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TECHNICAL REPORT No. 326966

Place and date of issue: Bellaria-Igea Marina - Italy, 05/08/2015

Customer: COLORIFICIO ATRIA S.r.l. - Contrada Camarro - Formeca - 91028 PARTANNA (TP) - Italy

Date test requested: 06/07/2015

Order number and date: 67107, 06/07/2015

Date specimen received: 15/07/2015

Test date: from 15/07/2015 to 04/08/2015

Purpose: verification of paints that absorb formaldehyde in the air in order to assess indoor pollution

Specimen origin: sampled and supplied by the Customer

Identification of specimen received: No. 2015/1501

Specimen name*

The specimen under examination is called “ATRIATHERMIKA GREEN”.

Description of specimen*

The specimen under examination is a sheet of inert material, nominal size 200 mm × 300 mm, coated with white interior paint.

(*) according to that stated by the Customer.

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Method

This document describes the work performed in order to verify the absorption of formaldehyde in the air by white interior paint.

Testing involves placing inside a stainless-steel VOC chamber, capacity 60 l, a known quantity of paint, amounting to 400 ml/m², applied in 3 coats to an inert substrate.

Inside the chamber there is a ventilation fan for continuous air circulation in order to avoid stratification; The clean air change rate is 0,5 changes per hour.

Testing was performed by setting thermodynamic and kinetic parameters in accordance with standards UNI EN 717-1:2004 dated 01/12/2004 “Wood-based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method” and UNI EN ISO 16000-9:2006 dated 06/07/2006 “Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method”, as shown in the following table:

Temperature	(23 ± 2) °C
Relative humidity	(50 ± 5) %
Air velocity	0,1-0,3 m/s
Air change rate	0,5 changes/h

The test involves the following steps:

- determination of emission from the “blank” and slope of its curve;
- determination of absorption by specimen.

For all tests, a known quantity of liquid formaldehyde on a slide is placed in the chamber and contaminates the air by evaporating. As the air leaves the chamber, it passes through a series of water-wash absorption columns, capacity 50 ml for the first two and approx. 250 ml for the third.

A pump is also used to aspirate outgoing air and a flow meter to monitor the litres passing through the chamber and absorption columns.

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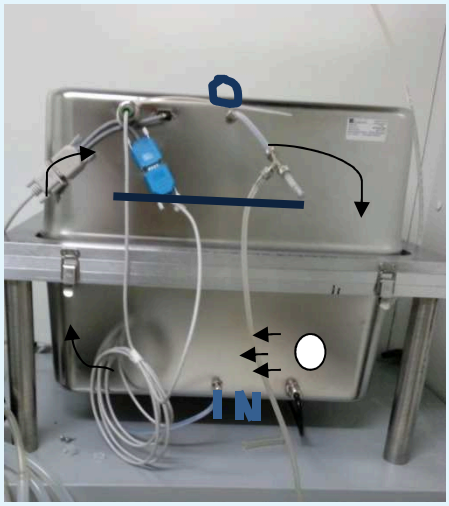

Photo of the emission chamber
The white circle at the bottom indicates the fan and the arrows the direction of air recirculation.
The paint specimen is shown by the blue line at the top.
At the bottom, we can see the clean air inlet port marked by “IN”
and at the top the contaminated air outlet port marked by “O”.

Results

Determination of emission from the blank and slope of its curve

Inside the chamber, a known quantity of formaldehyde is injected onto a slide and the test started with immediate recirculation.

Sampling is performed periodically, recording the litres of air passing through the chamber during the chosen range of time, taking the three aliquots of distilled water from the absorption columns and filling them with fresh water.

Laboratory analysis of the solution collected is then performed using a UV-VIS spectrophotometer and a special formaldehyde-determination kit; the instrument operates at a wavelength of 413 nm and the result provided is expressed in mg of formaldehyde per litre of water.

The concentration found is then multiplied by the litres of water sampled in order to obtain the total number of mg of formaldehyde passing through the columns.

The amounts of formaldehyde sampled during testing are given in the following table and plotted in graph “1” as a function of time/sampling period.

