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Numerical Simulation of Non-Newtonian Fluid Flow through Curved Outlet Backward Step Duct

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Abstract—Computational modeling is involved in communicating through the computer to expect the successfully numerical approaches and physical behavior of the solution. In the current research, the performance of laminal, in-compressible and non-Newtonian fluid flow through a curved outlet backward step duct with the expansion channel in the inner domain of the gas turbine combustor is studied. The Computational Fluid Dynamics (CFD) design a standard computational model that shows the fluid problem solved numerically, based on the Least Square Galerkin Finite Element Method (LSGFEM). The numerical simulation of the internal part of the gas turbine combustor is implemented. The numerical results of the velocity vector profile and pressure isobar flow rate to the non-Newtonian fluid flow are calculated into two different cases such that share thinning fluid flow (n=0.95) and share thickening fluid flow (n=1.1) through applying some boundary conditions. The streamline pattern of the velocity vector field is deliberated at different Reynolds numbers. The minimum and maximum velocity vector profile and pressure isobar flow rate at the inlet and outlet including their transformations are measured. Furthermore, the retract size of the vortex length systematized at the silent corner of downstream to the detected geometry is also calculated.

Keywords—Non-Newtonian Fluid, Gas-Turbine Combustor, Computational domain, FEM