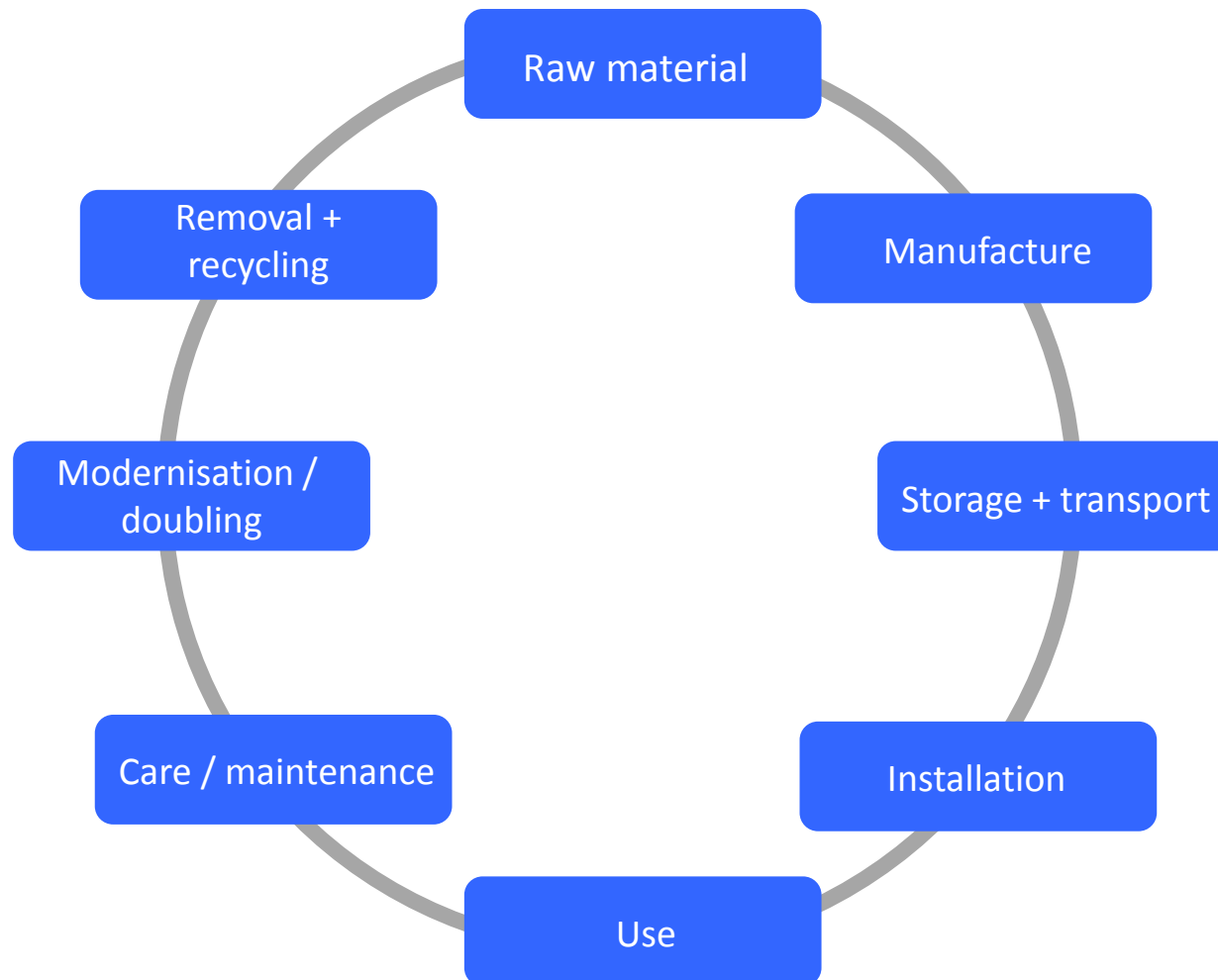


Life-cycle expectation & recycling of ETICS – experience and solutions

Third ETICS Forum on 12 October 2015 in Milan

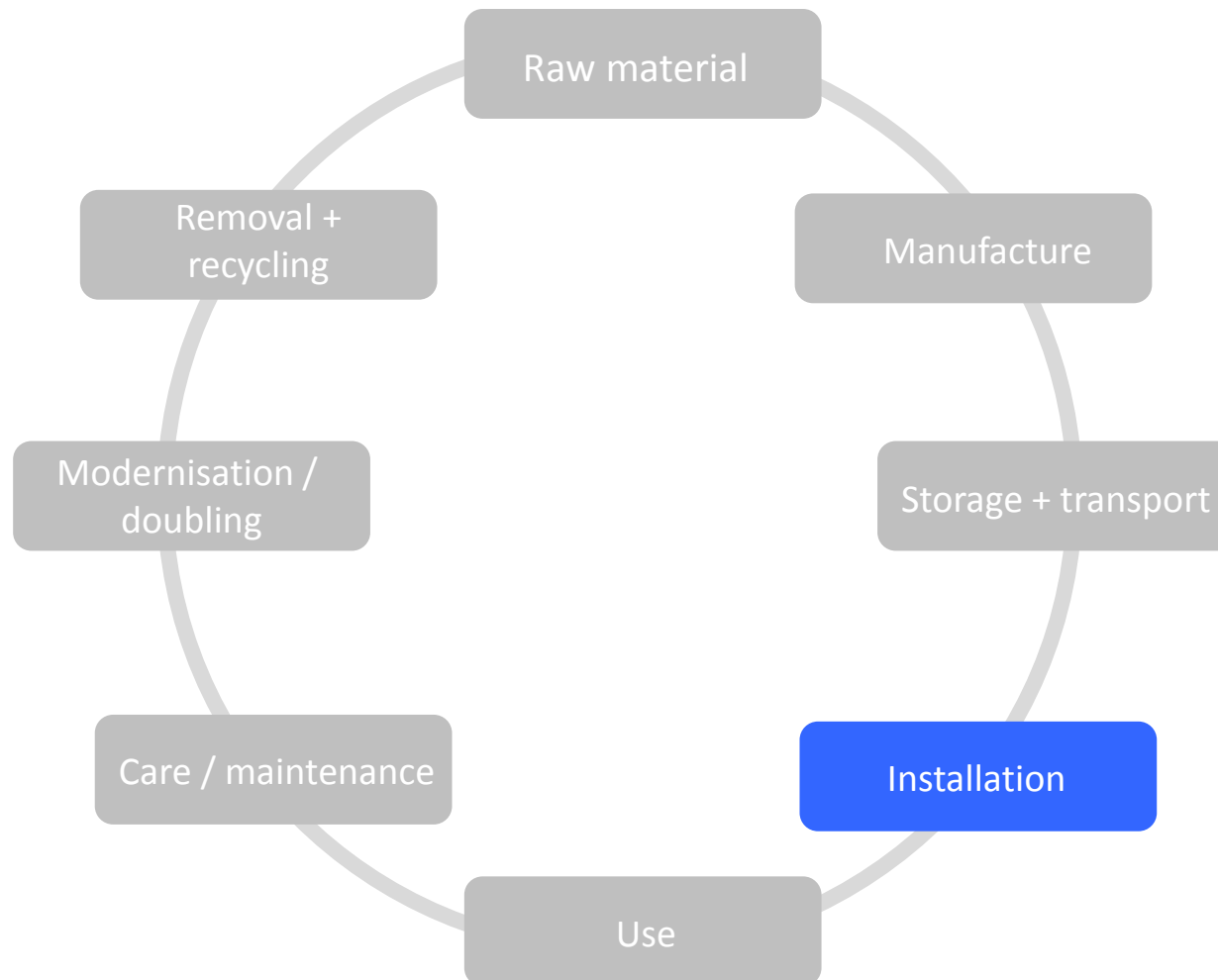
At the second European ETICS Forum held in Strasbourg in 2012, we presented you with the initial findings on the life cycle of ETICS and announced further studies on the issues of long-term viability and recycling. The results of these studies will be presented here today.





