REGULATORY ISSUES AND FLAME RETARDANT USAGE IN UPHOLSTERED FURNITURE IN EUROPE

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1. Present situation for upholstered furniture…

- Severe fire safety regulation in UK and Ireland (Match, cigarette and cribs, depending on the usage: domestic, public building,etc)
- Less severe situations in other countries
  - Regulation for public buildings only in many cases
  - When there is a regulation for domestic, limited to match
- High fire safety exigencies can require usage of flame retardants
- One of the blocking point of more severe and common regulations is the lack of knowledge in safety and health risks associated with the usage of flame-retardants
- The present study was performed by LNE to establish the situation on the basis of a neutral point of view.

2. General background…

Evaluation of the risks and the benefits procured by introducing flame-retardants into upholstered furniture within the life-cycle risk assessment

- Aim :
  - Inventory flame retardants in upholstered furniture
  - Assess risks (health/ safety) due to the presence of flame-retardants in upholstered furniture

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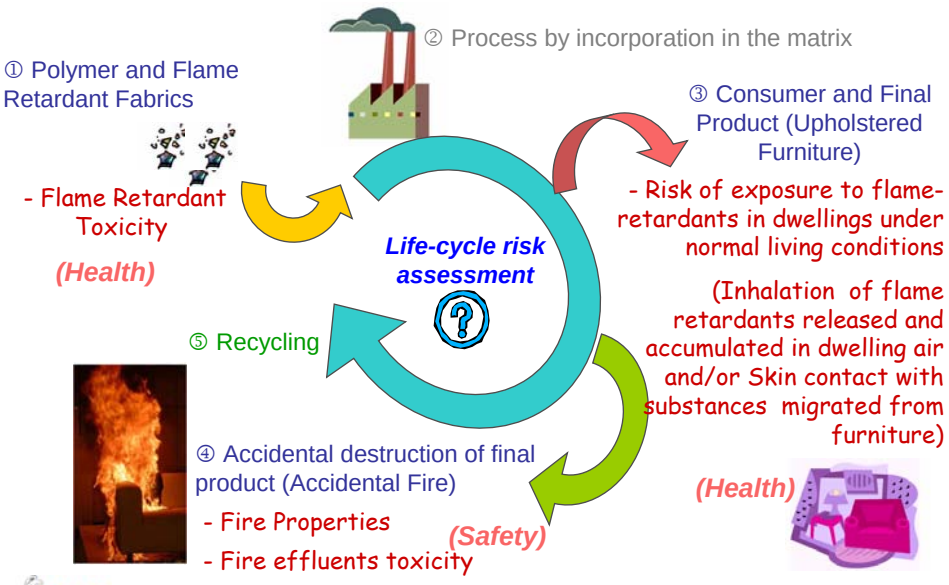
3. Life-Cycle Risk Assessment



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Directive 2001/95/EC of the European Parliament and of the Council of 3 December 2001 on General Product safety

Producers shall place only safe products on the market. A product is defined as safe if the health and safety requirements of the product (upholstered furniture) are fulfilled.

HEALTH

- ***Toxicity of the flame retardant (intrinsic properties) and final product*** (skin contact and/or inhalation) ***under normal living conditions*** (process, production, use, incineration, end-life and recycling, wastes). "of the product"

=> ***Regulation REACH*** (Registration, Evaluation, Authorisation and Restriction of Chemicals) (of the European Parliament and of the Council of 3 december 2001 on general product safety)

SAFETY

- ***Ignition :***

* Standard of ignition

* No European Regulation

The European Commission examines the possibility of adopting Europe-wide legislation concerning furniture fire safety (two EN standard regulations EN 597-1 & 2:1994 and EN 1021-1 & 2:1996).

- Toxicity of fire combustion effluents :

* No standards and no regulations

* ???

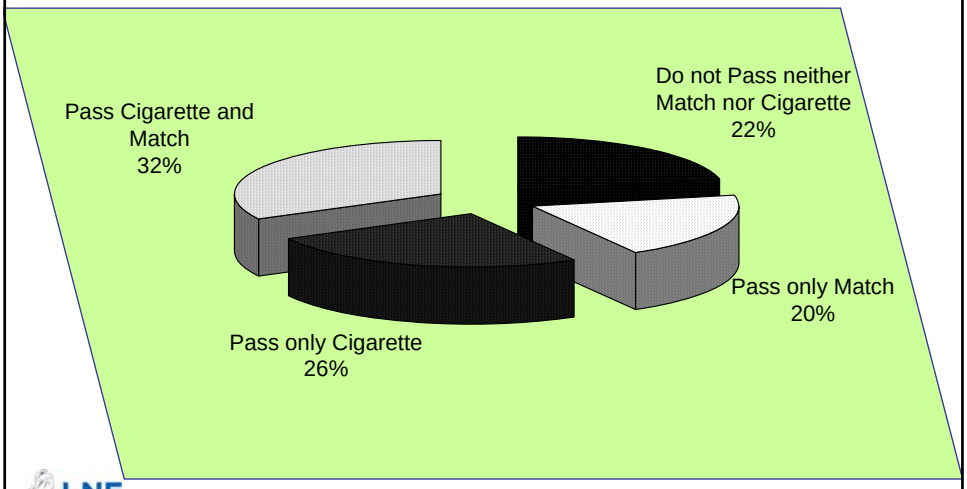
The EN standards are used to evaluate the ignitability of furniture :

