FIW München

Forschungsinstitut für Wärmeschutz e.V. München

Annual report 2020

FIW München

Forschungsinstitut für Wärmeschutz e.V. München

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1 Editorial

Looking back on 2020

2020 was not the worst year in the 102-year history of FIW München, but it was certainly the most unusual. The emergence of a new virus changed the entire world. Coronavirus was a dominating issue in 2020 for us here at the Institute too. The coronavirus pandemic has challenged a lot of us and called for a great deal of flexibility, creativity and extra commitment. Difficulties with sample collection and in organising internal operations were overcome, with protecting our employees given highest priority, as always. New formats such as video sampling were introduced and successfully implemented. We held our general meeting online, like almost all associations and societies, but unfortunately the research day had to be cancelled. Looking back, what is extremely positive is that our financial losses were kept within reasonable limits thanks to the performance of all FIW employees and the continued high level of trust placed in us by our customers in 2020.

We are therefore entering this year with confidence and a thirst for action. We will continue to promote quality consciousness, practise this awareness and take it into account in our standardisation and committee work. We are pleased to see that our proprietary voluntary certification programme that uses the Q-mark as a visible seal is in ever-increasing demand. We have prepared an urgently required expansion in construction capacity at the Institute and invested in the latest measurement technology and our equipment pool with an eye to the future. This will have a positive impact on the turnaround times of a number of audits in 2021 and subsequent years. We managed to conclude several major research projects successfully and apply or receive approval for a number of new projects in spite of coronavirus and the extensive restrictions placed on the workplace. We also intensified our cooperation with relevant scientific institutions in the field of applied contract research. New, reliable partners were acquired for this purpose.

2020 started on a positive note politically-speaking in relation to energy and climate policy and our interest in retrofitting existing buildings, in so far as tax incentives for certain energy-related measures for the construction sector were introduced on 01.01.2020.

Further political measures addressing energy and climate policy efforts in different sectors were also launched. We are encouraged to see that the features of the European Green Deal are increasingly taking shape. Its objective is clear: to retrofit more than twice as many buildings each year than the one before, amounting to 35 million by 2030.

We are all keeping a close eye on how the spirit of the times is continuing to evolve and consequently how the focus on sustainability is growing across each generation. It's true that coronavirus has changed our society and community of values more dramatically than anything we have seen in decades. Nevertheless, climate change is still the greatest challenge that mankind is facing. Short-term lockdowns are simply not a solution for protecting the climate and conserving resources. This requires a long-term strategy that is closely entwined with energy efficiency. This must be made much more explicit in funding instruments if we are to be able to meet long-term energy demands and achieve climate protection goals. It is of paramount importance that future stimulus packages in the construction sector take an "efficiency first" approach.

In the new year, we will continue to work towards and advocate for improving issue-related processes and programmes. This is the core mission of our Institute. Our primary motivation and our statutory mission since 1918 have been to prepare and continuously monitor these political measures, including technology impact assessments, by publishing scientifically sound findings.

Klaus-W. Körner
Chairman of the Board
FIW München

Prof. Dr.-Ing. Andreas H. Holm
Managing Director
Head of the Institute

2 FIW München at a glance

The structure of FIW München

As a key driver of innovation, FIW München has taken a leading role in the new and further development of methods in the field of energy efficiency for buildings and industrial applications. The directly charitable purpose of the registered association is centered on the development of new technologies, procedures, applications and services. This aim laid down in the statute is achieved by the following in particular:

- Research into the laws on heat and material transfers, in particular the scientific principles of thermal insulation.
- Disseminating this knowledge
- Thermotechnical testing of construction and thermal insulation materials and the constructions made from them
- Cooperation with heat conservation associations, technical associations and scientific institutes

Director of the institute:

Prof. Dr.-Ing. Andreas H. Holm

Insulation materials in the construction industry

Claus Karrer

Test body

Stephan Guess

Technical insulation

Roland Schreiner

Research and development

Christoph Sprengard

Certification

Wolfgang Albrecht

Services

EDP | Equipment manufacturing | Quality management | Administration

Within the testing and surveillance body, which complies with German Building Codes of the federal states, Stephan Guess is the head of the testing body and Stefan Kutschera is responsible for the surveillance body. The deputy for both positions is Roland Schreiner.

The employees of the certification, surveillance and testing body are professionally exempt from the requirement to comply with instructions issued by the institute's management within the scope of their activities according to the State Building Code and the EU Construction Products Regulation.

Core competencies and business areas

The structure and organisation of FIW München is based on both the business areas and the classical core competencies. These comprise, amongst other things, laboratory testing, open-air testing, the development of measurement equipment, in-situ demonstrations, studies, further education and standardisation.

Testing, surveillance, certification	Research and development	Transfer of knowledge and technology
Comprehensive assessment of the building envelope	Principles of thermal insulation, moisture protection and construction chemistry	National and international standards
In all aspects of	Testing of technologies and new materials to improve energy efficiency	Member of various expert committees
thermal insulation	Impact of influencing variables	Publications and presentations
moisture protection	Durability of materials and systems	Completion of training courses and symposia
fire protection	Initial research into construction materials and the development of construction systems	Development of measurement and testing equipment
stability	Energetic optimisation of the entire construction system	
material composition		
Development of testing standards, material standards, guidelines and worksheets		

Construction industry

Thermal insulation products for building equipment and industrial installations

Transport and logistics

Financial and personnel development

FIW München generated earnings of €7.6 million (8.28 million in the previous year) in the 2020 financial year. In 2020, the R & D service division will contribute slightly less than €1 million (€1 million in the previous year) to the slightly positive overall result of the Institute. Turnover for voluntary surveillance systems increased as a result of growing awareness among manufacturers and (end) consumers regarding the quality assurance of high-quality products. The testing and surveillance and research and development segments have undergone adjustments to facilitate the increasing product diversity of the insulation materials and insulation systems requiring testing. Several projects to modernise and expand the measuring and testing area have been launched and, based on the current state of progress, it will become operational on schedule in 2021. The acquisition in 2019 of the adjoining property at Am Kirchenhölzl 5, including the associated warehouse, will enable FIW München to expand at its current site in the long term.

After adjustments to facilitate the new order situation, the number of employees in 2020 remained comparable to the previous year, with the minor exception of a few long-serving FIW colleagues having taken retirement.

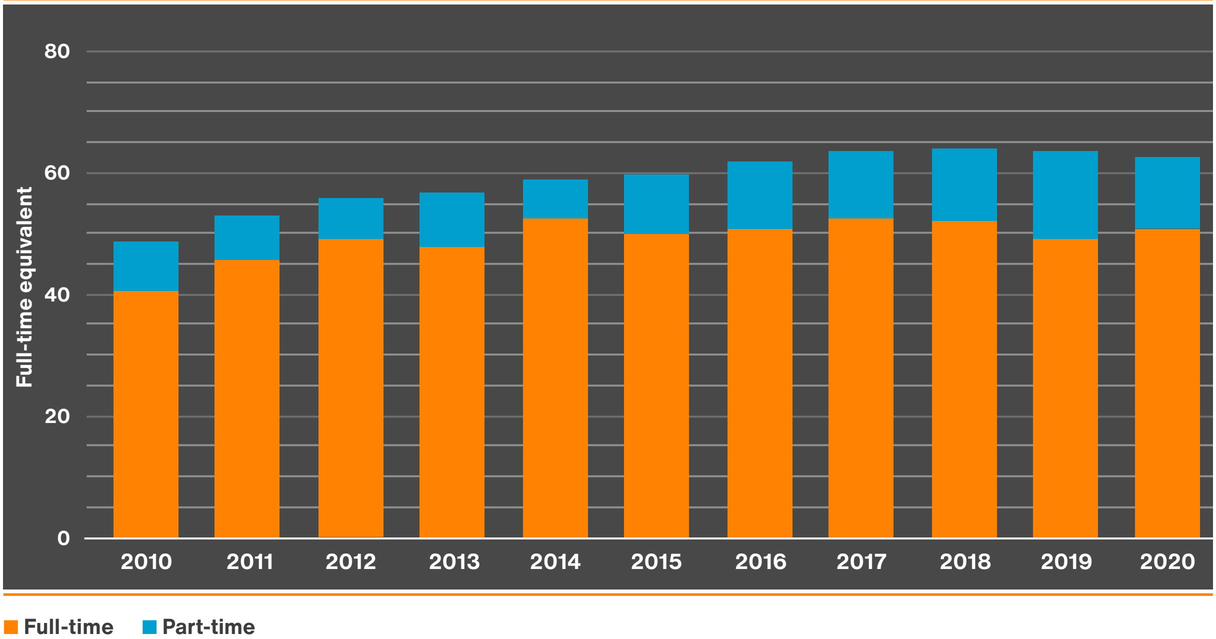
FIW München offers its employees long-term employment and development opportunities. The success of these measures is reflected by the general satisfaction at the institute and the sustained high employee retention rate. The high level of employee loyalty and preservation of skills and experience contribute significantly to the success of the institute and further confirm the high approval of the employer and high standards in place.

The following employees celebrated work anniversaries with us in the 2019 financial year:

Work anniversaries

10 year anniversaries	25 year anniversaries
Stephan Guess	Peter Eckart
Stefan Klasche	
Barbara Kuttner	
Tobias Timmermanns	

Employee development



3 Boards and committees

Networks, cooperations and committees

The success and quality of projects hinges on contributions from a large network and innovative partners. FIW München is therefore integrated into a network of national and international cooperations and is a member of several associations.

It also strives to accelerate and take an active role in shaping required changes in the field of standardisation to ensure that results are scientifically substantiated but nevertheless remain practically orientated and implementable.

This work often leads to high expenditures and typically constitutes a long-term commitment. Despite certain difficulties relating to financing, FIW München remains committed to its goal to continue to actively support standardisation work in the areas key to its customers.

Memberships of FIW München

- Advanced Porous Materials Association (AdvaPor), Strasbourg
- Allianz für Gebäude-Energie-Effizienz (geea), Berlin
- ASTM International, Philadelphia
- BDI – Initiative „Energieeffiziente Gebäude", Berlin
- Connect Deutschland e.V., Aschheim
- dena – Deutsche Energie-Agentur GmbH, Berlin
- DKV – Deutscher Kälte- und Klimatechnischer Verein e.V., Stuttgart
- DVM – Deutscher Verband für Materialforschung und -prüfung e.V., Berlin
- DIN Deutsches Institut für Normung e.V., Berlin
- EAE – European Association for External Thermal Insulation Composite Systems, Baden-Baden
- E2BA – Energy Efficient Buildings Association, Brussels
- Fachverband Gebäude-Klima e.V., Bietigheim-Bissingen
- Fachverband Luftdichtheit im Bauwesen e.V., Kassel
- Fachverband Innendämmung e.V., Frankfurt am Main
- Forschungsgesellschaft für Straßen- und Verkehrswesen, Cologne
- GRE – Gesellschaft für Rationelle Energieverwendung e.V., Kassel
- Industrie-Förderung GmbH, Berlin
- L'Institut International du Froid (IIF), Paris
- TÜV – Technischer Überwach ungsverein Bayern e.V., Munich
- Vacuum Insulation Panel Association (VIPA International), USA
- vbw – Vereinigung der bayerischen Wirtschaft e.V., Munich; (sponsoring member)
- VFBau – Verein zur Förderung der Normung im Bereich Bauwesen e.V., Berlin
- VMPA – Verband der Materialprüfungsanstalten e.V., Berlin

FIW München is also engaged in a number of additional project-related cooperation and framework agreements, especially in the field of research and development, which are subject to confidentiality. An institutional link is maintained with the Munich University of Applied Sciences, where the director of the institute, Prof. Andreas H. Holm teaches.

