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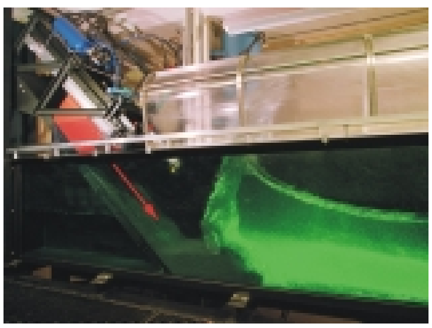
FlowMaster PIV system in Application

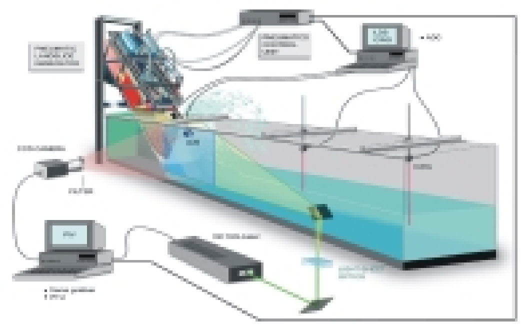
Large scale digital PIV applied to landslide generated impulse waves

Reference: Hermann M. Fritz, Laboratory of Hydraulics, Hydrology and Glaciology (VAW), Swiss Federal Institute of Technology (ETH),
Source: 10th Int. Symp. on Applications of Laser Techniques to Fluid Mechanics 38p1, Lisbon, Portugal, July 2000

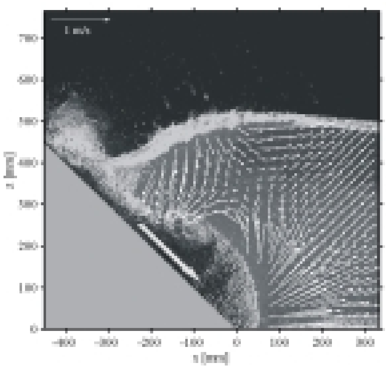
Digital large scale PIV was applied to an extremely unsteady three phase flow consisting of granular matter, air and water. Areas of interest up to 0.8 m by 0.8 m are investigated in the impulse wave generation zone.



Impact experiments were conducted in a rectangular prismatic water wave channel (LxWxH: 11m, 0.5m, 1m). Landslides were modelled with an artificial granular material (PP-BaSO4).



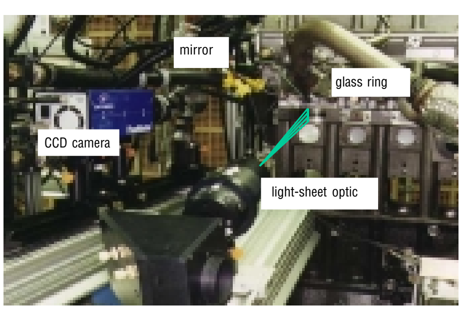
Experimental setup: LaVision's FlowMaster 2 CCD camera (Kodak -ES1.0), and a twin cavity Nd:YAG laser were used for PIV.



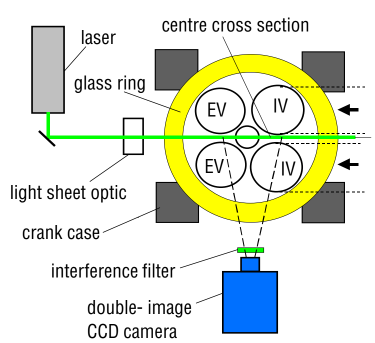
Velocity vector field with flow reattachment and characteristic saddle point above slide shoulder. hill slope angle= 45°, stillwater depth= 0.45 m, slide mass= 27 kg, impact velocity= 2.5 m/s

