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Periodic Cavitation in a High-Speed Water Inducer at an Off-Design Flow Coefficient RYAN LUNDGREEN, RYAN CLUFF, DANIEL MAYNES, STEVEN GORRELL, Brigham Young University, KERRY OLIPHANT, ConceptsNREC — Time resolved numerical simulations were conducted on a high-speed water inducer designed to operate under cavitating conditions at both on and off-design flow rates. A segregated solver was employed and the turbulence model was the realizable k-epsilon approach. The solution discretization is second order accurate in space and first order accurate in time. Cavitation within the domain becomes periodic as the cavitation number decreases. At flow coefficients smaller than the design flow coefficient, a large time-varying volume of cavitation is observed upstream of the inducer causing the system to become unstable for practical use. Large regions of reversed flow at the blade tip cause the incoming fluid to increase in velocity and the effective mass flow area to decrease. It is this increase in velocity that leads to the formation of the periodic vapor cavity upstream of the inducer. The vapor cavity increases in size until it completely blocks the core of the passage, forcing the flow out toward the shroud. As the flow near the shroud accelerates, the reversed flow at the blade tip decreases and the vapor cavity decreases in size until it collapse completely, causing a large jump in pressure throughout the entire flow domain.

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