International bodies and committees

CEN (Comité Européen de Normalisation)

- TC 88 Thermal Insulating Materials and Products
  Prof. Dr.-Ing. A. Holm (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 2 Coordination Group
  R. Schreiner, Prof. Dr.-Ing. A. Holm
- TC 88 / WG 4 Expanded Polystyrene Foam (EPS)
  S. Sieber, Prof. Dr.-Ing. A. Holm
- TC 88 / WG 4 / Drafting Panel
  S. Sieber
- TC 88 / WG 4 / TG ETICS
  S. Sieber
- TC 88 / WG 5 XPS
  S. Sieber
- TC 88 / WG 7 Phenolic Foam
  W. Albrecht
- TC 88 / / WG 8 Cellular Glass (CG)
  S. Sieber
- TC 88 / WG 10 Building Equipment and Industrial Installations
  R. Schreiner (Convenor), Prof. Dr.-Ing. A. Holm
- TC 88 / WG 10 Building Equipment and Industrial Installations – Task group Test methods (TGTM)
  R. Schreiner (TG Leader)
- TC 88 / WG 11 Vacuum-Insulation-Panels (VIP)
  C. Sprengard
- TC 88 / WG 12 Expanded Perlite Boards
  W. Albrecht
- TC 88 / WG 16 Evaluation of Conformity
  R. Alberti
- TC 88 / WG 17 Wood Fibre Boards (WF)
  Dr.-Ing. S. Treml
- TC 88 / WG 18 ETICS
  S. Sieber, Prof. Dr.-Ing. A. Holm
- TC 88/TG Liaison to TC 350/351
  Dr. rer. nat. R. Gellert (Convenor)
- TC 88 / WG 22 Factory made Calcium Silicate (CS) Products
  Prof. Dr.-Ing. A. Holm
- TC 89 Thermal performance of buildings and building components.
  Prof. Dr.-Ing. A. Holm
- TC 89 / WG 14 Determination of Thermal Resistance at Elevated Temperatures Using the Guarded Hotplate Method
  R. Schreiner
- TC 254 Flexible Sheets for Waterproofing
  Dr.-Ing. S. Treml
- TC 254 / TG WG 9 and 10 Artificial Ageing
  Dr.-Ing. S. Treml (Convenor)
- Group of Notified Bodies-CPR / SG 19 Thermal Insulation Products
  W. Albrecht, R. Schreiner

CEN Certification

- SDG 5 Thermal Insulation Products, Expert Group for Thermal Insulation (Creation of a uniform test level for thermal conductivity and all other proper-ties of insulation materials in Europe)
  W. Albrecht

ISO (International Organization for Standardization)

- TC 163 Thermal Performance and Energy Use in the Built Environment SC1
  Prof. Dr.-Ing. A. Holm (Chairman)

QAC (Quality Assurance Committee)

- VDI-KEYMARK Scheme for Thermal Insulation Products for Building Equipment and Industrial Installations, the Voluntary Product Certification Scheme
  R. Schreiner (Co-Chairman)
- Laboratory Group
  R. Schreiner

Other bodies

- Fachverband Innendämmung FV ID
  C. Sprengard
- Vacuum-Insulation-Panels International Association VIPA
  C. Sprengard
- International Vacuum-Insulation-Panels Symposium – Scientific Committee
  C. Sprengard
- Advanced Porous Materials Association ADVAPOR
  C. Sprengard

National bodies and committees

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

- NA 005-56 FBR "KOA 06 Energy saving and thermal insulation"
  Prof. Dr.-Ing. A. Holm (chairman) (coordination committee)
- NA 005 BR "Advisory board of the DIN building standards committee (NABau)"
  Prof. Dr.-Ing. A. Holm
- NA 005-12 FBR "Steering committee division 12 - energy performance"
  Prof. Dr.-Ing. A. Holm
- NA 005-56-10 AA "Insulation work on technical installations in buildings and in industry"
  R. Schreiner
- NA 005-56-60 AA Thermal insulating materials (SpA to CEN / TC 88, ISO / TC 163 and ISO / TC 61)
  Prof. Dr.-Ing. A. Holm (Obmann)
- NA 005-56-60 AA Thermal insulating materials
  W. Albrecht, R. Schreiner
- NA 005-56-60, Ad hoc 04 EPS
  S. Sieber
- NA 005-56-65 AA "Vacuum insulation panels (VIP)"
  C. Sprengard
- NA 005-56-69 AA "Insulating materials for technical installations in buildings and industry"
  R. Schreiner (chairman)
- NA 005-56-90 AA "Structural thermal insulation in building construction" (SpA to CEN / TC 89 and ISO / TC 163) (including standards series DIN 4108)
  Prof. Dr.-Ing. A. Holm (chairman)
- NA 005-56-92 AA Characteristic values and requirement conditions for heat transmission; rated values of thermal conductivity (DIN 4108-4) and minimum requirements for insulating materials (DIN 4108-10)
  W. Albrecht (chairman)
- NA 005-56-93 AA Air tightness (SpA ISO / TC 163 / SC1 / WG10)
  Dr.-Ing. S. Treml
- NA 005-56-97 AA Transparent components (SpA ISO / TC 163 / SC1 / WG 14)
  C. Sprengard
- NA 005-56-98 AA Thermotechnical measurement
  W. Albrecht, R. Schreiner
- NA 005-56-99 AA Moisture (Sp CEN / TC 89/WG 10)
  Prof. Dr.-Ing. A. Holm
- NA 005-02-09 AA Waterproofing membranes (Sp CEN / TC 254)
  Dr.-Ing. S. Treml
- NA 005-02-91 AA Flexible membranes under roof coverings (Sp CEN / TC 254 / WG 9)
  Dr.-Ing. S. Treml
- NA 005-02-92 AA Sarking boards (Sp CEN / TC 128 / SC 9 / WG 5)
  Dr.-Ing. S. Treml
- NA 042-02-01 AA Fibreboards (SpA CEN/TC 88/WG 17)
  Dr.-Ing. S. Treml

DIBt (Deutsches Institut für Bautechnik)

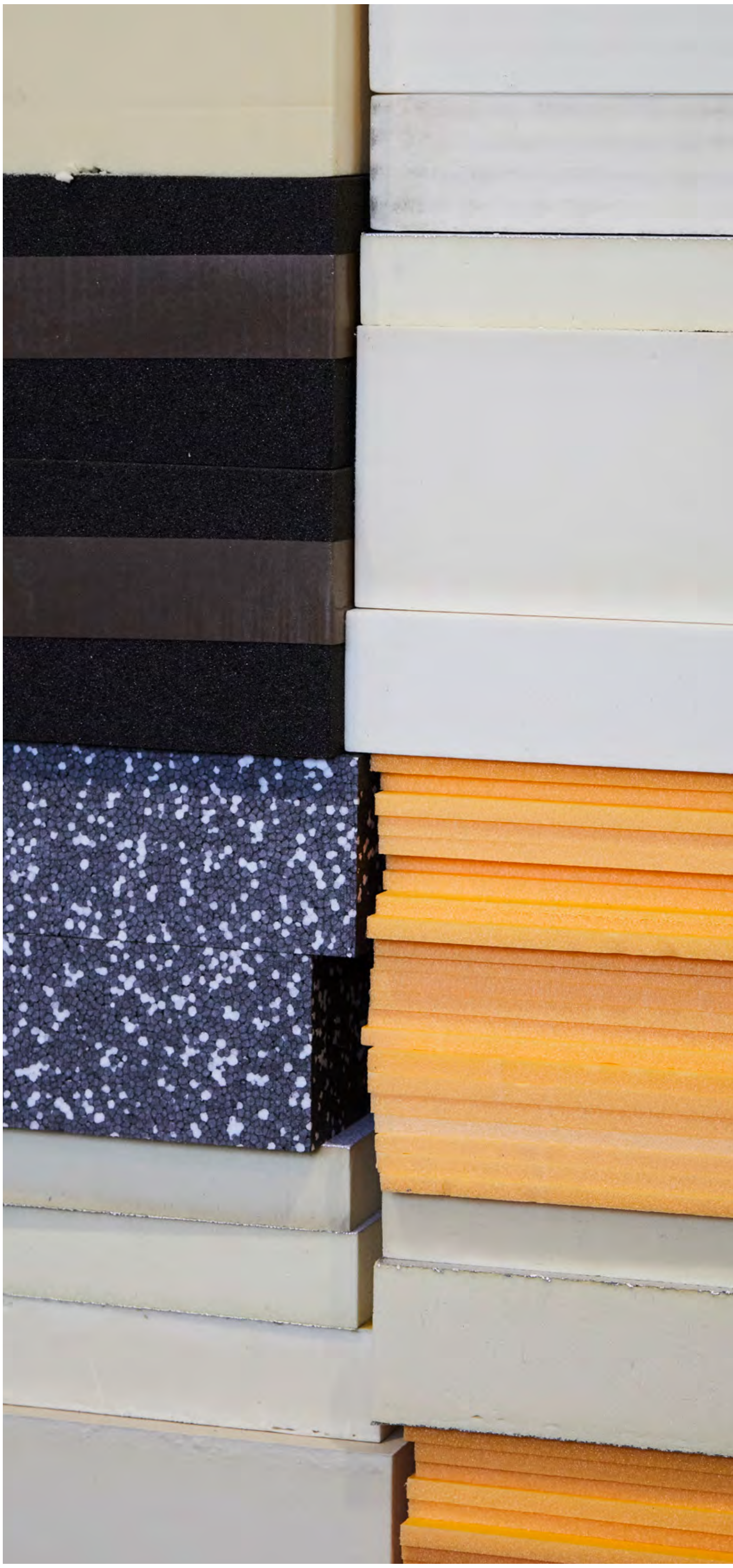
- SVA-A materials for thermal and sound insulation
  W. Albrecht
- SVA-B1 thermal conductivity
  W. Albrecht
- SVA-B3 thermal insulation outside the membrane
  W. Albrecht
- SVA Durability of moisture-variable vapour control layers
  Dr.-Ing. S. Treml
- Ad hoc committee: Load-bearing thermal insulation of greater thickness under foundation slab
  W. Albrecht
- ABM colloquium of the fire testing laboratories
  W. Albrecht
- Experience exchange on testing, inspection and certification bodies for, foam plastics and wood wool
  W. Albrecht

VDI (Association of German Engineers)

- Expert committee “Thermal insulation VDI 2055”
  R. Schreiner (chairman)
- Guidelines committee VDI 4610
  K. Wiesemeyer (chairwoman), R. Schreiner
- VDI-Gesellschaft Energie und Umwelt (VDI-GEU) division 1
  R. Schreiner

AGI (Arbeitsgemeinschaft Industriebau)

- AGI Working documents Q-series
  R. Alberti



Hauptverband der Deutschen Bauindustrie (HDB) – Bundesfachabteilung WKSB

- Technical committee (TC)
  R. Schreiner

ÜGPU (Überwachungsgemeinschaft Polyurethan-Hartschaum e.V.)

- Expert committee (analysis of third-party monitoring results of ÜGPU)
  W. Albrecht

IVPU (Industrieverband Polyurethan-Hartschaum e.V.)

- Technical committee of the Industrieverband Polyurethan-Hartschaum
  W. Albrecht

GSH (Güteschutzgemeinschaft Hartschaum e.V.)

- In-situ formed dispensed rigid polyurethane (PUR) (RAL-RG 710/7)
  R. Alberti
- GFA-PUR – Joint expert committee PUR roof spray foam and PUR spray foam
  S. Kutschera
- Working group Polystyrol (AAPS)
  S. Sieber
- Quality committee
  S. Sieber
- Steering committee
  S. Sieber

IVH (Rigid Foam Industry Association)

- Technical Working Committee (TAA)
  C. Karrer, S. Sieber
- Working Group on Composite Thermal Insulation Systems (AK WDVS)
  S. Sieber

VDI guideline development

The expert “Thermal insulation” committee has been established in specialist area 1 “Energy technology” of the VDI-Gesellschaft Energie und Umwelt (VDI-GEU). This VDI expert committee is responsible for several VDI guidelines for the "Technical insulation" sector, which are regularly submitted for confirmation or revision.

4 Working under pandemic conditions

Greater flexibility and awareness

The outbreak of the coronavirus pandemic in the spring and the subsequent unfamiliar distancing, mask-wearing and disinfection guidelines caused significant changes in the everyday working lives of the staff here at FIW. The Institute successfully reduced physical contact between people and prevented any members of staff from contracting coronavirus by introducing various measures at an early stage to make the workplace more flexible, including abolishing core and flexitime working, adapting the number of people working in offices, promoting homeworking and reducing the number of business trips), as well as raising awareness for potential routes of infection and strengthening the protective and hygiene measures in place at the Institute.

Laboratory work and everyday life at the Institute under increased safety measures

Thanks to timely and prudent preventive measures, we were not in a state of shock at any time. While many colleagues largely shifted from working in the office to working from home and communicating by video call, our colleagues in the laboratories and workshops and those in administrative roles continued to rely on their workplace at the Institute for the most part.

Meeting rooms and social spaces were converted into more workstations, while a number of offices were used on a rotation basis due to the requirement for single-person occupancy. Each and every individual was challenged by the need to wear the correct type of mask at all times, the additional hygiene measures, the need to stay up-to-date with the latest behavioural guidelines and particularly by how to communicate with colleagues about a shared project or piece of work. These additional challenges of working in a laboratory with distancing were nevertheless overcome with flying colours. We would like to take this opportunity to thank them for their commitment!

Video conferences and video sample collection replaced physical meetings

We have brought forward some already planned developments at FIW München and have had good experiences with distance working, for example, whether internally at FIW or in cooperation with clients. In the post-coronavirus era, we will maintain or expand the best of face-to-face and online meetings for the benefit of all.

During the lockdown period, we successfully tested a system whereby the manufacturer collects samples during a video conference supervised by FIW München. Even though it has since become possible to carry out normal sample collections and audits both within Germany and abroad under stringent hygiene conditions, without this system of video collection and the willingness of FIW's clients, it would not have been possible to comply with the testing programme. We would also like to thank all those involved in this undertaking!

Video collection: The FIW employee is based at the Institute, selects the product and supervises the collection process over a video call.

Sample shipment: The samples are sealed at the factory by the customer/manufacturer using tamper-proof tape before being sent to FIW München.

Safety: A security feature of the seal after destruction

Even friendliness is contagious

Things were the same for us professionally as they were in our private lives. All of our events fell victim to the pandemic, starting with the members' meeting and our much-loved research day, to institute-wide events such as a company outing, a visit to the Oktoberfest and a Christmas party, to joint events in smaller groups such as the B2Run company run, the weekly exertive Institute Sports Group or the monthly culinary feast organised by the cooking group – they were all postponed initially and eventually cancelled completely. Even the coffee machine lost its importance as the main meeting point for a casual conversation. Nevertheless, our colleagues did not let the situation dampen their spirits. They persevered under difficult conditions, redefined togetherness and took the opportunity to try new things and question existing processes.

The Institute's management met online with the engineers every two weeks, and the management team also convened in video conferences. Several FIW colleagues arranged to meet online for a coffee and a chat or for private game evenings and in doing so also contributed to a sense of cohesion at the Institute.

There is a continued sense of hope for a return to more carefree times in the daily interactions that take place in the corridors of the Institute. A smile is still visible even underneath a mask.

We can look back with great satisfaction and look to the future with hope. We are confident that we will be able to return to some much-loved routines after all the sacrifices we have made and even host one or two fantastic DISTANCED events.

Viruses have no idea how contagious gratitude can be. But we do. We would like to take this opportunity to thank all our colleagues and customers alike for their valued relationship with FIW München!

