MODELING and ANALYSIS of BALL VALVE at DIFFERENT POSITION I.E. 90°, 60°, 45°

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Abstract— As a last year project we took ball valve for modeling and analyzing at various angles to check its performance. In industries it is necessary to handle flow around the full seat diameter from the instant it starts to open and ball valve provide an outstanding feature, as compared to other valves. After researching various importance and ability of ball valve we planned to analyze ball valve and check at which position it gives a better performance. So we considered three positions i.e., 45°, 60°, & 90°. The analysis results states that the ball valve performs well at 45°.As it gives higher velocity compared to other positions at low pressure.

Key words: Modeling 1, Analysis 2, Ball 3, Valve 4

I. CREO MODELING

Creo is a necessary means for 3D CAD. It is a form of expert software, which supports finest method in design and retains the industrial benchmarks. As Creo coordinates freely with all other Creo apps, no risk of loss of time converting data across platform and eradicates costly data transfer faults. . Reduces design time line and also enhance product improving processes to implement significant designs.

After understanding the ball valve design, we started Creo modeling of ball valve. Below mentioned fig. is the parametric model of existing valve design used for domestic (sanitary) application. Figure shows the overview of the valve design.

Fig. 1: Outside View Of ball valve

Below mentioned fig. shows clear inner view of valve with outlet and inlet pipes connections.

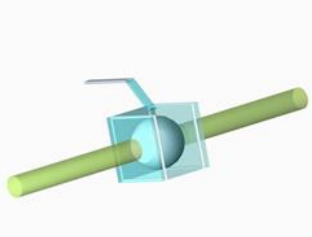

Fig. 2: Inner view Of ball valve with pipe connections

II. ANSYS ANALYSIS

ANSYS is a computer aided engineering software used to simulate communication of all fields of physics, fluid dynamics, heat transfer etc. for engineers. We did CFD (Computational Fluid Dynamics) analysis in ANSYS for various opening angles of ball valve like 90, 60, & 45.

