FIW Annual Report 2012

FIW München

Contents

Preface

Dear Members and Friends of our Institute,

The present annual and progress report 2012 should once again provide you with a summarized overview of the multi-layered activities from the previous year and simultaneously deals with the areas of operation that we have defined as focal points for the coming years.

It pleases me to say that we continue to deal with positive overall development in the area of certifications, quality monitoring and voluntary quality assurance as well as in terms of research activities. Thus, we were able to further develop our position not only in the national, but also in the international field as a recognized testing institute and regulatory agency. These activities are supplemented through customer-related consultation functions in order to optimize the characteristics of construction products and to ensure performance consistency and reliability in the use of these products; necessary measures for subsequent recycling possibilities are also included therein.

In addition to the important field of certifications and quality assurance, everything is possible as a result of a strengthening of the area of research. It serves to develop application possibilities and to ensure the use of those available up to this point. A very decisive requirement for the handling of these future challenges was to first guarantee a smooth generation change in the institute's management after the very successful 11-year work of Dr. Gellert. This was successful due to the engagement of Prof. Dr.-Ing. Andreas H. Holm, until August 2011 an employee at the Fraunhofer Institut für Bauphysik in Holzkirchen and professor of building physics and energy-efficient construction at the University of Applied Sciences Munich. As reported last year, Professor Holm started at the institute on 1 September 2011 and assumed management of the institute as Dr. Gellert's successor on 1 June 2012.

This change was not only smooth, but also promising. We are thus easily able to promote the work focal points of research in connection with the application and new development of products for energy-efficient construction and retrofitting.

Similarly, it was necessary to pursue the investment and retrofitting measures in old and new buildings started five years ago as well as the additional building acquired in 2009. Even in 2012 this was a focal point in the context of our investment activities that is sure to continue keeping us busy in the coming years. An important requirement for efficient processes and growth.

The comprehensive lecture, standard and committee activities of the institute's scientific employees stated in this report not only serve to transfer knowledge to politics and industry; they simultaneously serve the exchange between science and all parties interested in energy efficiency measures and corporate and social groups responsible for them.

Here, the Wärmeschutztag (thermal insulation day), which in the meantime is established and has become a central event, has special weight. We would like to once again state that the invoked energy revolution cannot be successful without improvement of energy efficiency in the building and in the annex area, and the economic aspects of climate and resource protection may not disappear from sight. At the same time, regulatory and grant policy necessities must be demanded, i.e. from policy to administrative knock-on effects, in order to guarantee – in the building sector, for example – that the desired retrofitting quota of 2 % of existing buildings is also actually achieved and implementation is accelerated.

Naturally, we not only concentrate our activities on this approach, but also on the media-related sector in order to confront irrelevant criticism, incorrect reporting in connection with the implementation of energy efficiency measures in the building sector, to contribute to the objectification of the discussion, and to support integrative processes. This in particular against the backdrop of a mutual chance.

Thus, I also personally do not promote exclusive, but rather an integrative implementation of the important component of the energy revolution.

In this regard we very much support the efforts of the EU Commission to achieve nearly climate-neutral buildings by 2020.

Accelerating an increase in energy efficiency in the overall building sector and at industrial facilities, and – building thereupon – the development of renewable energies without distancing oneself from market-based economic principles is our creed.

Nothing has changed with regard to the principle that unused energy is the highest level of energy efficiency – and thus the best native source of energy – regardless of energy imports or highly subsidized energy sources or the ecological balance of deteriorating energy sources. Thus, government control measures must be implemented in places where they are the most effective in the short-term and where they are economically and ecologically the highest and socially the most just in the middle- and long-term.

We as an institute continue to pursue this integrative implementation not only in the sense of perceived generational obligation, but also with the desire to make a contribution in terms of not landing in the economic or ecological lowest common denominator.

In addition to government control measures, other knock-on effects include the efforts of the economy, science and research to continue developing the principles, products and systems needed for the implementation of energy efficiency measures in the building sector and in industrial facilities, and to keep them constant in terms of use and capable in terms of effect through quality assurance.

Challenging tasks in the implementation of which we decisively position ourselves in terms of our members, and where appropriate also in cooperation with our research associations.

Klaus-W. Körner
Chief Executive Officer FIW München

The Renovation Market Needs Transparency and Information

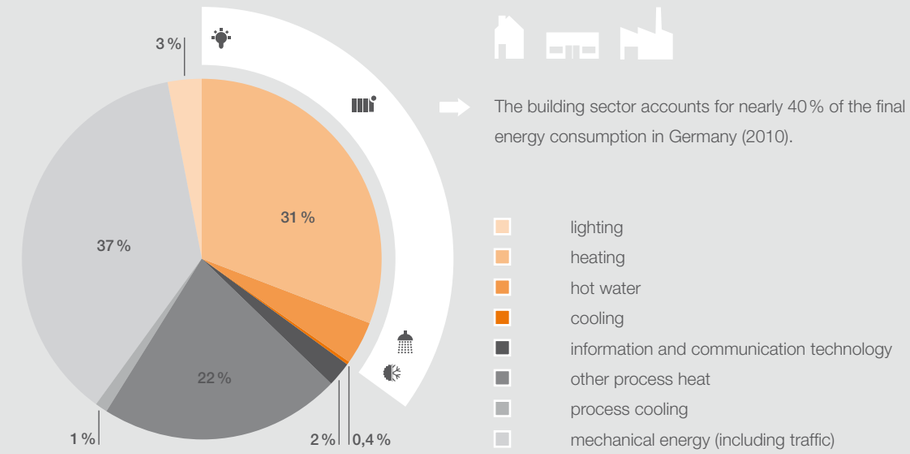
Politics, the construction and housing industries agree: Germany's building stock must become more energy efficient. After all, no other sector offers the opportunity of economically developing energy efficiency potentials as high. The energetic renovation of the "house system" may allow savings of around 80 percent of the energy used today by the year 2050. The increase of this "efficiency treasure" requires clear administrative regulations and an attractive incentive system as well as qualified information offers in order to make energetic building renovations into a process that is comprehensible for owners, professional and produces reliable results.

In practice many owners still postpone the necessary investments in energetic renovation measures even though high-quality products and technology as well as qualified renovation service providers are available for energetic renovation projects. One reason for this reservation is that the owners are often insecure and lack knowledge regarding the benefits of energetic renovations. In order to better inform owners, Germany's first renovation campaign across the trades is in the works. This campaign, which was initiated by the "Allianz für Gebäude-Energie-Effizienz" (geea) (Alliance for Building Energy Efficiency), purposes to show the house as a cohesive system consisting of building shell and installation engineering and thus prevent the possibility that information regarding individual efficiency measures specific to different trades contradict each other.

The Alliance for Building Energy Efficiency (geea) was founded in 2011 by the Deutsche Energie-Agentur GmbH (dena) (German Energy Agency) in collaboration with leading industry actors from the building and energy industries, skilled crafts and trades, finances and science. One of the founding members, the "Forschungsinstitut für Wärmeschutz e.V. München" (Research Institute for Thermal Protection in Munich), significantly helps develop shared positions and appropriate instruments for the renovation process. I am convinced that this cooperation will yield solutions that will help convince Germany's house owners of the benefits of energy efficient buildings using clear and easy-to-understand messages.

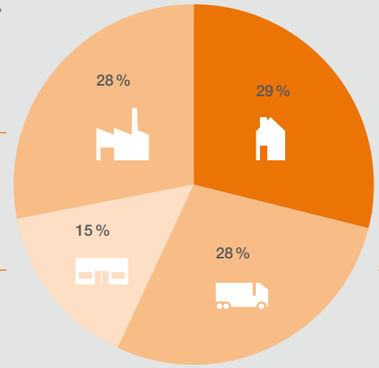
Stephan Kohler
Chairman of the Executive Board of Deutschen Energie-Agentur GmbH (dena)

Centrality of energy consumption.
The building sector is the largest individual item in the consumption balance.



source: BMWI-energy data, retrieved 2012

Energy consumption in Germany.
Private households were the largest factor of energy consumption in 2010.



source: dena-building report 2012

Editorial

Dear Reader,

The energetic retrofitting of existing buildings, but also the energy efficiency of new buildings are still important political topics when discussions are held on additional decreasing of primary energy needs at and around EnEV 2013. At the same time, media reports accumulate on supposed structural engineering problems and deficits in thermal insulation all the way to the absurd argument that energy savings through thermal insulation are impossible in terms of building physics. However, generally applicable statements on the individual potential of retrofitting measures to have an effect (thermal insulation of the envelope, window replacement and the renewal of heating systems) are not possible, as there can be great differences specific to each building.

Nevertheless, the fact is: thermal insulation is indispensable and affordable with regard to correct implementation without problems and without expected deficiencies – and ultimately also economical.

In the almost 100 years of its existence, FIW München has dealt intensely with the research and testing of technologies and new materials for the improvement of energy efficiency, and as a testing institute has supported manufacturers in the context of certification, quality monitoring and voluntary quality assurance of their innovative products. New products and new application possibilities constantly require research into product characteristics and constant quality assurance of construction products. In this regard, as an international testing institute and regulatory agency FIW München adopts an important function with a strong research department. FIW München will be a leader in the support of industry – not just in the insulation industry – in terms of research into and testing of technologies and new materials for the improvement of energy efficiency. Initiative for European and national research topics must also come from us in an increased manner. My wish is for FIW München to be understood as a partner for the manufacturer and to help you optimize the characteristics of their construction products and to ensure their performance consistency and reliability over the long-term. We want to remain your partner and intermediary with regard to launching new materials, components and construction systems.

Consequently, one of my duties at FIW München will be the use the institute's network, to advance mutual concerns, and to spread all types of information on energy-efficient construction and renovation to designers and users in particular. There is always a need for information and explanation in this regard, also as a result of increased requirements for heat protection for buildings due to energy-saving regulations. In order to change this, we want to intensify the dialogue with you. The success that we all want can only come from working together. I hope to be able to continue the over 90 years of FIW München tradition in this manner.

FIW München wants to accept responsibility. With open platforms such as the new internet presence, the newsletters that are published multiple times each year and the Wärmeschutztag (heat protection day), linked information is spread, integrative processes are promoted, food for thought is supplied, and measure recommendations are deduced. With the incorporation of politics, the institute is able – perhaps better than in other ways – to convey overall necessities and thus to promote subsequent political decisions.

In closing I would like to thank you all for the comprehensive support during my first year. My warmest thanks go to my predecessor Dr. Roland Gellert for the smooth transition phase and the very collegial collaboration and training in the last ten months.

To a fruitful collaboration and good times together with FIW!

Prof. Dr.-Ing. Andreas Holm
Head of the Institute FIW München

FIW München at a Glance

4.1 The association

The association was founded on 1 October 1918 as the “Forschungsheim für Wärmewirtschaft, München” (research Home for Heat Economy, Munich), and was registered in the register of associations with the number VR 1925 under the name Forschungsheim für Wärmeschutz e. V. München on 21 June 1921. The institute was given its current name in 1966 when it was renamed to become the “Research Institute for Thermal Insulation e. V. Munich” (e. V. = German foundation). Its headquarters are located at Lochhamer Schlag 4 in the Munich suburb of Gräfelfing.

The foundation is exclusively and directly non-profit making in the sense of the German revenue code section entitled “tax-privileged purposes”.

The purpose of the association is the promotion of scientific research in the sector of thermal insulation.

The purpose of statutes is realized by the following in particular:

- Researching the thermal and mass transfer laws, especially the scientific principles concerning the insulation against the heat and the cold
- The dissemination of this knowledge
- The technical thermal testing of construction and thermal insulation materials and the constructions made from them (practical designs)
- The cooperation with heat-economy associations, technical associations and scientific institutes

Board of Directors

The association is represented by the Chairman and the Deputy Chairman of the board of directors. The members of the board of directors are elected for a period of three years by the general assembly.

The following persons are members of the Board of Directors as of the election at the last general assembly 15 June 2012:

- Klaus-W. Körner (chairman)
- Michael Wörtler (deputy chairman)
- Helmut Bramann
- Volker Christmann
- Bernd-J. Deyle, Pliezhausen
- Holger Elter
- Dr. Jürgen Fischer
- Jörg M. Pradler
- Marin Schouten
- Dr. Wolfgang Setzler
- Klemens Steenheuer

Scientific Advisory Board

According to the statute, the scientific advisory board advises the executive board and senior management team in all academic and research-related matters of the association; it provides suggestions to the research themes, to encourage and support research and to ensure the quality of the research. No meeting of the scientific advisory board took place in the current year.

It is comprised of the following members:

- Univ. Prof. Dr.-Ing. Nabil A. Fouad
  Institute for building physics at Leibniz University, Hannover; publisher of the Bauphysik-Kalender, publisher Ernst und Sohn; member of the expert testing commission “building and construction” of the Chamber of Engineers Niedersachsen

- Prof. Dr.-Ing. Gerd Hauser
  Professor for building physics at the Technical University Munich and head of the Fraunhofer-Institut für Bauphysik; owner of an engineering office for building physics. Chairman of the Gesellschaft für Rationelle Energieverwendung; chair of the Fachverband Luftdichtheit im Bauwesen

- Prof. Dr.-Ing. Gerhard Hausladen
  Professor for building climate control and building services at the Technical University Munich; member of the energy commission of the regional capital of Munich; member of the DFG in the building & construction and architecture review board; chairman of the board of ClimaDesign e. V.

- Head of Division Dipl.-Ing Hans-Dieter Hegner
  Federal Ministry for Traffic, Building and City Development (BMVBS), Berlin, head of department B 13 “Civil engineering, sustainable building, building material research”; chairman of DIN AA “Energy savings and thermal insulation – characteristics and requirement conditions” at NABau; chairman of the expert committee “Building materials and building types for heat and sound insulation” at DIBt

- Dr.-Ing. Ernst-Günter Hencke
  VDI-Gesellschaft Energie und Umwelt, Düsseldorf, Specialist field management and safety in energy and environmental technology; specialist field energy conversion and application; specialist field strategic energy and environmental questions

- Prof. em. Dr. Dr. habil. Drs. h.c Gerd Wegener
  Former full professor and head of Holzforschung München

4.2 The Institute

The structure of FIW München

The structure and organization of FIW München is oriented to the business areas as well as to the classic core competencies. FIW München's core competencies and business areas cover a wide spectrum. They cover, amongst other things, laboratory tests, open-air tests, in-situ demonstrations, studies, further education and standardization.

Core competencies and business areas

Testing, monitoring and certification

Holistic evaluation of

- Insulating materials
- Masonry
- Windows

In all questions pertaining to

- thermal insulation
- moisture protection
- fire protection
- stability
- material composition

Development of testing standards, material standards, guidelines and worksheets

Research and development

- Basics of thermal insulation and moisture protection as well as construction chemistry
- Testing of technologies and new materials for improving energy efficiency
- Effect of determining factors
- Durability of materials and systems
- Industry-oriented initial research into construction material and construction system development
- Energetic optimization of the complete building system

Transfer of knowledge and technology

- National and international standardization
- Member of various expert committees
- Publications and lectures
- Realization of training sessions and symposia
- Development of measurement devices and testing equipment (scientific system and equipment building)

Building industry

Insulation of industrial systems and in industrial construction

Transport and logistics

Institute management

Managing institute director:
Prof. Dr.-Ing. Andreas Holm

Deputy director:
Wolfgang Albrecht

Technical Insulation
Roland Schreiner

Certification
Wolfgang Albrecht

Insulation products for buildings
Claus Karrer

Building physics & components
Christoph Sprengard

Administration and HR management: Rolf Opp

Equipment building and infrastructure: Michael Guess

Quality management: Ralph Alberti

Core competencies and business areas

Technical insulation

A functional technical insulation system is comprised of qualified insulating material and correspondingly optimized insulation technology components as well as system-based thermal bridges. Confident handling of all physical-technical influences is important in the design of an industrial system with a focus on energy efficiency and operational safety. The field of insulation for industrial systems – which is large unregulated in European and national legal requirements – is dependent on a functional network of partners from industry, associations, research institutions and testing institutes. Here, with the "Technical Insulation" department, FIW München has been the central platform that closes the gap between theoretical rules and standards and practical application since the institute was founded in 1918.