PIV-investigation of the in-cylinder tumble flow in an IC-engine

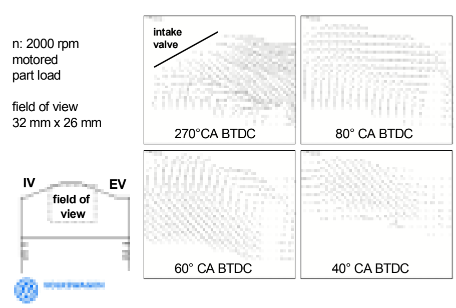
Reference: W. Hentschel, B. Block, Research and Development, Volkswagen AG, Wolfsburg, Germany; **Sources:** Application of laser-optical diagnostics for the support of direct-injection gasoline combustion process development 4. Int. Symp. für Verbrennungsdiagnostik, Baden-Baden, May 2000; PIV-investigation of the in-cylinder tumble flow in an IC-engine. 8th. Int. Conf. on Anemometry, Rom, Sept.1999



PIV setup on the transparent engine.
Arrangement of the LaVision FlowMaster 3S PIV camera (left) and the light sheet optic (bottom)



PIV setup on the glass ring engine
Nd:Yag double-pulse laser: 532 nm, ca. 2 x 20 - 50 mJ, pulse separation: 4 - 8 µs, **light sheet width**: ca. 1 mm **seeding**: oil droplets**, double-image CCD camera**: resolution 1024 x 1280 pixels, f = 85 mm / aperture 8 / 11, with 532 nm interference filter, **evaluation**: 2D-cross correlation **interrogation cells**: 32 x 32 pixels = 0,8 x 0,8 mm^2 $\rightarrow$ 32 x 40 vectors, **field of view**: 32 x 26 mm^2, in the cylinder centre



Intake and compression flow
PIV-measurement at a 4-valve SI-engine, central cross section

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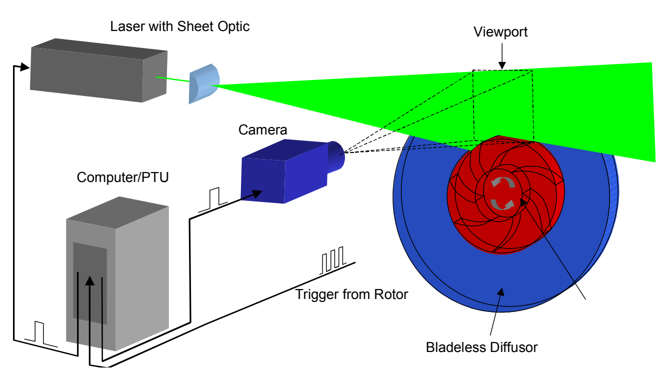
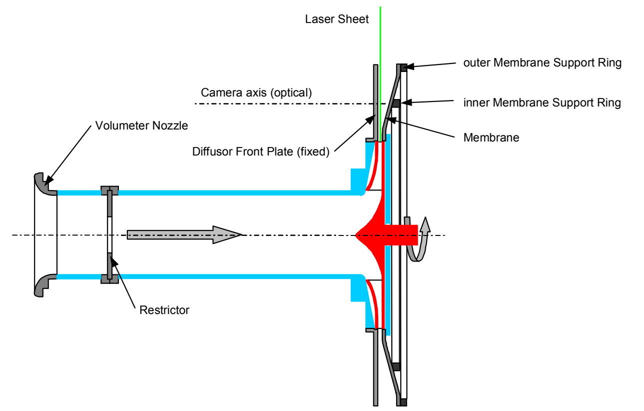
Flow Field Measurement of Unsteady Flows in Radial Diffusors using PIV

Reference: U. Lohmann, Energy and Power Station Technology, University of Essen, Germany

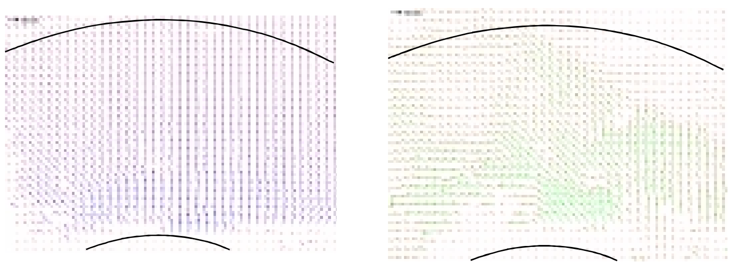
The operational characteristic of a blower is not exclusively depending on the scape of the rotor, also the stator has great influence on the maximum efficiency. Instantaneous PIV-measurements can be used for optimization of the diffusor flow and thus optimization of the blower performance.



