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PIV from lab to large wind tunnel

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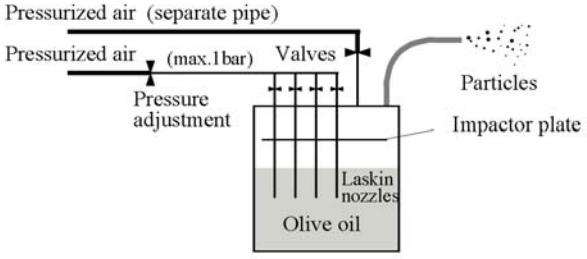
In the early 1990's, the relevant literature was written by Adrian, Riethmuller, and Lourenco (to name just a few). At DLR in Göttingen Jürgen Kompenhans and his former PhD students succeeded measuring in a transonic flow in a wind tunnel, but for three reasons PIV was not ready to be used as a matter of routine:

- It was hard to get enough particles of the right size homogeneously distributed in the laser light sheet, especially in blow-down facilities, at high flow velocities.
- The dynamic range of the velocity one could successfully measure was very limited and measuring reverse flows was impossible, as the particle images would have overlapped on the doubly exposed photographic film.
- Adjusting the set up for best focus meant photographing at different distances between camera and light sheet and analysing the result on the developed film under a microscope Than, going back to the position that seemed to be best and starting the measurement (mostly on the next day).

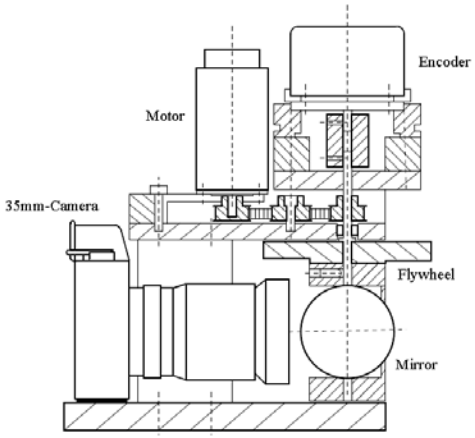
These three problems had to be solved and were solved by the methods described below.

The system worked pretty well even in the larges wind tunnels until the first cross-correlation video cameras came onto the market in 1996.

The author would like to state that - despite of the tonnes of paper that have been published on the improvement of digital PIV evaluation - the accuracy received with photographic PIV was not far from today's digital PIV. However, the recording of one good PIV image required typically a week of preparation in the wind tunnel, one day for developing and drying the negative, one day for preparing and drying the contact copy and about two days for an optical/digital evaluation.



Laskin nozzle particle generator



Schematic diagram of the rotating mirror system