

Advanced Aerogel Insulation materials for the Building Envelope

Certification, Life Cycle Aspects and AMANAC Cluster

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Certification

Initial Type Test of the new materials:

- Thermal Conductivity
- Mechanical Properties
- Fire Tests
- Acoustic Tests
- Ageing

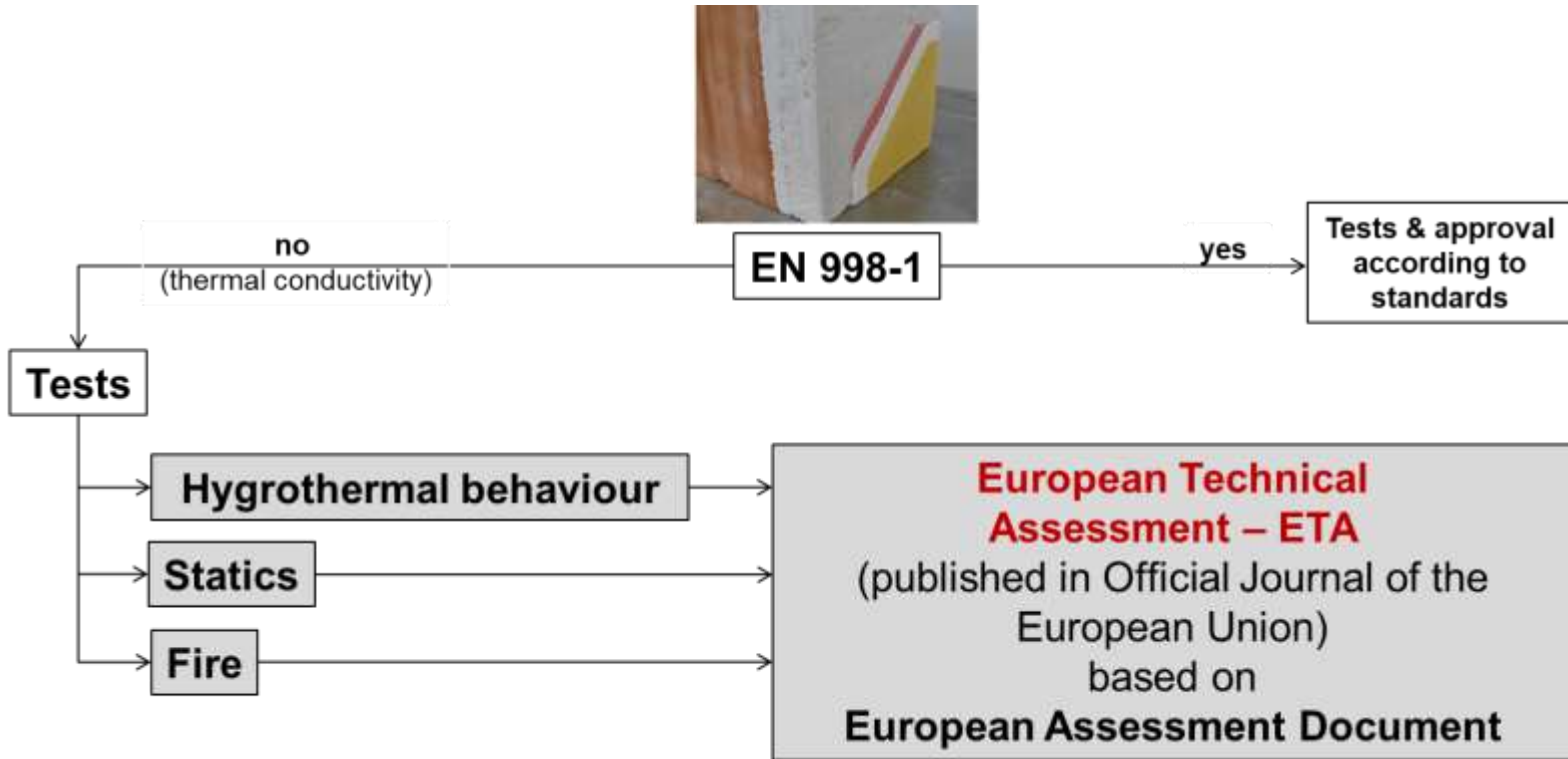


Certification of the new materials:

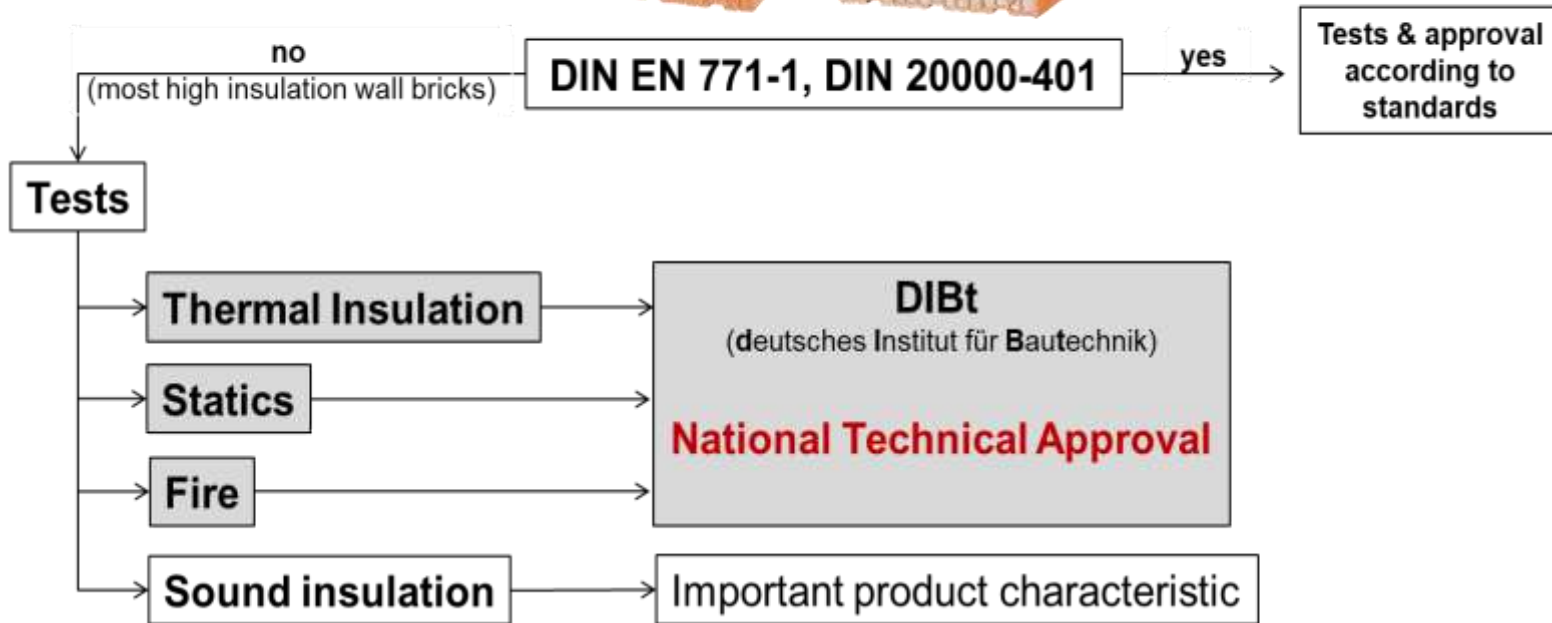
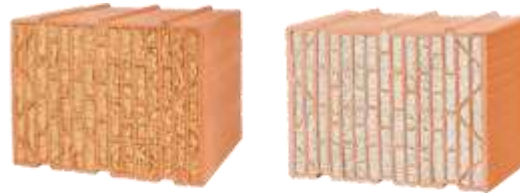
- Certification according European standards (EN 998-1, EN 16566, EN 771-1)
- EAD-European Assessment Document for the product/uses
- Certification according to national standards (Germany, UK, France, Italy)