5 Testing and surveillance

Testing and certification bodies share monitoring tasks

Only a limited number of thermal insulation materials without a European product standard or European Technical Assessment (ETA) will be subject to the separation of tasks stipulated by the State Building Code (LBO) into a testing body responsible for conducting product tests, a surveillance body responsible for audits and withdrawals in the manufacturing plant and a certification body responsible for assessing test and audit results and issuing certificates of conformity.

The conformity assessment of construction materials pursuant to the European Construction Products Regulation (EU-CPR) does not require the existence a surveillance body. All conformity tasks are carried out by a certification body and a testing body, whereby the responsibilities of the national testing body such as conducting audits of manufacturing plants and collecting product samples are assigned to the certification body. The latter furthermore reserves the right to assign a certain number of tasks to other bodies such as the testing body.

As a result, employees from the testing body responsible for supervising insulation material manufacturers often work independently in the same manufacturing plant on the same insulation material both acting as employees of the testing body pursuant to the LBO and on behalf of the certification body according to EU-CPR. On the other hand, according to the CPR, employees from the certification body are also permitted to assume the tasks of the testing body at the manufacturing plant pursuant to the State Building Code. They nonetheless remain the competent contact persons for all questions related to quality assurance and proof of conformity of thermal insulation materials on a national or European basis. This is particularly relevant since, following the ECJ ruling in Case C-100/13, thermal insulation materials subject to European regulatory framework can no longer be regulated at national level, contributing to the importance of testing and, if necessary, certification by a European notified body.

However, the senior building authorities of all federal states have issued decrees on the enforcement of the CPR permitting the continued use of general building authority approvals, provided that their ancillary conditions, i.e. compliance with self-monitoring and external surveillance by a surveillance body recognised pursuant to the LBO, are fulfilled. As a consequence there will continue to be overlaps between the tasks of the surveillance body pursuant to the LBO and the notified certification body.

Testing and trial facilities for existing buildings

FIW München is recognised and accredited as a testing laboratory pursuant to EN ISO/IEC 17025 on a national (testing, surveillance and certification body) and European (notified body) level. Its special expertise is further exhibited by its leading cooperation in the “Lambda Expert Group” for the voluntary European certification scheme CEN KEYMARK, whereby laboratories registered to determine the thermal conductivity of thermal insulations materials audit each other’s work and confirm measuring precision through interlaboratory testing. The laboratory group also additionally focuses on determining the maximum service temperature and water-soluble chlorides in the field of technical insulation materials. We are notably proud of our discovery of a comparative insulation material (expanded glass granulate) that ensures the required European level of thermal conductivity at higher temperatures.

In the field of “technical insulation", the testing body conducts thermal and mechanical tests across a broad range of temperatures. The laboratory tests conducted in line with European testing standards are supplemented by the recording of influencing variables on application-related insulation structures under practical conditions, e.g. on pipelines.
In addition to providing order verification for all technical insulation materials, the active design of the European voluntary quality assurance scheme (VDI/KEYMARK) constitutes a key service offered to our customers.

The energy efficiency of buildings and technical installations is, to a certain extent, contingent on the testing of materials, certification and quality assurance. In addition to our research and development work, we operate test laboratories to the highest quality standards and have gained decades of experience and a high reputation. We operate state-of-the-art testing facilities and employ a wide range of analysis techniques. Due to the increased demand for corresponding testing, our test laboratory is continuously experiencing growth in terms of both equipment and personnel. At present, the largest test body for thermal insulation materials in Europe has the following test facilities.

Testing and trial facilities for insulation materials in building construction

Evaluation of the performance of insulation materials through testing
- according to EN 13162-13171

Approval tests for new insulation materials
- according to testing specifications from DIBt

Initial tests for thermal insulation materials
- according to testing specifications from DIBt for type-approvals (BAG) or according to the European Assessment Document (EAD)

Fire behaviour and carbonization/smouldering
- Classification of the fire behaviour according to DIN EN 13501-1, Class A1, Class E
- Ignitability of products subjected to direct impingement of flame according to DIN EN ISO 11925-2
- Review of the building material class DIN 4102-B2 (normal ignitability)
- Determination of the tendency to carbonize continuously according to DIN EN 16733
- Non-combustibility test according to DIN EN ISO 1182
- Determination of the gross heat of combustion according to DIN EN ISO 1716

Testing the thermal conductivity of construction and thermal insulation products

according to the testing specifications DIN EN 12664, DIN EN 12667, DIN EN 12939, ISO 8301, ISO 8302, ASTM C177 and DIBt guidelines, Berlin
- at an average temperature in the temperature range -30 °C to +80 °C
- at an average temperature of 10 °C

Mechanical properties
- Characteristics, dimensions, thickness, bulk density
- Thickness for floating floor insulating products according to DIN EN 12431 (compressibility)
- Tensile strength, tear strength, transverse tensile strength (DIN EN 1607/1608)
- 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
- Coefficient of thermal expansion and contraction according to DIN EN 13471
- Slump after vibration
- Slump after climate testing at 40 °C / 90 % r. h.
- Determination of compressive creep according to DIN EN 1606 up to a thickness of 300 mm
- Anchor pull-out strength according to ETAG 004

Hygric properties and behaviour in frost
- Determination of water absorption during brief partial immersion according to DIN EN 1609 / DIN EN 29767
- Determination of water absorption during long-term immersion according to DIN EN 12087/ EN 16535
- Water absorption during temperature change 20 °C/40 °C
- Water absorption by diffusion at 50/1 °C according to DIN EN 12088
- Freeze-thaw cycles according to DIN EN 12091 and pressure behaviour according to DIN EN 826
- Determination of water vapour transmission properties according to DIN EN ISO 12572, DIN EN 12086, DIN EN 13469
- Conditioning to moisture equilibrium under specified temperature and humidity conditions according to DIN EN 12429
- Hygrothermal performance of building materials and products according to DIN EN ISO 12571 (DIN 52620)
- Moisture content according to DIN EN 322

Dimensional stability/deformability
- Determination of dimensional stability under constant normal laboratory conditions according to DIN EN 1603
- Determination of dimensional stability under specified temperature and humidity conditions according to DIN EN 1604
- Deformation under defined pressure and temperature conditions according to DIN EN 1605

Other properties
- Determination of volume percentage of closed cells of rigid materials according to ISO 4590
- Cell gas composition with a gas chromatograph
- Determination of the chloride content of wood wall panels according to DIN EN 13168
- Determination of airflow resistance according to DIN EN 29053

Testing and trial facilities for insulation materials in technical applications

Evaluation of the performance of insulation materials through testing according to EN 14303-14309, EN 14313, EN 14314

Thermal conductivity of insulation materials pursuant to the test specifications of DIN EN 12664, DIN EN 12667, ISO 8301, ISO 8302, ASTM C 177, ASTM C 518 and the guidelines of DIBt, Berlin

- in temperatures ranging from -180 °C to 900 °C
- at an average temperature of 10 °C
- at an average temperature of 40 °C

Thermal conductivity of pipe insulation materials and pipe insulation and pipe systems pursuant to the test specifications of DIN 52613, DIN EN ISO 8497

- in temperatures ranging from -70 °C to +300 °C
- at an average temperature of 10 °C for cold insulation
- at an average temperature of 40 °C for insulation materials for the insulation of heating systems
- at an average temperature of 50 °C for district heating pipelines

Dimensional stability/deformability

- according to DIN EN 1603 in a normal climate
- in predefined temperature and moisture conditions according to DIN EN 1604

Behaviour at higher temperatures

- Maximum service temperature according to DIN EN 14706 and DIN EN 14707

Measurements of the heat transfer and the temperature field with standardised and specialised measuring and testing equipment

- for insulation systems
- for building components

Requirements for the fire protection/fire behaviour of building materials

- Classification of the fire behaviour according to DIN EN 13501-1, Class A1, Class E
- Determination of the propensity to undergo continuous smouldering according to DIN EN 16733
- Non-combustibility test according to DIN EN ISO 1182
- Gross heat of combustion according to DIN EN ISO 1716
- Ignitability of products subjected to direct impingement of flame according to DIN EN ISO 11925-2

Mechanical properties (in some cases even at low temperatures down to -180°C)

- Characteristics, dimensions and bulk density according to DIN EN 1602 and DIN EN 13470
- Tensile strength according to DIN EN 1607, tear strength, transverse tensile strength
- Deformation under defined pressure and temperature conditions according to 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
- Coefficient of thermal expansion and contraction according to DIN EN 13471
- Compressive creep according to DIN EN 1606

Hygric properties and behaviour in frost

- Determination of long term water absorption by immersion according to DIN EN 12087 when fully immersed
- Water absorption with temperature change 20 °C/40 °C
- Determination of short term water absorption by partial immersion according to DIN EN 1609
- Water vapour transmission properties according to DIN EN ISO 12572, DIN EN 12086 and DIN EN 13469

Other properties

- Determination of volume percentage of closed cells of rigid materials according to ISO 4590
- Cell gas composition with a gas chromatograph
- Determination of trace quantities of water soluble chloride and pH according to DIN EN 13468
- Thermal stability
- Length-specific flow resistance according to DIN EN 29053, DIN EN ISO 9053-1
- Non-fibrous components (melted beads)
- Loss on ignition according to DIN EN 13820
- Determination of the silicon content of insulation materials

Acceptance measurements

- On-site measurements with a heat flow meter and/ or infrared camera

New measurement technologies and methods at FIW München

Initial situation

In the modern era, the ever-growing demand for cooling around the world is driving up energy consumption and polluting the environment because of increased CO_2 emissions. This makes it clear that energy-efficient technologies must be used for cooling, storage and refrigerated transport. The requirements of cold insulation have risen enormously in recent years because of these factors. In order to assess potential energy savings on operational systems through the use of thermal insulation, both the specific energy losses of all the individual components and the thermal properties of the cold insulation materials must be ascertained. The additional energy losses through flanges, fittings and valves on insulated pipelines must also be taken into account.

There is only one test standard available in Europe for determining the thermal properties of pipe insulation: EN ISO 8497 "Determination of heat transfer properties in a steady state of thermal insulation for pipes". An electrically heated test tube establishes the temperature difference in the insulation system that is required for the measurement. If this measuring method is also used below ambient temperature, the insulated test tube is placed in a climatic chamber. This allows the air inside the chamber to be cooled down to approx. -70 °C using cryostats. The advantage of this test method, with which the insulation systems mounted on the test pipe can be tested under use conditions, cannot be fully exploited in the case of cold insulation, as the heat flow is erroneously directed outwards due to the test pipes being electrically heated. The outer surface temperature of the insulation system at the time of measurement therefore does not correspond to the temperature under real operating conditions as it would be in a technical system. With an insulated cold pipe, the energy transfer and, due to the partial pressure difference, the transfer of water vapour in the direction of the pipe is halted.

A new measurement method was developed at FIW München to extend the operating conditions to cryogenic pipelines and to introduce active cooling of the pipeline when measuring the thermal properties of the insulation systems. This made it possible for the first time to offer thermal measurements of insulation systems for pipelines under real use conditions below ambient temperature. The assessment of the results also include an evaluation

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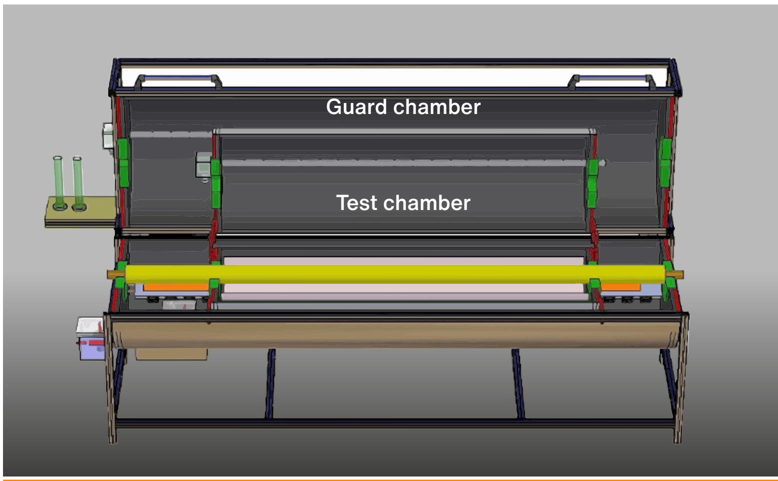
- Of a possible falling below the dew point on the surface of the insulation system
- Of an accumulation of moisture in the insulation material and
- Of the long-term performance.

Insulation systems with additional components such as fittings, flanges or valves can also be tested at any time.

“Hot box” principle of measurement

The "hot box method" was chosen as the measuring principle for the new pipe test stand (Fig. 1). An insulation system is fitted onto a test pipe. This test tube has a coolant flowing through it and is placed in the centre of a cylindrical test chamber. The energy flows required for the measurement can be precisely recorded here owing to the adiabatic functioning of the test chamber within a guard chamber. The guard chamber is maintained at the exact temperature of the test chamber using a thermopile with approximately 50x amplification. This ensures that the electrical energy supplied to the test chamber by surface heating only flows through the sample under examination to the "cold" test tube. The heat transfer properties of the pipe insulation system (e.g. the temperature-dependent thermal conductivity of an insulation material) can now be calculated from the difference in temperature between the test pipe and the surface of the insulation system, the electrical power of the panel heaters and the sample dimensions. An automatic measuring system is used to record all the measured variables. Any insulation system with different dimensions can be examined by using face plates of varying sizes in the guard chamber and test chamber.