From this are derived the core fields of activities in the "Technical Insulation" department. Center stage is taken by quality assurance and performance testing of technical insulation materials, comprehensive knowledge and the transfer of knowledge of physical-technical connections as well as the holistic assessment of complete insulation systems. Confirmation of a correct design and clarification of the cause of damages or defects in technical insulation can be completed at any time by our experts with many years of professional experience in expert statements.

The thermal insulation technical and mechanical tests are possible in the large temperature range of -180 °C to +1000 °C. The lab tests conducted in accordance with European standards are sensibly supplemented with the assessment of determining factors for application-related insulation installations under practical conditions, e. g. on boiler walls, pipelines, or under vibration loads. In addition to order testing for all technical insulating materials, active organization of European voluntary quality assurance (VDI/Keymark) rounds out the testing offer. Participation in European round robin tests is a fixed component of the work of accredited laboratories. We are particularly proud that we could find a reference insulating material to secure the European level of thermal conductivity at higher temperatures for which for the first time there is also a mathematical-physical model of all mechanisms involved in heat transport. Competent advising of insulation manufacturers in the context of required audits of the factory's own production control for voluntary quality assurance as well as legally specified CE labeling are a matter of course for us. The existing notifications as a product certification and testing center for all technical insulating materials will be appropriately continued in accordance with the new European construction product regulation.

Active transfer of knowledge is for us an obligation: This is evident in the cooperation with national and European standardization bodies and boards as well as in the execution of information events and training sessions.

The energetic observation of technical insulation systems via detailed assessment using three-dimensional finite-element modeling and the possibility of calculating insulation against heat and cold in accordance with VDI 2055 Part 1 "Calculation rules" results in statements on and classification of the energy efficiency of industrial systems in industry and in technical building services. In addition, simultaneously conducted system tests provide verified characteristic values that are of vital importance with regard to the assessment of technical insulation systems.

The management of the "Technical Insulation" department at FIW München was smoothly transferred from Dr. Ing. Martin Zeitler to Roland Schreiner on 1 July 2012.

Contact person: Roland Schreiner
T +49 89 85800-42 | schreiner@fiw-muenchen.de

FIW München at a Glance

Certification

For years FIW München has been a certification body recognized in accordance with state building code for thermal insulating materials, special applications for thermal insulating materials (e. g. insulating materials for the inverted roof, perimeter insulation or under load-bearing components) and for bricks with a conversion factor for the moisture content that deviates from DIN 4108-4. Together with the testing and surveillance center, FIW thus offers its customers a comprehensive service for just about all thermal insulating materials.

Approximately 10 years ago the function of the certification body was expanded to thermal insulation products after system 1 in accordance with § 11 of the construction product regulation. Here, FIW acts as a European notified certification body with code number 0751.

The introduction of the European construction product regulation (EU-BauPVo) on 1 July 2013 also brings several changes for the certification body with it. Thus, the certification body had to be clearly separate from the testing and surveillance center in terms of personnel and organization. FIW München solves this by founding an independent Certification department with Wolfgang Albrecht as the head of the certification center and Renate Hirmer as the deputy. The new Emission Measurements division was organizationally joined under the direction of Günther Bartonek, who built this division and has offered our customers measurements since December 2012.

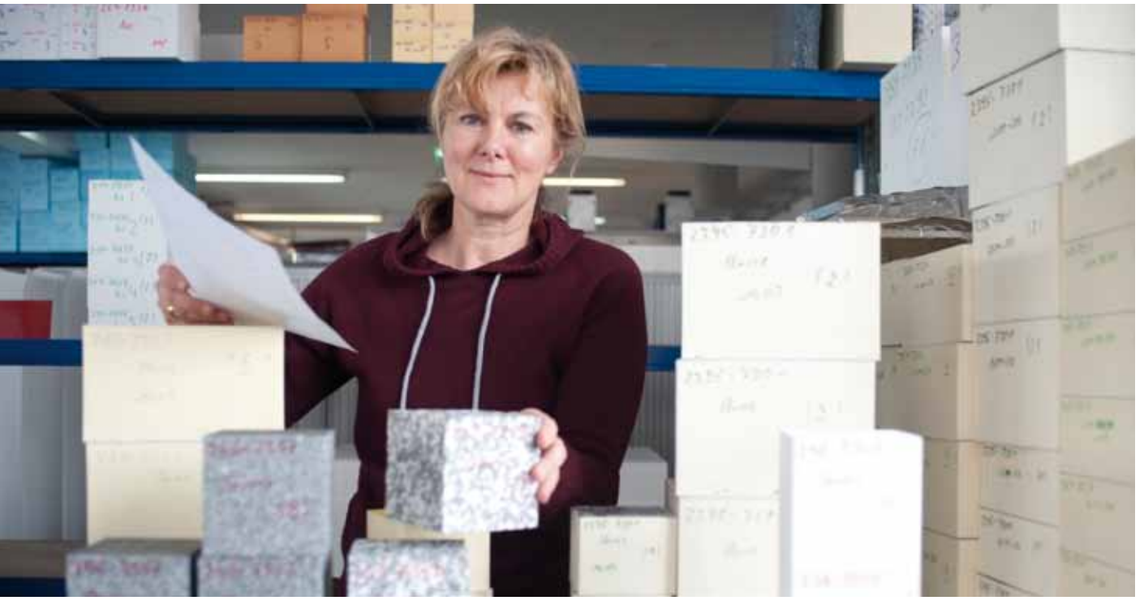
For years the testing division has been subject to the quality assurance system in accordance with DIN ISO / IEC 17025 with external and internal audits. With the introduction of the EU-BauPVo, the certification center must also be accredited by the German accreditation body (DAkkS) in accordance with EN 45011 and is thus also subject to external audits.

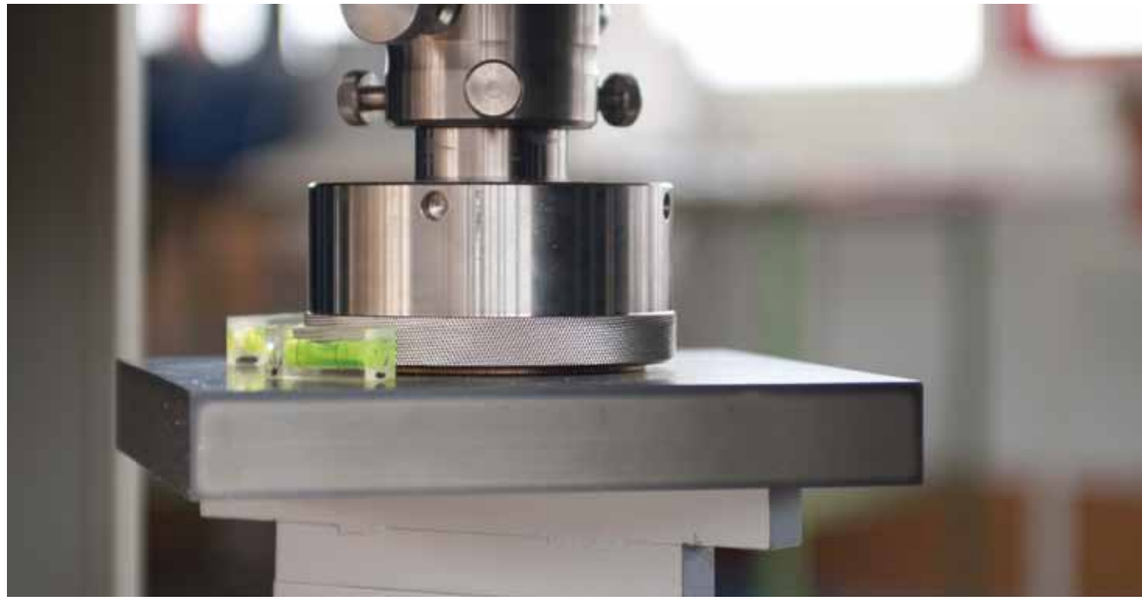
For FIW München and its customers, this is not only important with regard to today's certification center in accordance with LBO and EU-BauPVo; rather, it also facilitates future voluntary surveillance systems that can be specially adjusted to specific groups of substances or fields of application and that will play a continually greater role in the future.

Since summer 2012 FIW München has been a recognized testing, monitoring and certification center for the determination of moisture correction factors Fm for brickwork. In 2009 the individual brickwork products were removed from the building rules list with the respective entry of an Fm value that differs from DIN V 4108. The determination of the Fm values for all types of brickwork was outlined in a new entry in the building rules list under point 2.1.26. The accreditation of the testing, monitoring and certification centers was hereby not automatically rewritten in the new entry in the building rules list by DIBt. All testing, monitoring and certification centers needed to complete a new accreditation process.

FIW München was one of the first testing, monitoring and certification centers to receive accreditation and can now also continue to complete measurements and determine moisture correction factors for brickwork products and to monitor them.

Contact person: Wolfgang Albrecht
T + 49 89 85800-39 | albrecht@fiw-muenchen.de





Insulation products for buildings

The “insulation products for buildings” department aims for comprehensive, overall observation of thermal insulating materials for buildings through testing and monitoring as well as through training, research and standardization.

The main activity here is the monitoring and testing of thermal insulating materials. Monitoring is understood to not just be the formal auditing of manufacturing processes; rather, it is also the professionally competent supervision and support of the implementation of normative requirement and the execution of factory production control (FPC). Through the comprehensive, uniform monitoring of a large part of the manufacturing factories for thermal insulating materials, FIW München ensures a high-quality building material for the end consumer and a fair market environment for the manufacturer.

The objective of the testing center at FIW München is to offer all thermal insulating material-relevant tests or in exceptional cases to arrange them through cooperation with other competent partners. The many years of experience of the largest testing center in Europe for thermal insulating materials are incorporated into the relevant standards through participation in national and international committees. In turn, new testing procedures are promptly and competently implemented at FIW München and offered to manufacturers to prove the suitability of their products.

Naturally, FIW München is accredited nationally (PÜZ-Stelle) and in Europe (Notified Body), and is also accredited as a testing laboratory in accordance with EN 17025. The special competence is shown in the leading cooperation with the Lambda Expert Group (TC88/SDG 5), where the most competent laboratories for the determination of the thermal conductivity of thermal insulating materials audit one another and confirm measurement precision through round robin tests.

General questions on the characteristics and application of thermal insulating materials for buildings are intensely tested by the department. In previous years numerous public research projects, e. g. on the sustainability and moisture performance of insulating materials or on their applicability in external thermal insulation composite systems (ETICS), were completed. The knowledge gained therefrom is published and is applied through participation in technical or quality boards for associations and in committees. The department also conducts comprehensive research into the development of thermal insulating materials or into targeted improvement of specific characteristics on behalf of manufacturers. Results in the context of “industrial research” are subject to the absolute professional secrecy of the research center.

We always welcome every question regarding “thermal insulation products for buildings”!

Contact person: Claus Karrer
T +49 89 85800-49 | karrer@fiw-muenchen.de

FIW München at a Glance

↑ *WDVS facade Munich*

Building Physics & Components

With the change of department leadership from Dr. Martin H. Spitzner to Christoph Sprengard in August 2012, the direction of the building physics and components department changed. The grouping of monitoring tasks in the Thermal Insulation products for buildings department and the reduction of the standardization function make it possible for the “Building Physics & Components” department to focus on research work on thermal and moisture transport in the building envelope and to support the development of new products.

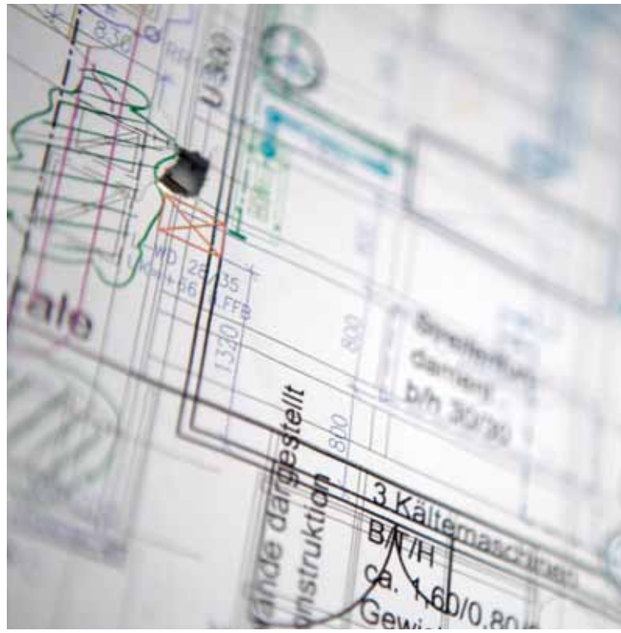
The core competency of the department is the thermal and moisture-related optimization of insulating and building materials as well as of components and insulation designs. Further developments are increasingly conducted with calculations and simulations using modern computer programs. The quality of such calculations is very dependent on the reliability and precision of the material data that must be determined in measuring arrangements. The “Building Physics & Components” department has at its disposal efficient testing devices and the most modern testing procedures with which even large components such as facade elements, windows, doors and brickwork can be tested in a 1:1 scale.

Our strength lies in the flexible combination of calculations, simulations and laboratory tests. Reliable material values are often not available as the basis for numeric calculations, in particular for new building products such as vacuum insulation panels (VIP), moisture-adaptive water-vapor barriers, low-emissivity coated multilayer films or brickwork filled with insulating material. The “Building Physics & Components” department determines these material values as the basis for mathematical tests on the product and supports the manufacturer on the path to the market.

The department's thermal and moisture-related know-how is also available to non-construction industries. Manufacturers of cooling appliances and freezers, transport containers, and vehicles fall back on our experienced experts in order to optimize the thermal behaviour of their products. Here it is often necessary to conduct instationary tests with increasing or decreasing temperatures or to determine the energy needs of the systems with dynamic simulations. In many cases, tests with realistic moisture conditions are also necessary to analyze moisture distributions in systems and to be better able to assess damages.

One focus of the work of the “Building Physics & Components” department is on the application and processing of research projects and studies for public providers. However, research and development projects are also increasingly realized at the direct behest of the industry. In this regard, topics range from classic building physics questions to heat and moisture transport, from further developments of products and components to application-specific tests on individual components.

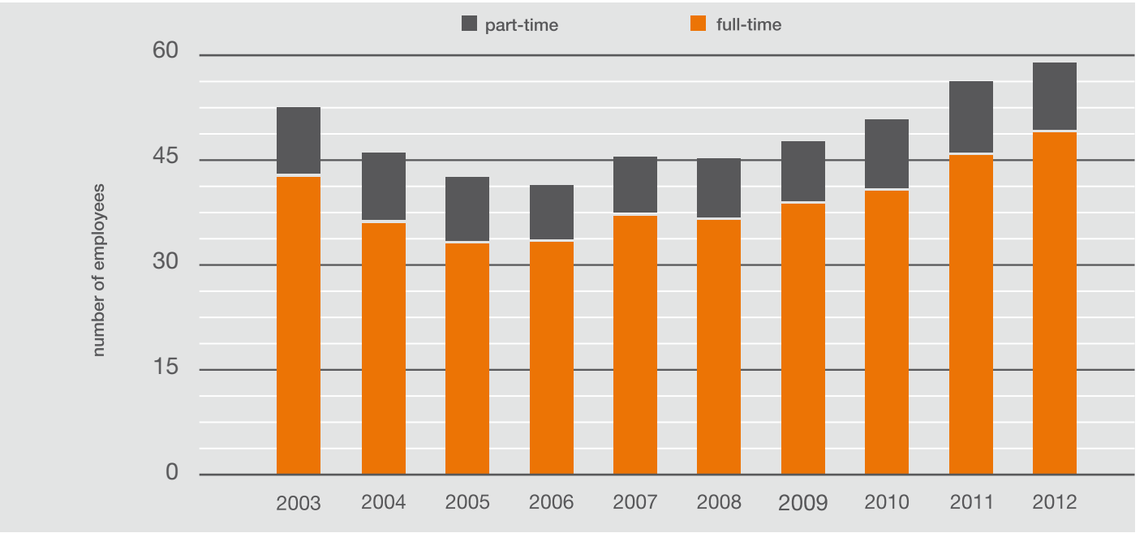
The energetic retrofitting of existing buildings is an indispensable component of the energy revolution. The ambitious energy saving goals of the federal government cannot be achieved without a decrease in existing buildings' heat loss. In this regard, the “Building Physics & Components” department supports the entire value chain in construction – from the material to the component and from the component to the complete thermal insulating building envelope. In many cases, holistic consideration must include the building's location, the climate and even user conduct in order to obtain reliable statements on the durable functionality of retrofitting measures. For example, such detailed statements are interesting to manufacturers of interior insulating materials who also receive component catalogues and positive lists for their products.



