A high-speed photograph showing a dense spray of small, light-colored particles moving from left to right. The particles are captured in motion, creating a blurred, dynamic effect. The background is dark, making the bright particles stand out. A yellow diagonal banner is overlaid on the right side of the image.

QUANTITATIVE FLOW VISUALIZATION SYSTEMS FOR FLUID FLOW MEASUREMENTS



QUANTITATIVE FLOW VISUALIZATION SYSTEMS

FOR FLUID MECHANICS APPLICATIONS

The TSI Models FM-1000 and FM-1100 Quantitative Flow Visualization Systems provides a turn-key solution to investigate quickly and accurately the flow field for your applications. The system is non-intrusive and offers high spatial and temporal resolution as well as the ability to resolve turbulent structures.

The Flow Visualization System consists of:

1. Continuous laser with integrated laser light sheet optics
2. High resolution and high frame rate camera
3. LaserPulse Synchronizer
4. Insight 4G software package to control the data acquisition and data processing
5. Micro bubble generator to seed air flows (for FM-1000)
6. Hollow sphere seed particles (for FM-1100)

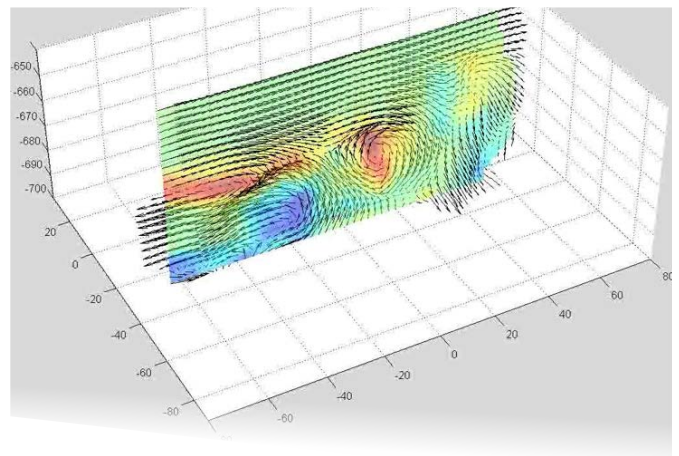
Flow measurements

The FM-1000 and FM-1100 systems are easily set up for flow investigations. Once the camera is focused on particles in the laser light sheet, flow information is captured and analyzed, giving instantaneous velocity field results for that particular plane. Capturing a sequence of the images provides useful statistical information such as average velocity field, vorticities, and shear, as well as time-animations providing detailed information regarding vortex trajectories and evolving regions of high and low velocity.

The optional BG-1000 micro bubble generator provides non-toxic tracer particles of 15 microns with high fidelity, resulting in accurate flow measurements.

