

European R&D - Membrane Testing and Development at IBP

ABSTRACT

The Fraunhofer Society, founded in the 1950s as a society of institutes for applied research, has shown a steady growth and comprises now 58 institutes working in all kinds of areas from microbiology to different engineering sectors. The average Fraunhofer institute is financed to one third by industrial contracts; the rest is covered by institutional funds and public contract research. The IBP (Institute for Building Physics) founded in 1929 was one of the first institutes to join the Fraunhofer Society. The IBP has an annual research budget of approximately 10 million€, employing more than 150 staff. More than 50 % of the annual budget is covered by industrial contracts. This high percentage of private funds was achieved by joint product developments mostly with German SMEs. The IBP's product development is based on a high level of fundamental research which precedes the actual product development stages. An example is the development of a smart vapor retarder whose characteristics were tailored by hygrothermal simulations. This retarder protects the building envelope from excessive interstitial condensation during the heating period while allowing substantial drying of moisture in the building assembly to the interior spaces in summer. In order to create such a retarder numerous simulations under all kind of boundary conditions had to be performed introducing a virtual retarder whose material properties could be tailored. Once the optimum characteristics of the virtual retarder were defined it was a rather simple task to select a membrane whose properties came close to the specifications. However, the fundamental scientific work necessary to develop the computer simulation tool took a lot of resources and is still going on. To facilitate the hygrothermal software development, its distribution and practical application the IBP has signed contracts with research organizations in different countries (e.g. USA, France, Finland, Norway, Poland). One of the latest IBP software developments is a model for the prediction of mold growth under transient hygrothermal conditions which has already been successfully applied and verified for several case studies. Further membrane developments of the IBP include skins for airplane insulation bags and perforated acoustic membranes for sound absorption in buildings. Several other building membranes (e.g. breather membranes) developed by industrial partners were extensively tested by the IBP under practical conditions. The acquired know-how opened the doors for the IBP to participate in the design process of innovative membrane constructions all over the world.

PROF. DR.-ING. DIPL.-PHYS. KLAUS SEDLBAUER studied physics at LMU Munich; diploma thesis: Pre-warming of indoor air by means of a ground-air heat-exchanger. Since 1992 scientific assistant and group manager at the Fraunhofer Institute for Building Physics in Stuttgart and Holzkirchen. Since 2000 deputy head of department for the field hygrothermics, focusing mainly on outdoor and laboratory testing as well as computer model calculation. In 2001, doctoral thesis on the subject of "The prediction of mold fungus growth on and in building elements" at the University of Stuttgart. From 2001 to 2003 deputy director. Summer semester 2003, professor at the Rosenheim Polytechnic. Since November 2003, director and professor at the University of Stuttgart.

1 Recent Publications in English

Kehrer, M.; Künzel, H.M.; Sedlbauer, K.: Ecological Insulation Materials – Does sorption moisture affect their insulation performance? *Journal of Thermal Envelope & Building Science* 26 (2003), H. 3, S. 207 - 212.

Sedlbauer, K.; Krus, M.; Breuer, K.: Mould Growth Prediction with a new Biohygrothermal Method and its Application in Practice. Tagungsbeitrag zur Material-Konferenz in Lodz, 11. – 13. Juni 2003, Lodz/Polen, S. 594 – 602.

Holm, A.; Künzel, H.M.; Sedlbauer, K.: The hygrothermal behaviour of rooms: Combining thermal Building Simulation and hygrothermal Envelope Calculation. Tagungsbeitrag zum Eight International IBPSA Conference "Building Simulation 2003" in Eindhoven, 11. – 14. August 2003, Eindhoven/Niederlande, S. 499 - 506.

Zillig, W.; Lenz, K.; Sedlbauer, K.; Krus, M.: Condensation on the facade. Influence of construction type and orientation. Tagungsbeitrag für die 2. internationale Conference on Building Physics in Leuven, 14. – 18. September 2003, Leuven/Belgien, S. 437 – 444.

Sedlbauer, K.; Krus, M.: A new Model for Mould Prediction and its Application in Practice. Tagungsbeitrag für die 2. internationale Conference on Building Physics in Leuven, 14. – 18. September 2003, Leuven/Belgien, S. 921 - 927.

Künzel, H.M.; Zirkelbach, D.; Sedlbauer, K.: Predicting Indoor Temperature and Humidity Conditions Including Hygrothermla Interactions with the Building Envelope. Proceedings of 1st Conference of Sustainable Energy and Green Architecture. 8. - 10. October 2003, Bangkok, S. GA 114-119. ISBN 974-456-165-3.

Sedlbauer, K.; Holm, A.; Künzel, K.H.; Radon, J.: Description of the IBP holistic hygrothermal model. IEA-Annex 41 – Moist Eng. Unpublished report.

Prof. Dr.-Ing. Klaus Sedlbauer
Fraunhofer-Institut fuer Bauphysik
Postfach 1152, D-83601 Holzkirchen
+49 (0) 8024/643-56 (telephone)
+49 (0) 8024/643-66 (fax)
sedlbauer@hoki.ibp.fhg.de