

Testing for Excellence

An International Perspective on the
CARB Regulation Order 93120

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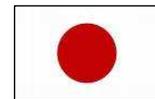


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Hi-Tech Manufacturing



- High Degree of Automation
- Formaldehyde Regulations since 1990 in Europe



Mature Process Control and Quality Assurance in production Process.

Strong emphasis on environmentally friendly products.

Possibility for Domestic Producers to Increase Markets to E1 (Europe and Japan)

Urban Wood Waste Recycling – limited by regulation?

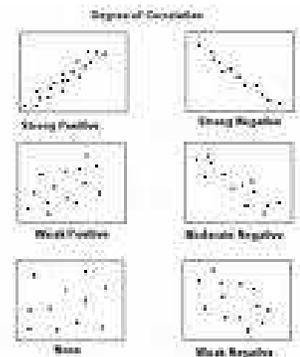


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Correlation of Test Methods?

- Do test Methods correlate and is international harmonization of standards a possible?
- Translation of Perforator to Chamber methods
- Surface Emission vs. Total Content Analysis

Individual Mills correlate panels emission values for each product individually, but ...



... particleboard, MDF, HW plywood as a group cannot be correlated. Wood is a **Variable natural product**, surface characteristics differ from product to product.



Create a 'passport' for panel products that allows them to be Traded across boundaries.

Adhesive Plants in Developing Countries



Resin Kettle

Methanol Tank

- Adhesive Manufacturers in developing countries may not have process control and QA measures to supply low -formaldehyde glue systems.
- Significant Technology Transfer and Capital Investment would be required to raise standards.

Plywood Manufacturers in Asia



> 6,000 microscale
Manufacturing mills in
Shengdong Province, PRC

Unregulated production

Manual labor intensive
industry



- Micro-scale Manufacturing and Family Ventures
- Lack of QA System and Control Equipment
- Unawareness of Formaldehyde Emission Standards

Access to Testing and Markets

- Will manufacturers of developing countries with small production volume have fair access to Testing Laboratories and market?

Large Chamber Testing Capacity

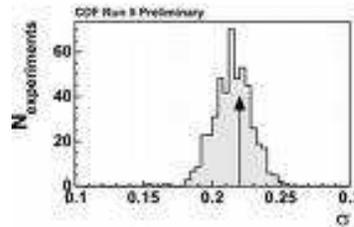
Number of ASTM E1333 Test Chambers	Yearly Test Capacity (quarterly – 300d)
10	3,000
50	15,000
100	30,000
500	150,000

ASTM E1333 Tests Required

Number of Primary Mills	5 Panel Products	4 Test per quarter
100	500	2,000
500	2,500	10,000
1,000	5,000	20,000
5,000	25,000	100,000
10,000	50,000	200,000

Lower Limit of Detection

- **Uncertainty** of analytical methods may be close to proposed **0.03 ppm** limit.

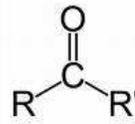


$C_{\text{bkg}} = 0.01 \text{ ppm}$ and $C_{\text{obs}} = 0.01 \text{ ppm}$

$$\sigma = \sqrt{B^2 + C^2} = \sqrt{0.01^2 + 0.01^2} = \underline{\underline{0.014 \text{ ppm}}}$$

At 97.9% confidence i.e. 3 sigma : $x \text{ ppm} \pm 0.042 \text{ ppm}$

Analyte Interferences and Background



Nitrous Oxides NO_x and Ozone O_3 elevate chamber background
Acetaldehyde, MIBK
Hexanal ... other aldehydes and ketones

- **At the trace level (say 50 ppb and less) other compounds may be present that form similar reaction with chromotropic acid.**
- **The minimal detectable concentration of formaldehyde by chromotropic acid is 0.04 ppm¹⁾.**

¹⁾Committee on Aldehydes Eds., *Formaldehyde and Other Aldehydes*.
NRC National Academy Press, Washington D.C. 1981. 340p

Discussion Points

1. Correlation and Harmonization of Standards
2. Equal access to laboratories, certifiers, and inspection services
3. Testing Capacity (number of laboratories).
4. Interferences at trace level and detection limit
5. ASTM E1333 Chamber Background (± 0.01 ppm)
6. Benefit of the CARB program to domestic manufacturers to export products to other formaldehyde regulating countries (F-Star in Japan and E1 in Europe)?