Contact person: Christoph Sprengard
T +49 89 85800-58 | sprengard@fiw-muenchen.de

FIW München at a Glance

Personnel Development



source: FIW München 2013

Compared to the previous year, the number of employees grew from 55 to around 57 core staff members (full-time equivalent). 59 people worked in the rooms of FIW München at the end of 2012, including personnel from temp agencies.

Employment status is comprised of the following:

Service anniversaries:

- **10 years of service**
  Sidonia Tana, Dpt. “Technical insulation”
- **15 years of service**
  Ralph Alberti, Dpt. “Technical insulation”
- **20 years of service**
  Stefan Hupfauer, Dpt. “Technical insulation”
- **35 years of service**
  Winfried Eiche, Dpt. “Building Physics & Components”

Personnel changes at FIW München

Leadership change

Prof. Dr.-Ing. Andreas H. Holm takes over management from Dr. Roland Gellert on 1 July 2012. Andreas Holm studies Physics at the Technical University Munich as well as at the universities of São Paulo and Porto. He began his professional career in 1996 as a scientific employee at the Fraunhofer-Institut for Bauphysik in Holzkirchen, where he was group leader in the Hygrothermics department from 2001 to 2004. He was the head of the Indoor Climate department from 2004 to 2011. In 2009 he was called to the professorship for Building Physics and Energy-Efficient Building at the University of Applied Sciences Munich. Since 2011 he has been the head of the Forschungsinstitut für Wärmeschutz e. V. Munich.

Wolfgang Albrecht has been the new deputy managing director since 1 August 2012. He replaces the Dr.-Ing Martin Zeitler's successor, who stepped down from general management and as the "Technical Insulation" department head on 31 July 2012.

Wolfgang Albrecht studied Physical Science and Technology at the Fachhochschule München with a focus on physical chemistry/environmental technology. After brief employment at the Gesellschaft für Strahlen- und Umweltforschung in Munich, Wolfgang Albrecht has been an employee at FIW München since 1981. He oversaw multiple projects such as the development of a high-precision measuring device to measure thermal conductivity, built the laboratories for the measuring of closed-cell content and cell gas composition and oversaw numerous research projects. Starting in 1982 he dealt with the third-party control of almost all thermal insulating materials. From 1983 to 2002 he headed the thermal conductivity low temperatures laboratory, which was completely redesigned and modernized in this period. Since 2000 Albrecht has directed the “Thermal Insulation” in Structural Engineering department and the corresponding certification center. In addition to numerous lectures and publications on the topic of insulating material characteristics and the application of thermal insulating materials, Wolfgang Albrecht works with committees of experts, national and international standardization committees.

Arrivals

Bernhard Berkmüller (third-party monitoring of insulating material manufacturers), Michael Zimmermann (testing of water vapor permeability) and Carsten Zacharias (testing of water absorption) have strengthened the Insulating Materials in the “Building Industry department” since the start of 2012.

Departures

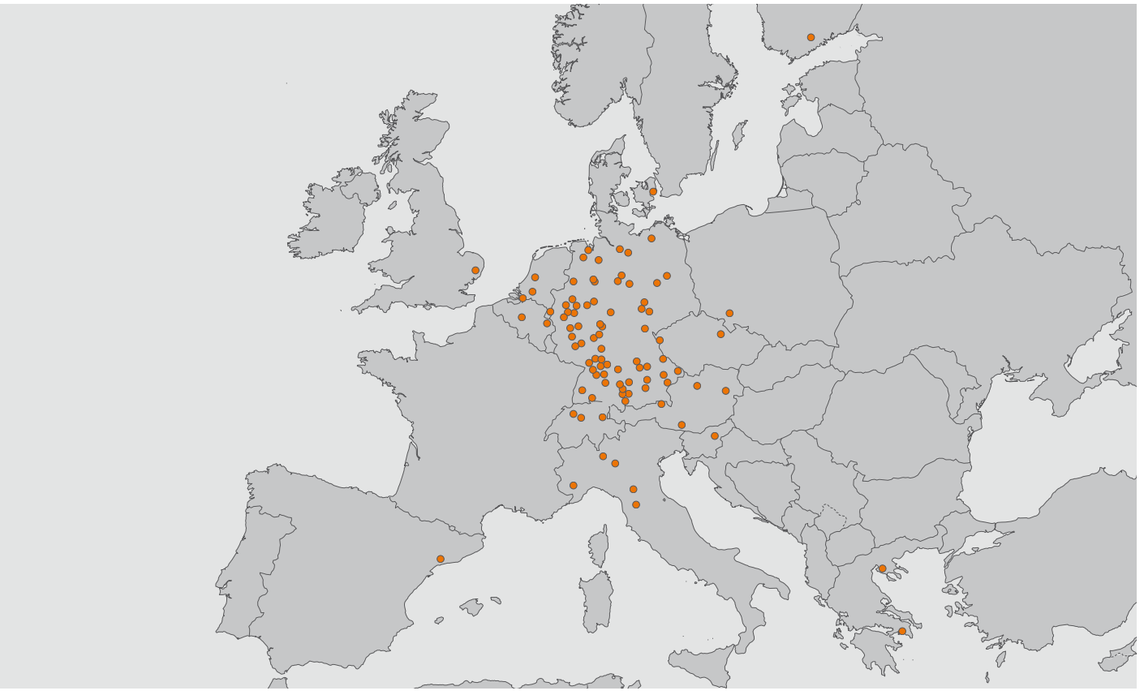
- Dr. Roland Gellert, CEO, departs the institute on 30 June 2012.
- Dr.-Ing. Martin H. Spitzner, department head for “Building Physics & Components”, departs on 30 September 2012.
- Reinhold Vieregg, head of IT, departs on 31 October 2012.

4.2.3 Financial Development

The growth in the HR department is also reflected in the institute's overall performance. Revenues increased to 7.25 million euro in 2012. The sales volume has increased by more than 60 % since 2000. Positive results with simultaneous revenue increases have been constantly achieved since 2008. This is primarily based on the fact that the testing and monitoring function was significantly enlarged. There were multiple committees with manufacturing plants domestically and abroad for a variety of new monitoring contracts. This trend is strengthened by increasing product variety, lower heat conductivities and greater insulating material thicknesses. Revenues also positively developed as a result of voluntary monitoring systems. Revenues from the field of research increased to a record high last year. Compared to the previous year, investments slightly increased to a total of almost 1.5 million euro.

Our customers largely come from the German-speaking market. However, the trend is gradually moving toward an international customer structure. In the last 20 years the percentage of revenues from abroad has almost doubled: Of the revenues from certificates and tests for 2012, 35 % were from abroad and 65 % were domestic. The reason for this is that many customers are monitored by FIW München not just at their national factories, but also at their international factories. Furthermore, FIW München was able to establish its own monitoring system in many countries together with industry partners. In addition, there are also increasing requests for research and development from abroad.

Regular Members



The association has a total of 117 regular members; FIW München warmly welcomes the following four companies as new members:

- FIBRAN S.A. Insulating Materials Industry, Thessaloniki, Greece
- HASIT Trockenmörtel GmbH, Freising
- RIsoTep GmbH, Lenzkirch
- Wiegla GmbH, Wiesbaden

- 3i International Innovative Insulation S.A., Athen, Greece

- AEROFLEX Europe GmbH, Ulm
- aprithan Schaumstoff-GmbH, Abtsgmünd
- ARMACELL GMBH, Münster
- aspen aerogels, Inc., Northborough, USA
- Austrotherm GmbH, Waldegg, Austria
- BASF Polyurethanes GmbH, Lemförde
- BASF SE, Ludwigshafen
- BAU-FRITZ GmbH & Co. KG, seit 1896, Erkheim
- Baustoffwerke Horsten GmbH & Co. KG, Friedeburg
- Bayer MaterialScience AG, Leverkusen
- BERO Gebr. Allendörfer Betonwerk GmbH, Gießen
- Bilfinger Berger Industrial Services GmbH, Munich
- BIS OKI Isoliertechnik GmbH, Pforzheim
- BOHLE ISOLIERTECHNIK GMBH, Gummersbach
- BROHLBURG Dämmstoff- und Recyclingwerke GmbH & Co. KG, Andernach
- BUNDESVERBAND PORENBETON, Berlin

- Celotex Limited, Hadleigh, Great Britain
- Deutsche Amphibolin-Werke, DAW Stiftung & Co. KG, Hirschberg-Großsachsen
- Deutsche FOAMGLAS® GmbH, Schmiedefeld
- Deutsche Isolahn Werke GmbH, Jever
- Deutsche Rockwool Mineralwoll GmbH & Co. OHG, Gladbeck
- Dieckhoff GmbH, Moers
- DOW Deutschland Anlagengesellschaft mbH, Eschborn
- DUNA-Corradini S.p.A., Soliera – Modena, Italy

- EDILTEC SRL, Modena, Italy

- Fachverband Wärmedämm-Verbundsysteme e. V., Baden-Baden
- FIBRAC ISOLANTI S.p.A, Carru, Italy
- FLUMROC AG, Flums, Switzerland
- Forschungsvereinigung Kalk-Sand e. V., Hannover
- FRAGMAT TIM d.d., Lasko, Slovenia

- G+H ISOLIERUNG GmbH, Ludwigshafen
- Giessener Dämmstoffe GmbH, Heuchelheim
- glapor Werk Mitterteich GmbH, Mitterteich
- Gonon Isolation AG (SA), Schleitheim, Switzerland
- Grupor® Kunststoffwerk Katzbach GmbH & Co. KG, Cham-Katzbach
- Güteschutzgemeinschaft Hartschaum e. V., Celle

- HAACKE Energie-Effizienz GmbH + CO. KG, Celle
- Hauptverband der Deutschen Bauindustrie e. V., Berlin

- IIG Industrieisolierungen GmbH, Gelsenkirchen
- Innolation GmbH, Lauingen
- IsoBouw Dämmtechnik GmbH, Abstatt
- ISOQUICK GmbH & Co. KG, Niederzissen
- IVH - Industrieverband Hartschaum e. V., Heidelberg
- IVPU-Industrieverband Polyurethan-Hartschaum e. V., Stuttgart
- JACKON Insulation GmbH, Steinhagen
- JOMA Dämmstoffwerk GmbH, Holzgünz
- JUNG & EBERLE Dämmtechnik GmbH, Bietigheim-Bissingen

- KAEFER ISOLIERTECHNIK GmbH & Co.KG, Bremen
- KAIMANN GmbH, Hövelhof
- KARL BACHL GmbH & Co KG, Röhrnbach
- KINGSPAN INSULATION B.V., LL Thiel, Netherlands
- Kingspan Unidek GmbH, Bretten
- KLB KLIMALEICHTBLOCK GMBH, Andernach
- Klaus-W. Körner, Munich
- Knauf Dämmstoffe GmbH, Wadersloh
- Knauf Insulation GmbH, Ferndorf, Austria
- KNAUF INSULATION SPRL, Vise, Belgium
- Kolektor Missel Insulations GmbH, Fellbach
- Korff Isolmatic Sp.z o.o., Sobotka, Poland

- LACKFA Isolierstoff GmbH + Co, Rellingen
- Landesinnungsverband des Bayerischen Zimmererhandwerks, Munich
- LAPE srl, Empoli, Italy
- Lindner Isoliertechnik & Industrieservice GmbH, Arnstorf
- L'ISOLANTE K-FLEX S.r.L., Roncello, Italy

- Monier Braas GmbH, Oberursel
- Münzinger + Frieser Holding GmbH, Reutlingen

- NAFAB GmbH, Bonn
- nestaan holland b.v., RZ Tholen, Netherlands

- PAROC GmbH, Hamburg
- PHILIPPINE GmbH & Co. Dämmstoffsysteme KG, Bochum-Gerthe
- PITTSBURGH CORNING EUROPE SA/NV, Lasne, Belgium

FIW München at a Glance

- ReadyTherm Maschinen-Dämmung GmbH & Co. KG, Essen
- Rockwool B.V., Roermond, Netherlands
- ROCKWOOL INTERNATIONAL A/S, Hedehusene, Denmark
- RYGOL DÄMMSTOFFE Werner Rygol GmbH & Co. KG, Painten

- SAGER AG, Dürrenäsch, Switzerland
- SAINT-GOBAIN ISOVER G+H AG, Ludwigshafen
- Saint-Gobain Construction Products CZ a.s., Castolovice, Czech Republic
- Saint-Gobain Rigips GmbH, Düsseldorf
- Saint-Gobain Rakennustuotteet OY, Hyvinkää
- SCHLAGMANN Baustoffwerke GmbH & Co. KG, Zeilarn
- SCHUTZ GmbH & Co. KGaA, Selters
- SCHWENK Dämmtechnik GmbH & Co. KG, Landsberg
- Sebald Iso-Systeme GmbH & Co. KG, Sinzing
- Sirap Insulation SrL, Verolanuova, Italy
- Steinbacher Dämmstoff GmbH, Erpfendorf, Austria/Tirol
- Storopack Deutschland GmbH & Co. KG, Metzingen
- Styron Deutschland GmbH, Schkopau
- swisspor AG, Steinhausen, Switzerland

- Technoform Bautec Kunststoffprodukte GmbH, Fuldabrück
- TEKTON-Werk GmbH, Neudenau-Siglingen
- Thermaflex International Holding, B.V., AM Waalwijk, Netherlands
- Thermal Ceramics de France SAS, Wissembourg, France
- THERMOPOR ZIEGEL-KONTOR ULM GMBH, Ulm
- TOPOX-FOAM S.L., Vallmoll, Spain
- ÜGPU Überwachungsgemeinschaft Polyurethan-Hartschaum e. V., Stuttgart

---

- UNION FOAM S.p.A., Bellusco, Italy
- UNIPOR Ziegel Marketing GmbH, Munich
- Uponor GmbH, Ochtrup
- URSA Deutschland GmbH, Leipzig

- VARIOTEC GmbH & Co. KG, Neumarkt

- Wienerberger GmbH, Hannover
- Wilhelm Brohlburg Kunststoff- und Kaschierwerke GmbH & Co. KG, Andernach
- WKI Isoliertechnik GmbH, Berlin

- Xella Technologie- und Forschungsgesellschaft mbH, Kloster Lehnin

---

- Zentralverband des Deutschen Baugewerbes, Berlin
- Zentralverband des Deutschen Dachdeckerhandwerks e. V., Cologne
- ZERZOG GMBH & CO. KG, Ottobrunn
- Ziegelwerk Bellenberg Wiest GmbH & Co. KG, Bellenberg
- Ziegelwerk EDER GmbH & Co. KG, Peuerbach-Bruck, Austria

4.3.2 Honorary Members

- Dr.-Ing. Joachim Achtziger
  (CEO until 2000)
- Dr. Walter F. Cammerer
  (CEO and science head until 1985)
- Heinz Gass
  (former deputy chairman)
- Univ.-Prof. (em.) Dr.-Ing. habil. Dr. h.c. mult. Dr. e.h. mult. Karl Gertis
  (em. Ordinarius in Building Physics at University Stuttgart)
- Peter Hefter
  (former chairman)
- Prof. Dr.-Ing. Hans-Gerd Meyer
  (long-standing member of the scientific advisory board)

The former CEO Dr. Roland Gellert was adopted as a new honorary member in the context of the general assembly.