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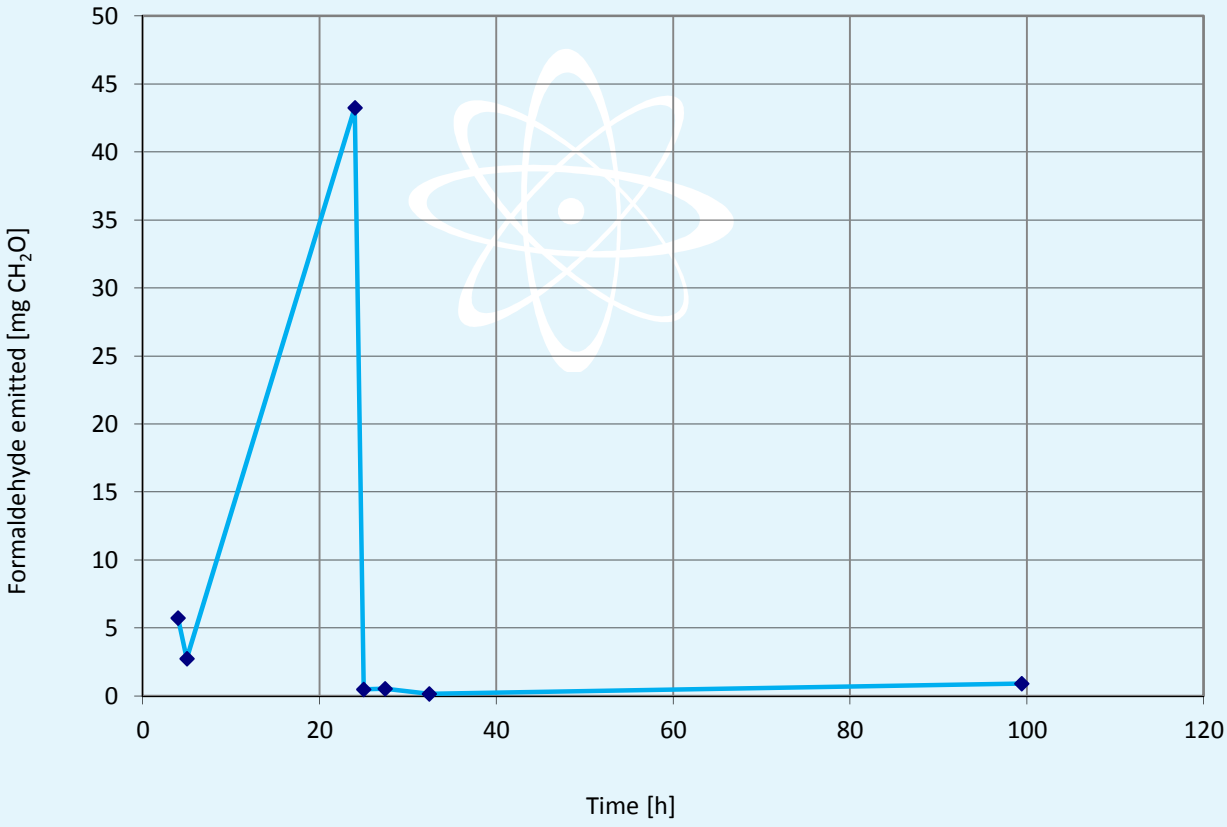
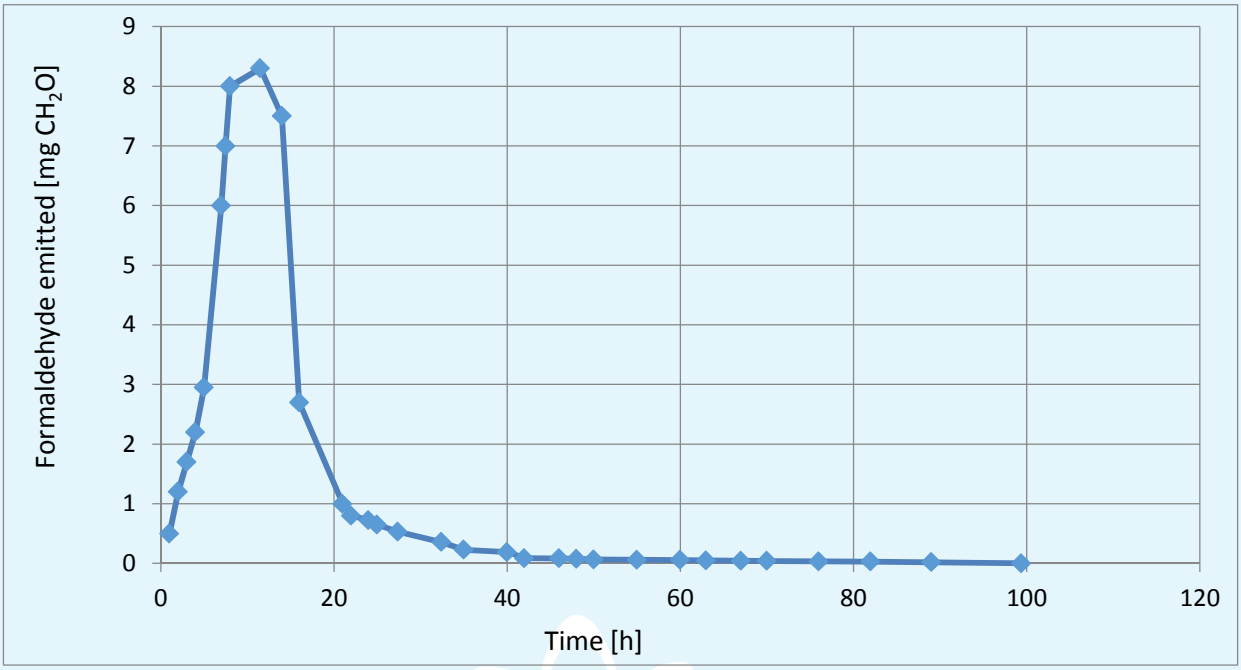
Sampling time [h]	Formaldehyde emitted [mg]
0-4	5,71
4-5	2,74
5-24	43,25
24-25	0,48
25-27	0,53
27-32	0,15
32-99	0,91



