

Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Flow past a rotating cylinder at high Reynolds number using PANS method RAJESH KUMAR, Department of Mechanical Engineering, NIT Kurukshetra — In the present study, high-Reynolds number flow past a rotating cylinder has been simulated using Partially-Averaged Navier-Stokes (PANS) method. The simulations are performed at $Re = 140000$. The spin ratio of the cylinder, which is defined by the ratio of the circumferential speed of the cylinder to the free-stream speed, varies from $a = 0$ to $a = 4$. The resolved and the modeled physical scales have been compared with the corresponding LES data for better understanding of the efficacy of the PANS method. The comparison of PANS results with the LES results showed good agreement. It has been recognized that the PANS simulation is able to produce fairly acceptable results using even a coarse-mesh. It is recognized that the time-averaged flow statistics obtained using PANS and URANS simulations are approximately same. However the vortex structure is much better captured by the PANS method. With the increase in the spin ratio, decrease in the time-averaged drag and increase in the time-averaged lift force acting on the cylinder have been observed. The vortices in far wake region are displaced and deformed but those in the vicinity of the cylinder are stretched at the bottom and accumulated over the top of the cylinder.

Rajesh Kumar
Department of Mechanical Engineering, NIT Kurukshetra

Date submitted: 01 Aug 2016

Electronic form version 1.4