

LDV Measurements of Wake-Induced Unsteady Flow within a Turbine Rotor Cascade

by

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ABSTRACT

The unsteady flow field within an annular turbine rotor was investigated experimentally using an LDV system with emphasis on the influence of turbine stator wake on the rotor flow field. Detailed measurements of time-averaged and time-dependent distributions of the velocity, the flow angle, and the turbulence intensity were carried out at design operating conditions. The obtained data was analyzed from the viewpoints of both absolute frame of reference (stationary coordinate system) and relative frame of reference (rotating coordinate system) by vectorial addition of the circumferential velocity component of the rotor speed.

Figure 1 shows the time-dependent distributions of the absolute velocity, absolute flow angle, relative velocity, relative flow angle, and turbulence intensity. The low velocity area caused by the wake behind the stator periodically affects the flow field around the rotor. These shapes of time-dependent distributions were re-analyzed as animations for flow visualization to gain a better understanding of the unsteady flow phenomenon in a turbine rotor.

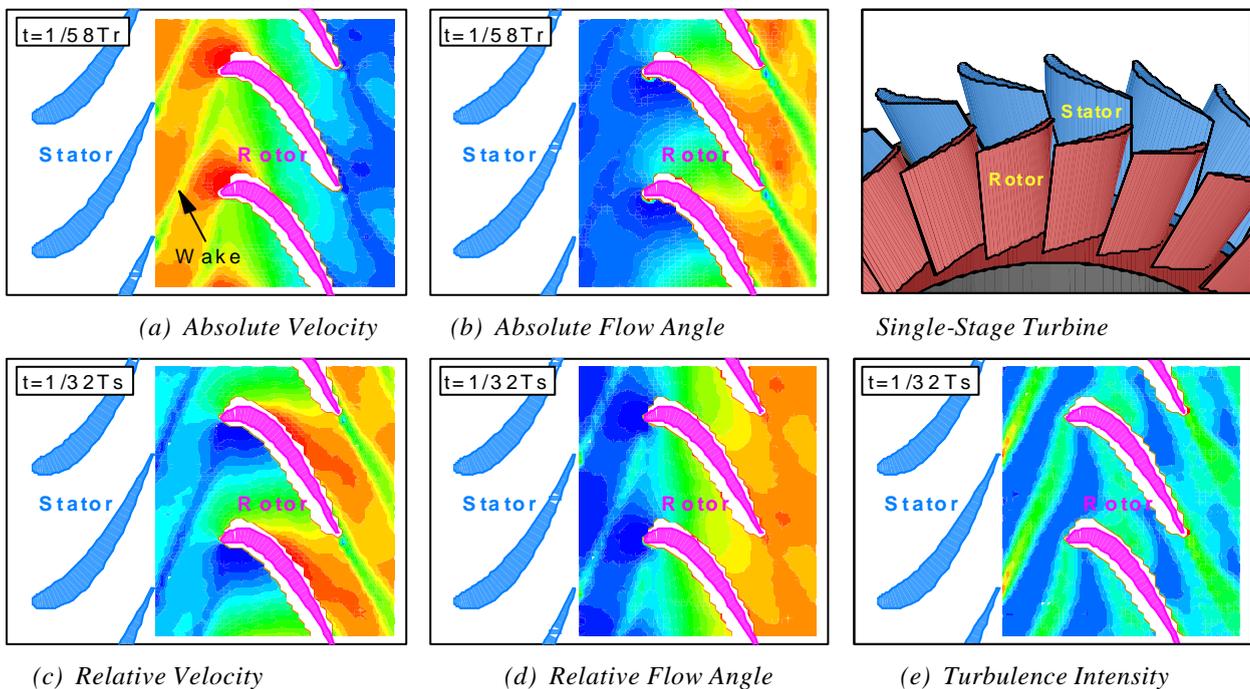


Fig. 1 Time-dependent flow distributions around turbine rotor cascade

