# DESIGNING AND FABRICATION OF AUTO PNEUMATIC BUTTERFLY VALVE

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**ABSTRACT**

*To design And Fabricate The Automatic Pneumatic Butterfly Valve Project is based on the application of butterfly valve integrated with the Pneumatic System and with automation. In these Manual Operation regarding the On/Off required to close the fluid valve is replaced with the low cost automation integrated with Pneumatic system and Butterfly Valve to reduce the wastage of fluid flow in system and the reduce the manpower optimization and to allocate that manpower to other source where manpower is needed.*

**Keyword :** Butterfly Valve **,** Pneumatic Cylinder **,** Solenoid Valve **,** Timer **,** Water Pump, Air Compressor

## 1. INTRODUCTION

A pneumatic water flow valve is a valve which can be used for isolating or regulating flow. The closing mechanism takes the form of a disk. Operation is similar to that of a ball valve, which allows for quick shut off. Butterfly valves are generally favored because they are lower in cost to other valve designs as well as being lighter in weight, meaning less support is required. The disc is positioned in the center of the pipe, passing through the disc is a rod connected to an actuator on the outside of the valve. Rotating the actuator turns the disc either parallel or perpendicular to the flow. Unlike a ball valve, the disc is always present within the flow; therefore a pressure drop is always induced in the flow, regardless of valve position.

### 1.1 BUTERFLY VALVE:-

Operation is similar to that of a ball valve, which allows for quick shut off. Butterfly valves are generally favoured because they cost less than other valve designs, and are lighter weight so they need less support. The disc is positioned in the centre of the pipe. A rod passes through the disc to an actuator on the outside of the valve. Rotating the actuator turns the disc either parallel or perpendicular to the flow. Unlike a ball valve, the disc is always present within the flow, so it induces a pressure drop, even when open.

A butterfly valve is from a family of valves called **quarter-turn valves**. In operation, the valve is fully open or closed when the disc is rotated a quarter turn. The "butterfly" is a metal disc mounted on a rod. When the valve is closed, the disc is turned so that it completely blocks off the passageway. When the valve is fully open, the disc is rotated a quarter turn so that it allows an almost unrestricted passage of the fluid. The valve may also be opened incrementally to throttle flow.

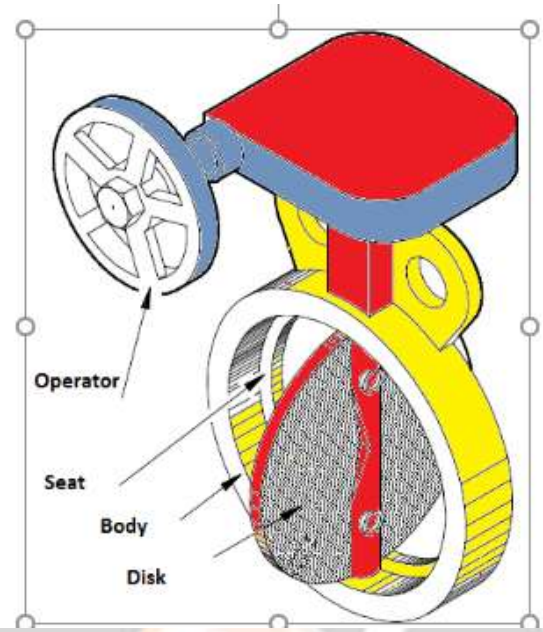



Figure 1:- Butterfly valve

**1.2 PNEUMATIC CYLINDER: -**

**Pneumatic cylinder(s)** (sometimes known as **air cylinders**) are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion.

Like hydraulic cylinders, something forces a piston to move in the desired direction. The piston is a disc or cylinder, and the piston rod transfers the force it develops to the object to be moved. Engineers sometimes prefer to use pneumatics because they are quieter, cleaner, and do not require large amounts of space for fluid storage.

