



## PRINCIPLES OF HEAT TRANSFER MODELLING USING THERMOCHROMIC LIQUID CRYSTALS AND LASER ANEMOMETRY

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### KEYWORDS:

**Main subjects:** heat and mass transfer, flow visualization

**Fluid:** turbulence flow, vortex generators

**Visualization method(s):** liquid crystal thermography, particle image velocimetry

**Other keywords:** true colour image processing

**ABSTRACT:** An advanced liquid crystal thermography (LCT), true colour image processing and laser anemometry (PIV) technique has been developed for heat transfer and fluid flow visualization. The method is based on a steady-state and transient techniques used to determine the distribution of surface temperature and then evaluation of heat transfer coefficient or the Nusselt number. The flow pattern produced by turbulence flow is visualized using a planar beam of double-impulse laser tailored by a cylindrical lens and oil particles. The method is used to study the influence of transverse vortex generators (ribbed wall) on heat transfer enhancement. Finally, the objective of the present paper is to review liquid crystal thermography and laser anemometry to determine heat transfer performance for some selected technical problems and industry achievements.

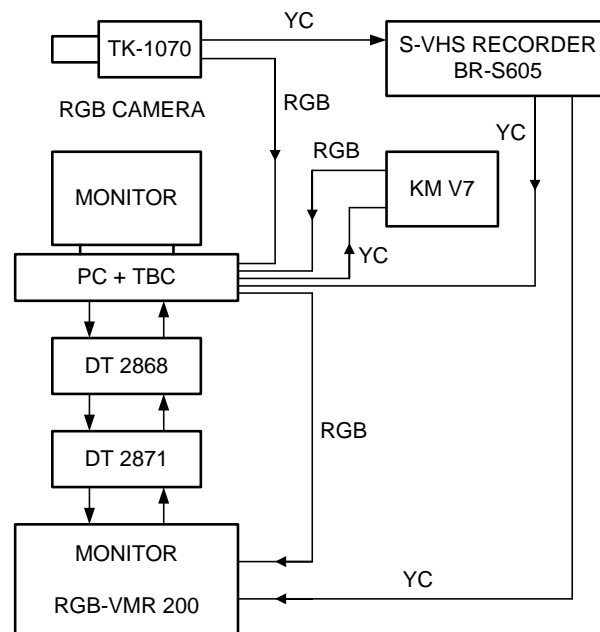


Fig. 1 The information flow chart for a true color image interpreter and computer-controlled video system

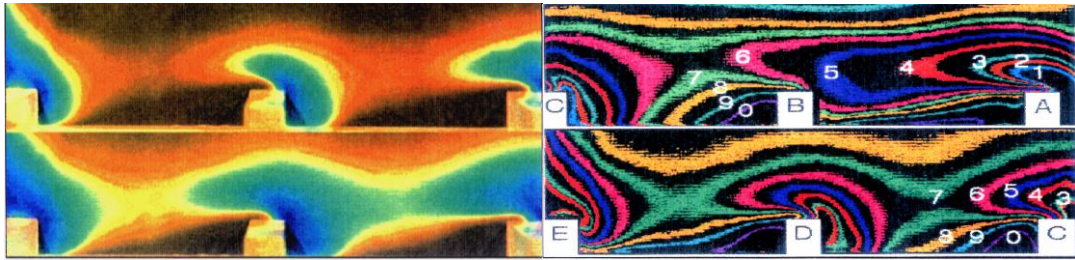


Fig. 2 True-colour images from liquid crystal thermography for an endwall surface with in-line square ribs (top) and pattern of ten Nusselt number  $Nu$  reconstructed by false colour images of the heat transfer surface (bottom)

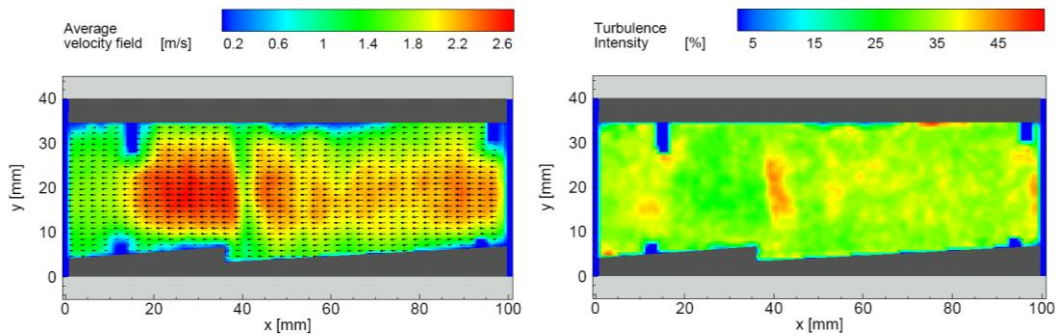


Fig. 3 The average velocity field (left) and turbulence intensity (right) in model heat exchanger with vortex generators from Particle Image Velocimetry (PIV)

## References

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