The Taguchi Experimental Study of High Static Pressure Performance Design for the Centrifugal Fan

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Abstract

This paper used the Taguchi experimental method to study the blade design and volute channel to get the high pressure performance for the centrifugal fan. There is used the CFD simulation technology to replace the real fan performance measurement and used the Taguchi experimental method to get the blade shape design parameters to cause higher static pressure. Here chose a centrifugal fan as a original target for improving the static pressure performance, and used \( L_{16}(4^5) \) four level orthogonal arrays to perform the Taguchi experimental method and chose five design control parameters such as the inlet angle of blade, the outlet angle of blade, the star angle of volute lingua, the inner diameter of vane wheel and the blade number of vane wheel. Each design control parameter has four design levels and arrange by the \( L_{16}(4^5) \) orthogonal arrays. Completed the CFD simulations to get the centrifugal fan performance and applied the parameter interactive analysis by the S/N ratio to get the best combination of the design parameters. For check the best design, made a real fan by CNC machining and measure the performance by the AMCA 210-99 wind tunnel. Compare the static pressure with the Taguchi blade and the original blade, there is higher 13%.