Because the operating fluid is a gas, leakage from a pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement

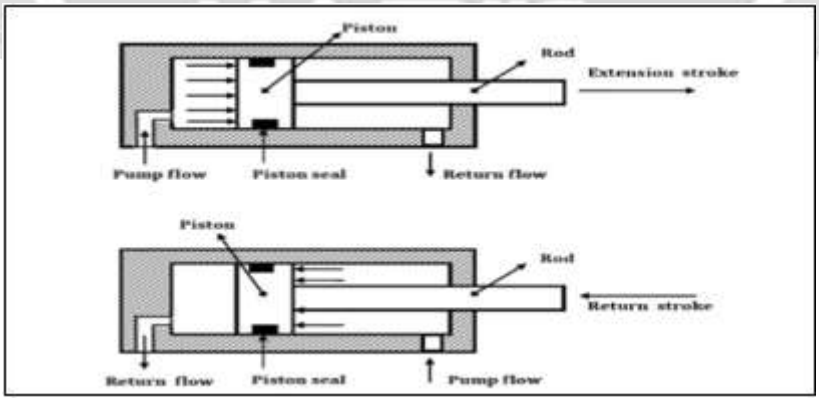



FIG 1.2 DOUBLE ACTING BUTTERFLY VALVE

**1.3 SOLENOID VALVE**

(A **solenoid valve** is an electromechanical device in which the solenoid uses an electric current to generate a magnetic field and thereby operate a mechanism which regulates the opening of fluid flow in a valve.

Solenoid valves differ in the characteristics of the electric current they use, the strength of the magnetic field they generate, the mechanism they use to regulate the fluid, and the type and characteristics of fluid they control. The mechanism varies from linear action, plunger-type actuators to pivoted-armature actuators and rocker actuators. The valve can use a two-port design to regulate a flow or use a three or more port design to switch flows between ports. Multiple solenoid valves can be placed together on a manifold.

Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design.