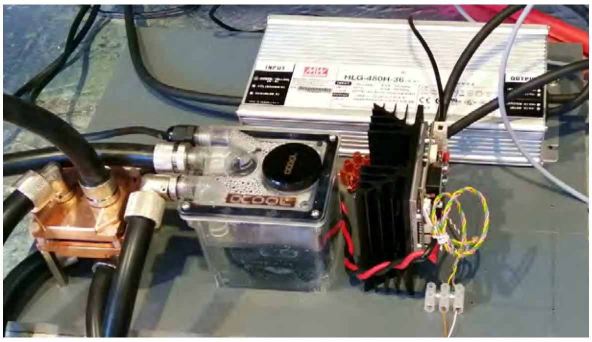
Considerable importance was attached to controlling the temperature of the guard chamber precisely, as this sensitive variable has a strong influence on the energy flows. The decisive factor here is to ensure thermal decoupling from the ambient temperature of the test apparatus. To achieve this, the guard chamber was equipped with a Peltier heat pump (Fig. 2) and the control sensor was substantially improved. This allowed the tester's controls to be adapted perfectly to the sensitive controlled system.



1: The hot box test tube, opened

Radiation processes in the test room that could influence the measurement are averted by installing reflective surfaces as radiation shields.

In the first phase of the project, the test rig was able to prove its capabilities down to a pipe temperature of approximately -50°C.



2: The Peltier heat pump for controlling the temperature of the guard chamber

Upgrade to test cryogenic operation

Upgrading the pipe test rig using the hot-box method to determine the length-specific energy losses in cryogenic operation (Fig. 3) was a useful addition to the range of tests offered by the "Technical Insulation" department at FIW München. All the necessary safety precautions for using the measuring system with liquid nitrogen were installed and confirmed with a corresponding certificate issued by an expert. A medium temperature of approximately -190 °C was ascertained when using liquid nitrogen to cool the pipeline to determine the thermal properties of the cold insulation. It can therefore be concluded that the insulation material has an average temperature of approximately -90°C.

3: Upgrade of the test rig to cryogenic temperatures by using liquid nitrogen

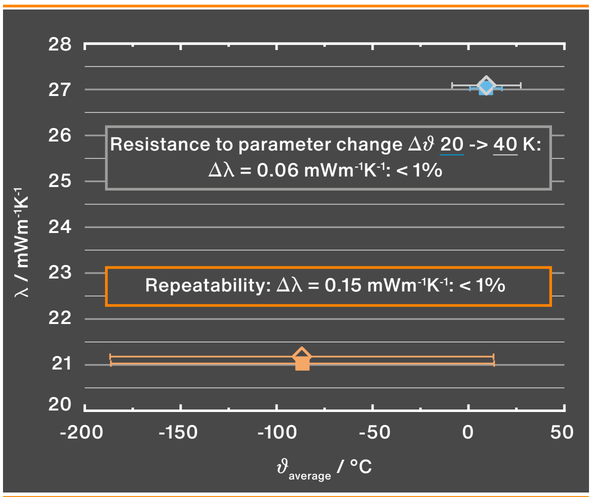
Comparison tests

It is possible to qualify the hot box test tube by comparing it with results from other test methods, or by demonstrating that the test result does not change with varying temperature differences on the test specimen following repeated tests at the same average temperature of the insulation system. This confirms that the measurement is carried out adiabatically without significant, systematic sources of error (Fig. 4). The repeatability of the measurement results is approximately 1% (Table 1).

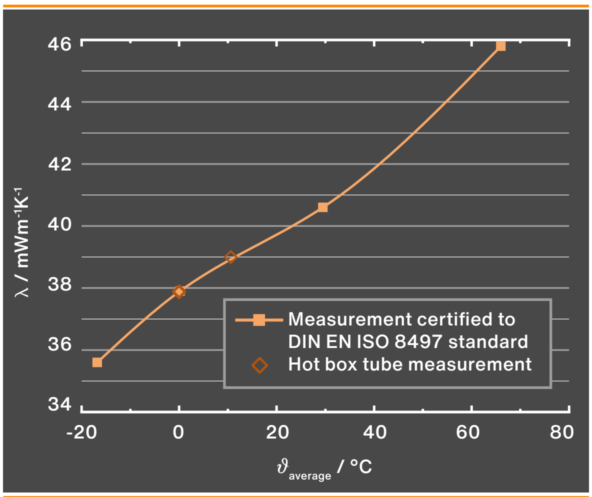
Comparative measurements with a typical cold insulation material, an insulation tube made of flexible elastomer foam, were able to confirm the test results pursuant to the European test method EN ISO 8497 with deviations of less than 1% (Fig. 5). Figure 6 shows the test results for determining the thermal conductivity of three different pipe insulation systems for cryogenic applications.

Through FIW München's participation in the VDI Guidelines Committee for VDI 4610 Part 1 and Part 2: "Energy efficiency of operational systems; thermal insulation/thermal bridge catalogue", it was possible to make the specific energy losses of standardised components of refrigeration pipelines accessible to the general public.

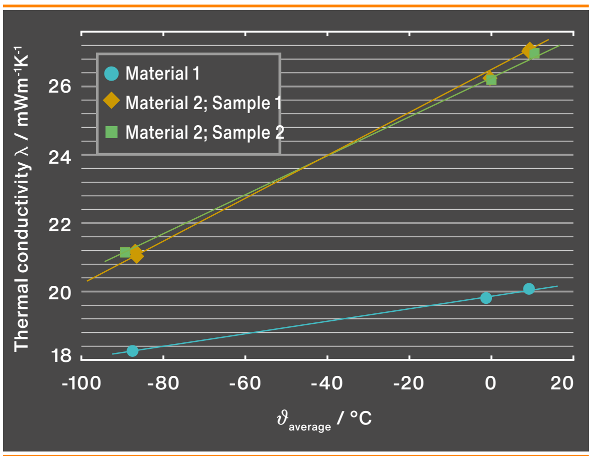
By upgrading the test rig for cryogenic operations, it is now also possible to measure the specific energy losses reliably for pipe insulation systems for technical installations with operating temperatures far below the ambient temperature.



4: Thermal conductivity at the same average temperature in the insulation material as a function of the temperature difference on the test specimen and with repeated measurement at low temperature



5: Comparative measurements using the test method DIN EN ISO 8497



6. Test results on three different pipe insulation systems in the cryogenic range

Average temperature in °C	Temperature difference in K	Thermal conductivity in mW m^{-1}K^{-1}	Difference (absolute/relative) in mW m^{-1}K^{-1} / %
9.13	16.66	27.03	0.06/0.22
9.36	35.76	27.09	
-86.52	199.76	21.03	0.15/0.71
-86.86	199.92	21.18	

Table 1: Repeatability of the measurement results

Dilatometer: Cold insulation materials without cracks

Cryogenic technical systems place high demands on the insulation material. When selecting an insulation material, it is important to ensure that the chosen material absorbs vibrations and shocks caused by extreme temperature cycles, withstands mechanical loads and provides sufficient protection against corrosion underneath the insulation. In such cases, it is essential to use an insulation system that is free of cracks.

Expansions of within the wall and the insulation material due to differences in temperature exert a great deal of stress on the insulation system. These shifts in the material can easily amount to several centimetres at temperatures in the range of liquefied natural gas (LNG, -162 °C). The specifications of cold insulation materials therefore refer to what is called the "cryogenic thermal stress resistance factor", which is a certainty of preventing cracking in insulation materials for cryogenic uses. To calculate this value, also known as the F-factor, it is important to know both the tensile strength and the change in length of the insulation material at low application temperatures.

Dilatometers are available for this purpose in materials testing, which can measure thin rod-shaped samples that are just a few millimetres thick. However, significantly larger sample areas are needed to determine the coefficient of linear expansion of insulating materials made of rigid polyurethane foam, for example, due to the inhomogeneity of the insulating material. FIW München has now been able to bring a suitable testing device into use in its low-temperature laboratory (Fig. 7).

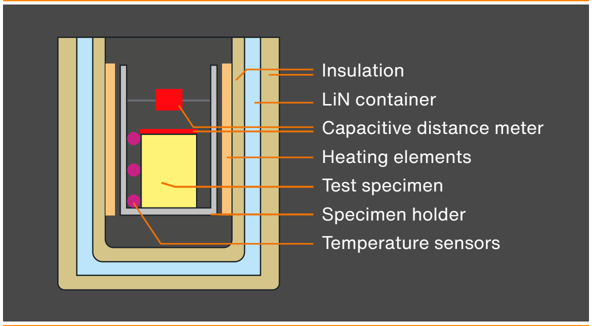
The linear thermal expansion coefficient of cold insulation materials can be determined in the temperature range between -190 °C to +30 °C using suitable control and measuring equipment. The measuring principle developed by FIW München will become part of ISO 23766 "Thermal insulating products for industrial installations - Determination of the coefficient of linear thermal expansion at sub-ambient temperatures". Experts from FIW München are assisting the ISO 163/SC 1/WG 20 working group that is responsible for the ISO standard.

7: Cryogenic laboratory at FIW München, device for determining the linear expansion of cold insulation materials

An insulated sample chamber is surrounded by liquid or vaporising nitrogen (LiN). The nitrogen vessel is in turn thermally insulated from the outside. Any temperature between room temperature and -190 °C can be set by regulating the liquid nitrogen supply. Electrical heating elements on the wall of the sample chamber allow for reheating rate of 1... 3 K/min in accordance with standards in order to be able to exclude irreversible changes once the test is concluded.

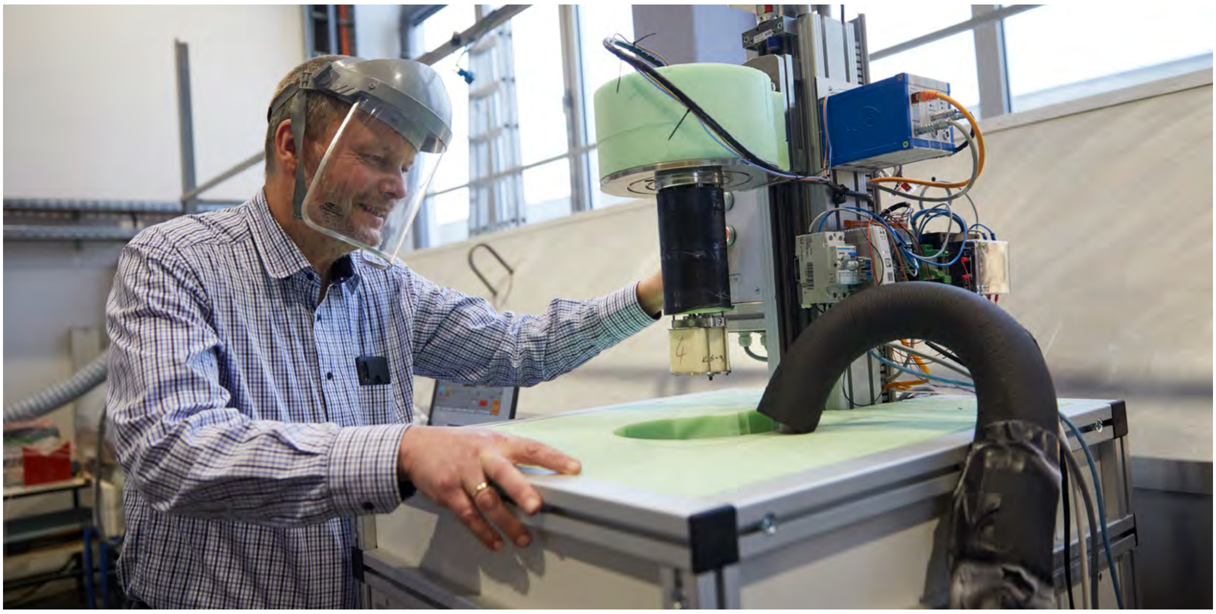
The change in length of a test specimen is measured at different temperatures to determine the linear thermal expansion coefficient. This is done by placing the specimen in the sample chamber, which can be adjusted to temperatures between -190 °C and 30 °C. A capacitive distance meter detects changes of the dimension of the sample. The measuring principle is illustrated in Figure 8.

The change in length as a function of temperature is set in relation to the total length of the sample that was determined at the beginning of the measurement process at a reference temperature (e.g. 23 °C). Both the average and the temperature-dependent linear expansion coefficient of cold insulation materials can be determined by means of a variable test sequence at different temperatures in the sample chamber.



8: Measuring principle of the device for determining the linear expansion of cold insulation materials

This provides FIW München with a testing device to guarantee the quality of cold insulation materials, for example for transporting and storing liquefied natural gas, an important component in the energy system of the future.