4.4 Memberships and Cooperations

FIW München is a member of the following institutions:

- Allianz für Gebäude-Energie-Effizienz, geea, Berlin
- American Society for Testing and Materials (ASTM), Philadelphia
- BDI – Initiative “Energieeffiziente Gebäude”
- DIN Deutsches Institut für Normung e. V., Berlin
- DKV Deutscher Kälte- und Klimatechnischer Verein, Stuttgart
- DVM DEUTSCHER VERBAND FÜR MATERIALFORSCHUNG UND -PRÜFUNG e. V., Berlin
- Energy Efficient Buildings Association E2BA, Brussels
- FACHINSTITUT GEBÄUDE-KLIMA e. V., Bietigheim-Bissingen
- Fachverband Luftdichtheit im Bauwesen e. V., Kassel
- Forschungsgesellschaft für Straßen- und Verkehrswesen, Cologne
- L’Institut International du Froid, Paris
- Technischer Überwachungsverein Bayern, Munich
- Vereinigung der bayerischen Wirtschaft e. V. vbw, Munich; sustaining member
- VMPA Verband der Materialprüfungsämter e. V., Berlin
- Verein zur Förderung der Normung im Bereich Bauwesen e. V. VFBau, Berlin
- There are cooperation agreements with the Deutsche Energie-Agentur GmbH (dena), Berlin, and the University of Applied Sciences, Munich

Highlights from Research and Development

5.1 selected projects

Long-term creep behaviour of EPS- and XPS insulating materials under compression load in accordance with DIN EN 1606 – round robin test
Wolfgang Albrecht

For several years thermal insulating materials have increasing been used beneath buildings' load-bearing foundation slabs. Both building planers and building supervision need “loadable” measurement values for stability and for the thermal insulation-related building design.

The European standardized testing procedure DIN EN 1606 has existed since 1997 for the testing of the long-term creep behaviour of thermal insulating materials under compression load. However, the standard does not contain any instructions on the measurement uncertainty of the testing procedure. What's more, in the past no round robin tests were conducted in order to be able to estimate various influences such as the installation of the test items and the extrapolation of the measurement results.

In order to clarify this question DIBt supports such a round robin test, in which five German testing institutes and four manufacturer laboratories from all over Europe are involved. FIW München is organizing the round robin test, conducting the preliminary study and analyzing the round robin test.

Results for EPS samples

Sample selection and sample preparation are very crucial to the informational value of the comparison of the creep tests in the participating laboratories. Due to the connection between bulk density and creep behaviour for EPS, samples were selected for the test from a very small bulk density range.

The analysis of the measurement values for nominal thickness 100 mm with eight participating laboratories showed that the measurement values from seven laboratories were in the range of ± 0.13 mm. The measurement values spread across a range of ± 0.08 mm at nominal thickness 300 mm and at three participating laboratories. This corresponds to relative deformations of 0.1 % to 0.2 %.

These low spreads in terms of the measurement values must be considered excellent if one considers the tolerances one normally needs to anticipate in the building industry. The measured spreads of the extrapolated deformations of 0.1 % to 0.2 % must be deemed low even in relation to the permitted deformations in the certifications for insulating materials under foundation slabs of 2 % to 5 %.

Thus, proof was successfully provided that the testing methods according to EN 1606 in the thickness range of 100 mm to 300 mm result in easily comparable, reproducible measurement values with sufficient care in sample selection, sample preparation and sufficiently stable indoor climate.

The results of this round robin test give planers and experts in administrative bodies and in industry assurance that the measurement method can generate measurement values in the required precision and reproducibility.

Material scattering and possible errors in sampling and sample preparation are not covered.

Previous results with XPS samples

The much more complex creep processes in XPS rigid foam are tested as the last part of the research project. As a result of the presence of various cell gases (contingent upon various blowing agents), the influencing factors are more diverse and in particular more time-dependent. The various parameters such as thickness, bulk thickness, compression strength along the width, evenness of the surface/foam skin and the change to the compression strength over time were tested in a parameter study.

In a second step, a round robin test was conducted on XPS boards that should provide information on the various parameter influences and the measurement inaccuracy contingent thereupon. The round robin test ran for over 10,000 hours and ended on November 2012. The datasets for the individual testing laboratories were entered in FIW through January 2013. The final analysis is not yet completed.

Conclusions from results up to this point

From the various measurement reports and analyses one can derive several conclusions that can have some influence on the revised new edition of EN 1606 in order to make the testing standard more easily manageable and more secure in the evidence of the testing results.

The individual observations result in the following recommendations:

- Application of the load and definition of the first measurement value after 1 minute should be more precisely defined.
- Instructions that the number of measurement values and time intervals must be very precisely adhered to, as otherwise other results must be expected in the extrapolation.
- The start of analysis for the extrapolation should be more precisely limited.
- Sample selection and grinding/milling of the samples should be described in more detail, as this can have tremendous effects on the testing results.
- The influence of temperature variations, linear expansion and the necessity of air-conditioning must be included in the testing standard.

Possibilities for recycling components of External thermal insulation composite system after it is deconstructed by feeding them into the product cycle for insulating materials and/or down cycling in the production of inferior goods to energy recovery
Wolfgang Albrecht

Based on previous knowledge of recycling External individual components of thermal insulation composite systems (ETICS), the material and energetic processing and recycling processes for the closely related ETICS components should be determined and assessed. Here it is very important to estimate the number of annually installed ETICS, operating life, repair and retrofitting capability as well as the number of dismantled ETICS and to determine when this is expected with the help of the ETICS association, the painter and plasterer association and the IVH.

According to information from the ETICS association, approx. 900 million m² of ETICS were installed in Germany in the last 35 years. Approximately 80 % of them are ETICS with EPS as insulating material; the rest were primarily designed with mineral wool and mineral insulating materials, but also with cork, wood fiber or polyurethane insulating materials.

Only 900,000 m² of ETICS are currently deconstructed annually. This corresponds to approx. 1 % of the ETICS installed in the last 35 years.

The ETICS is only deconstructed in individual cases (e. g. when the building is torn down) after an average operating time of 30 – 50 years. In most cases, the plastering is renewed or additions are made to the ETICS and it is doweled and replastered. This explains the relatively low deconstruction rate today. The greatest percentage of insulating materials and the adhesive plastering, glue and fabric that are deconstructed today are compacted (volume reduction) and thermally exploited with the residual waste in waste combustion plants. Thus, the volume is tremendously minimized (factor 50 – 150), and

Highlights from Research and Development

the energy contained in the EPS and the organic parts of the glue and plastering is almost completely recovered. (1kg of EPS waste has about the same heating value as 1 liter of heating oil).

However, in the distant future various solutions will be available for recycling ETICS. In addition to energy recovery, in particular the material recycling, various deconstruction and separation processes should be tested and analyzed with regard to their practical manage-ability and the corresponding necessary energy and transport expenses.

Finally, it is an economic and political consideration whether preference should be given to material recycling or energy recycling in modern waste combustion plants. The research project was started in 2012 in the context of the research initiative Zukunft Bau, represented by the Federal Institute for Building, City and Space Research and with financial funding and technical support from the ETICS association and the Industrieverband Hartschaum (IVH) and should run until the end of the first quarter of 2014. The scientific project partner is the Fraunhofer-Institut für Bauphysik, Holzkirchen.

Development of permeation measurement technology to determine the gas permeability critical to vacuum insulation panels (VIP)

Christoph Sprengard

Vacuum insulation panels (VIP) are a highly attractive alternative for buildings in high-price locations, for both new buildings and for building restorations due to their low thermal conductivity and the corresponding low space requirement. Durability is significantly determined by the barrier characteristics of the films used for the envelope. Very small gas permeation rates due to the film used – in the surface and on the sealing seams – cause a pressure increase in the VIP, which significantly increases its thermal conductivity. For targeted material and technology development, the use of a precise and highly sensitive measurement method is indispensable in order to more precisely measure permeation rates and to be able to directly compare film products and sealing seam formations with one another. Up to this point, film tests that can be compared are almost exclusively determined via indirect testing of thermal conductivity on whole panels.

In this research project, the new permeation measurement system should be used for the first time for the assessment of VIP envelope films based on the laser spectroscopy of Fraunhofer IWS, Dresden, and further developed for measuring sealing seams. Detection sensitivities of $P<10^{-5}$ grams of H_2O per m^2 and day allow for safe statements about the operating life of VIP and their further development as the basis for better products and for the started standardization of VIP on an international level.

The films to be tested are inserted in a two-chamber permeation cell. Through the presence of defined moisture in the antechamber, the concentration of the permeated water vapor can be measured via the reduction of a laser beam passing through a measuring cell. The concentration can be converted into a permeation rate for the material using the sample size and the measuring cell parameters. The permeation tests are conducted by the applicant, the Fraunhofer-Institut für Werkstoff- und Strahltechnik (IWS) in Dresden.

The thermal-related tests and the quick aging of the films are conducted at FIW München. For this, the thermal conductivity of VIP is measured with various barrier films and sealing seal formations in fresh and in artificially aged states. The permeation-related ageing influences are determined and compared with the rates measured directly on the films and the seams. Requirements for the fresh permeation rates for VIP can be derived therewith; the thermal-related quality of VIP over the target operating time in the building of 30 to 50 years should secure adherence to said rates. Thanks to industry partner VARIOTEC GmbH & Co. KG it has been ensured that the results of the project have a direct influence on the further development of the panels.

The research project, which was carried out together with the Fraunhofer-Institut für Werkstoff und Strahltechnik (IWS) in Dresden, is funded in the context of the research initiative Zukunft Bau, represented by the Federal Institute for Building, City and Space Research, and supported by industrial partner VARIOTEC GmbH & Co. KG in Neumarkt, Oberpfalz

Vacuum insulation panels (VIP) in building application – from insulating material to insulation system – processing, mounting, durability

Christoph Sprengard

Restraints and reservations of those constructing buildings with regard to the construction method with vacuum insulation panels (VIP) are a result of, amongst other things, uncertainty regarding thermal bridge problems (mounting, facade anchoring), questions regarding the quality and durability of the panels, adherence to proven construction methods and fears of additional costs and effort, which in particular are to be expected in the first construction project with VIP for planning and design. The results of this research work help to redress restraints and to dismantle reservations with regard to the VIP construction method. The following topics are covered by the research project:

Up to this point, almost all aging tests on VIP have been conducted in accordance with the DIBt process (without additional increase of the relative air humidity). Published factors and calculated service life in the building must be specified. The extrapolations of the durability of VIP in construction applications require a broad database in order to strengthen users' trust in the VIP construction method.

In contrast to the film joints on the edge of the panel (dealt with in detail in the previous “VIP optimization” project), the thermal bridges to connections and mountings have hardly been tested. The effect of these often three-dimensional thermal bridges on thermal passage cannot be neglected due to the good insulating effect of the VIP.

Questions from those constructing buildings were compiled for the brochure “VIP in construction practice” and for the “VIP optimization” research project; answering the questions is a requirement for better acceptance of vacuum insulation in construction. The questions include, amongst others:

- What effects does a ventilated panel have on a whole component's thermal performance?
- Can the minimum thermal insulation with regard to the absence of condensation and prevention of mold growth be adhered to at any time?
- How many ventilated panels can be tolerated to continue adhering to EnEV and KfW certificates?

The project is funded in the context of the research initiative Zukunft Bau, represented by the Federal Institute for Building, City and Space Research, and supported by industrial partner VARIOTEC GmbH & Co. KG in Neumarkt, Oberpfalz and Porextherm Dämmstoffe GmbH, Kempten.

Effect of masonry geometry, mortar and moisture on the equivalent thermal conductivity of high-quality thermal-related masonry

Christoph Sprengard

The equivalent thermal conductivity of masonry could be clearly reduced in recent years due to great advancements in production technology and is now almost at the level of insulating materials. However, the improvement to the masonry units has resulted in the systematic influences on equivalent thermal conductivity such as the type and dimensions of the mortar joints, grip pockets

Highlights from Research and Development

and thumbholes, masonry units dimensions and moisture content gaining clear influence. For several products the result of this is that influences that previously could be neglected – since they did not impair the U-value of the wall by more than 3 % – might now need to be taken into consideration (e. g. glue for aerated autoclaved concrete (AAC) masonry, grip pockets, thumbholes, etc.). Existing research results must therefore be expanded downward. Tests should be conducted to determine whether “threshold U-values” as of which the above-mentioned influences must be taken into consideration can be defined. An entire series of processes are used for conversions of the equivalent thermal conductivity of masonry to other unit dimensions and other types of mortar: e. g. 3-dimensional and 2-dimensional numeric calculations in accordance with DIN EN ISO 10211, conversions with the simplified process in accordance with DIN EN ISO 6946, as well as area percentage conversions and table processes – e. g. in DIN V 4108-4. There are clear differences in the results. In this project, the processes should be compared to one another with regard to precision. Measurements are taken on half-sized masonry units, building material and entire walls in order to verify the processes.

Many high performance thermal insulating masonry units are now manufactured with insulat-ing material filling. However, the thermal-related characteristic values are identified and specified for insulating materials and masonry units with insulating materials using various procedures. In the context of this project tests should be conducted to determine whether and under what conditions a harmonization of the procedures for determining the measurement values of the thermal conductivity of masonry and insulating material is possible. The effect of statistical factors (e. g. depending on the extent of random testing) and moisture (when ap-plying the e-functions from DIN EN ISO 10456 with DIN EN 1745) on the equivalent ther-mal conductivity and the U-value of masonry is tested using example calculations. Further-more, a recommendation should be developed with regard to how the process and the desig-nations in DIN EN 1745 can be better depicted in DIN V 4108-4.

The project is funded by the Deutsches Institut für Bautechnik, Berlin - DIBt.

Meta-study of thermal insulating materials – products – applications – innovations

Christoph Sprengard, Andreas Holm

Thermal insulation is an essential part in the reduction of the energy consumption and energy costs of buildings and thus an indispensable component of the energy revolution. Insulating materials can protect components and improve comfort. However, opposite these great benefits there is also a series of application questions for which the answers require sound knowledge. These questions may not be dramatized or ignored; they must be answered objectively. The results of the research project should impart knowledge on the use of insulating materials. The energy revolution cannot work without reducing heat losses in existing buildings. The correct use of insulating materials in existing buildings contributes to the success of the energy revolution.

The political discussion is scientifically supported through facts, instructions and argumentation aids so that the current positive readiness of decision-makers is not “tipped” by incorrect information and missing explanations. The points of political dealings must be indelibly set to sustainability. This also includes consideration of the sustainability of insulating materials. Reduction of losses and an increase in efficiency have a more significant value than the increased use of renewable energies. Safety against building damages are increased and not decreased by correct insulation. With the insulating materials available today, products for all detailed solutions in the reduction of heat loss in the building shell are on the market. The research project summarizes the state of technology and makes objective the excessive reporting on building damages, fires, biocides, hazardous waste and architectural changes in the building's basic structure. A work and argumentation aid for housing companies and those willing to renovate arises. The basis for this is a database with detailed solutions and field reports, facts about insulating materials and their application. Said database will also be suit-able for laymen – in the style of FAQs.
The project is funded in the context of the research initiative Zukunft Bau, represented by the Federal Institute for Building, City and Space Research. The project receives additional financial and technical support from the Gesamtverband der Dämmstoffindustrie (GDI), the Gesamtverband der deutschen Wohnungs- und Immobilienwirtschaft (GdW), and from the Fachverband Wärmedämm-Verbundsysteme (FV WDVS).

VIP Durability

Wolfgang Albrecht, Stefan Koppold

The interest in vacuum insulation panels has constantly increased in recent years; what the panels have in common is that they all have a very good thermal insulating property and simultaneously very low material strength. In this regard the VIP need a casing in the form of a high-barrier film with very low permeation rates so that an increase of the internal gas pressure in the panel can be kept to a very low minimum despite numerous external effects.

To this effect, today there is a predominant use of metallized multi-layer film systems on which there is also a high demand for mechanical strength, low thermal conductivity in the film, and sufficient weldability, with feasibility also to be taken into consideration.

Furthermore, mounting in the building envelope area is increasingly done by adhering the VIP to a supporting subsurface. In turn, the resulting direct contact with organic and inorganic glues or to the subground can have a negative effect in the form of interaction or incompatibility. In particular, contact with polymers and mineral glues and mortars, screed or the con-tents of concrete from the outer wall is interesting because it can ultimately result in a reduc-tion of the film's gas impermeability. The overlaying of chemical, mechanical and thermal pressures must also be tested.

The goal of the project was thus to test the effect of various adhesives and adhesive systems as well as of additional influential factors, such as the contents of concrete, on the durability of high-barrier film. The effect of the thermal expansion of adhered coatings on the durability of vacuum insulation panels should also be assessed. The required tests were conducted in part directly on the film in order to directly visually or analytically determine the corresponding reactions between the various effects and the film. The behaviour of complete VIP with various adhesives in various scenarios – for example a delayed hardening, increased thermal load or long-term contact with alkaline liquids – was also tested in order to also come to conclusions regarding the durability of the VIP.

