

FEASIBILITY STUDY OF PRESSURE SENSITIVE PAINT FOR USE IN TRANSIENT FACILITIES

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The project was focused on further developments of a Pressure Sensitive Paint (PSP) technique. In particular, emphasis was devoted to evaluate the experimental methodology applicable to short duration test rigs at VKI's Compression Tube facilities. This technique provides a global measurement of a continuous surface with high spatial resolution of the pressure field. Among other advantages, the PSP technique leads to a simplified model construction in contrast with conventional pressure tappings. Since the time response of PSP coating can be as fast as the luminiscence decay of the probe, it is possible to recover the steady pressure field in the transient operations (0.4 s).

Measurements were taken to characterize the steady and dynamic properties of commercially available polymer binder paint. The PSP formula used was platinum porphyrin luminophore (PtTFPP) in a fluoroacrylic polymer binder (FIB). The intensity PSP method was used for data acquisition. Both steady and dynamic calibrations were completed and adequate transform functions applied to obtain optimum results. An investigation of time response with respect to pressure and temperature was done as to properly assess the characteristics required for use in the turbine test rig. The limitations of this method were reviewed in order to ensure a proper analysis of the data.

An experiment with a jet impinging on an instrumented flat plate was completed to verify the originally proposed methodology. The test sample was calibrated using *a priori* method for both steady and dynamic conditions. A good agreement between the reference pressure and compensated pressure has been found.

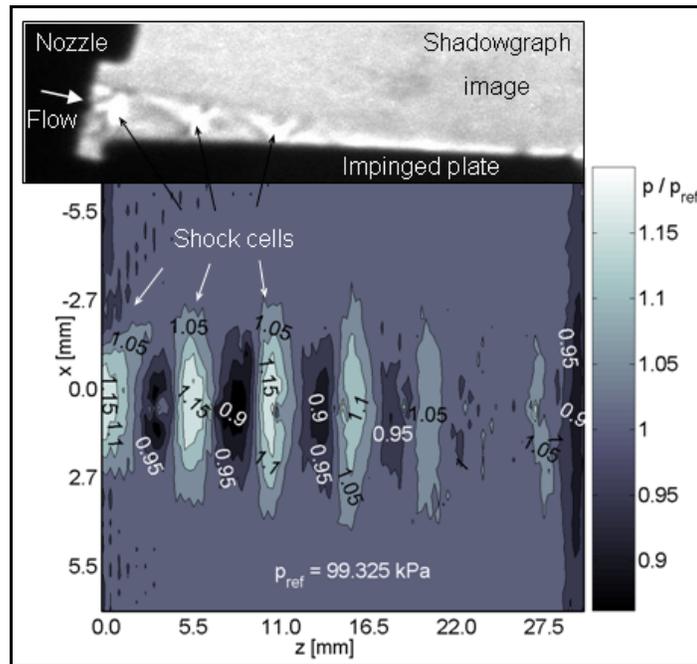


Figure 1: Reconstructed pressure field on the flat plate paralleled by a shadowgraph image of the underexpanded jet