

# **Formaldehyde situation in Europe: a French view What solutions for the future ?**

# WHO ARE WE ?

**UIPP is the French wood based panels Association**

**99% of particle board, 100% of MDF and 100% of OSB makers are members of the Association**

**The total production of UIPP members for 2011 was over 5 million of cubic meters.**

**More than 3,000 workers are employed in this industry sector.**

**Aminoplastic resin consumption is about 450,000 to 500,000 tons annually**

## REMINDER

### In the World

**In June 2004, IARC classified formaldehyde as C1A carcinogen (previous classification: C2)**

**Consequently, the reassessment of the EU classification has been blocked...**

**IARC in 2009 confirmed the classification of formaldehyde and extended it to myeloid leukaemia.**

## REMINDER

### In France

- **2006: order of 13 July 2006, processes involving formaldehyde are considered as carcinogen on a regulatory point of view. Consequently, formaldehyde is assimilated to a confirmed carcinogen agent at workplace. It entails obligations whose first is the substitution by less hazardous product.**



## REMINDER

### In France

- **2011: decree of 23 March 2011 and order of 19 April 2011 obligation to label construction products and wall cladding and floor paints and varnishes regarding their volatile pollutant emissions**
- **The classes, measured according to EN ISO 16000-9, are:  $\mu\text{g}/\text{m}^3$**

Classes	C	B	A	A+
Formaldéhyde	120	120	60	10

## REMINDER

### In France

**2011: decree of 2 December 2011, binding indoor long exposure limit value for formaldehyde at 30  $\mu\text{g}/\text{m}^3$  from 1 January 2015 and 10  $\mu\text{g}/\text{m}^3$  from 1 January 2023**

# REMINDER

## In Europe

**2011: REACH "Annex XV" dossier submitted by ANSES behalf of France for an CLP C1A+ M2 harmonised classification of formaldehyde;**

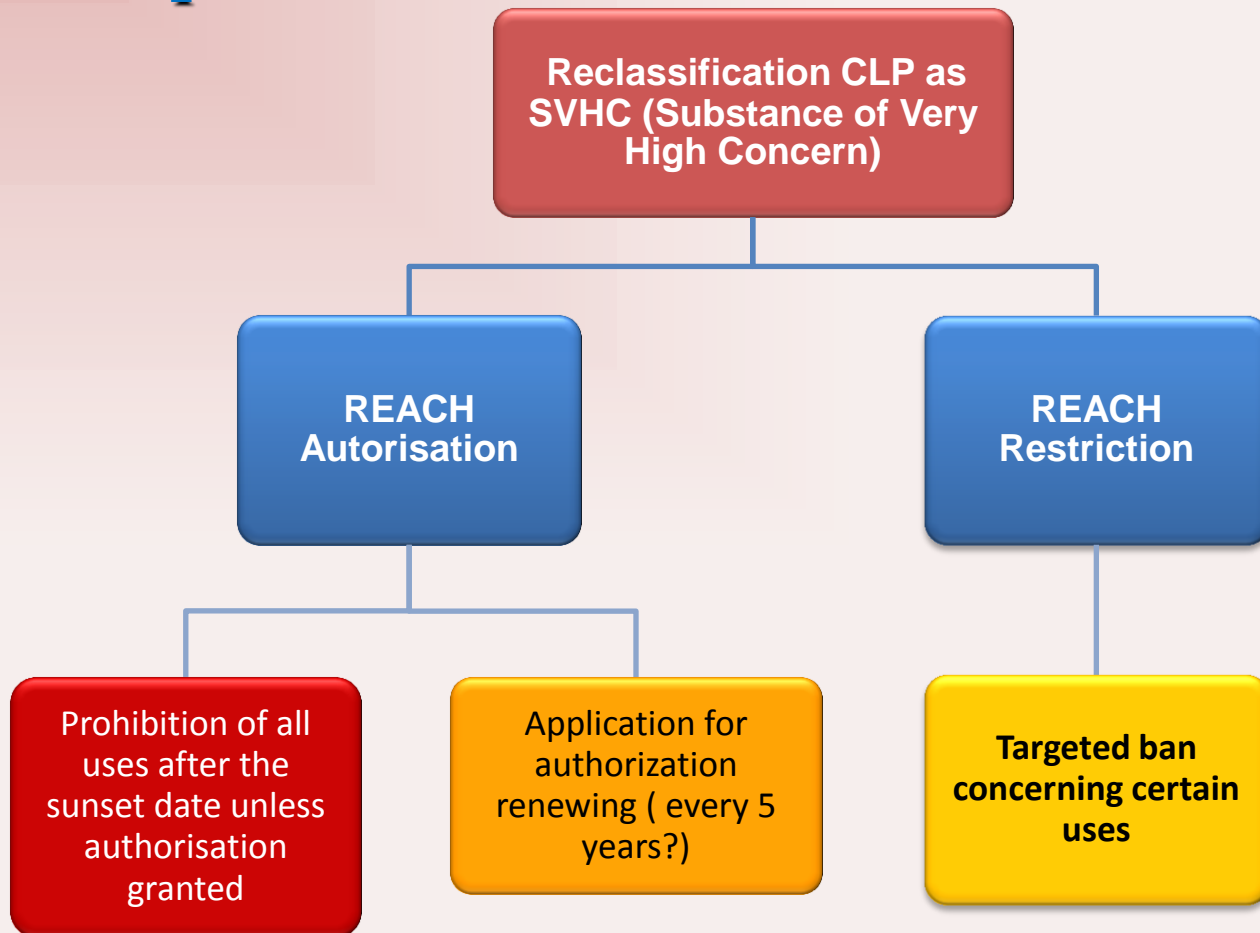
**The Risk Assessment Committee (RAC) of ECHA must render an opinion on the French proposal within 18 months => before 15/06/2013 .**

