Sistemi poliuretanici con migliorata reazione al fuoco

2ª Conferenza Nazionale Poliuretano Espanso Rigido

26 maggio 2015, Bologna

Market overview in Europe
EU revision. What about B3 foam?
Huntsman fire rated portfolio
Overview of fire testing

Alessandro Gallipoli,
Huntsman Polyurethanes Italy
The sandwich panel EAME market
Europe – Africa – Middle East

PIR
- Current market penetration limited, especially in South Europe
- More demanding processing requirement vs PUR
- Future growth expected as new laminators are designed to process PIR

2013 EAME market
Lamination of steel faced panels

PUR B2
- High market penetration in specific areas to meet local fire legislation
- Processing requirements similar to PUR B3
- Can compete with PIR only for SBI Euroclass

PUR B3
- Majority of current sandwich panels produced
- Expected lower share in the foreseeable future due to revision of EN 14509
EN 14509 revision, Reaction to Fire Test (SBI)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrinkling stress (external face)</td>
<td></td>
</tr>
<tr>
<td>- in span</td>
<td>100 MPa</td>
</tr>
<tr>
<td>- in span, elevated temperature</td>
<td>95 MPa</td>
</tr>
<tr>
<td>- at central support</td>
<td>80 MPa</td>
</tr>
<tr>
<td>- at central support elevated</td>
<td>75 MPa</td>
</tr>
<tr>
<td>Wrinkling stress (internal face)</td>
<td></td>
</tr>
<tr>
<td>- in span</td>
<td>100 MPa</td>
</tr>
<tr>
<td>- at central support</td>
<td>90 MPa</td>
</tr>
</tbody>
</table>

Reaction to fire: B−s2,d0 (with steel flashing details)

Fire resistance: E240: EI 15 (load 1.5 KN)

External fire performance: B Roof or B Roof(x)

Water permeability: Class C

Air permeability: 10 m³/h/m²

Water vapour permeability: Impermeable

Airborne sound insulation: $R_w (C_Ctr)$

Durability: Pass – light colours: reflectivity 40-90

Compulsory & External

EN ISO 11925-2 not allowed anymore with flashing protection

Revision of EN 14509 published in August 2014
EN 14509 revision:
Ignitability test & SBI of no fire rated foams (B3)

...until August 2014

Ignitability Test - EN ISO 11925-2

with flashing (protection) accedes to SBI

Classification:
Cs₃d₀
Ds₃d₀...
With ... flashings

Classification: CLASS F
No SBI allowed

today: no flashings allowed

SBI – EN 13823

naked foam

only foams which pass ignitability test with naked foam accede to SBI test
Fire rated product portfolio

ALL TECHNOLOGIES PASS IGNITABILITY TEST ON NAKED FOAM

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Technical background

What is Polyurethane (PUR)

\[ R\text{-N}=C=O + R'\text{-OH} \rightarrow R\text{-NH-CO-OR'} \]

MDI          Polyol             Urethane (PUR)

Degradation T 150-200°C

What is Polyisocyanurate (PIR)

\[ R\text{-N}=C=O + R'\text{-OH} \rightarrow R\text{-NH-CO-OR'} \]

MDI          Polyol             Urethane (PUR)

Degradation T > 270°C

Trimerisation

- Isocyanurates are very stable, both thermally and chemically (thanks to the exagonal structure), have improved fire rating and are more rigid than PUR.
- PIR reaction is more exothermic than PUR, but needs an higher activation energy.
Conversion distribution

High Index PIR 100 mm panel

Top Facing

Distance (mm)

Bottom Facing

PIR / urethane ratio

ANPE - 2a Conferenza Nazionale
Mechanism of combustion

Huntsman technology is designed taking into consideration this mechanism and maximizing the possibility to pass the most severe fire tests.
From small scale to large scale

EN ISO 11925-2

EN 13823 (SBI)

EN 1364 (Fire Resistance)

foam

panel

foam

constr. system

BS1d0
BS2d0
BS3d0

80-100 mm: REI-EI30
200 mm: EI60

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From panel to construction system

FIRE RESISTANCE CRITERIA

Load Bearing Capacity (R) – only for roof
Integrity (E)
Insulation (I)
Resistance to Fire
official results

**EI 30 with 100 mm wall panel**
(insulation failed @ 41 min)

**REI 30 with 100 mm roof panel**
(integrity failed @ 35 min)

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## Summary fire properties

<table>
<thead>
<tr>
<th>FOAM</th>
<th>REACTION TO FIRE</th>
<th>RESISTANCE TO FIRE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FIREPURE</strong></td>
<td>Bs3d0</td>
<td>Not tested yet</td>
</tr>
<tr>
<td></td>
<td>Bs2d0</td>
<td></td>
</tr>
<tr>
<td><strong>Low Index</strong></td>
<td>Bs2d0</td>
<td>Not tested yet</td>
</tr>
<tr>
<td><strong>Mid Index</strong></td>
<td>Bs2d0</td>
<td>100mm E 30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EI 20 (26 min)</td>
</tr>
<tr>
<td><strong>High Index</strong></td>
<td>Bs2d0</td>
<td>80-100mm RE 60 / E 45</td>
</tr>
<tr>
<td></td>
<td>Bs1d0</td>
<td>REI 30 / EI 30 (41 min)</td>
</tr>
</tbody>
</table>

**what is next?**

Huntsman development never stops!

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Domande?

http://www.huntsman.com/insulation