Experimental setup using LaVision's FlowMaster 3S PIV system



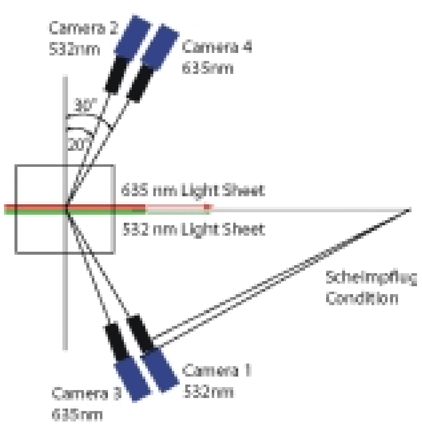
Setup of blower and diffusor. Aperture angle of the diffusor can be varied.


Diffusor flow field at design operation (left image, averaged). Velocity at the end of the diffusor is reduced about a factor of 2 compared to the entry region of the diffusor. Most of the kinetic energy is converted into pressure. Diffusor flow field with high restriction and high aperture angle of diffusor (right image). Increased turbulence and backward flow field areas are visible.

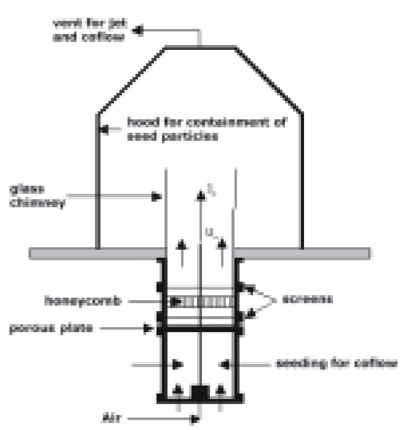
Highly-Resolved Three-Dimensional Velocity Measurements via Dual-Plane Stereo Particle Image Velocimetry (DSPIV) in Turbulent Flows

Reference: John A. Mullin and Werner J.A. Dahm, Laboratory for Turbulence & Combustion (LTC), Department of Aerospace Engineering, University of Michigan **Source:** AIAA conference 2002-0290, Reno, NV, USA, Jan. 2002

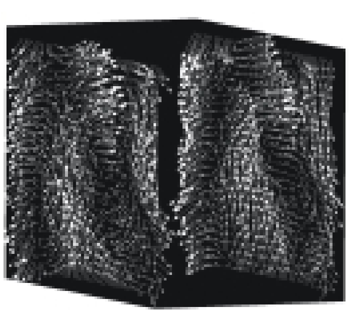
A frequency-based dual-plane stereoscopic particle image velocimetry (DSPIV) technique is used to obtain fully-resolved simultaneous measurement of all nine components of the instantaneous velocity gradient tensor field $\nabla u(x,t)$ at the small scales of a turbulent flow. The technique is based on two essentially independent stereo PIV systems that provide three-component velocity measurements in two differentially-spaced light sheets of different colors.



Asymmetric forward-forward scatter arrangement of the four FlowMaster 3S cameras, showing one camera in each color-pair oriented at 20-degrees and the other at 30-degrees relative to the sheet-normal.



Schematic indicating layout of coflowing turbulent jet facility used in this study.


Three-component velocity vectors in the green *(left)* and red *(right)* light sheet planes obtained in the centerline of the coflow and turbulent jet at Reynolds Number 6000. Laser sheet thickness: 800 µm; sheet separation: 400 µm

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06/02