Certification of high Insulation Renders in Germany



Certification of high Insulation Wall Bricks in Germany



Life cycle aspects and AMANAC Cluster

- Global challenges in the building sector are among other things the reduction of carbon dioxide emissions
- Environmental Life cycle assessment (LCA) is one possibility quantifying scientifically the environmental impacts of building products, elements or whole buildings
- Life cycle assessment supports in decision making processes
- AMANAC (Advanced Materials and Nanotechnology Cluster) is the cluster of all the EEB Advanced Material and nanotechnology projects
- Several Workshops of AMANAC cluster has addressed Life Cycle Assessment

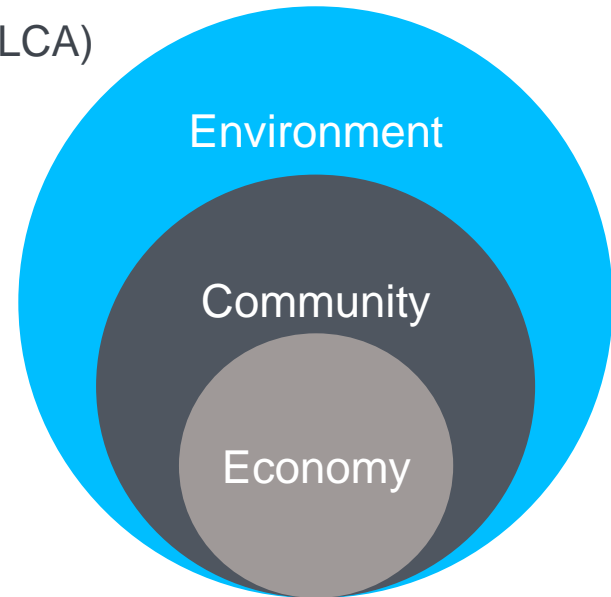


AMANAC Cluster Workshops

Outputs of the Vienna LCA, LCC Workshop in October 2018

Life Cycle Sustainability Assessment (LCSA) consists of three aspects:

- Environmental Life Cycle Assessment (LCA)
helps evaluating products ecologically
- Social Life Cycle Assessment (S-LCA)
considers social aspects
- With Life cycle costing analysis (LCC)
economic aspects can be assessed

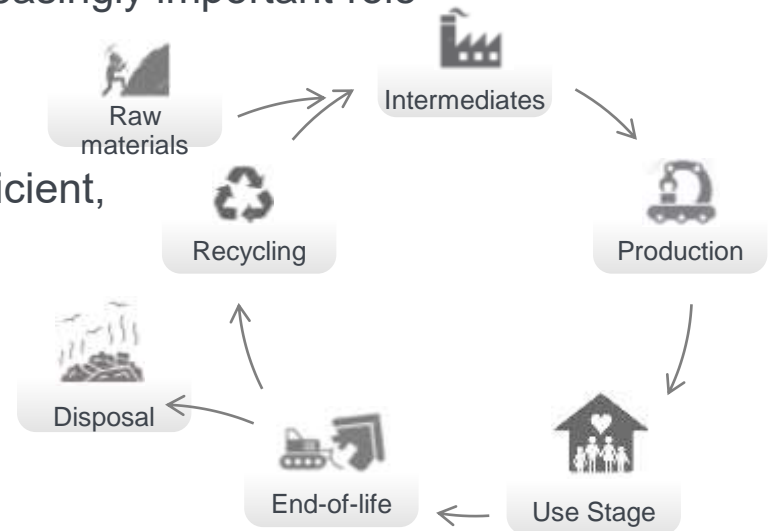


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The general opinion of Life cycle assessment

- The general Life Cycle Concept has changed from cradle-to-gate to cradle-to-grave to cradle to-cradle
- Recycling and re-use plays an increasingly important role
- Therefore, the general meaning is that LCA has to be integrated into the design practice and it's not sufficient, to calculate the life-cycle stages from cradle-to-gate.



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Problems of performing a cradle-to-cradle LCA

Problems of performing a LCA in the design process:

- Open decisions which cannot be met in early stages
- Availability of data: LCA should rely on available data of high quality
- Inconsistent parameters of assessment:
 - different functional units,
 - system,
 - data bases,
 - End-of-Life scenarios,...



