PIV MEASUREMENTS IN TWIN SYNTHETIC IMPINGING JETS

C.S. GRECO, A. IANIRO[1], M. IMBRIALE[1c], T. ASTARITA, G. CARDONE[2]

[1]Department of Aerospace Engineering, University of Naples FEDERICO II, 80125 via Claudio 21, Napoli, Italy
[2]Department of Aerospace Engineering, University of Naples FEDERICO II, 80125 p.le Tecchio 80, Napoli, Italy

[c] Corresponding author: Tel.: +39 340 7034694 – Tel-Fax: +39 081 768 3389; Email: michele.imbriale@unina.it

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ABSTRACT: Synthetic jets or zero-net mass flux jets are studied in different fields of fluid dynamics, e.g. to control the fluid flow and to increase the convective heat transfer [1-2]. Principally synthetic jets are studied in the single jet configuration that represents a promising application for the electronic components cooling but the high noise produced still represents a problem to solve. In this work a twin synthetic jets configuration is studied to evaluate the convective heat transfer coefficient achieved through the jets impingement on a heated flat surface. Twin synthetic jets are obtained with an oscillating membrane that splits a cavity in two sub-cavities with the same resonance. The double cavity arrangement allows the noise reducing in reference to the single cavity configuration: the trains of vortices are issued from the nozzles in phase opposition thus realizing noise reduction. Two cylindrical nozzles are present in the exit of cavities. The two synthetic jets impinge on a target surface. The wall convective heat transfer coefficient is evaluated from surface temperature measured with IR thermography and by means of the heated thin foil heat transfer sensor [3]. The flow is also characterized through PIV measurements those evaluating the stroke length [4] and consequently the Reynolds number. Experiments are performed at fixed value of Reynolds number based on nozzle diameter (equal to 2800) with different the jets pitch and the nozzle to target surface distance in order to investigate their influence on the heat transfer.

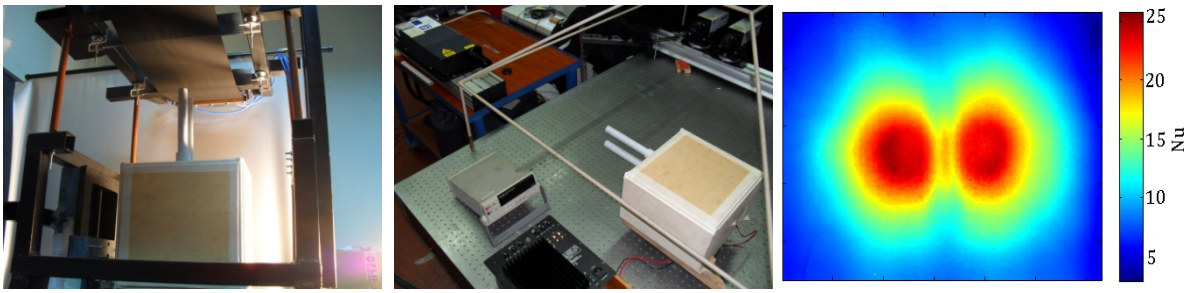

Fig. 1 Experimental apparatus: twin synthetic jets impingement on a heated thin foil (left), experimental apparatus for PIV measurement of twin synthetic jets velocity field (centre), Nusselt maps on target surface (right).

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