

Membranes and Energy Harvesting

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Rosemarie Wagner*

* Karlsruhe Institute of Technology (KIT)
Institute Design and Building Technology
Englerstrasse 7 D-76131 Karlsruhe Germany
e-mail: rosemarie.wagner@kit.edu, web page: <http://www.fgb.ieb.kit.edu>

ABSTRACT

Membranes, such as coated fabrics and foils, are used in lightweight, double-curved structures for shading, roofing and facades. If conditioned interior spaces are enclosed with membranes, building physics variables such as thermal resistance, radiation behavior, sound and moisture must be considered as additional requirements. The result is a multi-layered structure and often deprives the buildings of their lightness and transparency. The alternatives are high energy costs for heating or cooling. Approaches to use membranes for solar energy gain are existing approximately for 40 years. These applications are very diverse. Examples include the membrane roofs for the updraft power plant in Manzanares, arched truss structures with textile air collectors in the GDR as agricultural storage tents, or textile covers over biogas storage tanks as a technical application. A further development of textile air collectors was the experimental construction for the efficiency and use of spacer fabrics for solar thermal energy generation according to the principle of the polar bear fur in Denkendorf, Germany. Developments of the last 15 years are investigations and applications of flexible and lightweight PV modules, which are either applied to coated fabrics or printed as OPV on foils. The content of the session is to present the state of the art of research and development in theory and practice, what contribution pre-stressed flexural soft building materials in double curved surface structures will make to energy generation and reduction in the built environment. This includes solar air collectors, flexible PV modules, biogas storage systems, condensation tents for the production of drinking water, functionalized membranes for cooling and other innovative approaches and solutions.