DETERMINATION AND REDUCTION OF WIND LOADS ON HELIOSTATS

Name and Surname :	**Andreas Pfahl**	Name of PhD's manager(s):	**Prof. Müller-Steinhagen**
Speciality/ Degree :	**Dipl.-Ing.**		**Prof. Dillmann**
		Laboratory name :	**Institute of Technical Thermodynamics**
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For the dimensioning of heliostats wind loads are decisive. In the literature drag coefficients for heliostats are available but these data are not suitable to determine the influence of the back structure and of measures for wind load reduction. Further more the effect of wind shadowing for load combinations is treated only insufficiently. The dependency on the Reynolds number was not investigated at all.

Wind tunnel measurements of a single heliostat and of several field configurations were performed and compared with literature values. Measurements in a high pressure wind tunnel are projected for the end of this year. Here the Reynolds number can be varied in a wide range.

CFD (Computer Fluid Dynamics) simulations could help to investigate and optimize measures for wind load reduction to reduce the amount of wind tunnel measurements. For inlet conditions with low turbulence intensity the results of RANS (Reynolds Averaged Navier Stokes) simulations show good agreement with wind tunnel data. At turbulent inlet conditions the flow reaches the heliostat temporarily at diverse angles of attack. To estimate the effect of big turbulence structures on the wind loads an approaching flow of 30° to the mirror plane was chosen. The wind loads of several measures for load reduction were computed and compared with the values of an unmodified mirror plane.

For the determination of the absolute values of the drag coefficients at realistic turbulent inlet conditions this approach is not suitable. LES (Large Eddy Simulation) or a combination of LES and RANS would be necessary. Problematic is, that a long real time would have to be simulated to capture the turbulence structures which causes the biggest wind loads.