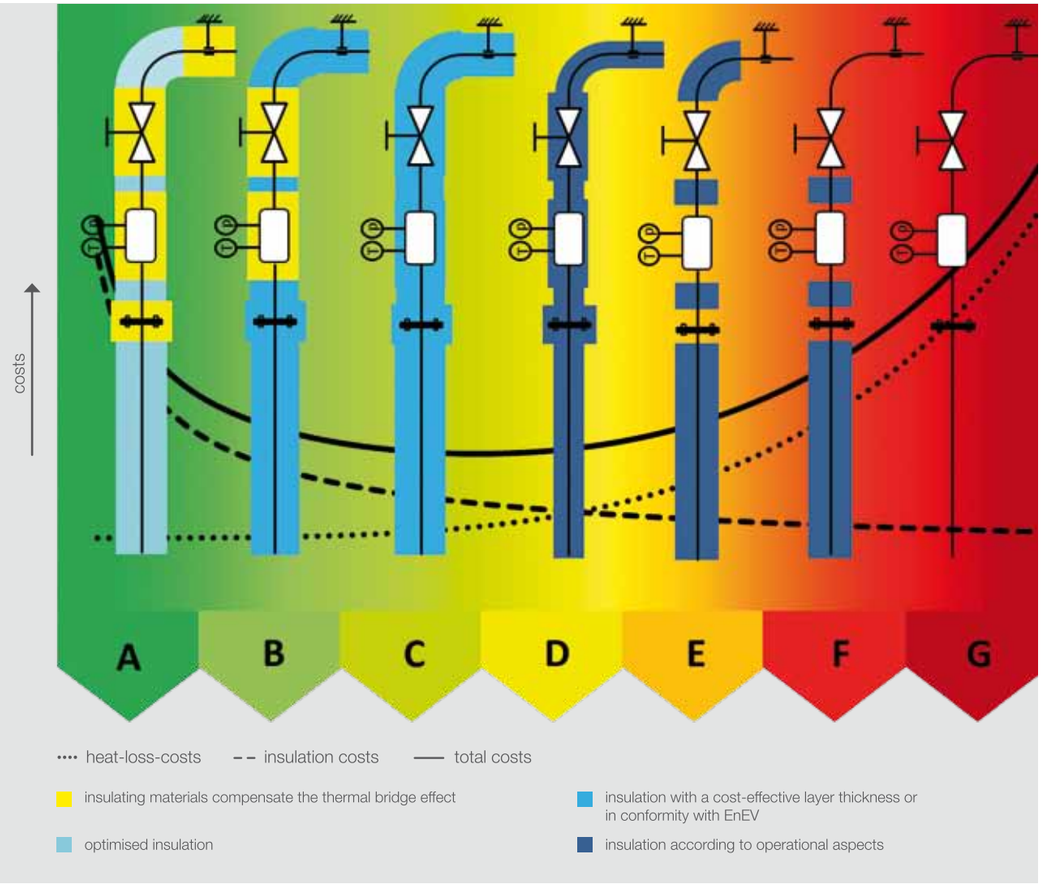
The project was financed by the Deutsche Institut für Bautechnik, Berlin - DIBt - and supported by industrial partner VARIOTEC GmbH & Co KG in Neumarkt, Oberpfalz. The work was conducted together with the Institut für Fenstertechnik (ift gemeinnützige Forschungs- und Entwicklungsgesellschaft mbH, Rosenheim).

Energy-efficient industrial systems, insulation against heat and cold

Martin Zeitler, Karin Wiesemeyer

The energy savings resulting from technical insulations in industrial systems in existing buildings continue to gain importance. Precise knowledge of existing systems is important in terms of identifying possible savings potentials. A detection tool for industrial insulations and a new process for designing energy-efficient insulations (optimized and economic insulation) were developed in the context of this research project. In the process, special consideration was given to determining heat loss via thermal bridges; thus was created a thermal bridge catalogue and a recommendation on energy-efficient

Highlights from Research and Development



↑ *Energy-efficient classes for industrial systems*

classes for the insulations of industrial systems.The heat losses of two different designs for a flange cap serve as examples below.

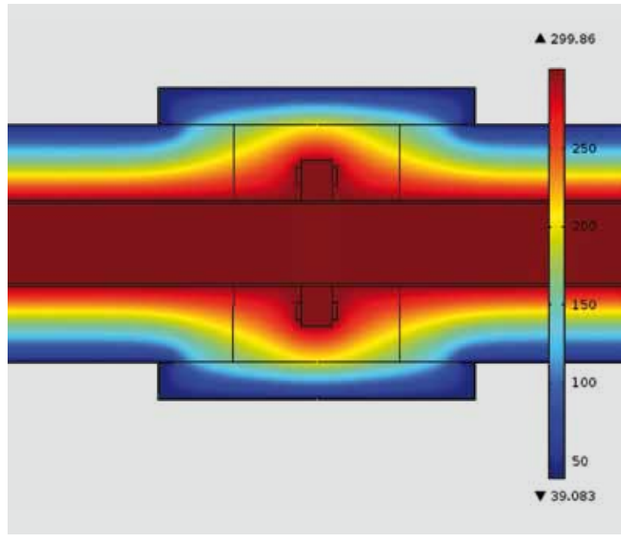
An insulation cap in accordance with the state of technology (same insulation thickness as normal pipeline, hollow space not filled, thermally separated aluminum sheet front plate) displays heat loss that is approximately six times greater than that of an unmolested insulation of the same length. By comparison, the best-practice recommendation: Cap insulation with high-quality insulating material (e. g. microporous insulating material), filled hollow space with darning wool and no front plates. Designed thus, the insulation cap even displays lower heat loss than the pipeline itself.

Even the surface temperatures speak for themselves. If a surface temperature of up to 75 °C arises at a medium temperature of 300 °C and a normal room temperature for the cap designed according to the state of technology, then the surface temperature of the best practice solution is reduced to only 45 °C.
This is just a small example of many possibilities of how insulation technology companies can avoid unnecessary heat loss or conflicts with regard to protection against contact.

In order to test the methods of object detection and designing energy-efficient insulations recommended in the research project and to determine savings potential, various industrial systems and heat transfer stations for the field of building services were visited in industrial enterprises by many project participants.

A detailed testing was conducted at a total of six industrial companies to determine the total heat loss of their industrial systems. The savings potentials resulting from the insulation of uninsulated components and pipelines is between 16 % and 36 % of the total heat loss of industrial systems. The average savings that could be striven toward in all of the observed companies was 23 %. An additional 7 % could be saved if all insulated building walls were given an “economic insulation thickness”. In order to facilitate quick transfer of knowledge, the research results were simultaneously incorporated into the research work in VDI 4610 “Energy-efficient industrial systems – insulation against heat and cold”.

The research project, which was carried out together with the Forschungsgesellschaft für Energiewirtschaft mbH (FfE GmbH), Munich, and the VDI, Düsseldorf, was financed by the Bayerischen Staatsministerium für Wirtschaft, Infrastruktur, Verkehr und Technologie. Armacell GmbH, Saint-Gobain Isover G+H AG, Kaimann GmbH, Knauf Insulation SPRL, Deutsche Rockwool Mineralwoll GmbH & Co. OHG and Sebald Iso-Systeme GmbH & Co. KG were also financial and technically involved.



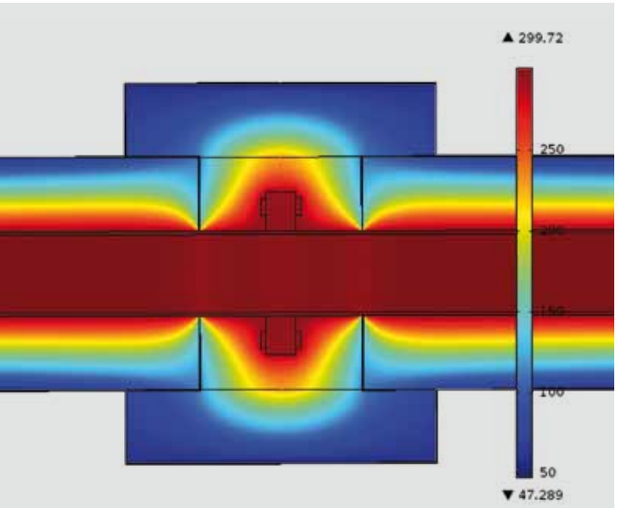
↑ *temperature curve of a FEM-simulation for a flange cap according to the state of technology*

Depiction of the heat and water vapor transport processes in cold storage houses with metrological support

Martin Zeitler, Karin Wiesemeyer

The operation of cooling houses is often negatively impacted by disturbances. Condensation, ice formation or resublimated air moisture in the form of powder snow accumulation negatively impact smooth operation. The cause of the penetration of air loaded with moisture is complex and is generally not just a result of water vapor diffusion processes. Often, more moisture is brought in due to convection via incompletely closed joints or gaps, but also via the cold storage doors themselves than is recondensed by the vaporizer and which can be discharged again in a controlled manner during the condensation process. Furthermore, moisture transport between the cold rooms of various temperatures and thus moisture levels and via the ceiling design is often underestimated in the construction of cooling houses.

Highlights from Research and Development



temperature curve of a FEM-simulation for a best-practice flange cap

Depending on the construction of the roof, moisture can force its way into the insulation via the socalled pump effect if the roof cladding is not installed in a way that makes it completely air-tight. If air loaded with moisture makes its way beneath the roof cladding just once, it will also find its way through the smallest joints and gaps in the other ways completely intact steam brakes from vapor blocking layers.

Often, various causes with simultaneously occurring effects also result in phenomena that at first cannot be or are hard to explain. Most of the time holistic approaches with supporting measurements help to investigate causes so that the results can be used as the basis for retro-fitting measures, or several problems can perhaps also be dealt with solely through optimization of operating conditions.

This project was carried out on behalf of the industry.

Energy savings from refrigerated containers – optimization of existing designs and development of new concepts

Christoph Sprengard, Andreas Holm, Ralph Alberti

The worldwide exchange of goods - which continues to increase - includes a variety of products that need to be cooled and refrigerated and which are shipped in refrigerated containers across the world's seas. The length of the trip is often many weeks. Depend-ing on the conditions, up to 1000 refrigerated and cooled containers are stored and in operation on a vessel. Cooling is primarily electrical, and the refrigerators often dis-charge the arising heat into the ambient air, which as a result is severely heated up in the belly of the ship. The refrigerators must then work against the high air temperature. The high temperature difference in the container envelope also results in a higher need for cooling air. Here, the large number of containers and the long travel times are the significant multipliers for energy consumption. Additional reasons for reducing cold air needs arise from the generation of electricity in generators on the ship itself, which are often operated with diesel or even with heavy fuel and emit large amounts of CO^2 and soot.

The energy-saving potential through the use of highly insulated constructions with regard to refrigerated containers was analyzed both experimentally and mathematically and subsequently optimized in thermal-related terms. Furthermore, an entire series of new concepts were adjusted for application in container construction and assessed with regard to their further energy-saving potential.

This project was carried out on behalf of the industry.

Metrological support for the new construction of an insulating material manufacturer's corporate headquarters

Christoph Sprengard, Holger Simon

FIW München is supporting an insulating material manufacturer in the new construction of a corporate headquarters with a training room with a measurement concept for temperature, moisture content and pressure differences in the construction.
The short-term objective of the tests is the validation of the previously made moisture-related calculations using instationary methods (WUFI) and assurance of the long-term functionality of the construction.

In the long-term, the data serve as a source for a live depiction of the processes in the wall and in the ceiling in the training room. The various thermal- and moisture-related performances of the insulating materials can thus be graphically conveyed. In addition to heat and moisture, the air pressure in the construction will also be determined at multiple points in the wall in order to measure possible convection in the insulating material. After the project is completed the measured data may help expand the WUFI material database.

This project was carried out on behalf of the industry.

Highlights from Research and Development

5.2 Additional projects

↑ *an unrenovated building*

↑ *thermography of a whole renovated facade*

“Technical Insulation” department

- Completion of first tests in the context of conformity assessment for the CE label for construction products, which has also been obligatory for technical insulating materials with regard to marketing in Europe since 1 August 2012. In particular, this deals with tests to determine temperature-based thermal conductivity, upper and lower application limit temperatures, compression strength, and the discharge of corrosive substances.
- Cold insulation made out of polyurethane (PUR) on-site foam: Assessment of existing insulating systems for spherical vessels
- Cold insulation made out of flexible elastomeric foam (FEF): Calculation of absence of condensation on surfaces, heat losses and specific costs of heat loss for the new construction of a production plant in the medical technology sector.
- Thermal design of a long-term latent heat accumulator
- Determination of mechanical and thermal insulation-related characteristics of insulation panels made out of polyurethane foam with glass fiber reinforced casing for use in driers in the pasta industry

“Insulating Materials in Building Industry” department

- Thermal and moisture-related tests on thermal insulating materials with new, more environmentally friendly additives
- Testing of the aging increments for foam plastics with cell gases other than air for other thicknesses and blowing agents
- Thermal, moisture-related and mechanical testing of insulating materials with so-called nanostructure
- Testing of thermal and hygric behaviour of an External thermal insulation composite system: Calculations and in-situ measurements of the west facade of BT3 at FIW München

Measurements of the thermal conductivity resistance of braces to improve the glass edge bond of insulated glass panes for windows and facades

Building Physics & Components department

- Measurement of emissivity and determination of the nominal value of IR reflecting coatings
- Calculation of the thermal characteristics of roller shutter casings with IR-reflecting coated insulation for the roller space
- Support of a pilot project for retrofitting an apartment building with an innovative External thermal insulation composite system (ETICS) with integrated vacuum insulation panels – issuance of a certificate for approval in individual cases and documentation of the thermal quality of the completed retrofitting using IR -thermography
- Verification of the airtightness of roller shutter casings and optimization of the inspection opening
- Use of polyurethane spray foam in accordance with ISO 1926 for use in lifeboats.
- Measurement of the pull strength of the plastered outer apron of a roller shutter casing according to ETAG No. 004
- Possibilities and limits of internal insulation made out of expanded polystyrene rigid foam (EPS): Numerical calculations and assessment of hygrothermal conditions
- Measurements and calculations of high performance masonry in the context of the development and optimization of the determination of moisture correction factors for wall materials and testing of the drying behaviour of masonry
- Measurements and calculations of thermally separated concrete reinforcements to determine the thermal bridge effect and the surface temperatures of balcony slabs
- Further development of mounting solutions for ETICS and for double brickwork using three-dimensional numeric methods
- Hygrothermal simulation of vegetated terraces to clarify the question of whether the roof constructions are durably functional in hygrothermal terms
- Hygrothermal simulation of new insulating systems and determination of the application limits
- Hygrothermal simulation of rafter roofs with sustainable insulation in various constructions and laying of the steam brake film from the outside

Quality at FIW – added value for the customer

For more than 10 years FIW München has been accredited as a testing laboratory according to DIN EN ISO/IEC 17025. The successful reaccreditation through the Deutsche Akkreditierungsstelle (DAkkS) in spring 2012 confirms our proven competence in the measurement and testing of insulating materials, construction materials, components and sarking. Thus, FIW München's test reports continue to be recognized nationally as well as internationally.

With their many years of experience and high technical competence, the employees in particular – in addition to the high-quality equipment of FIW München with testing and measuring devices – are the guarantor for guaranteeing the reliability of our test results.

Through active knowledge management, methodical, intensive training, and qualification of colleagues and of the in-house development of new testing devices, we will also guarantee it in the future.

The regular calibration and checking of all testing devices and measuring devices as well as participation in internal and external round robin tests guarantee adherence to the required measurement precision.

An independent certification center was created under the direction of Wolfgang Albrecht during the reorganization of FIW München in the context of the change in institute leadership in the middle of 2012.

The required first accreditation as a certification center in accordance with EN 45011 through DAkkS was started in December so that FIW München can also continue to be recognized as a Notified Body in the context of the switch to the construction product regulation.

