

# Optimization of Plasma Actuator Installed in Transportation Equipment

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## Abstract

In recent years, improvements in aerodynamic characteristics due to change in the surface shape of transportation equipment such as cars and airplanes are showing stalls. In this respect, there is a demand for development of a technology capable of a designing a shape without being restricted by aerodynamic characteristics regardless of its shape. We focus on the plasma actuator which may possibly suppress the separation of air flow irrespective of its shape. Fig. 1 shows a schematic diagram of a dielectric barrier discharge plasma actuator (PA). The PA is a device that generates an air flow by utilizing a plasma force generated by applying a high frequency / high voltage alternating current between electrodes by sandwiching a dielectric layer between two electrodes. In this study, the PA used PTFE tape as the dielectric layer is used. In the experimental apparatus shown in Fig. 2, the flow velocity induced by this PA was measured using the hot wire anemometer. Based on this experimental result, the optimum inter-electrode distance and the optimum number of dielectric tapes (0.09mm per sheet) of the PA are examined. Fig. 3 shows the relationship between the inter-electrode distance and the maximum velocity of the induced fluid flow. Fig. 4 shows the relationship between the maximum number of dielectric tapes and the maximum velocity of the induced fluid flow. From these results, it was revealed that the optimum inter-electrode distance was 1 mm and the optimum number of dielectric tapes was 5 in this experimental range.

**Keywords:** Plasma actuator (PA) , Inter-electrode distance, Number of dielectric tapes

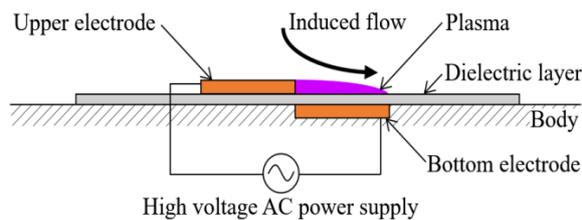


Fig. 1. Plasma actuator

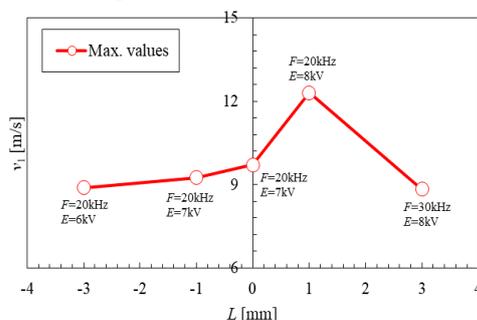


Fig.3. Effect of inter-electrode distance on maximum induced flow velocity

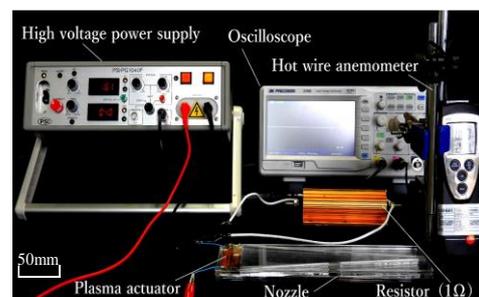


Fig. 2. Experimental apparatus

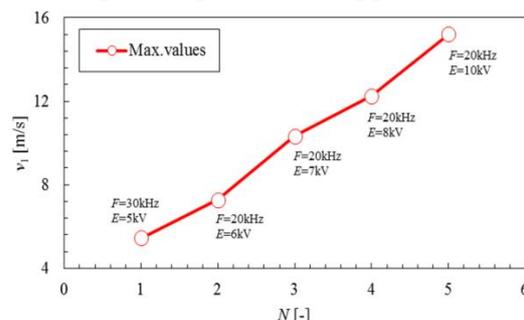


Fig.4. Effect of number of dielectric tapes on maximum induced flow velocity