**A meeting of RAC is scheduled for next November and formaldehyde is on the agenda.**

**Classification (C1A + M2) may be adopted between late 2013 and mid 2014.**

**The two following possible scenarii are expected:**

## In Europe



## In Europe

### Consequences of classification C1A (+ M2)

- **REACH: Formaldehyde is considered as a substance of very high concern and may be eligible for authorization and / or restriction**
- **REACH: prohibition of sale to the general public**
- **REACH obligation of information about articles (panels, furniture ...) containing more than 0.1% (w/w) considering each subset Article separately.**

## **In Europe**

### **Consequences of classification C1A (+ M2)**

**Health and Safety at Work obligation to seek an alternative**

**Increased regulatory constraints on all markets like biocides, plant protection products, cosmetics, boards**

**...**

**In total reinforcement in the level of regulatory constraints and pleasure of stakeholders for a substitution**

### Consequences of classification C1A (+ M2)

#### **Product and public exposure**

**Formaldehyde, considered as very high concern substance could be banned for sale.**

**In addition, image, vis-à-vis the general public, of products containing Formaldehyde (panels, furniture made with wood based panels ....) could be extremely degraded.**

**Demands would be made on products  
« Formaldehyde -free »**

**What is the current situation regarding formaldehyde at workplace?**

- In Europe**
- In France**



## In Europe

**Current value (indicative) is 0.5 ppm TWA and 1 ppm short term.**

**SCOEL has made a proposal for an exposure limit value at workplace. This value is still under discussion and will be indicative only.**

**The suggested value is 0.2 ppm for TWA and 0.4 ppm for short-term value (short term 15 min).**

## In France and Europe

- **Currently the workplace indicative exposure limit value is 0.5 ppm. Authorities are awaiting the decisions taken by the European Commission.**

**Following the Triebieg study, SCOEL has not yet officially give its position!**

**What is the situation regarding formaldehyde in the product?**

- In Europe**
- In France**

## In Europe

**Requirement for CE marking of the construction's panels with reference to formaldehyde class**

**In the framework of EPF, EU Panel manufacturers decided in 2007 to produce only class E1 panel: i.e. with emissions of less than 124  $\mu\text{g}/\text{m}^3$  measured according to the reference standard EN 717-1**

**Today, all manufacturers decide moving to a lower class that would be the class E1+ for which the emission value is 80  $\mu\text{g}/\text{m}^3$  measured according to the reference standard EN 717-1**

## In France

The French manufacturers of panels unanimously decided in 2005 to manufacture E1 class raw panel

French manufacturers are also moving to panels with very low formaldehyde content

**Formaldehyde is amongst the most challenged substances for its suspected health impact.**

**Today, the panel industry, larger user of products based on formaldehyde\*, faces a situation that could be described as a paradigm shift.**

**Certainly one of the biggest challenges of his life**

*More than 50% of the formaldehyde produced in the world is used for the resin production and about 90 % of these resins are used in the production of wood based panels*

**The French manufacturers gathered in UIPP, decided to perform an inventory of existing techniques on the reduction or substitution of formaldehyd.**

**This study was conducted by the company RESCOLL\* on behalf of the UIPP.**

**Here is a brief summary of the study**

*\* RESCOLL: Chemicals laboratory in Bordeaux, Managing Director : José ALCORTA*

For information

# Members of the steering committee of the study

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**In addition to formaldehyde issue, the key criteria of the survey was:**

