

Abstract Submitted  
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**Linear proportional-integral control of flow over a circular cylinder**<sup>1</sup> SEUNG JEON, HAECHON CHOI, Seoul National University — In the present study, we apply a linear proportional-integral (PI) control to the flow over a circular cylinder for mean-drag and lift-fluctuation reductions. Park *et al.* (PoF 1994) controlled the flow over a circular cylinder using a linear proportional control, but this control is very sensitive to the sensing location and works only for limited parameter ranges. In our study, we introduce a PI control to increase the controllability. The cross-flow velocity component at the centerline in the wake region is measured and is used for the determination of the control input (blowing/suction at the cylinder surface) through the PI control method. The actuation is given at the upper and lower slots on the cylinder surface near the separation point satisfying the zero-net mass flow rate. For two different Reynolds numbers,  $Re = 80$  and  $100$ , we vary the sensing location ( $x_s$ ) from  $1d$  to  $8d$  and the optimal proportional and integral gains for each sensing location are obtained using the surrogate management framework. With the PI control, the mean drag and lift fluctuations are significantly reduced and the effective control parameter ranges are widened.

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