ABSTRACT

It is important to recognize that, the design of any turbo machine include many static and dynamic conditions, which are directly or indirectly related with the efficiency of the machine. Though centrifugal fans/blowers have been developed as highly efficient machines, design is still based on various empirical rules proposed by designers. Thus the design methodology suggested by different researchers differs widely to one another. To get detail study of the flow inside the casing, experimental investigation is done, with various conditions. Flow analysis is done in volute casing of rectangular cross section, which is design on the “free vortex” and “constant velocity” method. After the investigation of flow modification is done in the casing and finally experimental results were obtained. Three and five hole probe were manufacture for the measurement of flow in the casing. Calibration of both probes is done in the windtunnel. For measurement of pressure water-tube manometer is used. Uncertainty analysis is done for confirmation of percentage of error in the measurements. Experimental and computational results were match for the complete analysis. As one of the objectives of present study is to combine & optimize those designs in order to yield an efficient design which gives desired performance. In centrifugal machines there is transfer and transformation of energy. Therefore it is challenging task to optimize the performance of volute casing. The design variables are iterated to satisfy the constraints. This is needed to achieve acceptable design. Almost all well-known references were referred before selecting constraints which limits the theoretical design. The constraints selected here are the outcomes of the work done by various researchers over many years. The new optimized design shows almost 10% increase in efficiency. The end results substantiate the present design and optimization methodology as a promising tool to a design engineer. Through analysis and comparison between combined heuristic optimization and Genetic Algorithms and the optimized design and the initial design, the validity and feasibility of the developed optimization design system is confirmed.

Optimized design is fabricated for the flow analysis. All the results were compared. Finally, results shows efficiency with power saving.