# Thermo-hydrodynamics performance analysis of fluid flow through concave delta winglet vortex generators by numerical simulation

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Abstrak

The numerical simulation of heat transfer and pressure drop characteristics was carried out on the airflow through a rectangular channel-mounted vortex generator (VG). The VG was installed on a plate that was attached to the heater. The inlet velocity of the airflow varied from 0.4 to 2.0 m/s. The VGs used in this study were concave delta winglet pairs (CDWPs) with the attack angle of 30° and with variation in the number of rows: one pair, two pairs, and three pairs. The CDWPs are predicted to produce the longitudinal vortex (LV), which increases the intensity of turbulence resulting in better mixing of flow. This, in turn, can improve the heat transfer between the plate surface and the airflow in the rectangular channel. The results showed that the installation of CDWPs does improve the overall heat transfer performance. However, it has the consequences of a greater pressure drop. Based on the variation in the number of rows, the greater the number of pairs of VGs was the greater the convection heat transfer coefficient (h) in both laminar and turbulent flows. The h value was based on the number of row of CDWPs: one pair, two pairs, and three pairs exhibited increases of 65.9-108.4%; 34.4-71%; and 42.2-110.7% compared to the baseline, respectively. A great number of rows of VGs also led to an increasing pressure drop value in laminar and turbulent flows. The percentage increases in pressure drop for CDWPs with one pair, two pairs, and three pairs, as compared to the baseline, were 70.1-92.1%; 123.6-161.3%, and 180-266.9%, respectively.