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Control of the near wake behind a circular cylinder using superhydrophobic surfaces[1] NAYOUNG KIM, HYUNSEOK KIM, HYUNGMIN PARK, Seoul National University — In the present study, the effect of superhydrophobic (SHPo) surface on turbulent wake behind a circular cylinder is studied. Using 2D particle image velocimetry, velocity fields are measured in a water tunnel at $Re_D = 0.7 - 2.5 \times 10^4$. For SHPo surfaces, spray-coating of hydrophobic nanoparticles and roughened Teflon (with a sandpaper) are applied. The griding direction of a Teflon surface is varied as streamwise and spanwise ones, respectively, to see the effect of slip direction as well. It is found that the surface slip increases the turbulence in the flows above the circular cylinder and along the separating shear layers, which result in the delay of flow separation and early vortex roll-up in the wake. As a result, the recirculation bubble in the wake is reduced by up to 50%, and the wake survey estimates the drag reduction of about 10%. On the other hand, the spanwise slip is found to be more effective than streamwise one in flow control, supporting the suggested mechanism. Finally, the SHPo surfaces are applied locally by varying its installation angle and SHPo surface applied around the separation point was most effective, indicating that the surface slip directly controls the flow separation.

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