Contact person: Ralph Alberti

Testing equipment and devices

7.1 Accredited test laboratories

In the context of the energy efficiency of buildings and technical systems, material testing, certification and quality assurance take on increasingly more significance. In addition to our research and development work, we operate test laboratories in accordance with the highest quality standards and have at our disposal ten years of experience with a great reputation. We have the most modern testing capabilities as well as diverse analysis techniques. Our test laboratory is constantly expanded in a high-quality way in terms of both instruments and personnel as a result of the increased demand for the corresponding tests. FIW München currently has the following testing facilities:

Measurement and testing of construction and thermal insulation products

Measurement and testing of thermal conductivity with testing procedures DIN EN 12664, DIN EN 12667, ISO 8301, ISO 8302, ASTM C 177 and the guidelines of DIBt, Berlin

- in the temperature range from -180 °C to +900 °C
- at mean temperature 10 °C
- at mean temperature 40 °C

Measurement and testing of the thermal conductivity of pipe insulating materials, pipe insulations and pipe systems in accordance with testing procedures DIN 52613 and DIN EN ISO 8497

- in the range of –70 °C to +300 °C mean temperature
- at mean temperature 10 °C for cold insulations
- at mean temperature 40 °C for insulating materials for insulating heating systems
- at mean temperature 50 °C for district heating pipelines

Measurement and testing of dimensional stability

- Dimensional stability according to DIN EN 1603
- Dimensional stability under defined temperature and moisture conditions according to DIN EN 1604

Determination of behaviour at higher temperatures

- Maximum service temperature according to EN 14706 and 14707
- Maximum service temperature with and without vibration

Determination of the minimum service temperature
Tests for the range of requirements for material fire protection / fire behaviour

- Non-combustibility according to DIN EN ISO 1182
- Combustion heat according to DIN EN ISO 1716
- Ignitability of products subjected to direct impingement of flame according to DIN EN ISO 11925-2 and DIN 4102-B2

Measurement and testing of mechanical properties

- Quality, dimensions, density according to DIN EN 1602 and DIN EN 13470
- Thickness under load (determination of floating floor insulating products according to DIN EN 12431)
- Tensile strength, tear strength, transverse tensile strength
- Deformation under defined pressure and temperature conditions in accordance with DIN EN 1605
- Compression behaviour according to DIN EN 826
- Shear behaviour according to DIN EN 12090
- Bending behaviour according to DIN EN 12089, behaviour under point load according to DIN EN 12430
- Dynamic stiffness according to DIN EN 29052-1
- Expansion and contraction coefficient according to DIN EN 13471
- Long-term compression behaviour, long-term creep behaviour according to DIN EN 1606
- Settlement after vibration test
- Settlement after vibration test after climate-controlled storage 40 °C / 90 % relative humidity
- Dowel hole stability in accordance with ETAG 004

Measurement and testing of hygric properties and behaviour in frost

- Water absorption according to DIN EN 12087
- Temperature change 20 / 40 °C
- Diffusion test 50 / 1 °C DIN EN 12088
- Water absorption under partial immersion according to DIN EN 1609
- Humidity content according to DIN EN 322
- Sorption moisture for construction materials according to DIN EN ISO 12571 (DIN 52 620)
- Conditioning to moisture equilibrium under specified temperature and humidity according to DIN EN 12429
- Frost / condensation transition test and pressure testing in accordance with DIN EN 12091

Measurement and testing of shape retention

- Dimension stability in accordance with DIN EN 1603
- Dimension stability under defined temperature and moisture conditions in accordance with DIN EN 1604

Measurement and testing of water vapor permeability (DIN EN 13469, DIN EN 12086 and DIN EN ISO 12572)

Emission measurements - Analytic determination of the emissions of volatile organic compounds (VOC). The emissions technical center has a 1m³ chamber, a 24-litre chamber and three FLEC cells with subunit and air control

- Determination of emissions: Sampling, storage and preparation according to DIN EN ISO 16000 - 11
- Determination of emissions in accordance with the test chamber procedure (1m3 chamber and 24-litre chamber) DIN EN ISO 16000 -9
- Determination of emissions in accordance with the test cell procedure DIN EN ISO 16000-10
- Determination of VOC on TENAX TA therm. Desorption and GC/MS analytics according to DIN ISO 16000-6 (other adsorption media after consultation)
- Determination of carbonyl compounds and formaldehyde according to DIN ISO 16000-3
- Assessment and documentation according to the DIBt certification principles for the sanitary analysis of construction products in inside buildings (AgBB procedure) and AgBB / DiBt - analysis mask ADAM

Testing equipment and devices

Measurement and testing of other properties

- Closed-cell content according to ISO 4590
- Cell gas composition
- Chloride content according to DIN EN 13468
- Thermal stability
- Length-specific flow resistance according to DIN EN 29053
- Non-fibrous components
- Ignition loss according to DIN EN 13820
- Fibre diameter
- Determination of the total lack absence of silicone in thermal insulating material
- Determination of radiation emission
- Thermography

Measurement and testing of components, structural designs, windows, window profiles and glasses

- Hot-box test beds for the determination of heat transfer
- Hot-box pipe test bed for cold insulations and k · A values for bearings and thermal bridges

Measurement and testing of underlays for roof coverings and walls in accordance with DIN EN 13859-1 and -2 (plastic, elastomer, bitumen overlay) and plastic and rubber vapour control layers in accordance with DIN EN 13984

- Pull / expansion behaviour
- Nail pull-out strength / tear resistance
- Flexibility at low temperature according to EN 1109
- Length, width, straightness and flatness
- Thickness and surface-related dimensions
- Dimensional stability
- Dimensional stability
- Watertightness in accordance with EN 1928
- Resistance to water penetration according to DIN EN 13111
- Artificial aging through long-term exposure to the combination of UV radiation, elevated temperature and water according to DIN EN 1297
- Artificial aging by long-term exposure to elevated temperature according to EN 1296
- Watertightness according to DIN EN 1928
- Reaction to fire
- Shearing resistance of the joints
- Resistance to impulsive load
- Determination of visible defects

7.2 Special testing devices

Determination of the air permeability of materials

The air permeability of the building envelope is an EnEV requirement. FIW München has measuring equipment in accordance with DIN EN 12114 in order to determine the air permeability of components and materials. The airtightness / air permeability test for overlay and sarking is conducted in accordance with product standards. Tests on the air permeability of other components such as roller shutter casings, ceiling panels or wood materials are asked for more and more frequently. Here it has been shown that the application of orthogonal strain boards (OSB) plates, for example, is only limitedly suitable for the manufacturing of airtight layers without additional measures.

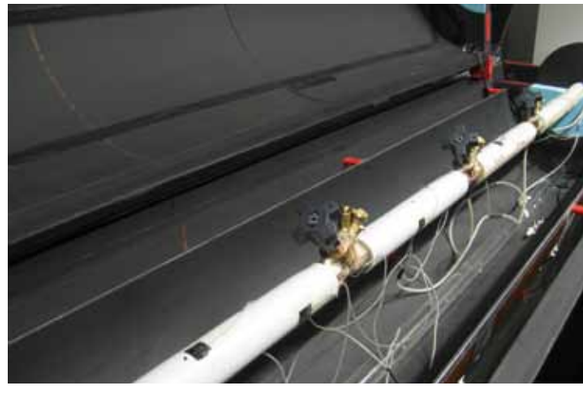
Contact person: Johannes Cammerer

Heat loss flow coefficient (k · A) or (Δk · A) value determination with the help of the hot-box pipe procedure

The heat loss of components in industrial systems is only rarely known. General values can be found in the thermal bridge catalogue created in the research project "Energy efficiency of industrial systems, insulation against heat and cold)". However, if heat loss should be assigned to a manufacturer's special insulation cap, said loss must be determined individually.

The heat loss of uninsulated or insulated components can be calculated in the finite element program or using analytical formulae, but it can also be determined metrologically. The hot-box pipe at FIW München can be used to determine the so-called heat loss flow coefficients (k · A) values and (Δk · A) values in W/K (definitions can be found in VDI 4610, Sheet 1). In the process, a test pipe is furnished with three identical insulated and uninsulated components; the rest of the pipe is insulated.

The total heat loss in the measurement section is determined using two different measuring methods: On the one hand, heat loss is determined using the medium's enthalpy change



from the beginning to the end of the measurement section. On the other, a heat flow meter is installed whose signal is proportional to the measuring system's heat loss.
An additional test only with the pipe insulation provides the heat loss via the insulation.

The heat loss of the insulated pipeline is subtracted from the total heat loss with installed components: This results in the heat loss through the components. By dividing the loss first by the number of components and then by the corresponding temperature difference, one gets the heat loss flow coefficient = (k · A) value in W/K.

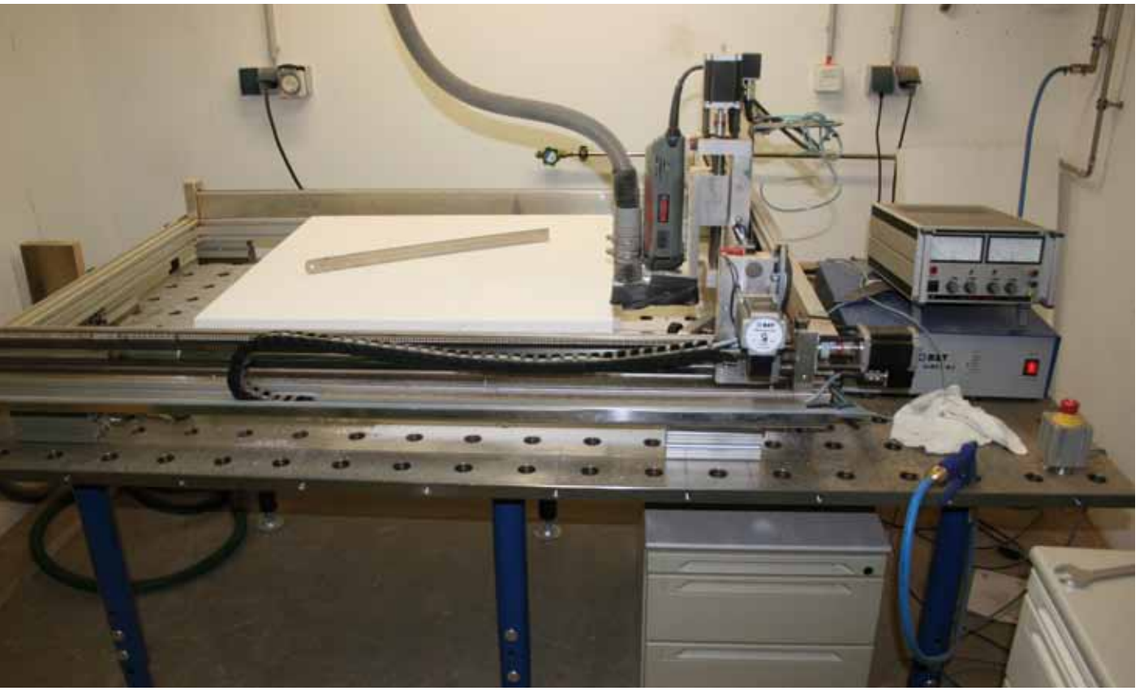
If components are measured that only have an overhanging element when see from outside (e. g. pipe clamps with thread bar), the heat loss flow coefficient (Δk · A) value is indicated, i.e. no length is assigned to the component.

In order to ensure the results, the measured value is compared to the results of a finite element simulation. There might be a "real factor" between measurement and calculation that can be applied to the following calculations in various dimensions.

The determine heat losses are necessary to determine the total heat loss of an industrial system.

Contact person: Karin Wiesemeyer

7.3 New measurement and testing equipment



1. Rapid test for alternating load test on bonding

Testing methods are included in NA 005-56-93 AA “Airtightness” that are suitable for the assessment of the durability of bonding for airtightness sheets below and adjacent to one another. Adhesive tapes and bonding agents are used for bonding. One testing method is the “peel test” generally applied to bondings, which serves to determine the strength of bondings. The disadvantage is that in practice a peeling strain to the bonding does not usually occur. In order to test the shearing strain that predominantly occurs in practice, a new testing device was developed in FIW research work together with Prof. Dr. Thomas Ackermann from the Fachhochschule Bielefeld.

In the process, an existing device at FIW for testing the settlement behaviour of loose insulating materials was modified in such a way that airtight bonding can be subjected to a shearing test load. Currently tests on bondings with various adhesives are conducted with the device to test the suitability of this testing method as a standard test.

Contact person: Johannes Cammerer

2. New standards in the determination of equivalent thermal conductivity - rotatable hot-plate device with heat flow meter method

Since August 2012 FIW München has had at its disposal a heat flow meter device with which large samples of up to approx. 1.2 m x 1.6 can be measured. The device was planned within a few weeks and was independently built to a large extent. After a comprehensive test phase,

the device is already being used for the measurements for the research project on the influence of the masonry block formats, mortar joints and gripping aids of high thermal insulating masonry.

The device can play out all of its strengths thanks to its variable orientation of the cooling plates. The whole device is rotatable a full 360°, where the cooling plates are kept in a stable construction with aluminum profiles. It is possible to determine equivalent thermal conductivity with various heat flow directions. Here, all orientations are conceivable: Downward, upward, or horizontal heat flow, and any desired angle in-between. With masonry there is usually a horizontal heat flow direction. The measurements of half-sized masonry units in hot-plate apparatuses in accordance with DIBt guidelines were previously only possible in a horizontal mounting position (with then vertical heat flow).This gap is now closed with the new apparatus.

The direction of the heat flow during the measurement is also interesting for other possible fields of application, materials and samples. Some examples include high thermal insulating glazing, multi-layered film insulating materials, membranes and insulation constructions made out of low-density materials on which the orientation of the component (and thus of the heat flow) has an effect. The large test surface is particularly interesting for the testing of vacuum insulation panels (VIP) and insulating glass units that cannot be cut to size.

The control system and measurement value logging was designed in such a way that long-term records with variable temperatures are possible in order to test instationary effects on heat transfer, such as heat storage and discharge processes or moisture transport processes

in soaked samples. FIW München thus makes available a valuable, new, and very flexible measuring device for research and monitoring.

Contact person: Christoph Sprengard

3. New CNC milling machine for material specimen preparation

The measurement of thermal conductivity in samples made out of hard materials such as lightweight concrete, brick fragments, foam glass, aerated concrete and sand-lime brick requires completely level and coplanar sample surfaces. The manufacturing of such samples using a saw is often only possible with limited precision. Since summer 2012 FIW München has had a CNC milling machine for the sample preparation of such materials.

With this milling machine specimens of size up to 1 m x 1.5 m can be milled precisely down to a few tenths of a millimeter. Completely level plates make it easier to install samples in the hot-plate apparatuses and ensure a better thermal connection, which significantly increases measuring precision when measuring thermal conductivity. With this milling machine it is even possible to mill complete test items for half-brick measurements of brickwork in a passage in a specified thickness.

The milling machine was acquired by the Building Physics and Components department in collaborating with the in-house workshop and optimized for brickwork sample preparation. The milling machine table and the fastening mechanisms for the specimens were independently designed and built at FIW. Efficient suction of the accrued milling dust was installed to protect employees.

In the future, in addition to the preparation of brickwork specimens, plans have also been made for use as a CNC milling machine in the workshop, and additional materials such as specimens made out of hard plastics for thermal separations in metal window frames can be machined.

Contact person: Christoph Sprengard

4. Testing equipment to determine water absorption by total immersion

With regard to perimeter insulating materials (cellar insulation, contact with the ground), an increased need for testing capacities was observed with the "Water absorption by total immersion" in accordance with EN 12087 as a result of increasing product variety and modified requirements in general technical approvals. The new testing equipment can test thermal insulating materials of up to 400 mm nominal thickness.

Contact person: Stefan Sieber

5. Testing equipment to determine freeze-thaw resistance

Investments were made in 2012 in additional equipment for the "determination of freeze-thaw resistance" in accordance with EN 12091. Thermal insulating materials that are exposed to moisture in their application (inverted roof, perimeter insulation) are tested for changes in the compression behaviour and with regard to their water absorption after 300 cycles, each consisting of one-hour storage at -20°C and underwater storage at +20°C. For the preconditioning of the specimens, the "determination of water absorption by diffusion" according to EN 12088 is generally given preference to the freeze-thaw resistance test. FIW München is planning the construction of 20 new test beds for this diffusion test in 2013.