In assessing the sustainability of construction products, the following aspects play a very important role and should therefore be displayed graphically in the ETICS life cycle: the raw material, manufacture and transport. In terms of content, this talk will focus on the processes following the installation of an external thermal insulation composite system.





TEN GOLDEN RULES

for the planning and installation of ETICS

REGEL NR. 1:

Einhaltung gesetzlicher Vorschriften und Festlegung des Leistungsumfanges

REGEL NR. 2:

Beachtung der detailgenauen Ausschreibung und der Angaben der Systemhersteller

REGEL NR. 3:

Auswahl qualifizierter Fachhandwerksbetriebe – möglichst keine Subunternehmer

REGEL NR. 4:

Kontrolle der Zulassungskonformität der Systembestandteile bei Lieferung und Einbau

REGEL NR. 5:

Überwachung der Arbeiten durch Teilabschnittskontrollen nach der 5-Finger-Methode®

REGEL NR. 6:

Dokumentation der Teilabschnittskontrollen

REGEL NR. 7:

Unbedingte Beachtung der vorgeschriebenen Brandschutzbestimmungen

REGEL NR. 8:

Kontrolle der Dübelausführung – insbesondere bei zwingenden Vorschriften

REGEL NR. 9:

Beachtung der Systemqualität – billig kann am Ende teuer werden

REGEL NR. 10:

Vereinbarung eines Wartungs- bzw. Kontrollvertrages



EXAMPLE:

RULE NO. 5:

Monitoring of the performed work by inspecting sections in accordance with the five-finger method®

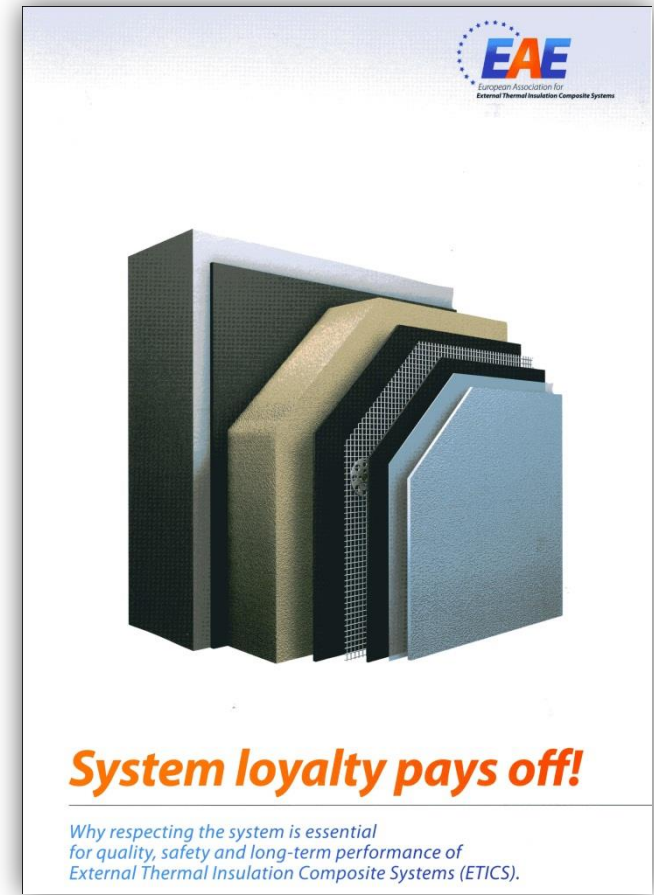
- Sub-surface inspection
- Board bonding
- Connection details
- Reinforcement
- Finishing coat

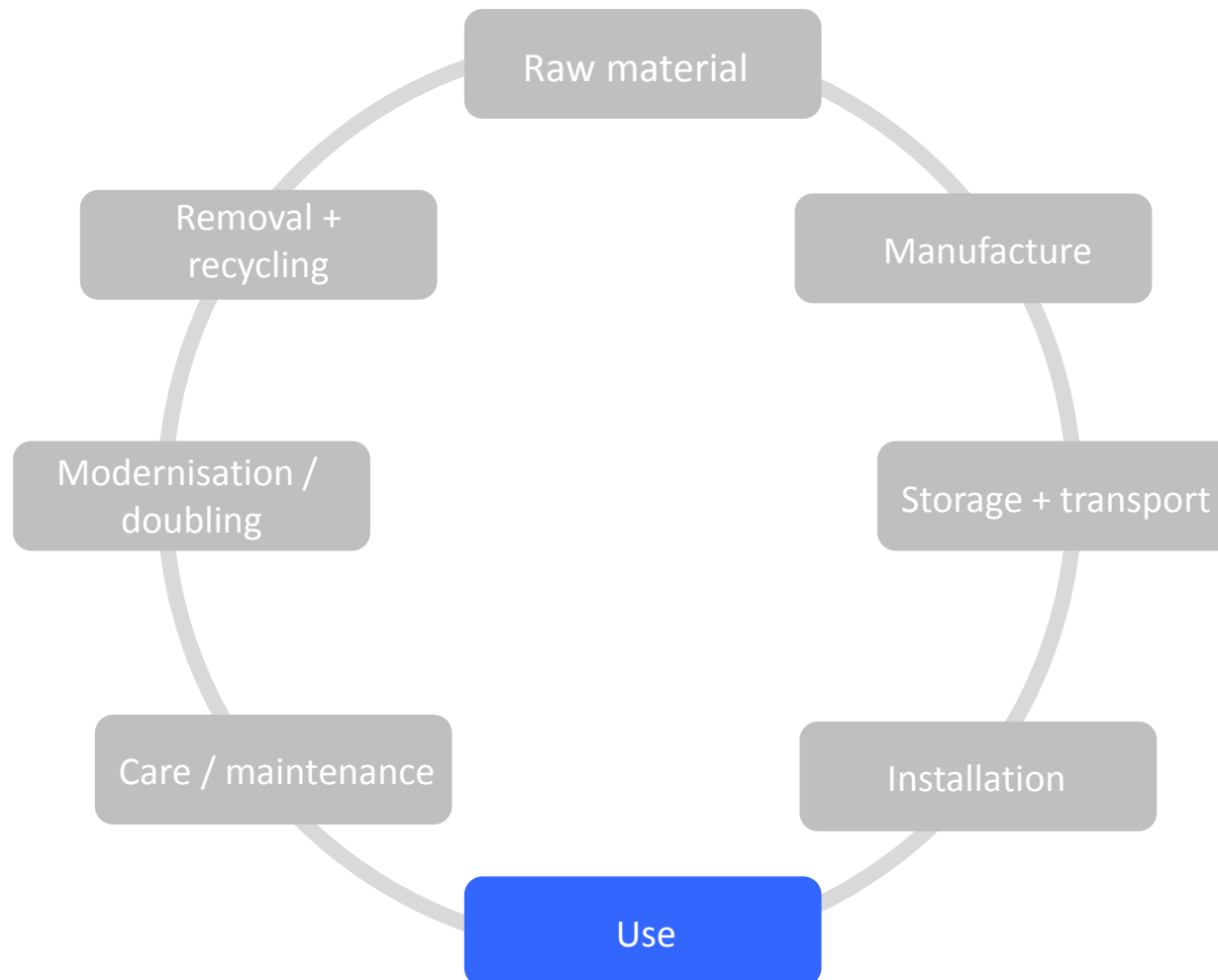


Only 100% compliance with the system guarantees that external thermal insulation composite systems are of a high quality.