•EN 597-1:1994 : Furniture - Assessment of the ignitability of mattresses and upholstered bed bases - Part 1: Ignition source: Smouldering cigarette and Part 2: Ignition source: Match flame equivalent.

-EN 1021-1:1996 : Assessment of ignitability of upholstered furniture - Part 1: Ignition source: Smouldering cigarette and Part 2: Ignition source: Match flame equivalent.

4. Bibliography on flame retarded upholstered furniture (Safety)

- *Ignition*



Note: Data extracted from CBUF, by kind of assembly (not by proportion on market)

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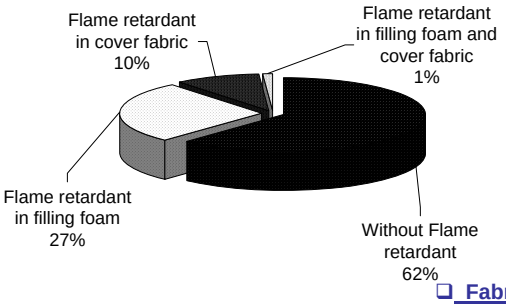
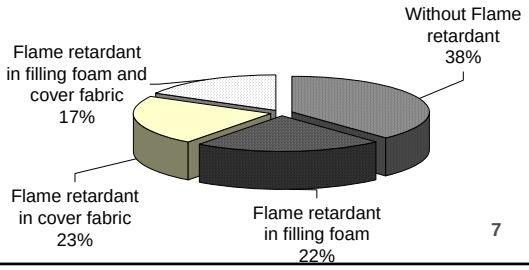
Allocation of flame retardant systems in upholstered furniture

❑ **Fabrics that pass cigarette test only**



❑ **Fabrics that pass match and cigarette tests**



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- *Toxicity of fire effluents from combustion*

For assessing risk due to fire effluents from combustion : 2 experimental conditions

In case the upholstered furniture ignites

In case upholstered furniture does not ignite but smoulders

Toxicity of fire effluents from combustion depends on :

1/ toxicity potential

2/ quantity of burnt product

Yield of burnt product should not reach the critical loss weight for a given volume

Yield of burnt product during smouldering of upholstered furniture with flame contact is not efficient enough to lead to toxic effects

There is a need for a method that assesses the toxic effect of fire effluents

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Toxicity and Mass loss

References:	Effect on rats for smoke combustion exposure	Mass loss (g/m³) or lethal concentration (g/m³)
LNE's Study for French Ministry (DGCCRF) « Relation between mass loss and toxic effect during combustion of furniture in a closed room » (1996)	Incapacitation	17 - 27
	lethality	21 - 37
Study of Gann et al. « Evaluation of toxic potency values for smoke from products and materials » (2004)	lethality	12 - 40

✓ **Flame retardants do not affect toxicity**

Example :

In a room of 20 m³, an upholstered furniture based on polyurethane, with a medium density of 35 kg/m³, burns (representative of a domestic room).

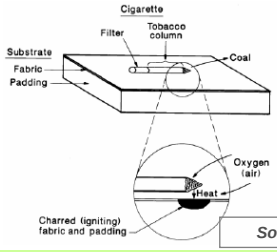
To reach lethality or incapacitation, the required maximal amount of burnt product is:

• for lethality : 740g

• for incapacitation : 540g

When an upholstered furniture does not burn (smouldering)

Source : LNE, 2008



Source : Gann, 2008

To pass match test, the maximal amount which should be burnt is 123 g

This value is lower than : 740g (lethality) or 540g (incapacitation)

- Several studies show that:
  - ✓ **Toxicity of smoke is linked to the mass loss (for a given product family)**
  - ⇒ **Possibility to predict an incapacitation or lethality with the mass loss measurement only (For upholstered furniture, the mass loss is a sufficient parameter to predict incapacitation and lethality due to combustion)**
  - ⇒ **It's not necessary to analyze the gases**
  - ✓ **Absence of risk of smoke toxicity is demonstrated for upholstered furniture which pass match test in a representative size domestic room**

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5. Bibliography on flame retarded upholstered furniture (Health)