Contact person: Stefan Sieber

FIW in committees and on boards

8.1 national committees and boards

- **AGI (Arbeitsgemeinschaft Industriebau)**
- **AGI Q-series worksheets,** Dr.-Ing. M. Zeitler

- **GSH** (Güteschutzgemeinschaft Hartschaum e. V.)
- **PUR on-site foam (casting foam) (RAL-RG 710/7),** R. Alberti
- **GFA-PUR – Joint expert committee PUR roof spray foam and PUR spray foam,** H. Simon
- **Polystyrene task force (AAPS),** S. Sieber

- **DIBt** (Deutsches Institut für Bautechnik)
- **SVA-A materials for insulation against heat and sound,** W. Albrecht
- **SVA-B1 thermal conductivity,** W. Albrecht
- **SVA-B3 exterior thermal insulation,** W. Albrecht
- **Ad hoc committee: Load-bearing thermal insulation of greater thickness under foundation slab,** W. Albrecht
- **ABM colloquium of the fire protection laboratories,** W. Albrecht
- **Experience exchange thermal insulation-related measurement (EWM),** W. Albrecht
- **Experience exchange testing, surveillance and certification centers, foam plastics and wood wool,** W. Albrecht
- **Experience exchange testing, monitoring and certification centers, mineral wool,** W. Albrecht

- **DIN CERTCO** (Gesellschaft für Konformitätsbewertung mbH)
- **ZA-UDB certification committee underlay and sarking for roof coverings (chairman),** J. Cammerer

- **Hauptverband deutsche Bauindustrie** (HDB) **– Federal division for heat, cold, sound and fire insulation**
- **Technical committee (TA),** Dr.-Ing. M. Zeitler

- **IVH** (Industrieverband Hartschaum e. V.)
- **Expert committee (monitoring processes on results and certification center),** W. Albrecht
- **TAA (technical task force),** C. Karrer

- **IVPU** (Industrieverband Polyurethan-Hartschaum e. V.)
- **Technical committee of the Industrieverband Polyurethan-Hartschaum,** W. Albrecht

- **ÜGPU** (Überwachungsgemeinschaft Polyurethan-Hartschaum e. V.)
- **Expert committee (analysis of third-party monitoring results of the ÜGPU,** W. Albrecht

- **VDI** (Verein Deutscher Ingenieure e. V.)
- **Guidelines committee VDI 2055,** Dr.-Ing. M. Zeitler (chairman)
- **Guidelines committee VDI 4610,** Dr.-Ing. M. Zeitler (chairman), K. Wiesemeyer
- **Guidelines committee VDI 4662,** Dr.-Ing. M. Zeitler
- **Steering committee: "Energy efficiency of industrial systems",** Dr.-Ing. M. Zeitler (chairman), K. Wiesemeyer
- **Expert committee "Energy use",** Dr.-Ing. M. Zeitler
- **VDI- Gesellschaft Energie und Umwelt (VDI-GEU), division 3,** Dr.-Ing. M. Zeitler

- **Zentralverband des Deutschen Baugewerbes** (ZDB)
- **Association for the promotion of insulating technology: advisory and internet group,** Dr.-Ing. M. Zeitler

- **Fachverband Wärmedämmverbundsysteme**
- **AK2 - EPS,** S. Sieber

- **DIN NABau** (Deutsches Institut für Normung e. V.)

- **NA 005-56 FBR "KOA 06 Energy savings and thermal insulation",** Prof. A. Holm (deputy chairman) (coordination committee)
- **NA 005-56-10 AA "Insulation work on industrial systems in buildings and in the industry",** Dr.-Ing. M. Zeitler
- **NA 005-56-20 GA Energetic assessment of buildings (amongst others DIN V 18599)**
- **NA 005-56-60 AA thermal insulating materials (SpA for CEN/TC 88, ISO/TC 163 and ISO/TC 61)** (chairman)
- **NA 005-56-60 AA Thermal insulating materials,** W. Albrecht
- **NA 005-56-60, Ad hoc 04 EPS,** S. Sieber
- **NA 005-56-60 AA, Ad hoc 09 Wood wool lightweight boards,** S. Sieber
- **NA 005-56-65 AA "Vacuum insulation panels (VIP)",** S. Koppold
- **NA 005-56-69 AA "Insulating materials for industrial systems in buildings and in the industry",** Dr.-Ing. M. Zeitler
- **NA 005-56-90 HA Thermal insulation and energy savings in buildings (SpA for CEN/TC 89 and ISO/TC 163) (amongst other, standard series DIN 4108),** Prof. A. Holm (chairman)
- **NA 005-56-91 AA Heat transfer (SpA for ISO/TC 163 and SC 2 WG 9) (amongst others, DIN 4108-2, DIN 4108 supplementary sheet 2, DIN technical report "4108-8 Prevention of mold in residential buildings"),** Prof. A. Holm (chairman)

- **NA 005-56-92 AA Characteristic values and requirement conditions for heat transfer; measurement values for thermal conductivity (DIN V 4108-4) and minimum requirements for insulating materials (DIN 4108-10),** W. Albrecht
- **NA 005-56-93 AA Airtightness,** J. Cammerer
- **NA 005-56-97 AA Transparent components (Sp ISO/ TC 163/ SC 1/ WG 14),** C. Sprengard
- **NA 005-56-98 AA Thermal insulating measurement,** W. Albrecht
- **NA 005-56-99 AA Moisture (Sp CEN/TC 89/WG 10),** J. Cammerer
- **NA 005-02-07 AA pre-fabricated accessory parts for roofing (Sp CEN/TC 128/SC 9),** J. Cammerer
- **NA 005-02-09 AA Sealing sheets (Sp CEN/TC 254),** J. Cammerer
- **NA 005-02-10 AA Roof and sealing sheets (Sp CEN/TC 254/SC 1),** J. Cammerer
- **NA 005-02-91 AA Flexible layers under roof coverings (Sp CEN/TC 254/WG 9,** J. Cammerer (chairman)
- **NA 005-02-92 AA Overlay sheets (Sp CEN/TC 128/SC 9/WG 5),** J. Cammerer (chairman)
- **NA 005-02 FBR Steering committee FB 02 – Sealing, moisture proofing,** J. Cammerer
- **AA DIN 18530 Solid ceiling structures for roofs,** J. Cammerer (pause)
- **Ad hoc 16 conformity procedure,** J. Cammerer

8.2 International committees and boards

- **ASHRAE** (American Society of Heating, Refrigerating and Air-Conditioning Engineers)
- **TC 1.12 Moisture Management in Buildings,** Prof. A. Holm
- **TC 4.4 Building Envelope Performance and Building Materials,** Prof. A. Holm
- **SPC 62.2 Ventilation and Acceptable IAQ in Low- Rise Residential Buildings,** Prof. A. Holm
- **SPC 160 Criteria for Moisture control Design Analysis,** Prof. A. Holm

- **CEN** (Comité Européen de Normalisation) **TC 88 Thermal Insulating Materials and Products** (Chairman)
- **TC 88/WG 1 General test methods,** C. Karrer
- **TC 88/WG 1 General test methods – ad hoc group ageing (accelerated aging for XPS, PUR, PF,** W. Albrecht
- **TC 88/WG 4 Expanded Polystyrene Foam (EPS),** S. Sieber
- **TC 88/WG 4 / Drafting Panel,** S. Sieber
- **TC 88/WG 4 / TG ETICS,** S. Sieber
- **TC 88/WG 4/TG Test Methods and Test Result,** S. Sieber
- **TC 88/WG 7 Phenolic Foam (Phenolharz-Hartschaum),** W. Albrecht
- **TC 88/WG8 Cellular Glass (CG),** S. Sieber
- **TC 88/WG 9 Wood wool (WW),** S. Sieber
- **TC 88/WG 11 Vacuum-Insulation-Panels (VIP),** S. Koppold
- **TC 88/WG 10 Building equipment and industrial installation (Convenor),** R. Schreiner
- **TC 88/WG 10 Building equipment and industrial installation – Task group Test methods TGTM (TG – Leader),** R. Schreiner
- **TC 88/WG 12 Expanded Perlite Boards,** W. Albrecht
- **TC 88/WG 16 Evaluation of Conformity,** R. Gellert
- **TC 88/TG "Liaison to TC 350/351" (Convenor),** R. Gellert
- **TC 89 Thermal performance of buildings and building components,** Prof. A. Holm
- **TC 89/WG 03 "Calculation of thermal insulation of equipment in buildings",** Dr.-Ing. M. Zeitler
- **TC 89/WG 11 Thermal performance of buildings and building equipment – Task group 1,** R. Schreiner
- **TC 89/WG 12 Reflective Insulation Materials**
- **TC 107/WG 10 "Flexible pipe systems for district heating",** Dr. Ing. M. Zeitler
- **TC 128 Roof covering products for discontinuous laying and products for wall cladding,** J. Cammerer
- **TC 128/SC 09 Prefabricated accessories for roofing TC 128/SC 9/WG 05 Rigid underlays (Convenor),** J. Cammerer
- **TC 254 Flexible sheets for waterproofing,** J. Cammerer
- **TC 254/WG 09 Underlays for discontinuous roof coverings (Convenor),** J. Cammerer
- **TC 254/TG WG 09 and 10 Artificial Ageing (Convenor),** J. Cammerer
- **TC 371 Project Committee on Energy Performance of Buildings**
- **Notified Bodies-CPD/SG 19 Thermal Insulation Products,** W. Albrecht, R. Schreiner
- **TC 163/ WG 5 Vacuum insulation panels (VIP), C. Sprengard,** S. Koppold
- **TC 163/SC 01/WG 07 Ageing of thermal insulation,** J. Cammerer
- **TC 163 SC 2 WG 9 Calculation of heat transmission,** M. Spitzner

- **QAC** (Quality Assurance Committee)
- **VDI-Keymark scheme for thermal insulation products for building equipment and industrial installations, the voluntary product certification scheme,** R. Schreiner
- **Laboratory group,** R. Schreiner

- **CEN Certification**
- **SDG 5 Thermal Insulation Products TG – Expert Group (Creation of a standardized thermal conductivity level for insulating materials in Europe),** W. Albrecht

- **ISO** (International Organization for Standardization)
- **TC 163 Thermal performance and energy use in the built environment,** M. Spitzner
- **TC 163 WG 4 JWG 163/205 Energy Efficiency of Building using holistic approach,** M.Spitzner
- **TC 163/SC 1/ WG 14 Hot-Box Test Method for windows and doors,** C. Sprengard

The FIW Wärmeschutztag (Thermal Insulation Day) 2012

Under the motto “Importance of energy efficiency in the context of the energy revolution. Concepts. Implementation”, FIW München's Thermal Insulation Day 2012 took place on 15 June 2012 in the Haus der Bayerischen Wirtschaft in Munich. Klaus-W. Körner, FIW München's chairman of the board, was happy to welcome 250 participants – in addition to Bavarian Minister of State for the Environment and Health Dr. Marcel Huber – to the Thermal Insulation Day. In his statements, which dealt with the topic “FIW in the environment of energy efficiency and climate change” , he addressed the fact that the institute, which almost 100 years ago was specifically founded for the purpose of improving the thermal insulation of buildings and industrial processes – today energy efficiency – is also confronting the tasks resulting from the determined energy revolution and the consequences of climate change. Neither can be separated from the other, said Körner. “Dependent upon the success of the remodeling of the energy supply and the correspondingly triggered tremendous social and economic transformation process are questions of the future competitiveness of our economy, the preservation of our prosperity through the prevention of social distortion, i.e. the economic future of Germany, but also the handling of global climate change.” Additional central points in Körner's statements were that the invoked energy revolution is utopian without improvement of energy efficiency and that existing buildings play a dominant role in energy efficiency. “Here lies the greatest ecological challenging potential to be activated in the short-term and economically exploited. Thus, it is not just the speed of implementation that must be increased, but also the retrofitting rate must be increased by last least two percent of existing buildings. In order to achieve this, projectable and consolidated financial incentives, i.e. a backdrop of long-term stable funding, that also must contain tax components and tenancy law-related adjustments are necessary.”

The Thermal Insulation Day was officially opened by a word of greeting from the Bavarian minister of state for the environment and health, Dr. Marcel Huber, MdL. The minister said that the important of FIW München is greater today than ever before.

“You originally were founded in 1918 to promote scientific bases for insulation against heat and cold. Almost 100 years later FIW München has become a modern research institution, a testing, monitoring and certification center for insulating materials and construction materials. For this I give you my sincerest congratulations,” said Dr. Huber.

Over the course of the day there were over 20 individual lectures divided into two blocks of topics so that participants could switch depending on where their interest lay. Just over half of the lectures dealt with structural engineering, the other half with industrial insulation. Dr. Matthias Metz, chairman of the board of Bausparkasse Schwäbisch Hall, gave a lecture on the topic “The German housing supply has gotten long in the tooth – Financing tasks in building retrofitting”. In Dr. Metz's lecture it became clear that there is still considerable untapped potential in the building energy efficiency sector and that it is definitely possible to mobilize private capital through subsidy incentives. Dr. Metz: “This capital exists and is waiting for the call, as it were. Because the energy revolution and its success have a significance to our prosperity and sustainability that goes far beyond our generation, and the building society savers can take on these tasks.”

Another lecture came from architect Dr. Burkhard Schulze Darup from the architecture firm Schulze Darup & Partner in Nurnberg. He spoke about “retrofitting with factor 10 – project examples with monitoring results”. It was strikingly clear that energy-efficient measures and retrofits are not just of a theoretical nature. To the contrary, their application is practiced in an ongoing manner and is economical. Using project examples with monitoring processes, Dr. Schulze Darup righted many of the false media depictions.

Wolfgang Albrecht, FIW München, dealt with the innovation and quality of building insulation. Market shares and focal points of the application possibilities of the most important insulating materials in Germany have to a large extent remained the same in recent years. Mineral wool (54 %) and EPS rigid foam dominate the market. However, efforts on the manufacturers' part with regard to product quality are necessary because the market demands greater insulation layer thicknesses, multi-layered constructions, slender constructions and lower thermal conductivity, but it also asks critical questions about emissions, recycling possibilities and the durability of application. In addition to mandatory certification tests, important instruments for the assurance of product quality include ongoing third-party monitoring to show product reliability, and where possible to increase it. The manufacturers' quality assurance system is based on the Lambda certifications, was expanded to include the voluntary monitoring of all product characteristics, and the adherence of all characteristics is

The FIW Wärmeschutztag (Thermal Insulation Day) 2012

documented with the awarding of the Ü symbol. With regard to innovations, one sees efforts on the one hand to reduce thermal conductivity with cell gas, and heat transfer with radiation on the other. Thus, silicate-based aerogels are used in translucent roof elements, in the fill in double brickwork, in interior insulation with mineral wool, and as nonwoven fabrics and plates in thermal insulation composite systems. With regard to VIP panels, support cores made out of pyrogen silicic acid or mineral wool and plastic composite films are evacuated in order to, for example, be used together with a covering made out of PUR insulating plates in a facade. Manufacturers of XPS rigid foam reduce thermal conductivity through the use of air and i-butane and air with IR absorber or HFKW or HFO as cell gas. With regard to PUR rigid foam, there are efforts to use pentane isomers, to manufacture smaller cells using additives and possibly even nanofoams. Heat transfer due to radiation is reduced with gray EPS, a material with IR-active substances such as graphite or aluminum particles.

The lecture series: “Current topics from industrial insulation” was moderated in a proven manner by Constantin Schirmer from Bayern Innovativ. With lectures from Alexander Wagner of E.ON Bayern Werke GmbH, Munich, and Ralph Alberti of FIW München, the thermal insulation of heat transport lines and heating systems was discussed against the backdrop of EEWärmeG and EnEV. For the heating system sector, EnEV sets clear requirements for the limitation of heat flow density and thus prescribes energy saving by “law”. These measures are highly energy-efficient; however, a heating system could be even more effective if all components, e. g. valves, were also actually insulated. Heat losses via the insulation for the heat transfer line were indirectly assessed with ratios against the backdrop of EEWärmeG.

In terms of the sector for the insulation of industrial systems, however, EnEV and EEWärmeG do not take effect with regard to energy saving.