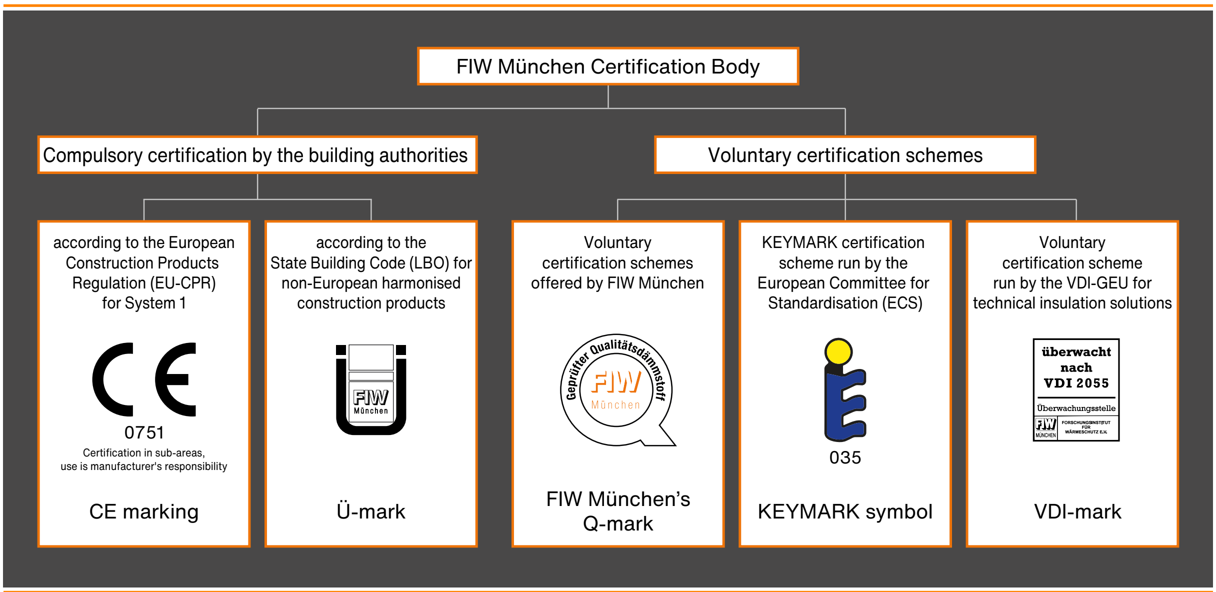
9: Dilatometer for low temperatures – Mounting of an insulation sample

6 Certification

FIW München is the main body for the certification of insulation materials and building components and can look back on a 100-year tradition of product testing and assessment in the building industry as a whole.

Even if there is usually no difference in quality to the naked eye, there can sometimes be major differences depending on the product and the intended use. European standards, which have been harmonised in many areas, merely form a (minimum) consensus at European level when it comes to defining the requirements for construction products. There are moreover still different national building inspection requirements. Manufacturers of high-quality products are forced to take action themselves, for example to define the interfaces between components and ensure consistent quality. Ultimately, a quality seal offers a guarantee for certain quality agreements, for example between ETICS system holders and insulation manufacturers, avoids criticism and costly recalls and creates trust among those involved in the market.

The various tasks of the certification body of FIW München are presented below, which in recent years has developed from a certification body that operates in line with the State Building Code to a certification body that complies with the European Construction Products Regulation (CPR) or voluntary certification programmes.



Certification: Overview of certification options at FIW München

Mandatory systems

A multitude of new processes and product developments in the field of construction technology deviate considerably from generally recognised technical rules or belong to the group of "unregulated construction products". These construction products or types of construction require either a general building approval (abZ) or approval in individual cases, a general building test certificate (abP) or a European Technical Assessment (ETA).

Certification in accordance with the EU Construction Products Regulation (CPR) necessitated by System 1

The certification body of FIW München is notified according to the European Construction Products Regulation (CPR) by the German Institute for Construction Technology (DIBt). One of the prerequisites for this is accreditation by the Deutsche Akkreditierungsstelle GmbH (DAkkS).

For European standardised construction products, the "systems for assessment and verification of reliability of performance" are regulated in Annex V of the CPR. Thermal insulation materials are initially always assigned to System 3, in which certification is not stipulated.

Some of the properties of thermal insulation materials fall into System 1 for the assessment and evaluation of reliability of performance due to their classification under Basic Requirements (BWR) 1 or 2 pursuant to Annex I of the Construction Products Regulation. In System 1, the notified certification body carries out product sampling for initial testing, an initial inspection and periodic auditing of factory production control (FPC). Regular sampling and testing of their properties is also not stipulated in System 1.

Certification pursuant to the CPR is limited to the properties that are governed by System 1. For thermal insulation materials, this is often the fire behaviour in classes C, B and A, if the production process influences the fire behaviour. In such cases, the "Certificate of Constancy of Performance" only indicates the fire behaviour. This means that the thermal conductivity of an insulation material is generally not certified pursuant to the CPR and is declared solely by the manufacturer.

In the declaration of performance (DoP), the manufacturer declares the properties of their construction product independently and in a legally binding manner and names any certification body that may have been involved as well as the notified testing body that carried out the required initial test. By using the CE mark, the manufacturer establishes the conformity of the construction product with a European Product Standard or European Technical Assessment (ETA) and refers to its Declaration of Performance.

Mandatory certification by the building authorities pursuant to the State Building Codes (LBO) for non-European harmonised building products

The certification body of FIW München is recognised by the building inspectorate as an approved certification body in accordance with the State Building Codes (LBO). FIW München is listed in the Directory of PÜZ Bodies of the German Institute for Building Technology (DIBt) for a large number of building products - mainly insulation materials.

Construction products covered by a harmonised European standard (hEN) or a European Technical Assessment (ETA or ETB) may not be regulated in parallel by the member states. Furthermore, the European standards and assessments are considered to be complete, which means that no additional national requirements need to be imposed on these construction products (see ECJ ruling C-100/13 of 16.10.2014). This means that general building inspectorate approvals (abZ) can now only be issued by DIBt for insulation materials for which there is no hEN or this has not yet been published in the OJEU (Official Journal of the European Union) and for which an applicant has not yet applied for an ETA.

General building inspectorate approvals (abZ) define the properties of the building product, regulate its use and require internal monitoring by the manufacturer and external monitoring by a recognised monitoring body with complete product testing twice a year.

A certification body approved by the building inspectorate verifies the conformity of the requirements according to abZ with the test and audit results of the testing and inspection body and issues a certificate of conformity. The manufacturer then marks the approved product with the Ü symbol in line with the "Regulation on the Mark of Conformity (ÜZVO)".

Voluntary certification schemes

While a CE label primarily indicates compliance with legal minimum standards, voluntary certification programmes offer consumers real added value: tested and certified compliance with uniform European quality standards. They also combine the various European and building authority requirements into one uniform scheme and enable different verification procedures to be merged on one level. Furthermore, these certificates can be used to verify compliance with individual requirements for the respective application. However, "voluntary" does not always mean "voluntary", meaning that there are different degrees of freedom for certification depending on the programme or certification mark.

Insulation KEYMARK

The KEYMARK is the voluntary certification scheme run by the European Committee for Standardisation (CEN). The Insulation KEYMARK, which regulates the certification of insulation materials for buildings and insulation materials for technical building equipment and industrial plants in the "Scheme Rules", is responsible for the implementation of thermal insulation materials. KEYMARK-certified products may bear the trademarked CEN KEYMARK symbol.

The requirement for inclusion in the Insulation KEYMARK catalogue is a harmonised European product standard (hEN) within which the insulation material falls. The KEYMARK certificate confirms the compliance of the listed products with the nominal values, levels and classes declared by the manufacturer pursuant to the hEN.

If no hEN has yet been issued for an insulation material or if properties that are not regulated in the hEN also need to be certified, it is possible to record this through individual voluntary certification programmes or quality assurance in accordance with VDI 2055 for technical/industrial applications.
The Insulation KEYMARK Scheme Rules require all properties declared in accordance with an hEN to be tested once a year using samples taken at the manufacturing plant. All the properties of insulation materials for technical building equipment and industrial applications must be verified for each certified product (product certification). All declared nominal values, levels and classes within a product group are tested once a year for insulation materials used in buildings.

FIW München is an authorised certification body (empowered body) and a registered laboratory as defined by the Insulation KEYMARK. FIW München is also a member of the "Quality Assurance Committee" (QAC) which acts as the steering committee for the Insulation-VDI-/KEYMARK certification programme, as well as the "Scheme Development Group" which is responsible for drawing up and amending basic documents.

Voluntary certification programmes offered by FIW München

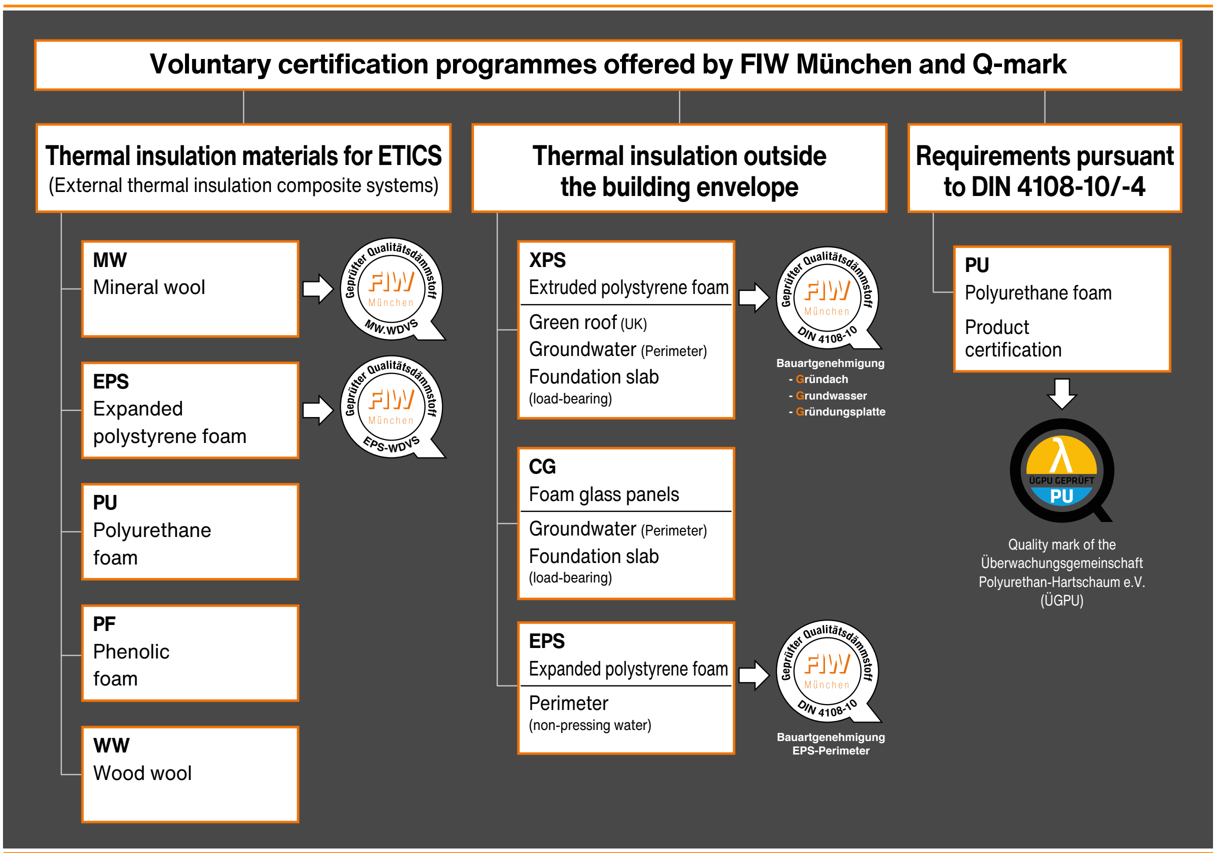
Voluntary certification schemes run by FIW München offer the possibility to obtain additional certification for properties or performances of a construction product that cannot be declared according to a European product standard (in contrast to the KEYMARK). They can be tailored individually in terms of the scope of testing and the implementation of certification (e.g. implementation of product sampling or certificate creation), allowing requirements from national application rules or bilateral agreements from manufacturers and customers to be taken into account.

As in the past (during the era of general building inspectorate approvals), manufacturers of thermal insulation materials, for example, are able to demonstrate to the planner, building contractor or end customer that inspections of the manufacturing plant, the manufacturer's laboratory as well as the annual random sample testing and confirmation of usability have been carried out. In addition, they also receive quasi automatically measured values from external surveillance conducted by a notified testing laboratory, which assist with the extension of any type-approval that might be required.

Voluntary certification schemes run by FIW München always require product certification, which means regular testing of all the relevant properties on a product sampled during a factory inspection. Twice-yearly auditing of the factory's in-house production control (self-monitoring) is just as much a part of the programmes as the transparent and consistent implementation of certification with the issuing of certificates and their revocation in the event of repeated non-compliances.

FIW München's certification body is accredited pursuant to EN 17065 by the DAkkS to carry out certification in accordance with voluntary certification schemes. FIW München has been developing and operating certification schemes since 2015 and offered the following ten schemes for different products and requirements in 2020:

- Certification scheme for ETICS insulation materials made of expanded polystyrene (EPS)
- Expanded scheme for ETICS insulation materials made of expanded polystyrene (EPS)
- Certification scheme for ETICS insulation materials made of mineral wool (MW)
- Certification scheme for ETICS insulation materials made of phenolic resin (PU)
- Certification scheme for ETICS insulation materials made of wood wool (WW)
- Certification scheme for ETICS insulation materials made of phenolic resin (PF)
- Certification scheme for thermal insulation materials for buildings made of polyurethane (PU)
- Certification scheme for insulation boards made of extruded polystyrene foam (XPS) as thermal insulation outside the waterproofing
- Certification scheme for insulation boards made of expanded polystyrene foam (EPS) as thermal insulation outside the waterproofing
- Certification program for insulation boards made of cellular glass (CG) as load-bearing layer and thermal insulation outside the waterproofing



Voluntary certification schemes: Certification under a voluntary certification scheme run by FIW München is always a requirement for the use of the Q-mark as a registered European Warranty Mark, which signifies the comprehensive certification and reliability of the insulation material.

The Q-mark

The Q-mark is a registered European certification mark which demonstrates that an insulation material has been extensively certified and is reliable.

A Q-mark is registered as a certification mark at the EUIPO, the European Intellectual Property Office, and is accompanied by a detailed legal examination of the statutes. This always refers to the stipulations in the various certification programmes offered by FIW München. Certification obtained through a voluntary certification scheme is therefore always a prerequisite for issuing a Q-mark for thermal insulation materials.

