CASE STUDY

Engineering Design Services

Engineering Design & Drafting | CAE Services: CFD & FEA | Reverse Engineering
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Ball Valve Strength Assessment Subjected to Internal Pressure Loading

Case Study Highlights

Client Profile:
Client: Engineering Design Consultant
Location: USA

Objective:
To assess the strength of a valve body subjected to internal pressure loading

Challenges:
- Developing CAD model of the ball valve body for accurate analysis results
- Applying suitable boundary conditions as per real application scenario
- Identifying possible design optimization based on analysis results

Solution:
The finite element model was developed from the CAD model of the valve body to perform structural analysis and equivalent stress values were determined. It was observed that the wall was subjected to high structural stresses leading to deformation above permissible range. Design optimization was recommended based on the analysis results to withstand pressure loading without excessive deformation.

Software Used: ANSYS Mechanical 14.5

Ball valves are extensively used in industrial applications to control high pressurized fluid flows (usually up to 1000 bar). The design of valve body thus requires to be assessed for strength and deformation that might be caused due excessive pressure loadings.

hitech CAE offered an engineering solution through finite element analysis to evaluate the strength of the ball valve subjected to high pressure loading.

The Solution
The CAD model of the valve body was developed from the drawings and was converted into a finite element model by dividing the geometry into number of smaller elements. Pressure loads were applied on one of the valve faces and structural analysis was performed to measure stress concentration and deformation values. The results showed that under high pressure loading, the strength of the wall was not sufficient and promoted deformation above the acceptable values.

Based on the results, change in the design parameters were recommended to effectively withstand high pressure without excessive deformation. Additionally, a change in the valve material was also suggested to improve the overall structural strength of the ball valve.

Benefits
- Assessed the valve geometry for structural strength prior to manufacturing stage
- Reduced the cost and time required to perform physical test trials
- Increased the life of the ball valve based on the design recommendations provided

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