

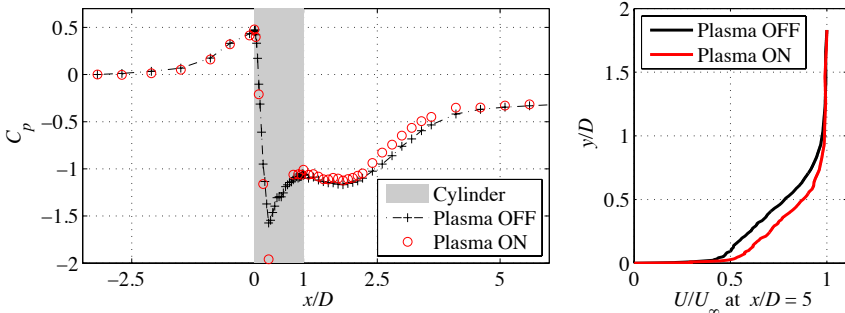
# Bluff Body Flow Control - the Experimental Study

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This project focuses on the study of Dielectric Barrier Discharge (DBD) plasma actuators with the objective of using the electric wind produced by the actuators to control flow separation and thus decrease the drag on bluff bodies.

The first goal of the project was to design and construct DBD plasma actuators and electrical circuits for their control to understand how the actuators interact with the flow and identify relevant parameters for separation control. A study of the electric wind induced by the actuator placed at the top of a cylinder showed velocities up to 4.5 m/s and a velocity profile similar to that of a wall jet. Phase-averaged measurements showed an increase of the velocities during both the forward and backward stroke of the alternating voltage cycle in agreement with the PUSH-push mechanism theory of DBD plasma actuators.



Separation control experiments on a half-cylinder bump protruding from a flat plate were conducted using a double DBD plasma actuator. Pressure measurements showed a dependency of the flow control on the actuator position. When the actuator is placed upstream but close to the uncontrolled separation position, the base pressure at the rear of the bump was increased, the reattachment point moved upstream (see figures) and a drag reduction up to 30% achieved. The final goal is, in a power efficient manner, to actively control separation to reduce drag on geometries similar to truck cabins.

Vernet, J., Örlü, R., Alfredsson, P.H., 2013, Experimental study of the electric wind induced by a dielectric barrier discharge plasma actuator, Proc. of the Int. Conf. on Jets, Wakes and Separated Flows, ICWJSF-2013, Nagoya, Japan.

\* Flow Research on Advanced and Novel Control Efficiency – FRANCE