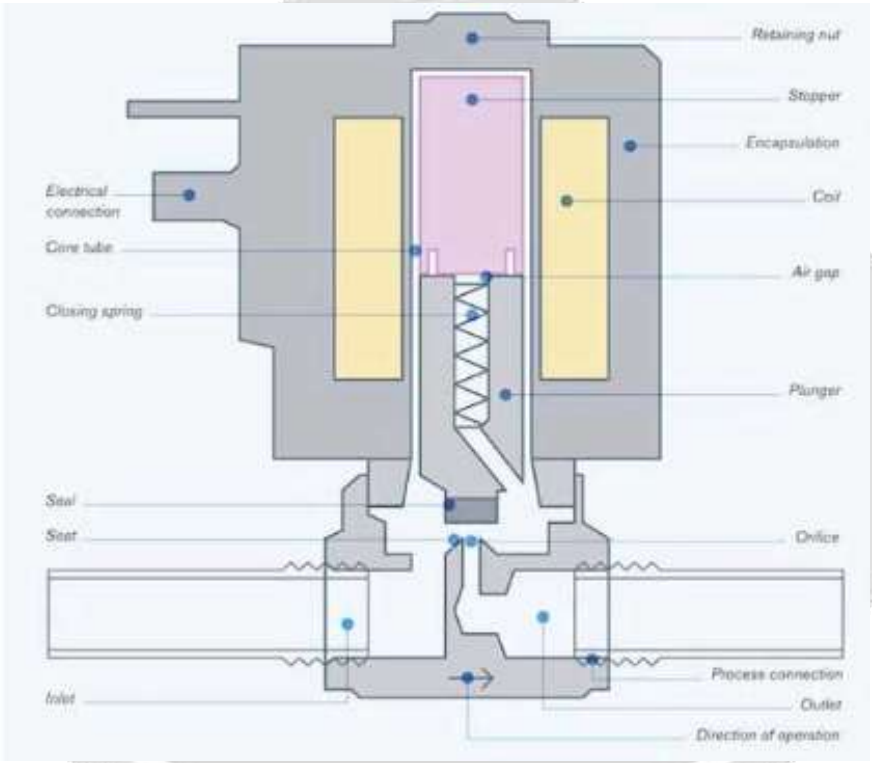



FIG 1.3 Diagram of Solenoid Valve

## 2. OBJECTIVE AND WORK PLAN

### 2.1 PROBLEM DEFINITION

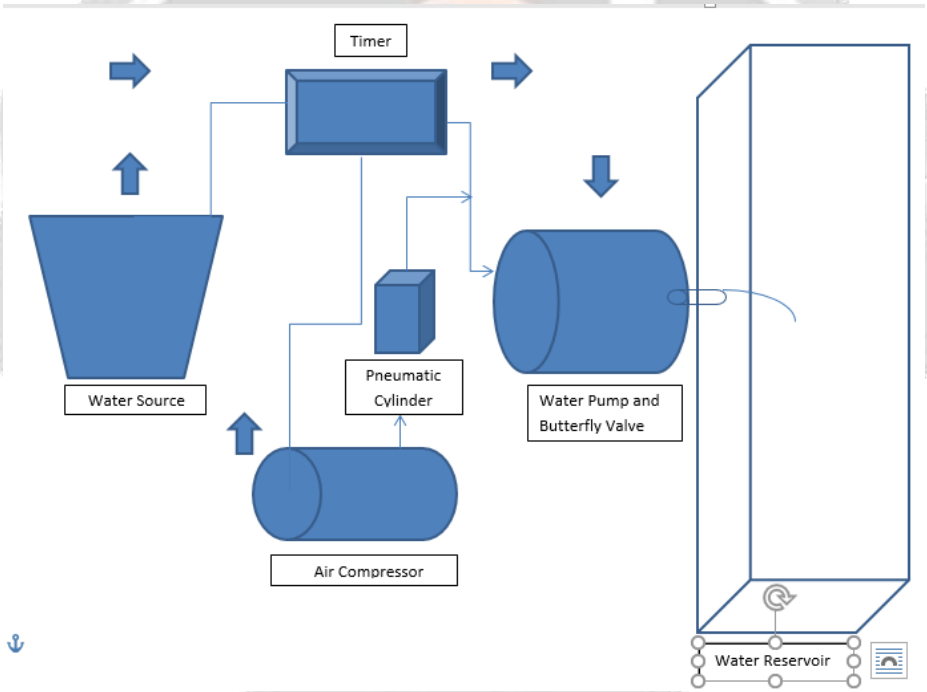
Due to increase competition in market it is tuff to stay in these market and to earn profit and to secure a good position in the market. To secure the good position the market it is essential to have low cost price of the product and with optimum Quality. So in Chemical, Petroleum, Water Industries it is necessary to control the Working Fluid and its wastage and to optimize the System in these industries Human Assistance is deputed to assist and control the flow at required interval of time. So in these manner the a Special Human is deputed to do Task successfully but on introduction of these Butterfly Valve integrated with Pneumatic System these problem can solved.

**2.2 OBJECTIVE**

1. The main purpose of our project is to automate the controlling the fluid flow.
2. To optimize the manpower allocated in system
3. One time investment with minimum cost.
4. Pollution Free system.
5. System with " Low Maintenance Cost"
6. Quickly Response to the functioned purpose.
7. Compact Structure to automate the desired function.
8. To use the low grade energy which is readily available.
9. To fabricate the Pneumatic system with aid of compact butterfly valve.
10. To reduce the wastage of fluid flow by controlling it automatically.

**2.3 SCHEMATIC LAYOUT OF AUTO PNEUMATIC BUTTERFLY VALVE-**

As the name of the project only indicates that there is through with the help of the Pneumatic System and with aid of Butterfly Valve both which are integrated with the Automatic System are being used to control the water flow in the system




**2.3 DESIGN OF PARTS: -**

**2.3.1 PNEUMATIC CYLINDER: - (AS PER ISO 6352)**

- As per ISO 6352 Double Acting Cylinder Single Rod End Cylinder Bore Diameter is related to Working pressure and hence our system working pressure is 0.7 MPA and hence selecting the lowest diameter to reduce the cost of the system the Cylinder diameter is 32 mm and 80 mm stroke length.