Before …

- ***Intrinsic Toxicity of flame retardant substance***
  - **Ecolabels** (Label EU Eco-flower criteria and Ecolabel Öeko-Tex)
  - **Directive 67/548/EC** (**relative to the classification, packaging and labelling of dangerous preparations**) will be **abrogated by *GHS (Globally Harmonised System of Classification and Labelling of Chemicals)***

- ***Studies on toxicity (skin contact and/or inhalation)*** outline that :
  - **flame retardants are not toxic after their incorporation in the matrix by *skin contact and/or inhalation***
    - ✓ ***Interpretation were limited by : experimental conditions, exposure conditions, flame retardant systems studied … ???***

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Now …

- ***Regulatory tool is available with REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals)***

Risk control (life-cycle of the product)

- ***GHS*** (Globally Harmonised System of classification and Labelling of Chemicals) : Assessment of **dangerous substances** according to criteria and methods or tests recognized. Those are described in regulation **relative to the classification** and labelling of chemical substances.

- Assessment of **toxic** risk during recycling (incineration) of a substance (**final product = upholstered furniture**) in function of **exposure conditions** is defined in **OEDC (Organisation of economic co-operation and development**).

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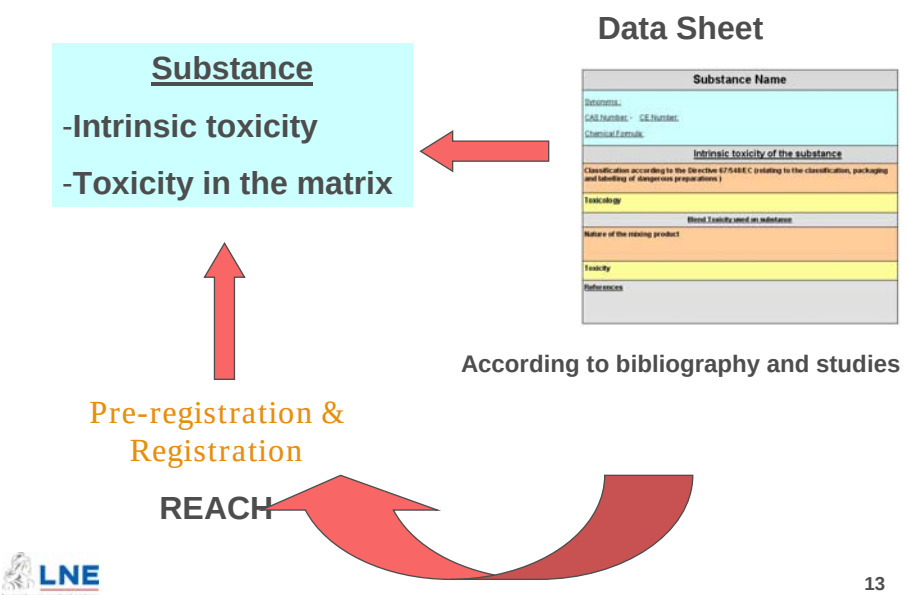
At LNE, data sheet, REACH and upholstered furniture ….



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Example of data sheet

Substance Name
Synonyms : CAS Number: - CE Number: Chemical Formula:
Intrinsic toxicity of the substance
Classification according to the Directive 67/548/EC (relating to the classification, packaging and labelling of dangerous preparations)
Toxicology
Toxicity of the mixture substance + matrix
Nature of the mixing product
Toxicity
References

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6. Conclusions (1)

❑ The main conclusions of this study are that there is no risk with flame retardant agent introduced in upholstered furniture if:

• **The flame retardant agent itself, and the flame retardant agent introduced in the matrix (final product) are both compliant with REACH requirements (health).**

- This includes considerations about:
  - the absence of risk due to the substances,
  - the process (fixation mode of the agent),
  - the ways of contamination (skin contact, exposition by inhalation)
  - the environmental impact with incineration (as a normal step in the life-cycle of the products).

• **The upholstered furniture is compliant with fire reaction scenarios of EN 1021-1 and EN 1021-2 (safety).**

- In this case, the maximum destructed zone compatible with the requirements leads to a maximum mass loss that produces an amount of toxic gases not sufficient to induce a toxic risk, whether the product is flame-retarded or not.

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6. Conclusions (2)

1. Risks and benefits in the use of flame retardant in upholstered furniture are demonstrated according to the General Safety Products Directive (GSP) (with REACH and standards for safety requirements)

2. This Directive (GSP) is generally applicable to :
   - ❑ Other additives (antioxidants, UV stabilizers…)
   - ❑ New Consumption products

3. Be careful to evaluate the safety risk, it is necessary to consider if fire scenario is representative of the risk :
   - ❑ Fire scenarios (standards)
   - ❑ Scenarios of OECD give information on models employed and evaluations of release of chemicals in environment

4. Our study was limited to upholstered furniture, and so to flame retardants used in this fields

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Thank you for your attention !