

TABLE OF CONTENT

List of Figures

- 1. Introduction
- 2. Measurements in pumps
 - 2.1. Experimental arrangement
 - 2.1.1. Optical set up
 - 2.1.2. Data processing system
 - 2.2. Typical results
 - 2.3. Recommendations for future work
- 3. Measurements in a wet steam turbine cascade
 - 3.1. General considerations
 - 3.2. Experimental arrangement
 - 3.2.1. Optical set up
 - 3.2.2. Data processing
 - 3.3. Measurements
 - 3.4. Future investigations

Conclusion

References

Figures

INTRODUCTION

In most fluid dynamic situations, the use of a pitot tube is sufficient to provide the experimentors with the necessary data relative to the fluid velocity. In unsteady flows, the task becomes impossible to achieve with such a device and the adequate instrument is then the hot wire or hot film anemometer. Such probes usually give good results but in many cases, it is very difficult or even impossible to introduce them in the test rig, especially in rotating machines. Another problem encountered with these devices is their extreme sensitivity to erosion and impact of foreign matter.

The use of an optical measuring technique would alleviate all these drawbacks and allow difficult measurements to be made. It is with the advent of laser velocimetry that a considerable improvement has been made in experimental investigations of rotating machines and two phase flows. In the latter case, the laser Doppler velocimeter is certainly the most adequate instrument for measuring droplet velocities and trajectories.

Laser Doppler velocimeters have been studied at the von Karman Institute since 1972 (ref. 1) and were first applied in gas-particle flows (ref. 2,3). Since that time, the VKI laser Doppler velocimeters have been used in many different fields, including fluidics, non newtonian fluids, jets, nozzle flows, centrifugal pumps, and wet steam turbine cascades.

The laser Doppler velocimeter was found to be a unique instrument for the investigation of the blade-to blade flow field in a pump (ref. 4) as well as for the measurement of droplet velocities in a wet steam cascade.

These investigations are presented herein.