



Two-in-one: Functional glue with flame retardant properties

Kiilto Oy

Dr. Pirjo Laurila
Dr. Raija Polvinen
Dr. Mikko Viljanmaa

Åbo Akademi

prof. Mikko Hupa
prof. Carl-Eric Wilén



Outline

- About Kiilto Oy
- End user applications; sandwich elements
- Conflicting needs of the customers; some testing methods
- Targets and methods of the project
- Room for innovations - strong background in science
- Kiilto R&D



Expertise in adhesives for almost 90 years



- Medium-sized Finnish chemical company
- Scope of business: developing, manufacturing and marketing of adhesives and relative products
- Founded in Tampere in 1919 - to Lempäälä in 1970
- Focusing on adhesives since the 1960's

3



Kiilto-products

- Adhesives
 - for construction, industry, consumers
- Lacquers, wooden floor oils
- Leveling compounds
- Water proofing membranes
- Grouts
- Sealants
- Thinners
- Foundry products





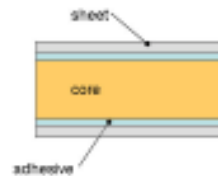
Environmental Aspects

- Integrated quality, environment and safety system
- Over 98% of products are water-based (solvent-free)
- Life-cycle thinking from selection of raw materials to package disposal
- Information, training and instructions on the environment protection
- Comprehensive range of fire resistant products, products with the highest indoor air quality (M1) and products with the Nordic Environmental Label (Swan).



Structural adhesives

- **A STRUCTURAL ADHESIVE** contributes substantially to the structural integrity of the rigid product being manufactured.
- Many types of sandwich elements are typical applications for our Kestopur polyurethane structural adhesives.





Structural adhesives

- Polyurethanes are very versatile adhesives. They have wide adhesion range, good strength and ability to maintain their elasticity at low temperatures.
- One extreme application of our Kestopur adhesives is the insulation panels of LNG-tankers, the adhesive works at almost liquid nitrogen temperature -196°C .
- Sandwich elements are widely used in building and construction both for land and marine applications



Structural adhesives

The adhesive plays the key role in sandwich elements;

The stiffness and load bearing ability of the sandwich panel may be several times better than the ability of the sheets or core material alone.

But, could the adhesive do even more?



Background

- International Convention for the Safety of Life at Sea (SOLAS) sets safety requirements for products to be installed into ships.
- According the Council Directive 96/98/EC products that fulfill the requirements of SOLAS may use the Mark of Conformity when the quality control and testing is approved by Notified Body.

Kiilto has several adhesives with the Mark of Conformity.



Background

- CE-marking for building and construction products will include the sandwich elements.
- The product standard EN 14509 sets strict requirements for the fire performance of the components alone and of the panel itself.





Testing for seas



- Adhesives need to pass the tests for surface flammability (IMO FTPC Part 5) for smoke generation and its toxicity (IMO FTPC Part 2; ISO 569:1994 Part 2)
- The sandwich structure has to pass the fire resistance test (IMO FTPC Part 3; ISO 834)



Testing for land



- Gross heat of combustion of the sandwich panel components separately and as a complete panel have limits in MJ/kg and MJ/m² set in EN-13501-1.
- The sandwich panel must pass the Single Burning Item test EN 13238.



Fire retardands

**Fire retardants effectively decrease the flammability
but**

- they may produce excessively smoke
- chemicals to prevent smoke formation are often very toxic (e.g. bromides, other halogens)
- high amount of organic compounds may increase the gross calorific value
- reaction to fire tests determine the temperature increase through the structure as a function of time
→ the adhesive will burn anyway



Customer needs

Improved safety of the sandwich elements in the case of fire can make difference for everyone's life

Reaction to fire tests as well as other fire performance tests are significant production and development cost for our customers

The adhesive could do more for the fire performance!



Targets of the project

- Improve the reaction to fire performance of our structural adhesives and also the fire performance of our customer's products
- Develop environmentally friendly and safe to use products
- Develop new product line for fire resistant assemblies; fire retard sealants



Approach

Strong scientific approach to the mechanisms and phenomena in co-operation with Åbo Akademi



Combustion and Materials Chemistry

Laboratory of Polymer Technology



Kiilto R&D



About 40 employees (20% of the Kiilto personnel)

Research and development director

12 R&D Managers

15 Laboratory assistants

10 People in quality control and customer service



Kiilto R&D



All manufactured products are based on own R&D

Aims

- to maintain the market leadership
- comprehensive product range
- be international
- technical expertise, innovative products
- continuous product development and improvement



Thank you for your interest!