- **Health and safety aspects,**
- **Availability of raw materials which are required to the binders production,**
- **Cost of these raw materials,**
- **Resins' reactivity,**
- **Performances of panels (internal bond strength, modulus of elasticity, water resistance, ...)**
- **Capability to transfer from lab to industrial process taking into account the state of existing facilities**

# Chemical way

## 1. Use of formaldehyde catchers :

- urea (*relatively low cost*) addition
- melamine [7] (1-4 %, liquid basis) This corresponds to UF resins doped/fortified with melamine (UFm or mUF resins), already used in industry.
- ammonia (post treatment catcher) : abandoned solution
- Kaurit® Plus / BASF (post treatment catcher)
- CHIMAR HELLAS systems

# Chemical way

## 1. Use of formaldehyde catchers :

- resin MUF + scavenger + special hardener, tested on particleboards (industrial scale) [ACM Wood Chemicals PLC]
- dihyhydrazides, tested on particleboards *decrease of formaldehyde emissions, with a relatively low quantity of catcher (best reduction obtained with 1 % m/m) // no information about panels properties*
- sodium pyrosulfite *strong decrease of formaldehyde emissions // encapsulation necessary & long-term effects of catchers*

## Chemical way

### 2. Use of binders based on isocyanates :

#### Use of binders based on isocyanate prepolymer

Nowadays, pMDI is the only alternative method used in the industry (particleboards, MDF and OSB). Nevertheless, the implementation for the whole panel industry requires a high technological level

#### Combined use of UF resins and isocyanates prepolymer:

The manufacture of some panels can also use isocyanates (core) in combination with PF or MUPF resins (surface).

## Chemical way

### 3. Other solutions

- modification of UF resins with nanoparticles *interesting results, but uncertainties regarding effects of nanoparticles on health*
- increase of the pressing temperature [FFIF] (Finish Forest Industry Federation)
- addition of additives reacting during the pressing [FFIF]
- use of binders based on PVAC (polyvinyl acetate) *Tested only for bonding decorative paper*

# Bio way

## Use of lignin

*The lignin is a natural and renewable raw material. It is present in abundant quantities and has a low cost and an important substitution potential (natural polymer network cross linked and branched).*

*But, due to its inertia, it must be activated to make it effective as an adhesive.*

# Bio way

## Use of lignin

**Use pure lignin** has no interest in the industry due to the loss of reactivity

**Reactivation of lignin at high temperature over 300°C** *solution used in Finland (up to a full production line), but abandoned because of the effects of the high temperature with a degradation of the mechanical properties, aspect of the board and high energy cost*

# Bio way

## Use of lignin

**reactivation of lignin by enzymatic oxidation** *no more information*

**chemical reactivation of lignin by use of hydrogen peroxide ( $H_2O_2$ ) and implementation with a catalyst of reaction** : semi-industrial tests in Sweden and USA; no other information obtained

**reactivation of lignin, modifying it genetically**: this method could be envisaged



# Bio way

## Other products

Use of corn starch

Using green algae

Other possibilities like oilseeds

# CONCLUSION

## Chemical way

**No economically viable alternative could have been therefore detected (except pMDI for some uses).**

**In these conditions, it seems difficult to propose additional improvement ways from petrochemical products only.**

# CONCLUSION

## Bio way

**Natural materials have several disadvantages:**

**their availability, alone or overlooked other products**

**their properties : the mechanical properties of panels produced with vegetable resins do not reach those of current products,**

**uncertainties about health and safety (no information about health impact). This requires studies to determine their degree of toxic hazard**

**their maturity : several technologies have not been tested at industrial scale yet ; the next step will be consequently to transfer these technologies from labs to industrial facilities**

# CONCLUSION

**Concerning chemical way and bio way, one of the main criteria identified for the evaluation of the substitution solutions is the available quantity for the production of boards (e.g. the French annual production of panels need more than 450 000 t of resins).**

# General conclusion

The resins usable in the referred application must comply with a number of characteristics:

- possible use with a simple adaptation of the production line,
- supply of large quantities,
- cost compatible with the application,
- respect of products characteristics,
- lower risk to the environment, health and safety, than those of current solutions.

**Consequently, as in the last studies, no « panacea » can be proposed, we only can identify ways providing a partial answer to the problem.**

**Today little or no solutions  
applicable to the industry panels!**

**Perhaps in the near future .....!**

**Thank you very much for your attention**