INFLUENCE OF BACKGROUND PATTERN ON THE TEMPERATURE FIELD MEASURED BY BACKGROUND ORIENTED SCHLIEREN

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ABSTRACT: Bluff bodies placed in a flow with a different temperature compared to that of the surroundings are of wide interest in practical engineering as well as in scientific applications[1,2]. The objective of this work is to find the optimal dot density for the background pattern using Background Oriented Schlieren (BOS) measurement. BOS is based on light deflection of a background pattern due to density gradients in the investigated flow field. The present contribution introduces the effect of different background structures on the resulting temperature field. It is obvious that the background quality (dot pattern and density) have an influence on the results, when the temperature (density) gradients locally vary. The measurements are carried out in the wake of an electrically heated cylinder (with a diameter of 10 mm and with a maximum surface temperature of 300ºC) mounted in a wind tunnel with a closed test section. The flow is kept in the laminar region. Such a flow is mostly two-dimensional, i.e. the flow does not change considerably along the axis of the cylinder. The main innovation of the developed method is the associated visualization of the temperature field. BOS is now employed in order to obtain quantitative results. First synchronization tests have helped determining the proper background pattern and the delay process for BOS in the present configuration[3,4]. The recorded BOS images are processed by a commercial PIV-software. The temperature field can finally be quantified by means of this software-based post-processing. First results are illustrated in Figure 1.

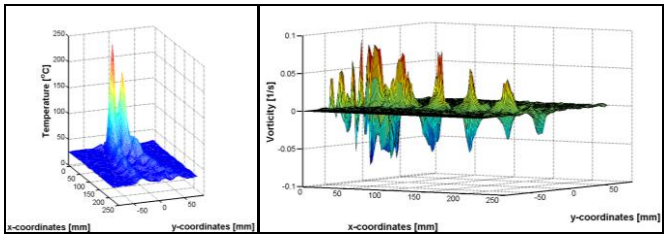

Fig. 1: Images of the temperature field in the wake of a heated cylinder (300 ºC) measured by BOS (left), together with the corresponding vorticity field obtained by PIV (right)

References

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