The members of the EAE are unequivocally committed to ensuring compliance with the system and thus the delivery of all components of an ETICS from the authorisation holder.

The relevant reasons can be found in the new EAE brochure.



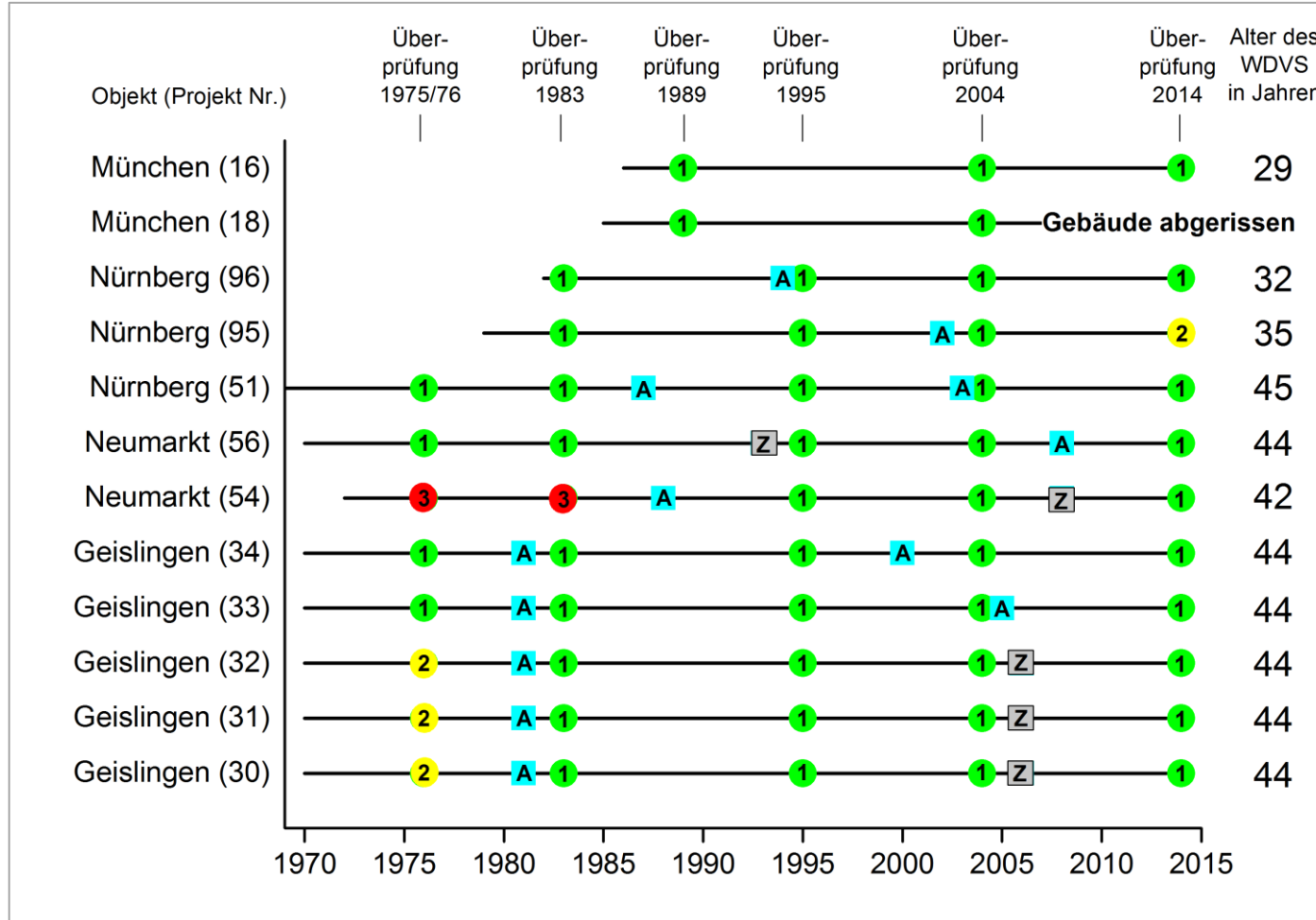


As promised in 2012, we have studied the long-term behaviour of ETICS together with the Fraunhofer Institute for Building Physics.

Since the 1970s, the Fraunhofer Institute for Building Physics has regularly surveyed a number of properties with the objective of determining how ETICS perform under practical conditions; surveys in 1975 – 1985 – 1995 – 2004. Most recent examinations in 2014.



Example: 44-year-old property; new coating and balcony renovation in 2008



Beurteilungsgruppen:

- ① praktisch ohne Mängel
- ② geringe Mängel (vereinzelt Risse an Dämmplattenstößen oder Kerbrisse an Fenstern)
- ③ größere Mängel (häufige bzw. längere Risse, Blasenbildung, Ablösung der Beschichtung, deutlich sichtbar)

Instandsetzungsmaßnahmen:

- A neuer Fassadenanstrich
- Z Aufdopplung einer zusätzlichen Dämmschicht mit armierter Beschichtung

Examples of examined properties: Property 31 Geislingen



Property 31, Geislingen, renovation in 2006 through doubling with 10 cm EPS (035), silicate coating → no deficiencies identified