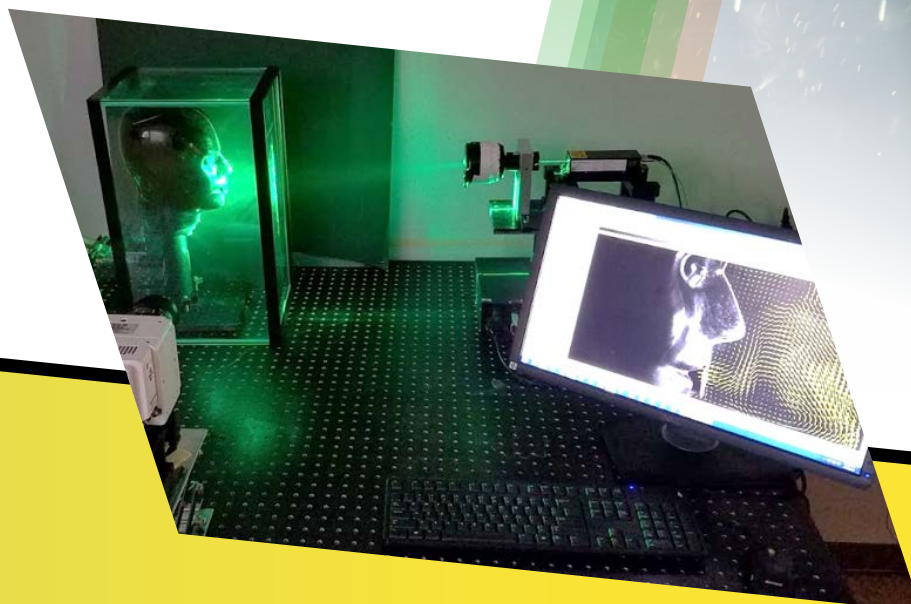
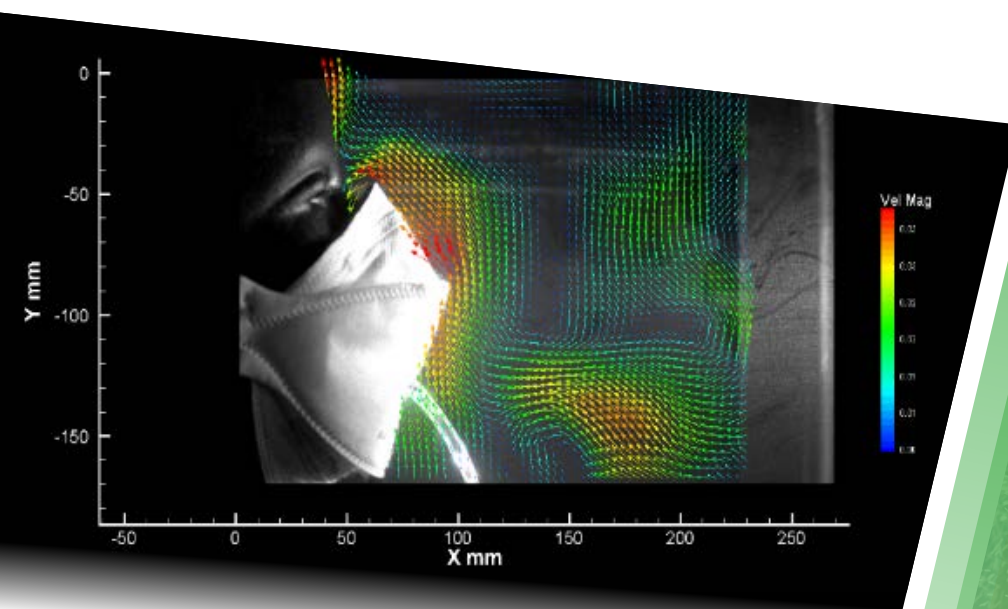
INVESTIGATION OF VORTEX SHEDDING FROM A CYLINDER IN A WATER CHANNEL

The FM-1100 system was used to study the vortex shedding from a cylinder. The cylinder was located in the water tunnel with the free stream velocity of 0.2 m/s. The measurements were taken at two diameter lengths away from the cylinder. Hollow glass spheres of 15 microns were used as seed particles to provide the flow information. The plot shows the positive and negative vorticity structures shedding behind the cylinder.



INVESTIGATION OF AIR FLOW AROUND N95 MASK

The FM-1000 system was used to determine the source of a leak on a mannequin wearing an N95 mask. The airflow around the mannequin head form was seeded with tracer particles that were illuminated by a laser sheet. The high-speed camera took a series of images in order to determine the source of a leak on a mannequin wearing an N95 mask. The Insight 4G software was used to analyze the images providing flow velocities in the region surrounding the mask. Results of the investigation reveal leakage occurring at the bridge of the nose, as indicated by the high velocity region (red vectors) shown in the plot below.



SPECIFICATIONS

Image capture rate	7400 Hz max at full pixel resolution
Field of view	Up to 0.5 m by 0.5 m
Velocity range	Up to 10m/s

Applications

- + Flow distribution and aerosol transport in coughing and sneezing
- + Measurements in wind tunnels and water channels
- + Turbulent flow investigations

Specifications are subject to change.

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