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Problems of performing a cradle-to-cradle LCA

To deal with the uncertainties, different approaches have been developed:

- Monte-Carlo-Simulations,
- Taylor series,
- Gaussian error propagation law,
- Scenario analysis, ...

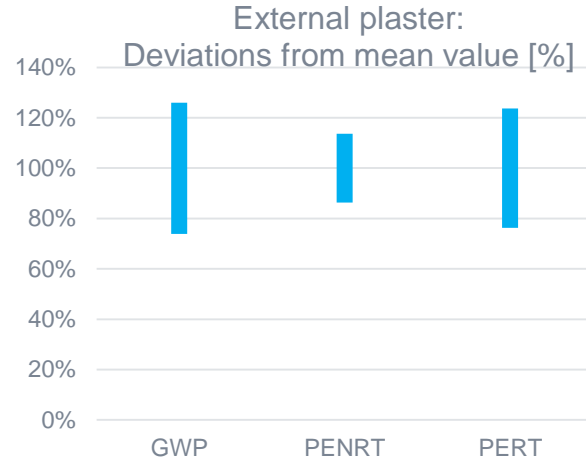
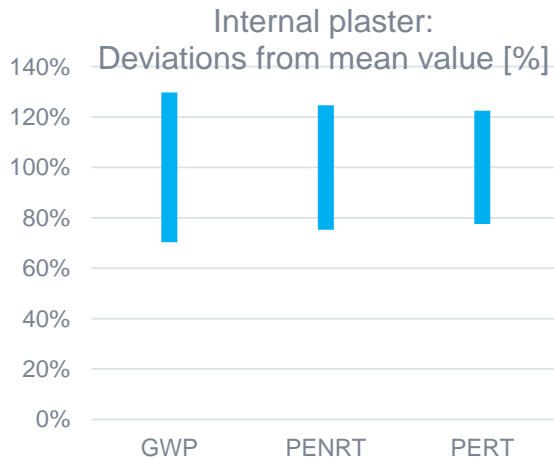
The impact on the results due to the uncertainties can be high, so it is important to estimate their influence

➤ Therefore, a compromise between complexity and feasibility has to be found

Aerogel-based Insulation plasters

Currently developed within the EU-project Wall-Ace

- Deviations through uncertainties/ optimizations of product formulations
- Life cycle stages A1 – A3 considered, GWP, PERT and PENRT
- Functional units: 1m², 5 cm thick (internal plaster) and 10 cm (external pl.)

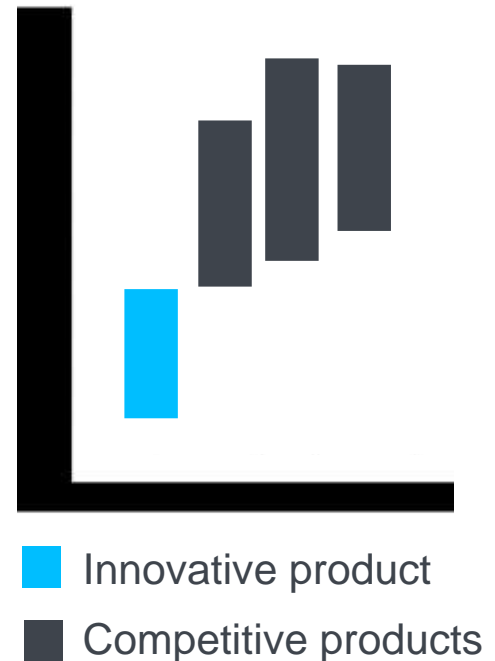


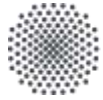
➤ Deviations between 13.5 % and 30 % from mean value

Conclusion

Feasibility of considering the uncertainties that cannot be reduced or completely eliminated:

- Classification of innovative materials can be done using **interval calculation method**.
- Comparison with established market products allows ranking.
- If ecological range of innovative material **is lower** than the ranges of existing products, **than a further development is advised**.
- This can be realised by using interval arithmetic based LCA calculation.
- JAVA programme **MultiVaLCA** based on this is currently being developed at USTUTT.





Thank you for your attention!

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