Examples of examined properties: Property 54 Neumarkt in der Obepfalz

2004



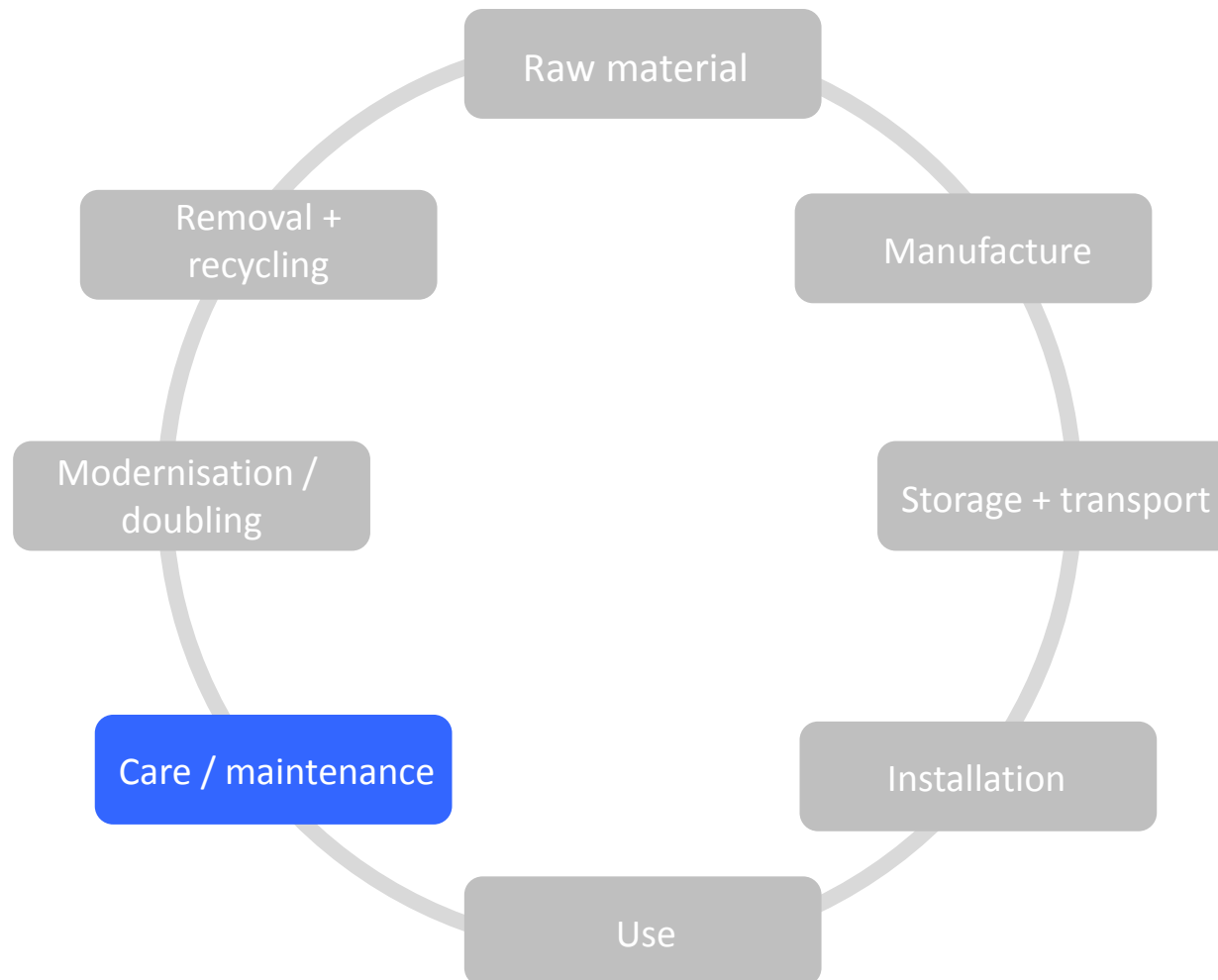
2014



Renovation in 2008 through doubling with 8 cm EPS (035), silicate coating → no deficiencies identified

Conclusion / key statements from assessment:

- The ageing behaviour and maintenance costs for facades with ETICS should not be assessed differently to conventionally plastered exterior walls;
- Damage to the facade is experienced less frequently than is the case with conventional plaster due to the decoupling effect of the insulating layer;
- New inspection confirms the IBP forecast of a ETICS service life of **60 years** (Bauphysik 28 (2006) H.3, S. 153-163).



In addition to high quality processing and compliance with the system, the requirements here include the regular **care and maintenance** of the ETICS.

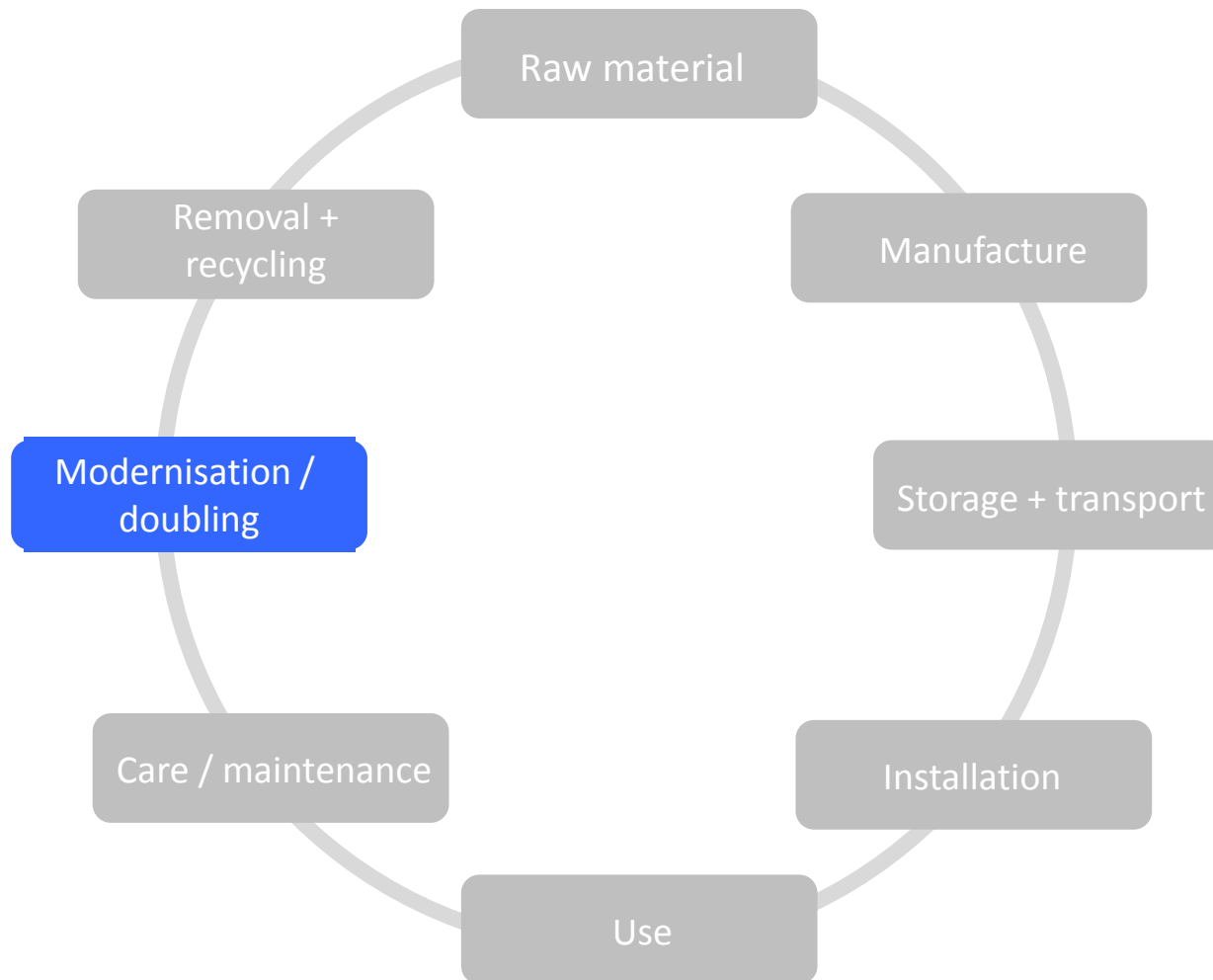
Regular inspections of the coatings and plaster as well as the facade constructions combined with a careful examination of the building's immediate surroundings can help to ensure that damage is discovered in good time and time-consuming and cost-intensive renovation work can be avoided.



What especially needs to be considered?

- Coatings and plaster must be checked for contamination, algae and fungal attacks as well as the formation of cracks;
- Connections and expansion joints must be inspected as regards their functionality and tightness;
- Horizontal surfaces such as window ledges, railing crowns and protruding components should be cleaned more frequently in order to prevent trails of dirt on the facade.