Dr.-Ing. Ernst-Günter Hencke of VDI-GEU, Düsseldorf, Roland Schreiner and Karin Wiesemeyer, both from FIW München, reported on the results of research work "Energy efficiency in industrial systems – from the point of view of insulation against heat and cold". The research project was subsidized by the Bavarian State Ministry for the Economy, Infrastructure, Traffic and Technology, as well as by renowned companies in the industry. Dr. Hencke reported that the first results of said work could be directly incorporated into VDI guidelines 4610. Methods for designing and insulating in accordance with the energy saving factors were developed that always have an eye on the feasibility of measures and are of course energy efficient. They go beyond the usual design methods for insulation in accordance with industrial factors and pay particular attention to heat loss via components and thermal bridges. In future, heat flow density via the insulation construction should no longer be relevant to the design, but rather the specific heat loss that describes the quality of the overall insulation. Schreiner indicated in his lecture that when insulating thermal bridges, e. g. pumps, their actual function might not be negatively impacted. Wiesemeyer showed how the so-called heat loss flow coefficient is determined and in which form it is included in the “Thermal bridge catalogue (VDI 4610 Sheet 2)”. At the end of the lecture she presented the “energy efficiency classes” in which insulation can be classed in order to be able to show their quality in a user-friendly manner with regard to energy saving.

Dr.-Ing. Martin Zeitler resummarized the most important points at the end of the lecture series and also referred to the ECOFYS study of the European Industrial Insulation Foundation (EiiF) in which considerable potential through insulating measures was found for the industrial system sector.

The FIW Wärmeschutztag (Thermal Insulation Day) 2012

The one-day event was followed by a festive evening for the Thermal Insulation Day 2012 at the Hotel “Vier Jahreszeiten”, an evening that was accompanied by three high climaxes. The first was the speech made by Federal Minister of Building Dr. Peter Ramsauer, MdB. The minister's exact words: "To many of us it might seem that thermal insulation is a topic of the last 10, 20 years. Without a doubt, right now the topic is going through a boom in the face of climate change. The storing of energy with the help of modern insulation and highly efficient brickwork is one of the basic requirements for being able to master the energy revolution. Without question, the building sector plays a key role in the energy revolution for the federal government. 40 percent of end energy consumption takes place in the building sector. The energetic retrofitting of existing buildings, the increase of energy efficiency in the transport sector, and the switch to a renewable energy supply are thus of central importance. Therefore, FIW's expertise is needed".

Klaus-W. Körner took the chance in the presence of Federal Building Minister Dr. Ramsauer to once again state that in addition to regulative and grant opportunities, tax law must also accompany necessary ecological remodeling and at the same time gave thanks for previous grant measures provided by the federal government. At the same time he stated that unused energy is the highest level of energy efficiency and the best domestic source of energy. "It makes one independent of expensive energy importers and highly subsidized energy sources or energy sources that make the ecological balance worse, i.e. energy efficiency is the best protection against higher energy prices. In the context of realizing a generational obligation, FIW München will bring existing knowledge, technical competence and its reputation to the necessary dialogue between political framework providers, producing industry, commercial fabricators in scientific terms and with research activities as well as exchange and clarification, with the objective being to allow generational justice to arise out of generational obligation. However, it is also necessary to create an additional basis for action strategies for the resolution and overcoming of variety of constraints and information deficits that still exist in the building sector. This should be clearly highlighted through this year's and the future direction for the Thermal Insulation Day and through practical application examples. In summary, a decoupling of the value chain and energy consumption must be strived for through an increase in energy efficiency and productivity."

The second climax of the evening was the honorific speech given by Körner for the departing CEO Dr. Roland Gellert and the official hand-over of office to his successor, Prof. Dr.-Ing Andreas Holm. Körner thanked Dr. Gellert for his twelve years of successful leadership of the institute and attested his impeccable work with great modesty. Körner awarded Dr. Gellert honorary membership in FIW in the name of the board of FIW München. The passionate golfer and hobby chef was given two fitting vouchers as parting gifts. Körner wished Dr. Holm all the best in his new position of responsibility at FIW München.

The third highlight was a musical highlight. It appealed to another honored guest of the evening, the president of the Bavarian music council, state minster, Dr. Thomas Goppel, MdL Dr. Karl Gertis, honorary member of FIW München and for his part also a composer, presented FIW München with a hymn he composed and put in his best in a world premier with a brass quartet. The audience was excited, and Körner – whose encouragement was the impetus for the composition – was positively touched. Prof. Gertis gave him the notes to the piece and said it is a good thing that FIW München already has its own hymn six years before its 100th birthday. FIW München can thus look back with satisfaction at an extremely successful Thermal Insulation Day 2012 and looks forward to once again playing host in Munich next year.

FIW München in words and in writing

10.1 Events, seminars, exhibitions

Events

- **Thermal Insulation Day on 15 June 2012**
- **Open House on 16 June 2012**

Seminars

- M. Zeitler, K. Wiesemeyer
  - EiiF Seminar: TIP checker on 31 January 2012 at FIW München, lecture and exercises: Measurements on industrial systems
  - VDI expert forum Presentation of VDI 4610 Sheet 1 “Energy efficiency in industrial systems – insulation against heat and cold” in Munich on 4 December 2012

- M. Zeitler
  - VDI knowledge forum “Insulation against heat and cold in industrial systems” in Stuttgart on 12 and 13 November 2012

Exhibitions

- The Technical Insulation and the “Building Physics & Components” departments were represented with a shared stand at BAUTEC in Berlin from 20 to 26 January 2012.

- The exhibition stand at the 8th international exhibition for insulating materials and insulation technology (ISO' 12) in Cologne from 10 to 11 May 2012 was attended by the Technical Insulation department

  Awarding of the ISO AWARD 2012 by M. Zeitler

10.2 Teaching and lectures

- M. Spitzner, H. Simon
  Technical University Munich, professorship for Building Physics, Professor Dr. Hauser, lecture series “In-depth seminar on building physics in accordance with DIN, EN and ISO” in the M.Sc. course of studies

- A. Holm
  - “Building physics application in old and new buildings” University of Stuttgart, Build-ing and Environmental Engineering department, degree program Master's online building physics
  - “Building physics – basics”, University of Applied Sciences Munich, 2012
  - “International construction”, TU Munich, department of structural engineering and surveying

10.3 Lectures

- A. Holm
  - Save energy by insulating! The optimal building envelope
    Event “Energetic building retrofitting” of the vbw Vereinigung der Bayerischen Wirtschaft e. V. on 9 July 2012
  - An eye on thermal insulation: Potentials and challenges of energy-efficient building envelopes
    dena energy efficiency congress 2012 on 19 September 2012
  - Risk and Benefits of thermal insulation
    ECBCS IEA Annex 55 Meeting Leuven on 30 October 2012
  - Possibilities of interior insulation and the importance of material quality and quality assurance
    Hanseatische Sanierungstage (Hanseatic retrofitting days) 2012 – 1 to 3 November 2012 in Heringsdorf
  - The world is a construction site: the building industry as impulse generator for advancement and innovation
    Deutscher Baugewerbetag (German building trade day) 2012 on 8 November 2012 in Berlin

- W. Albrecht
  - Is third-party monitoring of insulating material necessary – or is the CE label enough?
    How important are building technical approvals?
    Technical seminar from the company DOW Deutschland Anlagengesellschaft on
    23 February 2012 in Leipzig
  - EPS insulating materials compared to new insulating materials
    Symposium “EPS particle foam in the ecology area of tension and energy efficiency” on 1 March 2012 in Würzburg
  - Low Lambda products including PUR / PIR, how to handle?
    Keymark conference on 20/21 September 2012 in Brussels

- R. Alberti
  Contribution of heat loss from heating systems to heating energy needs.
  Efficiency and effectiveness?
  The FIW Wärmeschutztag (Thermal Insulation Day) on 15 June 2012

- R. Schreiner
- "Expanded glass granulate as a Round Robin material for thermal conductivity to higher temperatures"
  High-Temperature Guarded-Hot-Plate and Pipe Measurements: 2nd Operators Workshop (March 19-20, 2012) Co-sponsored by ASTM Committee C16 on Thermal Insulation
- Keymark Conference 2012 "Thermal insulation products", Brussels, 20/21 Sept. 2012
  VDI / Keymark scheme for industrial insulation
- When is the insulation for a thermal bridge efficient and when is it effective? VDI 4610 Sheet 2?
  The FIW Wärmeschutztag (Thermal Insulation Day) on 15 June 2012

- H. Simon
- Optimized jamb insulation for thermal bridge-free window and roller shutter assembly in new buildings and retrofitting sector
  TEC seminar in Sendenhorst on 2/3 and 9/10 March 2012
- Minimize heat loss - safely design component connections - retrofitting of roller shutter casings in existing buildings, thermal bridge-free window and roller shutter assembly, jamb insulation in old buildings
  Bauherren and Architektentag (constructor and architect day) 2012 in Kafering on 29 April 2012

- K. Wiesemeyer
- Presentation of VDI 4610 Sheet 1 "Energy efficiency in industrial systems - insulation against heat and cold"
  "Thermal bridge catalogue - results of research work - forecast for VDI 4610 Sheet 2"
  VDI expert forum on 4 December 2012 in Munich
- "Insulating industrial systems - economical insulation thickness, optimization and thermal bridges"
  Energy efficiency table Munich Oberbayern on 16 October 2012 in Weilheim
- "Energy-efficient insulation in the industry and in technical building services - energy efficiency classes for assessment"
  The FIW Wärmeschutztag (Thermal Insulation Day) on 15 June 2012
- "Energy saving potential by technical insulation"
  12th IAEE European Energy Conference, 09 - 12 September 2012, Venice

- M. Zeitler
- Maintaining insulation against heat and cold for pipelines
  Seminar: HAUS DER TECHNIK" Maintaining pipe-lines"
  26 January 2012 to 27 January 2012 in Munich
- Summary of lecture series "Current topics from industrial insulation"
  The FIW Wärmeschutztag (Thermal Insulation Day) on 15 June 2012

- R. Gellert
- Challenges and future tasks for the institute
  The FIW Wärmeschutztag (Thermal Insulation Day) on 15 June 2012
- Energetic retrofitting in existing buildings
  Die Umweltakademie e.V. on 22 March 2012 in Munich
- From the construction product guidelines of the construction product regulation: Clear conditions for CE label
  SKZ seminar: "EPS particle foam" on 1 March 2012 in Würzburg

10.4 Publications

- A. Holm (2012)
  Besser als ihr Ruf. Wärmedämmverbundsysteme unter der Lupe. In: db Deutsche Bauzeitung, Jg. 146, H. 11, Pg. 72-75

- A. Holm (2012)
  Wärmedämmung – unverzichtbar und mit Ingenieurkompetenz problemlos durchführbar. In: Deutsches Ingenieurblatt Jg.: 19, H. 12, Pg. 78

- A. Holm (2012)
  Vom "Forschungsheim" zur "notifizierten Stelle" nach BauPVO aus Bauplaner Special 2012/6 Deutsches Ingenieurblatt Jg.: 19, No. 6, Page 78

- A. Holm (2012)
  Der FIW Wärmeschutztag 2012 in München. In: wksb Zeitschrift für Wärmeschutz | Kälteschutz | Schallschutz | Brandschutz, Jg 57, H. 67, Pg. 71–78

- C. Sprengard, M. Spitzner, M. Schäfers, O. Pekrul, (2012)
  Der Kalksandstein Wärmebrückenkatalog – Detaillierter Wärmebrückennachweis in zwei Stunden. In: Mauerwerk, Jg. 16, H. 4, Pg. 193–200

- R. Schreiner (2012), Robert Zarr, Thomas Whitaker, Frank Tyler, (Hg.)
  Expanded glass granulate as a Round Robin material for thermal conductivity to higher temperatures. High-Temperature Guarded-Hot-Plate and Pipe Measurements: 2nd Operators Workshop (March 19–20, 2012): NIST Technical Note 1764

- M. Zeitler (2012)
  Energieeffizienzklassen für Dämmungen betriebstechnischer Anlagen. In: wksb Zeitschrift für Wärmeschutz | Kälteschutz | Schallschutz | Brandschutz, Jg. 57, H. 67, Pg. 23–26

- M. Zeitler, K. Wiesemeyer, Bundesingenieurkammer e.V. (Hg.) (2012)
  Energieeffizienz bei betriebs- und haustechnischen Anlagen. In: Deutsches Ingenieurblatt, 12., Fachverlag Schiele & Schön GmbH, Berlin

10.5 Diploma, Bachelor's and Master's Theses

In collaboration with the University of Munich and the Fraunhofer Institute for Building Physics, Holzkirchen, the following theses were supervised in 2012:

- Tobias Eckert
  master's thesis, University of Munich, master's program General Civil Engineering: "Assessment of the Building Shell of Residential Buildings in China in Terms of Comfort and Energy Behavior"

- Fabian Sauer
  master's thesis, University of Munich, master's program General Civil Engineering: "Calculative and Experimental Validation and Verification of a Hygrothermal Building Simulation Model (WUFI®plus)"

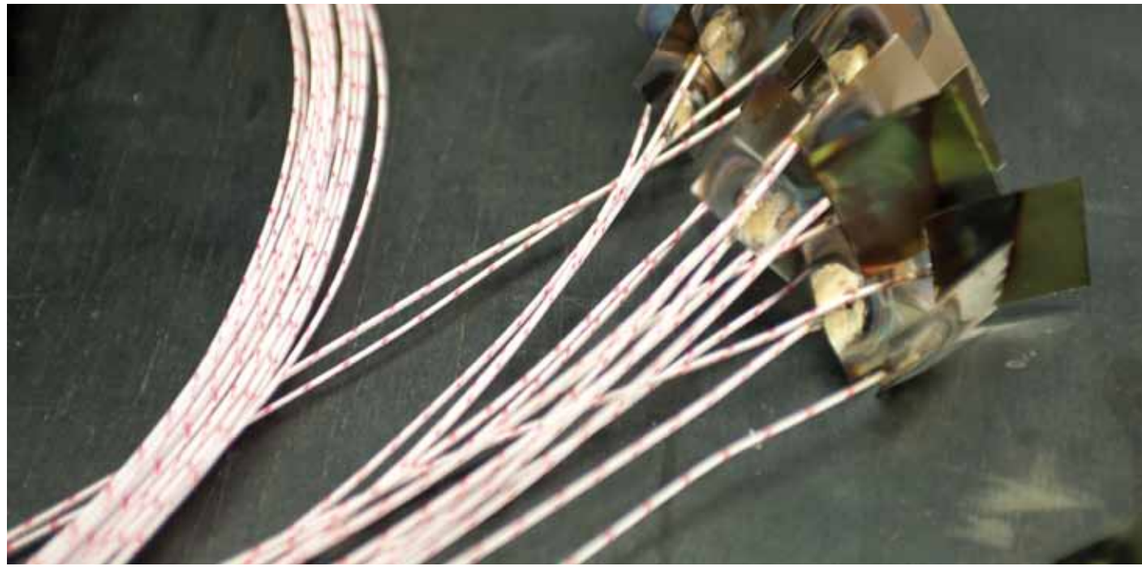
- Teresa Stangl
  bachelor's thesis, University of Munich, degree program Civil Engineering: "Exemplary Application of a Building Perfusion Model in Hygrothermal Building Simulation"

- Ch. Holtschlag
  bachelor's thesis, University of Applied Sciences Munich: "Hygrothermal Assessment of Structural Damage of Flat Roofs"

- Ulrich Gottanka
  master's thesis, University of Munich, master's program Civil Engineering: "Hygrothermal Simulation Calculation with POROTON®-WDF® Interior Insulation"

- Andreas Beck
  bachelor's thesis, University of Munich, degree program Civil Engineering: "Construction Costs of a Single-Family Home in Dependance of the Efficiency Building Standard (according to EnEV 2009)"

Imprint



Forschungsinstitut für Wärmeschutz e. V. München
Lochhamer Schlag 4 | DE-82166 Gräfelfing
T +49 89 85800-0 | F +49 89 85800-40
info@fiw-muenchen.de | www.fiw-muenchen.de

Concept, design, realisation and translation
Verenburg Kommunikation GmbH
Fürstenrieder Straße 279 | DE-81377 München
T +49 89 5177775-0 | F +49 89 5177775-20
kontakt@verenburg.com | www.verenburg.com

Photography and visual concept
Thomas Dachs
Markranstädter Straße 2a | DE-04229 Leipzig
T +49 179 4568518
info@thomasdachs.de | www.thomasdachs.de

Forschungsinstitut für Wärmeschutz e. V. München
Lochhamer Schlag 4 | DE-82166 Gräfelfing

T +49 89 85800-0 | F +49 89 85800-40
info@fiw-muenchen.de | www.fiw-muenchen.de