pressure flows to that region pushing us towards the train. (Bernoulli's theorem)

Working:

This material handling unit consist of three parts

1st part hollow cylindrical pipe having two narrow tapered drill holes.

2nd part is main body of the unit to which air pipe is connected. In this part vacuum is created.

3rd part is again a circular cylindrical pipe which sucks the air from atmosphere

As the principle is stated likewise compressor compress the air about 4 bar which is then supplies to the main unit ,this compressed air is passing through narrow holes with very high velocity hence it creates a vacuum in the main body.

This vacuum sucks the light materials like paper, tissue paper , clothes, dust ,light metal scraps etc. and throws it to a single specific place depending upon the pressure used.

Advantages:

1. It uses air which is easily available and cheap.
2. Low initial and operational cost.
3. Do not required any external power supply for its working.
4. It can be used to handle trash too
5. It is more efficient than any other picking system.

Disadvantages:

1. It cannot handle heavy materials
2. Compressor is used.

4. CONCLUSIONS

1. After doing the all actual experimentation and analysis it is conclude that light materials can be conveyed by using vacuum with the help of compressed air.
2. This devise can be used for pick and place applications like pick and place robots.
3. As compressed air is easily available in industry we can use this unit for material handling with no additional system and no additional cost.

4. Unit fabrication is very easy.

5. It can be used for material separation.

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