The studies conducted by the Fraunhofer Institute also show that the doubling of an existing ETICS represents a very sensible measure.

An upcoming facade renovation represents the perfect time for doubling: you will be incurring costs for scaffolding, cleaning, plastering and painting in any case.



Saving
(cumulative)

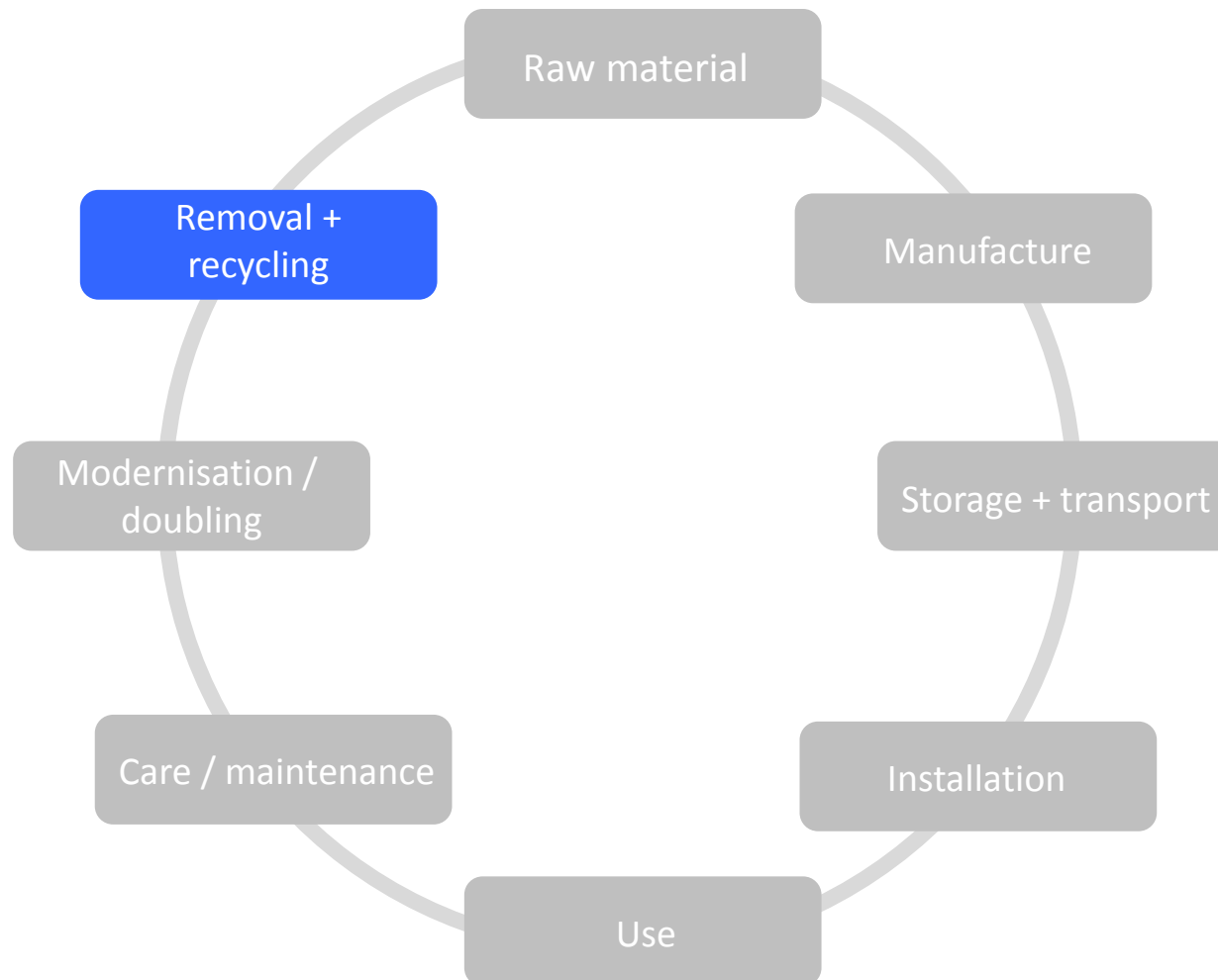
Additional saving
through doubling

Renovation
= Investment decision

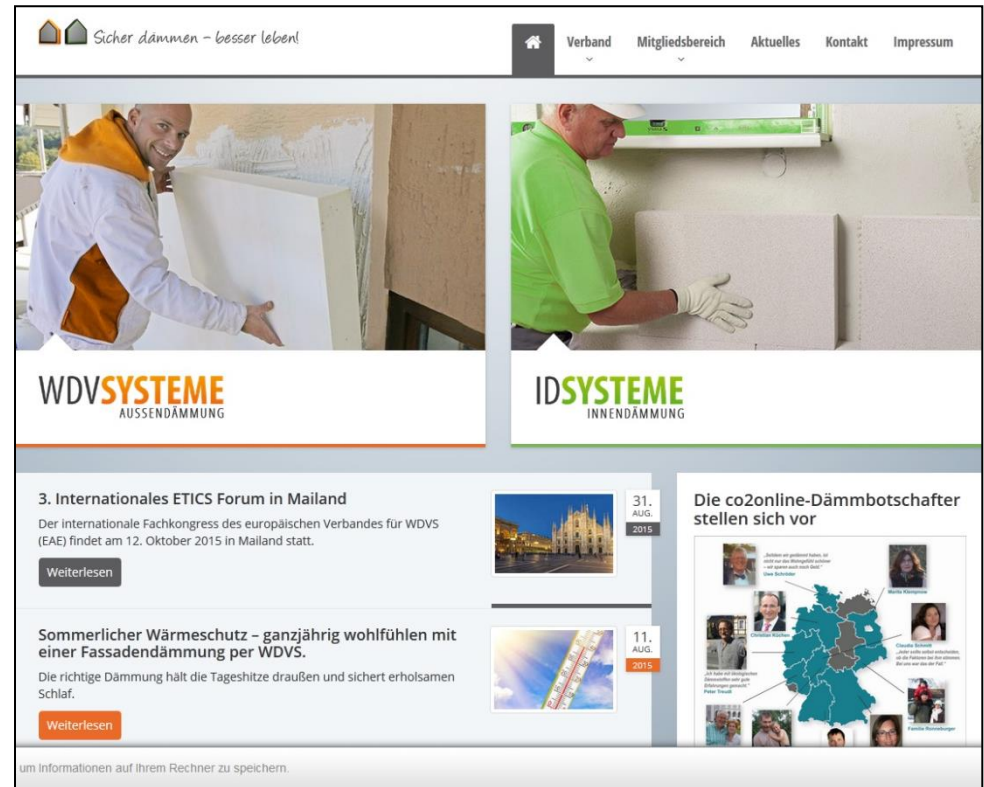
Service life >
50 years

Doubling allows for additional energy to be saved, the life cycle of the ETICS to be expanded further and also for the appearance of the facade to be improved.





The project announced in 2012 aimed at researching the **recycling of ETICS** has now been completed. The final report is available to download at www.heizkosten-einsparen.de.



