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A Comparison of three-bladed and four-bladed Inducers at On and Off Design Flow Rates



A computational fluid dynamic comparison was performed between on-design and off-design flow rates through a four-bladed and a three-bladed axial pump inducer. The simulations were run time-resolved and with two phases (water and water vapor). Turbulence modeling employed the realizable k- model and cavitation was predicted using the Rayleigh-Plesset model. The solution discretization is second order accurate in space and first order accurate in time. The results show classical breakdown curves for all four cases. Breakdown is the condition where the entire flow path in the inducer becomes filled with vapor and the head rise over the inducer is decreased dramatically. The purpose of this paper is to compare performance behaviors between a three-bladed and four-bladed inducer operating at on-design and off-design flow rates. Certain rotating instabilities have previously been observed with the four-bladed inducer and we investigate whether similar instabilities exist for a three-bladed geometry. We also investigate how off-design operation affects the stability of both inducer geometries.

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