A. Cfd Analysis Of Ball Valve At 90°:

90° Full Open Velocity Profile

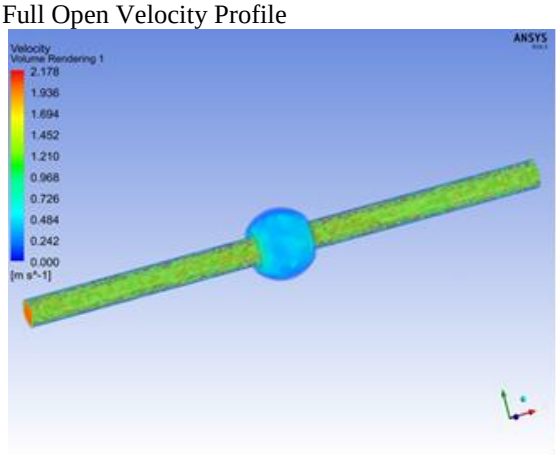

Fig. 3: Velocity Profiles 90°

90° Full Open Pressure profile

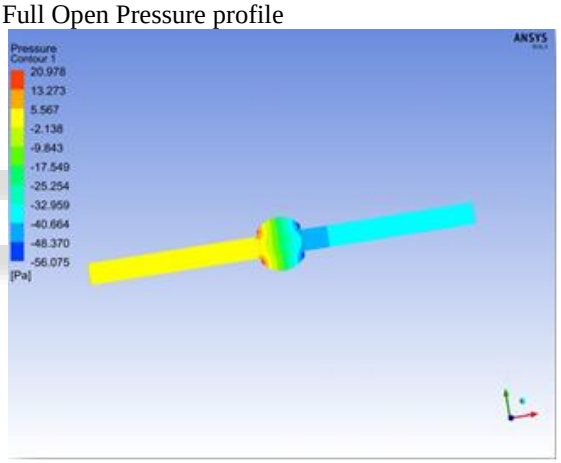

Fig. 4: Pressure Profiles 90°

90° Full Open Velocity Volume Rendering

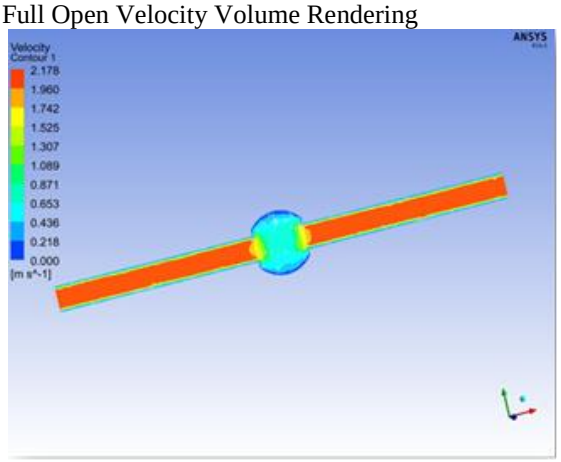

Fig. 5: Velocity Volume Rendering Profiles 90°

B. Cfd Analysis Of Ball Valve At 60°:

60° Open Velocity Profile

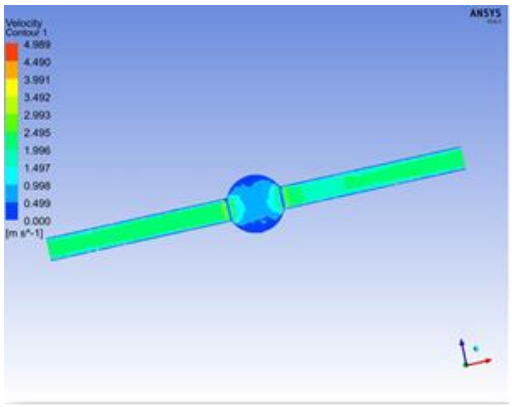

Fig. 6: Velocity Profiles 60°

60° Open Pressure Profile

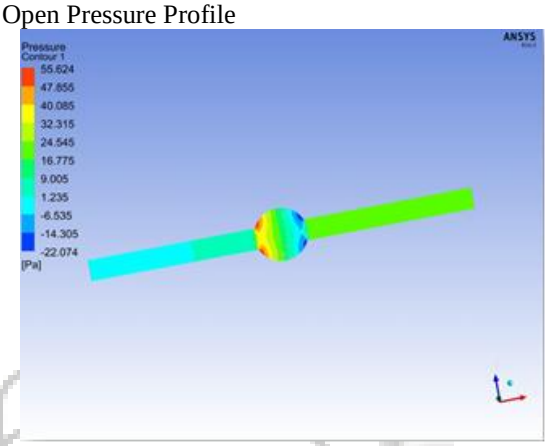

Fig. 7: Pressure Profiles 60°

60° Open Velocity Volume Rendering

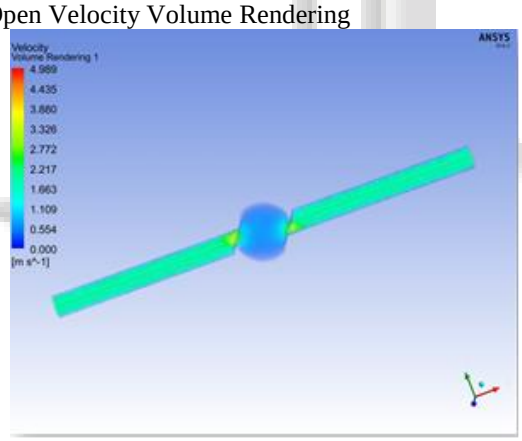

Fig. 8: Velocity Volume Rendering Profiles 60°

C. Cfd Analysis Of Ball Valve At 45°:

45° Open Velocity Profile (Inlet)

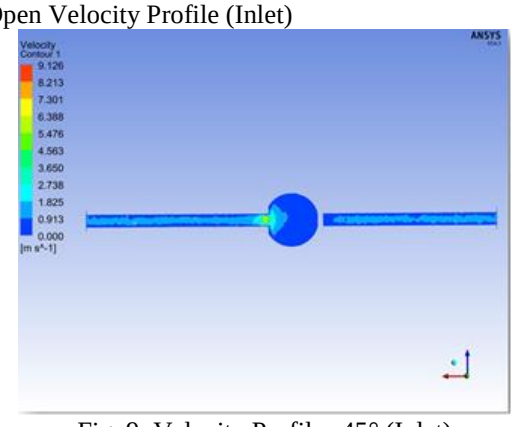

Fig. 9: Velocity Profiles 45° (Inlet)

45° Open Velocity Profile (Outlet)

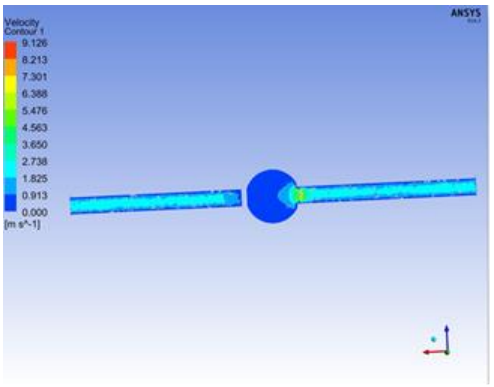

Fig. 10: Velocity Profiles 45° (Outlet)