The screenshot shows the EAE website with the following content:

- Header:** "Sicher dämmen - besser leben!" and navigation links: Verband, Mitgliedsbereich, Aktuelles, Kontakt, Impressum.
- Main Content:**
 - WDVSYSTEME AUSSENDÄMMUNG:** Image of a worker in a white and orange jacket installing external insulation.
 - IDSYSTEME INNENDÄMMUNG:** Image of a worker in a green shirt installing internal insulation.
- News Section:**
 - 3. Internationales ETICS Forum in Mailand:** Der internationale Fachkongress des europäischen Verbandes für WDV (EAE) findet am 12. Oktober 2015 in Mailand statt. [Weiterlesen](#)
 - Sommerlicher Wärmeschutz – ganzjährig wohlfühlen mit einer Fassadendämmung per WDV:** Die richtige Dämmung hält die Tageshitze draußen und sichert erholsamen Schlaf. [Weiterlesen](#)
- Calendar:**
 - 31. AUG. 2015:** Image of a church.
 - 11. AUG. 2015:** Image of a thermometer.
- Die co2online-Dämmbotschafter stellen sich vor:** A graphic showing a map of Germany with photos of ambassadors and their names: Jürgen, Sandra, Peter, and others.

um Informationen auf Ihrem Rechner zu speichern.

The research project and its findings are in the mainstream:

- First-generation ETICS are now facing an overhaul (renovation or doubling in order to meet the requirements of the current EnEv – Energy Savings Ordinance)
- The European Construction Products Regulation stipulates high requirements for the sustainable use of natural resources
- There is intensive debate in the media regarding the handling of EPS waste and the associated acceptance of this insulation material and ETICS as a whole

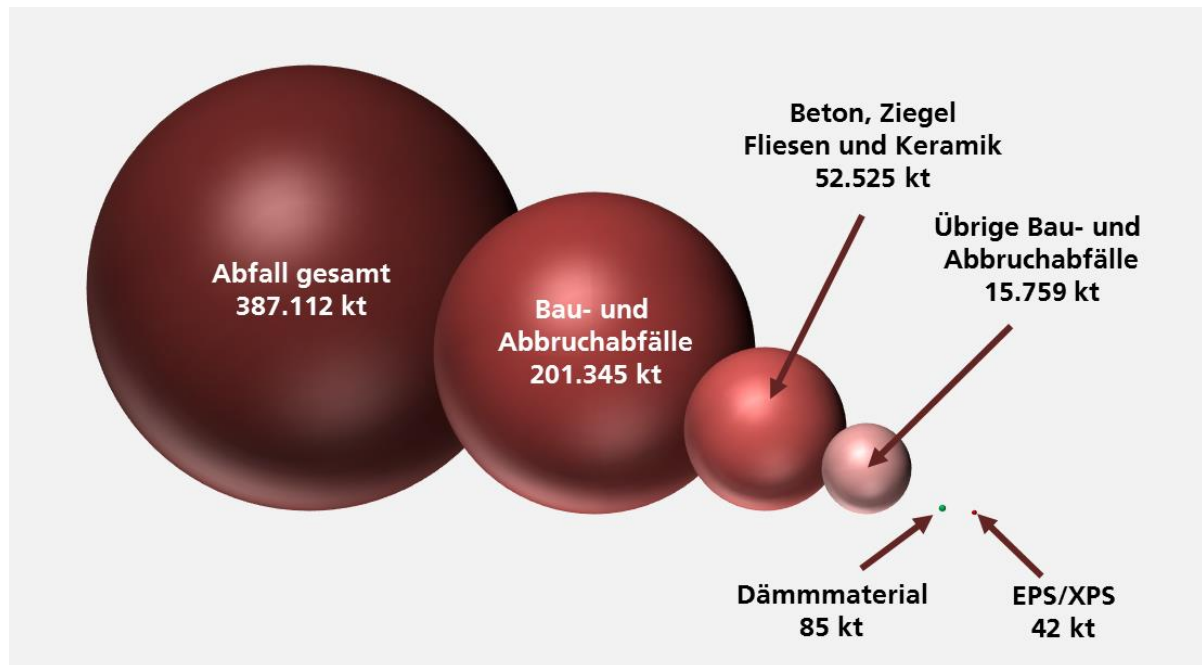
"Mountains of waste as high as the Alps"



- Emergence of the research project within the framework of the "Future Building" initiative of the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) – a grant of EUR 105,000 was approved by the BBSR
- Total project costs: EUR 210,000
Financial input of associations:
Industrial Rigid Foam Association (Industrieverband Hartschaum): EUR 50,000
German ETICS Association (Fachverband WDVS): EUR 50,000
Thermal Insulation Systems Quality Group in Austria (Qualitätsgruppe Wärmedämmsysteme Österreich): EUR 5,000
- Scientific project partners:
The Fraunhofer Institute for Building Physics and the Research Institute for Thermal Insulation in Munich

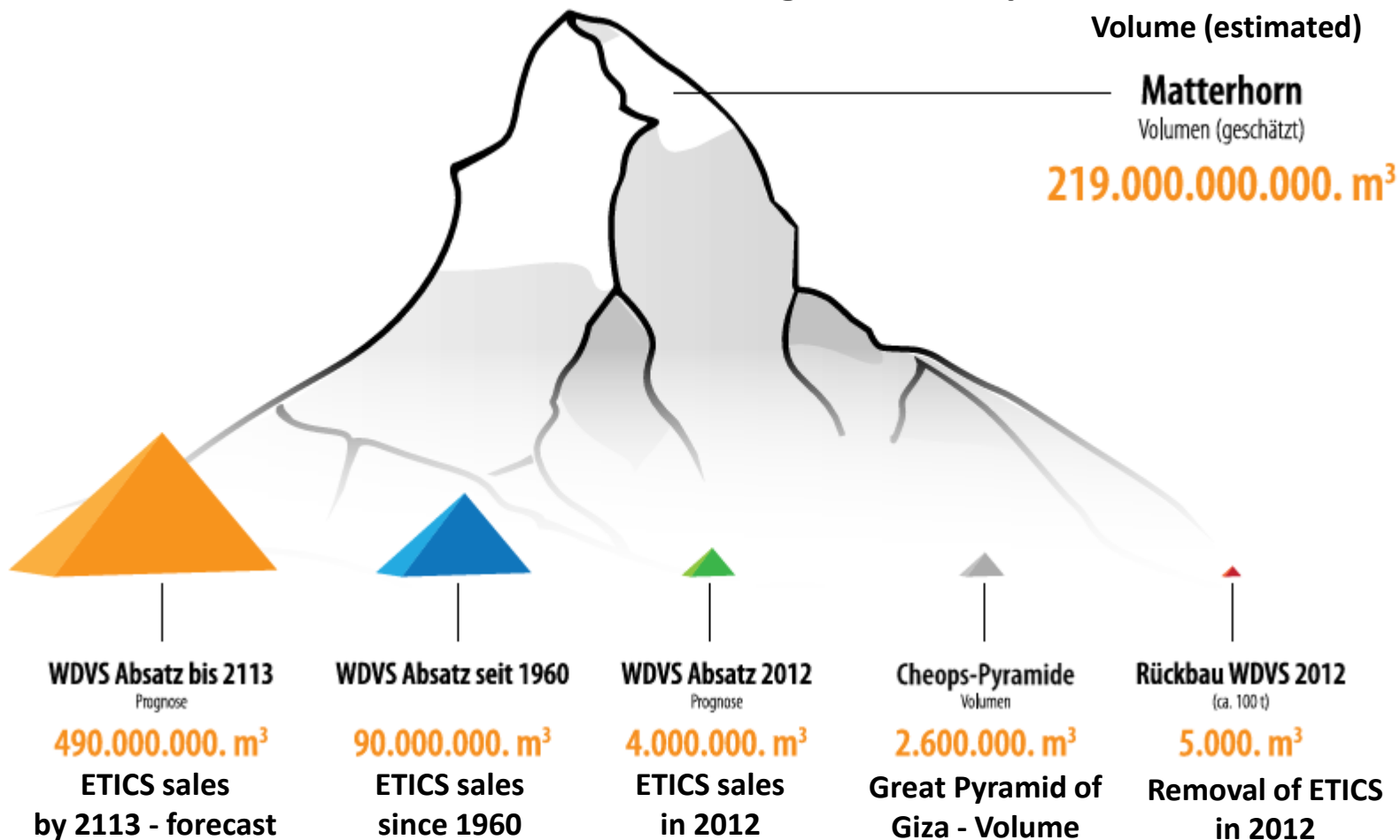
Quantities and data base:

- Volume of waste in Germany as at 2012 according to figures from the Federal Statistical Office: EPS from the building sector accounts for a share of less than 1%.



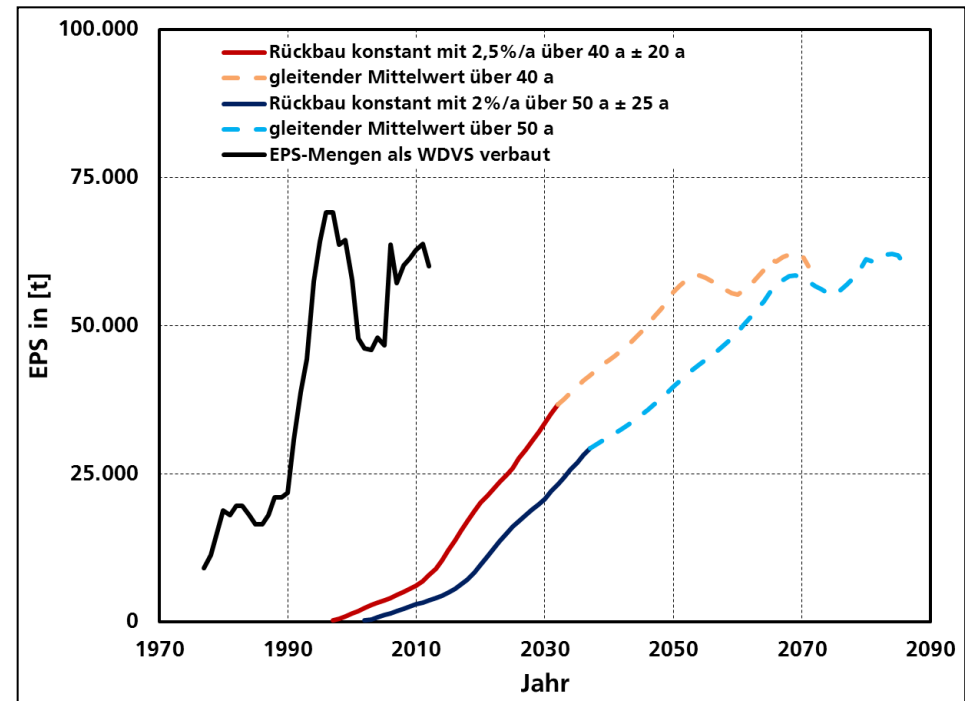
Results of the study:

There are no mountains of waste "as high as the Alps".



The consensus opinion of disposal firms and involved associations is that the volume of waste is very small.

While the volume of waste will increase in future, it will nevertheless remain well under control.



Forecast: EPS removal volumes

Option of conventional, partially selective and selective removal

	Conventional removal	Selective removal
Benefits	<ul style="list-style-type: none"> • Workload is reduced through the use of heavy machinery • A quick process • Workload is proportional to the building volume 	<ul style="list-style-type: none"> • Mixing of individual fractions is avoided • Mixing of hazardous materials is avoided • (Pre-)separation of the individual fractions takes place during the removal at the building site • Preferred procedure
Disadvantages	<ul style="list-style-type: none"> • Mixing of individual fractions • Separation and recovery of recyclable fractions has to take place at separate facilities • Unsuitable if hazardous materials have been installed 	<ul style="list-style-type: none"> • High proportion of manual preparatory work necessary • Work takes considerable time • Workload is proportional to the building surface and increases with the number of layers that are linked with one another



Selective peeling of the individual layers as part of the IBP test: finishing coat (left), insulating material (middle) and partially selective peeling in practice (right)

Recycling options

Mechanical Recycling

Materials and macromolecules are preserved

Comminution process

Extraction of others:
EPS fraction

Solvolysis

Extraction of polystyrene

Feedstock Recycling

Incineration of macromolecules

Conversion process

Extraction of:

- Styrene
- Ethyl benzene
- Toluol
- Benzen
- Varios olligomers

Energy Recovery

Macromolecules are broken down

Extraction of:

- Gas
- Electricity
- Steam

Removal of HBCD

- EPS containing HBCD may no longer be placed on the market as a recycling product. This means: EPS containing HBCD and EPS containing FR polymer may in future no longer be mixed.
- Replacement material for HBCD: FR polymer – fire behaviour and all positive product characteristics of EPS are maintained.
- The flame retardant HBCD is no problem during waste incineration. It is **completed destroyed** during the energy recovery process.



- Dissolving and separating using the CreaSolv® process
- Benefits:
 - Separation of foreign materials;
 - HBCD can be quantitatively removed;
 - PS polymer properties are maintained;
 - Recovery of bromine in a separate step;
 - Possible to produce high quality PS granulate
- Until now, the process has not been commercially viable due to the low volume of waste



- Due to the long service life of ETICS, the current level of recovered material is so low that **fears among the public** (consciously or unconsciously generated), for example about mountains of waste containing ETICS, are **unfounded**.

