Patent Search

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Abstract:

Mathematical Modelling and Design Optimization of Fluid Cascade Circulation with a Turbulence Model Abstract The study explains how to simulate fluid machinery u
equation turbulence models, essential for forecasting fluid behaviour in non-ideal situations. The study also delves into how suction can regulate air flow at the comp
under heavy loads, thereby minimizing air leakage and maximizing efficiency. Higher-order correlations are suggested to enhance prediction accuracy but at a higher
computational cost. Models of turbulence with a single equation produce accurate and computationally effective results. By observing a curved surface instead of a s
the Coanda effect, a new technique, reduces the secondary flow of fluid losses in fluid machinery. It decreases the intensity and extent of high-flow loss zones, which
19.21% decrease in total pressure loss across the cascade passageway. To investigate the connection between the various velocities in the flow field, we employed an
Decomposition (OD) method. In their experiments, they discovered that oscillating suction rendered the flow field more regular and predictable, which is desirable.

Complete Specification

Description:Mathematical Modelling and Design Optimization of Fluid Cascade Circulation with a Turbulence Model

Field and Background of the Invention

The present study highlights the significance of fluid machinery simulation, which includes using fluids like water or air. Engineers rely heavily on the effects of fluid machinery to foretell the machinery's behaviour under varying conditions. It's useful for enhancing the machine's performance through better design and optimiza Models of turbulence, which represent the chaotic and unpredictable motion of turbulence, include the zero-equation model and the six-equation model. One-equa turbulence models, such as the Spalart-Allmaras model, provide a good compromise between accuracy and computational cost. The Coanda effect, where a fluid fo curved surface instead of moving in a straight line, can reduce secondary flow losses in fluid machinery. The efficiency of fluid equipment degrades due to secondar losses when fluid flows in a direction perpendicular to the primary flow direction. Using the Coanda effect, engineers may lessen the impact of high-flow loss zones make their machines more efficient. This research assesses the Coanda effect's efficiency in minimizing secondary flow losses when employing one-equation turbul models to mimic fluid devices. The blades of fluid machinery, such as a cascade channel, are the primary subject of this research. We conducted experiments to det whether or not suction can effectively move regulation tip leaks in a highly loaded compressor cascade. They ran CFD simulations to examine the flow field and sele underlying mechanisms. The results may be helpful for engineers and designers who are trying to boost the efficiency of axial-flow compressors. Engineers and des can improve the machine's efficiency by cutting down on air loss by learning the mechanics of oscillating suction and applying them to manage tip leakage flow.

One-equation turbulence models are an excellent middle ground between the zero-equation simulation and the two-equation model, providing accurate (which is

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