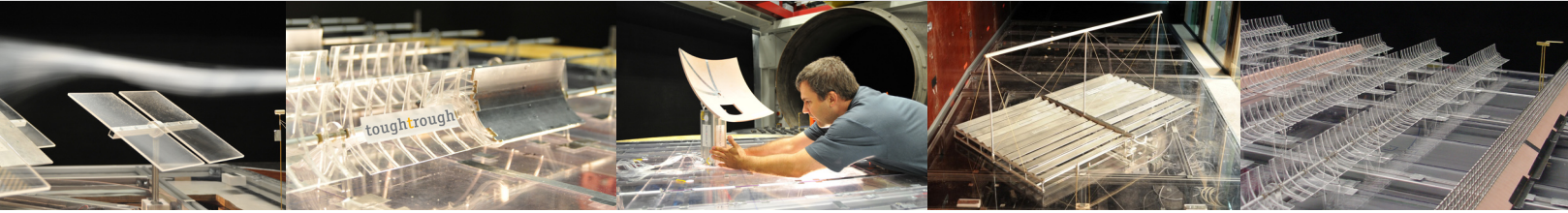


# toughtrough®

## Wind Tunnel Testing



### Improve the Design Data Base for Your CSP Projects!

**All solar collector fields are exposed to harsh environmental conditions during their lifetime such as strong winds, hail and sandstorms that may cause serious damage to the overall system. To achieve a highly resistant design and avoid excessive maintenance costs, incoming flow and collector angles have to be investigated to optimize the incident flow for the collector system.**

Aerodynamic studies in wind tunnels are an ideal method to analyze the specific characteristics of the solar collectors when exposed to environmental wind conditions. By measuring forces, moments and pressure fluctuations, you can identify loads on single collectors that can be used as highly sophisticated design data as well as on the whole solar field which has to be protected against environmental conditions – mainly wind and sand. Thus, areas that need further reinforcement are identified as well as areas where lower wind loads allow the reduction of materials, and therefore, of costs. Years of experience in the field of wind tunnel testing have made us experts on this matter. Based on the gained results, we develop innovative

strategies for efficient protection of collector fields against harmful environmental impacts. Also, we transfer our knowledge to other areas of application. Our service portfolio includes the setup of test plants, model construction and manufacturing as well as the testing itself and respective final data acquisition and evaluation.

#### Our services at a glance:

- Conception of overall test philosophy and corresponding measurement and test campaigns to get sophisticated design data
- Model design, construction and setup
- Selection of ideal test facility – wind tunnel (if not tested in own test facilities), incl. wind tunnel operations and management
- Planning, organization and realization of individual test campaigns
- Supply of relevant measurement and visualization techniques
- Data evaluation and expert reports
- Analysis of individual optimization potential for collector systems

**Please contact us for further information and to discuss your requirements.**

[www.toughtrough.com](http://www.toughtrough.com)

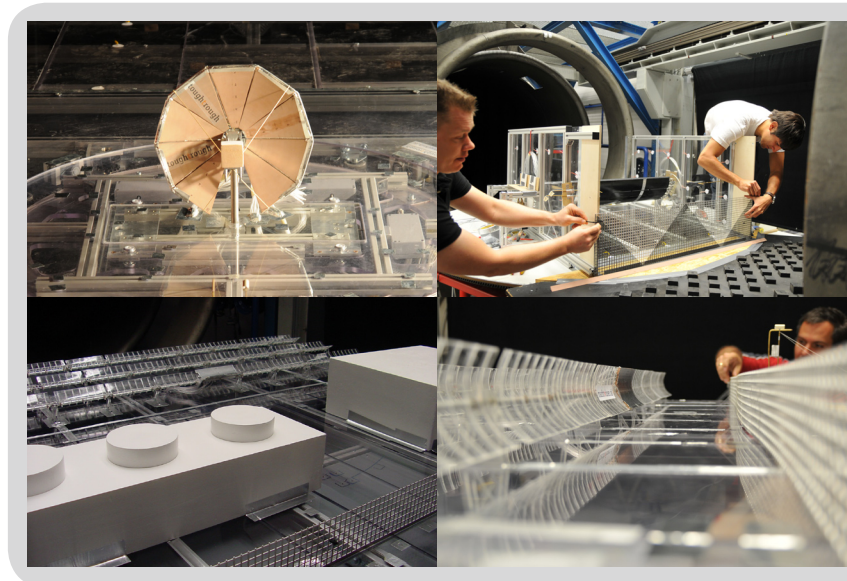
## Short Course – Applied Aerodynamics for Solar Power Plants I

With our Short Course on fluidic investigation of solar power plants we aim at imparting basic knowledge of aerodynamic theories as well as of designing, constructing, testing and finally optimizing solar power plants. Components of parabolic trough collectors, heliostats, Fresnel or dish systems shall be examined in full technical detail. Subsequently, these theoretical foundations shall be applied and broadened through practical experiments using our wind tunnel testing facility. In addition to the standard operational

measurements, potentially influential parameters shall be quantitatively assessed and approaches for optimization of corresponding energy plants will be analyzed in detail. Our courses aim to develop a better understanding of the construction and optimization of renewable energy plants, recognizing the growing importance of increasing the efficiency of such systems. The participants can then transfer the acquired knowledge and integrate it into their own projects and operations.

### Topics

- Introduction to fluid dynamics
- Similitude theory
- Wind tunnel engineering
- Fluidic measurement engineering
- Flow visualization
- Boundary layer theory and simulation
- Model set-up and design
- Wind tunnel testing
- Practical experimental techniques
- Wind tunnel performance measuring
- Measuring data analysis and evaluation
- Optimization



Further information and registration:  
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