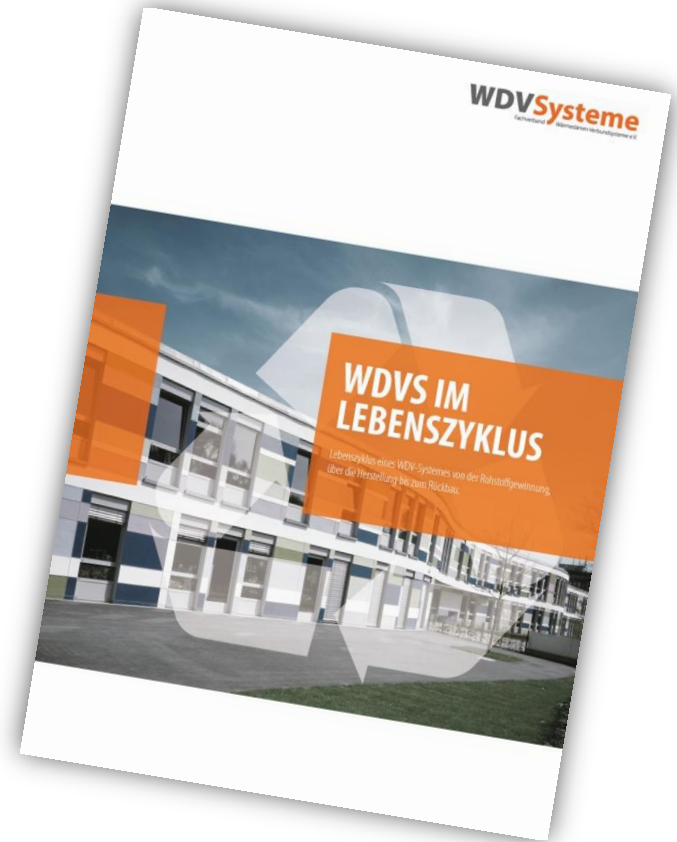
- Fraunhofer**
IBP
- Fraunhofer-Institut für Bauphysik IBP
Forschung, Entwicklung,
Demonstration und Beratung auf
den Gebieten der Bauphysik,
Zulassung neuer Baustoffe,
Bauteile und Bauteile,
Bauteiltechnisch anerkannte Stelle für
Prüfung, Überwachung und Zertifizierung
Institutsleiter
Prof. Dr.-Ing. Klaus Peter Seifbauer
- IBP-Bericht BBHB 019/2014/281
- Rückbau, Recycling und Verwertung von WDVS**
„Möglichkeiten der Wiederverwertung von Bestandteilen des WDVS nach dessen
Rückbau durch Zuführung in den Produktionskreislauf der Dämmstoffe bzw.
Downcycling in die Produktion minderwertiger Güter bis hin zur energetischen
Verwertung“
- Durchgeführt im Auftrag
Fachverband Wärmedämm-Verbundsysteme e. V.
Fremersbergstraße 33
76530 Baden-Baden
- Der Bericht umfasst
91 Seiten Text
10 Tabellen
40 Abbildungen
- Wolfgang Albrecht, FVW München
Christoph Schwitalla, Fraunhofer IBP
- Valley, 13. November 2014
- Abteilungsleiter
- Stellv. Institutsleiter
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Need for further research and development:

- **Identification and labelling of HBCD** in order to allow for starting products containing HBCD and starting products that are free of HBCD to be stored and processed separately and thus comply with the ban on mixing stipulated under the Waste Management Act.
- **Development of additional devices** for a quicker and more accurate **de-coating process** for the event that removal rates increase.
- **Development of new fixing techniques** – both for the system on the wall materials as well as the individual ETICS layers – which simplify the removal process.

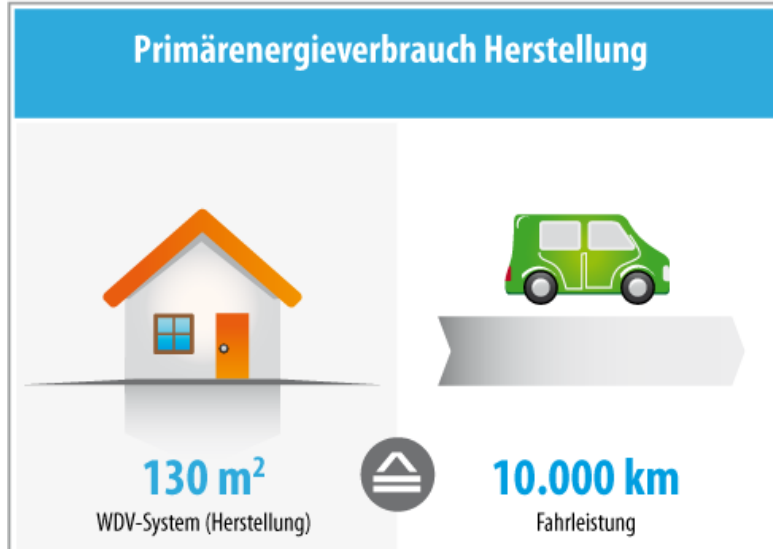
Next steps:

- Expansion of study to other insulation materials
- Publication of results in the "**ETICS Life Cycle**" brochure

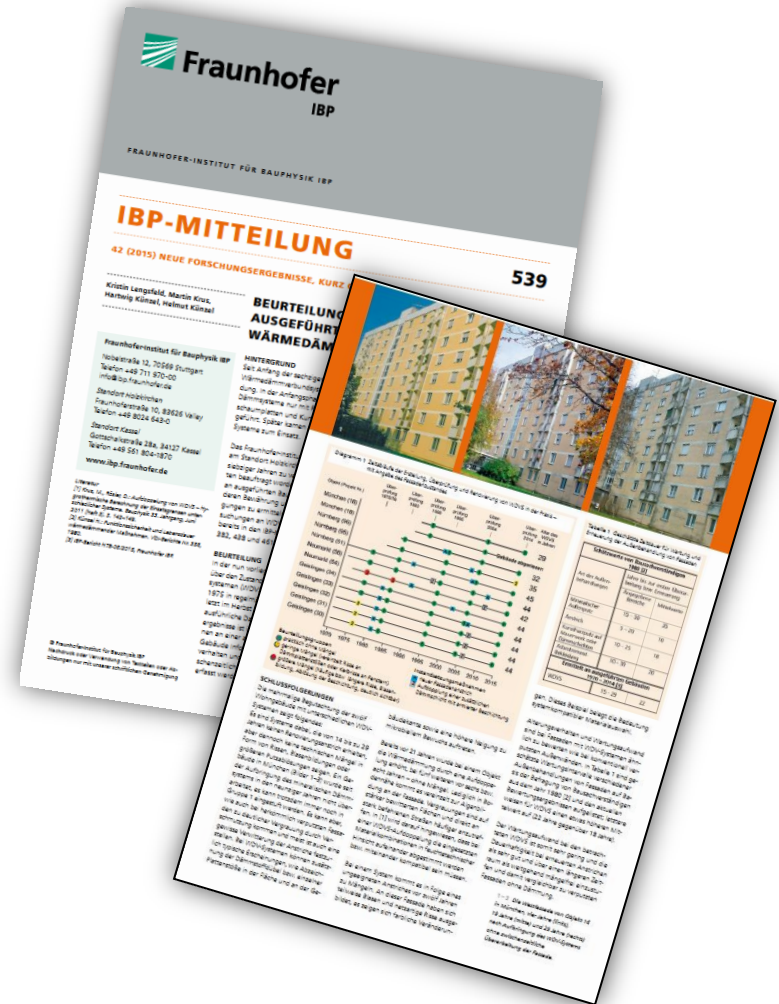


Conclusion on the ETICS life cycle

- The use of energy in the manufacturing of insulation materials for ETICS varies in its extent, but the fact is that during their life cycle all ETICS save many times more energy than the energy required to produce them and also protect the climate.



- The service life of ETICS is significantly longer than originally assumed. The ageing behaviour and maintenance costs for facades with ETICS should not be assessed differently to conventionally plastered exterior walls; the new inspection by the Fraunhofer Institute confirms the forecast of an ETICS service life of around 60 years.



- There are currently no mountains of ETICS waste and there also isn't expected to be any. At present, energy recovery is the method of choice. At the same time, research is continuing to be conducted with the objective of further optimising the interplay between the dismantling process, the provision of unmixed waste and its processing and recycling within the economic cycle.



In addition to environmental and technical aspects, we should also not forget "soft" factors. After all, with an external thermal insulation composite system, people are primarily buying convenience, cosiness, home comfort and thus a tool for improving their quality of life.



Thank you for your attention!