Enhanced insulation in timber-frame housing using recycled materials

John Desmond, Managing Director, Cygnum Timber Frame Ltd
WHAT IS INSULA TFH?

InsulaTFH is project to develop processes to manufacture pre-insulated timber-frame wall panels, using recycled materials with a target U value of 0.16W/m2k.
InsulaTFH - Background

Timber Frame Construction

• An energy efficient method of construction used worldwide

• Internal skin of a building is constructed using timber frame elements with insulation installed between timbers

• Typical applications include ‘once off’ homes, schools, care homes, hotels and high volume housing.

• Growing market share throughout many countries in Europe because of its environmental credentials
InsulaTFH - Background

Timber Frame Construction

• The wall, floor and roof elements are designed using autocad type software

• Manufacturing takes place in a factory environment, often with automated production lines.

• Kits are delivered on open 12m trailers and structures are typically erected in days.

• Insulation fitted on site after building is wind and watertight
Manufacturing process
Manufacturing Process
Ready for dispatch
Finished Timber Frame Buildings
Finished Timber Frame Buildings
The type, quantity and installation method of insulation used is key to the energy efficiency of a building.

The most common type used in timber frame is glass fibre:
# Glass Fibre
The most frequently used insulation in timber frame

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>• Cheaper</td>
<td>• Poor environmentally</td>
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<tr>
<td>• Easy to install</td>
<td>• Installation unreliable</td>
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<tr>
<td>• An ‘established’ product</td>
<td>• Health concerns</td>
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<td>• Not suitable for factory fit</td>
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Cellulose Insulation
From recycled materials

- Recycled newsprint: 81%
- Fire retardant (boric acid): 12%
- Rot retardent (borax): 7%
# Cellulose

a better alternative

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>• Better environmentally</td>
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</tr>
<tr>
<td>• More reliable installation</td>
<td></td>
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<tr>
<td>• Good u value</td>
<td></td>
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<tr>
<td>• Healthy</td>
<td></td>
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<tr>
<td>• Ideal for factory fitting</td>
<td></td>
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<tr>
<td>• Excellent filling achieved</td>
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<tr>
<td>• More expensive</td>
<td></td>
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<tr>
<td>• Special equip required</td>
<td></td>
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<tr>
<td>• Not well known</td>
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Having used cellulose for many years Cygnum concluded that it is the most suitable insulation available for our product but we needed to make it more affordable.
CURRENT PROCESS

Paper → Cellulose Factory → Installer’s Depot

Cellulose Factory → Packaged Cellulose

Timber Frame Factory → Building Project

Cellulose Factory → Packaged Cellulose

Timber Frame Factory → Open panel timber frame

John Desmond, Managing Director
We sought support under the **EU Eco Innovation program** to commercialise this concept.
Partners

• To help us achieve our objectives and meet the Eco Innovation criteria Cygnum engaged 2 key project partners:

1. Weinmann

2. FIEC
Partners - Weinmann

Leading European manufacturers of equipment systems for timber frame manufacturers since 1985 and part of Homag group since 1998

Weinmann Roles

1. Market research targeted at timber frame producers throughout Europe
2. Specification and design of a fully automated systems for medium to large volume producers

John Desmond, Managing Director
Partners – Fiec
The European Construction Industry Federation

34 national Member Federations in 29 countries

FIEC Roles

1. To gain Europe-wide benefits from InsulaTFH results and outputs, in particular to influence working practices such that users, industry professional bodies and specifically timber frame manufacturers will adopt, or at least become aware of, the methodologies being assimilated

John Desmond, Managing Director
Partners – Fiec
The European Construction Industry Federation

34 national Member Federations in 29 countries

FIEC Roles

2. To co-operate with related projects to achieve the best possible global commitment and coherence
THE CHALLENGES

1. Installing cellulose in factory

• Panels flat on bench so needs to be blown in at correct pressure

• Need to ensure all of the panel is filled – no gaps

• Need to ensure that it is at a correct density to ensure that it is not compromised during transport or installation

John Desmond, Managing Director
Panel Filling – installation of insulation between studs
Weather protected insulated panel
THE CHALLENGES

2. Developing a robust panel system

• Biggest danger is water ingress. Difficult to prevent any water ingress (particularly in Ireland!).

• After much trial and error we have developed a system where the panel is sheeted with OSB on both sides and sealed with a robust taping system.

John Desmond, Managing Director
Weather protected insulated panel
Weather protected insulated panels
THE CHALLENGES

3. Processing Waste paper into Cellulose Insulation

• Currently installing a micro processing line to meet our requirements

• Weinmann are designing a system to incorporate this as part of the panel production process.
Cellulose Processing – pre-commissioning
Results

• Reduced CO2 Emissions

• Improved Waste management by recycling of waste and diverting from landfill

• Reduced energy consumption – less energy required to produce cellulose than alternative insulations

• Reduced energy consumption of completed dwellings

John Desmond, Managing Director
Results (continued)

• Make cellulose option more affordable – improved market penetration

• Increase market share of timber frame

• Business advantage to Cygnum and other companies that adopt the technology
Overview of project


Value: €1,404,687
(EU contribution: €702,344, 50%)

Partners: Cygnum TF Ltd - Ireland
           Weinmann GmbH - Germany
           FIEC - Brussels (Europe)
Thank you

John Desmond
Managing Director
Cygnum Ltd