

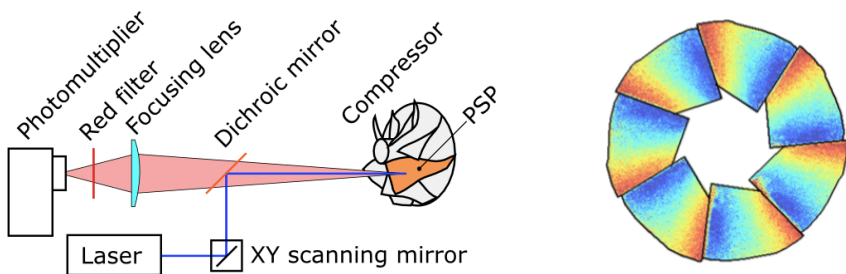
# Measuring Pressure on Rotating Compressor Blades

M. Pastuhoff, N. Tilmarm & P. H. Alfredsson  
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Pressure sensitive paint (PSP) is an optical non-intrusive technique for pressure measurements on surfaces in both steady and unsteady flows. In the thesis of Pastuhoff (2014) different acquisition, evaluation and signal-to-noise-raising methods have been evaluated and developed with focus on unsteady internal flow. In particular it describes a path towards measurements of unsteady pressure distributions on the impeller blades of turbocharger compressors appearing in compressors at surge. Due to complex geometries and high rotational speeds, pressure measurements on the impeller blades are unfeasible using traditional pressure taps and transducers and here the pressure was measured with PSP on the impeller blades of a rotating compressor.

As a first step, dynamic calibration of a polymer/ceramic pressure sensitive paint (PC-PSP) was made using a shock tube. The cut-off frequency for the tested ruthenium-based formulation was found to be a few kilohertz; sufficient for resolving unsteady compressor behaviour such as surge and rotating stall.

For the rotating compressor study with rotation speeds up to 50000 rpm, point measurements using a scanning laser for excitation and a photomultiplier tube for the acquisition of the luminescence was used and evaluated with the so called lifetime method. The measurements were able to capture the surge frequency as well as its spatial distribution.



M. Pastuhoff (2014) Measuring with pressure sensitive paint in time-varying flows. PhD thesis, KTH Mechanics.