Light Insulation
Microclimatic Shell as Building Insulation

Source: TU Darmstadt, Prof. Johann Eisele, EPA Architectural Competition

02.10.2012

Light Insulation | Martin Zeumer
The problem

- About 40% percent of the energy demand of Europe is needed for operation of buildings. 27% of the overall consumption is caused by households. Key driver is the heat production. The European building stock is mainly not efficient.

- The highest overall potential lies in renovation of small sized buildings.

- Already realized refurbishments mainly reached out for the “low-hanging fruits” and are realized without systematic approach.

- Personal ownership leads to specific representative necessities.

- EU stated high technical standards for the future.
The solution

- Integral façade system for walls and roofs with high energy-performance allowing “Nearly-zero” building performance as well as Plus-Energy Design.

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- a system easy to understand
- a system simple in construction
- a system robust in energetic performance
- a system customizable in spatially and aesthetically appearance to different situations
- a system cost effective in realization
- a system fast installed

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- “prefab house in building stock”

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Microclimatic shell in general

- Forced ventilation within the shell
- Bathroom and kitchen exhaust air if needed
- Pressure box of forced ventilation
- Fresh air supply
1. Intelligent shell with air flow all around the building
2. Air overflow openings to allow forced ventilation (low-tech)
3. Air-Air Heatpump (Standard Technology)
4. Air supply in existing chimneys
Section of the shell

- Integration of solar active technology on a low-cost level
- Giving high comfort due to the interior temperature increase
- Using existing wall as thermal mass
Market size

Building stock in Germany
≈ 7.5 Mio buildings

- 5.0 Mio buildings
- 100,000 buildings
- 15,000 buildings per year

65% building class III or below

2% annual refurbishment rate

15% refurbishments are not realized by heat insulation composite system
Market size


40% are appealed by the system

- have the access to the necessary capital
- are willing for a systematic approach in refurbishment
- See advantages in a technical design

Low volume of refurbishment

Energyefficient actions

Committed energy-saver

Open-minded skeptic

Unreflected maintaining

Dedicated to increase living qualities

Indifferent and unwilling
Market size

<table>
<thead>
<tr>
<th>Labor per service</th>
<th>Marketing</th>
<th>Production</th>
<th>Planning</th>
<th>Mounting</th>
<th>Commissioning and optimization</th>
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- local work
- possibility of centralization

6,000 buildings per year as market potential in Germany

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**Next steps**

1. **Step 1**
   - Validation of the system by a dynamic building simulation

2. **Step 2**
   - Technical Implementation of Production necessities, subcontracting structure for system components

3. **Step 3**
   - Sharpening market model and setting legal basis

4. **Step 4**
   - Test production of necessary materials; design of a web-based product pre-estimator

5. **Step 5**
   - Prototype: Winning partners for realization, planning, production, mounting, commissioning

6. **Step 6**
   - Marketing
     - Development of marketing models,
     - Marketing materials; launch of product estimator,
     - Product entry in craftsmen shops

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Reduction of CO$_2$ emission

2. year: 90 buildings
400t CO$_2$/a

40t CO$_2$/a

6.2t CO$_2$/a

Financial and energetic longterm return of investment

Making 2020 climate protection goals in housing affordable today!

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Thank you for your attention!

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