The certification schemes that underpin the Q-mark always include:

- At least two factory inspections per year by an auditor delegated by the certification body with product sampling, of which at least one is unannounced or as part of which random sampling is ensured by alternative measures
- Twice-yearly testing of all the properties relevant to the application of the thermal insulation material, taken from a single batch during factory inspections
- An audit of the factory production quality control system at least twice a year to check the reliability of the performance and the test results, based on the European product and conformity standard and additional application-related requirements
- The transparent and consistent certification process with temporary certificates and/or registration of the certificates on the FIW homepage

Cooperation agreement: Alexander Sinner, Chairman of FPX, and Prof. Andreas Holm, Head of Institute at FIW, at the signing of the cooperation agreement for the introduction of a certification system for voluntary and independent monitoring to ensure high standards of quality of XPS insulation materials

7 Research and Development

General information

The Research and Development department is responsible for the research activities of the institute with regard to thermal insulation. In the last few years, two thematic focal points of our project work and research activities have emerged. On the one hand, we focus on developing and improving insulation and building materials as well as building components and insulation constructions in terms of their thermal and moisture properties. This has been one of FIW München's classic fields of activity in applied research for more than 100 years.

On the other hand, however, there has been a significant increase in projects and questions concerning the energy efficiency of buildings and facilities. We are increasingly being asked for studies and calculations on how to save energy in existing buildings, on the sustainability of materials and building designs, and on the problem of "grey energy" in buildings and facilities. Clients in these cases include associations and stakeholders from product groups and others represent the housing industry, systems engineering and building envelope companies, as well as institutions and ministries of the federal and state governments. We selectively complement our expertise in thermal insulation and energy efficiency of components, systems and buildings by collaborating with other institutes and research centres, for example on systems engineering for heating or ventilation and water heating in residential and non-residential buildings.

In light of German and European climate legislation, questions about greenhouse gas emissions over the entire life cycle of buildings, components and systems are currently coming to the fore. Now that the transmission heat losses of buildings and components have already been reduced to a very great extent by the various Ordinances on Thermal Insulation and energy saving ordinances, the amounts of energy required to produce the components, systems and buildings are coming under increasing scrutiny. In this context, the technical issues of energy efficiency have largely been solved thanks to products from the construction and insulation industry: tried and tested products are available for new buildings and existing buildings as well as for all technical applications. Follow-up questions now concern the economic efficiency of measures in new and old buildings - from a microeconomic perspective for investors and from a macroeconomic perspective for Germany and Europe.

The constraints for all these studies are very volatile. The carbon price will result in significant shifts in the energy prices for fossil fuels. The ongoing decarbonisation of electricity and district heating in Germany will also have an impact on energy costs, but above all on greenhouse gas emissions for the construction sector. The use of renewable energy sources for heating buildings (especially pellet heating systems) also plays a role in the complex overall assessment.

Research is nevertheless continuing to improve materials, products and systems, both in improving the thermal and moisture properties and in reducing the environmental impact of manufacturing the products. The R & D department at FIW München is a flexible and reliable partner for measurements, simulations and expert assessments in this respect. Our particular strength lies in combining measurements and simulations at material, product and component level. The quality of the simulation results depends to a large extent on the quality of the material properties with which the programmes are "fed". This is why we are continuously expanding our material testing in order to be able to offer our customers the best possible quality.

The structural laboratory in particular has been expanded in recent years, for example with a fully automated device for determining sorption isotherms of building and insulating materials, plasters and mortars in the temperature range between 5°C and 60°C at ambient humidities of 0% to 98% and with a helium pycnometer for measuring the pore content and the pure density of materials.

Images of the structure and surface of materials assist with product development and can be captured at FIW München using a powerful digital microscope. Special software makes it possible to combine images from different angles of inclination with an extended depth of field to map three-dimensional structures on surfaces, for example.

The R & D department is continuously working on expanding the possibilities for distinguishing between the structure and physical properties of building and insulating materials. Further tests - especially for the fast-growing product group of thermal insulation plasters and thermal insulation mortars - are currently under development and will be available to manufacturers from spring 2021.

Large-scale component tests, for example in the Institute's hot boxes, are used to validate the ideas and improvements developed "on a small scale" on façade elements, windows, gates, masonry and technical insulation systems on a 1:1 scale. One focus of our materials research last year was on developing and improving insulating materials made from renewable raw materials in the context of industrial orders and a research project conducted by the Agency for Renewable Resources (FNR).

The segment's thermal and humidity engineering know-how is also used by other industries: Planners and manufacturers of chemical and power plants, manufacturers of refrigerators and freezers, air conditioning, transport containers and vehicles regularly rely on our expertise to optimise the thermal behaviour and long-term behaviour in the application of their products. Steady-state observations of heat transfers are no longer sufficient under normal circumstances for these applications, with predominantly changing boundary conditions instead required as a basis - e.g. daily or annual temperature fluctuations or climate data accurate to the hour for a variety of locations. These temperature fluctuations are often combined with realistic humidity conditions in order to analyse the moisture distribution in systems or to exclude any damage to building structures from the outset. Laboratory tests and simulations can then be validated by measurements recorded on site within the scope of surveillance, for example.

Further interesting questions of heat and mass transfer arise at higher air or media velocities, which are studied at FIW München using fluid-dynamic simulations. We have powerful computers and programmes at our disposal for this purpose and we are requested to do this frequently by chimney manufacturers, for example. Ongoing fluid mechanics investigations concern the thermal resistance of the air layers in roofs and between roller shutters and windows. The thermal resistance of standing air layers is well-understood, but unfortunately this is a relatively rare special case, because almost all air layers on buildings and systems are partially ventilated or even strongly ventilated cavities.

Our research fields and services

Research

- Research projects on all topics concerning the thermal and moisture protection of construction elements, individual components, complete systems, structural installations and buildings
- Research on energy saving in buildings and energy efficiency
- Application-oriented research on insulation materials, construction materials, components and systems
- Research on fundamental heat and moisture-related issues such as the systematic investigation of production parameters on the heat-related properties or the influence of moisture on the thermal conductivity of construction and insulation materials
- Applications for research projects and project management for research contracts in Germany and Europe
- Combination of numerical calculations, simulations and laboratory investigations for the further development of established products (e.g. for insulation materials made of renewable raw materials) and for new construction products (e.g. vacuum insulation panels (VIP) and insulation materials made of Advanced Porous Materials (APM)) and scientific support from initial concept to market launch
- Calculations, simulations and measurements of thermal and moisture properties; also for industries not related to construction, i.e. for refrigerators and in the logistics sector for transport containers and refrigerated vehicles
- Support along the entire construction value chain; from material to component and from component to the complete heat-insulating building envelope

Energy requirements of buildings

- Determination of the energy requirements of components, systems and buildings
- Holistic approach to thermal loss, taking the location, the climate and the user behaviour of the residents into account
- Assessment of potential for restructuring

Development of products and materials

- Optimisation of the thermal and moisture parameters of insulation and construction materials as well as of construction components and insulation structures
- Supporting the further development of materials, products, components, systems and parts through measurements, calculations and simulations
- Measurement of material parameters as input data for thermal engineering simulations
- Determination of the heat transfer of components and parts on a 1:1 scale up to a component size of 3.5 m x 3.5 m

Other research and simulations

- Simulations in the transient state with increasing or decreasing temperatures
- Simulation of movement in liquids and gases (CFD)
- Measurements of components or materials with realistic moisture content in order to analyse moisture distributions in systems and better assess damage
- On-site investigations and monitoring of existing and newly constructed buildings
- Investigation and simulation of the permanent functionality of constructions and restructuring measures
- Studies and assessments of potential
- Thermal bridge catalogues
- Support with technical manuals and product documentation

Current research activities and new approvals in 2020

Here at FIW München, we have been able to increase gradually the amount of R & D that we do over the last few years. We embarked on more new projects in 2020, and many ideas have been moved on to the application stage. In addition to the public research projects mentioned in the following, more and more industrial partners from a wide variety of sectors have commissioned FIW München to conduct (concept) studies and (application-oriented) research, which are subject to confidentiality and therefore cannot be listed in this report.

FIW study identifies higher CO_2 emissions if the Innovation Clause in the proposed Building Energy Code (GEG) is invoked

It was assumed that the freedoms afforded by the Innovation Clause in the proposed Building Energy Code would lower standards for refurbishments of connected buildings and result in higher CO_2 emissions. Our calculations now show that due to the mitigations in the current draft of the Building Energy Act, the CO_2 emissions of an accommodation could be expected to increase by up to 20%. This seriously contradicts the climate protection goals set out by the German government.

Accommodations are defined as connected residential or non-residential buildings. However, the term is not defined precisely in the draft law, with only free float being excluded. The Innovation Clause could therefore be applied to almost any 'cluster' of buildings. All five million semi-detached and terraced houses in the country could therefore be regarded as accommodations. Some two million apartment buildings were also built using what is known as a closed construction method. The Innovation Clause could provide a loophole for all of them.

The clause in section 103 of the October 2019 draft of the GEG stipulates that several buildings in an accommodation can meet the energy efficiency requirements collectively following a refurbishment. If one building in the accommodation is modernised in an energy-efficient way, the remaining buildings need only meet a considerably lower standard for the building envelope, with mitigations of up to 40%.

FIW München has calculated the consequences of this draft on the basis of three typical refurbishment projects. Invoking the Innovation Clause would result in CO_2 emissions being up to 20% higher once the impacts of the accommodation are taken into account.

The study is available as a free download:

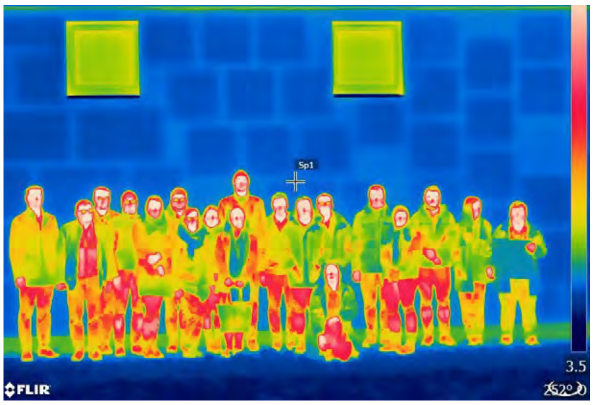
https://buveg.de/politik/#studien

Completed public projects

INNOVIP

The European research project "INNOVIP" came to a successful conclusion in autumn 2020. The 13 European partners did not let the COVID-19 pandemic stop them, even though some institutes in France, Spain and Portugal had to close down completely during the lockdown in spring. Fortunately, shortly before the lockdown, the last insulation measures were performed on the demonstration buildings and monitoring was initiated. FIW München was able to take over some of the audits being carried out by the institutes that had to close due to the pandemic. This allowed the project to be successfully completed during difficult times with only a short extension of three months. Only the international conference planned for April 2020 at the Bavarian Ministry of Economic Affairs had to be postponed due to travel restrictions, and even then it was only able to take place virtually in July.

The project coordinated by FIW München focused on further developing and improving vacuum panels for use as building insulation. The panels became better, more robust, cheaper and more durable all at the same time. Only the cooperation of an international consortium, involving manufacturers of core materials, foils, functional components, panels and building systems, made it possible to achieve these ambitious goals. The industrial companies were supported by scientific institutes and the construction industry.



Thermal bridge effect: Representatives of the INNOVIP consortium in front of the demonstration wall with the ETICS product made of vacuum panels with EPS sheathing. In the infrared image, the panel edges with their thermal bridge effect are clearly visible.

Loose silica and even volcanic perlite were analysed and tested as new, alternative core materials for vacuum insulated panels in the building sector. A design with a shaping cardboard box was used so that the loose filling materials would not result in a shapeless insulating material after evacuation. Using edge strips made of additional materials and other insulating materials offered a better means of securing the panels. The new products can be finished with a range of topcoats and have optional additional 'features' for specific applications that are achieved using nanomaterial coatings, such as the ability to reduce levels of VOCs in the air, cap temperature peaks or inhibit mould growth. The foils have also been significantly revised to ensure that the new panels can show their improvements in the long term. The project succeeded in combining several production processes and producing films, the barrier properties of which far exceed those of commercially available standard films. It was subsequently possible to reduce the number of barrier layers of such films without impairing the properties, which should result in a significant price reduction.

The consortium's website:

https://innovip-h2020.eu/

Image Film:

www.youtube.com/watch?v=isGYHMsVdRE

This project was funded by the European Union's Horizon 2020 research and innovation programme under grant agreement no. 723441.

INNOVIP Demo Product

INNOVIP Demo Product

Rapid-U

Gefördert durch:

Bundesministerium für Wirtschaft und Energie

aufgrund eines Beschlusses des Deutschen Bundestages

The German-Finnish collaborative project "Rapid-U", which aims to validate a measuring device for in-situ measurement of the heat transfer coefficient, was completed on schedule in 2020. Extensive laboratory tests were carried out on typical exterior walls of existing buildings for the project (03ET1564A), which was funded on the German side by the Federal Ministry of Economics and Technology through the project management organisation Jülich. Numerous buildings and building components were analysed through the cooperation with the German Energy Consultants' Network (DEN).

It is essential to have the most accurate knowledge possible about the true energy performance of a building in advance in order to carry out economical and efficient refurbishment measures. Calculating the U-value using tabulated values is often inaccurate and very risk-averse. Taking measurements with traditional methods is very time-consuming and expensive. Conversely, using short-term measurement methods is highly inaccurate and prone to error. Given that investments in energy efficiency measures are mainly triggered in the private sector when the measures are economical and the investors are presented with a vivid picture of the condition of the building components, measuring the actual quality of the building components on site is a very good way to stimulate energy efficiency measures in the building stock.