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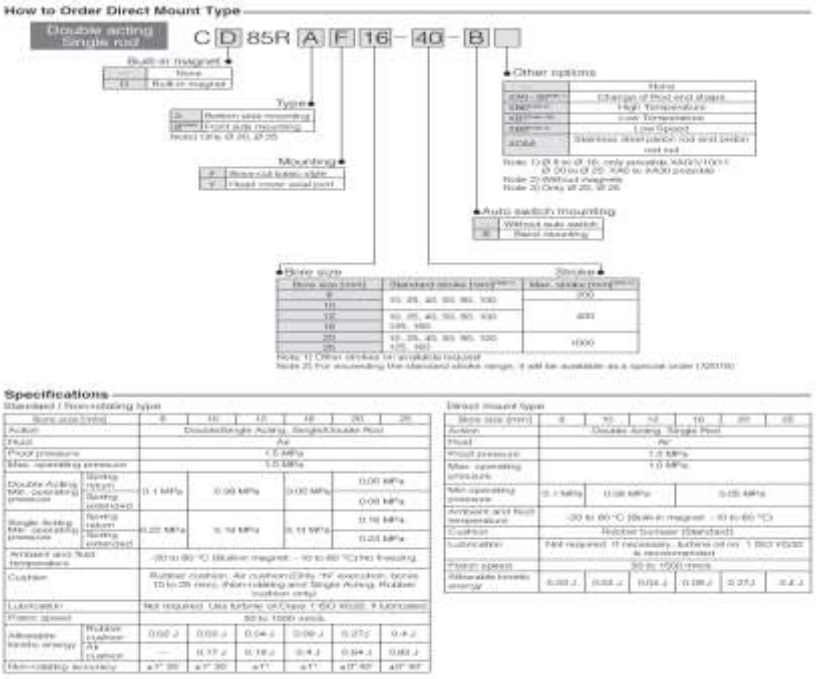


**2.3.2 Butterfly Valve**

- Butterfly valve is designed such way that its thickness should withstand the Pneumatic pressure of the system.

**Thin Cylinder**

$$t = \frac{P*D}{2*S}$$

t = Shell thickness mm
P = Maximum Working Pressure, MPa
D = Maximum Internal Diameter of Body, mm
S = Maximum Allowable Working Stress. MPa

**3.1.2 Thin Cylinder**

$$t = \frac{P*D}{2*S}$$

Where,

t = Shell thickness mm
P = Maximum Working Pressure, MPa
D = Maximum Internal Diameter of Body, mm
S = Maximum Allowable Working Stress. MPa

$$t = \frac{152 * 2.01}{2 * 35}$$

T= 4.55 mm

Where,

P= Max System working pressure (2.01 MPA).

D= Diameter of Butterfly Valve Disc (152 mm).

S= Maximum Ultimate Tensile Strength of Tin (35 MPA).

**TABLE 2.2** Tensile Strengths of Lead and some other Metals and Materials (All figures are for pure metals in the as cast condition unless otherwise stated. The strength of most metals is higher (approximately doubled) in rolled condition, and also much increased by alloying additions.)

| | Pb | Cu | Fe | Al | Zn (rolled) | Sn | soft solder |
|---|---|---|---|---|---|---|---|
| UTS ($MNm^{-2}$) | **12-17** | 120-170 | 100-230 | 90-100 | 110-150 | 20-35 | 55-75 |

| | Pb | glass | leather belt | pine spruce, along grain | oak | HDPE | PP | PVC |
|---|---|---|---|---|---|---|---|---|
| UTS ($MNm^{-2}$) | **12-17** | 30-90 | 30-50 | 20-50 | 60-110 | 20-36 | 28-40 | 50 |

## 4. CONCLUSIONS

(Our Auto Pneumatic Butterfly Valve System offers many advantages over the convention system used in industries so that plant efficiency increases without any changes in input but output increases and conventional system used offers many disadvantages which are listed below.

**Conventional System Disadvantes :-**

1. Conventional System used which is very costly.
2. Conventional system offers more maintenance.
3. Conventional system requires more manpower to operate the system.
4. Conventional system requires more maintenance cost.
5. Designing of Conventional system used are of complex design.
6. Conventional system efficiency is less.
7. Conventional system requires more operating cost.

**Auto Pneumatic Butterfly System Advantages :-**

1. Advanced System offers low cost equipment.
2. Advanced System is also equipped with the Automation facility.
3. Advanced System offers low maintenance.
4. Advanced system offers less manpower than conventional system.
5. Advances system also requires low maintenance cost.
6. Advanced system requires less operating cost.
7. Advanced system efficiency is more than conventional system.

So in above context we conclude that Auto Pneumatic Butterfly Valve system offers many advantages with respect to Conventional system in many ways such as less maintenance, more efficiency, less operating cost, integration with automation, less manpower requirement, more work output, pollution free operation, low grade energy used, less working pressure, and many other more advantages with context to conventional system.

## 6. REFERENCES


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