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"Weight Optimisation Of 12"-600 Gate Valve By Using Finite Element Analysis And Experimental Stress Analysis"-A Review

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ABSTRACT : *Now a day's everywhere Optimization concept is in the focus, no doubt its fruit of the cost cutting concept. But while optimizing sometimes quality of product is not given that much importance. Simplest and most common general type of gate valve is a 2 port valve, which has two positions. Open to allow flow and shut (closed) to stop flow. Ports are opening in valve body through which fluid can enter or leave. The ports are typically at opposite ends of body, therefore the disc is rotated a forth of full turn to change from open to shut position.Generally gate valves are manufactured by casting method. Gate valve Body contributes considerable amount of weight in assembly (about 50% of the total weight). So for optimization of gate vale body it is necessary to get the tensile stress pattern of the body, which is possible by using Finite Element Analysis. A previously studied Gate valve carried by classical theory and Finite element analysis by using Ansys. The results obtained by this two methods approximately same. So these results can be used for the further work. The paper gives the brief look on the suitability of gate valve weight reduction by using finite element analysis and compare with experimental stress analysis with matching principal stress one and two and voin mises stress theoretical and actual. and according to that weight reduction of valve body using constrains of valve body pressure and stress.*

I. INTRODUCTION

I In today's world of technological advancement in the field of fluid transfer systems, various components are incorporated in the field of fluid transfer systems for efficient transfer of fluid.one of the most important component that regulate flow of fluid through transfer lines are VALVE. a valve is device that regulates, directs or controls the flow of fluid by opening, closing or partially obstructing various passage ways they are used in various applications like industrial (oil, gas, power generation, mining chemical manufacturing),military, commercial, residential. Valves are various types having wide range of size and applications.so considering importance of valve we are reduce the manufacturing cost of valve.so major weight of body in assembly of valve that can be reduced without disturbing other parameters like pressure.

II. LITERATURE REVIEW:

Following is a list of review of work done by different researches in the area of weight optimization and experimental stress analysis technique.

- Dr. K.H. Jatkar & Sunil S. Dhanwe [1] has worked on classical theory and finite element analysis of the gate valve. Finite element analysis carried out by using Ansys software. Stress value of classical and finite element analysis compared and it matches approximately with each other. and that can be used for further development of the gate valve.
- Macura, et.al [2] have worked on experimental analysis of residual stresses on concrete part of pipelines-welded ball valve. Strain gauge technique used for measurement of residual stresses both immediately after welding and after pressuring of the ball valve. They have used special rectangular strain gauges in the form of rosettes with 1.5mm length. Cylindrical holes were drilled in centre of these rosettes successively in six depth steps for measurement of released relative strains. Results of realized measurement serve as a basis for evaluation of strength and service life of this component.
- Song, et.al [3] has conducted new process to meet desired need in valve design that is characterized by complex configuration. He proposed process which includes mainly three parts. First, CFD (Computational Fluid Dynamics) & FEM (Finite Element Method) analysis of a butterfly valve carried out to calculate the pressure loss coefficient & maximum stress in the valve disc. Secondly, topological optimization is carried out to identify basic shape of butterfly valve disc also size optimization is utilized to determine detailed size based on the result of topology optimization. Finally result of validation simulation agrees well with prediction that adopted method is reliable & can be applied in the optimization of butterfly valve.

- ASL, et.al [4] has analyzed a failed volute casing of a real centrifugal-pump. Firstly finite element method applied to the model for calculating mechanical capability under hydrostatic test. Then after obtaining the optimized geometry parameters in the simulation, six new volute casing were cast, fabricated and used in hydraulic test. The result shows that overall performance and efficiency decreases due to change in design of the volute shape segments are negligible. Modification in casing can be easily done in manufacturing lines which do not impose further costs.
- Joseph F Dues [5] has studied the geometry of the soda can is for minimize the amount of aluminum required. The wall thickness is very thin and is subject to an appreciable amount of stress and strain. He mounted a strain rosette strain gage to the can, and then relieving the stress by opening the can, the change in strain from the pressurized to unpressurized condition measured. For taking measurement P-3500 Strain Indicator is used. He concluded that the average longitudinal pressure is about 10% less than the pressure calculated from the average hoop strain. and this difference turns out to be fairly common and is then major potential source of error in this experiment.
- Xue Guan Song,et al [6] studied the multidisciplinary optimization of a butterfly valve. the initial model of valve is made, and then the initial analysis including fluid and structural analysis is carried out to predict the fluid and structural performance of the valve. Optimization is carried out in the form of mathematical functions and using with the trade-off method. Validation simulation shows that the orthogonal array experiments drastically reduced the numbers of the computer experiments, and trade-off method combined with response surface model can predict the optimum conditions accurately and effectively.

III. CONCLUSION

- Literature review of valve work done by different researches in the area of weight optimization and experimental stress analysis technique the result of each one showing that classical and analytical results are approximately matches with each other and that can be used for further development of the gate valve.

IV. FUTURE WORK

A review suggests that in forthcoming efforts analysis of gate valve could be best possible with Finite Element Method with ANSYS. The future work is to design the gate valve body for weight optimization the Principal stress first, second and voin mises stress value are find out by using FEA and using Experimental stress analysis(strain gauge rosette) we will find value of Principal stress and voin mises stress and compare value actual and therotical and we will optimize weight.

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