A fast, easy-to-use and non-damaging method for determining the U-value of a component was assessed in the course of the project. A large number of buildings can be surveyed quickly and inexpensively thanks to the simplicity of the measurement process. The resulting deeper knowledge of the building components helps with needs-based planning of any required renovation measures and acts as the basis for precise calculations of the expected savings. This also prevents any potential oversizing of measures because of safety margins in tabulated values, which in turn reduces investment costs and increases the attractiveness of energy renovation measures for investors and owners.

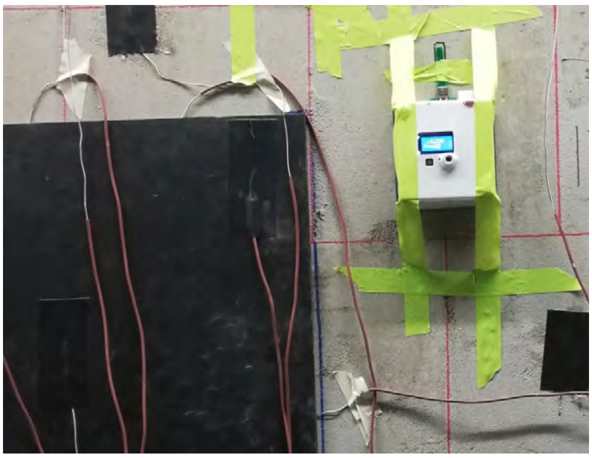
In addition to the potential savings and the improvements in demand-oriented planning, a U-value measurement system such as Rapid-U also allows for on-site monitoring of the success of insulation measures and quality control of individual building components. This increases the acceptance of and trust in energy-efficient renovation measures among the general public. This creates particularly high potential when it comes to residential buildings, as a large proportion of the building stock that is in need of refurbishment is privately owned.

The primary objective of the laboratory and in-situ investigations was to validate the performance of the Rapid-U devices under different boundary conditions. In the course of the experiments, eight wall types typically found in residential buildings in Germany were subjected to detailed laboratory tests to determine their thermal properties. The reference values of the thermal properties were determined using established laboratory measurement methods.

A graded approach was used for the Rapid-U measurements. The actual measurement accuracy and the impact of mounting the units on a wall were verified in experiments at constant temperatures both indoors and outdoors. It was ascertained that the measurement method delivers results with good accuracy, despite the very short measurement times of between 45 and 90 minutes. The effects of mounting and handling were included in the subsequent tests, in which variable temperatures were applied to the outside of the components, as they are often unavoidable in reality. Extensive simulation calculations were also carried out for this purpose.

U-value measurement results under transient boundary conditions fluctuate depending on the thermal inertia of the components and the temperature curves. These influences are eliminated by averaging for transient long-term measurements, such as with heat flow measuring plates. This cannot be done with short-term measurements and the measured values always represent the prevailing heat flow during the measurement period. Finding time windows or even predicting when a short-term measurement will yield results that match the steady-state U-value is the real challenge of measuring U-values in a short period of time.

Using the Rapid-U measurement system correctly requires a high level of experience and knowledge of the measurement technology as well as the thermal behaviour of components under real and therefore fluctuating boundary conditions. The alignment and positioning of the devices on the component surfaces that are to be measured also have a significant influence on the measurement results. While the reference methods have an integrative character because of the larger measurement areas, the impacts of small-scale inconsistencies are directly reflected in the results of the Rapid-U instruments. The top priority during the project was therefore the training and continuous professional development of experts in how to apply the Rapid-U measurement technique in practice by means of a constant exchange of empirical values from the laboratory and the field. Partially valid results could therefore be obtained using the Rapid-U measurement technique, even under in-situ conditions. However, in Germany's temperate climate, only a few days a year are suitable for taking a quick U-value measurement with Rapid-U because it is critical to comply with certain boundary conditions. This puts further restrictions on the usability of Rapid-U.



Rapid-U devices in use on a test wall in the hot box test rig

Project 03ET1564A was funded by the Federal Ministry for Economic Affairs and Energy on the basis of a resolution of the German Bundestag.

EMIRIM – Improving emissivity measurements on reflective insulation materials

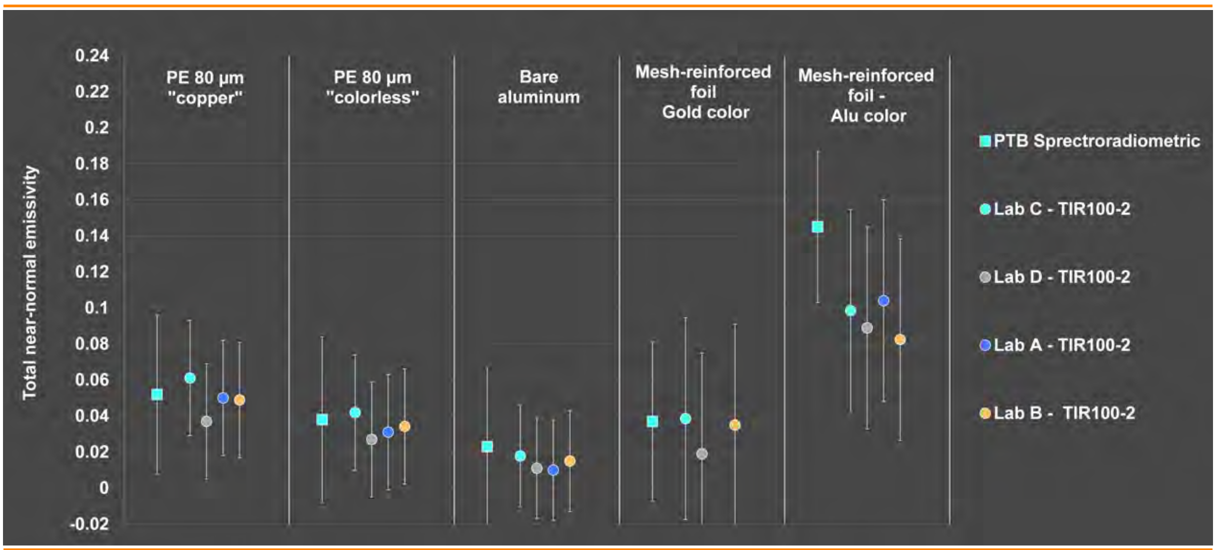
FIW München was one partner in an illustrious group that was involved in a three-year project to improve measurements of the total hemispherical emissivity of reflective films: national metrological institutes, institutions involved in certifying insulation materials, research laboratories, a manufacturer of low-emissivity insulation materials and the manufacturer of TIR-100 emissometers (IN-GLAS).

Alongside improving the accuracy, repeatability and calibration of the industrial measurement technique, one aim of the project was to develop a "best practice guide" for emissivity measurements using the TIR-100 instrument. Important boundary conditions for carrying out the measurement were defined.

Taking measurements with the TIR-100 devices provides an almost normal emissivity, which still has to be converted into the total hemispherical emissivity for use in construction, for example in measuring the thermal resistance of air layers or gas gaps in glazing.

Both the uncertainties in measuring the normal emissivity using the TIR-100 device and the uncertainties in converting it to hemispherical emissivity were analysed in the project. This yields a combined expanded uncertainty of 0.36 for the total hemispherical emissivity. This conclusion is based on a limited number of emissivity results with relatively large uncertainties. As a consequence, at this time the members of the EMIRIM project recommend against lowering the limit value for the lowest declarable emissivity to 0.05, as is envisaged in the proposed amendments and comments aimed at improving DIN EN 16012.

The project was funded by the European Metrology Programme for Innovation and Research (EMPIR) under grant agreement 16NRM06 "EMIRIM". The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the countries participating in EMPIR.



Emissivity measurements: Comparison of the measurement results on different reflective foils from various laboratories using the TIR-100-2

New research project

THEA

Gefördert durch:

Bundesministerium für Wirtschaft und Energie

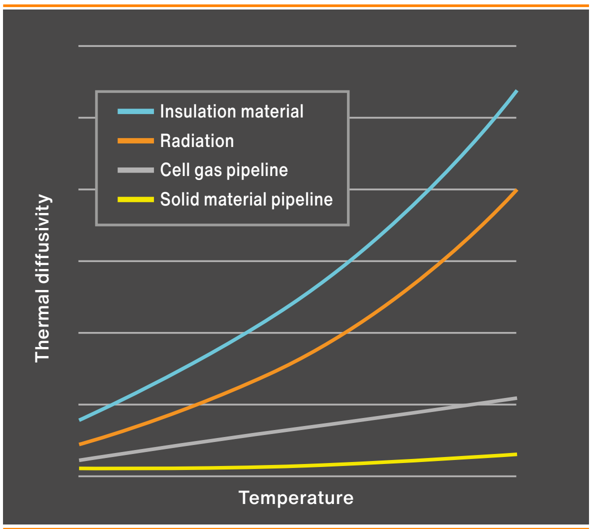
aufgrund eines Beschlusses des Deutschen Bundestages

In this publicly funded project, two research institutions - the Deutsches Zentrum für Luft- und Raumfahrt e. V. (German Aerospace Centre) and we, the Forschungsinstitut für Wärmeschutz e. V. München (FIW München) - will develop thermally and acoustically insulating materials using aerogel composites and create shielding with them, from the laboratory to the sandwich component, characterise them with a newly developed measuring apparatus, manufacture them and test them under real-life conditions. Reference samples are also being developed that can be used for instrument calibration and round robin tests, among other things. Taking part in the project are our industrial partners MERCEDES-AMG GmbH, Adler Pelzer Holding GmbH, BSH Hausgeräte GmbH and Diehl Aviation Laupheim GmbH.

Our objective is to develop a thermal conductivity measuring device for the temperature range between 800°C and approximately 1000°C, which is of particular interest in industrial applications as well as in the automotive sector. In this respect, we are already in a position to expand on a wealth of experience: The measuring range of our GHP devices already goes up to a temperature of approximately 850°C hot side temperature, which is unmatched by any commercial supplier worldwide.

Measuring the thermal insulation properties of a material layer –in the case of insulating materials usually a plate – is typically carried out in a plate device (Guarded Hot Plate = GHP) or a heat flow meter (HFM). The technique involving the plate device is the reference method used to obtain an absolute measurement. The thermal conductivity measurement is derived from the current and voltage measurements, the dimensions and the temperature. The heat output of the warm measuring zone and the temperature of the cold side must be kept constant. Depending on the thermal resistance of the sample, a constant temperature difference can then be identified on the surfaces of the sample. This means that the heat flow through the sample remains stable. It is therefore a steady-state procedure.

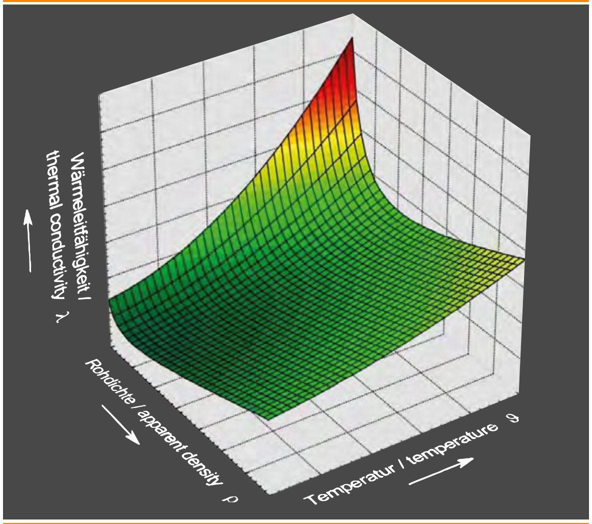
Strictly speaking, the thermal conductivity measurement is an equivalent thermal conductivity that combines the heat transfer paths of solid heat conduction, thermal radiation, heat conduction of the gas enclosed in the pores and convective heat transfer in one parameter (Figure 1). The thermal resistance of a sample is usually measured and with it the capacity of a layer of material to reduce heat transfer. Converting the thermal resistance to the thickness of the insulation layer turns a value measured on a layer into a parameter for a material that is independent of the thickness.



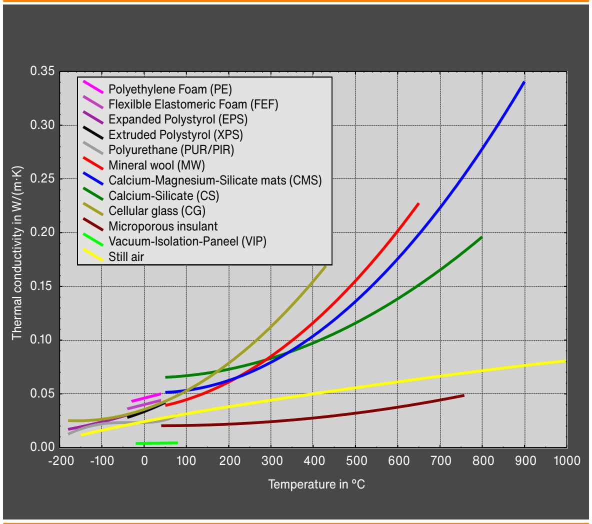
1: Heat transfer in an insulation material as the sum of the individual components

In contrast to the building sector, where the (equivalent) thermal conductivity for the average temperature of the insulation layer of 10 °C is usually given as a fixed value, the thermal conductivity as a function of temperature is needed for virtually all technical applications - and often for a very wide temperature range (Fig. 3). Given that the transfer of heat by radiation in particular depends to a large degree on temperature, the thermal conductivity of a substance increases by the third power of temperature. In materials with a very low bulk density and an open-cell structure, this increase is compounded by a significant amount of heat transfer due to convection in the material layer under consideration (Fig. 2).

