Published on *CD-adapco* (http://www.cd-adapco.com)

Performance of Three-Dimensional Annular Diffusers with Varying Dump Gap Ratios

Experiments were performed on two annular diffusers to characterize the flow separation and pressure recovery to create a foundation for future active flow control techniques. Both diffusers had the same fully developed inlet flow condition, however, the expansion of the two diffusers differed such that one diffuser replicated a typical compressor discharge diffuser found in a real machine while the other would create a naturally separated flow along the outer wall. Both diffusers were tested at two Reynolds numbers, $5x10^4$ and $1x10^5$, with and without a vertical wall downstream of the exit to replicate the dump diffuser that re-directs the flow from the pre-diffuser outlet radially to the combustor.These experimental results were used to validate a 3-dimensional RANS CFD model using realizable k-? turbulence with all wall Y+ treatment. Static pressure measurements were obtained along the OD and ID wall of the diffusers to determine the recovered pressure throughout the diffuser. Results show that the typical compressor discharge diffuser decreases in performance as the dump gap ratio decreases, while the naturally separated diffuser?s performance increases At a dump gap ratio of 0.5, both diffusers performed similarly.

Author Name:
B. C. Bernier
J. Dunn
M. Ricklick
J. Kapat
Industries:
Turbomachinery [1]
Products:
STAR-CCM+® [2]
Conference Location:
Orlando, Florida
Link:
Aiaa [3]
Rights:
2011 AIAA
Conference Date:
Tuesday, January 4, 2011
Paper Reference:
AIAA 2011-745
Conference Name:
49th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition

CD-adapco is the world's largest independent CFD focused provider of engineering simulation

software, support and services. We have over 30 years of experience in delivering industrial strength engineering simulation.

Source URL: http://www.cd-adapco.com/conference_proceeding/performance-three-dimensional-annular-diffusers-varying-dump-gap-ratios?language=en

Links:
[1] http://www.cd-adapco.com/industries/turbomachinery
[2] http://www.cd-adapco.com/products/star-ccm%C2%AE
[3] http://www.aiaa.org/content.cfm?pageid=406