Graph "1": expression of formaldehyde emissions as a function of sampling time

The points shown on graph "1" are the result of cumulative sampling of one or more hours; in order to facilitate reading of the formaldehyde emission curve, we have produced an emission distribution based on logical assumption as shown by graph "2".



Graph "2": emission curve with assumed data distribution

The slope of the curve in graph "2" shows us that formaldehyde emission reaches its peak within the first 24 h before dropping sharply and plateauing out.

In quantitative terms, total emitted formaldehyde is always less than the amount injected; clearly, a part does not evaporate, remaining bound to a solid residue found on the slide at the end of each test.

When evaluating abatement, logic dictates that reference be made to the quantity emitted and not the total amount injected.

Having established the maximum emission/release time, of approx. 24 h, a second blank test is performed, but this time the specimen of liquid formaldehyde is left in a "steady state" for 72 h, i.e. by not exchanging the air but recirculating it using the internal fan; the air inlet and outlet ports are then reopened with 0,5 volumes/h and single sampling after 24 h, this being cumulative for entire test period.

Of the 20 mg of formaldehyde placed in the chamber, 14,1 mg had been sampled after 24 h; sampling after 25 h showed only residual traces at the outlet.

Determination of absorption with the specimen

Having completed the test to determine the blank value, the apparatus is once again readied, placing in the chamber a slide with 20 mg of formaldehyde, as in the case of the blank, and the glass panel, nominal size 200 mm × 300 mm, coated on one side with the paint under examination.

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Photo of open chamber with specimen and glass slide containing the formaldehyde requiring abatement

The paint specimen is therefore brought into contact with the air contaminated by formaldehyde for 72 h.

There is no air exchange, but fan-forced air circulation ensures optimum absorption.

At the end of the 72 h, fresh, clean air is introduced and at the same time air leaving the chamber is sampled for 24 h.

Sampling and analysis methods are identical to those used for determination of emission from the blank and slope of its curve.

Water analysis after 24 h shows formaldehyde concentrations below instrument detection limits, i.e. 0,5 mg/l, thus falling to total formaldehyde values of less than 0,2 mg and thereby demonstrating the system's effectiveness.

The result refers to a single test and determination for both blank and specimen.

Chief technician:
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Dott. Oscar Filippini

Chief Executive Officer
(Dott. Arch. Sara Lorenza Giordano)

Firmato digitalmente da SARA LORENZA GIORDANO