The aim of this project is to develop aerogels for thermal and acoustic insulation purposes for various temperature ranges. Their area of application for insulation or shielding in the field of industrial high-temperature processes, combustion engines, gas turbines and even high-temperature fuel cells, which are rapidly gaining importance in the mobility sector and beyond, is in the range of high temperatures of up to 1000°C. Other potential uses include ovens and cookers, for instance those with ceramic hobs, where high temperatures occur and large temperature differences have to be bridged in a very confined space. Due to the very fine-pored structure of the aerogels, the temperature dependence of the thermal conductivity is significantly less pronounced than with conventional insulation materials, which is another favourable property of the aerogels that lend them to use as high-temperature insulation.



2: Thermal conductivity as a function of temperature and bulk density



3: Thermal conductivity as a function of temperature and bulk density

8 FIW München events and publications

Events, seminars and trade fairs

Seminars

FIW München successfully hosted seminars on the topic of thermal insulation for technical installations for a number of years. In addition to the training courses for insulation manufacturers held at the institute, the contents can also be individually adapted to meet the demands and requirements of customers. The training courses cover the basics of heat transport and heat transfer as well as calculations and application examples.

As a result of the long-term rise in energy prices, the impact of moisture and corrosion on the calculations of insulation and economic efficiency are clearly presented to the training participants. Last but not least, the topic is rounded off by an informative look at the applicable standards, regulations, worksheet and product specifications.

Teaching and lectures

Prof. Dr.-Ing. Andreas H. Holm

- “Fundamentals of building physics", Munich University of Applied Sciences
- "Dynamic hygric-thermal behaviour of buildings" as part of the master's programme in civil and environmental engineering, Technical University Munich

Presentations

Prof. Dr.-Ing. Andreas H. Holm

- “Strategy for Renovation: how deep should we go?”, National Dialogue Event on the topic of the European Green Deal and German EPBD Implementation, 1 January 2020 at the Bundestag in Berlin
- “What can or must ETICS quality certificates achieve in the future?”, Allgäuer Baufachkongress 2020, from 15 - 17 January 2020 in Oberstdorf
- “Prerequisites for optimal acoustics and a good indoor climate - The right sound and thermal insulation. A clear view of windows + facades” - New build + refurbishment of schools + day-care centres, 1st Architects' Day on Windows + Facades on 23.1.2020 in Berlin
- “CO_2 savings and energy efficiency in the residential building sector from the perspective of the planned federal funding for efficient buildings”, BuVEG - Bundesverband energieeffiziente Gebäudehülle, 28 January 2020 in Berlin
- “The new Building Energy Act (GEG) - what has changed?”, KALKSANDSTEIN Building Seminars 2020, on 11 February 2020 in Papenburg, 12 February 2020 in Bremen, 18 February 2020 in Norderstedt, 19 February 2020 in Hanover, 20 February 2020 in Osnabrück.
- “Refurbishment breadth and/or refurbishment depth?”, "Efficiency class instead of mass", Berlin Energy Days on 27 May 2020 in Berlin
- “The role of the building envelope in the context of the 2050 goals”, Roadmap Energy Efficiency 2050, 1st meeting of the Buildings WG, online presentation
- “When will a building be fit in 2050?”, keynote lecture at the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety - BMU, on 23 June 2020, online lecture.
- “Why is everyone talking about grey energy?”, FSDE Digital Expert Forum (Forum for Safe Insulation with EPS), on 17 September 2020, online lecture.
- “Innovations in the facade sector”, Future Perspectives in Facade Construction conference at the TU Berlin, on 13 November 2020, online lecture

Christoph Sprengard

- “Innovative Vacuum-Insulation-Panels (VIPs) for the use in the building sector – INNOVIP – project summary” at the INNOVIP Final Dissemination Webinar on 15 July 2020, online event

Publications

- C. Sprengard and U. Berardi, “An overview of and introduction to current researches on super insulating materials for high-performance buildings”, Energy and Buildings, Volume 214, 1 May 2020

- C. Sprengard, „Nachhaltigkeitsaspekte bei Materialien und Konstruktionen für energieeffiziente Gebäude – Langzeitbetrachtungen für Bau- und Dämmstoffe“ in the conference proceedings of the 22nd EIPOS EXPERT CONFERENCE ON BUILDING DAMAGE ASSESSMENT/14th BVS BUILDING SYMPOSIUM, Dresden, 10/11 December 2020

- C. Sprengard und M. Klempnow, “U-Wert-Messung am Objekt – Wissenschaftliche Erkenntnisse aus dem Forschungsprojekt ‘Rapid-U’ – Untersuchungen im Labor und in der Praxis” in the conference proceedings of the 31st Hanseatic Refurbishment Days - Protecting and Preserving - with Expertise and Craftsmanship, Lübeck 2020/2021

- C. Sprengard, C. Kokolsky und W. Meyer, “Innendämmung mit Holzfaserdämmplatten – Bauphysikalisch sichere Ausführung von Bauteilen und Anschlüssen”, information brochure published by the Association of Insulating Materials from Renewable Resources (VDNR), Wuppertal, 2020/2021

- R. Schreiner, “Energieeffizienzklassen für technische Dämmsysteme”, Issue 1/2020 at Isolierer.net

- R. Schreiner, “Neue Grundlagen der Normung für Dämmstoffe”, Issue 2/2020 at Isolierer.net

- R. Schreiner und K. Wiesemeyer, “Der Wärmebrückenkatalog ‘Technik’”, in the Ingenieur-Spiegel

- A. H. Holm, “Die Bedeutung der energieeffizienten Gebäudehülle für Energiewende und Klimaschutz”, https://www.fiw-muenchen.de/media/pdf/aktionsbuendnis_forschungsbericht20_21.pdf

FIW München in the press

Master theses

The following Master's thesis was supervised and completed in 2020 in conjunction with the Technical University of Munich (TUM), and more specifically the Building Physics department headed by Prof. Dr.-Ing. Dipl.-Phys. Klaus Peter Sedlbauer. Further Bachelor's and Master's theses are nearing completion.

You Wu
“The potential of an insulating material made of a combination of wood fibres and aerogels for use in construction”, Master's thesis in the field of Civil Engineering

9 Internal updates

New beeping noises at FIW München

A short beep is an increasingly common sound at some of the test benches at FIW München when a laboratory technician handles a test specimen. The source of these beeps quickly becomes clear: FIW München now uses QR codes, which are attached to the specimen, to identify the specimen unambiguously and to assign it to individual measurement results. This code contains, among other things, a unique identifier under which FIW München's integrated electronic laboratory information system (LIMS) stores all the associated measurement results.

Numerous tests were and are still necessary to ensure that all the components work together and that the goal of end-to-end electronic traceability that is available at all times can be achieved. The first step was to agree on the 2D code, which has been included in the bottom left-hand margin of every first page of an inspection report since 2020.

The IT managers then set about testing the shelf life of labels and work with the laboratory specialists to determine their optimum size. This is because the test specimens are exposed to different conditions in the course of their service life at FIWs: heat, cold and humidity are a major problem for many adhesives, and a number of inks available on the market cannot withstand the changeable, harsh test conditions. The QR scanners we used were also put through their paces.

Another problem area concerns the IT systems: some of the existing measuring stations still work with their own proprietary identifiers and must be connected to the central system. Adjustments must therefore be made to that as well. "Separating" the specimens, which are created by cutting out parts of a delivery during the testing process at FIW München and must then be clearly identifiable, led to adjustments in the LIMS data model.

The overriding maxim is that the entire process, in other words the label and its components, must not interfere with the measurement under any circumstances.

The changeover will take some time at FIW München, because for economic reasons some changes are only tackled when the respective measuring workstation is replaced. However, our customers can contribute to keeping our processes lean too:

Attach the advice note with the code sent by the engineer to the outside of your material deliveries so that the goods can be identified easily, quickly and accurately and assigned to the corresponding transaction as soon as they are received. Thank you.

Cycling for the environment and for a good cause

THE MAJORITY OF FIW CYCLING EMPLOYEES AND COLLEAGUES BEFORE THE START OF THE PANDEMIC

It started as a competition amongst budding athletes at FIW München and has now evolved into a wide-spread campaign at the institute with half of all employees now involved: the calculation of the distance cycled to work.

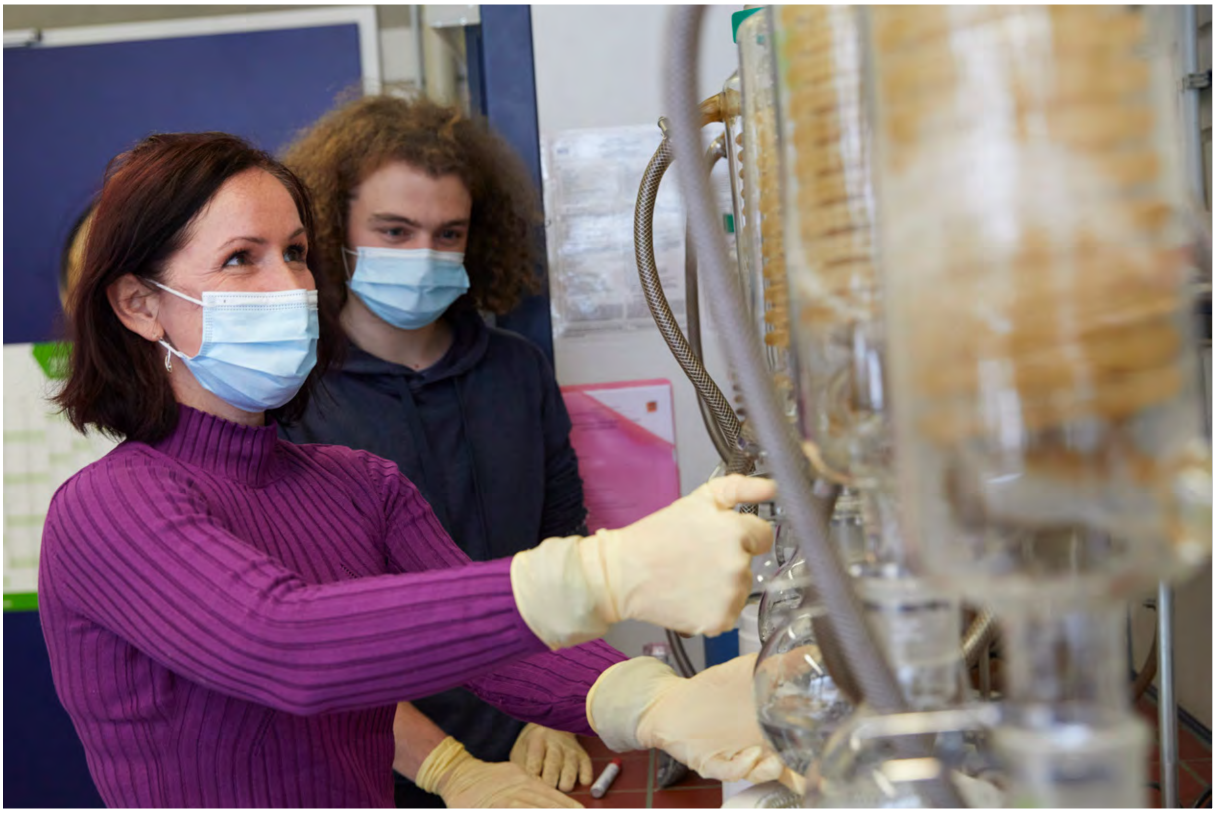
More than 40,000 km were covered in 2020. A slight decrease compared to the year 1 BC (Before Corona), mainly due to the many days spent homeworking. Eleven of our colleagues braved the wind and weather to clock up more than 100 cycling days in 2020. The longest distance cycled to work and back was 133 kilometres. All of the participants are planning on increasing the total mileage in 2021 to achieve a new best value on an individual and institute-wide level.

They aren't just motivated by the competitiveness and target of achieving as many kilometers as possible and reduce their carbon footprint with manpower. The institute's management also honours the commitment and is committed to achieving a healthier lifestyle, sustainable climate protection and a better future.

Following on from the donation of 2,500 trees as part of the children's and youth initiative Plant-for-the-Planet in 2016, support for the project "Hoffnungsstark - Umweltbildung gegen die Ausgrenzung Jugendlicher" from the "Zentrum für Umwelt und Kultur Benediktbeuern" in 2017, the Energieschule München project in 2018 and the Regens-Wagner-Stiftung Dillingen in 2019, support was given to several charitable institutions in 2020. Just as in 2019, the total amount was boosted by the savings from not sending Christmas cards by post.

There is also recognition for the commitment of the athletes: the long-awaited covered bicycle rack for those cold and wet days was finally completed in 2020. The renovation of the showers went into overtime due to coronavirus, but this is now in the final phase and they will be available in time for the start of the season.

FIW München as a training provider



Thanks to its wide range of products and services, FIW München offers a variety of opportunities for personal development, from building up technical expertise and process know-how to expanding one's range of methods, research activities, experience in project management and acquisition, and building up networks, for example by working in standardisation committees.

Starting at FIW München is as varied as it is challenging, whether as an intern, during your studies, as part of a Bachelor's or Master's thesis, as a guest researcher, through direct employment or by starting an apprenticeship. Internal training courses are used to prepare the skilled new technical employees for their responsibilities and specialised work at FIW München.

In addition to manufacturing, servicing and maintaining our physical apparatus and measuring equipment, the evaluation and recording of physical measurements is a key part of the daily routine of our physics laboratory assistants who attend the vocational school phase near the Bavarian border in Selb. You will work closely with our engineers in testing and certification as well as in research to develop new testing and measuring methods, for example.

Legal notice

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