45° Open Pressure Profile

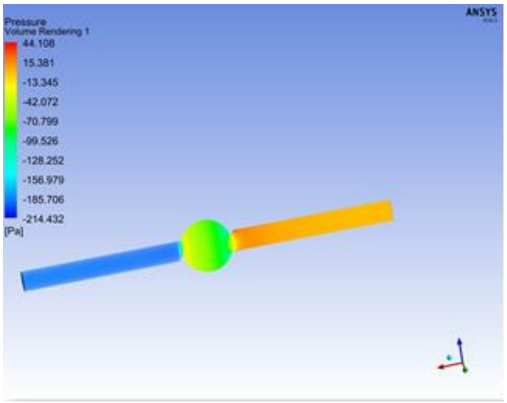

Fig. 11: Pressure Profiles 45°

45° Open Velocity Volume Rendering

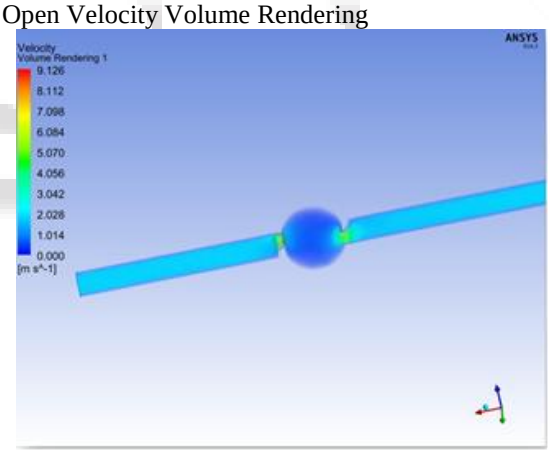

Fig. 12: Velocity Volume Rendering Profiles 45°

Positions	Velocity (m/s)	Pressure (pa)	Volume Rendering (m/s)
90°	2.178	44.108	2.178
60°	4.989	55	4.989
45°	**9.126**	**20.978**	**9.126**

Table 1: Reading of the analysis

III. CONCLUSIONS

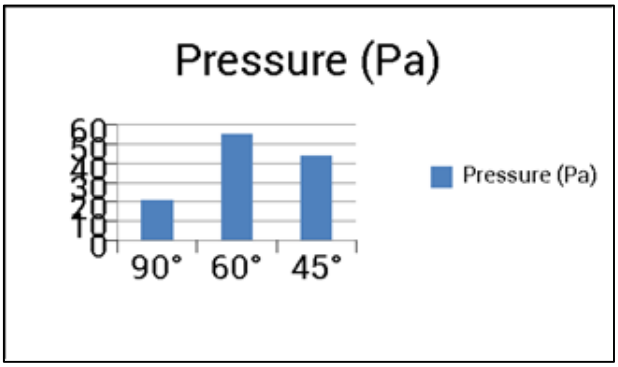

Chart 1: pressure at various positions

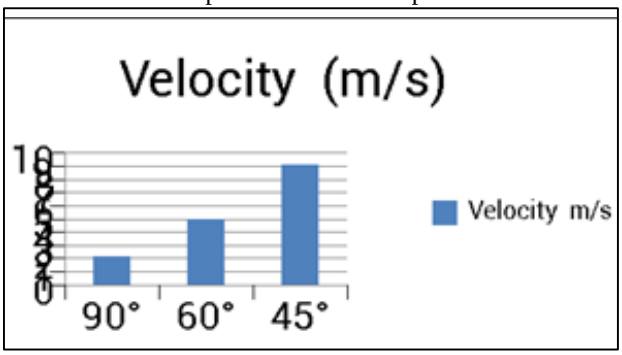

Chart. 2: flow velocity at various positions

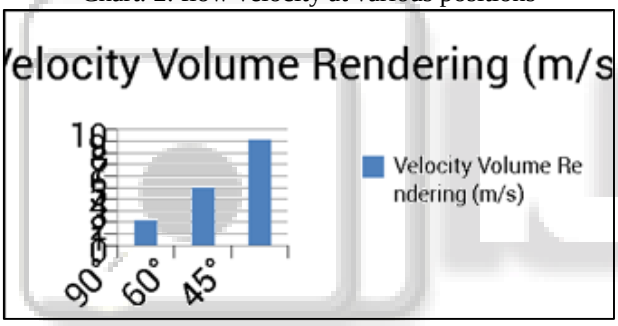

Chart3: Volume rendered through the valve

As you can see from the above charts and table mentioned that the valve gives best velocity flow at low pressure at 45°.so, by doing an analysis on the standard dimensioned ball valve we conclude that the ball valve gives its best performance at 45°.

As you can see from the table-1 that,

1) At 90° the fluid or gas exerts more pressure on the valve and the velocity is too low which is not effective and causes harm to the body.
2) At 60° the pressure exceeds more compared to 90°, which is not good for the performance of the valve, and also velocity obtained is very low.
3) So as per analysis results we conclude that the ball valve performs well at 45° because the pressure acting the valve is low and the velocity of fluid or gas passing is high compared to other position of ball.

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