Thermal renovation of building fabric using modern insulation materials
Overview of Presentation

• Why we need to retrofit?
• Perceived barriers – economic, political, social, technical, supply chain
• Choosing insulation
• Case studies
• Summary
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The UK Government has committed to cut carbon emissions by 34% by 2020 and 80% by 2050
• Housing is responsible for 27% of CO$_2$ emissions
• Solid wall housing accounts for over 30% of English housing stock
• No single catch-all solution to tackling the energy efficiency of our housing stock.
Benefits of deep energy retrofits

- Avoiding illness cold related health issues
- Higher indoor thermal comfort
- Job creation – supply chain
- Social inclusion (e.g. by rehabilitating poor districts)
- Reduced energy costs
- Reduced CO2 emissions
Fabric first Approach
Barriers to Retrofit?

- Building aesthetics
- "Hard to treat" properties
- Consumer awareness
- Cost
- Supply Chain
Refurbishment Trigger Points

- Moving House
- Boiler / Radiator Replacement
- Change Energy Supplier
- Central Heating
- New Kitchen / Bathroom
- Render replacement
- Window Replacement
- Re-plastering
- External Lining
- Re-wiring / Re-plumbing
- Change of Tenure
Further Challenges

• Public Awareness and suspicion

• Changes/inconsistencies in Government Policy

• Shortage of Skilled Labour in certain disciplines

• Financial incentives “patchy” and often difficult to access

• UK moves towards private rented sector

• Warranties on products and workmanship - CIGA and SWIGA
Modern Insulation types compared to achieve R value of 5

<table>
<thead>
<tr>
<th>Material</th>
<th>Typical λ (W/m·K)</th>
<th>Thickness (mm) required for R-value of 5.0 m²K/W</th>
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<tbody>
<tr>
<td>Dense block</td>
<td>1.28</td>
<td>6400</td>
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<tr>
<td>Brick</td>
<td>0.77</td>
<td>3850</td>
</tr>
<tr>
<td>Timber</td>
<td>0.13</td>
<td>650</td>
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<td>Glass mineral wool</td>
<td>0.044</td>
<td>220</td>
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<tr>
<td>Extruded polystyrene</td>
<td>0.034</td>
<td>170</td>
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<tr>
<td>PIR</td>
<td>0.022</td>
<td>110</td>
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Case study 1 – Nottingham City Homes

The issues

- 29,000 social housing units which did not meet current Building Regulations or Decent Homes Standard
- The majority of these of solid wall construction
The solution

- Trial analysis carried out before scaling up the project
- A range of PIR insulation products used in the project
- Insulation all applied internally
- Other measures applied at same time
The outcome

- Fully refurbished homes to Building Regulations levels
- Homes brought up to Decent Homes Standards
- Lower fuel bills for occupiers
Case study 2 – Rochdale high rise apartments

The issues:
• 7 apartment blocks, 1960s construction
• No cavity wall insulation
• Wall tie corrosion due to wind driven rain
• Sub-50mm cavities (below the “norm”)
The solution

- Injected PUR system used to bond inner and outer leaves together and prevent driving rain
- Minimal disruption to building occupiers
- Entire project completed in 7 months
- BBA Certification
The outcome

- The insulated blocks are saving around 448 tonnes of carbon every year over the lifetime of the building
- Reduced heating bills for occupiers

Left – red and yellow areas show high heat loss

Right – Green and blue areas show low heat loss
Case study 3 – External wall insulation

The issues:

- “REEMA” system Houses – uninsulated concrete housing
- Energy rating of “E”
- U-value of 2.34W/m².K
- Some properties owner occupied- mixed tenancy – some social some private
The solution

- Work with tenants and homeowners to come up with a community scheme
- External wall insulation added
- Minimal disruption to building occupiers
- Other measures at same time
• Work In Progress
• Use of multiple material types
• Other works scheduled at same time
The outcomes

- Heat loss reduced by a factor of 10
- Reduced heating bills for occupiers
- Improved aesthetics
Summary

• Technically – very few retrofit challenges that cannot be solved using modern insulation materials
• Innovation in insulation materials will lead to new possibilities and drive down costs
• UK Warranty Schemes such as CIGA and SWIGA will improve end user/consumer confidence
• Improvements in Installation capacity and quality required for External wall refurbishment