

عنوان مقاله:

Experimental Investigation and ANN Prediction on the Underbody Drag Minimization in Truck Model using DC Pulsed DBD Plasma Actuator as an Active Flow Control Device

محل انتشار:

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خلاصه مقاله:

Copious researches have been accomplished in the realm of automotive aerodynamics leading to the reduction of drag in cars, trucks and buses. The overwhelming results have further spearheaded the present work in emphasizing the underbody drag minimization of distribution trucks using plasma actuator as an active flow control technique. Four different types of plasma actuators also called Active Side Skirt were experimentally evaluated on the scale down model of truck in a subsonic wind tunnel along with five different voltages ranging from 12 kV to 28 kV. The plasma actuator was positioned on the sides of the truck vertically as four individual units covering the front tyres and rear tyres. The results exhibit that the plasma actuator with a larger insulated electrode and with an electrode overlap distance had a good drag reduction rate of 8% at higher velocity (28 kV). The plasma generated by the Active Side Skirt induces an ionic wind along the stream wise direction keeping the flow attached throughout thereby helping in a reduced drag. An artificial neural network was developed using the data from the experimental analysis with Voltage, Velocity, Top width, Bottom width and Overlap distance as input parameter for training the network, further coefficient of drag taken as output parameter. A total of two hidden layers and seven neurons was used for the prediction. The test data that was not used for training, correlated with the ANN predicted value furthermore with the experimental values.

کلمات کلیدی:

Underbody drag, Truck, Artificial neural network, Plasma Actuator, Active Side skirt, Active flow control, Drag reduction

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