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Characterization of tunable active grid generated turbulence in a water tunnel facility[1] CHRIS RUHL, ASHWIN VINOD, ARINDAM BANERJEE, Lehigh Univ — In the past quarter-century, extensive research of wind-tunnel active grid turbulence generating devices has allowed researchers to fine-tune turbulent flow in experimental settings. That research and capability are rarely available in experimental facilities that use water as the preferred fluid medium. Our group has successfully employed a Makita-style active grid turbulence generator that is comprised of ten rotating shafts with a dedicated stepper motor to control each shaft. A total of sixty rotating winglets rotate using various control protocols to produce controlled and elevated levels of free-stream turbulence For the current experimental campaign, we vary the shaft angular frequency ranging from 0.25 to 3.0Hz to vary the vane Rossby number; the free stream velocities are also varied between 0.10m/s-0.83m/s to vary the mesh Reynolds number. Besides, the winglet blockage was varied by altering the size and solidity of the winglets. We will present the results of our experiments by presenting flow statistics such as turbulence intensity, Taylor Reynolds number, flow anisotropy, and integral length scale for the various cases tested. A comparison will be also be done with wind-tunnels tests over the same parameter range.

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